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Supplementary information

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Copper-catalysed enantioconvergent *O*-alkylation of alcohols with racemic α-tertiary haloamides to access enantioenriched hindered dialkyl ethers

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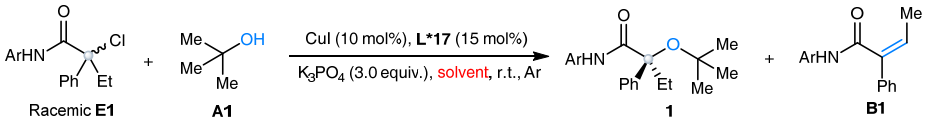
Supplementary Methods

General Information

Most of the reactions were carried out under argon atmosphere using Schlenk techniques. Reagents were purchased at the highest commercial quality and used without further purification, unless otherwise stated. $Cu(OTf)\cdot tol_{1/2}$ and $Cu(NTf_2)_2$ were purchased from Bide Pharmatech Ltd. CuI was purchased from Sigma-Aldrich. Anhydrous 1,2-dichloroethane (DCE) was purchased from J&K Scientific and stored under argon. K_3PO_4 was purchased from Bide Pharmatech Ltd, which was dried at 250 ℃ for 3 h in vacuum. Analytical thin layer chromatography (TLC) was performed on precoated silica gel 60 GF254 plates. Flash column chromatography was performed using Tsingdao silica gel (60, particle size 0.040–0.063 mm). As the eluent, the petroleum ether (PE) and EtOAc were purchased from Shanghai Titan Scientific Co. Ltd without further purification. Visualization on TLC was achieved by use of UV light (254 nm), iodine or basic $KMnO_4$ indicator. NMR spectra were recorded on Bruker DRX-400 spectrometers at 400 MHz for ^1H NMR, 100 MHz for ^{13}C NMR and 376 MHz for ^{19}F NMR, respectively, in $CDCl_3$ with tetramethylsilane (TMS) as internal standard. The chemical shifts were expressed in ppm and coupling constants were given in Hz. Data for ^1H NMR are recorded as follows: chemical shift (ppm), multiplicity (s, singlet; d, doublet; t, triplet; q, quartet; p, pentet, m, multiplet; br, broad), coupling constant (Hz), integration. Data for ^{13}C NMR were reported in terms of chemical shift (δ, ppm). Mass spectrometric data were obtained using Bruker Apex IV RTMS. Enantiomeric excess (e.e.) was determined using Agilent high-performance liquid chromatography (HPLC) with a Hitachi detector. Column conditions were reported in the experimental section below. Specific optical rotation was measured on a Rudolph-Autopol I. X-ray diffraction was measured on a “Bruker APEX-II CCD” diffractometer with Cu–Kα radiation.

Supplementary Tables for Experiments

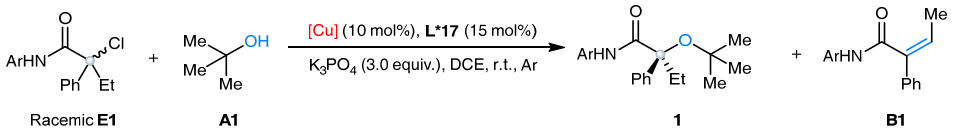
Supplementary Table 1. Reaction condition optimization with α-tertiary haloamide **E1** and *tert*-butanol **A1**: screening of different solvents



Entry	Solvent	Conv. of **E1** (%)	Yield of **1** (%)	Yield of **B1** (%)	e.e. of **1** (%)
1	DCM	100	79	trace	68
2	DCE	100	82	trace	70
3	$CHCl_3$	100	59	trace	66
4	1,4-Dioxane	50	17	13	69
5	THF	93	25	13	38
6	MTBE	10	4	trace	65
7	Cyclohexane	25	14	trace	68
8	EtOAc	91	40	8	47
9	PhCl	100	86	trace	63
10	MeCN	87	39	12	12
11	DMF	100	trace	15	ND

Reaction conditions: **E1** (0.05 mmol), **A1** (1.5 equiv.), CuI (10 mol%), **L*17** (15 mol%) and K_3PO_4 (3.0 equiv.) in solvent (0.50 mL) at room temperature (r.t.) for 48 h under argon. Conversion of **E1**, yields of **1** and **B1** are based on ^{1}H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. Ar, 4-cyano-2-methylphenyl; ND, not determined.

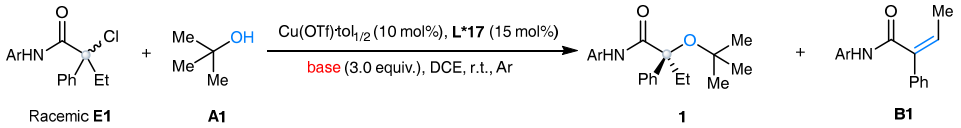
Supplementary Table 2. Reaction condition optimization with α-tertiary haloamide **E1** and *tert*-butanol **A1**: screening of different copper salts



Entry	[Cu]	Conv. of **E1** (%)	Yield of **1** (%)	Yield of **B1** (%)	e.e. of **1** (%)
1	CuI	100	82	trace	70
2	$CuBr_2$	100	76	trace	62
3	CuTc	100	78	5	67
4	$Cu(MeCN)_4BF_4$	100	73	6	64
5	$Cu(OAc)_2$	100	72	trace	69
6	$CuBr{\cdot}Me_2S$	100	66	trace	64
7	$Cu(OTf)_2$	100	75	trace	69
8	$Cu(PPh_3)_3{\cdot}CF_3$	100	29	56	0
9	$Cu(OTf){\cdot}tol_{1/2}$	100	85	trace	72

Reaction conditions: **E1** (0.05 mmol), **A1** (1.5 equiv.), [Cu] (10 mol%), **L*17** (15 mol%) and K_3PO_4 (3.0 equiv.) in DCE (0.50 mL) at room temperature (r.t.) for 48 h under argon. Conversion of **E1**, yields of **1** and **B1** are based on ^1H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. Ar, 4-cyano-2-methylphenyl.

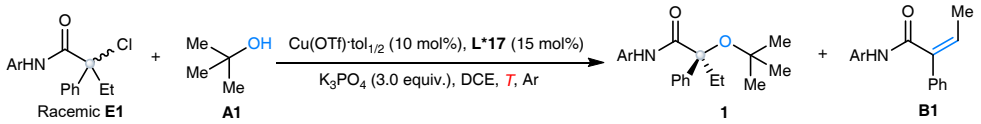
Supplementary Table 3. Reaction condition optimization with α-tertiary haloamide **E1** and *tert*-butanol **A1**: screening of different bases



Entry	Base	Conv. of **E1** (%)	Yield of **1** (%)	Yield of **B1** (%)	e.e. of **1** (%)
1	K_3PO_4	100	85	trace	72
2	K_2CO_3	100	63	trace	60
3	Rb_2CO_3	100	85	trace	60
4	Cs_2CO_3	100	80	5	60
5	$CsHCO_3$	38	17	trace	72
6	KOAc	13	0	trace	ND
7	KH_2PO_4	6	0	trace	ND
8	DBU	51	10	32	0
9	BTMG	90	27	51	2

Reaction conditions: **E1** (0.05 mmol), **A1** (1.5 equiv.), Cu(OTf)·$tol_{1/2}$ (10 mol%), **L*17** (15 mol%) and base (3.0 equiv.) in DCE (0.50 mL) at room temperature (r.t.) for 48 h under argon. Conversion of **E1**, yields of **1** and **B1** are based on ^{1}H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. Ar, 4-cyano-2-methylphenyl; DBU, 1,8-diazabicyclo[5.4.0]undec-7-ene; BTMG, 2-*tert*-butyl-1,1,3,3-tetramethyl-guanidine; ND, not determined.

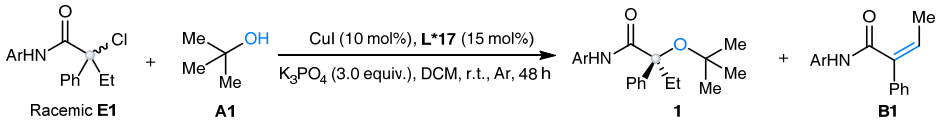
Supplementary Table 4. Reaction condition optimization with α-tertiary haloamide **E1** and *tert*-butanol **A1**: screening of different temperature



Entry	*T* (°C)	Conv. of **E1** (%)	Yield of **1** (%)	Yield of **B1** (%)	e.e. of **1** (%)
1	25	100	85	trace	72
2	10	100	84	trace	78
3	0	100	86	trace	84
4	−10	100	91	trace	90
5[a]	−10	100	84	trace	74

Reaction conditions: **E1** (0.05 mmol), **A1** (1.5 equiv.), Cu(OTf)·tol$_{1/2}$ (10 mol%), **L*17** (15 mol%) and K_3PO_4 (3.0 equiv.) in DCE (0.50 mL) for 5 days under argon. Conversion of **E1**, yields of **1** and **B1** are based on ^{1}H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. [a]**L*10** was used. Ar, 4-cyano-2-methylphenyl.

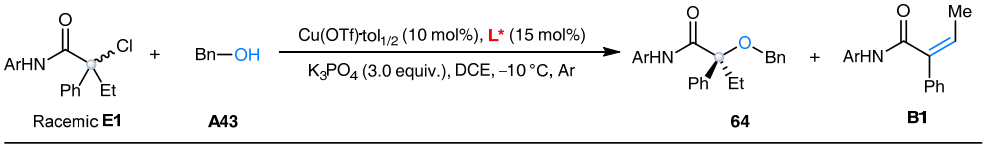
Supplementary Table 5. Reaction condition optimization with α-tertiary haloamide **E1** and *tert*-butanol **A1**: variation of reaction parameters

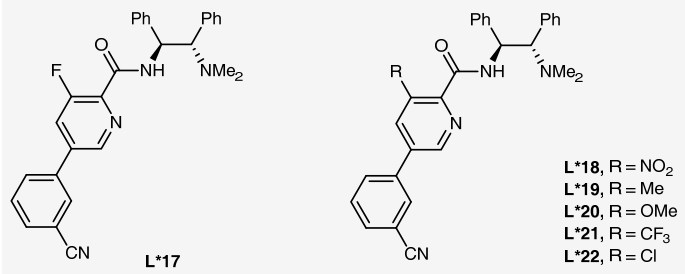


Entry	Conv. of **E1** (%)	Yield of **1** (%)	Yield of **B1** (%)	e.e. of **1** (%)
1[a]	28	20	trace	0
2[b]	88	14	70	0
3[c]	19	13	trace	0
4[d]	91	0	72	ND
5[e]	75	0	8	ND

Reaction conditions: **E1** (0.05 mmol), **A1** (1.5 equiv.), CuI (10 mol%), **L*17** (15 mol%) and K_3PO_4 (3.0 equiv.) in DCM (0.50 mL) at room temperature (r.t.) for 48 h under argon. Conversion of **E1**, yields of **1** and **B1** are based on ^{1}H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. [a]Without CuI. [b]Without **L*17**. [c]Without CuI and **L*17**. [d]Without **L*17** and ^{t}BuOH. [e]Without ^{t}BuOH. Ar, 4-cyano-2-methylphenyl. ND, not determined.

Supplementary Table 6. Reaction condition optimization with α-tertiary haloamide **E1** and benzyl alcohol **A43**: screening of different ligands

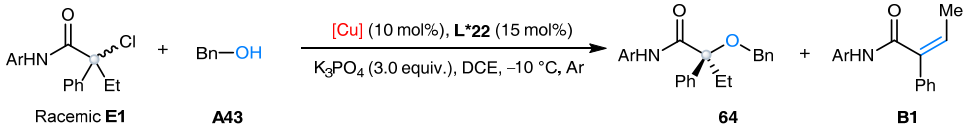




Entry	L*	Conv. of **E1** (%)	Yield of **64** (%)	Yield of **B1** (%)	e.e. of **64** (%)
1	**L*17**	86	77	trace	90
2	**L*18**	65	58	trace	89
3	**L*19**	88	79	trace	90
4	**L*20**	69	67	trace	83
5	**L*21**	71	71	trace	90
6	**L*22**	92	85	trace	90

Reaction conditions: **E1** (0.05 mmol), **A43** (1.5 equiv.), Cu(OTf)·tol$_{1/2}$ (10 mol%), **L*** (15 mol%) and K_3PO_4 (3.0 equiv.) in DCE (0.50 mL) at –10 °C for 5 days under argon. Conversion of **E1**, yields of **64** and **B1** are based on ^{1}H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. Ar, 4-cyano-2-methylphenyl; Bn, benzyl.

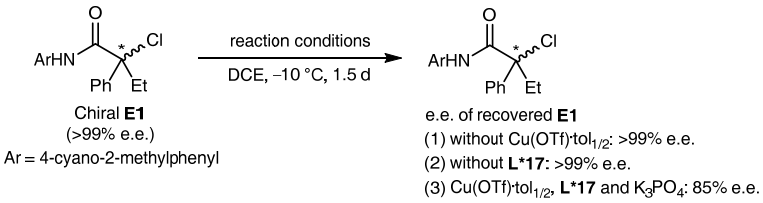
Supplementary Table 7. Reaction condition optimization with α-tertiary haloamide **E1** and benzyl alcohol **A43**: screening of different copper salts



Entry	[Cu]	Conv. of **E1** (%)	Yield of **64** (%)	Yield of **B1** (%)	e.e. of **64** (%)
1	$Cu(OTf)\cdot tol_{1/2}$	92	85	trace	90
2	$Cu(OAc)_2$	27	26	trace	88
3	CuTc	85	77	trace	73
4	$Cu(OTf)\cdot Ph_{1/2}$	91	87	trace	90
5	$Cu(OTf)_2$	100	92	trace	90
6	$Cu(NTf_2)_2$	100	94	trace	91

Reaction conditions: **E1** (0.05 mmol), **A43** (1.5 equiv.), [Cu] (10 mol%), **L*22** (15 mol%) and K_3PO_4 (3.0 equiv.) in DCE (0.50 mL) at –10 °C for 5 days under argon. Conversion of **E1**, yields of **64** and **B1** are based on ^1H NMR analysis of the crude products using 1,3,5-trimethylbenzene as an internal standard; e.e. value is based on HPLC analysis. Ar, 4-cyano-2-methylphenyl; Bn, benzyl.

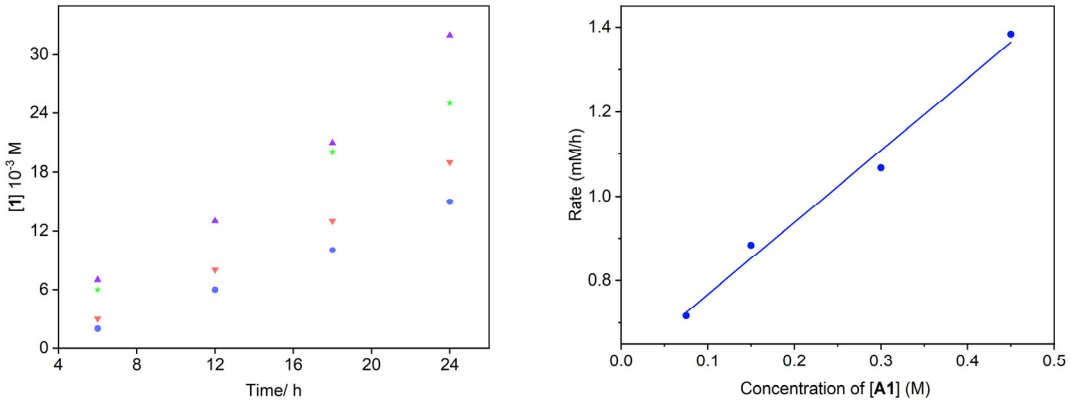
Supplementary Figures for Experiments



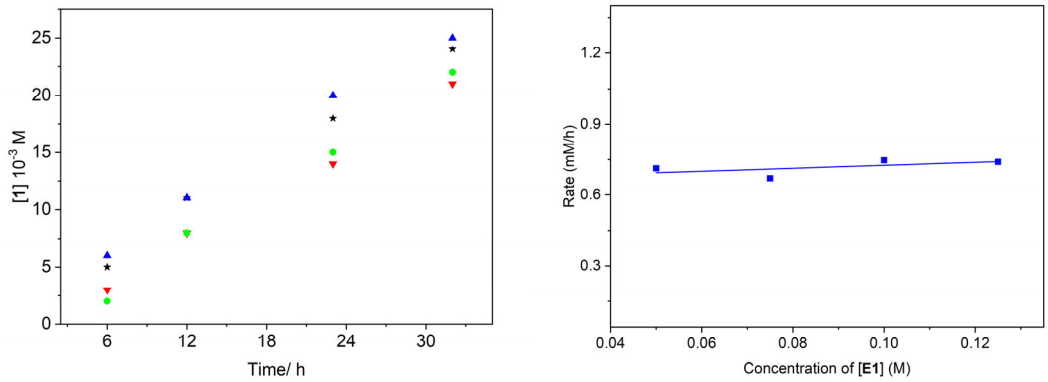
Chiral **E1**
(>99% e.e.)
Ar = 4-cyano-2-methylphenyl

e.e. of recovered **E1**
(1) without Cu(OTf)·tol$_{1/2}$: >99% e.e.
(2) without **L*17**: >99% e.e.
(3) Cu(OTf)·tol$_{1/2}$, **L*17** and K_3PO_4: 85% e.e.

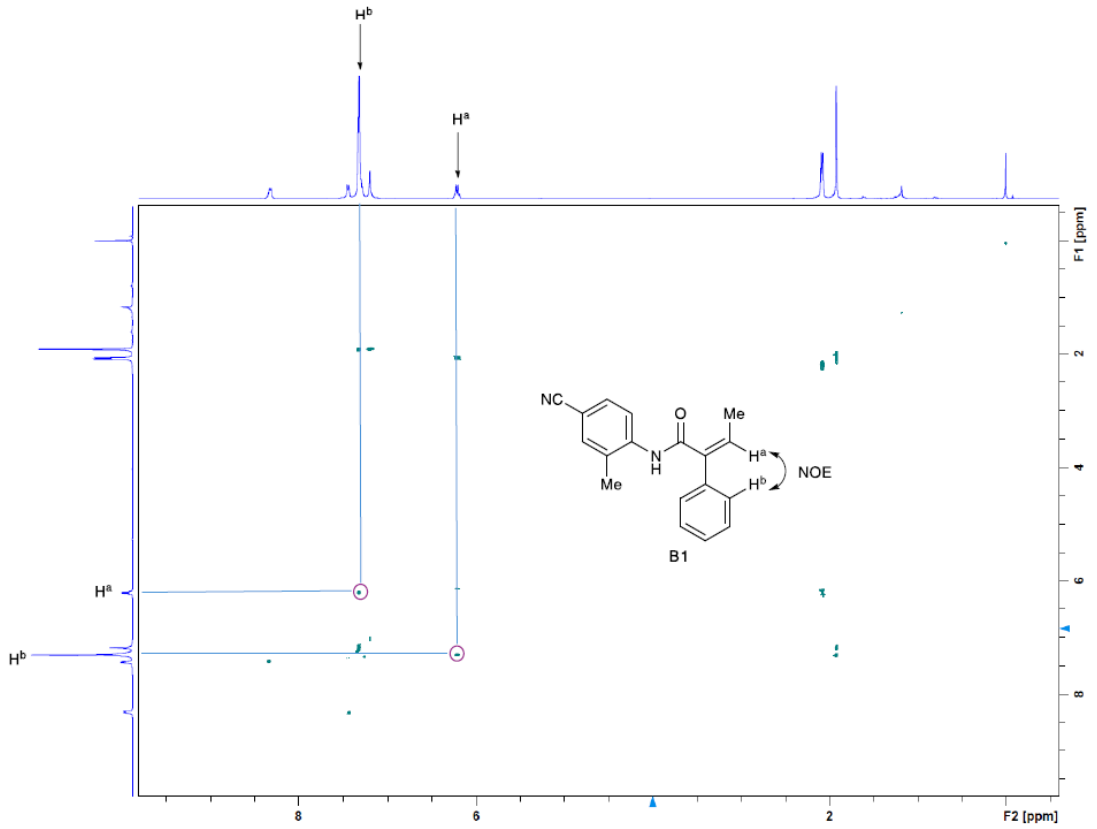
Supplementary Figure 1. The control experiment studies on the racemization of chiral α-tertiary haloamide **E1** under certain reaction conditions.



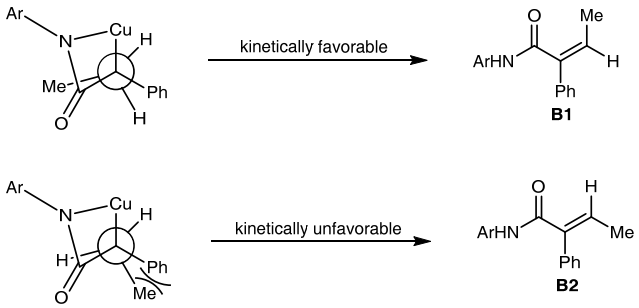
Supplementary Figure 2. Kinetic experiment of the reaction disclosed a first-order dependence of reaction rate on the concentration of tertiary alcohol **A1**.



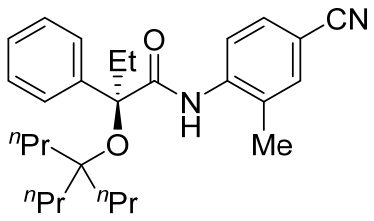
Supplementary Figure 3. Kinetic experiment of the reaction disclosed a nearly zero-order dependence of reaction rate on the concentration of α-tertiary haloamide **E1**.



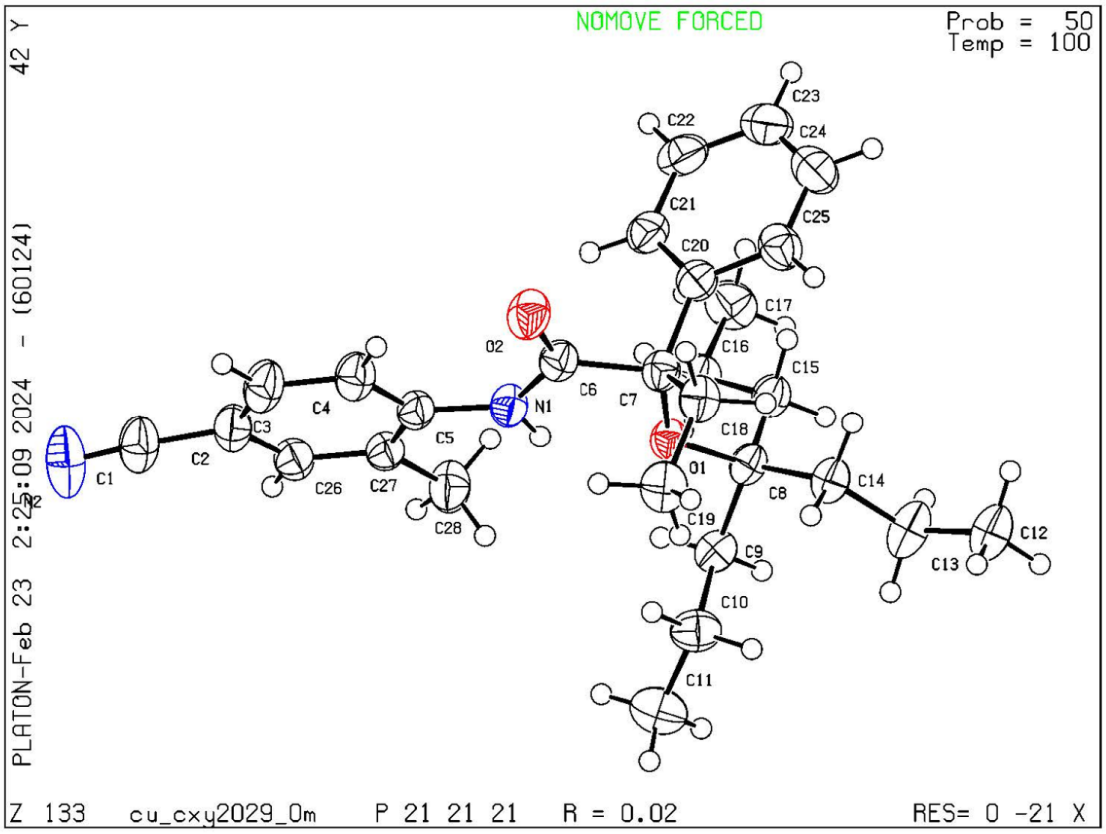
Supplementary Figure 4. 2D NOESY spectrum of **B1** for supporting the formation of (*Z*)-alkene. Strong NOE enhancements were observed between the olefinic hydrogen (H^a) and the *ortho*-hydrogen of the aryl ring (H^b).



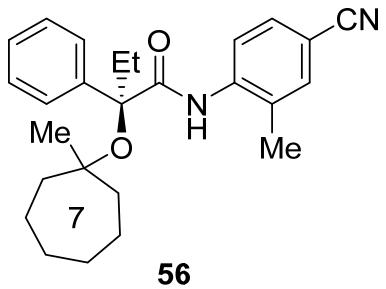
Supplementary Figure 5. The possible kinetic explanation for formation of (*Z*)-alkene **B1**. We speculated that the *Z*-alkene was likely a kinetically-controlled product. Based on our understanding of the process to form the alkene, we proposed a reasonable kinetic explanation for the formation of the *Z*-alkene **B1**.



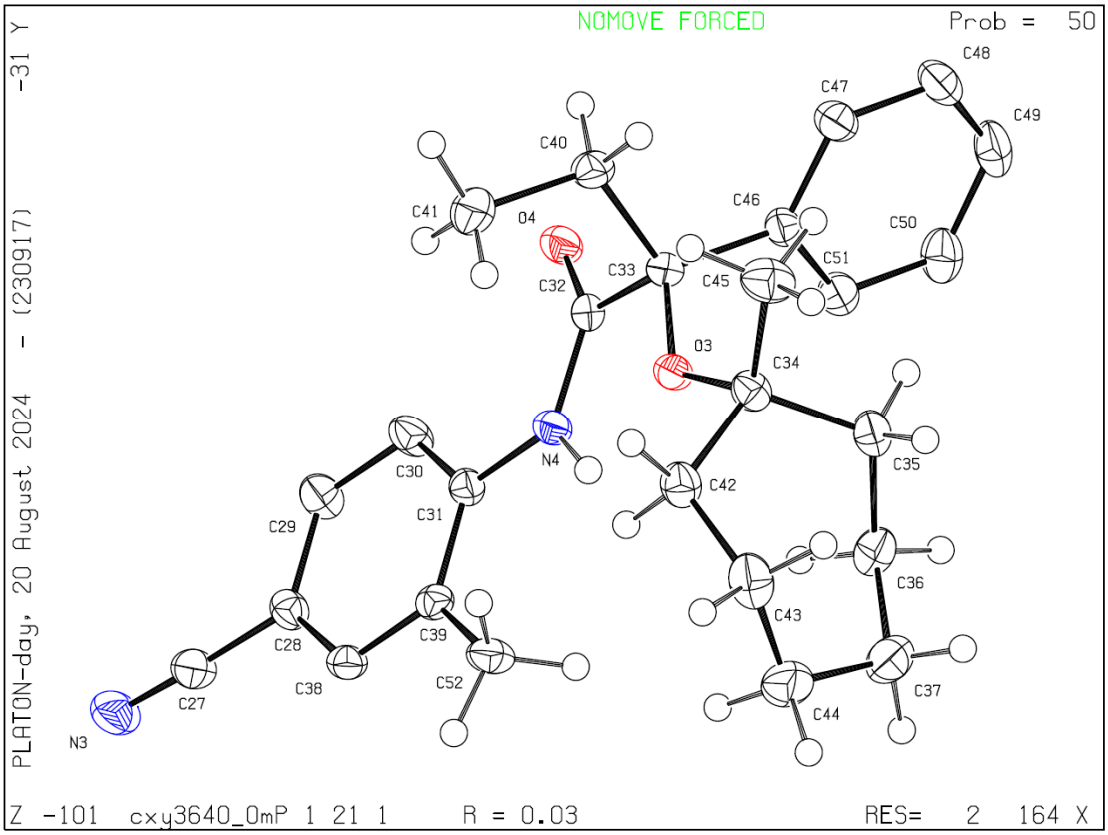
30



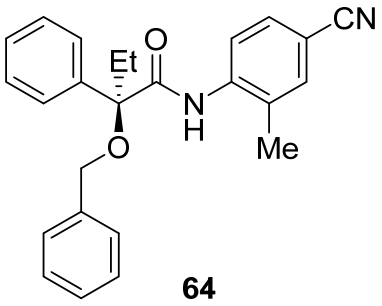
Supplementary Figure 6. The X-ray structure of **30** (CCDC 2386430, 50% probability ellipsoids).



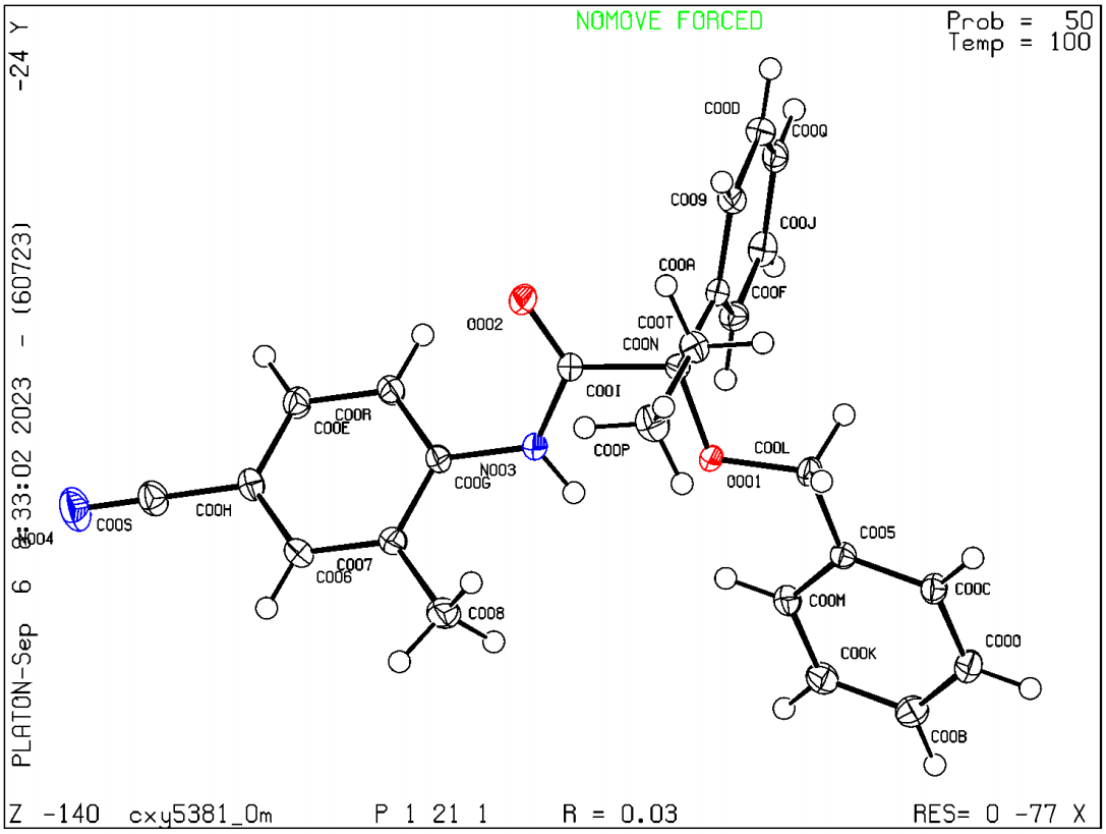
56



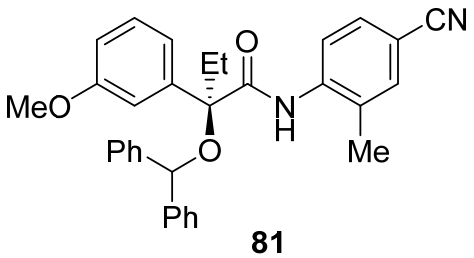
Supplementary Figure 7. The X-ray structure of **56** (CCDC 2386428, 50% probability ellipsoids).



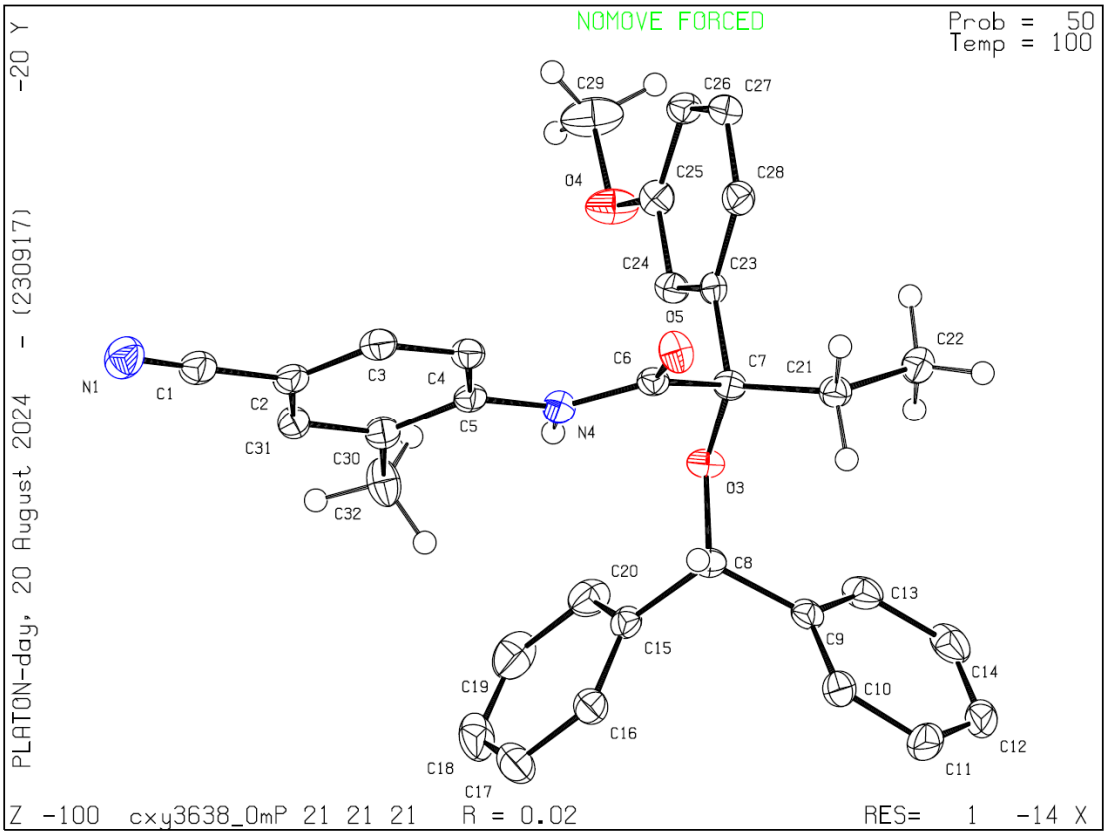
64



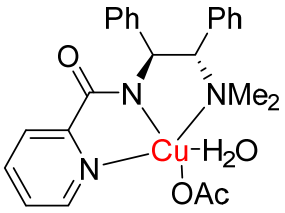
Supplementary Figure 8. The X-ray structure of **64** (CCDC 2386427, 50% probability ellipsoids).



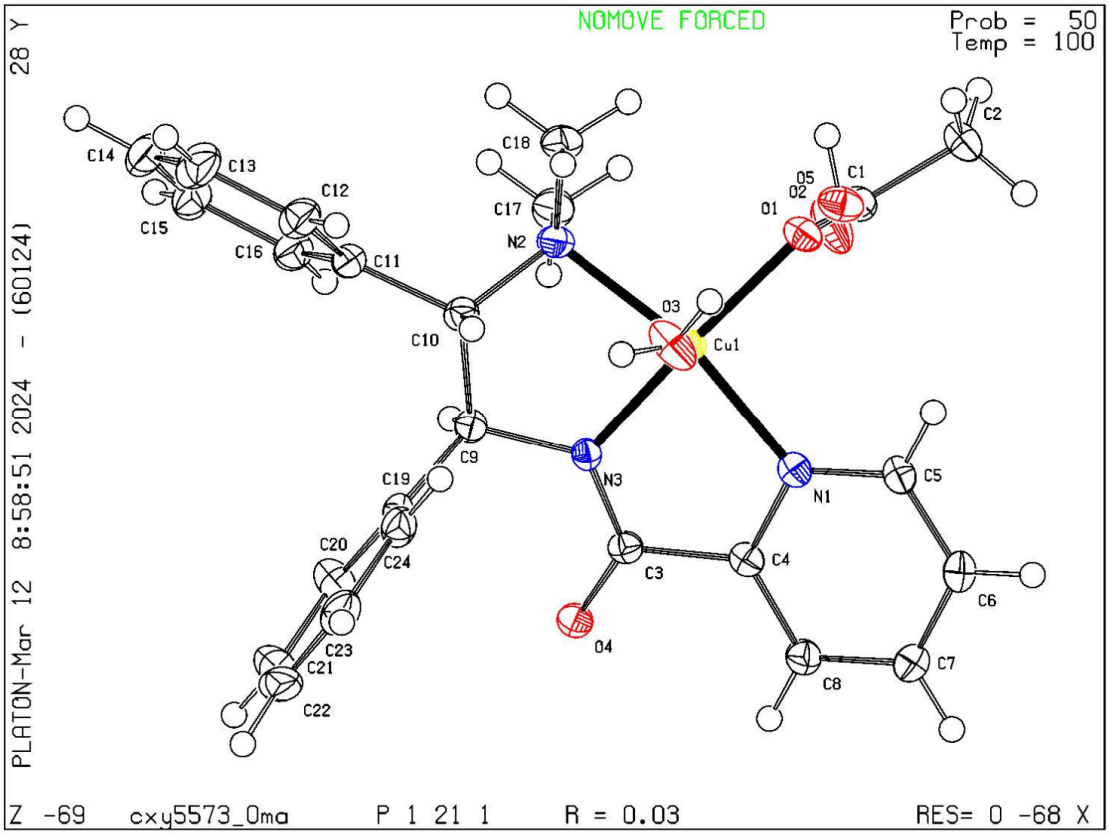
81



Supplementary Figure 9. The X-ray structure of **81** (CCDC 2386429, 50% probability ellipsoids).



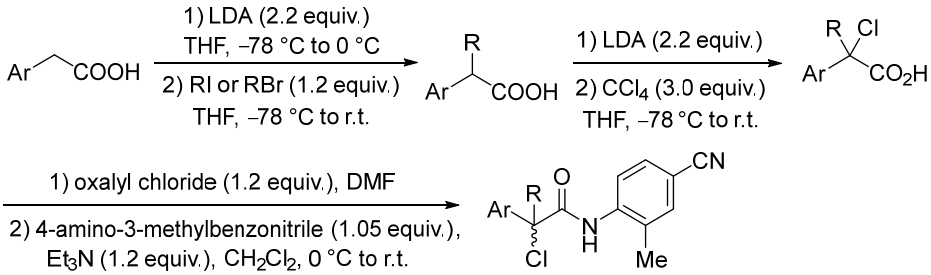
C2



Supplementary Figure 10. The X-ray structure of **C2** (CCDC 2386426, 50% probability ellipsoids).

General Procedures for Synthesis of Substrates and Ligands

Synthesis of α-tertiary haloamides



General Procedure 1:

According to the reported procedure of literature[1] with slightly modification.

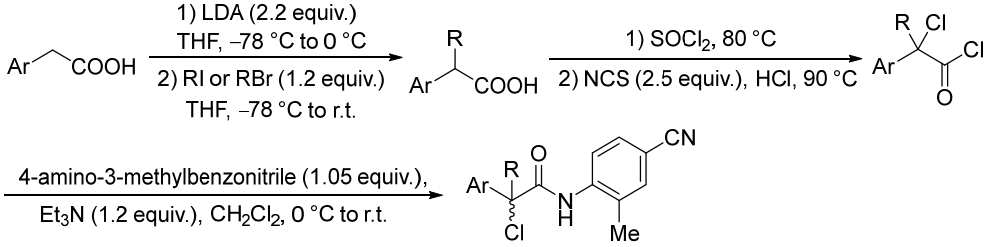
To a solution of aryl acetic acid (10.0 mmol, 1.0 equiv.) in anhydrous THF (30 mL) at −78 ℃ was added LDA (22.0 mL, 2.2 equiv., 1.0 M in THF) via syringe under argon. After being stirred at −78 ℃ for 0.5 h, the reaction mixture was warmed up to 0 ℃ and stirred for another 2 h. Then the solution was cooled to −78 °C again and alkyl iodide or alkyl bromide (12.0 mmol, 1.2 equiv.) was added slowly in one portion. The reaction was warmed up to room temperature over 2 h and stirred overnight. After completion, the resulting solution was quenched with brine, acidified with 1.0 M aqueous HCl solution, and extracted with EtOAc (3 x 10 mL). The combined organic phase was dried over Na_2SO_4, filtered and concentrated to afford the crude acid, which was used directly in the next step without further purification.

To a solution of the above acid in anhydrous THF (30 mL) was added LDA (22.0 mL, 2.2 equiv., 1.0 M in THF) via syringe at −78 °C under argon. After being stirred at −78 ℃ for 0.5 h, the reaction was stirred at 0 °C for another 2 h. Then the reaction mixture was cooled down to −78 ℃ again and a solution of CCl_4 (30.0 mmol, 3.0 equiv.) in THF (5 mL) was slowly added into the mixture. After being stirred at −78 °C for 3 h, the reaction mixture was warmed up to room temperature over 1 h and stirred overnight. After completion, the reaction was quenched with brine, acidified with 1.0 M aqueous HCl solution, and extracted with EtOAc (3 x 10 mL). The combined organic phase was washed with brine, dried over Na_2SO_4, filtered and concentrated to afford the crude α-chloro acid, which was used directly in the next step without further purification.

To a solution of the α-chloro acid in anhydrous CH_2Cl_2 (40 mL) was slowly added oxalyl chloride (1.52 g, 12.0 mmol, 1.2 equiv.) and three drop of DMF at 0 ℃. The reaction mixture was stirred at 40 ℃ for 5 h. Then, the solvent was removed under reduced pressure to afford the α-chloro acid chloride, which was used directly in the next step without further purification.

To a solution of 4-amino-3-methylbenzonitrile (1.39 g, 10.5 mmol, 1.05 equiv.) and Et_3N (1.22 g, 12.0 mmol, 1.2 equiv.) in anhydrous CH_2Cl_2 (40 mL) was added the above α-chloro acid chloride at 0 ℃. After being stirred at 0 ℃ for 0.5 h, the reaction mixture was warmed up to room temperature and stirred overnight. After completion

(monitored by TLC), the reaction was quenched with 1.0 M aqueous HCl solution (20 mL) and extracted with CH_2Cl_2 (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 20/1) to give the tertiary alkyl chlorides.



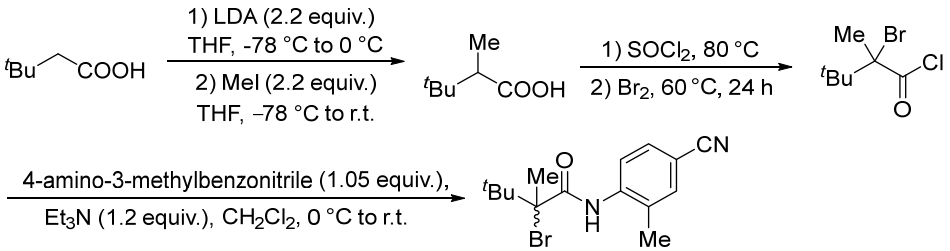
General Procedure 2:

According to the reported procedure of literature[1] with slightly modification.

The obtained crude acid was dissolved in $SOCl_2$ (5 mL), and the resulting solution was refluxed at 80 ℃ for 2 h. Then the mixture was cooled to room temperature, and NCS (3.32 g, 25.0 mmol, 2.5 equiv.), $SOCl_2$ (5.0 mL), and concentrated HCl (4 drops) were slowly added. The resulting mixture was heated at 90 ℃ for 4 h. Then the mixture was cooled to room temperature, the precipitate was filtered off and washed with CCl_4, and the solvent concentrated under reduced pressure. The resulting liquid residue was used in the third step without further purification.

Note: The first step and the third step were same as above **General Procedure 1**.

Synthesis of tertiary alkyl bromide E22



E22

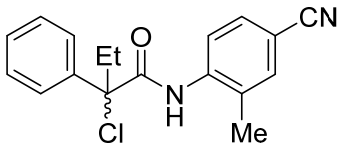
General Procedure 3:

According to reported procedure of the literature[2] with slightly modification.

The crude substituted acetic acid was dissolved in $SOCl_2$ (5.0 mL), and the mixture was stirred at 80 ℃ for 3 h. Then the reaction was cooled to room temperature, and Br_2 (1.6 mL, 30.0 mmol, 3.0 equiv.) and $SOCl_2$ (3.0 mL) were slowly added. The resulting mixture was stirred at 60 ℃ for 24 h. The solvent was concentrated under reduced pressure to remove the $SOCl_2$ and Br_2 to afford the crude α-bromo dialkyl chloride, which was used in the third step without further purification.

Note: The first step and the third step were same as above **General Procedure 1**.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide (E1)



E1

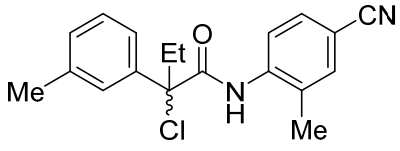
According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E1** as a white solid (2.47 g, 79% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 8.26 (d, *J* = 8.5 Hz, 1H), 7.61 (d, *J* = 7.2 Hz, 2H), 7.53 (d, *J* = 8.5 Hz, 1H), 7.48 – 7.29 (m, 4H), 2.73 – 2.57 (m, 1H), 2.56 – 2.38 (m, 1H), 2.21 (s, 3H), 1.06 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.3, 139.7, 139.6, 133.9, 131.3, 128.8, 128.3, 126.3, 121.0, 118.8, 108.0, 79.9, 34.7, 17.2, 9.4.

HRMS (ESI) m/z calcd. for $C_{18}H_{17}ClN_2NaO$ $[M + Na]^+$ 335.0922, found 335.0920.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-(m-tolyl)butanamide (E2)



E2

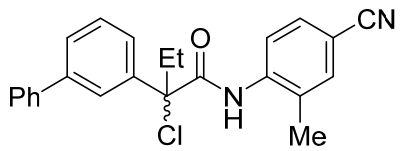
According to **General Procedure 2** with 2-(m-tolyl)acetic acid (1.5 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E2** as a white solid (2.35 g, 72% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (s, 1H), 8.25 (d, *J* = 8.5 Hz, 1H), 7.52 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.46 – 7.43 (m, 1H), 7.42 – 7.37 (m, 2H), 7.33 – 7.26 (m, 1H), 7.17 (d, *J* = 7.5 Hz, 1H), 2.70 – 2.59 (m, 1H), 2.50 – 2.40 (m, 1H), 2.38 (s, 3H), 2.21 (s, 3H), 1.06 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4, 139.6 (d, *J* = 2.1 Hz), 138.6, 133.9, 131.3, 129.6, 128.7, 128.3, 126.9, 123.4, 121.0, 118.8, 107.9, 79.9, 34.6, 21.6, 17.2, 9.4.

HRMS (ESI) m/z calcd. for $C_{19}H_{19}ClN_2NaO$ $[M + Na]^+$ 349.1078, found 349.1079.

2-([1,1'-Biphenyl]-3-yl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide (E3)



E3

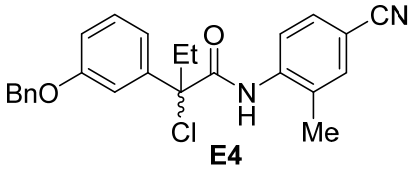
According to **General Procedure 2** with 2-([1,1'-biphenyl]-3-yl)acetic acid (2.12 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E3** as a light yellow oil (2.45 g, 63% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.53 (s, 1H), 8.25 (d, *J* = 8.5 Hz, 1H), 7.84 (s, 1H), 7.62 – 7.55 (m, 4H), 7.54 – 7.42 (m, 5H), 7.41 – 7.34 (m, 1H), 2.78 – 2.64 (m, 1H), 2.57 – 2.44 (m, 1H), 2.22 (s, 3H), 1.10 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.2, 141.9, 140.5, 140.2, 139.5, 134.0, 131.3, 129.2, 129.0, 128.4, 127.8, 127.6, 127.3, 125.2, 125.1, 121.1, 118.8, 108.0, 78.0, 34.9, 17.3, 9.5.

HRMS (ESI) m/z calcd. for $C_{24}H_{21}ClN_2NaO$ $[M + Na]^+$ 411.1235, found 411.1233.

2-(3-(Benzyloxy)phenyl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide (E4)



E4

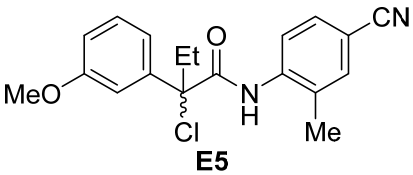
According to **General Procedure 1** with 2-(3-(benzyloxy)phenyl)acetic acid (2.42 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E4** as a light yellow oil (1.88 g, 45% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.39 (s, 1H), 8.23 (d, *J* = 8.5 Hz, 1H), 7.52 (dd, *J* = 8.5, 1.4 Hz, 1H), 7.45 – 7.40 (m, 3H), 7.39 – 7.29 (m, 4H), 7.25 – 7.22 (m, 1H), 7.21 – 7.16 (m, 1H), 6.96 (dd, *J* = 8.1, 2.2 Hz, 1H), 5.07 (s, 2H), 2.68 – 2.55 (m, 1H), 2.48 – 2.36 (m, 1H), 2.18 (s, 3H), 1.04 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.2, 158.9, 141.1, 139.6, 136.5, 133.9, 131.3, 129.9, 128.7, 128.2, 128.1, 127.6, 120.9, 118.8, 118.7, 114.6, 113.7, 107.9, 79.5, 70.2, 34.6, 17.2, 9.3.

HRMS (ESI) m/z calcd. for $C_{25}H_{23}ClN_2NaO_2$ $[M + Na]^+$ 441.1340, found 441.1338.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide (E5)

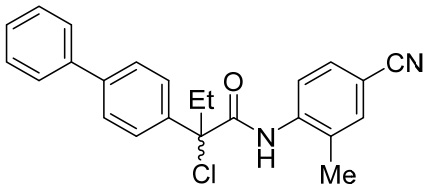


E5

According to **General Procedure 1** with 2-(3-methoxyphenyl)acetic acid (1.66 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E5** as a white solid (1.44 g, 42% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.40 (s, 1H), 8.23 (d, *J* = 8.5 Hz, 1H), 7.51 (d, *J* = 8.5 Hz, 1H), 7.45 (s, 1H), 7.32 (t, *J* = 8.3 Hz, 1H), 7.21 – 7.14 (m, 2H), 6.92 – 6.85 (m, 1H), 3.82 (s, 3H), 2.70 – 2.58 (m, 1H), 2.50 – 2.38 (m, 1H), 2.20 (s, 3H), 1.05 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.2, 159.8, 141.1, 139.6, 133.9, 131.3, 129.9, 128.3, 121.0, 118.8, 118.5, 113.6, 112.9, 108.0, 79.6, 55.4, 34.6, 17.2, 9.3.
HRMS (ESI) m/z calcd. for $C_{19}H_{19}ClN_2NaO_2$ $[M + Na]^+$ 365.1027, found 365.1027.

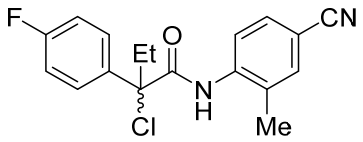
2-([1,1'-Biphenyl]-4-yl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide (E6)



E6

According to **General Procedure 1** with 2-([1,1'-biphenyl]-4-yl)acetic acid (2.12 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E6** as a light yellow oil (2.64 g, 68% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (s, 1H), 8.27 (d, *J* = 8.5 Hz, 1H), 7.71 – 7.65 (m, 2H), 7.65 – 7.55 (m, 4H), 7.53 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.49 – 7.40 (m, 3H), 7.39 – 7.30 (m, 1H), 2.80 – 2.63 (m, 1H), 2.57 – 2.43 (m, 1H), 2.25 (s, 3H), 1.11 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.2, 141.7, 140.0, 139.6, 138.7, 134.0, 131.3, 128.9, 128.4, 127.8, 127.4, 127.1, 126.8, 121.0, 118.8, 108.0, 79.9, 34.8, 17.3, 9.5.
HRMS (ESI) m/z calcd. for $C_{24}H_{21}ClN_2NaO$ $[M + Na]^+$ 411.1235, found 411.1234.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-(4-fluorophenyl)butanamide (E7)

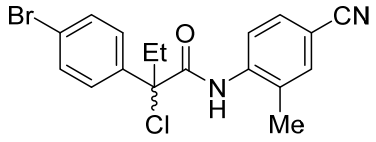


E7

According to **General Procedure 1** with 2-(4-fluorophenyl)acetic acid (1.54 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E7** as a light yellow solid (1.89 g, 57% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.60 (s, 1H), 8.24 (d, *J* = 8.5 Hz, 1H), 7.65 – 7.57 (m, 2H), 7.53 (d, *J* = 8.5 Hz, 1H), 7.47 (s, 1H), 7.08 (t, *J* = 8.6 Hz, 2H), 2.73 – 2.58 (m, 1H), 2.48 – 2.37 (m, 1H), 2.26 (s, 3H), 1.07 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.1, 162.7 (d, *J* = 247.6 Hz), 139.4, 135.7 (d, *J* = 3.2 Hz), 134.0, 131.3, 128.4, 128.3 (d, *J* = 8.2 Hz), 121.0, 118.7, 115.7 (d, *J* = 21.6 Hz), 108.2, 79.4, 35.0, 17.3, 9.4.
^{19}F NMR (376 MHz, $CDCl_3$) δ –112.9.
HRMS (ESI) m/z calcd. for $C_{18}H_{16}ClFN_2NaO$ $[M + Na]^+$ 353.0827, found 353.0827.

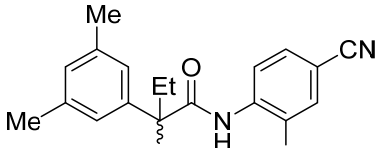
2-(4-Bromophenyl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide (E8)



E8

According to **General Procedure 1** with 2-(4-bromophenyl)acetic acid (2.15 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E8** as a light yellow oil (2.08 g, 53% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.51 (s, 1H), 8.10 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.33 (m, 6H), 2.60 – 2.45 (m, 1H), 2.40 – 2.25 (m, 1H), 2.17 (s, 3H), 0.97 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 167.8, 139.4, 138.9, 134.0, 131.9, 131.2, 128.7, 128.1, 123.0, 121.2, 118.7, 108.2, 79.4, 34.9, 17.3, 9.4.
HRMS (ESI) m/z calcd. for $C_{18}H_{15}BrClN_2O$ $[M – H]^–$ 389.0056, found 389.0058.

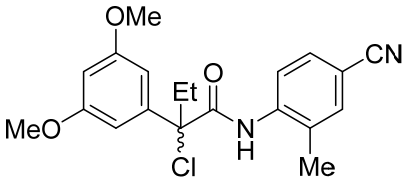
2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethylphenyl)butanamide (E9)



E9

According to **General Procedure 2** with 2-(3,5-dimethylphenyl)acetic acid (1.64 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E9** as a white solid (2.28 g, 67% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (s, 1H), 8.25 (d, *J* = 8.5 Hz, 1H), 7.52 (d, *J* = 8.5 Hz, 1H), 7.45 (s, 1H), 7.19 (s, 2H), 6.99 (s, 1H), 2.63 (dq, *J* = 14.3, 7.1 Hz, 1H), 2.45 (dd, *J* = 14.5, 7.2 Hz, 1H), 2.33 (s, 6H), 2.21 (s, 3H), 1.05 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 139.6, 139.5, 138.5, 133.9, 131.3, 130.5, 128.3, 124.0, 121.0, 118.8, 107.8, 79.9, 34.5, 21.5, 17.2, 9.4.
HRMS (ESI) m/z calcd. for $C_{20}H_{21}ClN_2NaO$ $[M + Na]^+$ 363.1235, found 363.1233.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethoxyphenyl)butanamide (E10)



E10

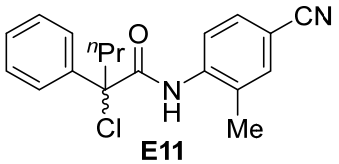
According to **General Procedure 1** with 2-(3,5-dimethoxyphenyl)acetic acid (1.96 g, 10.0 mmol) and iodoethane (1.87 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E10** as a light yellow oil (1.94 g, 52% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35 (s, 1H), 8.22 (d, *J* = 8.5 Hz, 1H), 7.51 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.45 (s, 1H), 6.76 (d, *J* = 2.2 Hz, 2H), 6.44 (t, *J* = 2.1 Hz, 1H), 3.80 (s, 6H), 2.68 – 2.54 (m, 1H), 2.48 – 2.36 (m, 1H), 2.20 (s, 3H), 1.04 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.1, 161.0, 141.7, 139.6, 133.9, 131.3, 128.4, 121.0, 118.8, 107.9, 104.9, 99.9, 79.4, 55.5, 34.5, 17.2, 9.3.

HRMS (ESI) m/z calcd. for $C_{20}H_{21}ClN_2NaO_3$ $[M + Na]^+$ 395.1133, found 395.1134.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylpentanamide (E11)



E11

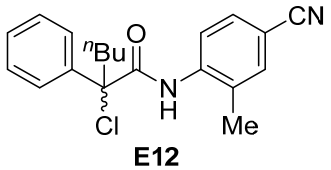
According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 1-iodopropane (2.04 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E11** as a light yellow oil (2.42 g, 74% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.49 (s, 1H), 8.22 (d, *J* = 8.5 Hz, 1H), 7.65 – 7.56 (m, 2H), 7.49 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.45 – 7.32 (m, 4H), 2.65 – 2.50 (m, 1H), 2.45 – 2.31 (m, 1H), 2.19 (s, 3H), 1.57 – 1.42 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4, 140.0, 139.6, 133.9, 131.2, 128.8, 128.7, 128.5, 126.2, 121.1, 118.8, 108.0, 79.0, 43.5, 18.4, 17.2, 13.9.

HRMS (ESI) m/z calcd. for $C_{19}H_{19}ClN_2NaO$ $[M + Na]^+$ 349.1078, found 349.1077.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylhexanamide (E12)



E12

According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 1-bromobutane (1.64 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by

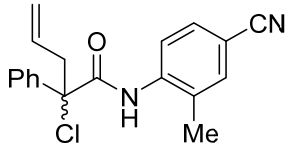
column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E12** as a light yellow oil (2.76 g, 81% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.49 (s, 1H), 8.24 (d, *J* = 8.5 Hz, 1H), 7.61 (d, *J* = 7.4 Hz, 2H), 7.51 (d, *J* = 8.5 Hz, 1H), 7.47 – 7.28 (m, 4H), 2.67 – 2.51 (m, 1H), 2.46 – 2.33 (m, 1H), 2.20 (s, 3H), 1.52 – 1.30 (m, 4H), 0.91 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4, 140.0, 139.6, 133.9, 131.3, 128.8, 128.7, 128.4, 126.2, 121.0, 118.8, 108.0, 79.2, 41.3, 27.1, 22.6, 17.2, 13.9.

HRMS (ESI) m/z calcd. for $C_{20}H_{21}ClN_2NaO$ $[M + Na]^+$ 363.1235, found 363.1233.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylpent-4-enamide (E13)



E13

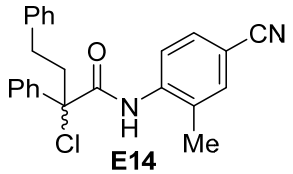
According to **General Procedure 1** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 3-bromoprop-1-ene (1.45 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E13** as a white solid (2.11 g, 65% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (s, 1H), 8.24 (d, *J* = 8.5 Hz, 1H), 7.68 – 7.61 (m, 2H), 7.54 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.48 – 7.37 (m, 4H), 5.90 – 5.74 (m, 1H), 5.29 – 5.14 (m, 2H), 3.40 (dd, *J* = 14.6, 6.9 Hz, 1H), 3.19 (dd, *J* = 14.6, 6.9 Hz, 1H), 2.23 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 167.8, 139.5, 139.3, 133.9, 131.6, 131.3, 128.9, 128.8, 128.5, 126.3, 121.1, 120.5, 118.7, 108.1, 77.5, 45.7, 17.2.

HRMS (ESI) m/z calcd. for $C_{19}H_{18}ClN_2O$ $[M + H]^+$ 325.1102, found 325.1104.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2,4-diphenylbutanamide (E14)



E14

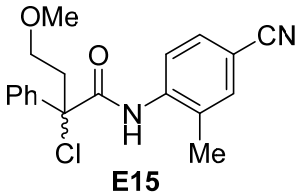
According to **General Procedure 1** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and (2-bromoethyl)benzene (2.22 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E14** as a light yellow oil (2.68 g, 69% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 8.24 (d, *J* = 8.5 Hz, 1H), 7.71 – 7.60 (m, 2H), 7.55 – 7.49 (m, 1H), 7.46 – 7.36 (m, 4H), 7.29 – 7.17 (m, 5H), 2.97 – 2.88 (m, 1H), 2.84 – 2.72 (m, 2H), 2.71 – 2.62 (m, 1H), 2.21 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.0, 140.7, 139.6, 139.5, 134.0, 131.3, 129.0, 128.9, 128.6, 128.5, 128.4, 126.3, 126.2, 121.1, 118.8, 108.1, 78.6, 43.6, 31.5, 17.3.

HRMS (ESI) m/z calcd. for $C_{24}H_{21}ClN_2NaO$ $[M + Na]^+$ 411.1235, found 411.1229.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-4-methoxy-2-phenylbutanamide (E15)



E15

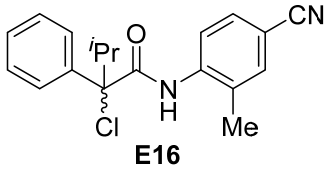
According to **General Procedure 1** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 1-bromo-2-methoxyethane (1.67 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E15** as a light yellow oil (2.13 g, 62% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 8.21 (d, *J* = 8.5 Hz, 1H), 7.62 (d, *J* = 7.6 Hz, 2H), 7.51 (d, *J* = 8.5 Hz, 1H), 7.47 – 7.31 (m, 4H), 3.74 – 3.61 (m, 1H), 3.58 – 3.46 (m, 1H), 3.27 (s, 3H), 3.10 – 2.98 (m, 1H), 2.69 – 2.58 (m, 1H), 2.22 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 167.9, 139.7, 139.6, 133.9, 131.3, 129.0, 128.9, 128.4, 126.1, 121.1, 118.8, 108.0, 76.4, 68.9, 58.8, 40.5, 17.2.

HRMS (ESI) m/z calcd. for $C_{19}H_{19}ClN_2NaO_2$ $[M + Na]^+$ 365.1027, found 365.1028.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (E16)



E16

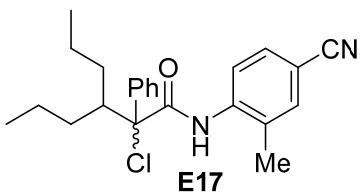
According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 2-iodopropane (2.04 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E16** as a white solid (2.81 g, 86% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.68 (s, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.85 – 7.65 (m, 2H), 7.55 – 7.28 (m, 5H), 3.25 – 3.12 (m, 1H), 2.23 (s, 3H), 1.17 (d, *J* = 6.4 Hz, 3H), 0.82 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.3, 139.6, 138.6, 133.9, 131.2, 128.6, 128.5, 126.4, 121.1, 118.8, 107.9, 86.2, 37.6, 19.0, 17.3, 17.0.

HRMS (ESI) m/z calcd. for $C_{19}H_{18}ClN_2O$ $[M - H]^-$ 325.1108, found 325.1111.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenyl-3-propylhexanamide (E17)



E17

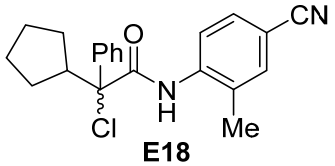
According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 4-bromoheptane (2.15 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E17** as a light yellow solid (1.87 g, 49% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.72 (s, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.79 (d, *J* = 7.5 Hz, 2H), 7.51 – 7.32 (m, 5H), 2.87 – 2.78 (m, 1H), 2.25 (s, 3H), 1.61 – 1.43 (m, 4H), 1.34 – 1.17 (m, 3H), 1.08 – 0.99 (m, 1H), 0.94 (t, *J* = 6.7 Hz, 3H), 0.74 (t, *J* = 6.9 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 139.7, 138.7, 133.9, 131.1, 128.7, 128.5, 128.4, 126.6, 121.2, 118.8, 107.9, 86.9, 47.1, 36.6, 33.7, 22.2, 21.9, 17.3, 14.6, 14.5.

HRMS (ESI) m/z calcd. for $C_{23}H_{28}ClN_2O$ $[M + H]^+$ 383.1885, found 383.1884.

2-chloro-*N*-(4-cyano-2-methylphenyl)-2-cyclopentyl-2-phenylacetamide (E18)



E18

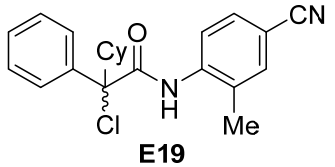
According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and bromocyclopentane (1.79 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the substrate **E18** as a light yellow oil (1.97 g, 56% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.53 (s, 1H), 8.16 (d, *J* = 8.5 Hz, 1H), 7.74 – 7.66 (m, 2H), 7.48 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.43 (s, 1H), 7.40 – 7.29 (m, 3H), 3.51 – 3.23 (m, 1H), 2.22 (s, 3H), 2.01 – 1.84 (m, 1H), 1.74 – 1.59 (m, 4H), 1.54 – 1.34 (m, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.48 (s), 139.58 (d, *J* = 16.4 Hz), 133.89 (s), 131.17 (s), 128.56 (d, *J* = 5.8 Hz), 126.40 (s), 121.16 (s), 118.79 (s), 107.88 (s), 84.59 (s), 48.73 (s), 29.19 (s), 28.16 (s), 26.13 (s), 25.84 (s), 17.29 (s).

HRMS (ESI) m/z calcd. for $C_{21}H_{22}ClN_2O$ $[M + H]^+$ 353.1415, found 353.1413.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-cyclohexyl-2-phenylacetamide (E19)

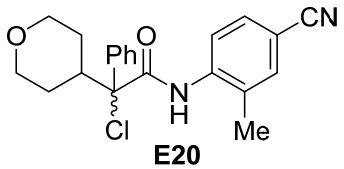


E19

According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and iodocyclohexane (2.52 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E19** as a light yellow oil (2.68 g, 73% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.73 (s, 1H), 8.19 (d, *J* = 8.5 Hz, 1H), 7.86 – 7.59 (m, 2H), 7.54 – 7.28 (m, 5H), 2.85 – 2.71 (m, 1H), 2.23 (s, 3H), 1.87 – 1.75 (m, 2H), 1.74 – 1.63 (m, 2H), 1.53 – 1.31 (m, 3H), 1.28 – 1.08 (m, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.2, 139.6, 138.2, 133.9, 131.2, 128.6, 128.5, 128.4, 126.6, 121.0, 118.8, 107.9, 85.4, 47.4, 29.2, 26.9, 26.2, 17.3.
HRMS (ESI) m/z calcd. for $C_{22}H_{22}ClN_2O$ $[M - H]^-$ 365.1421, found 365.1421.

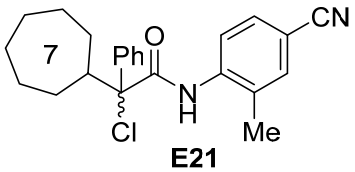
2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-phenyl-2-(tetrahydro-2*H*-pyran-4-yl)acetamide (E20)



E20

According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and 4-iodotetrahydro-2*H*-pyran (2.54 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E20** as a light yellow oil (1.77 g, 48% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.58 (s, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.72 (d, *J* = 7.4 Hz, 2H), 7.49 (d, *J* = 8.5 Hz, 1H), 7.47 – 7.31 (m, 4H), 4.02 (dd, *J* = 11.3, 3.9 Hz, 1H), 3.94 (dd, *J* = 11.4, 4.2 Hz, 1H), 3.49 (td, *J* = 11.8, 2.1 Hz, 1H), 3.36 (td, *J* = 12.1, 1.9 Hz, 1H), 3.00 (tt, *J* = 11.6, 3.3 Hz, 1H), 2.22 (s, 3H), 1.94 – 1.81 (m, 1H), 1.79 – 1.70 (m, 1H), 1.61 – 1.48 (m, 1H), 1.16 – 1.08 (m, 1H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 167.6, 139.4, 137.2, 133.9, 131.2, 128.8, 128.7, 128.6, 126.4, 121.1, 118.7, 108.1, 83.7, 67.8, 67.6, 45.0, 29.1, 27.0, 17.3.
HRMS (ESI) m/z calcd. for $C_{21}H_{22}ClN_2O_2$ $[M + H]^+$ 369.1364, found 369.1370.

2-Chloro-*N*-(4-cyano-2-methylphenyl)-2-cycloheptyl-2-phenylacetamide (E21)

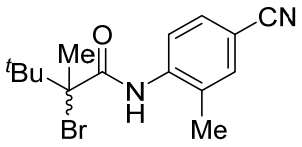


E21

According to **General Procedure 2** with 2-phenylacetic acid (1.36 g, 10.0 mmol) and bromocycloheptane (2.13 g, 12.0 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E21** as a light yellow oil (2.02 g, 53% yield over three steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.73 (s, 1H), 8.15 (d, *J* = 8.5 Hz, 1H), 7.73 (d, *J* = 7.7 Hz, 2H), 7.49 – 7.28 (m, 5H), 3.03 (t, *J* = 8.7 Hz, 1H), 2.23 (s, 3H), 1.93 – 1.69 (m, 2H), 1.67 – 1.46 (m, 7H), 1.43 – 1.23 (m, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 139.6, 138.7, 133.9, 131.1, 128.6, 128.5, 128.4, 126.6, 121.1, 118.8, 107.9, 87.2, 47.6, 31.5, 29.0, 28.1, 27.6, 27.5, 27.1, 17.3.

HRMS (ESI) m/z calcd. for $C_{23}H_{26}ClN_2O$ $[M + H]^+$ 381.1728, found 381.1726.

2-Bromo-*N*-(4-cyano-2-methylphenyl)-2,3,3-trimethylbutanamide (E22)



E22

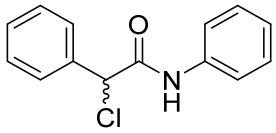
According to **General Procedure 3** with 3,3-dimethylbutanoic acid (1.16 g, 10.0 mmol) and iodomethane (3.12 g, 22.0 mmol, 2.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to afford the substrate **E22** as a white solid (1.45 g, 45% yield over three steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (s, 1H), 8.17 (d, J = 8.5 Hz, 1H), 7.44 (dd, J = 8.5, 1.8 Hz, 1H), 7.39 (s, 1H), 2.27 (s, 3H), 1.98 (s, 3H), 1.16 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.8, 139.9, 133.9, 131.2, 128.3, 120.6, 118.8, 107.7, 82.3, 39.8, 27.3, 26.8, 17.6.

HRMS (ESI) m/z calcd. for $C_{15}H_{19}BrN_2NaO$ $[M + Na]^+$ 345.0573, found 345.0574.

2-Chloro-*N*,2-diphenylacetamide (E23)



E23

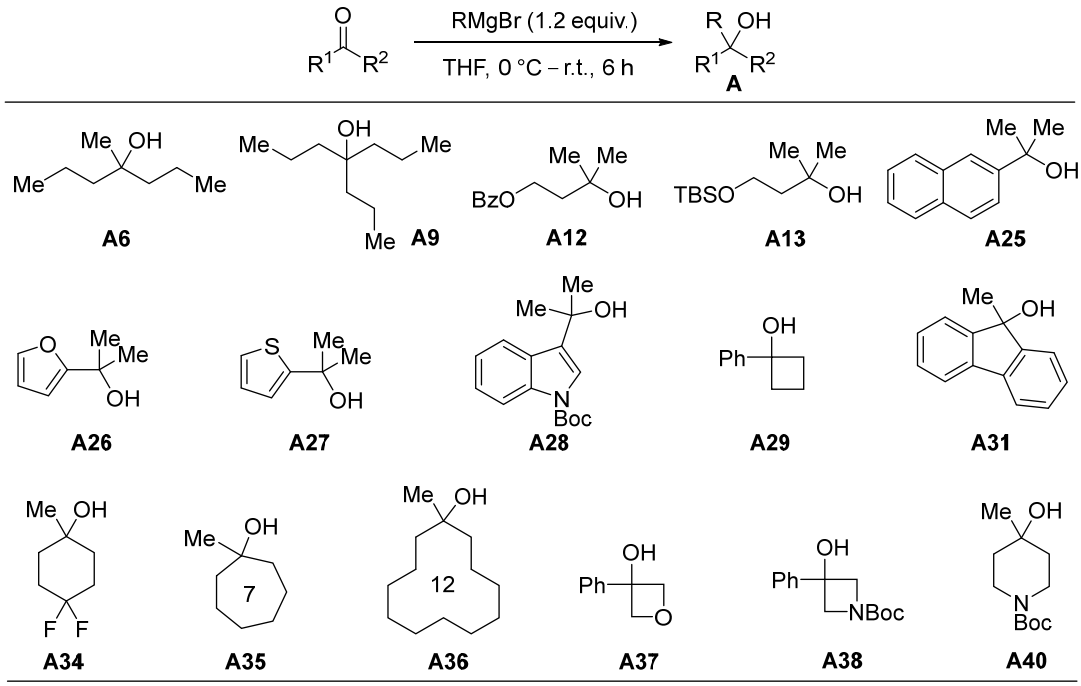
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (s, 1H), 7.68 – 7.48 (m, 4H), 7.48 – 7.31 (m, 5H), 7.19 (t, J = 7.4 Hz, 1H), 5.52 (s, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 165.4, 136.9, 136.7, 129.3, 129.2, 129.1, 127.9, 125.2, 120.1, 62.0.

HRMS (ESI) m/z calcd. for $C_{14}H_{13}ClNO$ $[M + H]^+$ 246.0680, found 246.0683.

Note: The α-secondary chloroamide **E23** was known compound and synthesized according to the reported literature[1].

Synthesis of the tertiary alcohols



Supplementary Figure 11. The tertiary alcohols synthesized in this study.

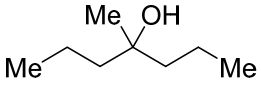
General Procedure 4:

According to the reported procedure of literature[3] with slightly modification.

To a solution of ketone (10.0 mmol) in THF (20.0 mL) was dropwise added MeMgBr or PhMgBr (4.0 mL, 3.0 M in THF, 1.2 equiv.) at 0 ℃ under argon atmosphere. After the addition, the mixture was stirred at room temperature for 6 h. After completion (monitored by TLC with $KMnO_4$ indicator), the reaction mixture was quenched by saturated NH_4Cl (aq), and then the aqueous layer was extracted with ethyl acetate (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 10/1) to give the tertiary alcohols.

Note: The corresponding tertiary alcohols **A9**, **A12**–**A13**, **A25**–**A27**, **A29**, **A31**, **A35**–**A38**, **A40** are known compounds. The tertiary alcohols **A6**, **A28** and **A34** are new compounds. All above tertiary alcohols were synthesized according to the reported literature[3]. The other tertiary, secondary and primary alcohols were commercially available.

4-Methylheptan-4-ol (A6)



A6

According to **General Procedure 4** with 4-heptanone (1.14 g, 10.0 mmol) and MeMgBr (4.0 mL, 3.0 M in THF, 1.2 equiv.), the reaction mixture was purified by

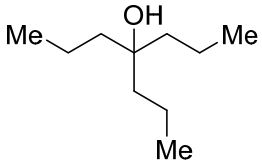
column chromatography (eluent: petroleum ether/EtOAc = 10/1) to yield the tertiary alcohol **A6** as a colorless oil (1.16 g, 89% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 1.47 – 1.26 (m, 9H), 1.15 (s, 3H), 0.92 (t, *J* = 7.0 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 72.8, 44.3, 26.9, 17.1, 14.7.

HRMS (ESI) m/z calcd. for $C_8H_{18}NaO$ $[M + Na]^+$ 153.1250, found 153.1251.

4-Propylheptan-4-ol (A9)

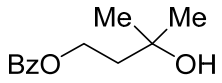


A9

^{1}H NMR (400 MHz, $CDCl_3$) δ 1.44 – 1.23 (m, 12H), 1.14 (s, 1H), 0.91 (t, *J* = 7.1 Hz, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 74.5, 41.7, 16.7, 14.7.

3-Hydroxy-3-methylbutyl benzoate (A12)

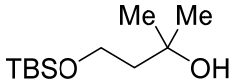


A12

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 – 7.97 (m, 2H), 7.59 – 7.50 (m, 1H), 7.48 – 7.38 (m, 2H), 4.51 (t, *J* = 6.8 Hz, 2H), 2.15 (s, 1H), 1.99 (t, *J* = 6.8 Hz, 2H), 1.33 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 133.0, 130.3, 129.5, 128.4, 70.0, 62.0, 41.8, 29.7.

4-((*tert*-Butyldimethylsilyl)oxy)-2-methylbutan-2-ol (A13)

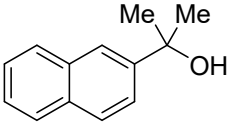


A13

^{1}H NMR (400 MHz, $CDCl_3$) δ 3.90 (t, *J* = 5.8 Hz, 2H), 3.81 (s, 1H), 1.70 (t, *J* = 5.8 Hz, 2H), 1.24 (s, 6H), 0.90 (s, 9H), 0.09 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 70.8, 60.9, 43.0, 29.2, 25.8, 18.0, -5.7.

2-(Naphthalen-2-yl)propan-2-ol (A25)

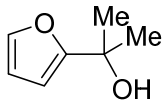


A25

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 – 7.89 (m, 1H), 7.85 – 7.76 (m, 3H), 7.62 – 7.55 (m, 1H), 7.50 – 7.40 (m, 2H), 1.99 (s, 1H), 1.66 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 146.5, 133.2, 132.4, 128.2, 128.0, 127.5, 126.1, 125.8, 123.6, 122.4, 72.7, 31.7.

2-(Furan-2-yl)propan-2-ol (A26)

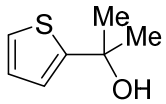


A26

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 (d, *J* = 0.8 Hz, 1H), 6.32 (d, *J* = 1.4 Hz, 1H), 6.20 (d, *J* = 3.2 Hz, 1H), 2.13 (s, 1H), 1.60 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 160.3, 141.4, 110.0, 103.6, 68.8, 28.7.

2-(Thiophen-2-yl)propan-2-ol (A27)

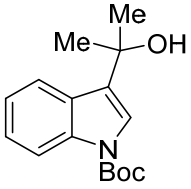


A27

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18 (dd, *J* = 4.8, 1.3 Hz, 1H), 6.96 – 6.91 (m, 2H), 2.23 (s, 1H), 1.66 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 154.4, 126.6, 123.8, 122.0, 71.3, 32.3.

***tert*-Butyl 3-(2-hydroxypropan-2-yl)-1*H*-indole-1-carboxylate (A28)**



A28

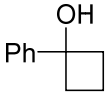
According to **General Procedure 4** with *tert*-butyl 3-acetyl-1*H*-indole-1-carboxylate (2.59 g, 10.0 mmol) and MeMgBr (4.0 mL, 3.0 M in THF, 1.2 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 15/1) to yield the tertiary alcohol **A28** as a white solid (2.09 g, 76% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, *J* = 7.8 Hz, 1H), 7.87 (d, *J* = 7.8 Hz, 1H), 7.51 (s, 1H), 7.36 – 7.31 (m, 1H), 7.30 – 7.23 (m, 1H), 2.07 (s, 1H), 1.74 (s, 6H), 1.70 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 149.9, 136.2, 128.7, 128.3, 124.2, 122.4, 121.4, 121.1, 115.4, 83.7, 70.1, 30.5, 28.2.

HRMS (ESI) m/z calcd. for $C_{16}H_{21}NNaO_3$ $[M + Na]^+$ 298.1414, found 298.1414.

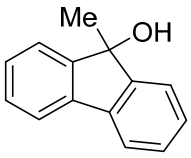
1-Phenylcyclobutan-1-ol (A29)



A29

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 – 7.43 (m, 2H), 7.42 – 7.30 (m, 2H), 7.30 – 7.21 (m, 1H), 2.61 – 2.44 (m, 2H), 2.42 – 2.27 (m, 3H), 2.08 – 1.92 (m, 1H), 1.77 – 1.59 (m, 1H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 146.3, 128.4, 127.2, 125.0, 77.0, 36.8, 13.1.

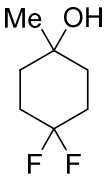
9-Methyl-9*H*-fluoren-9-ol (A31)



A31

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 7.6 Hz, 2H), 7.54 (d, *J* = 7.2 Hz, 2H), 7.39 – 7.25 (m, 4H), 1.94 (d, *J* = 56.4 Hz, 1H), 1.72 (d, *J* = 1.7 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 149.9, 138.8, 128.9, 128.1, 123.3, 120.0, 79.6, 26.1.

4,4-Difluoro-1-methylcyclohexan-1-ol (A34)



A34

According to **General Procedure 4** with 4,4-difluorocyclohexan (1.34 g, 10.0 mmol) and MeMgBr (4.0 mL, 3.0 M in THF, 1.2 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 10/1) to yield the tertiary alcohol **A34** as a white solid (1.26 g, 84% yield).
^{1}H NMR (400 MHz, $CDCl_3$) δ 2.21 – 2.00 (m, 2H), 1.97 – 1.84 (m, 2H), 1.73 – 1.66 (m, 4H), 1.29 (s, 3H), 1.21 (s, 1H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 125.9, 123.5 (d, *J* = 2.9 Hz), 121.2, 68.3, 35.4 (d, *J* = 9.1 Hz), 30.0 (d, *J* = 2.1 Hz), 29.8 (t, *J* = 2.4 Hz).
^{19}F NMR (376 MHz, $CDCl_3$) δ –93.5 (d, *J* = 235.4 Hz), –103.5 (d, *J* = 235.4 Hz).
HRMS (ESI) m/z calcd. for $C_7H_{12}F_2NaO$ $[M + Na]^+$ 173.0748, found 173.0785.

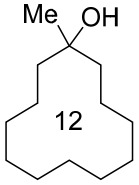
1-Methylcycloheptan-1-ol (A35)



A35

^{1}H NMR (400 MHz, $CDCl_3$) δ 1.76 – 1.45 (m, 11H), 1.44 – 1.33 (m, 2H), 1.23 (s, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 74.0, 43.0, 31.1, 29.7, 22.6.

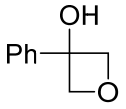
1-Methylcyclododecan-1-ol (A36)



A36

^{1}H NMR (400 MHz, $CDCl_3$) δ 1.61 – 1.50 (m, 2H), 1.48 – 1.24 (m, 21H), 1.17 (s, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 73.6, 36.2, 29.1, 26.4, 26.0, 22.6, 22.1, 19.9.

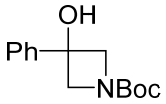
3-Phenyloxetan-3-ol (A37)



A37

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 – 7.51 (m, 2H), 7.42 – 7.34 (m, 2H), 7.35 – 7.25 (m, 1H), 4.88 – 4.81 (m, 4H), 3.94 (s, 1H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 142.4, 128.7, 127.9, 124.6, 85.8, 75.5.

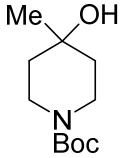
***tert*-Butyl 3-hydroxy-3-phenylazetidine-1-carboxylate (A38)**



A38

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 – 7.43 (m, 2H), 7.37 (t, *J* = 7.5 Hz, 2H), 7.32 – 7.25 (m, 1H), 4.21 (d, *J* = 9.2 Hz, 2H), 4.15 (d, *J* = 9.2 Hz, 2H), 3.76 (s, 1H), 1.44 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 156.6, 143.4, 128.6, 127.7, 124.6, 80.0, 71.1, 64.4, 28.4.

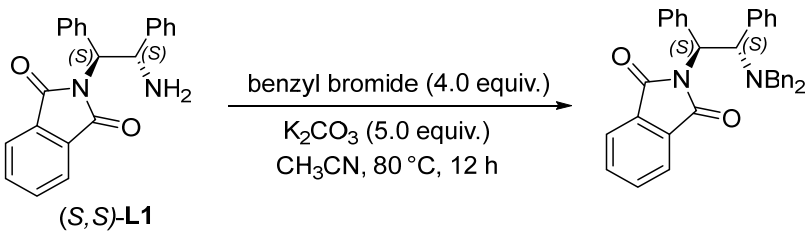
***tert*-Butyl 4-hydroxy-4-methylpiperidine-1-carboxylate (A40)**



A40

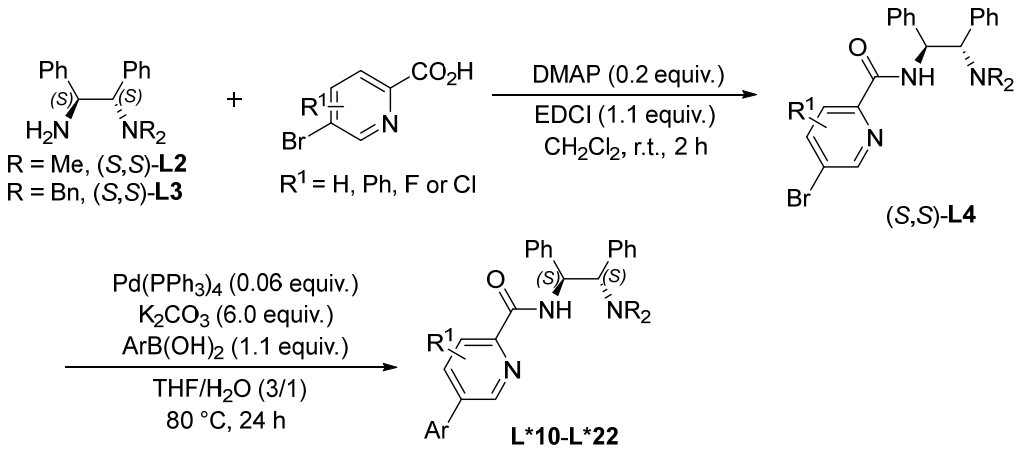
^{1}H NMR (400 MHz, $CDCl_3$) δ 3.64 (d, *J* = 11.3 Hz, 2H), 3.30 – 3.04 (m, 2H), 1.90 (s, 1H), 1.54 – 1.45 (m, 4H), 1.41 (s, 9H), 1.21 (s, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 154.9, 79.4, 67.9, 40.2, 38.4, 29.9, 28.4.

Synthesis of the ligands



General Procedure 5:

To a solution of diamine (*S*,*S*)-**L1** (2.05 g, 6.0 mmol, 1.0 equiv.) in anhydrous acetonitrile (50 mL) were successively added benzyl bromide (3.08 g, 18.0 mmol, 3.0 equiv.) and K_2CO_3 (4.15 g, 30.0 mmol, 5.0 equiv.) at room temperature. The reaction mixture was stirred at 80 ℃ for 12 h. The reaction mixture was quenched by H_2O (15 mL), and then the aqueous layer was extracted with CH_2Cl_2 (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 15/1 to 10/1) to give product as a white solid (2.79 g, 89% yield).



General Procedure 6:

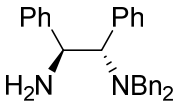
To a solution of diamine (*S*,*S*)-**L2** or (*S*,*S*)-**L3** (5.0 mmol, 1.0 equiv.) in anhydrous CH_2Cl_2 (10 mL) were successively added the substituted 5-bromo-picolinic acid (5.5 mmol, 1.1 equiv.), DMAP (0.12 g, 1.0 mmol, 0.2 equiv.) and EDCI (5.5 mmol, 1.1 equiv.) under argon at room temperature. The reaction mixture was stirred for 2 h at room temperature. After completion, the reaction mixture was concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 10/1 to 5/1) to give the ligand (*S*,*S*)-**L4**.

To a solution of the ligand (*S*,*S*)-**L4** in THF/H_2O (20 mL, 3/1) were successively added $Pd(PPh_3)_4$ (0.06 equiv.), K_2CO_3 (6.0 equiv.) and aryl boronic acid (1.1 equiv.) under argon. The reaction was reflux at 80 ℃ for 24 h. Then the reaction was quenched by H_2O (10 mL). The organic layer was separated and the aqueous layer was extracted with ethyl acetate (3 x 10 mL). The combined organic phase was dried with Na_2SO_4, filtered and concentrated under reduced pressure. The residue was

purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to give the ligands **L*10**–**L*22**.

Note: The diamines (*S*,*S*)-**L1**, (*S*,*S*)-**L2**, (*R*,*R*)-**L2** and (*S*,*S*)-**L3** were synthesized according to the reported literature[4]. The ligands (*R*,*R*)-**L*17** and (*R*,*R*)-**L*22** were synthesized by the same procedures as above with (*S*,*S*)-**L*17** and (*S*,*S*)-**L*22**.

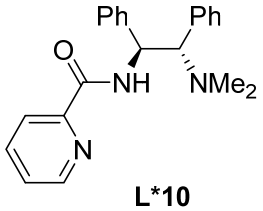
(1*S*,2*S*)-*N*^{1},*N*^{1}-Dibenzyl-1,2-diphenylethane-1,2-diamine ((*S*,*S*)-L3)



(*S*,*S*)-**L3**

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 7.4 Hz, 4H), 7.36 (t, *J* = 7.5 Hz, 4H), 7.30 – 7.13 (m, 5H), 7.10 – 6.90 (m, 7H), 4.58 (d, *J* = 10.7 Hz, 1H), 4.05 (d, *J* = 13.6 Hz, 2H), 3.86 (d, *J* = 10.7 Hz, 1H), 3.10 (d, *J* = 13.6 Hz, 2H), 2.13 (s, 2H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 143.3, 139.6, 134.8, 130.0, 129.0, 128.6, 128.01 (d, *J* = 2.2 Hz), 127.7, 127.1, 126.9, 68.9, 55.9, 54.0.
HRMS (ESI) m/z calcd. for $C_{28}H_{29}N_2$ $[M + H]^+$ 393.2325, found 393.2327.

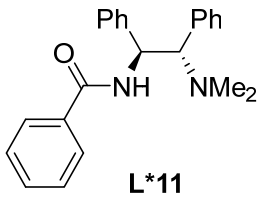
***N*-((1*S*,2*S*)-2-(Dimethylamino)-1,2-diphenylethyl)picolinamide (L*10)**



L*10

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.) and picolinic acid (0.27 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 3/1) to yield the ligand **L*10** as a white solid (0.55 g, 79% yield).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.28 (s, 1H), 8.62 (d, *J* = 4.6 Hz, 1H), 8.14 (d, *J* = 7.8 Hz, 1H), 7.85 – 7.72 (m, 1H), 7.45 – 7.35 (m, 1H), 7.30 – 7.18 (m, 5H), 7.16 – 6.93 (m, 5H), 5.51 – 5.29 (m, 1H), 3.90 (d, *J* = 10.6 Hz, 1H), 2.22 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 164.3, 150.5, 148.3, 141.1, 137.2, 133.4, 129.8, 128.0, 127.7. 127.6, 127.5, 126.9, 126.0, 122.3, 73.7, 54.7, 41.1.
HRMS (ESI) m/z calcd. for $C_{22}H_{24}N_3O$ $[M + H]^+$ 346.1914, found 346.1913.

***N*-((1*S*,2*S*)-2-(Dimethylamino)-1,2-diphenylethyl)benzamide (L*11)**



L*11

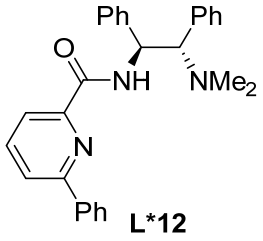
According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.) and benzoic acid (0.27 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 4/1 to 2/1) to yield the ligand **L*11** as a white solid (0.61 g, 89% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (s, 1H), 7.93 – 7.82 (m, 2H), 7.54 – 7.41 (m, 3H), 7.27 – 7.16 (m, 5H), 7.15 – 6.98 (m, 5H), 5.27 (dd, *J* = 10.9, 3.4 Hz, 1H), 3.78 (d, *J* = 10.9 Hz, 1H), 2.19 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 167.3, 141.1, 134.8, 132.6, 131.4, 129.9, 128.6, 128.0, 127.8, 127.7, 127.4, 127.2, 126.9, 73.8, 55.0, 40.8.

HRMS (ESI) m/z calcd. for $C_{23}H_{25}N_2O$ $[M + H]^+$ 345.1961, found 345.1963.

***N*-((1*S*,2*S*)-2-(Dimethylamino)-1,2-diphenylethyl)-6-phenylpicolinamide (L*12)**



L*12

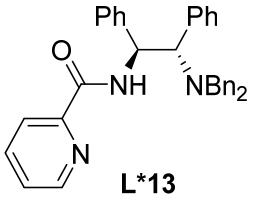
According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.) and 6-phenylpicolinic acid (0.44 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*12** as a white solid (0.70 g, 83% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.84 (d, *J* = 3.8 Hz, 1H), 8.15 (d, *J* = 7.3 Hz, 2H), 8.07 (dd, *J* = 6.9, 1.4 Hz, 1H), 7.95 – 7.78 (m, 2H), 7.50 (dt, *J* = 24.3, 7.1 Hz, 3H), 7.30 – 7.18 (m, 5H), 7.17 – 7.00 (m, 5H), 5.36 (dd, *J* = 10.1, 4.5 Hz, 1H), 3.87 (d, *J* = 10.2 Hz, 1H), 2.30 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 164.5, 155.4, 150.3, 140.9, 138.4, 138.2, 133.4, 129.8, 129.5, 128.9, 128.0, 127.8, 127.7, 127.5, 126.9, 126.8, 122.4, 120.5, 74.3, 54.6, 41.3.

HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_3O$ $[M + H]^+$ 422.2227, found 422.2226.

***N*-((1*S*,2*S*)-2-(Dibenzylamino)-1,2-diphenylethyl)picolinamide (L*13)**

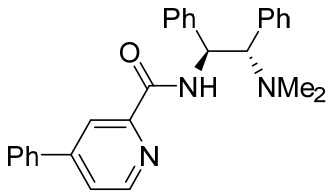


L*13

According to **General Procedure 6** with diamine (*S*,*S*)-**L3** (0.78 g, 2.0 mmol, 1.0 equiv.) and picolinic acid (0.27 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 10/1 to 5/1) to yield the ligand **L*13** as a white solid (0.86 g, 86% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.61 (d, *J* = 4.5 Hz, 1H), 8.92 – 8.77 (m, 1H), 8.16 (d, *J* = 7.8 Hz, 1H), 7.86 (td, *J* = 7.7, 1.7 Hz, 1H), 7.58 – 7.48 (m, 5H), 7.35 – 7.19 (m, 9H), 7.18 – 7.12 (m, 2H), 7.06 – 6.95 (m, 5H), 5.63 – 5.48 (m, 1H), 4.11 – 3.93 (m, 3H), 3.20 – 3.03 (m, 2H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 163.9, 150.5, 148.1, 141.0, 139.3, 137.4, 133.2, 130.1, 129.2, 128.4, 128.0, 127.9, 127.7, 127.6, 127.1, 126.9, 126.2, 122.4, 67.0, 54.2, 53.5.
HRMS (ESI) m/z calcd. for $C_{34}H_{32}N_3O$ $[M + H]^+$ 498.2540, found 498.2542.

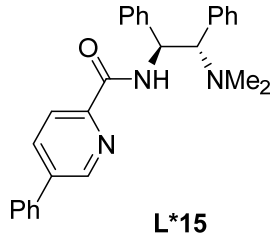
***N*-((1*S*,2*S*)-2-(Dimethylamino)-1,2-diphenylethyl)-4-phenylpicolinamide (L*14)**



L*14

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.), 4-bromopicolinic acid (0.45 g, 2.2 mmol, 1.1 equiv.) and phenylboronic acid (0.27 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*14** as a light yellow solid (0.57 g, 68% yield over two steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.33 (d, *J* = 5.2 Hz, 1H), 8.66 (d, *J* = 5.1 Hz, 1H), 8.41 (d, *J* = 1.3 Hz, 1H), 7.71 – 7.62 (m, 3H), 7.52 – 7.43 (m, 3H), 7.27 – 7.21 (m, 5H), 7.19 – 6.99 (m, 5H), 5.45 (dd, *J* = 10.7, 5.5 Hz, 1H), 3.94 (d, *J* = 10.7 Hz, 1H), 2.25 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 164.4, 150.9, 149.7, 148.9, 140.9, 137.6, 133.9, 133.3, 129.8, 129.4, 129.2, 128.0, 127.8, 127.6, 127.1, 126.9, 123.7, 120.3, 73.6, 54.8, 41.1.
HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_3O$ $[M + H]^+$ 422.2227, found 4222.2227.

***N*-((1*S*,2*S*)-2-(Dimethylamino)-1,2-diphenylethyl)-5-phenylpicolinamide (L*15)**

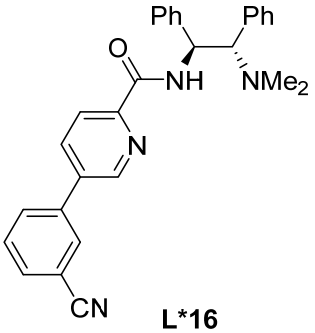


L*15

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.), 5-bromopicolinic acid (0.45 g, 2.2 mmol, 1.1 equiv.) and phenylboronic acid (0.27 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*15** as a white solid (0.53 g, 63% yield over two steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.30 (d, *J* = 5.3 Hz, 1H), 8.84 (d, *J* = 1.6 Hz, 1H), 8.20 (dd, *J* = 8.1, 0.6 Hz, 1H), 7.99 (dd, *J* = 8.1, 2.3 Hz, 1H), 7.66 – 7.58 (m, 2H), 7.54 –

7.47 (m, 2H), 7.46 – 7.40 (m, *J* = 7.3, 3.6, 1.3 Hz, 1H), 7.27 – 7.19 (m, 5H), 7.18 – 6.99 (m, 5H), 5.45 (dd, *J* = 10.7, 5.5 Hz, 1H), 3.95 (d, *J* = 10.7 Hz, 1H), 2.25 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 164.3, 149.0, 146.9, 140.9, 139.0, 137.2, 135.4, 134.0, 133.2, 129.8, 129.2, 128.6, 128.1, 127.8, 127.7, 127.6, 127.3, 127.0, 122.4, 73.6, 54.7, 41.0.
HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_3O$ $[M + H]^+$ 422.2227, found 422.2228.

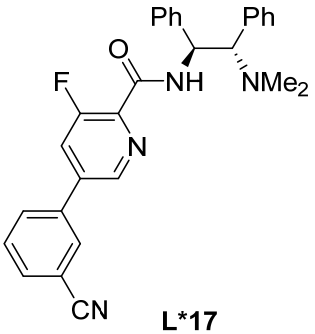
5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl) picolinamide (L*16)



L*16

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (1.20 g, 2.0 mmol, 1.0 equiv.), 5-bromopicolinic acid (0.44 g, 2.2 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.32 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*16** as a white solid (0.79 g, 89% yield over two steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.32 (d, *J* = 5.0 Hz, 1H), 8.92 – 8.76 (m, 1H), 8.25 (dd, *J* = 8.1, 0.6 Hz, 1H), 7.98 (dd, *J* = 8.1, 2.3 Hz, 1H), 7.90 (t, *J* = 1.4 Hz, 1H), 7.87 – 7.80 (m, 1H), 7.75 – 7.69 (m, 1H), 7.62 (t, *J* = 7.8 Hz, 1H), 7.27 – 7.19 (m, 5H), 7.17 – 7.04 (m, 5H), 5.42 (dd, *J* = 10.7, 5.2 Hz, 1H), 3.92 (d, *J* = 10.7 Hz, 1H), 2.24 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 163.8, 150.2, 146.7, 140.9, 138.6, 136.6, 135.6, 133.2, 132.0, 131.6, 130.8, 130.2, 129.8, 128.0, 127.8, 127.6, 127.5, 126.9, 122.6, 118.3, 113.6, 73.7, 54.8, 41.0.
HRMS (ESI) m/z calcd. for $C_{29}H_{27}N_4O$ $[M + H]^+$ 447.2179, found 447.2180.

5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-3-fluoropicolinamide (L*17)



L*17

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (1.20 g, 5.0 mmol, 1.0 equiv.), 5-bromo-3-fluoropicolinic acid (1.21 g, 5.5 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.81 g, 5.5 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*17** as a white solid (1.74 g, 75% yield over two steps).

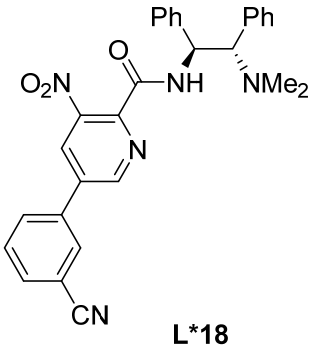
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.12 (d, *J* = 4.0 Hz, 1H), 8.68 (s, 1H), 7.90 (s, 1H), 7.84 (d, *J* = 7.7 Hz, 1H), 7.76 (d, *J* = 7.6 Hz, 1H), 7.72 – 7.59 (m, 2H), 7.28 – 7.17 (m, 5H), 7.17 – 6.98 (m, 5H), 5.42 (dd, *J* = 10.5, 5.0 Hz, 1H), 3.92 (d, *J* = 10.6 Hz, 1H), 2.24 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 161.9 (d, *J* = 5.9 Hz), 160.7, 157.9, 142.1 (d, *J* = 5.3 Hz), 140.7, 138.9 (d, *J* = 4.7 Hz), 137.8 (d, *J* = 4.6 Hz), 136.9, 133.1, 132.6, 131.5, 130.8, 130.4, 129.8, 128.0, 127.8, 127.7, 127.6, 126.9, 124.1 (d, J = 20.6 Hz), 118.1, 113.9, 73.5, 54.6, 41.0.

^{19}F NMR (376 MHz, $CDCl_3$) δ –118.7.

HRMS (ESI) m/z calcd. for $C_{29}H_{26}FN_4O$ $[M + H]^+$ 465.2085, found 465.2085.

5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-3-nitropicolinamide (L*18)



L*18

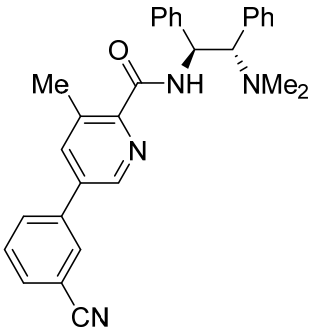
According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.72 g, 3.0 mmol, 1.0 equiv.), 5-bromo-3-nitropicolinic acid (0.82 g, 3.3 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.48 g, 3.3 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 7/1 to 4/1) to yield the ligand **L*18** as a light yellow solid (1.08 g, 73% yield over two steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.96 (s, 2H), 8.08 (s, 1H), 7.89 (s, 1H), 7.86 – 7.75 (m, 2H), 7.66 (t, *J* = 7.8 Hz, 1H), 7.27 – 7.18 (m, 5H), 7.16 – 7.00 (m, 5H), 5.34 (dd, *J* = 10.6, 3.8 Hz, 1H), 3.86 (d, *J* = 10.8 Hz, 1H), 2.23 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 161.2, 148.4, 146.6, 143.1, 140.1, 137.4, 136.0, 133.1, 132.6, 131.6, 130.8, 130.6, 129.9, 129.8, 128.1, 127.9, 127.8, 127.4, 127.1, 117.9, 114.1, 73.7, 54.9, 40.9.

HRMS (ESI) m/z calcd. for $C_{29}H_{26}N_5O_3$ $[M + H]^+$ 492.2030, found 492.2032.

5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-3-methylpicolinamide (L*19)



L*19

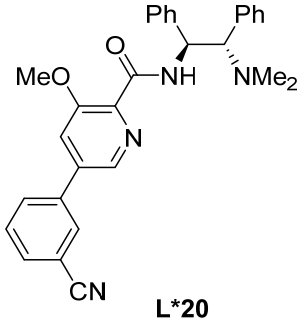
According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.), 5-bromo-3-methylpicolinic acid (0.48 g, 2.2 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.32 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*19** as a white solid (0.77 g, 81% yield over two steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.36 (d, *J* = 5.1 Hz, 1H), 8.70 (d, *J* = 2.0 Hz, 1H), 7.91 (s, 1H), 7.88 – 7.82 (m, 1H), 7.75 – 7.70 (m, 2H), 7.66 – 7.58 (m, 1H), 7.26 – 7.19 (m, 5H), 7.16 – 7.02 (m, 5H), 5.38 (dd, *J* = 10.5, 5.2 Hz, 1H), 3.86 (d, *J* = 10.5 Hz, 1H), 2.77 (s, 3H), 2.23 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 165.5, 147.5, 143.9, 141.3, 138.9, 138.5, 136.0, 135.7, 133.5, 131.9, 131.5, 130.7, 130.1, 129.8, 128.0, 127.7, 127.6, 127.5, 126.8, 118.4, 113.6, 73.9, 54.7, 41.2, 20.7.

HRMS (ESI) m/z calcd. for $C_{30}H_{29}N_4O$ $[M + H]^+$ 461.2336, found 461.2337.

5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-3-methoxypicolinamide (L*20)



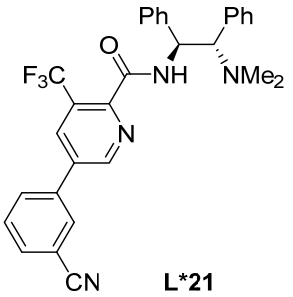
L*20

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.), 5-bromo-3-methoxypicolinic acid (0.51 g, 2.2 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.32 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*20** as a white solid (0.73 g, 77% yield over two steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.04 (d, *J* = 4.9 Hz, 1H), 8.46 (d, *J* = 1.7 Hz, 1H), 7.90 (s, 1H), 7.85 (d, *J* = 7.9 Hz, 1H), 7.74 (d, *J* = 7.7 Hz, 1H), 7.64 (d, *J* = 7.6 Hz, 1H), 7.47 (d, *J* = 1.6 Hz, 1H), 7.26 – 7.17 (m, 5H), 7.13 – 7.01 (m, 5H), 5.43 (dd, *J* = 10.4, 5.2 Hz, 1H), 4.00 (s, 3H), 3.87 (d, *J* = 10.5 Hz, 1H), 2.23 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 163.7, 156.0, 141.1, 139.2, 138.4, 137.7, 133.5, 132.1, 131.6, 130.9, 130.1, 129.8, 128.6, 127.9, 127.7, 127.6, 127.5, 126.7, 118.6, 118.3, 113.6, 73.7, 56.2, 54.7, 41.2.
HRMS (ESI) m/z calcd. for $C_{30}H_{29}N_4O_2$ $[M + H]^+$ 477.2285, found 477.2286.

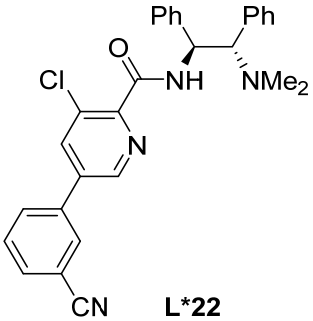
5-(3-Cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-3-(trifluoromethyl)picolinamide (L*21)



L*21

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (1.20 g, 3.0 mmol, 1.0 equiv.), 5-bromo-3-(trifluoromethyl)picolinic acid (0.89 g, 3.3 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.48 g, 3.3 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 2/1) to yield the ligand **L*21** as a yellow solid (1.13 g, 73% yield over two steps).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.00 (d, *J* = 2.0 Hz, 1H), 8.85 (d, *J* = 4.8 Hz, 1H), 8.28 (d, *J* = 1.9 Hz, 1H), 7.93 (s, 1H), 7.90 – 7.83 (m, 1H), 7.81 – 7.75 (m, 1H), 7.67 (t, *J* = 7.8 Hz, 1H), 7.27 – 7.18 (m, 5H), 7.16 – 7.03 (m, 5H), 5.41 (dd, *J* = 10.6, 5.0 Hz, 1H), 3.85 (d, *J* = 10.7 Hz, 1H), 2.22 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 163.2, 149.9, 148.9, 140.5, 137.0, 135.9, 134.26 (q, *J* = 5.7 Hz), 133.0, 132.7, 131.6, 130.8, 130.5, 129.8, 128.0, 127.8, 127.7, 127.4, 126.9, 126.1 (q, *J* = 34.3 Hz), 122.7 (q, *J* = 272.2 Hz), 118.0, 114.0, 73.7, 54.9, 41.0.
^{19}F NMR (376 MHz, $CDCl_3$) δ –59.3.
HRMS (ESI) m/z calcd. for $C_{30}H_{26}F_3N_4O$ $[M + H]^+$ 515.2053, found 515.2056.

3-Chloro-5-(3-cyanophenyl)-*N*-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl) picolinamide (L*22)



L*22

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (1.20 g, 5.0 mmol, 1.0 equiv.), 5-bromo-3-chloropicolinic acid (1.30 g, 5.5 mmol, 1.1 equiv.) and (3-cyanophenyl)boronic acid (0.81 g, 5.5 mmol, 1.1 equiv.), the reaction mixture was

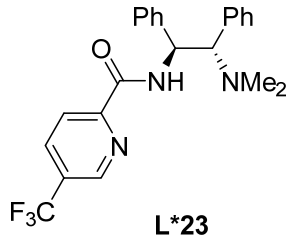
purified by column chromatography (eluent: petroleum ether/EtOAc = 5/1 to 3/1) to yield the ligand **L*22** as a white solid (1.99 g, 83% yield over two steps).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.07 (d, *J* = 4.3 Hz, 1H), 8.75 (d, *J* = 1.6 Hz, 1H), 7.97 (d, *J* = 1.6 Hz, 1H), 7.90 (s, 1H), 7.84 (d, *J* = 7.8 Hz, 1H), 7.76 (d, *J* = 7.7 Hz, 1H), 7.65 (t, *J* = 7.8 Hz, 1H), 7.28 – 7.16 (m, 5H), 7.15 – 7.01 (m, 5H), 5.38 (dd, *J* = 10.6, 5.0 Hz, 1H), 3.87 (d, *J* = 10.6 Hz, 1H), 2.23 (s, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 163.0, 146.4, 144.4, 140.8, 138.1, 137.1, 136.9, 133.1, 132.5, 132.1, 131.5, 130.7, 130.3, 129.8, 128.0, 127.8, 127.6, 127.5, 126.9, 118.1, 113.9, 73.7, 54.9, 41.1.

HRMS (ESI) m/z calcd. for $C_{29}H_{26}ClN_4O$ $[M + H]^+$ 481.1790, found 481.1791.

N-((1*S*,2*S*)-2-(dimethylamino)-1,2-diphenylethyl)-5-(trifluoromethyl)picolinamide (L*23)



L*23

According to **General Procedure 6** with diamine (*S*,*S*)-**L2** (0.48 g, 2.0 mmol, 1.0 equiv.) and 5-(trifluoromethyl)picolinic acid (0.42 g, 2.2 mmol, 1.1 equiv.), the reaction mixture was purified by column chromatography (eluent: petroleum ether/EtOAc = 3/1) to yield the ligand **L*23** as a white solid (0.69 g, 84% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.35 (d, *J* = 4.2 Hz, 1H), 8.93 (s, 1H), 8.27 (d, *J* = 8.2 Hz, 1H), 8.07 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.27 – 7.17 (m, 5H), 7.15 – 7.00 (m, 5H), 5.36 (dd, *J* = 10.7, 5.0 Hz, 1H), 3.89 (d, *J* = 10.7 Hz, 1H), 2.22 (s, 6H).

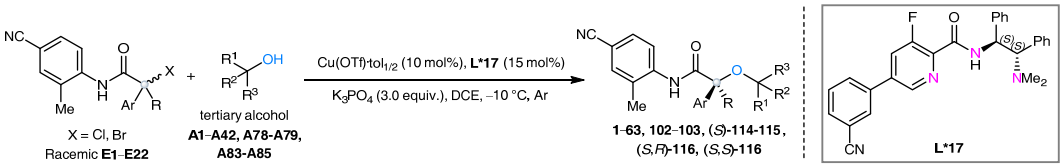
^{13}C NMR (100 MHz, $CDCl_3$) δ 162.9, 153.4, 145.4 (q, *J* = 3.9 Hz), 140.7, 134.6 (q, *J* = 3.4 Hz), 133.0, 129.7, 128.6 (q, *J* = 32.9 Hz), 128.1, 127.8, 127.7, 127.5, 127.1, 123.3 (q, *J* = 271.0 Hz), 122.2, 73.6, 54.9, 41.0.

^{19}F NMR (376 MHz, $CDCl_3$) δ –62.5.

HRMS (ESI) m/z calcd. for $C_{23}H_{23}F_3N_3O$ $[M + H]^+$ 414.1788, found 414.1791.

Enantioconvergent *O*-Alkylation of Alcohols or Phenol with α-Haloamides

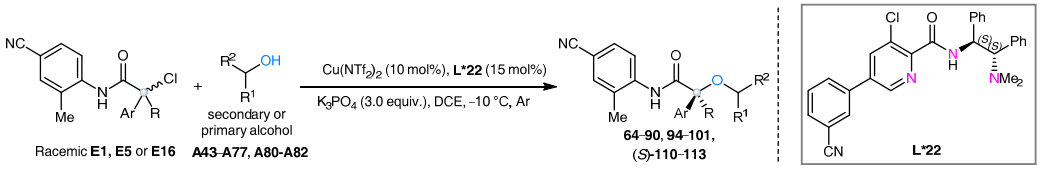
Substrate scope of α-tertiary haloamides with tertiary alcohols (Fig. 2, 1–63; Fig. 4a, 102–103; Fig. 5a, (*S*)-114–115 and Fig. 5b, (*S*,*R*)-116, (*S*,*S*)-116)



General Procedure A:

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with α-tertiary haloamides (0.20 mmol, 1.0 equiv.), Cu(OTf)·tol$_{1/2}$ (5.17 mg, 0.02 mmol, 10 mol%), **L*17** (13.92 mg, 0.03 mmol, 15 mol%) and K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.). Then tertiary alcohol (0.30 mmol, 1.5 equiv.) and anhydrous DCE (2.0 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

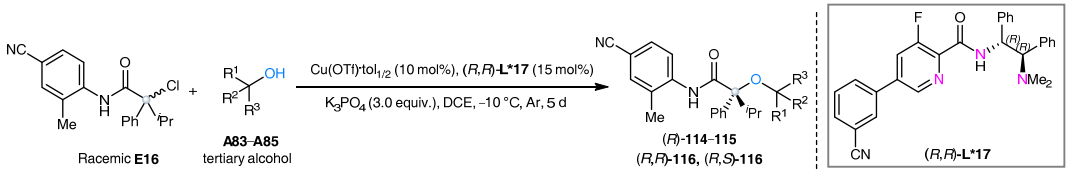
Substrate scope of α-tertiary haloamides with primary or secondary alcohols (Fig. 3, 64–90; Fig. 4a, 94–101; and Fig. 5a, (*S*)-110–113)



General Procedure B:

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with α-tertiary haloamides (0.20 mmol, 1.0 equiv.), Cu(NTf$_2$)$_2$ (12.5 mg, 0.02 mmol, 10 mol%), **L*22** (14.4 mg, 0.03 mmol, 15 mol%) and K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.). Then secondary or primary alcohol (0.30 mmol, 1.5 equiv.) and anhydrous DCE (2.0 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

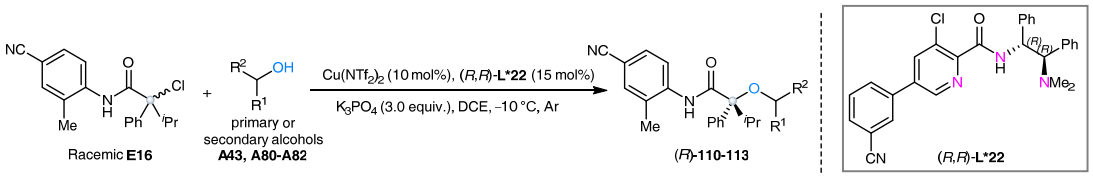
Substrate scope of α-tertiary haloamides with tertiary alcohols (Fig. 5a, (*R*)-114–115; Fig. 5b, (*R*,*R*)-116, (*R*,*S*)-116)



General Procedure C:

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with α-tertiary haloamides (0.20 mmol, 1.0 equiv.), Cu(OTf)·tol$_{1/2}$ (5.17 mg, 0.02 mmol, 10 mol%), (*R*,*R*)-**L*17** (13.92 mg, 0.03 mmol, 15 mol%) and K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.). Then tertiary alcohol (0.30 mmol, 1.5 equiv.) and anhydrous DCE (2.0 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

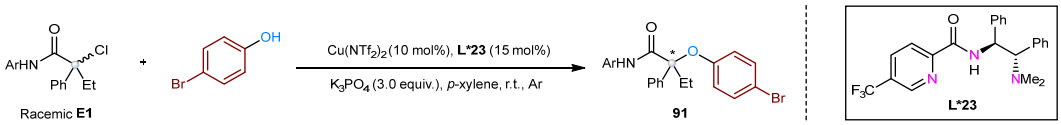
Substrate scope of tertiary α-tertiary haloamides with primary or secondary alcohols (Fig. 5a, (*R*)-110–113)



General Procedure D:

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with α-tertiary haloamides (0.20 mmol, 1.2 equiv.), Cu(NTf$_2$)$_2$ (12.5 mg, 0.02 mmol, 10 mol%), (*R*,*R*)-**L*22** (14.4 mg, 0.03 mmol, 15 mol%) and K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.). Then secondary or primary alcohol (0.30 mmol, 1.5 equiv.) and anhydrous DCE (2.0 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

General procedure for α-tertiary haloamide E1 with phenol (Fig. 3, 91)

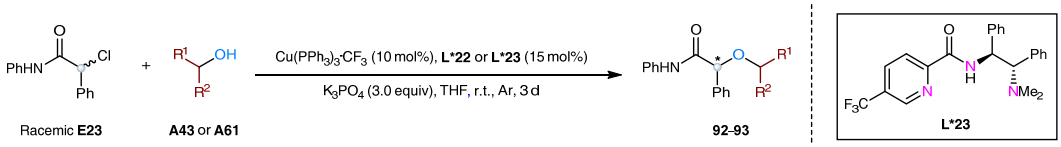


General Procedure E:

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with α-tertiary haloamide **E1** (62.5 mg, 0.20 mmol, 1.0 equiv.), Cu(NTf$_2$)$_2$ (12.5 mg, 0.02 mmol, 10 mol%), **L*23** (12.4 mg, 0.03 mmol, 15 mol%) and K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.). Then phenol (41.5 mg, 0.24 mmol, 1.2 equiv.) and anhydrous *p*-xylene (2.0 mL) were sequentially added into the mixture, and the reaction mixture was stirred at room temperature for 3 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was

evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

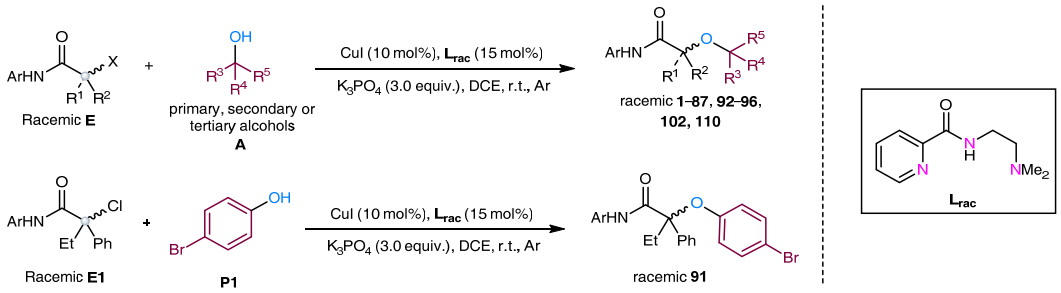
Substrate scope of α-secondary haloamide E23 with primary or secondary alcohol (Fig. 3, 92–93)



General Procedure F:

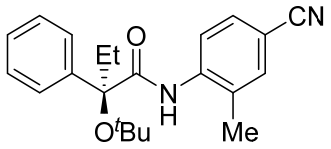
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with $Cu(PPh_3)_3 \cdot CF_3$ (18.4 mg, 0.02 mmol, 10 mol%), **L*22** or **L*23** (0.03 mmol, 15 mol%), K_3PO_4 (128.0 mg, 0.60 mmol, 3.0 equiv.), and anhydrous THF (2.0 mL) were added into the mixture. And the mixture was pre-stirred at room temperature for 1 h. Then α-secondary haloamide **E23** (49.1 mg, 0.20 mmol, 1.0 equiv.) and primary or secondary alcohol (0.30 mmol, 1.5 equiv.) were sequentially added into the mixture, and stirred at room temperature for 3 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product.

General procedure for preparation of racemic products



Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with amagnetic stir bar was charged with CuI (0.95 mg, 0.005 mmol, 10 mol%), $\mathbf{L_{rac}}$ (1.34 mg, 0.0075 mmol, 15 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), and anhydrous DCE (0.50 mL). Then α-haloamides (0.05 mmol, 1.0 equiv.) and alcohol or phenol (0.075 mmol, 1.5 equiv.) were sequentially added into the mixture and the reaction mixture was stirred at room temperature for 24 h. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired racemic product.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide (1)



1

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **1** as a colorless oil (61.7 mg, 88% yield, 90% e.e.).

[α]$_D^{27}$ = +35 (c 0.5, $CHCl_3$).

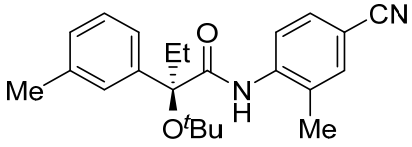
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 10.03 min, t_R (minor) = 20.72 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.51 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.44 (m, 4H), 7.37 – 7.27 (m, 3H), 2.69 – 2.57 (m, 1H), 2.50 – 2.39 (m, 1H), 2.35 (s, 3H), 1.20 (s, 9H), 1.01 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 142.1, 140.1, 133.7, 131.5, 128.4, 128.2, 127.1, 126.9, 119.8, 119.1, 106.7, 84.9, 78.2, 31.0, 27.0, 17.4, 8.4.

HRMS (ESI) m/z calcd. for $C_{22}H_{26}N_2NaO_2$ $[M + Na]^+$ 373.1886, found 373.1885.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-(m-tolyl)butanamide (2)



2

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(m-tolyl)butanamide **E2** (65.4 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **2** as a colorless oil (41.6 mg, 57% yield, 91% e.e.).

[α]$_D^{27}$ = +6 (c 0.4, $CHCl_3$).

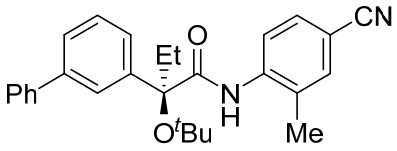
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 8.01 min, t_R (minor) = 10.69 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.52 (s, 1H), 8.41 (d, *J* = 8.3 Hz, 1H), 7.58 – 7.41 (m, 2H), 7.32 –7.27 (m, 2H), 7.24 – 7.18 (m, 1H), 7.10 (d, *J* = 7.4 Hz, 1H), 2.69 – 2.55 (m, 1H), 2.48 – 2.38 (m, 1H), 2.36 (s, 3H), 2.34 (s, 3H), 1.20 (s, 9H), 1.00 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.0, 141.9, 140.2, 137.9, 133.7, 131.5, 129.0, 128.2, 127.7, 126.9, 124.2, 119.8, 119.1, 106.7, 84.9, 78.1, 31.0, 27.0, 21.7, 17.4, 8.5.

HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_2$ $[M + Na]^+$ 387.2043, found 387.2045.

(*S*)-2-([1,1'-Biphenyl]-3-yl)-2-(*tert*-butoxy)-*N*-(4-cyano-2-methylphenyl) butanamide (3)



3

According to **General Procedure A** with 2-([1,1'-biphenyl]-3-yl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide **E3** (77.8 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **3** as a colorless oil (46.1 mg, 54% yield, 90% e.e.).

[α]$_D^{27}$ = +44 (c 0.6, $CHCl_3$).

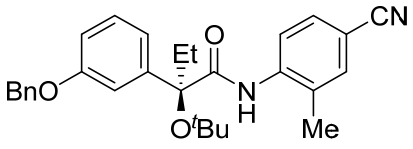
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 9.23 min, t_R (minor) = 17.33 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.56 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.71 (s, 1H), 7.60 – 7.29 (m, 10H), 2.76 – 2.63 (m, 1H), 2.56 – 2.43 (m, 1H), 2.36 (s, 3H), 1.24 (s, 9H), 1.04 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 142.6, 141.3, 141.1, 140.1, 133.8, 131.5, 128.8, 127.5, 127.3, 127.2, 127.1, 127.0, 126.1, 126.0, 119.9, 119.2, 106.8, 85.0, 78.3, 31.1, 27.1, 17.5, 8.5.

HRMS (ESI) m/z calcd. for $C_{28}H_{30}N_2NaO_2$ $[M + Na]^+$ 449.2199, found 449.2197.

(*S*)-2-(3-(Benzyloxy)phenyl)-2-(*tert*-butoxy)-*N*-(4-cyano-2-methylphenyl) butanamide (4)



4

According to **General Procedure A** with 2-(3-(benzyloxy)phenyl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide **E4** (83.8 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **4** as a colorless oil (53.9 mg, 59% yield, 91% e.e.).

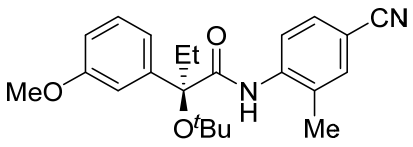
[α]$_D^{27}$ = +27 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 14.38 min, t_R (minor) = 36.48 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.45 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.53 – 7.44 (m, 2H), 7.42 – 7.22 (m, 6H), 7.13 – 7.05 (m, 2H), 6.95 – 6.88 (m, 1H), 5.04 (s, 2H), 2.65 – 2.52 (m, 1H), 2.44 – 2.34 (m, 1H), 2.32 (s, 3H), 1.19 (s, 9H), 0.98 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.8, 158.7, 143.8, 140.1, 136.9, 133.8, 131.5, 129.4, 128.6, 128.1, 127.5, 126.8, 119.7, 119.2, 114.5, 114.1, 106.7, 84.7, 78.3, 70.1, 31.0, 27.0, 17.4, 8.5.
HRMS (ESI) m/z calcd. for $C_{29}H_{32}N_2NaO_3$ $[M + Na]^+$ 479.2305, found 479.2308.

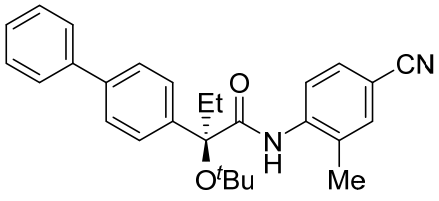
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide (5)



5

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **5** as a colorless oil (50.2 mg, 66% yield, 91% e.e.).
$[\alpha]_D^{27}$ = +53 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 22.87 min, t_R (major) = 31.70 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.47 (s, 1H), 8.39 (d, *J* = 8.3 Hz, 1H), 7.55 – 7.40 (m, 2H), 7.30 – 7.20 (m, 1H), 7.15 – 7.00 (m, 2H), 6.87 – 6.78 (m, 1H), 3.79 (s, 3H), 2.68 – 2.55 (m, 1H), 2.47 – 2.37 (m, 1H), 2.35 (s, 3H), 1.23 (s, 9H), 0.99 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 159.5, 143.8, 140.1, 133.7, 131.5, 129.4, 126.9, 119.8, 119.5, 119.1, 113.7, 112.7, 106.7, 84.8, 78.3, 55.3, 31.0, 26.9, 17.4, 8.4.
HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_3$ $[M + H]^+$ 381.2173, found 381.2173.

(*S*)-2-([1,1'-Biphenyl]-4-yl)-2-(*tert*-butoxy)-*N*-(4-cyano-2-methylphenyl)butanamide (6)

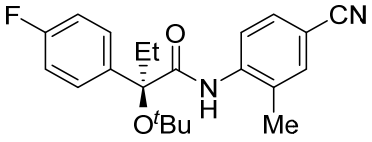


6

According to **General Procedure A** with 2-([1,1'-biphenyl]-4-yl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide **E6** (77.8 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run in $PhCF_3$, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **6** as a light yellow oil (46.1 mg, 54% yield, 87% e.e.).

HPLC analysis: Chiralcel IB (*n*-hexane/*i*-PrOH = 92/8, flow rate 0.9 mL/min, λ = 270 nm), t_R (minor) = 10.81 min, t_R (major) = 11.96 min.
[α]$_D^{27}$ = +18 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.58 (s, 1H), 8.43 (d, *J* = 8.3 Hz, 1H), 7.60 – 7.54 (m, 6H), 7.52 – 7.47 (m, 2H), 7.43 (t, *J* = 7.6 Hz, 2H), 7.34 (t, *J* = 7.4 Hz, 1H), 2.72 – 2.61 (m, 1H), 2.54 – 2.43 (m, 1H), 2.38 (s, 3H), 1.24 (s, 9H), 1.04 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 141.1, 141.0, 140.4, 140.1, 133.8, 131.6, 128.8, 127.6, 127.5, 127.1, 127.0, 126.9, 119.8, 119.1, 106.8, 84.8, 78.3, 31.1, 27.1, 17.5, 8.5.
HRMS (ESI) m/z calcd. for $C_{28}H_{30}N_2NaO_2$ $[M + Na]^+$ 449.2199, found 449.2200.

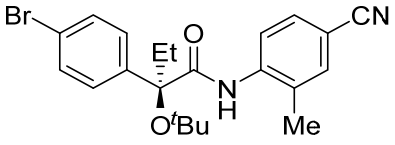
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-(4-fluorophenyl)butanamide (7)



7

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(4-fluorophenyl)butanamide **E7** (66.2 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **7** as a colorless oil (55.3 mg, 75% yield, 83% e.e.).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 97/3, flow rate 1.0 mL/min, λ = 290 nm), t_R (major) = 13.10 min, t_R (minor) = 15.81 min.
[α]$_D^{27}$ = +55 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.61 – 7.36 (m, 4H), 7.03 (t, *J* = 8.7 Hz, 2H), 2.67 – 2.54 (m, 1H), 2.47 – 2.38 (m, 1H), 2.37 (s, 3H), 1.20 (s, 9H), 1.01 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 162.5 (d, *J* = 246.0 Hz), 140.0, 138.0 (d, *J* = 3.3 Hz), 133.8, 131.5, 128.9 (d, *J* = 8.1 Hz), 126.9, 119.8, 119.1, 115.3 (d, J =21.4 Hz), 106.8, 84.4, 78.3, 31.0, 27.2, 17.4, 8.5.
^{19}F NMR (376 MHz, $CDCl_3$) δ –113.7.
HRMS (ESI) m/z calcd. for $C_{22}H_{25}FN_2NaO_2$ $[M + Na]^+$ 391.1792, found 391.1792.

(*S*)-2-(4-Bromophenyl)-2-(*tert*-butoxy)-*N*-(4-cyano-2-methylphenyl)butanamide (8)

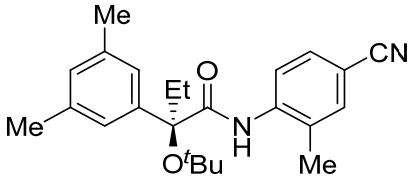


8

According to **General Procedure A** with 2-(4-bromophenyl)-2-chloro-*N*-(4-cyano-2-methylphenyl)butanamide **E8** (78.3 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –10 °C in $PhCF_3$, the reaction mixture was purified by

column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **8** as a colorless oil (50.7 mg, 59% yield, 80% e.e.).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 98/2, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 13.86 min, t_R (minor) = 16.44 min.
[α]$_D^{27}$ = +36 (c 0.4, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.45 (s, 1H), 8.37 (d, *J* = 8.3 Hz, 1H), 7.48 (t, *J* = 8.6 Hz, 4H), 7.37 (d, *J* = 8.6 Hz, 2H), 2.65 – 2.53 (m, 7.2 Hz, 1H), 2.45 – 2.37 (m, 1H), 2.35 (s, 3H), 1.22 (s, 9H), 1.00 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.4, 141.4, 139.9, 133.8, 131.6, 128.8, 126.9, 122.4, 119.8, 119.0, 106.9, 84.5, 78.5, 31.1, 26.9, 17.4, 8.4.
HRMS (ESI) m/z calcd. for $C_{22}H_{25}BrN_2NaO_2$ $[M + Na]^+$ 451.0992, found 451.0985.

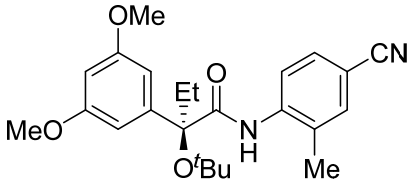
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethylphenyl) butanamide (9)



9

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethylphenyl)butanamide **E9** (68.2 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **9** as a colorless oil (51.5 mg, 68% yield, 91% e.e.).
[α]$_D^{27}$ = +43 (c 0.6, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 5.92 min, t_R (minor) = 8.58 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.55 (s, 1H), 8.42 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.44 (m, 2H), 7.08 (s, 2H), 6.92 (s, 1H), 2.66 – 2.54 (m, 1H), 2.46 – 2.38 (m, 1H), 2.37 (s, 3H), 2.29 (s, 6H), 1.20 (s, 9H), 0.99 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 173.2, 141.8, 140.2, 137.7, 133.7, 131.5, 129.9, 126.9, 124.9, 119.8, 119.2, 106.6, 84.8, 78.1, 31.0, 27.1, 21.6, 17.5, 8.5.
HRMS (ESI) m/z calcd. for $C_{24}H_{30}N_2NaO_2$ $[M + Na]^+$ 401.2199, found 401.2199.

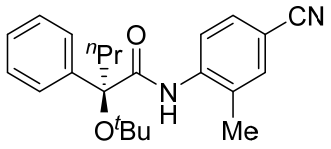
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethoxyphenyl) butanamide (10)



10

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3,5-dimethoxyphenyl)butanamide **E10** (74.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **10** as a colorless oil (52.5 mg, 64% yield, 90% e.e.).
[α]$_D^{27}$ = +43 (c 0.6, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 92/8, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 28.14 min, t_R (major) = 36.82 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.42 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.52 – 7.44 (m, 2H), 6.70 – 6.62 (m, 2H), 6.39 (t, *J* = 2.2 Hz, 1H), 3.77 (s, 6H), 2.67 – 2.53 (m, 1H), 2.42 – 2.36 (m, 1H), 2.35 (s, 3H), 1.26 (s, 9H), 0.98 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.6, 160.7, 144.6, 140.1, 133.8, 131.5, 126.9, 119.8, 119.1, 106.7, 105.7, 99.2, 84.7, 78.3, 55.3, 31.0, 26.9, 17.4, 8.4.
HRMS (ESI) m/z calcd. for $C_{24}H_{30}N_2NaO_4$ $[M + Na]^+$ 433.2098, found 433.2097.

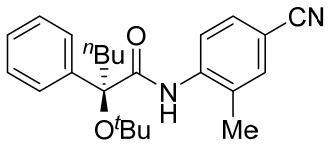
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylpentanamide (11)



11

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylpentanamide **E11** (65.4 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ in $PhCF_3$ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **11** as a colorless oil (37.2 mg, 51% yield, 87% e.e.).
[α]$_D^{27}$ = +25 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 13.80 min, t_R (major) = 17.35 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.52 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.54 – 7.44 (m, 4H), 7.37 – 7.25 (m, 3H), 2.62 – 2.51 (m, 1H), 2.35 (s, 3H), 2.34 – 2.26 (m, 1H), 1.64 – 1.49 (m, 1H), 1.34 – 1.26 (m, 1H), 1.19 (s, 9H), 0.99 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 173.0, 142.2, 140.1, 133.8, 131.5, 128.4, 128.2, 127.0, 126.9, 119.7, 119.1, 106.7, 84.4, 78.1, 36.4, 31.0, 17.4, 17.2, 14.2.
HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_2$ $[M + Na]^+$ 387.2043, found 387.2041.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylhexanamide (12)



12

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylhexanamide **E12** (68.2 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ in $PhCF_3$ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **12** as a colorless oil (34.1 mg, 45% yield, 88% e.e.).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 23.56 min, t_R (major) = 39.36 min.

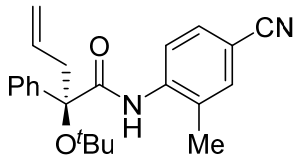
[α]$_D^{27}$ = +38 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.46 (m, 4H), 7.37 – 7.27 (m, 3H), 2.64 – 2.52 (m, 1H), 2.40 – 2.28 (m, 4H), 1.57 – 1.47 (m, 1H), 1.45 – 1.35 (m, 2H), 1.30 – 1.24 (m, 1H), 1.19 (s, 9H), 0.93 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.0, 142.2, 140.1, 133.8, 131.5, 128.4, 128.2, 127.1, 126.9, 119.8, 119.1, 106.7, 84.4, 78.1, 34.1, 31.0, 25.9, 23.0, 17.5, 14.1.

HRMS (ESI) m/z calcd. for $C_{24}H_{30}N_2NaO_2$ $[M + Na]^+$ 401.2199, found 401.2198.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylpent-4-enamide (13)



13

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylpent-4-enamide **E13** (65.0 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **13** as a colorless oil (39.9 mg, 55% yield, 84% e.e.).

[α]$_D^{27}$ = +27 (c 0.6, $CHCl_3$).

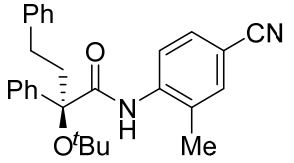
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 95/5, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 13.27 min, t_R (minor) = 17.69 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.46 (s, 1H), 8.36 (d, *J* = 8.7 Hz, 1H), 7.61 – 7.41 (m, 4H), 7.38 – 7.27 (m, 3H), 5.94 – 5.80 (m, 1H), 5.25 – 5.06 (m, 2H), 3.42 – 3.18 (m, 2H), 2.34 (s, 3H), 1.22 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.4, 141.4, 140.1, 133.7, 132.7, 131.5, 128.4 (d, *J* = 1.3 Hz), 127.2, 127.0, 119.9, 119.1, 119.0, 106.8, 84.3, 78.6, 38.8, 31.1, 17.4.

HRMS (ESI) m/z calcd. for $C_{23}H_{26}N_2NaO_2$ $[M + Na]^+$ 385.1886, found 385.1887.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2,4-diphenylbutanamide (14)



14

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2,4-diphenylbutanamide **E14** (77.8 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **14** as a colorless oil (48.6 mg, 57% yield, 87% e.e.).

[α]$_D^{27}$ = +34 (c 0.5, $CHCl_3$).

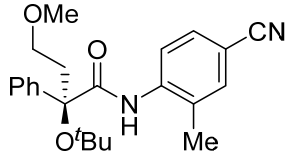
HPLC analysis: Chiralcel IC (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 25.13 min, t_R (minor) = 29.35 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.57 (s, 1H), 8.43 (d, *J* = 8.4 Hz, 1H), 7.57 – 7.45 (m, 4H), 7.39 – 7.12 (m, 8H), 3.03 – 2.76 (m, 2H), 2.73 – 2.53 (m, 2H), 2.39 (s, 3H), 1.26 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 141.6, 141.5, 140.1, 133.8, 131.6, 128.6, 128.5, 128.4, 127.1, 126.9, 126.2, 119.9, 106.9, 84.3, 78.5, 36.5, 31.1, 30.3, 17.5.

HRMS (ESI) m/z calcd. for $C_{28}H_{30}N_2NaO_2$ $[M + Na]^+$ 449.2199, found 449.2201.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-4-methoxy-2-phenylbutanamide (15)



15

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-4-methoxy-2-phenylbutanamide **E15** (68.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **15** as a colorless oil (45.7 mg, 60% yield, 83% e.e.).

[α]$_D^{27}$ = +39 (c 0.3, $CHCl_3$).

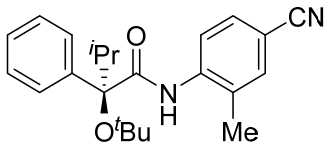
HPLC analysis: Chiralcel IB (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 11.47 min, t_R (minor) = 13.67 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.37 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.54 – 7.45 (m, 4H), 7.39 – 7.27 (m, 3H), 3.59 – 3.45 (m, 2H), 3.28 (s, 3H), 3.00 – 2.87 (m, 1H), 2.74 – 2.65 (m, 1H), 2.34 (s, 3H), 1.23 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.5, 141.4, 140.1, 133.8, 131.6, 128.5, 128.4, 126.8, 126.7, 119.8, 119.1, 106.8, 82.6, 78.5, 68.5, 58.8, 34.2, 30.9, 17.4.

HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_3$ $[M + Na]^+$ 403.1992, found 403.1984.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (16)



16

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **16** as a colorless oil (52.5 mg, 72% yield, 96% e.e.).

[α]$_D^{27}$ = −7 (c 0.6, $CHCl_3$).

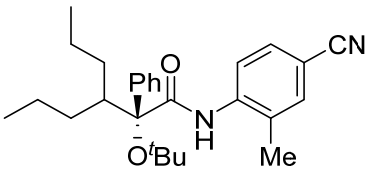
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 6.85 min, t_R (major) = 8.28 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.56 (s, 1H), 8.54 (d, *J* = 8.5 Hz, 1H), 7.59 – 7.44 (m, 4H), 7.41 – 7.28 (m, 3H), 3.12 – 2.96 (m, 1H), 2.35 (s, 3H), 1.17 (d, *J* = 6.7 Hz, 3H), 1.12 (d, *J* = 6.8 Hz, 3H), 1.07 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 140.2, 138.0, 133.8, 131.5, 130.5, 128.5, 127.9, 126.8, 119.9, 119.2, 106.6, 87.8, 78.3, 33.5, 30.7, 19.1, 18.1, 17.6.

HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_2$ $[M + Na]^+$ 387.2043, found 387.2044.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenyl-3-propylhexanamide (17)



17

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenyl-3-propylhexanamide **E17** (76.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **17** as a colorless oil (52.2 mg, 62% yield, 90% e.e.).

[α]$_D^{27}$ = −11 (c 0.5, $CHCl_3$).

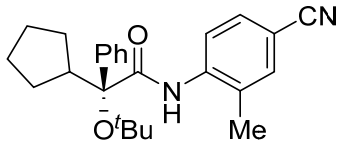
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 99/1, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.28 min, t_R (major) = 7.73 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.66 (s, 1H), 8.52 (d, *J* = 8.5 Hz, 1H), 7.56 – 7.45 (m, 4H), 7.38 – 7.31 (m, 3H), 2.58 – 2.50 (m, 1H), 2.37 (s, 3H), 1.96 – 1.77 (m, 2H), 1.51 – 1.23 (m, 6H), 1.05 (s, 9H), 0.94 (t, *J* = 7.2 Hz, 3H), 0.85 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.6, 140.2, 138.6, 133.8, 131.5, 130.2, 128.6, 128.0, 126.8, 120.0, 119.2, 106.6, 87.9, 78.3, 44.4, 34.8, 34.3, 30.8, 23.9, 21.7, 17.7, 15.1, 14.8.

HRMS (ESI) m/z calcd. for $C_{27}H_{36}N_2NaO_2$ $[M + Na]^+$ 443.2669, found 443.2672.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-cyclopentyl-2-phenylacetamide (18)



18

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-cyclopentyl-2-phenylacetamide **E18** (70.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **18** as a white solid (66.4 mg, 85% yield, 90% e.e.).

$[\alpha]_D^{27}$ = +35 (c 0.4, $CHCl_3$).

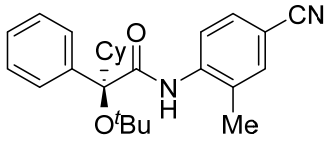
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 7.58 min, t_R (major) = 8.66 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.74 (s, 1H), 8.50 (d, *J* = 8.5 Hz, 1H), 7.58 – 7.42 (m, 4H), 7.38 – 7.28 (m, 3H), 3.35 – 3.18 (m, 1H), 2.36 (s, 3H), 2.12 – 1.99 (m, 2H), 1.89 – 1.77 (m, 1H), 1.60 – 1.44 (m, 5H), 1.10 (s, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 140.2, 139.8, 133.8, 131.6, 130.0, 128.5, 127.9, 126.8, 119.8, 119.2, 106.5, 87.3, 78.3, 45.2, 31.0, 29.5, 28.6, 26.1, 25.8, 17.6.

HRMS (ESI) m/z calcd. for $C_{25}H_{30}N_2NaO_2$ $[M + Na]^+$ 413.2199, found 413.2196.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-cyclohexyl-2-phenylacetamide (19)



19

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-cyclohexyl-2-phenylacetamide **E19** (73.4 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **19** as a colorless oil (59.9 mg, 74% yield, 90% e.e.).

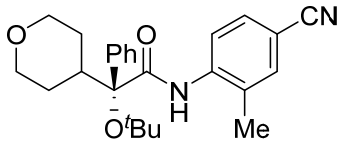
$[\alpha]_D^{27}$ = +4 (c 0.3, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.30 min, t_R (major) = 8.68 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.56 (s, 1H), 8.58 (d, *J* = 8.5 Hz, 1H), 7.61 – 7.47 (m, 4H), 7.40 – 7.33 (m, 3H), 2.62 (t, *J* = 11.1 Hz, 1H), 2.37 (s, 3H), 2.33 – 2.25 (m, 1H),

1.90 (d, *J* = 10.2 Hz, 2H), 1.80 – 1.70 (m, 2H), 1.41 – 1.26 (m, 4H), 1.08 (s, 9H), 1.00 – 0.83 (m, 1H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 140.2, 137.8, 133.8, 131.6, 130.5, 128.5, 127.9, 126.7, 119.8, 119.2, 106.5, 87.3, 78.2, 44.4, 30.7, 29.3, 28.3, 27.2, 27.0, 26.5, 17.7.
HRMS (ESI) m/z calcd. for $C_{26}H_{32}N_2NaO_2$ $[M + Na]^+$ 427.2356, found 427.2357.

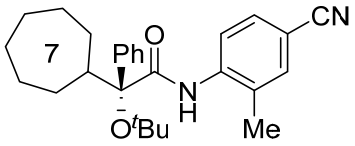
(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenyl-2-(tetrahydro-2*H*-pyran-4-yl)acetamide (20)



20

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenyl-2-(tetrahydro-2*H*-pyran-4-yl)acetamide **E20** (73.8 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/ EtOAc = 6/1) to yield the product **20** as a light yellow solid (63.4 mg, 78% yield, 95% e.e.).
$[\alpha]_D^{27}$ = +16 (c 0.6, $CHCl_3$).
HPLC analysis: Chiralcel IF (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 34.13 min, t_R (minor) = 41.02 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.46 (s, 1H), 8.54 (d, *J* = 8.5 Hz, 1H), 7.59 – 7.46 (m, 4H), 7.42 – 7.32 (m, 3H), 4.16 – 4.04 (m, 1H), 4.02 – 3.90 (m, 1H), 3.58 – 3.36 (m, 2H), 2.92 – 2.80 (m, 1H), 2.34 (s, 3H), 2.13 – 2.03 (m, 1H), 1.81 – 1.67 (m, 2H), 1.52 – 1.38 (m, 1H), 1.10 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.4, 140.0, 137.0, 133.8, 131.6, 130.4, 128.9, 128.1, 126.8, 119.9, 119.1, 106.8, 86.6, 78.6, 68.6, 68.5, 42.3, 30.7, 29.3, 28.8, 17.7.
HRMS (ESI) m/z calcd. for $C_{25}H_{30}N_2NaO_3$ $[M + Na]^+$ 429.2149, found 429.2153.

(*S*)-2-(*tert*-Butoxy)-*N*-(4-cyano-2-methylphenyl)-2-cycloheptyl-2-phenylacetamide (21)

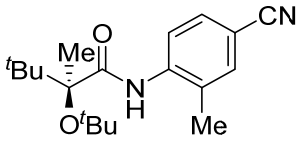


21

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-cycloheptyl-2-phenylacetamide **E21** (76.2 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **21** as a colorless oil (48.6 mg, 58% yield, 87% e.e.).
$[\alpha]_D^{27}$ = −9 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 7.71 min, t_R (major) = 10.87 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.66 (s, 1H), 8.54 (d, *J* = 8.5 Hz, 1H), 7.56 – 7.40 (m, 4H), 7.38 – 7.28 (m, 3H), 2.82 – 2.70 (m, 1H), 2.36 (s, 3H), 2.12 – 2.02 (m, 1H), 1.86 – 1.71 (m, 2H), 1.64 – 1.40 (m, 7H), 1.35 – 1.14 (m, 2H), 1.06 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.3, 140.2, 138.7, 133.8, 131.5, 130.2, 128.5, 128.0, 126.8, 119.8, 119.2, 106.5, 87.9, 78.3, 43.5, 30.8, 30.7, 30.2, 28.1, 28.0, 27.5, 26.7, 17.7.
HRMS (ESI) m/z calcd. for $C_{27}H_{34}N_2NaO_2$ $[M + Na]^+$ 441.2512, found 441.2516.

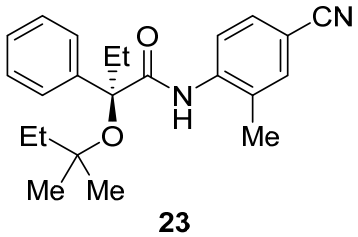
(*S*)-2-(*tert*-butoxy)-*N*-(4-cyano-2-methylphenyl)-2,3,3-trimethylbutanamide (22)



22

According to **General Procedure A** with 2-bromo-*N*-(4-cyano-2-methylphenyl)-2,3,3-trimethylbutanamide **E22** (64.6 mg, 0.20 mmol) and *tert*-butanol **A1** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **22** as a white solid (39.2 mg, 62% yield, 49% e.e.).
$[\alpha]_D^{27}$ = −34 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IF (*n*-hexane/*i*-PrOH = 98/2, flow rate 1.0 mL/min, λ = 214 nm), t_R (minor) = 16.85 min, t_R (major) = 18.79 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.79 (s, 1H), 8.54 (d, *J* = 8.6 Hz, 1H), 7.52 (dd, *J* = 8.6, 1.6 Hz, 1H), 7.46 (s, 1H), 2.34 (s, 3H), 1.63 (s, 3H), 1.37 (s, 9H), 1.00 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 174.4, 140.1, 133.9, 131.6, 126.0, 119.3, 119.1, 106.4, 85.3, 76.3, 39.1, 30.7, 25.8, 17.8, 17.3.
HRMS (ESI) m/z calcd. for $C_{19}H_{27}N_2O_2$ $[M – H]^-$ 315.2073, found 315.2078.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(*tert*-pentyloxy)-2-phenylbutanamide (23)

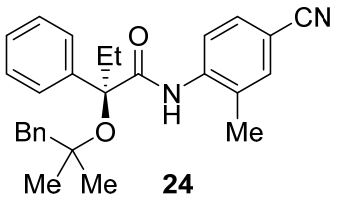


23

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-methylbutan-2-ol **A2** (26.4 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **23** as a colorless oil (55.4 mg, 76% yield, 90% e.e.).

$[\alpha]_D^{27}$ = +47 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 7.84 min, t_R (minor) = 17.24 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.48 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.56 – 7.43 (m, 4H), 7.41 – 7.25 (m, 3H), 2.68 – 2.57 (m, 1H), 2.52 – 2.40 (m, 1H), 2.35 (s, 3H), 1.61 – 1.44 (m, 2H), 1.21 (s, 3H), 1.07 – 0.91 (m, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 173.1, 142.3, 140.1, 133.8, 131.4, 128.3, 128.2, 127.1, 127.0, 120.0, 119.1, 106.8, 84.9, 80.7, 37.4, 27.5, 27.4, 27.3, 17.5, 9.2, 8.5.
HRMS (ESI) m/z calcd. for $C_{23}H_{28}N_2NaO_2$ $[M + Na]^+$ 387.2043, found 387.2041.

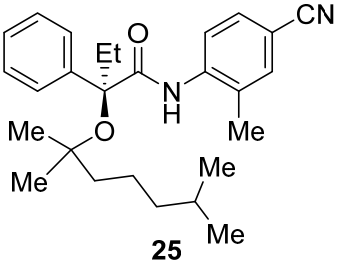
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2-methyl-1-phenylpropan-2-yl)oxy)-2-phenylbutanamide (24)



24

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-methyl-1-phenylpropan-2-ol **A3** (45.1 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **24** as a colorless oil (52.9 mg, 62% yield, 90% e.e.).
$[\alpha]_D^{27}$ = +15 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 290 nm), t_R (major) = 17.49 min, t_R (minor) = 34.06 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.98 (s, 1H), 8.09 (d, *J* = 8.4 Hz, 1H), 7.51 – 7.40 (m, 4H), 7.36 – 7.27 (m, 3H), 7.24 – 7.14 (m, 5H), 2.92 – 2.78 (m, 2H), 2.71 – 2.58 (m, 1H), 2.53 – 2.40 (m, 1H), 2.04 (s, 3H), 1.30 (s, 3H), 1.05 (s, 3H), 1.00 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 142.1, 139.9, 137.7, 133.8, 131.1, 130.8, 128.5, 128.4, 128.2, 128.1, 127.0, 126.7, 121.4, 119.1, 107.3, 85.2, 80.4, 51.7, 28.1, 27.5, 27.4, 17.3, 8.6.
HRMS (ESI) m/z calcd. for $C_{28}H_{30}N_2NaO_2$ $[M + Na]^+$ 449.2199, found 449.2200.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2,6-dimethylheptan-2-yl)oxy)-2-phenylbutanamide (25)



25

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2,6-dimethylheptan-2-ol **A4** (43.3 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **25** as a light yellow oil (57.2 mg, 68% yield, 90% e.e.).

[α]$_D^{27}$ = +31 (c 0.5, $CHCl_3$).

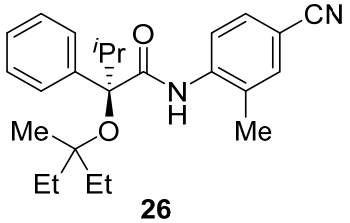
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 6.19 min, t_R (minor) = 13.49 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.48 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.55 – 7.41 (m, 4H), 7.37 – 7.26 (m, 3H), 2.67 – 2.55 (m, 1H), 2.53 – (dt, *J* = 14.3, 7.1 Hz, 1H), 2.35 (s, 3H), 1.56 – 1.48 (m, 1H), 1.46 – 1.36 (m, 4H), 1.22 (s, 3H), 1.16 – 1.08 (m, 2H), 1.02 (s, 3H), 0.99 (d, *J* = 7.2 Hz, 3H),0.88 (s, 3H), 0.87 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.1, 142.2, 140.1, 133.8, 131.5, 128.3, 128.2, 127.1, 126.9, 120.0, 119.1, 106.8, 85.0, 80.5, 45.2, 39.4, 28.1, 28.0, 27.4, 22.7, 22.6, 22.4, 17.5, 8.4.

HRMS (ESI) m/z calcd. for $C_{27}H_{36}N_2NaO_2$ $[M + Na]^+$ 443.2669, found 443.2668.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-((3-methylpentan-3-yl)oxy)-2-phenylbutanamide (26)



26

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-methylpentan-3-ol **A5** (30.7 mg, 0.30 mmol, 1.5 equiv.) run at –10 ºC for 5 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **26** as a light yellow oil (64.4 mg, 82% yield, 95% e.e.).

[α]$_D^{27}$ = −4 (c 0.4, $CHCl_3$).

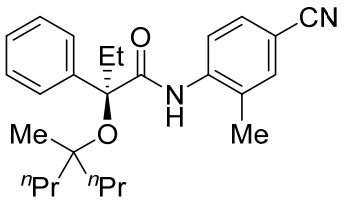
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.34 min, t_R (major) = 6.45 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.64 (s, 1H), 8.55 (d, *J* = 8.5 Hz, 1H), 7.57 – 7.48 (m, 4H), 7.36 – 7.29 (m, 3H), 3.12 – 2.98 (m, 1H), 2.35 (s, 3H), 1.57 – 1.44 (m, 2H), 1.18 (d, *J* = 6.7 Hz, 3H), 1.12 (d, *J* = 6.8 Hz, 3H), 1.15 – 1.03 (m, 4H), 0.89 – 0.80 (m, 4H), 0.73 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 140.2, 138.0, 133.8, 131.5, 130.5, 128.6, 127.8, 126.9, 120.0, 119.2, 106.6, 87.9, 83.9, 34.0, 32.4, 31.2, 24.6, 19.4, 18.1, 17.7, 8.8, 8.6.

HRMS (ESI) m/z calcd. for $C_{25}H_{32}N_2NaO_2$ $[M + Na]^+$ 415.2356, found 415.2359.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((4-methylheptan-4-yl)oxy)-2-phenylbutanamide (27)



27

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 4-methylheptan-4-ol **A6** (39.1 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **27** as a colorless oil (45.5 mg, 56% yield, 90% e.e.).

[α]$_D^{27}$ = +40 (c 0.5, $CHCl_3$).

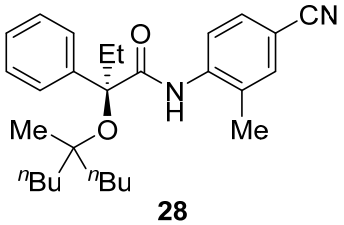
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 7.41 min, t_R (minor) = 16.70 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.55 (s, 1H), 8.44 (d, *J* = 8.4 Hz, 1H), 7.54 – 7.44 (m, 4H), 7.37 – 7.27 (m, 3H), 2.66 – 2.44 (m, 2H), 2.35 (s, 3H), 1.62 – 1.45 (m, 2H), 1.40 – 1.17 (m, 6H), 1.06 (s, 3H), 1.00 (t, *J* = 7.2 Hz, 3H), 0.91 (t, *J* = 7.2 Hz, 3H), 0.78 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.3, 142.1, 140.2, 133.8, 131.5, 128.3, 128.2, 127.3, 126.9, 119.9, 119.1, 106.8, 85.1, 83.1, 43.7, 42.9, 27.8, 25.3, 17.6, 17.5, 17.4, 14.6, 14.3, 8.4.

HRMS (ESI) m/z calcd. for $C_{26}H_{34}N_2NaO_2$ $[M + Na]^+$ 429.2512, found 429.2511.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((5-methylnonan-5-yl)oxy)-2-phenylbutanamide (28)



28

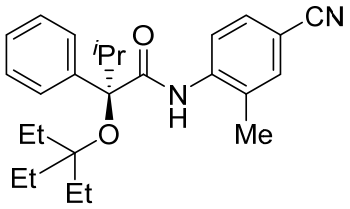
According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 5-methylnonan-5-ol **A7** (47.5 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **28** as a colorless oil (53.9 mg, 62% yield, 90% e.e.).

[α]$_D^{27}$ = +46 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 6.54 min, t_R (minor) = 14.30 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.54 (s, 1H), 8.44 (d, *J* = 8.4 Hz, 1H), 7.53 – 7.46 (m, 4H), 7.35 – 7.27 (m, 3H), 2.66 – 2.45 (m, 2H), 2.35 (s, 3H), 1.63 – 1.49 (m, 2H), 1.33 – 1.14 (m, 10H), 1.06 (s, 3H), 1.00 (t, *J* = 7.2 Hz, 3H), 0.91 (t, *J* = 6.9 Hz, 3H), 0.85 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 173.3, 142.2, 140.2, 133.8, 131.5, 128.3, 128.2, 127.3, 126.9, 120.0, 119.1, 106.8, 85.1, 83.2, 41.0, 40.3, 27.8, 26.6, 26.5, 25.3, 23.2, 23.0, 17.5, 14.1, 14.0, 8.5.
HRMS (ESI) m/z calcd. for $C_{28}H_{38}N_2NaO_2$ $[M + Na]^+$ 457.2825, found 457.2826.

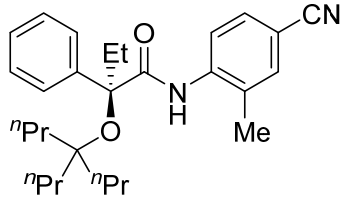
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((3-ethylpentan-3-yl)oxy)-3-methyl-2-phenylbutanamide (29)



29

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-ethylpentan-3-ol **A8** (34.9 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **29** as a colorless oil (57.7 mg, 71% yield, 95% e.e.).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 95/5, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.57 min, t_R (major) = 7.91 min.
$[\alpha]_D^{27}$ = +4 (c 0.4, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.85 (s, 1H), 8.61 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.45 (m, 4H), 7.38 – 7.28 (m, 3H), 3.08 – 2.95 (m, 1H), 2.36 (s, 3H), 1.49 – 1.37 (m, 3H), 1.23 – 1.17 (m, 4H), 1.17 – 1.10 (m, 5H), 0.80 (t, *J* = 7.4 Hz, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 140.2, 137.3, 133.8, 131.6, 130.8, 128.8, 127.7, 126.8, 119.9, 119.2, 106.6, 88.3, 87.4, 34.4, 28.6, 19.6, 18.0, 17.6, 8.7.
HRMS (ESI) m/z calcd. for $C_{26}H_{34}N_2NaO_2$ $[M + Na]^+$ 429.2512, found 429.2517.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-phenyl-2-((4-propylheptan-4-yl)oxy) butanamide (30)



30

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 4-propylheptan-4-ol **A9** (47.5 mg,

0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25/1) to yield the product **30** as a white solid (46.1 mg, 53% yield, 90% e.e.).

$[\alpha]_D^{27}$ = +39 (c 0.5, $CHCl_3$).

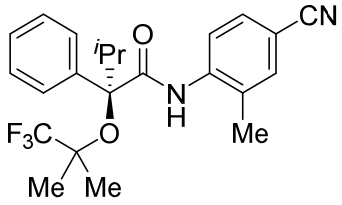
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 5.97 min, t_R (minor) = 14.00 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.55 (d, *J* = 8.5 Hz, 1H), 7.58 – 7.41 (m, 4H), 7.38 – 7.28 (m, 3H), 2.65 – 2.44 (m, 2H), 2.36 (s, 3H), 1.44 – 1.18 (m, 12H), 1.04 (t, *J* = 7.2 Hz, 3H), 0.80 (t, *J* = 7.0 Hz, 9H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.5, 141.3, 140.2, 133.8, 131.6, 128.4, 128.3, 128.0, 126.7, 119.6, 119.2, 106.7, 86.3, 85.2, 40.2, 28.7, 17.4, 17.3, 14.5, 8.6.

HRMS (ESI) m/z calcd. for $C_{28}H_{38}N_2NaO_2$ $[M + Na]^+$ 457.2825, found 457.2824.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((1,1,1-trifluoro-2-methylpropan-2-yl)oxy)butanamide (31)



31

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1,1,1-trifluoro-2-methylpropan-2-ol **A10** (38.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25/1) to yield product **31** as a colorless oil (53.6 mg, 64% yield, 95% e.e.).

$[\alpha]_D^{27}$ = +5 (c 0.6, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.91 min, t_R (major) = 7.67 min.

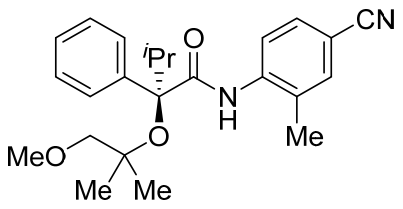
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.48 (d, *J* = 8.5 Hz, 1H), 7.57 – 7.48 (m, 4H), 7.44 – 7.36 (m, 3H), 3.10 – 2.98 (m, 1H), 2.32 (s, 3H), 1.42 (s, 3H), 1.21 (d, *J* = 6.7 Hz, 3H), 1.16 (d, *J* = 6.8 Hz, 3H), 0.70 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.3, 139.9, 136.8, 134.0, 131.3, 130.5, 129.4, 128.3, 127.7, 125.9 (q, *J* = 282.7 Hz), 120.5, 119.1, 107.1, 89.0, 79.8 (q, *J* = 27.5 Hz), 33.7, 21.7, 20.8, 19.4, 17.5, 17.2 (q, *J* = 1.0 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ –83.6.

HRMS (ESI) m/z calcd. for $C_{23}H_{25}F_3N_2NaO_2$ $[M + Na]^+$ 441.1760, found 441.1766.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((1-methoxy-2-methylpropan-2-yl)oxy)-3-methyl-2-phenylbutanamide (32)



32

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1-methoxy-2-methylpropan-2-ol **A11** (31.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **32** as a light yellow oil (49.7 mg, 63% yield, 95% e.e.).

[α]$_D^{27}$ = −32 (c 0.5, $CHCl_3$).

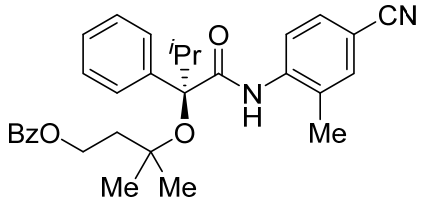
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 7.07 min, t_R (major) = 10.54 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.87 (s, 1H), 8.20 (d, *J* = 8.2 Hz, 1H), 7.68 – 7.59 (m, 2H), 7.57 – 7.49 (m, 2H), 7.40 – 7.30 (m, 3H), 3.27 (s, 3H), 3.21 (d, *J* = 9.3 Hz, 1H), 2.91 – 2.73 (m, 2H), 2.39 (s, 3H), 1.19 (d, *J* = 6.7 Hz, 3H), 1.01 (d, *J* = 6.4 Hz, 6H), 0.96 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 140.5, 138.1, 134.1, 130.9, 130.5, 129.7, 128.4, 127.7, 122.4, 119.2, 107.3, 87.0, 81.8, 78.9, 59.0, 37.1, 26.5, 23.3, 18.5, 18.3, 17.7.

HRMS (ESI) m/z calcd. for $C_{24}H_{30}N_2NaO_3$ $[M + Na]^+$ 417.2149, found 417.2152.

(*S*)-3-((1-((4-Cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-3-methylbutyl benzoate (33)



33

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-hydroxy-3-methylbutyl benzoate **A12** (62.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product **33** as a light yellow oil (67.8 mg, 68% yield, 95% e.e.).

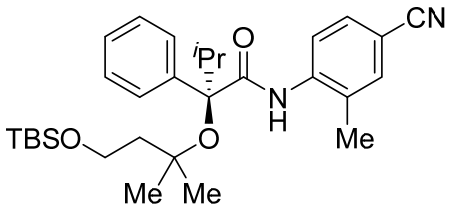
[α]$_D^{27}$ = −17 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 9.87 min, t_R (major) = 13.24 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.35 (s, 1H), 8.48 (d, *J* = 8.5 Hz, 1H), 8.06 – 7.86 (m, 2H), 7.61 – 7.50 (m, 4H), 7.48 (s, 1H), 7.45 – 7.39 (m, 2H), 7.38 – 7.30 (m, 3H), 4.53

– 4.26 (m, 2H), 3.14 – 3.00 (m, 1H), 2.34 (s, 3H), 1.75 – 1.65 (m, 1H), 1.63 – 1.50 (m, 1H), 1.31 (s, 3H), 1.19 (d, J = 6.7 Hz, 3H), 1.13 (s, 3H), 1.10 (d, J = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 166.5, 140.0, 137.8, 133.9, 133.1, 131.4, 130.3, 130.1, 129.5, 128.8, 128.4, 128.1, 127.3, 120.4, 119.1, 106.9, 88.3, 79.4, 61.4, 41.9, 33.9, 28.6, 28.5, 19.1, 18.2, 17.7.
HRMS (ESI) m/z calcd. for $C_{31}H_{34}N_2NaO_4$ $[M + Na]^+$ 521.2411, found 521.2418.

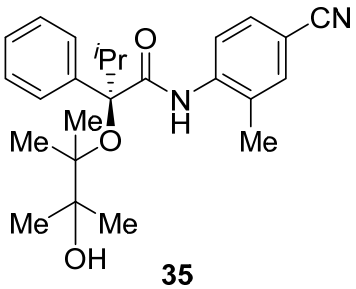
(*S*)-2-((4-((*tert*-Butyldimethylsilyl)oxy)-2-methylbutan-2-yl)oxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (34)



34

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 4-((*tert*-butyldimethylsilyl)oxy)-2-methylbutan-2-ol **A13** (65.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **34** as a colorless oil (60.0 mg, 59% yield, 92% e.e.).
$[\alpha]_D^{27}$ = −9 (c 0.3, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 95/5, flow rate 0.8 mL/min, λ = 270 nm), t_R (minor) = 7.91 min, t_R (major) = 9.93 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.43 (s, 1H), 8.49 (d, J = 8.5 Hz, 1H), 7.61 – 7.43 (m, 4H), 7.39 – 7.31 (m, 3H), 3.80 – 3.57 (m, 2H), 3.07 – 2.95 (m, 1H), 2.34 (s, 3H), 1.57 – 1.51 (m, 2H), 1.19 (s, 3H), 1.17 (d, J = 6.7 Hz, 3H), 1.09 (d, J = 6.8 Hz, 3H), 0.97 (s, 3H), 0.85 (s, 9H), -0.01 (s, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 140.1, 138.0, 133.9, 131.5, 130.4, 128.6, 127.9, 127.1, 120.3, 119.1, 106.8, 87.9, 80.0, 59.5, 46.8, 34.1, 28.5, 28.3, 25.9, 19.2, 18.2, 17.7, -5.3, -5.4.
HRMS (ESI) m/z calcd. for $C_{30}H_{44}N_2NaO_3Si$ $[M + Na]^+$ 531.3013, found 531.3016.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((3-hydroxy-2,3-dimethylbutan-2-yl)oxy)-3-methyl-2-phenylbutanamide (35)



35

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and pinacol **A14** (35.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product **35** as a white solid (58.8 mg, 72% yield, 94% e.e.).

[α]$_D^{27}$ = −99 (c 0.2, $CHCl_3$).

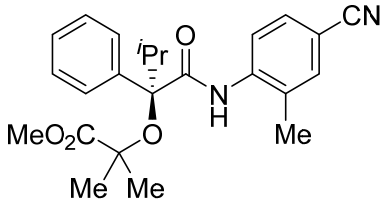
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 8.16 min, t_R (major) = 26.22 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 10.15 (s, 1H), 8.03 (d, *J* = 8.3 Hz, 1H), 7.75 (d, *J* = 6.9 Hz, 2H), 7.56 – 7.43 (m, 2H), 7.41 – 7.30 (m, 3H), 2.88 – 2.76 (m, 1H), 2.35 (s, 3H), 1.84 (s, 1H), 1.43 (s, 3H), 1.25 (d, *J* = 6.6 Hz, 3H), 1.15 (s, 3H), 1.10 (s, 3H), 0.79 (d, *J* = 6.6 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 140.5, 138.3, 134.3, 131.2, 130.7, 130.4, 128.1, 127.5, 124.0, 119.1, 107.6, 86.6, 83.6, 78.0, 39.4, 26.4, 25.4, 25.1, 20.3, 18.9, 18.3, 17.9.

HRMS (ESI) m/z calcd. for $C_{25}H_{32}N_2NaO_3$ $[M + Na]^+$ 431.2305, found 431.2306.

Methyl (*S*)-2-((1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-2-methylpropanoate (36)



36

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and methyl 2-hydroxy-2-methylpropanoate **A15** (35.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether /EtOAc = 6/1) to yield the product **36** as a white solid (54.7 mg, 67% yield, 94% e.e.).

[α]$_D^{27}$ = +6 (c 0.5, $CHCl_3$).

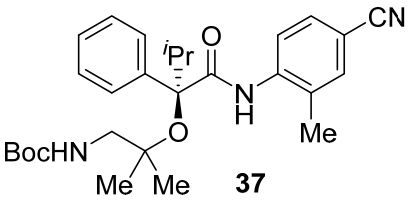
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 7.76 min, t_R (major) = 10.28 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.87 (s, 1H), 8.47 (d, *J* = 8.4 Hz, 1H), 7.58 – 7.44 (m, 4H), 7.37 – 7.29 (m, 3H), 3.44 (s, 3H), 2.99 – 2.85 (m, 1H), 2.45 (s, 3H), 1.46 (s, 3H), 1.35 (s, 3H), 1.21 (d, *J* = 6.7 Hz, 3H), 1.08 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 174.8, 170.9, 140.2, 135.4, 133.9, 131.3, 131.2, 129.0, 127.9, 127.7, 120.6, 119.2, 106.9, 88.8, 78.4, 52.2, 35.8, 29.6, 24.9, 19.0, 18.0, 17.7.

HRMS (ESI) m/z calcd. for $C_{24}H_{28}N_2NaO_4$ $[M + Na]^+$ 431.1947, found 431.1939.

***tert*-Butyl (*S*)-(2-((1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-2-methylpropyl)carbamate (37)**



37

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and *tert*-butyl (2-hydroxy-2-methylpropyl)carbamate **A16** (56.8 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/ EtOAc = 20/1) to yield the product **37** as a light yellow oil (40.3 mg, 42% yield, 94% e.e.).

$[\alpha]_D^{27}$ = −10 (c 0.5, $CHCl_3$).

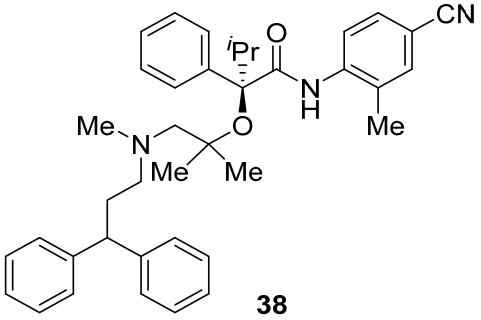
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 14.59 min, t_R (minor) = 24.79 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.60 (s, 1H), 8.20 (d, *J* = 8.4 Hz, 1H), 7.57 – 7.46 (m, 4H), 7.41 – 7.31(m, 3H), 4.75 (s, 1H), 3.02 – 2.78 (m, 3H), 2.41 (s, 3H), 1.35 (s, 9H), 1.24 (s, 3H), 1.18 (d, *J* = 6.6 Hz, 3H), 1.10 (d, *J* = 6.6 Hz, 3H), 0.81 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 156.3, 140.3, 138.2, 134.0, 130.9, 130.1, 129.7, 128.7, 128.1, 122.3, 119.2, 107.4, 87.9, 79.6, 79.5, 52.0, 33.8, 28.3, 25.7, 25.5, 19.2, 18.1, 17.9.

HRMS (ESI) m/z calcd. for $C_{28}H_{37}N_3NaO_4$ $[M + Na]^+$ 502.2676, found 502.2672.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((1-((3,3-diphenylpropyl)(methyl)amino)-2-methylpropan-2-yl)oxy)-3-methyl-2-phenylbutanamide (38)



38

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1-((3,3-diphenylpropyl)(methyl)amino)-2-methylpropan-2-ol **A17** (89.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product **38** as a white solid (67.0 mg, 57% yield, 93% e.e.).

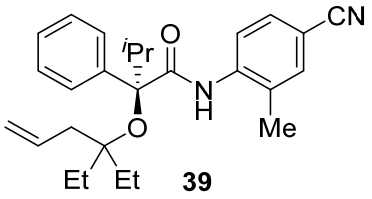
$[\alpha]_D^{27}$ = −38 (c 0.4, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 0.8 mL/min, λ = 260 nm), t_R (minor) = 8.44 min, t_R (major) = 10.34 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 11.41 (s, 1H), 7.67 (d, *J* = 6.7 Hz, 2H), 7.54 (s, 1H), 7.49 (s, 2H), 7.33 – 7.13 (m, 9H), 6.99 – 6.89 (m, 4H), 3.63 (t, *J* = 7.7 Hz, 1H), 2.69 – 2.59 (m, 1H), 2.58 – 2.51 (m, 1H), 2.41 (s, 3H), 2.37 (s, 3H), 2.35 – 2.19 (m, 2H), 2.11

– 2.03 (m, 1H), 1.96 – 1.82 (m, 1H), 1.79 – 1.67 (m, 1H), 1.19 (d, J = 6.7 Hz, 3H), 1.0 0 (s, 3H), 0.80 (s, 3H), 0.75 (d, J = 6.9 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 144.4, 144.2, 141.4, 138.9, 135.0, 134.7, 130.4, 128.6, 128.5, 128.0, 127.5, 127.4, 127.3, 126.5, 126.4, 119.0, 109.3, 86.8, 80.3, 71.6, 59.5, 49.4, 45.5, 40.6, 33.2, 28.6, 23.2, 18.9, 18.6, 18.1.
HRMS (ESI) m/z calcd. for $C_{39}H_{46}N_3O_2$ $[M + H]^+$ 588.3585, found 588.3584.

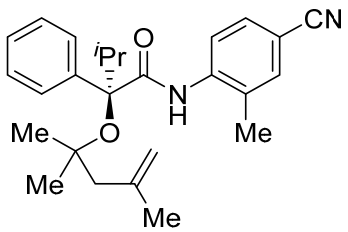
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((3-ethylhex-5-en-3-yl)oxy)-3-methyl-2-phenylbutanamide (39)



39

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-ethylhex-5-en-3-ol **A18** (38.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25/1) to yield the product **39** as a light yellow solid (57.8 mg, 69% yield, 94% e.e.).
$[\alpha]_D^{27}$ = −11 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.64 min, t_R (major) = 7.04 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.76 (s, 1H), 8.57 (d, J = 8.5 Hz, 1H), 7.59 – 7.47 (m, 4H), 7.39 – 7.29 (m, 3H), 5.85 – 5.71 (m, 1H), 5.09 – 4.93 (m, 2H), 3.10 – 2.95 (m, 1H), 2.36 (s, 3H), 2.26 – 2.16 (m, 1H), 2.06 – 1.96 (m, 1H), 1.48 – 1.33 (m, 2H), 1.27 – 1.18 (m, 4H), 1.16 – 1.06 (m, 4H), 0.88 – 0.75 (m, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.7, 140.2, 137.2, 134.2, 133.9, 131.5, 130.8, 128.9, 127.8, 127.1, 120.1, 119.2, 117.9, 106.8, 88.4, 86.4, 41.1, 34.5, 29.5, 29.0, 19.6, 18.0, 17.7, 8.7, 8.6.
HRMS (ESI) m/z calcd. for $C_{27}H_{34}N_2NaO_2$ $[M + Na]^+$ 441.2512, found 441.2510.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2,4-dimethylpent-4-en-2-yl)oxy)-3-methyl-2-phenylbutanamide (40)



40

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 2,4-dimethylpent-4-en-2-

ol **A19** (34.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25/1) to yield the product **40** as a light yellow solid (51.8 mg, 64% yield, 95% e.e.).

$[\alpha]_D^{27}$ = −10 (c 0.4, $CHCl_3$).

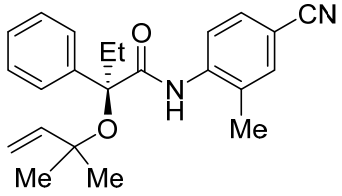
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.91 min, t_R (major) = 6.61 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.39 (s, 1H), 8.41 (d, *J* = 8.5 Hz, 1H), 7.53 (dd, *J* = 10.9, 9.3 Hz, 4H), 7.43 – 7.28 (m, 3H), 4.77 (d, *J* = 59.7 Hz, 2H), 3.03 (hept, *J* = 6.8 Hz, 1H), 2.34 (s, 3H), 2.17 (t, *J* = 9.9 Hz, 1H), 2.07 (d, *J* = 13.2 Hz, 1H), 1.73 (s, 3H), 1.18 (d, *J* = 6.7 Hz, 3H), 1.15 (s, 3H), 1.07 (d, *J* = 6.8 Hz, 3H), 1.01 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 142.1, 140.1, 138.0, 133.9, 131.4, 130.6, 128.6, 127.8, 127.6, 120.8, 119.1, 115.6, 107.0, 88.0, 81.0, 52.2, 34.3, 28.2, 28.1, 25.1, 19.1, 18.3, 17.8.

HRMS (ESI) m/z calcd. for $C_{26}H_{32}N_2NaO_2$ $[M + Na]^+$ 427.2356, found 427.2354.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(3-methoxyphenyl)-2-((2-methylbut-3-en-2-yl)oxy)butanamide (41)



41

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-methylbut-3-en-2-ol **A20** (25.8 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **41** as a colorless oil (56.5 mg, 78% yield, 92% e.e.).

$[\alpha]_D^{27}$ = +42 (c 0.5, $CHCl_3$).

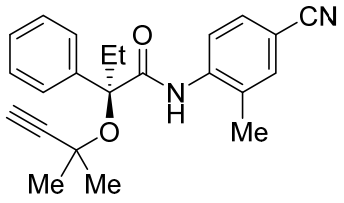
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 8.78min, t_R (minor) = 16.45 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.36 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.53 – 7.43 (m, 4H), 7.36 – 7.27 (m, 3H), 5.92 – 5.80 (m, 1H), 4.99 (d, *J* = 17.5 Hz, 1H), 4.90 (d, *J* = 10.8 Hz, 1H), 2.62 – 2.41 (m, 2H), 2.33 (s, 3H), 1.38 (s, 3H), 1.20 (s, 3H), 0.95 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.8, 143.8, 141.9, 140.1, 133.8, 131.5, 128.3, 127.1, 126.9, 119.9, 119.1, 112.8, 106.8, 85.4, 78.6, 29.1, 28.4, 26.5, 17.4, 8.5.

HRMS (ESI) m/z calcd. for $C_{23}H_{26}N_2NaO_2$ $[M + Na]^+$ 385.1886, found 385.1886.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2-methylbut-3-yn-2-yl)oxy)-2-phenylbutanamide (42)



42

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-methylbut-3-yn-2-ol **A21** (25.2 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **42** as a colorless oil (41.1 mg, 57% yield, 90% e.e.).

[α]$_D^{27}$ = −9 (c 0.4, $CHCl_3$).

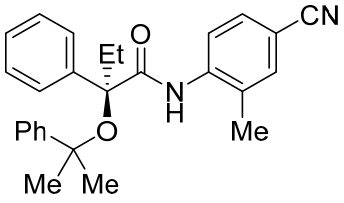
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 95/5, flow rate 0.9 mL/min, λ = 270 nm), t_R (major) = 13.76 min, t_R (minor) = 25.58 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (s, 1H), 8.33 (d, *J* = 8.4 Hz, 1H), 7.56 – 7.40 (m, 4H), 7.38 – 7.22 (m, 3H), 2.89 – 2.74 (m, 1H), 2.72 – 2.57 (m, 1H), 2.46 (s, 1H), 2.24 (s, 3H), 1.67 (s, 3H), 1.44 (s, 3H), 0.90 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.3, 141.2, 140.1, 133.8, 131.4, 128.3, 128.1, 127.0, 126.3, 120.1, 119.1, 106.8, 86.4, 85.1, 75.2, 70.2, 33.2, 32.0, 25.9, 17.3, 8.6.

HRMS (ESI) m/z calcd. for $C_{23}H_{24}N_2NaO_2$ $[M + Na]^+$ 383.1730, found 383.1729.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-phenyl-2-((2-phenylpropan-2-yl)oxy) butanamide (43)



43

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-phenylpropan-2-ol **A22** (40.9 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **43** as a colorless oil (53.6 mg, 65% yield, 91% e.e.).

[α]$_D^{27}$ = −18 (c 0.5, $CHCl_3$).

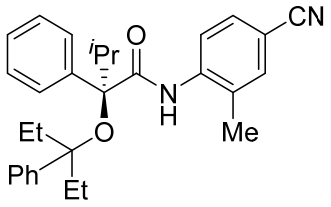
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 10.45 min, t_R (minor) = 19.99 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.22 (s, 1H), 8.38 (d, *J* = 8.5 Hz, 1H), 7.48 (d, *J* = 8.5 Hz, 1H), 7.45 – 7.39 (m, 3H), 7.39 – 7.34 (m, 2H), 7.29 – 7.21 (m, 6H), 2.49 – 2.27 (m, 2H), 2.21 (s, 3H), 1.60 (s, 3H), 1.59 (s, 3H), 0.69 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.0, 146.9, 141.3, 140.1, 133.8, 131.5, 128.2, 128.0, 127.3, 127.0, 126.9, 125.4, 119.9, 119.1, 106.8, 86.0, 79.3, 30.1, 29.6, 27.4, 17.4, 8.2.

HRMS (ESI) m/z calcd. for $C_{27}H_{28}N_2NaO_2$ $[M + Na]^+$ 435.2043, found 435.2042.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((3-phenylpentan-3-yl)oxy)butanamide (44)



44

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-phenylpentan-3-ol **A23** (49.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **44** as a colorless oil (51.8 mg, 57% yield, 94% e.e.).

$[\alpha]_D^{27}$ = +14 (c 0.4, $CHCl_3$).

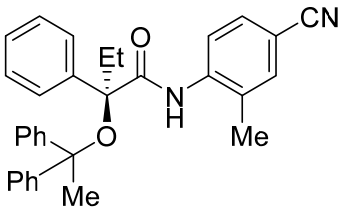
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 99/1, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 11.22 min, t_R (minor) = 14.04 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.84 (s, 1H), 8.60 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.48 (m, 2H), 7.28 – 7.17 (m, 6H), 7.10 (t, *J* = 7.5 Hz, 2H), 6.94 (d, *J* = 7.6 Hz, 2H), 2.70 – 2.58 (m, 1H), 2.39 (s, 3H), 2.12 – 2.00 (m, 1H), 1.97 – 1.85 (m, 1H), 1.56 – 1.50 (m, 1H), 1.22 (d, *J* = 6.5 Hz, 3H), 1.14 – 1.04 (m, 1H), 0.87 (d, *J* = 6.7 Hz, 3H), 0.77 (t, *J* = 7.1 Hz, 3H), 0.55 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 142.7, 140.2, 135.5, 133.9, 131.5, 131.0, 128.6, 127.6, 127.5, 127.4, 127.2, 126.9, 119.9, 119.2, 106.7, 89.3, 85.8, 34.8, 31.7, 26.8, 18.7, 18.0, 17.9, 8.5, 8.3.

HRMS (ESI) m/z calcd. for $C_{30}H_{34}N_2NaO_2$ $[M + Na]^+$ 477.2512, found 477.2513.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(1,1-diphenylethoxy)-2-phenylbutanamide (45)



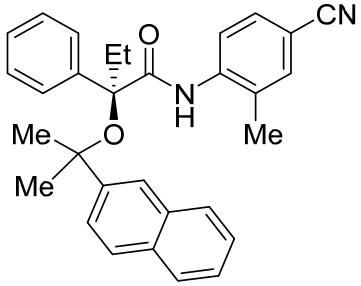
45

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 1,1-diphenylethan-1-ol **A24** (59.5 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **45** as a white solid (48.4 mg, 51% yield, 90% e.e.).

$[\alpha]_D^{27}$ = −5 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 10.51 min, t_R (minor) = 24.86 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.29 (s, 1H), 8.42 (d, *J* = 8.5 Hz, 1H), 7.50 – 7.15 (m, 17H), 2.45 (q, *J* = 7.3 Hz, 2H), 2.19 (s, 3H), 1.88 (s, 3H), 0.65 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 149.0, 148.1, 140.6, 140.1, 133.9, 131.4, 128.2, 128.1, 128.0, 129.9, 127.2, 127.0, 126.9, 126.8, 126.5, 125.9, 120.1, 119.1, 106.9, 86.8, 83.2, 28.1, 26.9, 17.8, 8.3.
HRMS (ESI) m/z calcd. for $C_{29}H_{32}N_2NaO_2$ $[M + Na]^+$ 463.2356, found 463.2354.

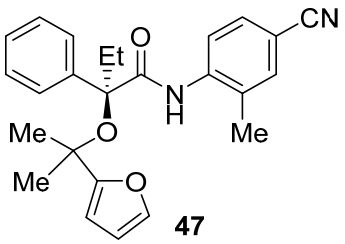
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2-(naphthalen-2-yl)propan-2-yl)oxy)-2-phenylbutanamide (46)



46

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-(naphthalen-2-yl)propan-2-ol **A25** (55.9 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **46** as a colorless oil (53.7 mg, 58% yield, 90% e.e.).
$[\alpha]_D^{27}$ = −13 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 16.34 min, t_R (minor) = 30.34 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.17 (s, 1H), 8.34 (d, *J* = 8.5 Hz, 1H), 7.82 – 7.75 (m, 2H), 7.74 – 7.68 (m, 2H), 7.63 (s, 1H), 7.49 – 7.42 (m, 3H), 7.40 (s, 1H), 7.38 – 7.34 (m, 2H), 7.18 – 7.12 (m, 3H), 2.50 – 2.30 (m, 2H), 2.19 (s, 3H), 1.72 (s, 3H), 1.70 (s, 3H), 0.69 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.8, 143.9, 141.2, 140.0, 133.7, 132.8, 132.5, 131.4, 128.2, 128.1, 127.9, 127.4, 127.0, 126.8, 126.3, 126.2, 124.5, 123.5, 119.9, 119.1, 106.8, 86.1, 79.4, 30.0, 29.7, 27.6, 17.4, 8.3.
HRMS (ESI) m/z calcd. for $C_{31}H_{30}N_2NaO_2$ $[M + Na]^+$ 485.2199, found 485.2201.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2-(furan-2-yl)propan-2-yl)oxy)-2-phenylbutanamide (47)



47

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 2-(furan-2-yl)propan-2-ol **A26** (37.8 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **47** as a white solid (50.7 mg, 63% yield, 90% e.e.).

[α]$_D^{27}$ = −18 (c 0.6, $CHCl_3$).

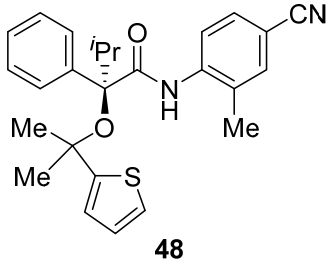
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 10.43 min, t_R (minor) = 20.10 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.62 (s, 1H), 8.40 (d, *J* = 9.1 Hz, 1H), 7.53 – 7.44 (m, 2H), 7.33 – 7.26 (m, 3H), 7.24 – 7.16 (m, 3H), 6.17 (dd, *J* = 3.2, 1.8 Hz, 1H), 5.81 (dd, *J* = 3.2, 0.6 Hz, 1H), 2.52 – 2.38 (m, 4H), 2.17 – 2.05 (m, 1H), 1.63 (s, 3H), 1.42 (s, 3H), 0.81 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.5, 157.1, 141.3, 140.8, 140.2, 133.8, 131.5, 128.1, 128.0, 127.1, 127.0, 119.8, 119.1, 110.5, 106.7, 106.6, 85.6, 74.5, 28.7, 28.0, 26.8, 17.4, 8.0.

HRMS (ESI) m/z calcd. for $C_{25}H_{26}N_2NaO_3$ $[M + Na]^+$ 425.1836, found 425.1833.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((2-(thiophen-2-yl)propan-2-yl)oxy)butanamide (48)



48

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 2-(thiophen-2-yl)propan-2-ol **A27** (42.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/ EtOAc = 25/1) to yield the product **48** as a light yellow solid (49.3 mg, 57% yield, 95% e.e.).

[α]$_D^{27}$ = −16 (c 0.4, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.15 min, t_R (major) = 6.89 min.

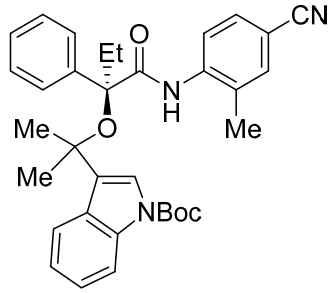
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.45 (d, *J* = 8.5 Hz, 1H), 7.52 (d, *J* = 8.5 Hz, 1H), 7.46 – 7.38 (m, 3H), 7.26 – 7.17 (m, 3H), 7.14 (d, *J* = 5.1 Hz, 1H), 6.73 –

6.68 (m, 1H), 6.48 (d, J = 3.5 Hz, 1H), 2.95 – 2.83 (m, 1H), 2.13 (s, 3H), 1.56 (s, 6H), 1.19 (d, J = 6.7 Hz, 3H), 0.98 (d, J = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 152.7, 140.0, 137.0, 133.8, 131.3, 130.2, 128.1, 127.5, 127.4, 126.3, 124.4, 122.9, 120.3, 119.1, 106.8, 88.6, 78.2, 35.9, 32.6, 29.5, 18.6, 18.3, 17.2.

HRMS (ESI) m/z calcd. for $C_{26}H_{28}N_2NaO_2S$ $[M + Na]^+$ 455.1764, found 455.1761.

tert-Butyl (_S_)-3-(2-((1-((4-cyano-2-methylphenyl)amino)-1-oxo-2-phenylbutan-2-yl)oxy)propan-2-yl)-1_H_-indole-1-carboxylate (49)



49

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and *tert*-butyl 3-(2-hydroxypropan-2-yl)-1H-indole-1-carboxylate **A28** (82.6 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **49** as a colorless oil (46.3 mg, 42% yield, 90% e.e.).

$[\alpha]_D^{27}$ = +6 (c 0.5, $CHCl_3$).

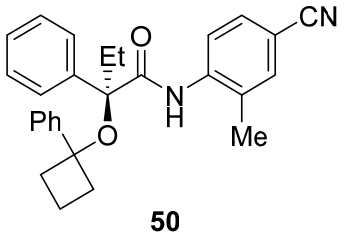
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 5.91 min, t_R (minor) = 16.71 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 8.25 (d, J = 8.5 Hz, 1H), 7.97 (d, J = 7.6 Hz, 2H), 7.42 (d, J = 8.5 Hz, 1H), 7.37 – 7.29 (m, 3H), 7.28 – 7.14 (m, 5H), 7.09 (s, 1H), 2.64 – 2.48 (m, 1H), 2.42 – 2.30 (m, 1H), 1.82 (s, 3H), 1.81 (s, 3H), 1.75 (s, 3H), 1.65 (s, 9H), 0.78 (t, J = 7.0 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.5, 149.4, 141.2, 139.7, 135.9, 133.6, 131.1, 128.8, 127.9, 127.8, 127.2, 126.8, 126.4, 124.3, 122.5, 121.9, 121.2, 119.9, 119.1, 115.6, 106.8, 85.8, 83.9, 29.5, 29.0, 28.6, 28.2, 16.7, 8.1.

HRMS (ESI) m/z calcd. for $C_{34}H_{38}N_3O_4$ $[M + H]^+$ 552.2857, found 552.2860.

(_S_)-_N_-(4-Cyano-2-methylphenyl)-2-phenyl-2-(1-phenylcyclobutoxy)butanamide (50)



50

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 1-phenylcyclobutan-1-ol **A29** (44.5 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25/1) to yield the product **50** as a colorless oil (62.8 mg, 74% yield, 91% e.e.).

$[\alpha]_D^{27}$ = +19 (c 0.5, $CHCl_3$).

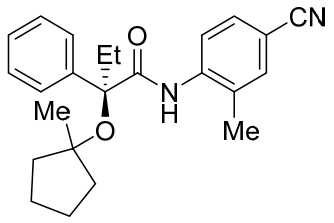
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 8.50 min, t_R (minor) = 16.94 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.31 (s, 1H), 8.37 (d, *J* = 8.4 Hz, 1H), 7.52 – 7.26 (m, 12H), 2.56 – 2.45 (m, 1H), 2.40 – 2.28 (m, 3H), 2.27 (s, 3H), 2.23 – 2.15 (m, 1H), 2.03 – 1.94 (m, 1H), 1.68 – 1.60 (m, 1H), 1.34 – 1.23 (m, 1H), 0.75 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.6, 143.5, 140.3, 140.0, 133.8, 131.4, 128.3, 128.1, 127.7, 127.6, 127.0, 126.9, 125.0, 120.0, 119.1, 106.8, 86.1, 80.8, 37.1, 36.9, 35.4, 27.1, 17.4, 13.5, 8.2.

HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_2NaO_2$ $[M + Na]^+$ 447.2043, found 447.2045.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((1-methylcyclopentyl)oxy)-2-phenylbutanamide (51)



51

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 1-methylcyclopentan-1-ol **A30** (30.1 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **51** as a light yellow oil (61.0 mg, 81% yield, 90% e.e.).

$[\alpha]_D^{27}$ = +27 (c 0.5, $CHCl_3$).

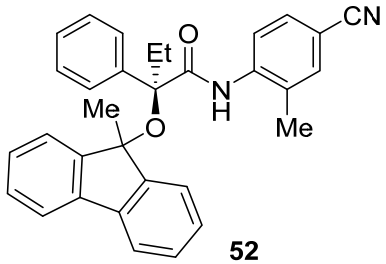
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 8.23 min, t_R (minor) = 16.51 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.39 (d, *J* = 8.4 Hz, 1H), 7.54 – 7.43 (m, 4H), 7.36 – 7.24 (m, 3H), 2.64 – 2.52 (m, 1H), 2.51 – 2.41 (m, 1H), 2.32 (s, 3H), 2.02 – 1.92 (m, 1H), 1.86 – 1.68 (m, 3H), 1.62 – 1.46 (m, 3H), 1.42 – 1.30 (m, 1H), 1.17 (s, 3H), 0.97 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.1, 142.0, 140.1, 133.8, 131.4, 128.4, 128.1, 126.9 (d, *J* = 3.5 Hz), 120.0, 119.1, 106.7, 87.8, 85.1, 41.6, 40.8, 26.9, 25.9, 23.0, 22.8, 17.4, 8.6.

HRMS (ESI) m/z calcd. for $C_{24}H_{28}N_2NaO_2$ $[M + Na]^+$ 399.2043, found 399.2043.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((9-methyl-9*H*-fluoren-9-yl)oxy)-2-phenylbutanamide (52)



52

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 9-methyl-9*H*-fluoren-9-ol **A31** (58.9 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **52** as a white solid (52.9 mg, 56% yield, 91% e.e.).

$[\alpha]_D^{27}$ = +112 (c 0.6, $CHCl_3$).

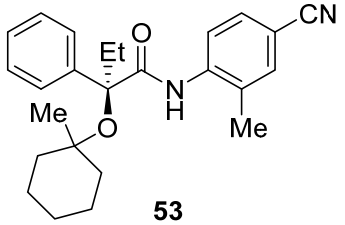
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 9.81 min, t_R (minor) = 13.95 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.71 (s, 1H), 8.43 (d, *J* = 8.4 Hz, 1H), 7.63 – 7.48 (m, 3H), 7.47 – 7.23 (m, 2H), 7.32 – 7.22 (m, 2H), 7.18 – 7.10 (m, 1H), 7.05 – 6.94 (m, 3H), 6.84 (t, *J* = 7.8 Hz, 2H), 6.80 – 6.73 (m, 2H), 2.51 (s, 3H), 2.16 – 1.93 (m, 2H), 1.79 (s, 3H), 0.79 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 146.7, 146.1, 140.1, 139.9, 138.8, 138.2, 133.9, 131.6, 129.3, 128.5, 128.0, 127.9, 127.4, 127.2, 126.8, 124.4, 124.1, 120.1, 120.0, 119.9, 119.1, 106.9, 86.9, 84.3, 29.6, 27.4, 17.7, 8.4.

HRMS (ESI) m/z calcd. for $C_{32}H_{28}N_2NaO_2$ $[M + Na]^+$ 495.2043, found 495.2043.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((1-methylcyclohexyl)oxy)-2-phenylbutanamide (53)



53

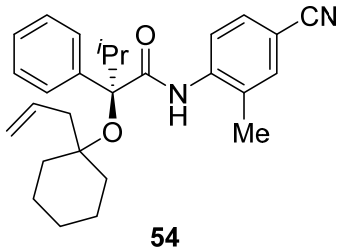
According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 1-methylcyclohexan-1-ol **A32** (34.3 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **53** as a light yellow oil (57.0 mg, 73% yield, 91% e.e.).

$[\alpha]_D^{27}$ = +37 (c 0.7, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 8.16 min, t_R (minor) = 18.70 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.36 (s, 1H), 8.36 (d, *J* = 8.3 Hz, 1H), 7.54 – 7.40 (m, 4H), 7.39 – 7.26 (m, 3H), 2.67 – 2.53 (m, 1H), 2.53 – 2.40 (m, 1H), 2.34 (s, 3H), 1.80 – 1.63 (m, 3H), 1.60 – 1.48 (m, 2H), 1.46 – 1.30 (m, 5H), 1.09 (s, 3H), 0.98 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 173.3, 142.6, 140.2, 133.8, 131.3, 128.3, 128.1, 127.2, 126.9, 120.4, 119.1, 106.9, 85.1, 80, 40.6, 40.0, 27.6, 25.4, 25.3, 23.3, 23.2, 17.7, 8.5.
HRMS (ESI) m/z calcd. for $C_{25}H_{31}N_2O_2$ $[M + H]^+$ 391.2380, found 391.2379.

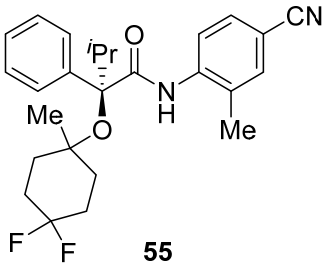
(*S*)-2-((1-Allylcyclohexyl)oxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (54)



54

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1-allylcyclohexan-1-ol **A33** (42.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **54** as a white solid (52.5 mg, 61% yield, 91% e.e.).
$[\alpha]_D^{27}$ = −16 (c 0.6, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.49 min, t_R (major) = 6.83 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.57 (s, 1H), 8.51 (d, *J* = 8.5 Hz, 1H), 7.63 – 7.47 (m, 4H), 7.40 – 7.31 (m, 3H), 5.88 – 5.57 (m, 1H), 5.04 – 4.86 (m, 2H), 3.13 – 3.01 (m, 1H), 2.34 (s, 3H), 2.18 – 2.08 (m, 1H), 1.75 – 1.66 (m, 1H), 1.65 – 1.50 (m, 6H), 1.48 – 1.36 (m, 2H), 1.29 – 1.24 (m, 2H), 1.20 (d, *J* = 6.7 Hz, 3H), 1.10 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 140.2, 137.8, 134.3, 133.9, 131.4, 130.6, 128.8, 127.8, 127.3, 120.4, 119.2, 117.7, 106.8, 88.2, 83.1 39.9, 36.7, 36.4, 34.5, 25.3, 23.4, 22.8, 19.2, 18.3, 17.8.
HRMS (ESI) m/z calcd. for $C_{28}H_{34}N_2NaO_2$ $[M + Na]^+$ 453.2512, found 453.2510.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((4,4-difluoro-1-methylcyclohexyl)oxy)-3-methyl-2-phenylbutanamide (55)



55

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 4,4-difluoro-1-methylcyclohexan-1-ol **A34** (45.0 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/ EtOAc = 20/1) to yield the product **55** as a white solid (47.6 mg, 54% yield, 95% e.e.).

[α]$_D^{27}$ = −16 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.55 min, t_R (major) = 9.07 min.

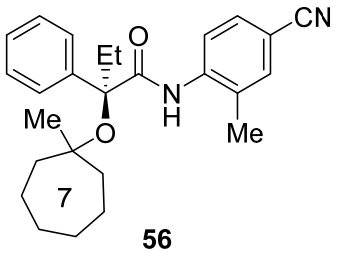
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.02 (s, 1H), 8.48 (d, *J* = 8.5 Hz, 1H), 7.65 – 7.46 (m, 4H), 7.43 – 7.32 (m, 3H), 3.08 – 2.97 (m, 1H), 2.32 (s, 3H), 2.16 – 1.98 (m, 2H), 1.88 – 1.62 (m, 3H), 1.53 – 1.38 (m, 2H), 1.32 – 1.27 (m, 1H), 1.22 (s, 3H), 1.19 (d, *J* = 6.7 Hz, 3H), 1.01 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.8, 139.8, 137.4, 134.0, 131.5, 130.1, 128.9, 128.0, 127.0, 122.8 (t, *J* = 239.6 Hz), 120.6, 119.0, 107.2, 88.1, 77.7, 36.0 (m), 35.6 (m), 35.0, 30.5 (t, *J* = 24.5 Hz), 30.3 (t, *J* = 24.5 Hz), 25.3, 18.7, 18.3, 17.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ –95.1 (d, *J* = 241.0 Hz), –100.9 (d, *J* = 241.3 Hz).

HRMS (ESI) m/z calcd. for $C_{26}H_{30}F_2N_2NaO_2$ $[M + Na]^+$ 463.2168, found 463.2175.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((1-methylcycloheptyl)oxy)-2-phenylbutanamide (56)



56

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 1-methylcycloheptan-1-ol **A35** (38.5 mg, 0.30 mmol, 1.5 equiv.) run at –20 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **56** as a white solid (51.8 mg, 64% yield, 90% e.e.).

[α]$_D^{27}$ = +36 (c 0.5, $CHCl_3$).

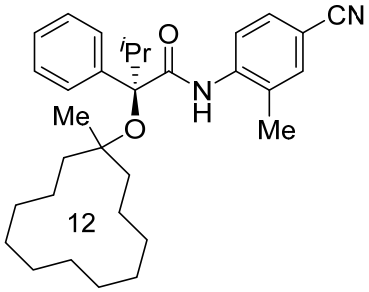
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 8.23 min, t_R (minor) = 18.75 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.49 (s, 1H), 8.40 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.45 (m, 4H), 7.35 – 7.24 (m, 3H), 2.68 – 2.55 (m, 1H), 2.51 – 2.40 (m, 1H), 2.37 (s, 3H), 2.08 – 1.97 (m, 1H), 1.79 – 1.47 (m, 9H), 1.46 – 1.35 (m, 2H), 1.03 (s, 3H), 1.00 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.3, 142.5, 140.2, 133.8, 131.4, 128.3, 128.1, 127.1, 127.0, 120.1, 119.1, 106.8, 85.0, 84.4, 43.7, 43.1, 30.6, 30.5, 27.8, 27.4, 22.90 (d, *J* = 5.1 Hz), 17.7, 8.5.

HRMS (ESI) m/z calcd. for $C_{26}H_{32}N_2NaO_2$ $[M + Na]^+$ 427.2356, found 427.2356.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-((1-methylcyclododecyl)oxy)-2-phenylbutanamide (57)



57

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1-methylcyclododecan-1-ol **A36** (59.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/ DCM = 3/1) to yield the product **57** as a light yellow oil (60.6 mg, 62% yield, 95% e.e.).

$[\alpha]_D^{27}$ = −4 (c 0.5, $CHCl_3$).

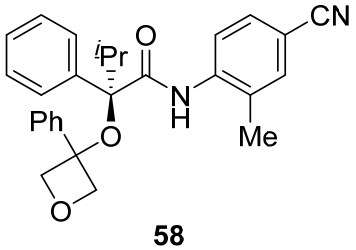
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 98/2, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 8.47 min, t_R (major) = 9.51 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.59 (s, 1H), 8.53 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.46 (m, 4H), 7.38 – 7.29 (m, 3H), 3.09 – 2.97 (m, 1H), 2.36 (s, 3H), 1.76 – 1.66 (m, 1H), 1.59 – 1.52 (m, 1H), 1.45 – 1.20 (m, 17H), 1.17 (d, *J* = 6.7 Hz, 4H), 1.12 (d, *J* = 6.8 Hz, 4H), 1.03 (s, 3H), 0.88 – 0.75 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 140.2, 138.1, 133.9, 131.5, 130.5, 128.6, 127.7, 127.0, 120.2, 119.2, 106.7, 88.0, 84.0, 36.9, 36.0, 34.3, 26.6, 26.3, 25.9, 25.6, 22.9, 22.7, 22.4, 22.3, 20.5, 20.3, 19.3, 18.2, 17.6.

HRMS (ESI) m/z calcd. for $C_{32}H_{44}N_2NaO_2$ $[M + Na]^+$ 511.3295, found 511.3295.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((3-phenyloxetan-3-yl)oxy)butanamide (58)

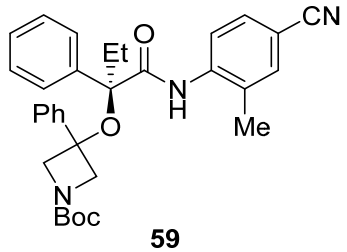


58

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-phenyloxetan-3-ol **A37** (45.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **58** as a light yellow oil (42.3 mg, 48% yield, 87% e.e.).

[α]$_D^{27}$ = −5 (c 0.4, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 11.47 min, t_R (major) = 13.58 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.65 (s, 1H), 8.58 (d, *J* = 8.5 Hz, 1H), 7.63 – 7.49 (m, 2H), 7.29 – 7.18 (m, 4H), 7.07 (t, *J* = 7.6 Hz, 2H), 7.04 – 6.93 (m, 4H), 4.96 (d, *J* = 6.3 Hz, 1H), 4.68 (d, *J* = 7.8 Hz, 1H), 4.46 (dd, *J* = 10.5, 7.2 Hz, 2H), 2.65 – 2.53 (m, 1H), 2.48 (s, 3H), 1.22 (d, *J* = 6.7 Hz, 3H), 0.87 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 170.5, 141.3, 139.9, 134.0, 133.8, 131.5, 130.7, 128.9, 128.4, 127.8, 127.6, 127.5, 125.4, 120.4, 119.0, 107.3, 89.6, 85.1, 80.6, 36.2, 18.3, 17.7, 17.5.
HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_2NaO_3$ $[M + Na]^+$ 463.1992, found 463.1995.

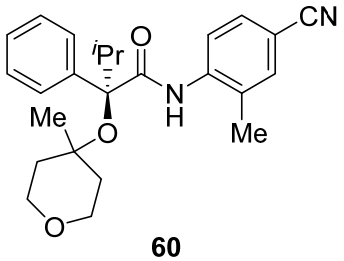
tert-Butyl (*S*)-3-((1-((4-cyano-2-methylphenyl)amino)-1-oxo-2-phenylbutan-2-yl)oxy)-3-phenylazetidine-1-carboxylate (59)



59

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and *tert*-butyl 3-hydroxy-3-phenylazetidine-1-carboxylate **A38** (74.8 mg, 0.30 mmol, 1.5 equiv.) run at –20 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 7/1) to yield the product **59** as a white solid (48.4 mg, 46% yield, 90% e.e.).
[α]$_D^{27}$ = −7 (c 0.7, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 0.9 mL/min, λ = 280 nm), t_R (minor) = 22.40 min, t_R (major) = 26.48 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.37 (d, *J* = 8.5 Hz, 1H), 7.55 – 7.44 (m, 2H), 7.32 – 7.25 (m, 8H), 7.23 – 7.17 (m, 2H), 4.35 (d, *J* = 9.3 Hz, 1H), 4.22 – 4.11 (m, 2H), 4.09 – 4.02 (m, 1H), 2.30 (s, 3H), 2.25 – 2.13(m, 1H), 2.07 – 1.95 (m, 1H), 1.36 (s, 9H), 0.72 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 156.2, 141.1, 139.8, 138.5, 133.9, 131.4, 128.8, 128.5, 128.4, 127.7, 127.4, 126.5, 120.3, 119.0, 107.3, 87.2, 80.2, 76.5, 62.4, 59.8, 28.3, 27.7, 17.3, 8.3.
HRMS (ESI) m/z calcd. for $C_{32}H_{35}N_3NaO_4$ $[M + Na]^+$ 548.2520, found 548.2519.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-((4-methyltetrahydro-2*H*-pyran-4-yl)oxy)-2-phenylbutanamide (60)



60

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 4-methyltetrahydro-2*H*-pyran-4-ol **A39** (34.8 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product **60** as a light yellow oil (45.5 mg, 56% yield, 95% e.e.).

[α]$_D^{27}$ = −9 (c 0.5, $CHCl_3$).

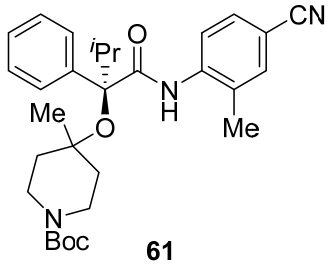
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 10.44 min, t_R (major) = 14.38 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.31 (s, 1H), 8.50 (d, *J* = 8.5 Hz, 1H), 7.67 – 7.45 (m, 4H), 7.42 – 7.31 (m, 3H), 3.92 – 3.78 (m, 1H), 3.76 – 3.67 (m, 1H), 3.56 – 3.45 (m, 1H), 3.42 – 3.33 (m, 1H), 3.13 – 3.02 (m, 1H), 2.34 (s, 3H), 1.83 – 1.71 (m, 1H), 1.60 – 1.49 (m, 1H), 1.41 – 1.33 (m, 1H), 1.22 (s, 3H), 1.19 (d, *J* = 6.7 Hz, 3H), 1.14 – 1.09 (m, 1H), 1.07 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 140.0, 137.8, 133.9, 131.5, 130.4, 128.8, 128.0, 127.0, 120.4, 119.1, 107.0, 88.1, 64.6, 64.5, 40.3, 39.9, 34.3, 24.8, 19.0, 18.2, 17.8.

HRMS (ESI) m/z calcd. for $C_{25}H_{30}N_2NaO_3$ $[M + Na]^+$ 429.2149, found 429.2153.

***tert*-Butyl (*S*)-4-((1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-4-methylpiperidine-1-carboxylate (61)**



61

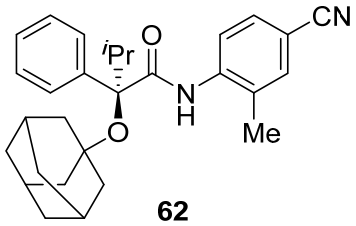
According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and *tert*-butyl 4-hydroxy-4-methylpiperidine-1-carboxylate **A40** (64.6 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 7/1) to yield the product **61** as a colorless oil (61.7 mg, 61% yield, 94% e.e.).

[α]$_D^{27}$ = −21 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 12.03 min, t_R (major) = 14.80 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.20 (s, 1H), 8.48 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.48 (m, 4H), 7.43 – 7.33 (m, 3H), 3.57 – 3.38 (m, 2H), 3.37 – 3.26 (m, 1H), 3.24 – 3.14 (m, 1H), 3.11 – 2.98 (m, 1H), 2.33 (s, 3H), 1.77 (s, 1H), 1.67 – 1.57 (m, 1H), 1.52 – 1.46 (m, 1H), 1.43 (s, 9H), 1.31 – 1.24 (m, 1H), 1.23 – 1.15 (m, 6H), 1.05 (d, *J* = 6.7 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 154.7, 139.9, 137.8, 134.0, 131.4, 130.3, 128.8, 128.0, 127.1, 120.5, 119.0, 107.0, 88.1, 79.7, 77.9, 40.4, 39.0, 38.8, 34.5, 28.4, 24.9, 18.9, 18.3, 17.8.
HRMS (ESI) m/z calcd. for $C_{30}H_{39}N_3NaO_4$ $[M + Na]^+$ 528.2833, found 528.2838.

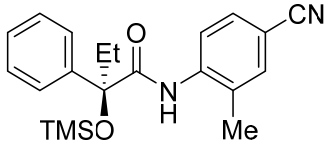
(*S*)-2-(Adamantan-1-yloxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (62)



62

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 1-adamantanol **A41** (45.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **62** as a colorless oil (59.3 mg, 67% yield, 95% e.e.).
$[\alpha]_D^{27}$ = +19 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.06 min, t_R (major) = 8.57 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.66 (s, 1H), 8.54 (d, *J* = 8.5 Hz, 1H), 7.54 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.50 – 7.44 (m, 3H), 7.37 – 7.28 (m, 3H), 3.14 – 2.98 (m, 1H), 2.35 (s, 3H), 1.97 (s, 3H), 1.77 (d, *J* = 11.1 Hz, 3H), 1.54 – 1.38 (m, 9H), 1.21 – 1.12 (m, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 140.3, 138.9, 133.8, 131.5, 130.3, 128.6, 127.9, 126.8, 119.8, 119.2, 106.5, 87.5, 78.7, 44.3, 35.9, 33.4, 31.0, 19.4, 18.3, 17.8.
HRMS (ESI) m/z calcd. for $C_{29}H_{35}N_2O_2$ $[M + H]^+$ 443.2693, found 443.2691.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-phenyl-2-((trimethylsilyl)oxy)butanamide (63)

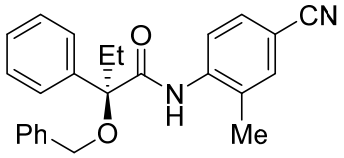


63

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and hydroxytrimethylsilane **A42** (27.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **63** as a colorless oil (66.7 mg, 91% yield, 82% e.e.).
[α]$_D^{27}$ = −24 (c 0.4, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 7.40 min, t_R (minor) = 14.18 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.43 (s, 1H), 8.41 (d, *J* = 8.3 Hz, 1H), 7.50 – 7.46 (m, 4H), 7.39 – 7.29 (m, 3H), 2.72 – 2.64 (m, 1H), 2.36 (s, 3H), 2.19 – 2.10 (m, 1H), 1.03 (t, *J* = 7.3 Hz, 3H), 0.03 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 172.5, 142.1, 139.9, 133.8, 131.5, 128.6, 128.5, 126.9, 126.4, 119.9, 119.0, 106.9, 83.6, 29.4, 17.3, 8.2, 1.7.
HRMS (ESI) m/z calcd. for $C_{21}H_{26}N_2NaO_2Si$ $[M + Na]^+$ 389.1656, found 389.1654.

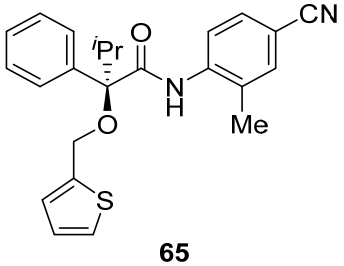
(*S*)-2-(Benzyloxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide (64)



64

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and phenylmethanol **A43** (32.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **64** as a colorless oil (72.3 mg, 94% yield, 91% e.e.).
[α]$_D^{27}$ = +10 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 214 nm), t_R (major) = 12.21 min, t_R (minor) = 16.44 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.15 (s, 1H), 8.31 (d, *J* = 8.5 Hz, 1H), 7.56 (d, *J* = 7.6 Hz, 2H), 7.48 – 7.29 (m, 10H), 4.41 (d, *J* = 10.6 Hz, 1H), 4.29 (d, *J* = 10.6 Hz, 1H), 2.86 – 2.70 (m, 1H), 2.37 – 2.20 (m, 1H), 2.13 (s, 3H), 1.04 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 139.9, 139.3, 137.5, 133.8, 131.3, 128.9, 128.7, 128.5, 128.2, 127.5, 127.4, 126.5, 120.3, 119.0, 107.1, 85.4, 65.3, 25.0, 17.2, 7.6.
HRMS (ESI) m/z calcd. for $C_{25}H_{24}N_2NaO_2$ $[M + Na]^+$ 407.1730, found 407.1725.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(thiophen-2-ylmethoxy)butanamide (65)



65

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and thiophen-2-ylmethanol **A44** (34.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **65** as a colorless oil (75.2 mg, 93% yield, 94% e.e.).

[α]$_D^{27}$ = −35 (c 0.5, $CHCl_3$).

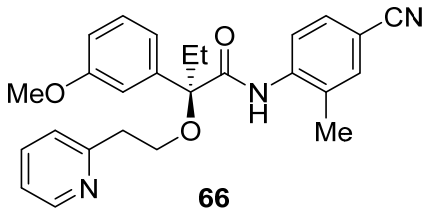
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 9.22 min, t_R (major) = 15.10 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.05 (s, 1H), 8.37 (d, *J* = 8.5 Hz, 1H), 7.60 – 7.53 (m, 2H), 7.49 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.42 (dd, *J* = 8.1, 6.8 Hz, 3H), 7.38 – 7.28 (m, 2H), 6.98 (dd, *J* = 5.0, 3.5 Hz, 1H), 6.92 (d, *J* = 3.1 Hz, 1H), 4.69 (d, *J* = 11.4 Hz, 1H), 4.47 (d, *J* = 11.4 Hz, 1H), 3.06 (dt, *J* = 13.8, 6.9 Hz, 1H), 2.13 (s, 3H), 1.20 (d, *J* = 7.0 Hz, 3H), 1.15 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.4, 140.4, 139.9, 137.0, 133.8, 131.3, 128.6, 128.5, 128.2, 127.7, 126.9, 125.8, 125.7, 120.4, 119.1, 107.0, 88.7, 62.2, 32.3, 18.0, 17.9, 17.3.

HRMS (ESI) m/z calcd. for $C_{24}H_{24}N_2NaO_2S$ $[M + Na]^+$ 427.1451, found 427.1457.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(3-methoxyphenyl)-2-(2-(pyridin-2-yl) ethoxy)butanamide (66)



66

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and 2-(pyridin-2-yl)ethan-1-ol **A45** (36.9 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4/1) to yield the product **66** as a colorless oil (58.4 mg, 68% yield, 90% e.e.).

[α]$_D^{27}$ = +9 (c 0.6, $CHCl_3$).

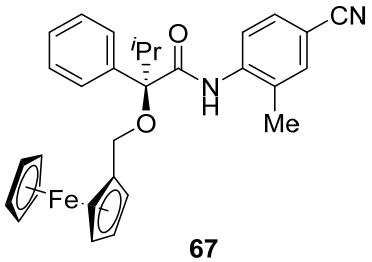
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 31.65 min, t_R (major) = 37.08 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.06 (s, 1H), 8.50 (dd, *J* = 4.9, 0.8 Hz, 1H), 8.19 (d, *J* = 8.3 Hz, 1H), 7.63 (td, *J* = 7.7, 1.8 Hz, 1H), 7.49 – 7.33 (m, 2H), 7.27 – 7.14 (m, 3H), 7.00 – 6.90 (m, 2H), 6.87 – 6.78 (m, 1H), 3.90 – 3.80 (m, 1H), 3.77 (s, 3H), 3.70 – 3.62 (m, 1H), 3.15 (t, *J* = 6.1 Hz, 2H), 2.68 – 2.53 (m, 1H), 2.23 – 2.09 (m, 4H), 0.86 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 159.8, 158.7, 149.4, 141.1, 140.0, 136.5, 133.7, 131.1, 129.6, 128.1, 123.4, 121.7, 121.0, 119.0, 118.7, 113.1, 112.8, 107.2, 84.8, 61.9, 55.2, 38.6, 24.7, 17.3, 7.4.

HRMS (ESI) m/z calcd. for $C_{26}H_{27}N_3NaO_3$ $[M + Na]^+$ 452.1945, found 452.1941.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(1-ferrocenemethoxy)-3-methyl-2-phenylbutanamide (67)



67

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-me thyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and ferrocenemethanol **A46** (64. 8 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatog raphy on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **67** as a yellow oil (62.8 mg, 62% yield, 95% e.e.).

[α]$_D^{27}$ = +25 (c 0.6, $CHCl_3$).

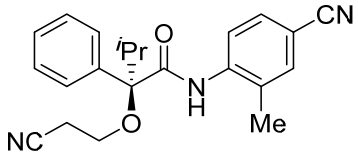
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 9.14 min, t_R (major) = 12.73 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.01 (s, 1H), 8.33 (d, *J* = 8.5 Hz, 1H), 7.54 (d, *J* = 7.4 Hz, 2H), 7.50 – 7.29 (m, 5H), 4.31 (d, *J* = 10.4 Hz, 1H), 4.25 – 4.20 (m, 1H), 4.19 – 4.12 (m, 2H), 4.11 – 4.03 (m, 7H), 3.07 – 2.90 (m, 1H), 2.07 (s, 3H), 1.15 (d, *J* = 6.9 Hz, 3H), 1.10 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.9, 140.0, 137.5, 133.8, 131.3, 128.4, 128.2, 128.1, 127.6, 120.4, 119.1, 106.9, 88.3, 83.4, 63.5, 32.4, 18.2, 17.9, 17.3.

HRMS (ESI) m/z calcd. for $C_{30}H_{30}FeN_2NaO_2$ $[M + Na]^+$ 529.1549, found 529.1551.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(2-cyanoethoxy)-3-methyl-2-phenylbutanamide (68)



68

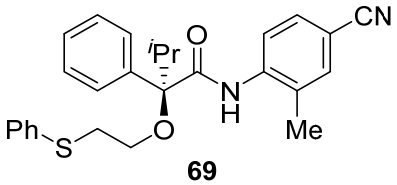
According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 3-hydroxypropanenitrile **A47** (21.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5/1) to yield the product **68** as a light yellow oil (51.3 mg, 71% yield, 92% e.e.).

[α]$_D^{27}$ = −30 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel IB (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 28.20 min, t_R (minor) = 34.70 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (s, 1H), 8.33 (d, *J* = 8.4 Hz, 1H), 7.55 – 7.33 (m, 7H), 3.71 – 3.62 (m, 1H), 3.48 – 3.40 (m, 1H), 3.06 – 2.88 (m, 1H), 2.68 – 2.49 (m, 2H), 2.36 (s, 3H), 1.16 (d, *J* = 6.9 Hz, 3H), 1.13 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 169.8, 139.7, 136.4, 134.0, 131.2, 128.8, 128.7, 128.2, 128.1, 120.9, 119.0, 117.6, 107.4, 88.6, 58.7, 31.0, 19.5, 18.0, 17.9, 17.6.
HRMS (ESI) m/z calcd. for $C_{22}H_{23}N_3NaO_2$ $[M + Na]^+$ 384.1682, found 384.1685.

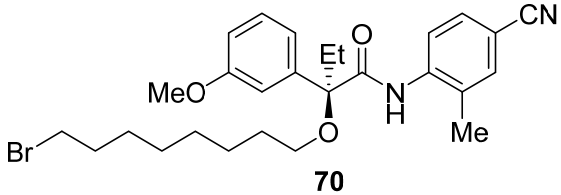
(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(2-(phenylthio)ethoxy) butanamide (69)



69

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 2-(phenylthio)ethan-1-ol **A48** (46.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **69** as a colorless oil (56.9 mg, 64% yield, 91% e.e.).
$[\alpha]_D^{27}$ = −16 (c 0.6, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 11.04 min, t_R (major) = 22.27 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.14 (s, 1H), 8.25 (d, *J* = 8.4 Hz, 1H), 7.52 – 7.44 (m, 4H), 7.40 – 7.29 (m, 3H), 7.28 – 7.10 (m, 5H), 3.70 – 3.58 (m, 1H), 3.52 – 3.41 (m, 1H), 3.13 (t, *J* = 5.8 Hz, 2H), 3.00 – 2.81 (m, 1H), 2.33 (s, 3H), 1.11 (d, *J* = 6.9 Hz, 3H), 1.07 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 170.5, 140.0, 137.1, 135.4, 133.9, 131.1, 129.2, 129.1, 128.5, 128.4, 128.3, 128.2, 126.5, 121.2, 119.1, 107.3, 88.1, 62.2, 34.6, 31.9, 17.9, 17.7.
HRMS (ESI) m/z calcd. for $C_{27}H_{28}N_2NaO_2S$ $[M + Na]^+$ 467.1764, found 467.1771.

(*S*)-2-((8-bromooctyl)oxy)-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide (70)

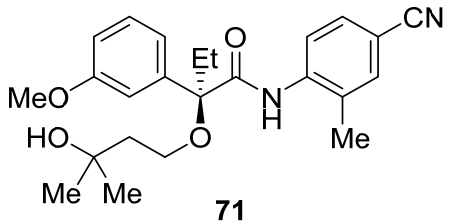


70

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and 8-bromooctan-1-ol **A49** (62.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **70** as a colorless oil (71.1 mg, 69% yield, 91% e.e.).
$[\alpha]_D^{27}$ = +21 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 13.28 min, t_R (minor) = 28.12 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.14 (s, 1H), 8.33 (d, *J* = 9.1 Hz, 1H), 7.50 – 7.43 (m, 2H), 7.34 – 7.24 (m, 1H), 7.09 – 6.98 (m, 2H), 6.88 – 6.81 (m, 1H), 3.80 (s, 3H), 3.49 – 3.31 (m, 3H), 3.28 – 3.17 (m, 1H), 2.70 – 2.56 (m, 1H), 2.34 (s, 3H), 2.22 – 2.07 (m, 1H), 1.95 – 1.78 (m, 2H), 1.74 – 1.63 (m, 2H), 1.50 – 1.39 (m, 4H), 1.38 – 1.27 (m, 4H), 0.94 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 159.8, 141.3, 140.0, 133.8, 131.4, 129.7, 127.2, 120.3, 119.0, 118.7, 112.9, 112.8, 107.0, 84.7, 62.6, 55.3, 34.0, 32.7, 30.1, 29.3, 28.7, 28.1, 26.2, 24.7, 17.3, 7.5.
HRMS (ESI) m/z calcd. for $C_{27}H_{36}BrN_2O_3$ $[M + H]^+$ 515.1904, found 515.1909.

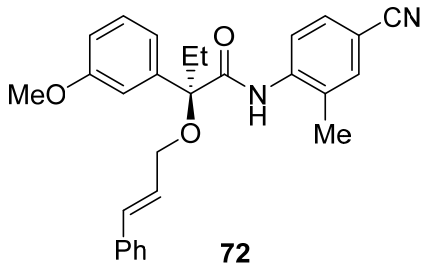
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(3-hydroxy-3-methylbutoxy)-2-(3-methoxyphenyl)butanamide (71)



71

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.6 mg, 0.20 mmol) and 3-methylbutane-1,3-diol **A50** (31.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 2/1) to yield the product **71** as a colorless oil (71.4 mg, 87% yield, 90% e.e.).
$[\alpha]_D^{27}$ = −15 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 80/20, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 9.49 min, t_R (major) = 16.67 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.02 (s, 1H), 8.24 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.42 (m, 2H), 7.34 – 7.24 (m, 1H), 7.15 – 7.00 (m, 2H), 6.85 (dd, *J* = 8.2, 2.4 Hz, 1H), 3.80 (s, 3H), 3.62 – 3.50 (m, 1H), 3.48 – 3.37 (m, 1H), 2.72 – 2.51 (m, 1H), 2.30 (s, 3H), 2.25 – 2.14 (m, 1H), 1.97 – 1.84 (m, 2H), 1.74 – 1.67 (m, 1H), 1.27 (s, 3H), 1.26 (s, 3H), 0.94 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 159.9, 141.1, 139.9, 133.8, 131.2, 129.8, 127.9, 120.9, 119.0, 118.6, 113.1, 112.7, 107.2, 85.3, 70.3, 59.9, 55.3, 43.0, 30.1, 29.8, 24.8, 17.4, 7.6.
HRMS (ESI) m/z calcd. for $C_{24}H_{31}N_2O_4$ $[M + H]^+$ 411.2278, found 411.2277.

(*S*)-2-(Cinnamyloxy)-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl) butanamide (72)



72

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and (*E*)-3-phenylprop-2-en-1-ol **A51** (40.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to yield the product **72** as a colorless oil (64.3 mg, 73% yield, 91% e.e.).

$[\alpha]_D^{27}$ = –15 (c 0.6, $CHCl_3$).

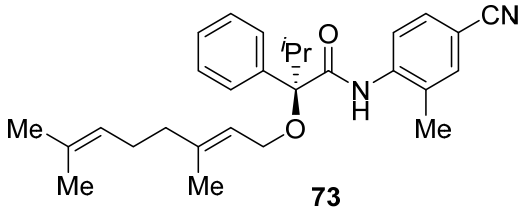
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 18.48 min, t_R (major) = 34.47 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.10 (s, 1H), 8.31 (d, *J* = 8.5 Hz, 1H), 7.49 – 7.24 (m, 8H), 7.18 – 7.07 (m, 2H), 6.87 (dd, *J* = 8.1, 1.9 Hz, 1H), 6.74 – 6.65 (m, 1H), 6.40 – 6.26 (m, 1H), 4.14 – 3.94 (m, 2H), 3.80 (s, 3H), 2.75 – 2.60 (m, 1H), 2.31 (s, 3H), 2.28 – 2.15 (m, 1H), 0.99 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.9, 159.9, 141.0, 139.9, 136.4, 133.8, 132.3, 131.3, 129.8, 128.8, 128.1, 127.5, 126.5, 124.9, 120.5, 119.0, 118.7, 113.2, 112.8, 107.2, 85.3, 64.0, 55.3, 25.1, 17.4, 7.6.

HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_2NaO_3$ $[M + Na]^+$ 463.1992, found 463.1990.

(*S*,*E*)-*N*-(4-Cyano-2-methylphenyl)-2-((3,7-dimethylocta-2,6-dien-1-yl)oxy)-3-methyl-2-phenylbutanamide (73)



73

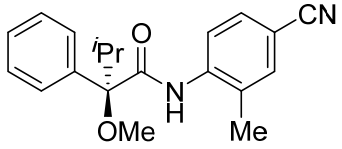
According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*E*)-3,7-dimethylocta-2,6-dien-1-ol **A52** (46.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **73** as a colorless oil (77.4 mg, 87% yield, 94% e.e.).

$[\alpha]_D^{27}$ = −22 (c 0.9, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.37 min, t_R (major) = 6.91 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.13 (s, 1H), 8.39 (d, *J* = 8.5 Hz, 1H), 7.55 – 7.29 (m, 7H), 5.44 – 5.34 (m, 1H), 5.14 – 5.04 (m, 1H), 3.98 (dd, *J* = 10.9, 6.5 Hz, 1H), 3.79 (dd, *J* = 10.9, 6.9 Hz, 1H), 3.06 – 2.86 (m, 1H), 2.27 (s, 3H), 2.17 – 2.00 (m, 4H), 1.68 (s, 3H), 1.61 (s, 3H), 1.55 (s, 3H), 1.13 (d, *J* = 7.0 Hz, 3H), 1.08 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 140.7, 140.1, 137.5, 133.8, 131.9, 131.4, 128.3, 128.1, 128.0, 127.3, 123.7, 120.3, 120.2, 119.1, 106.9, 88.1, 62.0, 39.5, 32.7, 26.4, 25.7, 18.0, 17.8, 17.7, 17.2, 16.6.
HRMS (ESI) m/z calcd. for $C_{29}H_{36}N_2NaO_2$ $[M + Na]^+$ 467.2669, found 467.2668.

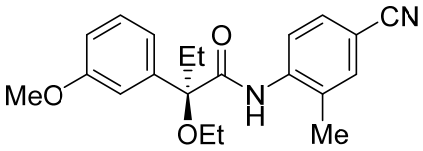
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-methoxy-3-methyl-2-phenylbutanamide (74)



74

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and methanol **A53** (9.6 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **74** as a white solid (62.5 mg, 97% yield, 95% e.e.).
$[\alpha]_D^{27}$ = −16 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 7.36 min, t_R (major) = 10.90 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (s, 1H), 8.36 (d, *J* = 8.5 Hz, 1H), 7.56 – 7.43 (m, 4H), 7.42 – 7.36 (m, 2H), 7.35 – 7.29 (m, 1H), 3.27 (s, 3H), 3.00 – 2.80 (m, 1H), 2.29 (s, 3H), 1.11 (d, *J* = 6.9 Hz, 3H), 1.06 (d, *J* = 6.8 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 170.8, 140.0, 137.0, 133.8, 131.3, 128.3, 128.2, 128.1, 127.6, 120.6, 119.0, 107.1, 88.2, 52.9, 32.0, 17.9, 17.8, 17.4.
HRMS (ESI) m/z calcd. for $C_{20}H_{22}N_2NaO_2$ $[M + Na]^+$ 345.1573, found 345.1573.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-ethoxy-2-(3-methoxyphenyl)butanamide (75)

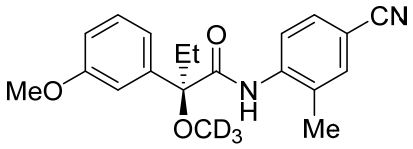


75

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and ethanol **A54** (13.8 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **75** as a colorless oil (59.2 mg, 84% yield, 90% e.e.).

[α]$_D^{27}$ = +27 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 260 nm), t_R (minor) = 13.15 min, t_R (major) = 19.78 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.16 (s, 1H), 8.32 (d, *J* = 8.3 Hz, 1H), 7.53 – 7.42 (m, 2H), 7.30 – 7.23 (m, 1H), 7.07 (d, *J* = 7.8 Hz, 1H), 7.05 – 7.00 (m, 1H), 6.84 (dd, *J* = 8.2, 1.9 Hz, 1H), 3.80 (s, 3H), 3.49 – 3.37 (m, 1H), 3.36 – 3.21 (m, 1H), 2.68 –2.56 (m, 1H), 2.33 (s, 3H), 2.19 – 2.07 (m, 1H), 1.32 (t, *J* = 6.9 Hz, 3H), 0.94 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 159.8, 141.4, 140.0, 133.8, 131.4, 129.7, 127.3, 120.3, 119.0, 118.6, 112.9, 112.8, 107.0, 84.8, 58.4, 55.3, 24.9, 17.2, 15.5, 7.5.
HRMS (ESI) m/z calcd. for $C_{21}H_{24}N_2NaO_3$ $[M + Na]^+$ 375.1679, found 375.1676.

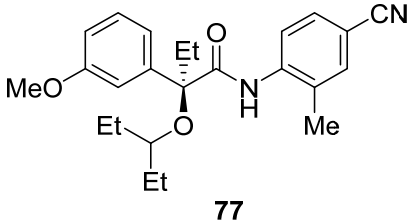
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(methoxy-*d*$_3$)-2-(3-methoxyphenyl) butanamide (76)



76

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and methan-*d*$_3$-ol **A55** (10.5 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **76** as a colorless oil (64.2 mg, 94% yield, 91% e.e.).
[α]$_D^{27}$ = +25 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 12.19 min, t_R (minor) = 28.18 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.99 (s, 1H), 8.27 (d, *J* = 8.3 Hz, 1H), 7.49 – 7.41 (m, 2H), 7.34 – 7.24 (m, 1H), 7.10 – 7.00 (m, 2H), 6.91 – 6.76 (m, 1H), 3.80 (s, 3H), 2.69 – 2.56 (m, 1H), 2.32 (s, 3H), 2.21 – 2.07 (m, 1H), 0.94 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 159.9, 140.9, 139.9, 133.8, 131.2, 129.7, 127.7, 120.7, 119.0, 118.8, 113.0, 112.9, 107.1, 85.1, 55.3, 50.3, 24.3, 17.4, 7.4.
HRMS (ESI) m/z calcd. for $C_{20}H_{19}D_3N_2NaO_3$ $[M + Na]^+$ 364.1716, found 364.1710.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(3-methoxyphenyl)-2-(pentan-3-yloxy)butanamide (77)



77

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and pentan-3-ol **A56** (26.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **77** as a colorless oil (68.6 mg, 87% yield, 91% e.e.).

[α]$_D^{27}$ = +50 (c 0.6, $CHCl_3$).

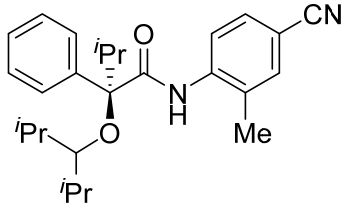
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 13.72 min, t_R (minor) = 40.22 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.36 (s, 1H), 8.42 (d, *J* = 8.4 Hz, 1H), 7.61 – 7.37 (m, 2H), 7.34 – 7.20 (m, 1H), 7.10 – 6.98 (m, 2H), 6.85 (dd, *J* = 8.1, 2.1 Hz, 1H), 3.79 (s, 3H), 3.51 – 3.32 (m, 1H), 2.58 – 2.45 (m, 1H), 2.35 (s, 3H), 2.30 – 2.18 (m, 1H), 1.66 – 1.53 (m, 2H), 1.37 – 1.22 (m, 2H), 0.98 (t, *J* = 7.2 Hz, 3H), 0.91 (t, *J* = 7.4 Hz, 3H), 0.75 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.2, 159.5, 142.1, 140.0, 133.8, 131.5, 129.4, 127.1, 120.1, 119.5, 119.1, 113.7, 113.0, 106.9, 85.0, 75.6, 55.3, 25.9, 25.6, 25.5, 17.4, 8.8, 8.7, 8.1.

HRMS (ESI) m/z calcd. for $C_{24}H_{30}N_2NaO_3$ $[M + Na]^+$ 417.2149, found 417.2147.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2,4-dimethylpentan-3-yl)oxy)-3-methyl-2-phenylbutanamide (78)



78

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 2,4-dimethylpentan-3-ol **A57** (34.8 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **78** as a colorless oil (70.7 mg, 87% yield, 93% e.e.).

[α]$_D^{27}$ = −14 (c 0.7, $CHCl_3$).

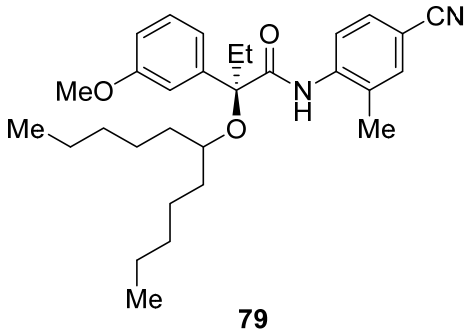
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 5.16 min, t_R (major) = 6.73 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.58 (s, 1H), 8.60 (d, *J* = 8.5 Hz, 1H), 7.56 (d, *J* = 8.5 Hz, 1H), 7.51 (s, 1H), 7.44 – 7.29 (m, 5H), 3.22 (t, *J* = 2.8 Hz, 1H), 2.78 – 2.64 (m, 1H), 2.37 (s, 3H), 2.00 – 1.87 (m, 1H), 1.24 – 1.19 (m, 1H), 1.17 (s, 3H), 1.15 (s, 3H), 1.04 (d, *J* = 7.0 Hz, 3H), 0.96 (d, *J* = 6.9 Hz, 3H), 0.59 (d, *J* = 7.0 Hz, 3H), 0.37 (d, *J* = 7.0 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.4, 140.1, 137.1, 133.9, 131.4, 130.1, 128.7, 128.1, 127.2, 120.4, 119.1, 106.9, 88.5, 81.5, 32.6, 30.7, 29.4, 19.6, 19.4, 19.2, 19.1, 18.9, 18.0, 17.8.

HRMS (ESI) m/z calcd. for $C_{26}H_{34}N_2NaO_2$ $[M + Na]^+$ 429.2512, found 429.2517.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(3-methoxyphenyl)-2-(undecan-6-yloxy)butanamide (79)



79

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and undecan-6-ol **A58** (51.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **79** as a colorless oil (78.5 mg, 82% yield, 91% e.e.).

$[\alpha]_D^{27}$ = +39 (c 0.5, $CHCl_3$).

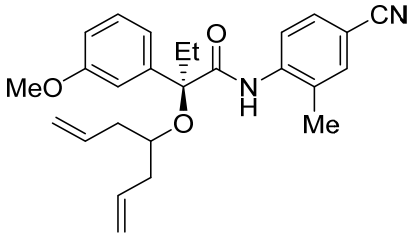
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 8.05 min, t_R (minor) = 25.04 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.37 (s, 1H), 8.42 (d, *J* = 8.4 Hz, 1H), 7.56 – 7.44 (m, 2H), 7.32 – 7.23 (m, 1H), 7.14 – 6.99 (m, 2H), 6.85 (dd, *J* = 8.2, 2.0 Hz, 1H), 3.79 (s, 3H), 3.57 – 3.43 (m, 1H), 2.57 – 2.43 (m, 1H), 2.34 (s, 3H), 2.29 – 2.17 (m, 1H), 1.59 – 1.49 (m, 2H), 1.41 – 1.07 (m, 13H), 1.06 – 1.01 (m, 1H), 0.97 (t, *J* = 7.2 Hz, 3H), 0.89 (t, *J* = 6.9 Hz, 3H), 0.82 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 172.2, 159.5, 142.0, 140.0, 133.8, 131.5, 129.4, 127.0, 120.1, 119.6, 119.1, 113.8, 113.0, 106.9, 85.0, 73.9, 55.2, 34.1, 33.6, 32.1, 31.8, 25.5, 24.3, 24.1, 22.7, 22.5, 17.4, 14.1, 14.0, 8.1.

HRMS (ESI) m/z calcd. for $C_{30}H_{42}N_2NaO_3$ $[M + Na]^+$ 501.3088, found 501.3086.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(hepta-1,6-dien-4-yloxy)-2-(3-methoxyphenyl) butanamide (80)



80

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and hepta-1,6-dien-4-ol **A59** (33.6 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **80** as a colorless oil (65.2 mg, 78% yield, 91% e.e.).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 92/8, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 29.90 min, t_R (major) = 36.11 min.

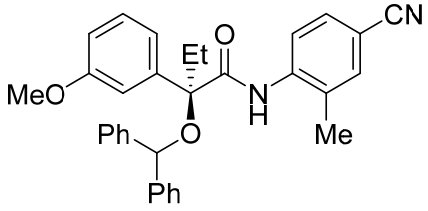
[α]$_D^{27}$ = +33 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.26 (s, 1H), 8.36 (d, *J* = 8.3 Hz, 1H), 7.55 – 7.40 (m, 2H), 7.33 – 7.23 (m, 1H), 7.10 – 6.95 (m, 2H), 6.92 – 6.80 (m, 1H), 5.89 – 5.72 (m, 1H), 5.70 – 5.55 (m, 1H), 5.15 – 5.06 (m, 2H), 5.06 – 4.89 (m, 2H), 3.79 (s, 3H), 3.67 – 3.48 (m, 1H), 2.58 – 2.47 (m, 1H), 2.44 – 2.31 (m, 5H), 2.30 – 2.18 (m, 1H), 2.08 – 1.90 (m, 2H), 1.00 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.7, 159.6, 141.5, 139.9, 133.8, 133.7, 133.6, 131.3, 129.6, 127.5, 120.6, 119.7, 119.0, 118.2, 118.0, 113.9, 113.3, 107.1, 85.4, 72.8, 55.3, 38.7, 38.4, 25.5, 17.5, 8.1.

HRMS (ESI) m/z calcd. for $C_{26}H_{30}N_2NaO_3$ $[M + Na]^+$ 441.2149, found 441.2146.

(*S*)-2-(Benzhydryloxy)-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl) butanamide (81)



81

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and diphenylmethanol **A60** (55.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **81** as a white solid (73.6 mg, 75% yield, 92% e.e.).

[α]$_D^{27}$ = +9 (c 0.5, $CHCl_3$).

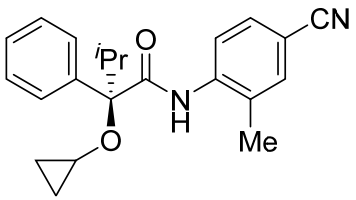
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 16.60 min, t_R (minor) = 18.47 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.95 (s, 1H), 8.31 (d, *J* = 8.5 Hz, 1H), 7.45 (d, *J* = 8.6 Hz, 1H), 7.41 – 7.34 (m, 3H), 7.33 – 7.14 (m, 9H), 7.06 (d, *J* = 7.7 Hz, 1H), 6.96 (s, 1H), 6.82 (dd, *J* = 8.1, 2.2 Hz, 1H), 5.39 (s, 1H), 3.62 (s, 3H), 2.53 – 2.37 (m, 1H), 2.22 – 2.10 (m, 1H), 2.08 (s, 3H), 0.60 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 159.7, 143.1, 142.8, 140.9, 139.9, 133.8, 131.3, 129.6, 128.7, 128.5, 127.8, 127.5, 127.3, 126.7, 126.2, 120.3, 119.2, 119.0, 113.9, 112.8, 107.1, 88.0, 79.3, 55.1, 26.4, 17.2, 7.7.

HRMS (ESI) m/z calcd. for $C_{32}H_{30}N_2NaO_3$ $[M + Na]^+$ 513.2149, found 513.2146.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-cyclopropoxy-3-methyl-2-phenylbutanamide (82)



82

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and cyclopropanol **A61** (17.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **82** as a white solid (51.6 mg, 74% yield, 90% e.e.).

$[\alpha]_D^{27}$ = −7 (c 0.6, $CHCl_3$).

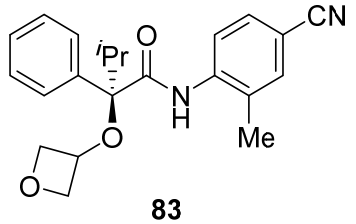
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 6.85 min, t_R (major) = 10.44 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.95 (s, 1H), 8.39 (d, *J* = 8.5 Hz, 1H), 7.56 – 7.48 (m, 3H), 7.46 (s, 1H), 7.42 – 7.29 (m, 3H), 3.23 – 3.15 (m, 1H), 3.11 – 2.99 (m, 1H), 2.27 (s, 3H), 1.14 (d, *J* = 6.9 Hz, 3H), 1.10 (d, *J* = 6.8 Hz, 3H), 0.73 – 0.66 (m, 1H), 0.58 – 0.45 (m, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.8, 139.9, 137.7, 133.8, 131.4, 128.3, 128.2, 128.1, 127.3, 120.3, 119.1, 107.0, 89.4, 50.1, 32.4, 18.0, 17.6, 17.3, 7.1, 6.3.

HRMS (ESI) m/z calcd. for $C_{22}H_{24}N_2NaO_2$ $[M + Na]^+$ 371.1730, found 371.1734.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-(oxetan-3-yloxy)-2-phenylbutanamide (83)



83

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and oxetan-3-ol **A62** (22.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4/1) to yield the product **83** as a light yellow oil (55.4 mg, 76% yield, 92% e.e.).

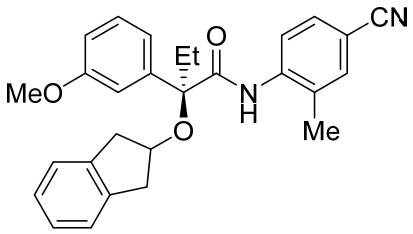
$[\alpha]_D^{27}$ = +21 (c 1.0, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 14.63 min, t_R (major) = 21.78 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.07 (s, 1H), 8.35 (d, *J* = 8.3 Hz, 1H), 7.54 – 7.47 (m, 2H), 7.43 – 7.31 (m, 5H), 4.74 – 4.59 (m, 3H), 4.52 – 4.42 (m, 2H), 3.03 – 2.92 (m, 1H), 2.36 (s, 3H), 1.05 (t, *J* = 7.1 Hz, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 139.7, 137.0, 133.9, 131.4, 128.8, 128.7, 127.8, 127.4, 120.5, 118.9, 107.4, 89.3, 79.8, 79.5, 68.2, 31.8, 18.0, 17.4, 17.2.
HRMS (ESI) m/z calcd. for $C_{22}H_{24}N_2NaO_3$ $[M + Na]^+$ 387.1679, found 387.1679.

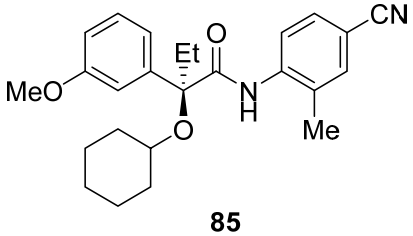
(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((2,3-dihydro-1*H*-inden-2-yl)oxy)-2-(3-methoxyphenyl)butanamide (84)



84

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and 2,3-dihydro-1*H*-inden-2-ol **A63** (40.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **84** as a colorless oil (60.7 mg, 69% yield, 92% e.e.).
$[\alpha]_D^{27}$ = +42 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 20.19 min, t_R (major) = 23.36 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.13 (s, 1H), 8.35 (d, *J* = 8.5 Hz, 1H), 7.51 – 7.45 (m, 1H), 7.40 (s, 1H), 7.35 – 7.25 (m, 1H), 7.17 – 7.01 (m, 6H), 6.86 (d, *J* = 8.2 Hz, 1H), 4.43 – 4.30 (m, 1H), 3.79 (s, 3H), 3.25 – 3.03 (m, 2H), 2.97 – 2.75 (m, 2H), 2.72 – 2.50 (m, 1H), 2.36 – 2.20 (m, 1H), 2.13 (s, 3H), 1.02 (t, *J* = 7.1 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 159.8, 141.6, 140.1, 139.9, 133.8, 131.4, 129.7, 127.3, 126.9, 126.8, 124.5, 120.1, 119.2, 119.0, 113.4, 113.2, 107.0, 85.7, 75.9, 55.3, 40.8, 40.7, 25.5, 17.0, 8.0.
HRMS (ESI) m/z calcd. for $C_{28}H_{28}N_2NaO_3$ $[M + Na]^+$ 463.1992, found 463.1991.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(cyclohexyloxy)-2-(3-methoxyphenyl) butanamide (85)

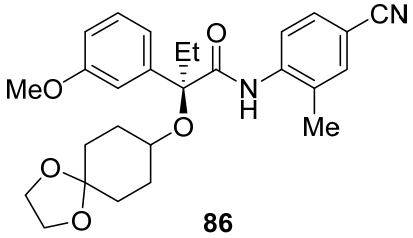


85

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and cyclohexanol **A64** (30.0 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/DCM = 3/1) to yield the product **85** as a colorless oil (66.6 mg, 82% yield, 90% e.e.).
[α]$_D^{27}$ = +62 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 15.92 min, t_R (major) = 24.16 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.38 (s, 1H), 8.38 (d, *J* = 8.6 Hz, 1H), 7.55 – 7.40 (m, 2H), 7.33 – 7.20 (m, 1H), 7.13 – 6.97 (m, 2H), 6.87 – 6.80 (m, 1H), 3.80 (s, 3H), 3.50 – 3.30 (m, 1H), 2.66 – 2.50 (m, 1H), 2.36 (s, 3H), 2.27 – 2.12 (m, 1H), 1.87 – 1.78 (m, 1H), 1.76 – 1.70 (m, 1H), 1.68 – 1.57 (m, 1H), 1.56 – 1.42 (m, 3H), 1.32 – 1.13 (m, 4H), 0.98 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 159.6, 142.2, 140.0, 133.8, 131.4, 129.5, 127.1, 120.1, 119.3, 119.1, 113.6, 113.0, 106.9, 85.1, 72.5, 55.3, 34.3, 34.2, 25.5, 25.4, 24.1 (d, *J* = 4.5 Hz), 17.4, 8.0.
HRMS (ESI) m/z calcd. for $C_{25}H_{30}N_2NaO_3$ $[M + Na]^+$ 429.2149, found 429.2146.

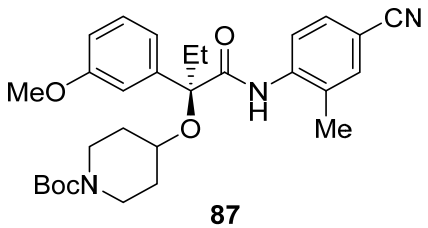
(*S*)-2-((1,4-Dioxaspiro[4.5]decan-8-yl)oxy)-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide (86)



86

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and 1,4-dioxaspiro[4.5]decan-8-ol **A65** (47.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **86** as a colorless oil (72.4 mg, 78% yield, 91% e.e.).
[α]$_D^{27}$ = +43 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel IB (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 16.54 min, t_R (minor) = 31.35 min.
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.30 (s, 1H), 8.37 (d, *J* = 9.0 Hz, 1H), 7.55 – 7.43 (m, 2H), 7.29 – 7.23 (m, 1H), 7.14 – 6.97 (m, 2H), 6.90 – 6.80 (m, 1H), 4.00 – 3.87 (m, 4H), 3.79 (s, 3H), 3.53 (d, *J* = 4.6 Hz, 1H), 2.68 – 2.52 (m, 1H), 2.37 (s, 3H), 2.26 – 2.16 (m, 1H), 1.91 – 1.71 (m, 4H), 1.61 – 1.39 (m, 4H), 0.99 (t, *J* = 7.2 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.6, 159.6, 141.8, 139.9, 133.8, 131.4, 129.6, 127.2, 120.2, 119.3, 119.0, 113.6, 113.1, 107.7, 107.0, 85.3, 70.3, 64.4, 64.3, 55.3, 31.9, 31.8, 30.9, 30.7, 25.4, 17.5, 8.0.
HRMS (ESI) m/z calcd. for $C_{27}H_{32}N_2NaO_5$ $[M + Na]^+$ 487.2203, found 487.2203.

***tert*-Butyl (*S*)-4-((1-((4-cyano-2-methylphenyl)amino)-2-(3-methoxyphenyl)-1-oxobutan-2-yl)oxy)piperidine-1-carboxylate (87)**



87

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and *tert*-butyl 4-hydroxypiperidine-1-carboxylate **A66** (60.3 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4/1) to yield product **87** as a colorless oil (72.1 mg, 71% yield, 91% e.e.).

[α]$_D^{27}$ = +39 (c 0.5, $CHCl_3$).

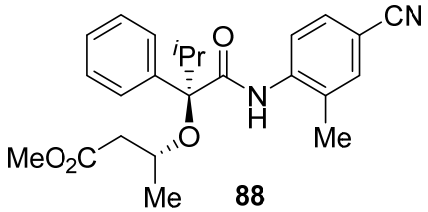
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 85/15, flow rate 1.0 mL/min, λ = 270 nm), t_R (minor) = 30.57 min, t_R (major) = 38.97 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.35 (d, *J* = 9.1 Hz, 1H), 7.53 – 7.45 (m, 2H), 7.33 – 7.25 (m, 1H), 7.09 – 6.98 (m, 2H), 6.93 – 6.83 (m, 1H), 3.93 – 3.82 (m, 1H), 3.80 (s, 3H), 3.78 – 3.68 (m, 1H), 3.61 – 3.51 (m, 1H), 3.08 – 2.94 (m, 1H), 2.93 – 2.80 (m, 1H), 2.68 – 2.53 (m, 1H), 2.35 (s, 3H), 2.26 – 2.14 (m, 1H), 1.88 – 1.78 (m, 1H), 1.72 – 1.55 (m, 1H), 1.45 (s, 9H), 1.41 – 1.24 (m, 2H), 0.99 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 159.7, 154.6, 139.8, 133.8, 131.4, 129.7, 127.2, 120.3, 119.2, 118.9, 113.7, 113.1, 107.2, 85.5, 79.8, 70.2, 55.3, 41.5, 33.4, 33.1, 28.4, 25.5, 17.4, 8.0.

HRMS (ESI) m/z calcd. for $C_{29}H_{37}N_3NaO_5$ $[M + Na]^+$ 530.2625, found 530.2623.

Methyl (*R*)-3-(((*S*)-1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)butanoate (88)



88

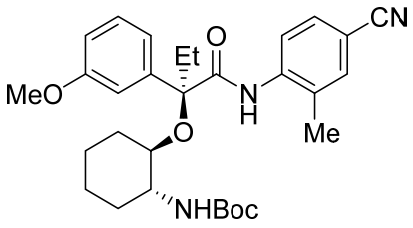
According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and methyl (*R*)-3-hydroxybutanoate **A67** (35.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to yield the product **88** as a light yellow oil (55.6 mg, 68% yield, >20:1 d.r.).

[α]$_D^{27}$ = −32 (c 0.4, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.36 (s, 1H), 8.47 (d, *J* = 8.5 Hz, 1H), 7.58 – 7.53 (m, 1H), 7.51 (s, 1H), 7.49 – 7.43 (m, 2H), 7.43 – 7.32 (m, 3H), 4.13 – 4.03 (m, 1H), 3.69

(s, 3H), 2.84 – 2.71 (m, 1H), 2.62 – 2.53 (m, 1H), 2.51 – 2.43 (m, 1H), 2.35 (s, 3H), 1.12 (d, J = 6.8 Hz, 3H), 1.08 (d, J = 6.7 Hz, 3H), 0.65 (d, J = 6.1 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.4, 170.8, 139.9, 136.6, 133.9, 131.4, 129.4, 128.8, 128.3, 127.7, 120.6, 119.1, 107.1, 88.2, 67.2, 51.7, 43.0, 32.4, 21.6, 18.7, 17.7, 17.5.
HRMS (ESI) m/z calcd. for $C_{24}H_{28}N_2NaO_4$ $[M + Na]^+$ 431.1941, found 431.1944.

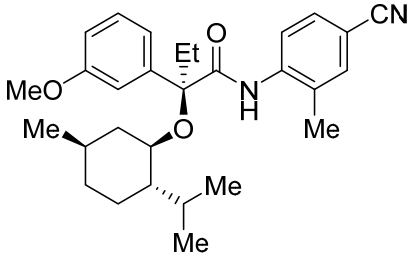
***tert*-Butyl ((1*R*,2*R*)-2-(((*S*)-1-((4-cyano-2-methylphenyl)amino)-2-(3-methoxyphenyl)-1-oxobutan-2-yl)oxy)cyclohexyl)carbamate (89)**



89

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and *tert*-butyl ((1*R*,2*R*)-2-hydroxycyclohexyl)carbamate **A68** (64.6 mg, 0.30 mmol, 1.5 equiv.) run at –10 ℃ for 5 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield product **89** as a white solid (77.2 mg, 74% yield, >20:1 d.r.).
$[\alpha]_D^{27}$ = +34 (c 0.6, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.62 (s, 1H), 8.07 (d, J = 8.1 Hz, 1H), 7.53 – 7.38 (m, 2H), 7.23 (t, J = 7.9 Hz, 1H), 7.13 – 6.93 (m, 2H), 6.85 – 6.77 (m, 1H), 4.54 (d, J = 8.7 Hz, 1H), 3.78 (s, 3H), 3.70 – 3.57 (m, 1H), 3.40 – 3.25 (m, 1H), 2.78 – 2.64 (m, 1H), 2.50 (s, 3H), 2.37 – 2.15 (m, 1H), 2.05 – 1.88 (m, 1H), 1.58 – 1.38 (m, 3H), 1.32 – 1.25 (m, 1H), 1.22 (s, 9H), 1.16 – 1.15 (m, 1H), 1.06 (t, J = 7.2 Hz, 3H), 1.01 – 0.81 (m, 2H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 159.4, 155.9, 143.8, 140.3, 133.8, 130.5, 129.3, 122.8, 119.3, 119.2, 113.3, 113.1, 107.4, 84.0, 79.4, 76.5, 55.2, 53.2, 32.2, 31.5, 28.3, 24.0, 23.8, 23.5, 17.7, 7.9.
HRMS (ESI) m/z calcd. for $C_{30}H_{39}N_3NaO_5$ $[M + Na]^+$ 544.2782, found 544.2778.

***(S)*-*N*-(4-Cyano-2-methylphenyl)-2-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-2-(3-methoxyphenyl)butanamide (90)**



90

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-(3-methoxyphenyl)butanamide **E5** (68.4 mg, 0.20 mmol) and (1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexan-1-ol **A69** (46.9 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **90** as a colorless oil (62.0 mg, 67% yield, 19:1 d.r.).

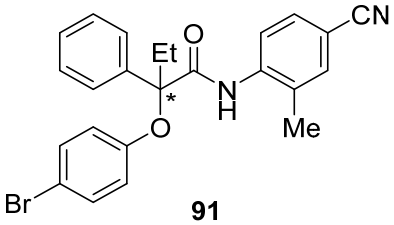
$[\alpha]_D^{27}$ = +9 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.32 (s, 1H), 8.41 (d, *J* = 9.1 Hz, 1H), 7.54 – 7.44 (m, 2H), 7.27 – 7.21 (m, 1H), 7.10 – 6.99 (m, 2H), 6.86 –6.78 (m, 1H), 3.79 (s, 3H), 3.53 –3.44 (m, 1H), 2.77 – 2.64 (m, 1H), 2.48 – 2.38 (m, 1H), 2.35 (s, 3H), 2.25 – 2.14 (m, 1H), 1.72 – 1.62 (m, 1H), 1.60 – 1.51 (m, 1H), 1.44 – 1.33 (m, 1H), 1.30 – 1.20 (m, 2H), 1.07 – 0.95 (m, 7H), 0.81 (t, *J* = 9.1 Hz, 3H), 0.77 – 0.66 (m, 1H), 0.62 (d, *J* = 6.5 Hz, 3H), 0.58 – 0.46 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 159.4, 144.0, 140.1, 133.8, 131.4, 129.2, 127.0, 120.3, 119.4, 119.0, 113.6, 112.7, 106.9, 84.0, 74.9, 55.3, 49.4, 43.4, 34.0, 31.4, 25.6, 24.9, 22.9, 22.1, 21.8, 17.4, 16.3, 8.2.

HRMS (ESI) m/z calcd. for $C_{29}H_{38}N_2NaO_3$ $[M + Na]^+$ 485.2775, found 485.2774.

2-(4-bromophenoxy)-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide (91)



91

According to **General Procedure E** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-2-phenylbutanamide **E1** (62.4 mg, 0.20 mmol) and 4-bromophenol **P1** (41.5 mg, 0.24 mmol, 1.2 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **91** as a white solid (51.2 mg, 57% yield, 32% e.e.).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 254 nm), t_R (major) = 11.18 min, t_R (minor) = 19.24 min.

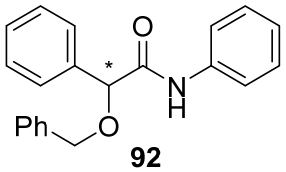
$[\alpha]_D^{27}$ = –9 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.92 (s, 1H), 8.26 (d, *J* = 8.5 Hz, 1H), 7.57 (d, *J* = 7.3 Hz, 2H), 7.50 (d, *J* = 8.5 Hz, 1H), 7.47 (s, 1H), 7.44 – 7.34 (m, 3H), 7.31 (d, *J* = 8.9 Hz, 2H), 6.70 (d, *J* = 8.9 Hz, 2H), 2.88 – 2.75 (m, 1H), 2.48 – 2.35 (m, 1H), 2.29 (s, 3H), 0.84 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 152.8, 139.5, 139.2, 133.9, 132.4, 131.4, 129.0, 128.6, 127.9, 125.8, 121.0, 120.5, 118.8, 115.3, 107.7, 87.8, 25.6, 17.3, 7.5.

HRMS (ESI) m/z calcd. for $C_{24}H_{20}BrN_2O_2$ $[M – H]^-$ 447.0708, found 447.0712.

2-(Benzyloxy)-*N*,2-diphenylacetamide (92)



92

According to **General Procedure F** with 2-chloro-*N*,2-diphenylacetamide **E23** (49.1 mg, 0.20 mmol) and phenylmethanol **A43** (32.4 mg, 0.30 mmol, 1.5 equiv.) using **L*22**, the reaction mixture was purified by column chromatography on (petroleum ether/EtOAc = 10/1) to yield **92** as a white solid (28.5 mg, 45% yield, 87% e.e.).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 95/5, flow rate 0.8 mL/min, λ = 254 nm), t_R (major) = 22.07 min, t_R (minor) = 28.66 min.

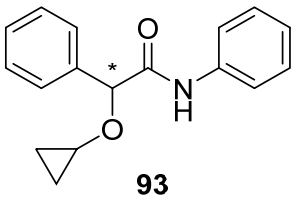
[α]$_D^{27}$ = –17 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59 (s, 1H), 7.56 (d, *J* = 7.8 Hz, 2H), 7.50 (d, *J* = 7.0 Hz, 2H), 7.44 – 7.27 (m, 10H), 7.10 (t, *J* = 7.4 Hz, 1H), 4.95 (s, 1H), 4.69 (d, *J* = 11.5 Hz, 1H), 4.53 (d, *J* = 11.6 Hz, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 137.3, 136.7, 129.0, 128.8, 128.7, 128.4, 128.2, 127.3, 124.5, 119.8, 81.4, 71.5.

HRMS (ESI) m/z calcd. for $C_{21}H_{20}NO_2$ $[M + H]^+$ 318.1489, found 318.1484.

2-Cyclopropoxy-*N*,2-diphenylacetamide (93)



93

According to **General Procedure F** with 2-chloro-*N*,2-diphenylacetamide **E23** (49.1 mg, 0.20 mmol) and cyclopropanol **A61** (17.4 mg, 0.30 mmol, 1.5 equiv.) using **L*23**, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15/1) to yield product **93** as a white solid (33.7 mg, 63% yield, 95% e.e.).

HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 254 nm), t_R (major) = 7.98 min, t_R (minor) = 9.47 min.

[α]$_D^{27}$ = –26 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.42 (s, 1H), 7.62 – 7.54 (m, 2H), 7.50 – 7.41 (m, 2H), 7.40 – 7.26 (m, 5H), 7.10 (dd, *J* = 10.7, 4.2 Hz, 1H), 4.96 (s, 1H), 3.44 – 3.40 (m, 1H), 0.78 – 0.68 (m, 2H), 0.62 – 0.46 (m, 2H).

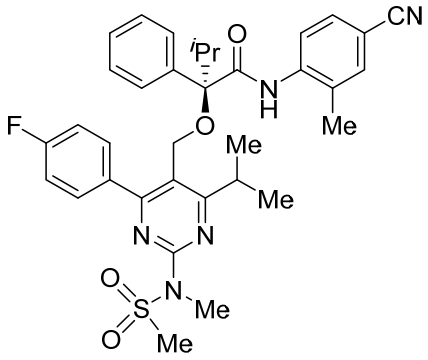
^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 137.3, 137.1, 129.0, 128.6 (d, *J* = 6.4 Hz), 127.1, 124.5, 119.7, 82.7, 53.2, 6.5, 5.6.

HRMS (ESI) m/z calcd. for $C_{17}H_{18}NO_2$ $[M + H]^+$ 268.1332, found 268.1331.

Synthetic Applications

Late-stage O-alkylation of complex bioactive molecules

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-((4-(4-fluorophenyl)-6-isopropyl-2-(*N*-methylmethylsulfonamido)pyrimidin-5-yl)methoxy)-3-methyl-2-phenylbutanamide (94)



94

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and *N*-(4-(4-fluorophenyl)-5-(hydroxymethyl)-6-isopropylpyrimidin-2-yl)-*N*-methylmethanesulfonamide **A70** (106.0 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product **94** as a white solid (85.0 mg, 66% yield, 95% e.e.).

$[\alpha]_D^{27}$ = −37 (c 0.5, $CHCl_3$).

HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 13.79 min, t_R (major) = 21.57 min.

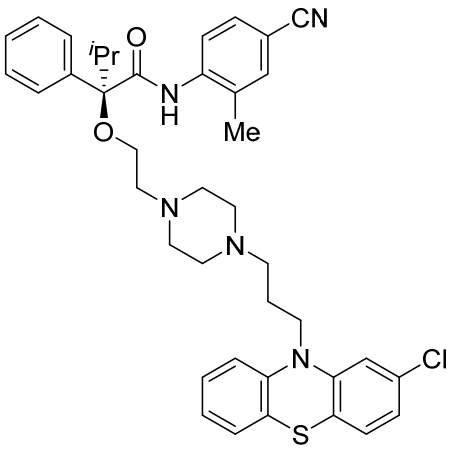
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.58 (s, 1H), 8.22 (d, *J* = 8.5 Hz, 1H), 7.51 (d, *J* = 8.5 Hz, 1H), 7.48 – 7.41 (m, 3H), 7.38 (s, 5H), 7.03 (t, *J* = 8.5 Hz, 2H), 4.49 (d, *J* = 10.4 Hz, 1H), 4.28 (d, *J* = 10.4 Hz, 1H), 3.54 (s, 3H), 3.48 (s, 3H), 2.90 – 2.72 (m, 2H), 1.99 (s, 3H), 1.18 (d, *J* = 6.6 Hz, 3H), 1.09 (d, *J* = 6.6 Hz, 3H), 1.06 – 0.95 (m, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 178.3, 169.7, 166.6, 164.7, 162.2, 158.2, 139.5, 136.1, 134.0, 131.8 (d, *J* = 3.3 Hz), 131.1 (d, *J* = 16.7 Hz), 131.0, 128.9, 128.5 (d, *J* = 29.0 Hz), 128.0, 121.1, 118.9, 118.2, 115.5 (d, *J* = 21.7 Hz), 107.6, 89.2, 58.5, 42.6, 33.1, 31.4, 30.5, 22.3, 22.2, 18.3, 17.5, 17.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ –110.7.

HRMS (ESI) m/z calcd. for $C_{35}H_{39}FN_5O_4S$ $[M + H]^+$ 644.2701, found 644.2706.

(*S*)-2-(2-(4-(3-(2-Chloro-10*H*-phenothiazin-10-yl)propyl)piperazin-1-yl)ethoxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (95)



95

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 2-(4-(3-(2-chloro-10*H*-phenothiazin-10-yl)propyl)piperazin-1-yl)ethan-1-ol **A71** (121.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 1/1) to yield the product **95** as a light yellow oil (129.1 mg, 93% yield, 94% e.e.).

[α]$_D^{27}$ = −31 (c 0.5, $CHCl_3$).

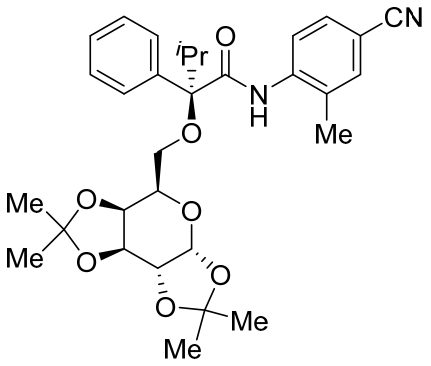
HPLC analysis: Chiralcel IA (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 17.71 min, t_R (major) = 49.15 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.70 (s, 1H), 7.99 (d, *J* = 8.1 Hz, 1H), 7.58 – 7.46 (m, 4H), 7.40 – 7.33 (m, 2H), 7.32 – 7.28 (m, 1H), 7.17 – 7.08 (m, 2H), 7.00 (d, *J* = 8.1 Hz, 1H), 6.94 – 6.89 (m, 1H), 6.88 – 6.83 (m, 2H), 6.82 (d, *J* = 1.9 Hz, 1H), 3.85 (t, *J* = 6.7 Hz, 2H), 3.43 – 3.34 (m, 1H), 3.33 – 3.23 (m, 1H), 2.86 – 2.74 (m, 1H), 2.69 – 2.59 (m, 1H), 2.53 – 2.35 (m, 5H), 2.35 – 2.08 (m, 9H), 1.90 – 1.77 (m, 2H), 1.13 (d, *J* = 6.9 Hz, 3H), 1.00 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.7, 146.5, 144.5, 140.4, 137.6, 134.0, 133.2, 130.9, 130.7, 128.3, 128.1, 128.0, 127.9, 127.5, 127.4, 124.8, 123.5, 123.4, 122.9, 122.3, 119.0, 115.9, 115.8, 108.1, 88.0, 62.7, 58.8, 55.4, 53.9, 52.8, 45.2, 34.7, 24.1, 18.1, 18.0, 17.9.

HRMS (ESI) m/z calcd. for $C_{40}H_{45}ClN_5O_2S$ $[M + H]^+$ 694.2977, found 694.2981.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(((3a*R*,5*R*,5a*S*,8a*S*,8b*R*)-2,2,7,7-tetramethyltetrahydro-5*H*-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl)methoxy)butanamide (96)



96

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and diacetone-D-galactose **A72** (78.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **96** as a light yellow oil (72.7 mg, 66% yield, >20:1 d.r.).

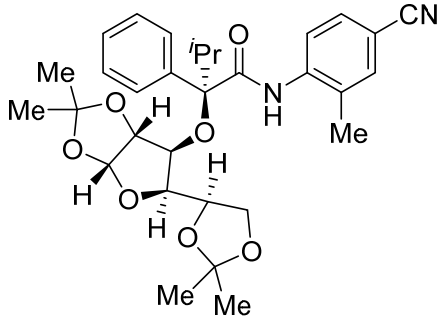
$[\alpha]_D^{27}$ = −84 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.27 (s, 1H), 8.08 (d, *J* = 8.7 Hz, 1H), 7.61 (d, *J* = 7.4 Hz, 2H), 7.53 – 7.46 (m, 2H), 7.42 – 7.35 (m, 2H), 7.34 – 7.28 (m, 1H), 5.48 (d, *J* = 4.9 Hz, 1H), 4.58 (dd, *J* = 7.9, 2.4 Hz, 1H), 4.32 (dd, *J* = 4.9, 2.5 Hz, 1H), 4.13 (dd, *J* = 7.9, 1.7 Hz, 1H), 4.09 – 3.93 (m, 1H), 3.48 – 3.33 (m, 2H), 2.81 – 2.69 (m, 1H), 2.36 (s, 3H), 1.57 (s, 3H), 1.35 (s, 3H), 1.24 (s, 3H), 1.22 (s, 3H), 1.17 (d, *J* = 6.8 Hz, 3H), 0.96 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 140.2, 137.1, 134.0, 130.7, 130.5, 128.3, 128.2, 128.0, 123.0, 119.1, 109.5, 108.9, 107.7, 96.2, 87.9, 71.2, 70.7, 70.6, 67.7, 64.9, 35.9, 26.1, 25.8, 25.0, 24.4, 17.9, 17.8.

HRMS (ESI) m/z calcd. for $C_{31}H_{39}N_2O_7$ $[M + H]^+$ 551.2752, found 551.2756.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(((3a*R*,5*R*,6*S*,6a*R*)-5-((*R*)-2,2-dimethyl-1,3-dioxolan-4-yl)-2,2-dimethyltetrahydrofuro[2,3-*d*][1,3]dioxol-6-yl)oxy)-3-methyl-2-phenylbutanamide (97)



97

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and diacetone-*D*-glucose **A73** (78.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **97** as a white solid (76.0 mg, 69% yield, >20:1 d.r.).

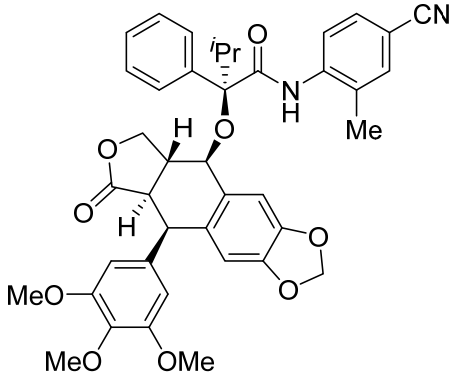
$[\alpha]_D^{27}$ = −22 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.03 (s, 1H), 8.49 (d, *J* = 8.5 Hz, 1H), 7.56 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.52 – 7.36 (m, 6H), 5.62 (d, *J* = 3.6 Hz, 1H), 4.42 – 4.32 (m, 1H), 4.24 (d, *J* = 2.9 Hz, 1H), 4.20 – 4.13 (m, 1H), 4.04 – 3.94 (m, 2H), 3.30 (d, *J* = 3.6 Hz, 1H), 2.94 – 2.80 (m, 1H), 2.25 (s, 3H), 1.37 (d, *J* = 3.0 Hz, 6H), 1.30 (s, 3H), 1.20 – 1.11 (m, 6H), 1.00 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 139.7, 136.5, 133.9, 131.4, 129.2, 129.1, 128.7, 127.6, 120.7, 118.9, 111.6, 109.7, 107.4, 104.3, 89.0, 82.6, 81.1, 71.8, 68.1, 31.3, 26.8, 26.5, 25.6, 25.3, 18.7, 17.9, 17.4.

HRMS (ESI) m/z calcd. for $C_{31}H_{38}N_2NaO_7$ $[M + Na]^+$ 573.2571, found 573.2574.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-(((5*R*,5a*R*,8a*R*,9*R*)-8-oxo-9-(3,4,5-trimethoxyphenyl)-5,5a,6,8,8a,9-hexahydrofuro[3',4':6,7]naphtho[2,3-*d*][1,3]dioxol-5-yl)oxy)-2-phenylbutanamide (98)



98

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and podophyllotoxin **A74** (124.3 mg, 0.30 mmol, 1.5 equiv.) run for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 3/1) to yield the product **98** as a white solid (81.8 mg, 58% yield, >20:1 d.r.).

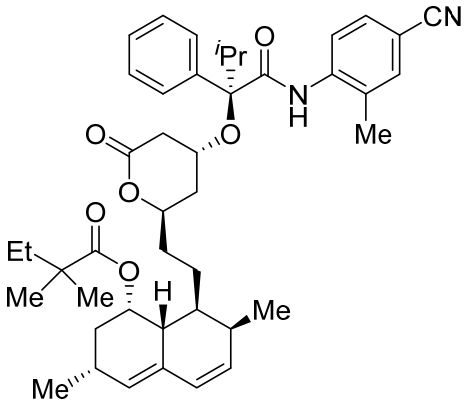
$[\alpha]_D^{27}$ = −36 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.05 (s, 1H), 8.51 (d, *J* = 8.5 Hz, 1H), 7.63 (d, *J* = 7.2 Hz, 2H), 7.56 – 7.41 (m, 5H), 7.13 (s, 1H), 6.51 (s, 1H), 6.37 (s, 2H), 6.05 (d, *J* = 0.8 Hz, 1H), 6.00 (d, *J* = 0.8 Hz, 1H), 4.51 (d, *J* = 4.2 Hz, 1H), 4.44 (d, *J* = 9.1 Hz, 1H), 4.07 (dd, *J* = 8.7, 6.9 Hz, 1H), 3.82 (s, 3H), 3.73 (s, 6H), 3.36 – 3.24 (m, 1H), 3.09 – 2.93 (m, 1H), 2.72 – 2.61 (m, 1H), 2.56 (dd, *J* = 14.0, 4.3 Hz, 1H), 2.07 (s, 3H), 1.25 (d, *J* = 6.7 Hz, 3H), 0.99 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.5, 169.1, 152.8, 147.8, 147.7, 139.1, 137.6, 135.5, 134.5, 134.1, 131.7, 131.5, 131.2, 129.8, 129.4, 129.1, 126.9, 120.3, 118.7, 109.7, 108.5, 107.7, 107.5, 101.6, 90.2, 75.8, 70.7, 60.8, 56.4, 46.2, 43.3, 40.2, 38.4, 18.6, 18.0, 17.3.

HRMS (ESI) m/z calcd. for $C_{41}H_{40}N_2NaO_9$ $[M + Na]^+$ 727.2626, found 727.2618.

(1*S*,3*R*,7*S*,8*S*,8a*R*)-8-(2-((2*R*,4*R*)-4-(((*S*)-1-((4-Cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-6-oxotetrahydro-2*H*-pyran-2-yl)ethyl)-3,7-dimethyl-1,2,3,7,8,8a-hexahydronaphthalen-1-yl 2,2-dimethylbutanoate (99)



99

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (1*S*,3*R*,7*S*,8*S*,8a*R*)-8-(2-((2*R*,4*R*)-4-hydroxy-6-oxotetrahydro-2*H*-pyran-2-yl)ethyl)-3,7-dimethyl-1,2,3,7,8,8a-hexahydronaphthalen-1-yl 2,2-dimethylbutanoate **A75** (125.6 mg, 0.30 mmol, 1.5 equiv.) run at room temperature for 5 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4/1) to yield product **99** as a colorless oil (129.0 mg, 91% yield, >20:1 d.r.).

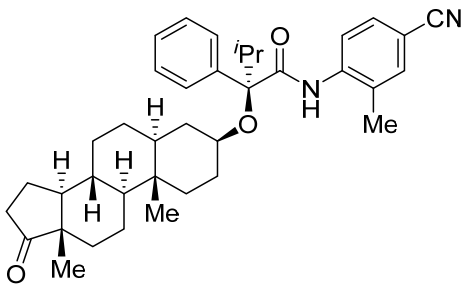
$[\alpha]_D^{27}$ = +18 (c 0.4, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.95 (s, 1H), 8.49 (d, *J* = 9.1 Hz, 1H), 7.60 – 7.50 (m, 2H), 7.45 – 7.36 (m, 5H), 5.97 (d, *J* = 9.6 Hz, 1H), 5.73 (dd, *J* = 9.5, 6.1 Hz, 1H), 5.50 (s, 1H), 5.27 (d, *J* = 3.0 Hz, 1H), 4.40 – 4.30 (m, 1H), 4.28 – 4.16 (m, 1H), 2.93 – 2.82 (m, 1H), 2.75 – 2.65 (m, 1H), 2.64 – 2.54 (m, 1H), 2.49 – 2.38 (m, 1H), 2.29 (s, 3H), 2.27 – 2.16 (m, 2H), 2.04 – 1.88 (m, 2H), 1.70 – 1.53 (m, 2H), 1.50 – 1.39 (m, 2H), 1.36 – 1.21 (m, 3H), 1.21 – 1.10 (m, 7H), 1.09 – 1.01 (m, 10H), 0.83 (d, *J* = 7.0 Hz, 3H), 0.74 (t, *J* = 7.5 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 177.4, 169.6, 169.0, 139.5, 137.1, 134.1, 132.6, 131.4, 131.3, 129.8, 129.3, 128.8, 128.7, 128.5, 127.6, 120.2, 119.0, 107.3, 88.7, 67.9, 64.8, 42.9, 38.4, 37.4, 36.6, 34.0, 33.3, 32.9, 32.8, 30.6, 30.0, 27.3, 24.8, 24.6, 24.4, 23.0, 18.6, 17.8, 17.4, 13.9, 9.3.

HRMS (ESI) m/z calcd. for $C_{44}H_{57}N_2O_6$ $[M + H]^+$ 709.4211, found 709.4218.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(((3*S*,5*S*,8*R*,9*S*,10*S*,13*S*,14*S*)-10,13-dimethyl-17-oxohexadecahydro-1*H*-cyclopenta[a]phenanthren-3-yl)oxy)-3-methyl-2-phenylbutanamide (100)



100

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and Epiandrosterone **A76** (87.1 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 10/1) to yield the product **100** as a white solid (95.3 mg, 82% yield, >20:1 d.r.).

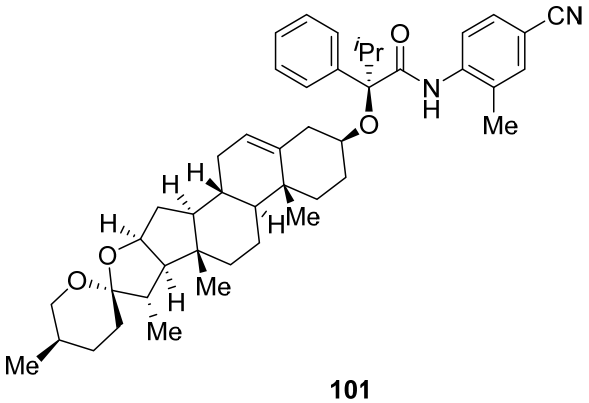
$[\alpha]_D^{27}$ = +42 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.35 (s, 1H), 8.48 (d, *J* = 8.5 Hz, 1H), 7.54 (d, *J* = 8.6 Hz, 1H), 7.49 (s, 1H), 7.44 – 7.39 (m, 2H), 7.38 – 7.31 (m, 3H), 3.44 – 3.32 (m, 1H), 2.86 – 2.75 (m, 1H), 2.46 – 2.36 (m, 1H), 2.32 (s, 3H), 2.09 – 1.99 (m, 1H), 1.92 – 1.84 (m, 1H), 1.81 – 1.62 (m, 5H), 1.61 – 1.38 (m, 5H), 1.25 – 1.06 (m, 10H), 1.00 – 0.85 (m, 3H), 0.83 (s, 3H), 0.77 (s, 3H), 0.65 – 0.53 (m, 2H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 140.0, 137.8, 133.8, 131.4, 129.1, 128.4, 128.1, 127.2, 120.2, 119.1, 106.8, 87.8, 73.0, 54.3, 51.4, 47.8, 44.8, 37.1, 36.6, 35.8, 35.4, 34.9, 31.6, 31.5, 30.7, 30.4, 28.3, 21.7, 20.4, 18.8, 17.9, 17.4, 13.8, 12.2.

HRMS (ESI) m/z calcd. for $C_{38}H_{48}N_2NaO_3$ $[M + Na]^+$ 603.3557, found 603.3554.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(((4*S*,5'*R*,6a*R*,6b*S*,8a*S*,8b*R*,9*S*,10*R*,11a*S*,12a*S*,12b*S*)-5',6a,8a,9-tetramethyl-1,3,3',4,4',5,5',6,6a,6b,6',7,8,8a,8b,9,11a,12,12a,12b-icosahydrospiro[naphtho[2',1':4,5]indeno[2,1-*b*]furan-10,2'-pyran]-4-yl)oxy)butanamide (101)



101

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and diosgenin **A77** (124.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography

on silica gel (petroleum ether/EtOAc = 15/1) to yield the product **101** as a white solid (76.1 mg, 54% yield, >20:1 d.r.).

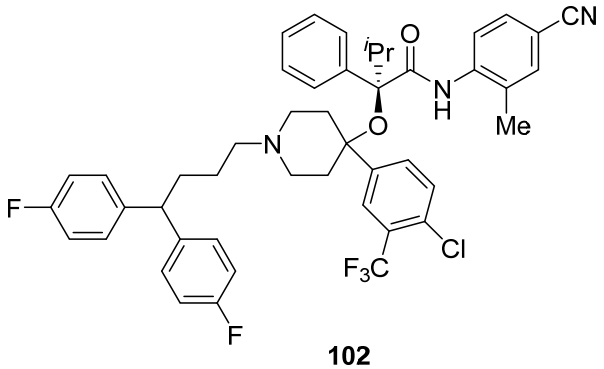
[α]$_D^{27}$ = −47 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.37 (s, 1H), 8.49 (d, *J* = 8.5 Hz, 1H), 7.54 (d, *J* = 8.5 Hz, 1H), 7.49 (s, 1H), 7.45 – 7.29 (m, 5H), 4.81 (d, *J* = 4.8 Hz, 1H), 4.45 – 4.33 (m, 1H), 3.51 – 3.42 (m, 1H), 3.40 – 3.26 (m, 2H), 3.03 – 2.67 (m, 1H), 2.33 (s, 3H), 2.07 – 1.33 (m, 19H), 1.29 – 1.21 (m, 1H), 1.20 – 1.09 (m, 8H), 1.09 – 0.98 (m, 2H), 0.98 – 0.96 (m, 2H), 0.95 (s, 3H), 0.89 – 0.81 (m, 1H), 0.78 (d, *J* = 6.3 Hz, 3H), 0.75 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 140.3, 140.0, 138.0, 133.8, 131.5, 129.1, 128.5, 128.2, 127.2, 121.6, 120.2, 119.1, 109.3, 106.8, 87.7, 80.8, 73.4, 66.8, 62.1, 56.5, 50.0, 41.6, 40.7, 40.2, 39.7, 37.5, 36.5, 31.9, 31.8, 31.4, 31.3, 31.1, 30.7, 30.3, 28.8, 20.8, 19.3, 18.7, 17.9, 17.4, 17.2, 16.3, 14.5.

HRMS (ESI) m/z calcd. for $C_{46}H_{61}N_2O_4$ $[M + H]^+$ 705.4626, found 705.4632.

(*S*)-2-((1-(4,4-Bis(4-fluorophenyl)butyl)-4-(4-chloro-3-(trifluoromethyl)phenyl)piperidin-4-yl)oxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide (102)



102

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and Penfluridol **A78** (157.2 mg, 0.30 mmol, 1.5 equiv.) run at 0 ℃ for 5 days, the reaction mixture was purified by columnchromatography on silica gel (petroleum ether/EtOAc = 3/1) to yield the product **102** as a white solid (138.4 mg, 85% yield, 88% e.e.).

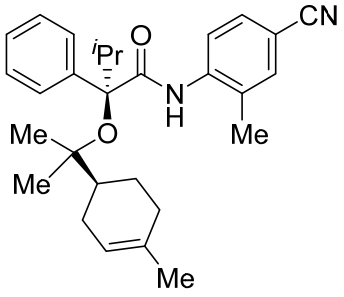
[α]$_D^{27}$ = +62 (c 0.7, $CHCl_3$).

HPLC analysis: Chiralcel IF (*n*-hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 270 nm), t_R (major) = 20.62 min, t_R (minor) = 24.88 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.44 (s, 1H), 8.45 (d, *J* = 8.4 Hz, 1H), 7.55 – 7.48 (m, 2H), 7.25 (d, *J* = 0.5 Hz, 1H), 7.22 (d, *J* = 8.4 Hz, 1H), 7.17 – 7.10 (m, 6H), 7.08 (s, 1 H), 7.03 – 6.97 (m, 2H), 6.94 (t, *J* = 8.4 Hz, 5H), 3.83 (t, *J* = 7.7 Hz, 1H), 2.80 – 2.66 (m, 2H), 2.59 (d, *J* = 21.3 Hz, 1H), 2.40 (s, 5H), 2.25 (t, *J* = 7.1 Hz, 2H), 2.11 (d, *J* = 9.0 Hz, 2H), 2.01 – 1.87 (m, 4H), 1.42 – 1.31 (m, 2H), 1.22 (t, *J* = 8.7 Hz, 3H), 0.94 (t, *J* = 10.9 Hz, 3H).

^{13}C NMR (100 MHz, CDCl3) δ 170.4, 161.4 (d, *J* = 243.2 Hz), 141.6, 140.5 (d, *J* = 3.0 Hz), 139.8, 135.2, 134.0, 131.5, 131.3, 131.1, 131.0, 130.8, 129.1 (d, *J* = 7.6 Hz), 128.7, 127.6 (q, *J* = 31.0 Hz), 127.3, 127.0, 126.0 (q, *J* = 5.0 Hz), 122.6 (q, *J* = 271.5 Hz), 120.4, 119.0, 115.3 (d, *J* = 21.0 Hz), 107.2, 89.3, 78.6, 58.0, 50.5, 50.0, 49.7, 39.5, 36.7, 34.8, 33.7, 25.6, 18.8, 18.2, 17.8.
^{19}F NMR (376 MHz, $CDCl_3$) δ –62.5, –116.8.
HRMS (ESI) m/z calcd. for $C_{47}H_{46}ClF_5N_3O_2$ $[M + H]^+$ 814.3193, found 814.3193.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-((2-((*S*)-4-methylcyclohex-3-en-1-yl)propan-2-yl)oxy)-2-phenylbutanamide (103)

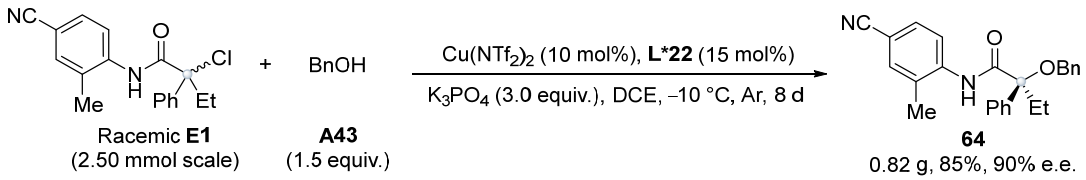


103

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (-)-α-terpineol **A79** (46.3 mg, 0.30 mmol, 1.5 equiv.) at –10 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product **103** as a light yellow oil (63.1 mg, 71% yield, >20:1 d.r.).
$[\alpha]_D^{27}$ = −42 (c 0.3, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.27 (s, 1H), 8.49 (d, *J* = 8.5 Hz, 1H), 7.57 – 7.46 (m, 4H), 7.38 – 7.30 (m, 3H), 5.33 (d, *J* = 3.2 Hz, 1H), 3.11 – 3.00 (m, 1H), 2.30 (s, 3H), 2.18 – 2.02 (m, 1H), 2.02 – 1.77 (m, 4H), 1.64 (s, 3H), 1.44 – 1.29 (m, 2H), 1.23 – 1.15 (m, 6H), 1.08 (d, *J* = 6.7 Hz, 3H), 0.72 (s, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 140.2, 138.4, 134.0, 133.9, 131.4, 130.5, 128.5, 127.8, 127.3, 120.6, 120.2, 119.1, 106.8, 88.0, 82.8, 46.6, 34.0, 31.1, 27.2, 25.4, 24.8, 24.7, 23.3, 19.4, 18.3, 17.8.
HRMS (ESI) m/z calcd. for $C_{29}H_{36}N_2NaO_2$ $[M + Na]^+$ 467.2669, found 467.2668.

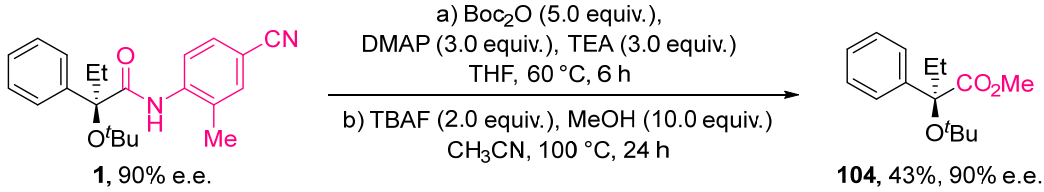
Further transformations of the products

The gram-scale synthesis of 64



Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with tertiary α-carbonyl alkyl chlorides **E1** (0.78 g, 2.5 mmol, 1.0 equiv.), $Cu(NTf_2)_2$ (155.0 mg, 0.25 mmol, 10 mol%), **L*22** (180.0 mg, 0.375 mmol, 15 mol%) and K_3PO_4 (1.6 g, 7.5 mmol, 3.0 equiv.). Then primary alcohol **A43** (405.0 mg, 3.75 mmol, 1.5 equiv.) and anhydrous DCE (22.0 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 8 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel to afford the desired product **64** (0.82 g, 85% yield, 90% e.e.).

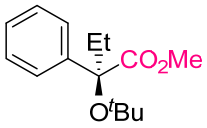
The synthesis of 104



To a solution of **1** (70.0 mg, 0.20 mmol, 1.0 equiv.), 4-dimethylamino pyridine (DMAP, 73.3 mg, 0.60 mmol, 3.0 equiv.) and triethylamine (60.7 mg, 0.60 mmol, 3.0 equiv.) in anhydrous THF (4.0 mL) was slowly added Boc_2O (218.0 mg, 1.0 mmol, 5.0 equiv.) into the mixture at room temperature. Then the resulting mixture was stirred at 60 °C for 6 h. Upon completion (monitored by TLC), the reaction mixture was concentrated under reduced pressure to remove the solvent. The residue was purified by column chromatography on silica gel (eluent: petroleum ether/EtOAc = 20/1) to afford the *N*-Boc-protected product.

To a solution of *N*-Boc protected product of **1** in anhydrous CH_3CN (2.0 mL) was added TBAF (0.4 mL, 2.0 equiv., 1M in THF) in a 10 mL Schlenk tube under argon atmosphere at room temperature. Then anhydrous MeOH (64.1 mg, 2.0 mmol, 10.0 equiv.) was added into the mixture and stirred at 100 °C for 24 h. Upon completion (monitored by TLC), the precipitate was filtered off and washed by CH_2Cl_2. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 30/1) to give **104** as a colorless oil (21.5 mg, 43% yield over two steps, 90% e.e.).

Methyl (*S*)-2-(*tert*-butoxy)-2-phenylbutanoate (104)



104

HPLC analysis: Chiralcel OJ-H (*n*-hexane/*i*-PrOH = 100/0, flow rate 0.7 mL/min, λ = 260 nm), t_R (minor) = 7.69 min, t_R (major) = 9.72 min.

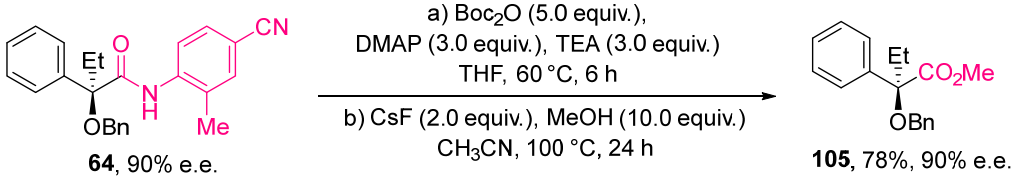
[α]$_D^{27}$ = −24 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (d, *J* = 7.5 Hz, 2H), 7.30 (t, *J* = 7.6 Hz, 2H), 7.22 (t, *J* = 7.2 Hz, 1H), 3.67 (s, 3H), 2.40 – 2.15 (m, 2H), 1.32 (s, 9H), 0.63 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 175.8, 142.5, 127.9, 127.1, 125.5, 82.9, 76.5, 52.0, 30.4, 30.2, 7.9.

HRMS (ESI) m/z calcd. for $C_{15}H_{22}NaO_3$ $[M + Na]^+$ 273.1461, found 273.1457.

The synthesis of 105

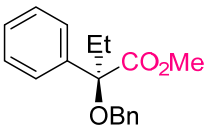


64, 90% e.e. **105**, 78%, 90% e.e.

The procedure for synthesis of *N*-Boc protected product of **64** was same as **1**.

To a solution of *N*-Boc-protected product in anhydrous CH_3CN (2.0 mL) was added CsF (60.8 mg, 0.4 mmol, 2.0 equiv.) in a 10 mL Schlenk tube under argon atmosphere at room temperature. Then anhydrous MeOH (64.1 mg, 2.0 mmol, 10.0 equiv.) was added into the mixture and stirred at 100 °C for 24 h. Upon completion (monitored by TLC), the precipitate was filtered off and washed by CH_2Cl_2. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 30/1) to give **105** as a colorless oil (44.3 mg, 78% yield over two steps, 90% e.e.).

Methyl (*S*)-2-(benzyloxy)-2-phenylbutanoate (105)



105

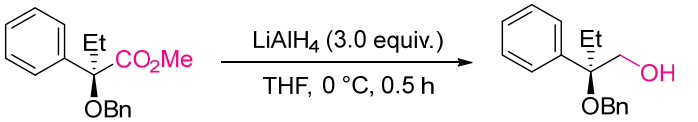
HPLC analysis: Chiralcel IC (*n*-hexane/*i*-PrOH = 95/5, flow rate 0.6 mL/min, λ = 254 nm), t_R (minor) = 4.46 min, t_R (major) = 4.93 min.

[α]$_D^{27}$ = −23 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 – 7.48 (m, 2H), 7.43 (d, *J* = 7.3 Hz, 2H), 7.35 (t, *J* = 7.5 Hz, 4H), 7.31 – 7.25 (m, 2H), 4.48 (d, *J* = 11.0 Hz, 1H), 4.33 (d, *J* = 11.0 Hz, 1H), 3.73 (s, 3H), 2.46 – 2.35 (m, 1H), 2.34 – 2.22 (m, 1H), 0.83 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 139.6, 138.4, 128.3, 127.8, 127.5, 126.2, 84.8, 66.2, 52.4, 28.1, 7.4.
HRMS (ESI) m/z calcd. for $C_{18}H_{20}NaO_3$ $[M + Na]^+$ 307.1305, found 307.1305.

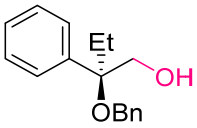
The synthesis of 106



105, 90% e.e. **106**, 91%, 90% e.e.

To a solution of **105** (56.9 mg, 0.2 mmol) in anhydrous THF (2.0 mL) was slowly added $LiAlH_4$ (22.8 mg, 0.6 mmol, 3.0 equiv.) under argon atmosphere at 0 ℃. Then the resulting mixture was stirred at 0 ℃ for 30 min. Upon completion (monitored by TLC), the reaction mixture was quenched by saturated NH_4Cl (aq), and the aqueous layer was extracted with ethyl acetate (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 5/1) to give **106** as a colorless oil (46.6 mg, 91% yield, 90% e.e.).

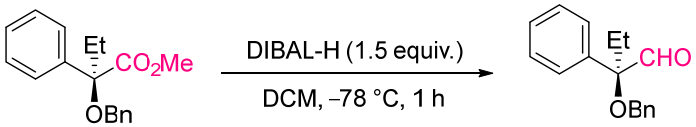
(*S*)-2-(Benzyloxy)-2-phenylbutan-1-ol (106)



106

HPLC analysis: Chiralcel IC (*n*-hexane/*i*-PrOH = 95/5, flow rate 1.0 mL/min, λ = 214 nm), t_R (minor) = 6.96 min, t_R (major) = 7.86 min.
$[\alpha]_D^{27}$ = −6 (c 0.4, $CHCl_3$).
^{1}H NMR (400 MHz, CDCl3) δ 7.47 – 7.41 (m, 2H), 7.41 – 7.32 (m, 6H), 7.32 – 7.25 (m, 2H), 4.36 (d, *J* = 11.2 Hz, 1H), 4.30 (d, *J* = 11.2 Hz, 1H), 3.94 (s, 2H), 2.14 – 2.04 (m, 1H), 2.03 – 1.92 (m, 1H), 1.73 (s, 1H), 0.86 (t, *J* = 7.4 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 141.5, 138.8, 128.5 (d, *J* = 1.1 Hz), 127.5, 127.4, 127.3, 126.6, 82.0, 65.2, 64.2, 27.4, 7.8.
HRMS (ESI) m/z calcd. for $C_{17}H_{20}NaO_2$ $[M + Na]^+$ 279.1356, found 279.1357.

The synthesis of 107

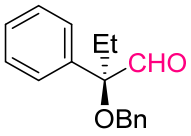


105, 90% e.e. **107**, 82%, 90% e.e.

To a solution of **105** (56.9 mg, 0.2 mmol) in anhydrous CH_2Cl_2 (2.0 mL) was slowly added DIBAL-H (0.3 mL, 1.5 equiv., 1M in THF) in a 10 mL Schlenk tube under argon atmosphere at –78 ℃. Then the mixture was stirred at –78 ℃ for 1 h. Upon completion (monitored by TLC), the reaction mixture was quenched by saturated NH_4Cl (aq), and the aqueous layer was extracted with CH_2Cl_2 (3 x 10 mL). The

combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 20/1） to give **107** as a colorless oil (41.7 mg, 82% yield, 90% e.e.).

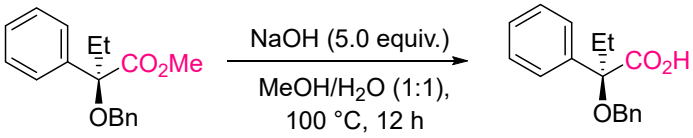
(*S*)-2-(Benzyloxy)-2-phenylbutanal (107)



107

HPLC analysis: Chiralcel IB (*n*-hexane/*i*-PrOH = 99/1, flow rate 0.8 mL/min, λ = 214 nm), t_R (major) = 6.86 min, t_R (minor) = 7.40 min.
[α]$_D^{27}$ = −26 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.63 (s, 1H), 7.48 (d, *J* = 7.4 Hz, 2H), 7.45 – 7.35 (m, 6H), 7.35 – 7.27 (m, 2H), 4.49 (d, *J* = 11.2 Hz, 1H), 4.42 (d, *J* = 11.2 Hz, 1H), 2.47 – 2.33 (m, 1H), 2.25 – 2.12 (m, 1H), 0.88 (t, *J* = 7.4 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 201.0, 138.0, 136.8, 128.8, 128.5, 128.2, 127.8, 127.4, 126.9, 87.0, 65.6, 24.4, 7.1.
HRMS (ESI) m/z calcd. for $C_{17}H_{18}NaO_2$ $[M + Na]^+$ 277.1199, found 277.1201.

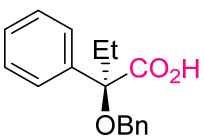
The synthesis of 108



105, 90% e.e. **108**, 84%, 90% e.e.

To a solution of **105** (56.9 mg, 0.2 mmol) in the mixture solvent MeOH/H_2O (2.0 mL, 1:1) was slowly added NaOH (40.0 mg, 5.0 equiv.) in a 10 mL Schlenk tube, and refluxed at 100 ℃ for 12 h. Then the reaction was cooled down to room temperature, and the reaction mixture was quenched by HCl (aq, 1 mL, 1 N). The aqueous layer was extracted with ethyl acetate (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 3/1) to give **108** as a colorless oil (45.4 mg, 84% yield, 90% e.e.).

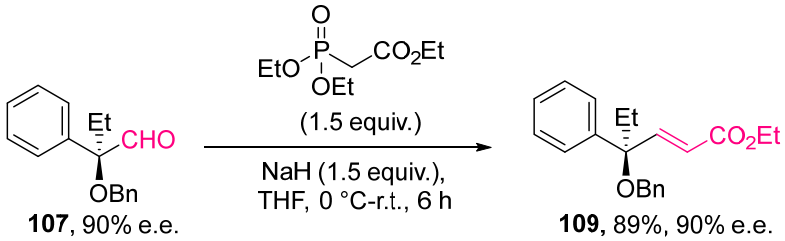
(*S*)-2-(benzyloxy)-2-phenylbutanoic acid (108)



108

HPLC analysis: Chiralcel IC (*n*-hexane/*i*-PrOH = 95/5, flow rate 1.0 mL/min, λ = 260 nm), t_R (minor) = 5.49 min, t_R (major) = 6.35 min.
[α]$_D^{27}$ = −20 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 7.3 Hz, 2H), 7.43 – 7.29 (m, 8H), 4.36 (d, *J* = 10.5 Hz, 1H), 4.29 (d, *J* = 10.5 Hz, 1H), 2.63 – 2.49 (m, 1H), 2.37 – 2.22 (m, 1H), 0.99 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 174.5, 138.2, 137.1, 128.7, 128.6, 128.1, 127.9, 126.6, 84.8, 65.8, 26.0, 7.6.
HRMS (ESI) m/z calcd. for $C_{17}H_{18}NaO_3$ $[M + Na]^+$ 293.1148, found 293.1149.

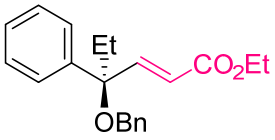
The synthesis of 109



107, 90% e.e. **109**, 89%, 90% e.e.

To a suspension of NaH (60% dispersion in mineral oil, 12 mg, 0.3 mmol) in THF (2 mL) was slowly added ethyl 2-(diethoxyphosphoryl)acetate (68 mg, 0.3 mmol) at 0 °C. After being stirred at 0 °C for 10 min, a solution of **107** (50.8 mg, 0.2 mmol) in THF (2 mL) was slowly added into the mixture. After being stirred for 6 h at room temperature, the reaction mixture was quenched by saturated NH_4Cl (aq), and the aqueous layer was extracted with ethyl acetate (3 x 10 mL). The combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure. The residue was purified by silica gel column chromatography (eluent: petroleum ether/EtOAc = 20/1) to give **109** as a colorless oil (57.7 mg, 89% yield, 90% e.e.).

Ethyl (*R*,*E*)-4-(benzyloxy)-4-phenylhex-2-enoate (109)



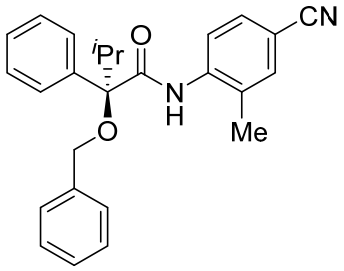
109

HPLC analysis: Chiralcel IG (*n*-hexane/*i*-PrOH = 99/1, flow rate 0.8 mL/min, λ = 214 nm), t_R (minor) = 9.21 min, t_R (major) = 9.86 min.
[α]$_D^{27}$ = +11 (c 0.3, $CHCl_3$).
^{1}H NMR (400 MHz, CDCl3) δ 7.45 (d, *J* = 7.5 Hz, 2H), 7.36 (dd, *J* = 8.7, 6.0 Hz, 6H), 7.30 – 7.26 (m, 2H), 6.97 (d, *J* = 15.7 Hz, 1H), 6.23 (d, *J* = 15.7 Hz, 1H), 4.34 – 4.11 (m, 4H), 2.30 – 2.10 (m, 2H), 1.28 (t, *J* = 7.1 Hz, 3H), 0.91 (t, *J* = 7.3 Hz, 3H).
^{13}C NMR (100 MHz, CDCl3) δ 166.8, 151.3, 141.4, 138.8, 128.5, 128.3, 127.6, 127.3, 127.1, 126.9, 120.4, 81.1, 64.5, 60.5, 28.0, 14.3, 7.6.
HRMS (ESI) m/z calcd. for $C_{21}H_{24}NaO_3$ $[M + Na]^+$ 347.1618, found 347.1615.

Catalyst-Controlled Stereoselectivity and Stereodivergence

Catalyst-controlled stereoselectivity for *O*-alkylation of alcohols

(*S*)-2-(Benzyloxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide ((–)-110)



(–)-**110**

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and phenylmethanol **A43** (32.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (–)-**110** as a light yellow oil (66.9 mg, 84% yield, 95% e.e.).

$[\alpha]_D^{27}$ = −37 (c 0.6, $CHCl_3$).

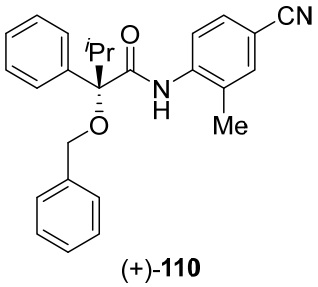
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 99/1, flow rate 1.0 mL/min, λ = 273 nm), t_R (minor) = 24.27 min, t_R (major) = 27.71 min.

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.02 (s, 1H), 8.40 (d, *J* = 8.5 Hz, 1H), 7.59 – 7.53 (m, 2H), 7.48 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.44 – 7.29 (m, 9H), 4.51 (d, *J* = 10.9 Hz, 1H), 4.28 (d, *J* = 10.9 Hz, 1H), 3.10 – 2.98 (m, 1H), 1.99 (s, 3H), 1.20 (d, *J* = 6.9 Hz, 3H), 1.15 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.6, 140.0, 137.8, 137.2, 133.8, 131.3, 128.7, 128.5, 128.4, 128.2, 128.1, 127.4, 127.3, 120.3, 119.1, 107.0, 88.5, 66.9, 32.5, 18.1, 18.0, 17.1.

HRMS (ESI) m/z calcd. for $C_{26}H_{26}N_2NaO_2$ $[M + Na]^+$ 421.1886, found 421.1884.

(*R*)-2-(Benzyloxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide ((+)-110)

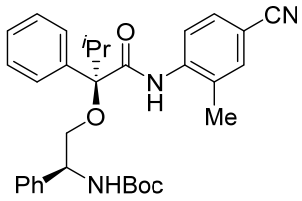


(+)-**110**

According to **General Procedure D** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and phenylmethanol **A43** (32.4 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column

chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (+)-**110** as a light yellow oil (60.6 mg, 76% yield, 94% e.e.).
[α]$_D^{27}$ = +31 (c 0.5, $CHCl_3$).
HPLC analysis: Chiralcel OD-H (*n*-hexane/*i*-PrOH = 99/1, flow rate 1.0 mL/min, λ = 273 nm), t_R (major) = 23.97 min, t_R (minor) = 28.38 min.
Note: The ^{1}H NMR and ^{13}C NMR data of (+)-**110** is the same as (–)-**110**.

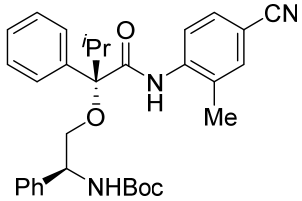
***tert*-Butyl ((*S*)-2-(((*S*)-1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-1-phenylethyl)carbamate ((*S*)-111)**



(*S*)-**111**

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and tert-butyl (*S*)-(2-hydroxy-1-phenylethyl)carbamate **A80** (71.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*S*)-**111** as a white solid (99.2 mg, 94% yield, >20:1 d.r.).
[α]$_D^{27}$ = −13 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (s, 1H), 8.10 (d, *J* = 8.3 Hz, 1H), 7.48 – 7.19 (m, 12H), 5.05 – 4.70 (m, 2H), 3.69 (s, 1H), 3.45 – 3.35 (m, 1H), 2.95 – 2.83 (m, 1H), 2.14 (s, 3H), 1.34 (s, 9H), 1.09 (t, *J* = 6.9 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 170.5, 155.5, 139.9, 138.9, 137.1, 133.9, 130.8, 129.5, 128.9, 128.5, 128.3, 128.0, 126.6, 122.0, 119.1, 107.5, 87.9, 79.9, 67.0, 54.6, 31.3, 28.3, 18.0, 17.9, 17.3.
HRMS (ESI) m/z calcd. for $C_{32}H_{37}N_3NaO_4$ $[M + Na]^+$ 550.2676, found 550.2681.

***tert*-Butyl ((*S*)-2-(((*R*)-1-((4-cyano-2-methylphenyl)amino)-3-methyl-1-oxo-2-phenylbutan-2-yl)oxy)-1-phenylethyl)carbamate ((*R*)-111)**



(*R*)-**111**

According to **General Procedure D** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and tert-butyl (*S*)-(2-hydroxy-1-phenylethyl)carbamate **A80** (71.2 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*R*)-**111** as a white solid (90.8 mg, 86% yield, >20:1 d.r.).

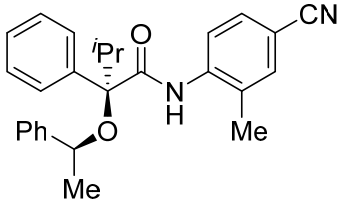
$[\alpha]_D^{27}$ = +18 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.88 (s, 1H), 8.14 (d, *J* = 8.1 Hz, 1H), 7.49 – 7.27 (m, 9H), 7.25 – 7.14 (m, 3H), 4.95 (s, 2H), 3.80 – 3.61 (m, 1H), 3.49 – 3.41 (m, 1H), 3.04 – 2.81 (m, 1H), 2.03 (s, 3H), 1.36 (s, 9H), 1.17 – 1.04 (m, 6H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.5, 155.4, 139.9, 139.0, 137.0, 133.8, 130.9, 129.3, 128.8, 128.6, 128.5, 128.2, 127.9, 126.5, 122.0, 119.1, 107.4, 88.0, 79.9, 66.8, 54.7, 30.9, 28.3, 18.1, 17.8, 17.3.

HRMS (ESI) m/z calcd. for $C_{32}H_{37}N_3NaO_4$ $[M + Na]^+$ 550.2676, found 550.2683.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((*S*)-1-phenylethoxy)butanamide ((*S*)-112)



(*S*)-**112**

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*S*)-1-phenylethan-1-ol **A81** (36.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*S*)-**112** as a light yellow solid (75.1 mg, 91% yield, >20:1 d.r.).

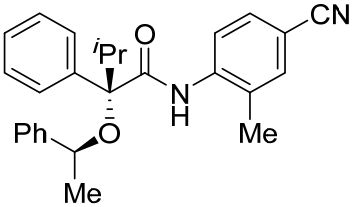
$[\alpha]_D^{27}$ = −36 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.97 (s, 1H), 8.40 (d, *J* = 8.5 Hz, 1H), 7.54 – 7.47 (m, 1H), 7.43 – 7.35 (m, 3H), 7.27 – 7.24 (m, 3H), 7.20 – 7.08 (m, 3H), 7.04 – 6.95 (m, 2H), 4.50 (q, *J* = 6.4 Hz, 1H), 3.00 – 2.82 (m, 1H), 1.97 (s, 3H), 1.28 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.7 Hz, 3H), 1.07 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.7, 144.4, 139.8, 136.8, 133.8, 131.2, 129.5, 128.5, 128.4, 128.0, 127.5, 127.4, 125.7, 120.5, 119.1, 106.9, 89.1, 73.3, 33.2, 25.1, 18.4, 18.0, 17.0.

HRMS (ESI) m/z calcd. for $C_{27}H_{28}N_2NaO_2$ $[M + Na]^+$ 435.2043, found 435.2041.

(*R*)-*N*-(4-Cyano-2-methylphenyl)-3-methyl-2-phenyl-2-((*S*)-1-phenylethoxy)butanamide ((*R*)-112)



(*R*)-**112**

According to **General Procedure D** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*S*)-1-phenylethan-1-ol

A81 (36.7 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*R*)-**112** as a colorless oil (71.8 mg, 87% yield, >20:1 d.r.).

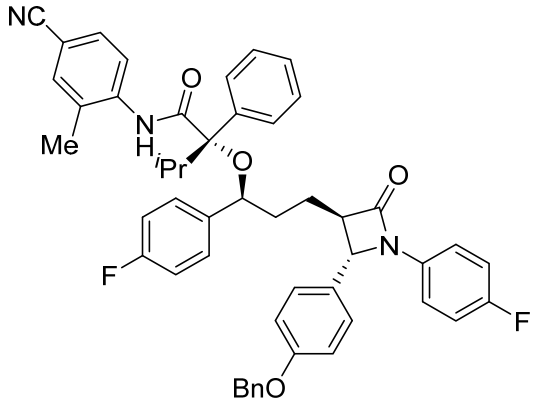
[α]$_D^{27}$ = −21 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.09 (s, 1H), 8.40 (d, *J* = 8.5 Hz, 1H), 7.53 – 7.47 (m, 1H), 7.40 (ddd, *J* = 19.7, 11.0, 6.4 Hz, 6H), 7.28 – 7.20 (m, 5H), 4.50 (q, *J* = 6.4 Hz, 1H), 2.69 (dt, *J* = 13.5, 6.7 Hz, 1H), 2.23 (s, 3H), 1.16 (d, *J* = 6.4 Hz, 3H), 1.04 (d, *J* = 6.8 Hz, 3H), 0.87 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.8, 144.3, 139.9, 137.3, 133.7, 131.4, 129.1, 128.6, 128.4, 128.2, 127.6, 127.0, 125.9, 120.1, 119.1, 106.8, 89.1, 72.8, 31.4, 25.4, 18.5, 17.9, 17.4.

HRMS (ESI) m/z calcd. for $C_{27}H_{28}N_2NaO_2$ $[M + Na]^+$ 435.2043, found 435.2040.

(*S*)-2-((*S*)-3-((2*S*,3*R*)-2-(4-(Benzyloxy)phenyl)-1-(4-fluorophenyl)-4-oxoazetidin-3-yl)-1-(4-fluorophenyl)propoxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide ((*S*)-113)



(*S*)-**113**

According to **General Procedure B** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (3*R*,4*S*)-4-(4-(benzyloxy)phenyl)-1-(4-fluorophenyl)-3-((*S*)-3-(4-fluorophenyl)-3-hydroxypropyl) azetidin-2-one **A82** (149.9 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*S*)-**113** as a white solid (131.1 mg, 83% yield, >20:1 d.r.).

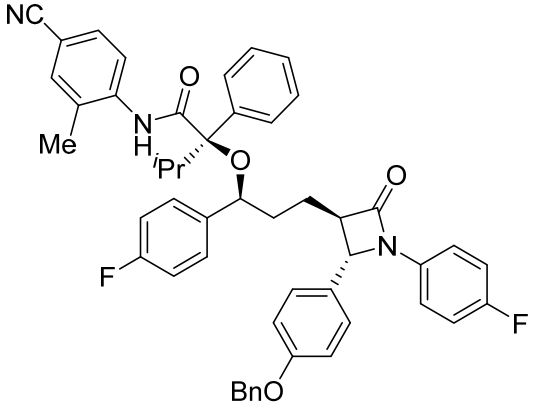
[α]$_D^{27}$ = +19 (c 0.4, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.89 (s, 1H), 8.39 (d, *J* = 8.5 Hz, 1H), 7.49 (d, *J* = 8.5 Hz, 1H), 7.44 – 7.37 (m, 5H), 7.36 – 7.26 (m, 3H), 7.23 – 7.10 (m, 7H), 6.98 – 6.83 (m, 6H), 6.83 – 6.76 (m, 2H), 5.05 (s, 2H), 4.42 (dd, *J* = 8.0, 5.1 Hz, 1H), 4.33 (d, *J* = 1.7 Hz, 1H), 2.97 – 2.75 (m, 2H), 2.07 (s, 3H), 1.95 – 1.77 (m, 2H), 1.57 – 1.46 (m, 2H), 1.18 (d, *J* = 6.6 Hz, 3H), 1.03 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 170.3, 166.9, 163.2, 160.7, 160.2, 159.1, 157.8, 139.7, 137.59 (d, *J* = 3.1 Hz), 136.6, 136.5, 133.9, 133.8 (d, *J* = 2.7 Hz), 131.3, 128.7, 128.6, 128.4 (d, *J* = 200.8 Hz), 128.3 (d, *J* = 241.6 Hz), 128.2, 128.1, 127.9 (d, *J* = 8.0 Hz),

127.5, 120.6, 119.0, 118.3 (d, J = 7.8 Hz), 115.8 (d, J = 22.6 Hz), 115.6, 115.3 (d, J = 21.2 Hz), 107.2, 89.2, 75.8, 70.1, 60.8, 60.1, 35.4, 32.5, 24.4, 18.4, 18.1, 17.2.
^{19}F NMR (376 MHz, $CDCl_3$) δ –114.2, –117.9.
HRMS (ESI) m/z calcd. for $C_{50}H_{45}F_2N_3NaO_4$ $[M + Na]^+$ 812.3270, found 812.3274.

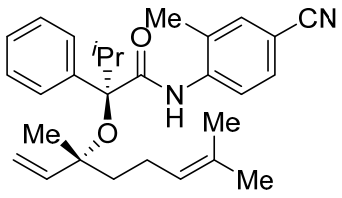
(*R*)-2-((*S*)-3-((2*S*,3*R*)-2-(4-(Benzyloxy)phenyl)-1-(4-fluorophenyl)-4-oxoazetidin-3-yl)-1-(4-fluorophenyl)propoxy)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide ((*R*)-113)



(*R*)-**113**

According to **General Procedure D** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (3*R*,4*S*)-4-(4-(benzyloxy)phenyl)-1-(4-fluorophenyl)-3-((*S*)-3-(4-fluorophenyl)-3-hydroxypropyl) azetidin-2-one **A82** (149.9 mg, 0.30 mmol, 1.5 equiv.), the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*R*)-**113** as a white solid (143.8 mg, 91% yield, >20:1 d.r.).
$[\alpha]_D^{27}$ = +20 (c 0.6, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 9.07 (s, 1H), 8.39 (d, J = 8.5 Hz, 1H), 7.50 (d, J = 8.5 Hz, 1H), 7.45 – 7.36 (m, 10H), 7.35 – 7.31 (m, 1H), 7.19 – 7.12 (m, 4H), 7.08 (d, J = 8.4 Hz, 2H), 6.99 – 6.92 (m, 4H), 6.89 (t, J = 8.6 Hz, 2H), 5.06 (s, 2H), 4.31 – 4.20 (m, 2H), 2.66 (t, J = 7.1 Hz, 1H), 2.59 – 2.48 (m, 1H), 2.24 (s, 3H), 1.73 – 1.65 (m, 1H), 1.64 – 1.54 (m, 1H), 1.49 – 1.31 (m, 2H), 1.03 (d, J = 6.7 Hz, 3H), 0.79 (d, J = 6.5 Hz, 3H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 170.3, 166.9, 163.5, 161.1, 160.2, 159.1, 157.8, 139.8, 137.9 (d, J = 3.0 Hz), 137.0, 136.6, 133.9, 133.8, 131.4, 129.4, 128.9, 128.4, 128.3 (d, J = 8.0 Hz), 128.2, 128.1 (d, J = 223.3 Hz), 127.5, 127.1, 120.3, 119.1, 118.3 (d, J = 7.7 Hz), 115.8 (d, J = 22.5 Hz), 115.5 (d, J = 21.3 Hz), 115.4, 107.1, 89.6, 75.1, 70.1, 60.6, 59.9, 35.7, 31.1, 24.4, 18.7, 17.7, 17.4.
^{19}F NMR (376 MHz, $CDCl_3$) δ –113.6, –117.9.
HRMS (ESI) m/z calcd. for $C_{50}H_{45}F_2N_3NaO_4$ $[M + Na]^+$ 812.3270, found 812.3274.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*R*)-3,7-dimethylocta-1,6-dien-3-yl)oxy)-3-methyl-2-phenylbutanamide ((*S*)-114)



(*S*)-**114**

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (-)-linalool **A83** (46.3 mg, 0.30 mmol, 1.5 equiv.) run at –10 ºC for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*S*)-**114** as a light yellow oil (61.4 mg, 69% yield, >20:1 d.r.).

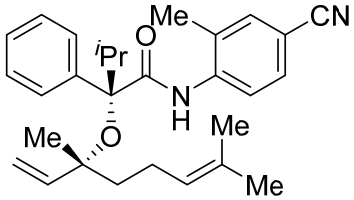
[α]$_D^{27}$ = −22 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.42 (s, 1H), 8.51 (d, *J* = 8.5 Hz, 1H), 7.54 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.49 (s, 1H), 7.44 (dd, *J* = 7.7, 1.8 Hz, 2H), 7.35 – 7.27 (m, 3H), 5.92 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.06 – 4.94 (m, 2H), 4.83 (d, *J* = 17.5 Hz, 1H), 3.10 – 3.00 (m, 1H), 2.33 (s, 3H), 2.01 – 1.88 (m, 2H), 1.66 (s, 3H), 1.55 (s, 3H), 1.50 (t, *J* = 8.5 Hz, 2H), 1.17 (d, *J* = 6.7 Hz, 3H), 1.08 (d, *J* = 6.8 Hz, 3H), 0.81 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 141.9, 140.1, 137.6, 133.8, 132.0, 131.5, 130.8, 128.7, 127.6, 127.1, 123.6, 120.3, 119.1, 114.7, 106.8, 88.4, 81.3, 44.5, 33.9, 25.7, 23.1, 22.9, 19.1, 18.1, 17.7.

HRMS (ESI) m/z calcd. for $C_{29}H_{36}N_2NaO_2$ $[M + Na]^+$ 467.2669, found 467.2674.

(*R*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*R*)-3,7-dimethylocta-1,6-dien-3-yl)oxy)-3-methyl-2-phenylbutanamide ((*R*)-114)



(*R*)-**114**

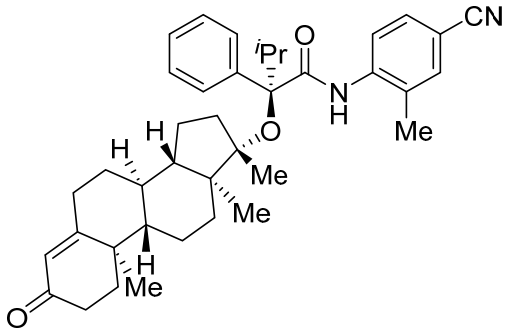
According to **General Procedure C** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (-)-linalool **A83** (46.3 mg, 0.30 mmol, 1.5 equiv.) at –10 ºC for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*R*)-**114** as a light yellow oil (54.2 mg, 61% yield, >20:1 d.r.).

[α]$_D^{27}$ = +19 (c 0.3, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.44 (s, 1H), 8.50 (d, *J* = 8.5 Hz, 1H), 7.54 (d, *J* = 8.5 Hz, 1H), 7.51 – 7.43 (m, 3H), 7.32 – 7.25 (m, 3H), 5.62 (dd, *J* = 17.4, 11.0 Hz, 1H), 4.92 (t, *J* = 6.7 Hz, 1H), 4.67 (s, 1H), 4.64 (d, *J* = 6.8 Hz, 1H), 3.06 – 2.92 (m, 1H), 2.34 (s, 3H), 2.02 – 1.92 (m, 2H), 1.65 (s, 3H), 1.55 (s, 3H), 1.35 – 1.26 (m, 5H), 1.18 (d, *J* = 6.7 Hz, 3H), 1.06 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 142.7, 140.1, 137.7, 133.9, 131.9, 131.4, 130.7, 128.6, 127.5, 127.2, 123.7, 120.3, 119.1, 112.4, 106.8, 88.1, 80.9, 42.4, 34.5, 25.7, 23.5, 22.7, 19.0, 18.1, 17.8, 17.7.
HRMS (ESI) m/z calcd. for $C_{29}H_{36}N_2NaO_2$ $[M + Na]^+$ 467.2669, found 467.2672.

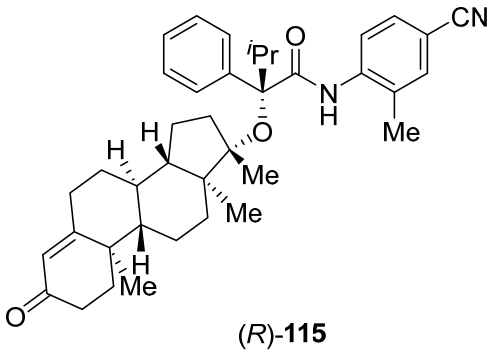
(*S*)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(((8*R*,9*S*,10*R*,13*S*,14*S*,17*S*)-10,13,17-trimethyl-3-oxo-2,3,6,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)oxy)butanamide ((*S*)-115)



(*S*)-**115**

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 17-methyltestosterone **A84** (90.7 mg, 0.30 mmol, 1.5 equiv.) run at –10 °C for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*S*)-**115** as a white solid (102.0 mg, 86% yield, >20:1 d.r.).
$[\alpha]_D^{27}$ = −5 (c 0.5, $CHCl_3$).
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.96 (s, 1H), 8.34 (d, *J* = 8.5 Hz, 1H), 7.64 – 7.57 (m, 2H), 7.58 – 7.53 (m, 1H), 7.51 (s, 1H), 7.39 – 7.31 (m, 3H), 5.70 (s, 1H), 3.03 – 2.90 (m, 1H), 2.47 – 2.30 (m, 6H), 2.28 – 2.19 (m, 1H), 2.04 – 1.91 (m, 2H), 1.82 – 1.74 (m, 1H), 1.72 – 1.50 (m, 4H), 1.49 – 1.37 (m, 3H), 1.35 – 1.22 (m, 3H), 1.21 – 1.17 (m, 5H), 1.06 (s, 3H), 1.03 – 0.97 (m, 4H), 0.94 (d, *J* = 6.8 Hz, 4H), 0.91 – 0.80 (m, 2H).
^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 171.4, 170.9, 139.9, 137.4, 134.1, 131.5, 131.2, 128.6, 128.1, 127.5, 124.0, 121.8, 119.0, 107.4, 89.8, 87.9, 53.7, 48.6, 47.7, 38.6, 37.0, 36.8, 36.2, 35.7, 33.9, 32.7, 31.7, 31.6, 23.6, 22.9, 20.7, 18.7, 18.5, 18.3, 17.4, 15.6.
HRMS (ESI) m/z calcd. for $C_{39}H_{48}N_2NaO_3$ $[M + Na]^+$ 615.3557, found 615.3556.

(*R*)-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenyl-2-(((8*R*,9*S*,10*R*,13*S*,14*S*,17*S*)-10,13,17-trimethyl-3-oxo-2,3,6,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)oxy)butanamide ((*R*)-115)



(*R*)-**115**

According to **General Procedure C** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and 17-methyltestosterone **A84** (90.7 mg, 0.30 mmol, 1.5 equiv.) run at –10 ℃ for 7 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*R*)-**115** as a white solid (92.5 mg, 78% yield, >20:1 d.r.).

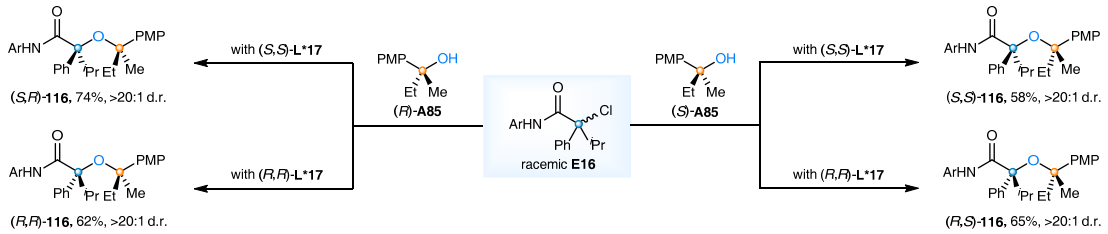
$[\alpha]_D^{27}$ = +64 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.03 (s, 1H), 8.19 (d, *J* = 8.4 Hz, 1H), 7.58 – 7.45 (m, 4H), 7.40 – 7.3 (m, 3H), 5.71 (s, 1H), 3.14 – 3.04 (m, 1H), 2.45 – 2.31 (m, 6H), 2.27 – 2.19 (m, 1H), 2.06 – 1.97 (m, 1H), 1.76 – 1.63 (m, 4H), 1.57 – 1.33 (m, 5H), 1.30 (s, 3H), 1.23 – 1.18 (m, 6H), 1.12 – 1.07 (m, 6H), 1.06 – 1.02 (m, 1H), 1.00 – 0.82 (m, 3H), 0.56 – 0.45 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 172.1, 170.9, 140.0, 137.8, 134.1, 131.0, 128.9, 128.6, 127.7, 124.0, 122.8, 119.0, 107.6, 89.7, 88.1, 53.8, 48.5, 47.4, 38.6, 36.3, 36.2, 35.7, 33.9, 33.4, 32.7, 32.0, 31.6, 23.7, 22.9, 20.7, 19.7, 18.4, 18.0, 17.4, 16.6.

HRMS (ESI) m/z calcd. for $C_{39}H_{48}N_2NaO_3$ $[M + Na]^+$ 615.3557, found 615.3554.

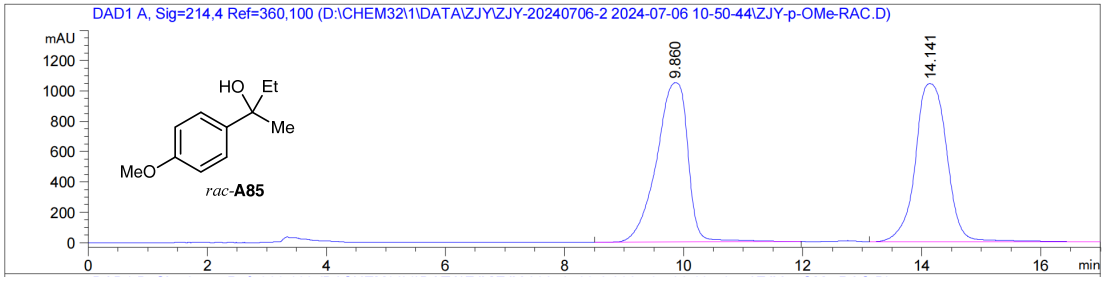
Catalyst-controlled stereodivergent synthesis of all four possible stereoisomers of sterically hindered dialkyl ether 116



Supplementary Figure 12. The catalyst-controlled stereodivergent synthesis of **116**.

The chiral tertiary alcohol (*R*)-**A85** and (*S*)-**A85** were prepared using Chiralcel IC from racemic tertiary alcohol **A85**. And the racemic tertiary alcohol **A85** was synthesized according to **General Procedure 4** with 4'-methoxyacetophenone and EtMgBr. The absolute configurations of (*R*)-**A85** and (*S*)-**A85** were confirmed according to the reported literature[5]. The e.e. values of (*R*)-**A85** and (*S*)-**A85** were no less than 99%.

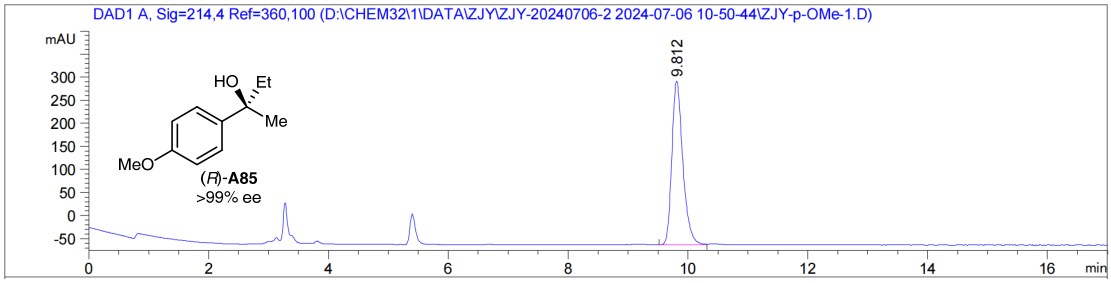
HPLC analysis: Chiralcel IC (*n*-Hexane/*i*-PrOH = 95/5, flow rate 1.0 mL/min, λ = 214 nm), t_R (*R*) = 9.81 min, t_R (*S*) = 14.49 min.

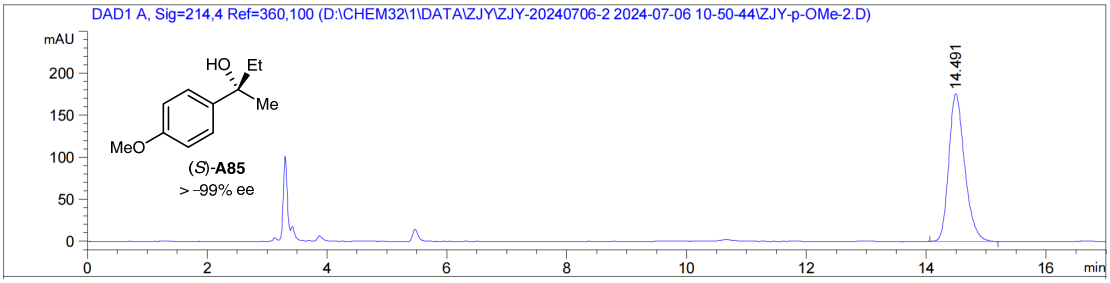



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Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
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----|-------|----|-------|----------|----------|--------|
   1   9.860 BB    0.4983 3.85921e4  1051.28259  49.9605
   2  14.141 BBA   0.5801 3.86531e4  1043.62512  50.0395

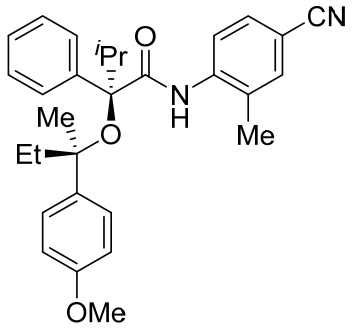
Totals :                  7.72452e4  2094.90771
```





Supplementary Figure 13. HPLC spectrums of *rac*-**A85**, (*R*)-**A85** and (*S*)-**A85**.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*R*)-2-(4-methoxyphenyl)butan-2-yl)oxy)-3-methyl-2-phenylbutanamide ((*S*,*R*)-116)



(*S*,*R*)-**116**

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*R*)-2-(4-methoxyphenyl)butan-2-ol (*R*)-**A85** (54.1 mg, 0.30 mmol, 1.5 equiv.) run at –10 ℃ for 8 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*S*,*R*)-**116** as a white solid (69.7 mg, 74% yield, >20:1 d.r.).

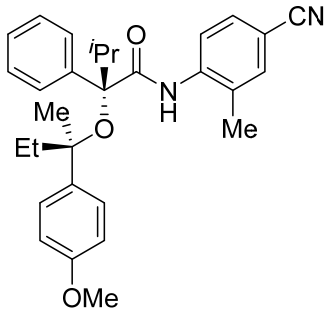
$[\alpha]_D^{27}$ = −6 (c 0.6, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.10 (s, 1H), 8.46 (d, *J* = 8.5 Hz, 1H), 7.52 (d, *J* = 8.5 Hz, 1H), 7.46 (s, 1H), 7.23 – 7.17 (m, 1H), 7.17 – 7.09 (m, 4H), 7.08 – 7.03 (m, 2H), 6.70 (d, *J* = 8.7 Hz, 2H), 3.76 (s, 3H), 2.81 – 2.68 (m, 1H), 2.23 (s, 3H), 2.06 – 1.95 (m, 1H), 1.88 – 1.77 (m, 1H), 1.31 (s, 3H), 1.14 (d, *J* = 6.7 Hz, 3H), 0.84 (d, *J* = 6.8 Hz, 3H), 0.55 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 158.6, 140.1, 136.7, 136.3, 133.8, 131.3, 130.5, 128.0, 127.6, 127.0, 120.3, 119.1, 113.0, 106.8, 88.6, 82.7, 55.2, 39.4, 36.3, 22.8, 18.4, 18.2, 17.7, 8.9.

HRMS (ESI) m/z calcd. for $C_{30}H_{34}N_2NaO_3$ $[M + Na]^+$ 493.2462, found 493.2462.

(*R*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*R*)-2-(4-methoxyphenyl)butan-2-yl)oxy)-3-methyl-2-phenylbutanamide ((*R*,*R*)-116)



(*R*,*R*)-**116**

According to **General Procedure C** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*R*)-2-(4-methoxyphenyl)butan-2-ol (*R*)-**A85** (54.1 mg, 0.30 mmol, 1.5 equiv.) run at –10 ℃ for 8 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*R*,*R*)-**116** as a white solid (58.4 mg, 62% yield, >20:1 d.r.).

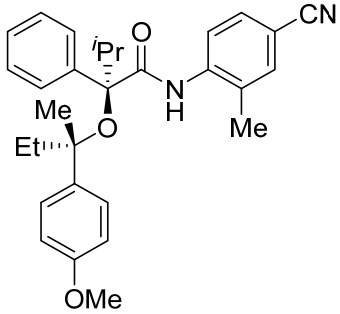
$[\alpha]_D^{27}$ = +41 (c 0.5, $CHCl_3$).

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.24 (s, 1H), 8.44 (d, *J* = 8.5 Hz, 1H), 7.52 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.44 (s, 1H), 7.33 (d, *J* = 7.0 Hz, 2H), 7.14 – 7.01 (m, 5H), 6.66 (d, *J* = 8.8 Hz, 2H), 3.76 (s, 3H), 2.94 – 2.82 (m, 1H), 2.07 (s, 3H), 1.89 – 1.71 (m, 2H), 1.54 (s, 3H), 1.20 (d, *J* = 6.7 Hz, 3H), 0.93 (d, *J* = 6.8 Hz, 3H), 0.58 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 158.5, 140.1, 137.3, 137.0, 133.8, 131.3, 130.3, 127.8, 127.3, 127.1, 127.0, 120.3, 119.1, 113.3, 106.7, 88.1, 82.6, 55.3, 38.4, 36.6, 22.4, 18.5, 18.3, 17.2, 9.0.

HRMS (ESI) m/z calcd. for $C_{30}H_{34}N_2NaO_3$ $[M + Na]^+$ 493.2462, found 493.2464.

(*S*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*S*)-2-(4-methoxyphenyl)butan-2-yl)oxy)-3-methyl-2-phenylbutanamide ((*S*,*S*)-116)

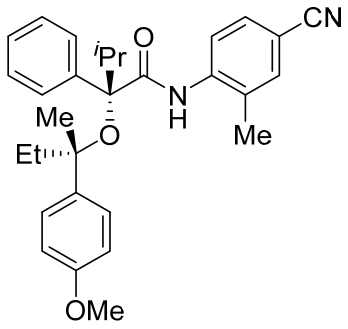


(*S*,*S*)-**116**

According to **General Procedure A** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*S*)-2-(4-methoxyphenyl)butan-2-ol (*S*)-**A85** (54.1 mg, 0.30 mmol, 1.5 equiv.) run at –10 ℃ for 8 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to yield the product (*S*,*S*)-**116** as a white solid (54.6 mg, 58% yield, >20:1 d.r.).

$[\alpha]_D^{27}$ = −37 (c 0.4, $CHCl_3$).
HRMS (ESI) m/z calcd. for $C_{30}H_{34}N_2NaO_3$ $[M + Na]^+$ 493.2462, found 493.2463.
Note: The ^1H NMR and ^{13}C NMR data of (*S*,*S*)-**116** is the same as (*R*, *R*)-**116**.

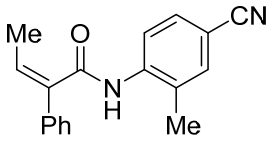
(*R*)-*N*-(4-Cyano-2-methylphenyl)-2-(((*S*)-2-(4-methoxyphenyl)butan-2-yl)oxy)-3-methyl-2-phenylbutanamide ((*R*,*S*)-116)



(*R*,*S*)-**116**

According to **General Procedure C** with 2-chloro-*N*-(4-cyano-2-methylphenyl)-3-methyl-2-phenylbutanamide **E16** (65.4 mg, 0.20 mmol) and (*S*)-2-(4-methoxyphenyl)butan-2-ol (*S*)-**A85** (54.1 mg, 0.30 mmol, 1.5 equiv.) run at –10 °C for 8 days, the reaction mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6/1) to yield the product (*R,S*)-**116** as a white solid (61.2 mg, 65% yield, >20:1 d.r.).
$[\alpha]_D^{27}$ = −48 (c 0.6, $CHCl_3$).
HRMS (ESI) m/z calcd. for $C_{30}H_{34}N_2NaO_3$ $[M + Na]^+$ 493.2462, found 493.2464.
Note: The ^1H NMR and ^{13}C NMR data of (*R,S*)-**116** is the same as (*S*, *R*)-**116**.

(*E*)-*N*-(4-Cyano-2-methylphenyl)-2-phenylbut-2-enamide (B1)



B1

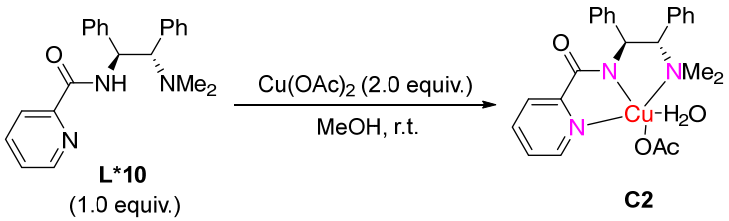
^1H NMR (400 MHz, $CDCl_3$) δ 8.43 (d, *J* = 8.4 Hz, 1H), 7.54 (d, *J* = 8.4 Hz, 1H), 7.45 – 7.30 (m, 6H), 7.21 (s, 1H), 6.30 (q, *J* = 7.2 Hz, 1H), 2.17 (d, *J* = 7.2 Hz, 3H), 1.99 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 166.3, 140.1, 137.8, 137.7, 135.3, 133.9, 131.3, 129.0, 128.5, 127.6, 127.4, 120.9, 119.0, 107.3, 17.1, 16.0.
HRMS (ESI) m/z calcd. for $C_{18}H_{17}N_2O$ $[M + H]^+$ 277.1335, found 277.1336.

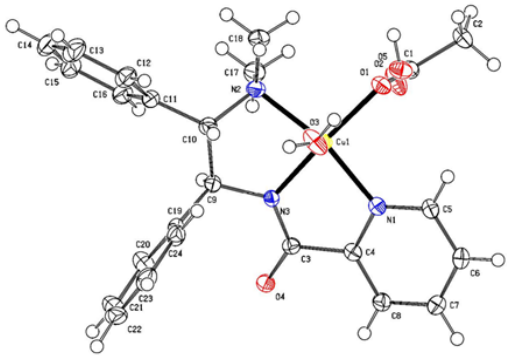
Mechanistic Studies

The preparation of complex C1

According to the literature reported procedure[1], to a solution of ligand **L*8** (33.3 mg, 0.1 mmol) in methanol (2 mL), was added $Cu(OAc)_2$ (36.5 mg, 0.2 mmol) at room temperature, and stirred for 6 h. Then the solution was concentrated in vacuo, the residue dissolved in CH_2Cl_2 (5 mL) and filtered. The crude reaction product was recrystallized from dichloromethane/hexane to obtain pure product **C1**.

The preparation of complex C2

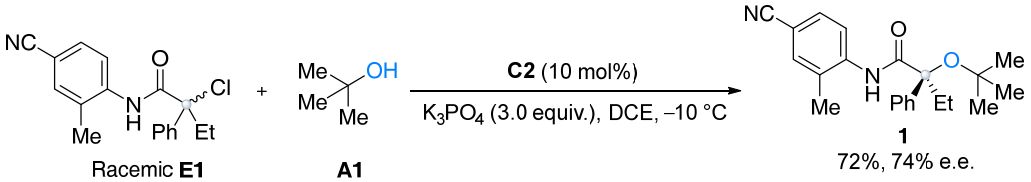




X-ray crystal structure of **C2**

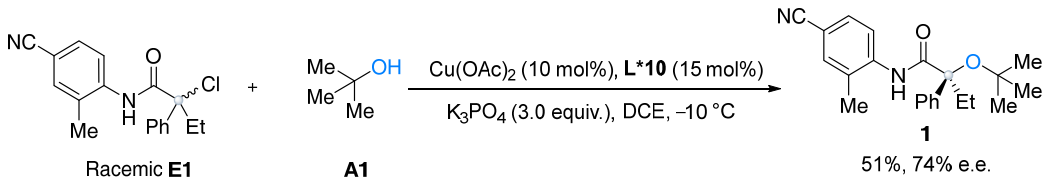
To a solution of ligand **L*10** (34.5 mg, 0.1 mmol) in MeOH (2.0 mL) was added $Cu(OAc)_2$ (36.5 mg, 0.2 mmol, 2.0 equiv.) at room temperature, and stirred for 6 h. Then the solution was concentrated in vacuo, the residue was dissolved in CH_2Cl_2 (5.0 mL) and filtered. The crude complex was recrystallized from dichloromethane/*n*-hexane to obtain pure complex **C2** (40.3 mg, 83% yield).

The catalytic activity of complex C2



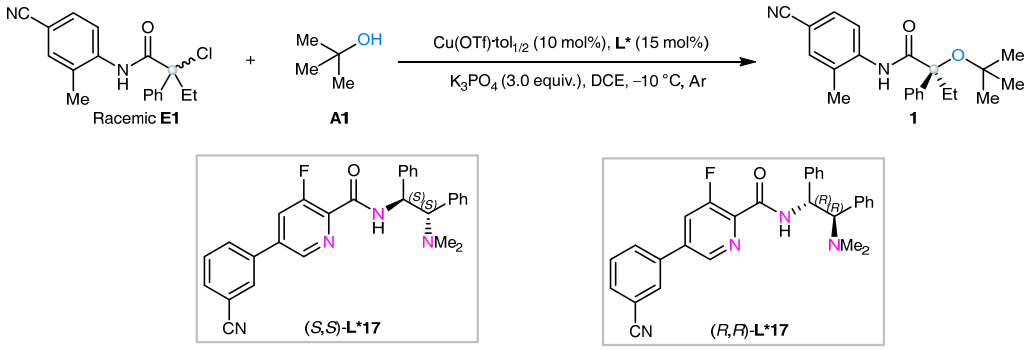
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **C2** (2.4 mg, 10 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), α-tertiary haloamide **E1** (15.6 mg, 0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** (5.6 mg, 0.075 mmol, 1.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for

5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the desired product **1** (12.6 mg, 72%, 74% e.e.).



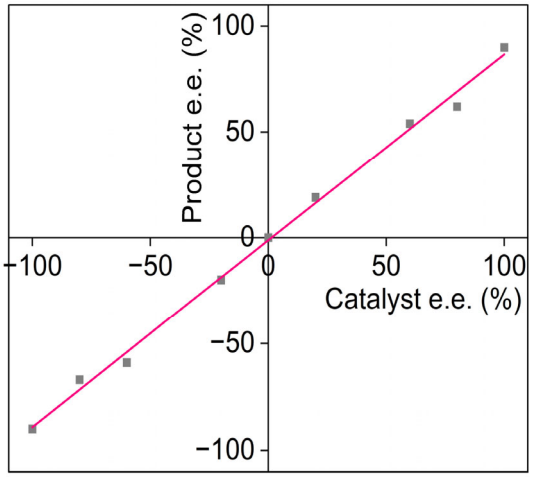
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*10** (2.6 mg, 10 mol%), $Cu(OAc)_2$ (0.9 mg, 15 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), tertiary α-carbonyl alkyl chloride **E1** (15.6 mg, 0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** (5.6 mg, 0.075 mmol, 1.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for 5 days. Upon completion, the precipitate was filtered off and washed by CH_2Cl_2. The filtrate was evaporated and the residue was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20/1) to afford the desired product **1** (8.9 mg, 51%, 74% e.e.).

The linear relationship experiment



Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*17** (3.48 mg, 15 mol%), Cu(OTf)·$tol_{1/2}$ (1.29 mg, 10 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), α-tertiary haloamide **E1** (15.6 mg, 0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** (5.6 mg, 0.075 mmol, 1.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C. Upon completion, the product was separated by preparative thin-layer chromatography. The e.e. values of products were then determined by HPLC, which indicated a linear relationship between e.e. values of products and corresponding catalysts. The catalyst **L*17** with different e.e. values were prepared by mixing *(S,S)*-**L*17** (99% e.e.) and *(R,R)*-**L*17** (99% e.e.) in appropriate ratios.

Entry	e.e. of Catalyst (%)	e.e. of Product 1 (%)
1	100	90
2	80	62
3	60	54
4	20	19
5	0	0
6	–20	–20
7	–60	–59
8	–80	–67
9	–100	–90

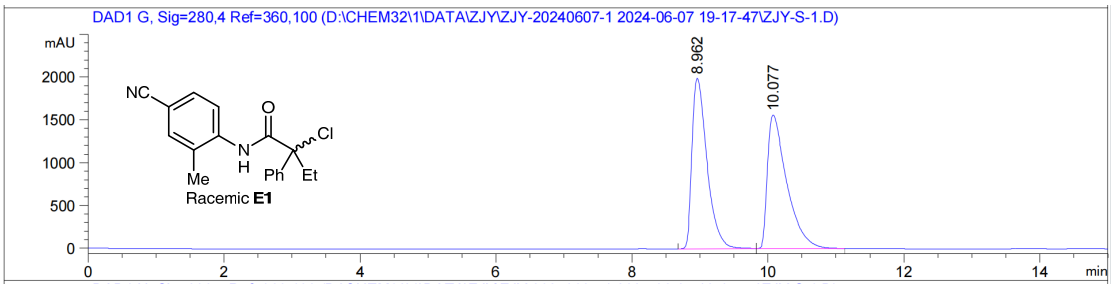


Supplementary Figure 14. The linear relationship experiment between e.e. values of catalyst **L*17** and product **1**.

Control reactions with the enantiopure or racemic tertiary alkyl chlorides

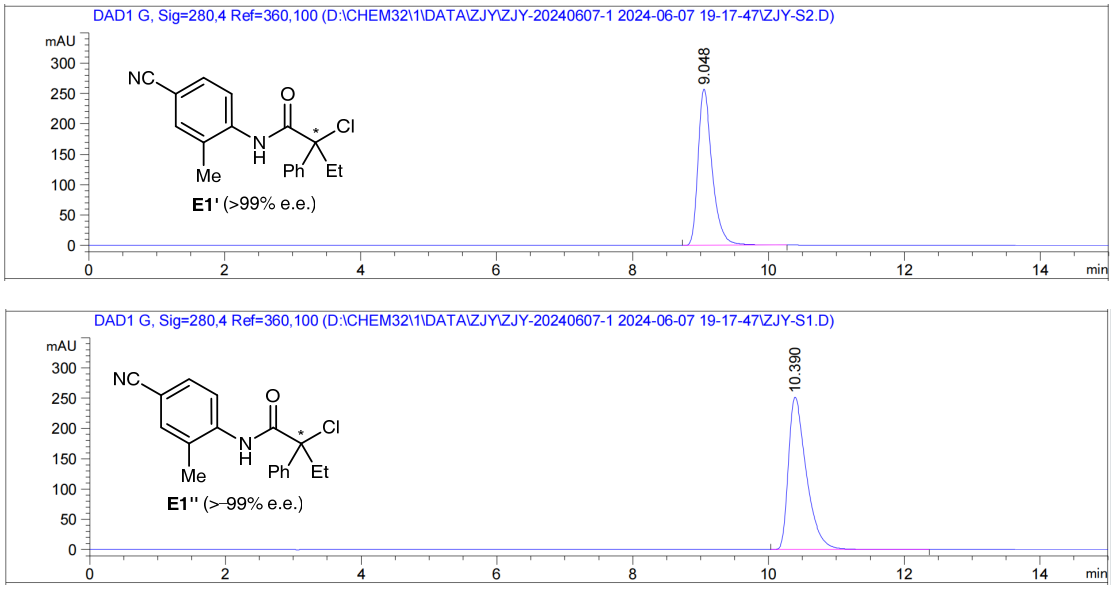
The chiral tertiary alkyl chloride **E1'** and **E1''** were prepared using Chiralcel AD-H from racemic α-tertiary haloamide **E1**. The e.e. values of **E1'** and **E1''** were no less than 99%.

HPLC analysis: Chiralcel AD-H (*n*-Hexane/*i*-PrOH = 90/10, flow rate 1.0 mL/min, λ = 280 nm), t_R(**E1'**) = 9.05 min, t_R(**E''**) = 10.39 min.

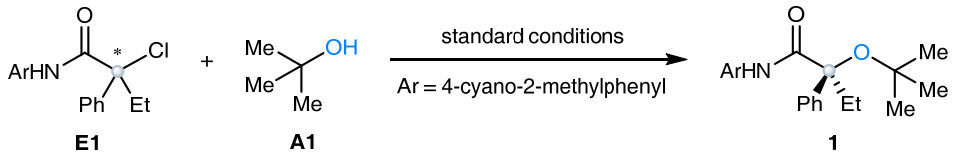


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Signal 7: DAD1 G, Sig=280,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.962 BB    0.2318 3.03080e4  1988.91553  49.7662
   2  10.077 BB    0.2911 3.05928e4  1557.65356  50.2338
```



Supplementary Figure 15. HPLC spectrums of racemic **E1**, **E1'** and **E''**.



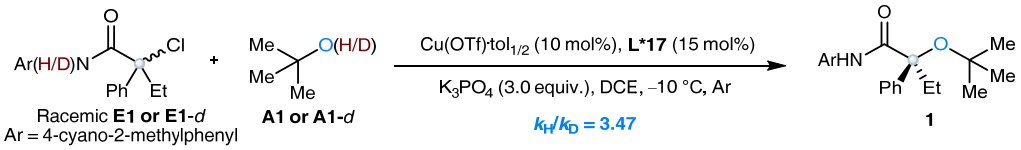
E1 **A1** **1**

Entry	Substrate	Time (d)	Recovered **E1**	**1**
1	**E1** (0% e.e.)	1	69%, 1% e.e.	30%, 90% e.e.
2	**E1** (0% e.e.)	2	35%, 7% e.e.	63%, 90% e.e.
3	**E1'** (>99% e.e.)	1	58%, 91% e.e.	40%, 90% e.e.
4	**E1'** (>99% e.e.)	2	26%, 84% e.e.	71%, 90% e.e.
5	**E1''** (>99% e.e.)	1	65%, 96% e.e.	31%, 90% e.e.
6	**E1''** (>99% e.e.)	2	39%, 92% e.e.	55%, 90% e.e.

Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*17** (3.48 mg, 15 mol%), Cu(OTf)·tol$_{1/2}$ (1.29 mg, 10 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), α-tertiary haloamide **E1** or **E1'** or **E1''** (15.6 mg, 0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** (5.6 mg, 0.075 mmol, 1.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for appropriate time. Upon completion, the product was filtered off and washed by CH_2Cl_2 and EtOAc for three times. The combined organic solvent was concentrated to afford crude product **1**. The

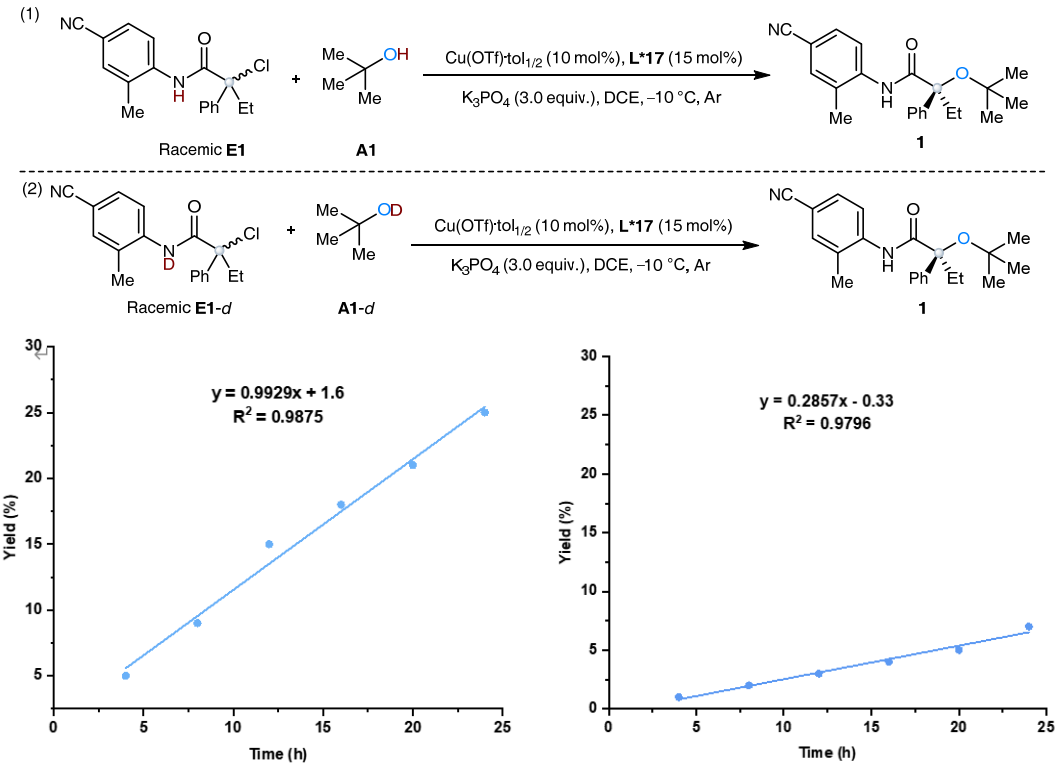
yield of product **1** was analyzed by ^{1}H NMR spectroscopy using 1,3,5-trimethoxybenzene as an internal standard. And the product **1** and recovered **E1** was separated by preparative thin-layer chromatography. The e.e. values of **1** and recovered **E1** were determined by HPLC analysis.

The KIE (kinetic isotope effect) experiment



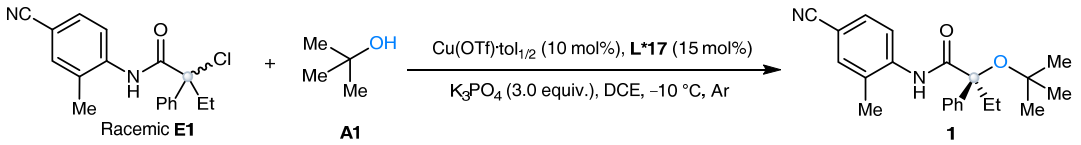
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*17** (3.48 mg, 15 mol%), Cu(OTf)·tol$_{1/2}$ (1.29 mg, 10 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), α-tertiary haloamide **E1** or **E1**-*d* (0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** or **A1**-*d* (0.075 mmol, 1.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C for appropriate time. Upon completion, the product was filtered off and washed by CH_2Cl_2 and EtOAc for three times. The combined organic solvent was concentrated to afford crude product **1**. The yield of product **1** was analyzed by ^{1}H NMR spectroscopy using 1,3,5-trimethoxybenzene as an internal standard.

Note: The **E1**-*d* was prepared from **E1** dissolved in CH_3OD and stirred at room temperature for 4 h. The **A1**-*d* was commercially available.



Supplementary Figure 16. The KIE (kinetic isotope effect) experiment of the reaction.

The kinetic experiment for determining the dependence of reaction rate on the concentration of tertiary alcohol A1



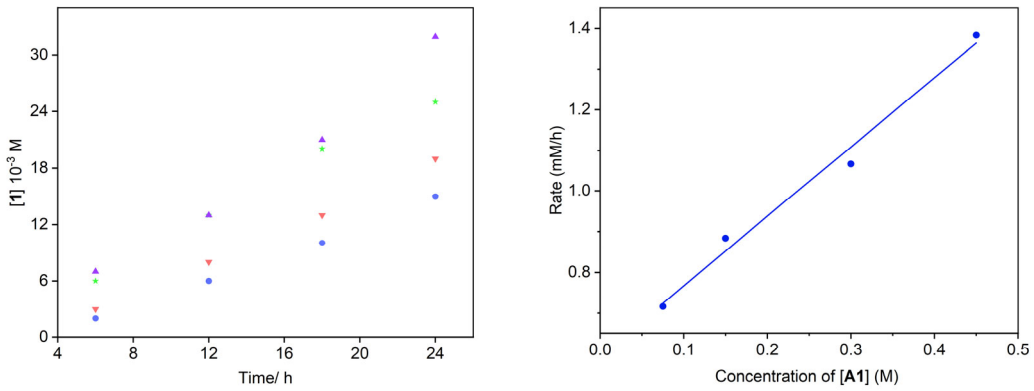
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*17** (3.48 mg, 15 mol%), Cu(OTf)·tol$_{1/2}$ (1.29 mg, 10 mol%), K_3PO_4 (32.0 mg, 0.15 mmol, 3.0 equiv.), α-tertiary haloamide **E1** (15.6 mg, 0.05 mmol, 1.0 equiv.). Then *tert*-butanol **A1** (0.75–4.5 equiv.) and anhydrous DCE (0.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 ℃ for appropriate time. At a proper time interval, the product was filtered off and washed by CH_2Cl_2 and EtOAc for three times. The combined organic solvent was concentrated to afford crude product. The yield of **1** was analyzed by ^{1}H NMR spectroscopy using 1,3,5-trimethoxybenzene as an internal standard.

Supplementary Table 8. The molar concentration ($\times10^{-3}$ M) of product **1** with different initial concentrations of tertiary alcohol **A1** in standard conditions at different time intervals.

Time (h)	0.075 M [**A1**]	0.150 M [**A1**]	0.300 M [**A1**]	0.450 M [**A1**]
6 h	0.002	0.003	0.006	0.007
12 h	0.006	0.008	0.013	0.013
18 h	0.010	0.013	0.020	0.021
24 h	0.015	0.019	0.025	0.032

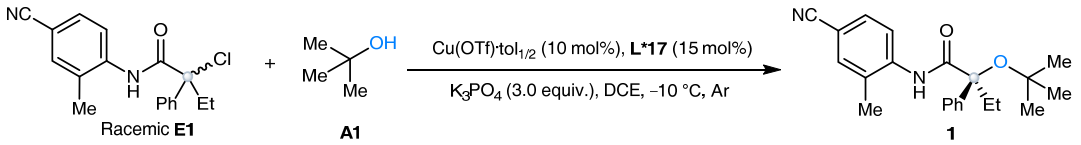
Supplementary Table 9. The rate values at different initial concentrations of tertiary alcohol **A1**.

[**A**] (M)	0.075	0.150	0.300	0.450
Rate	0.7167	0.8833	1.0667	1.3833



Supplementary Figure 17. The kinetic study on concentration of tertiary alcohol **A1**.

The kinetic experiment for determining the dependence of reaction rate on the concentration of α-tertiary haloamide E1



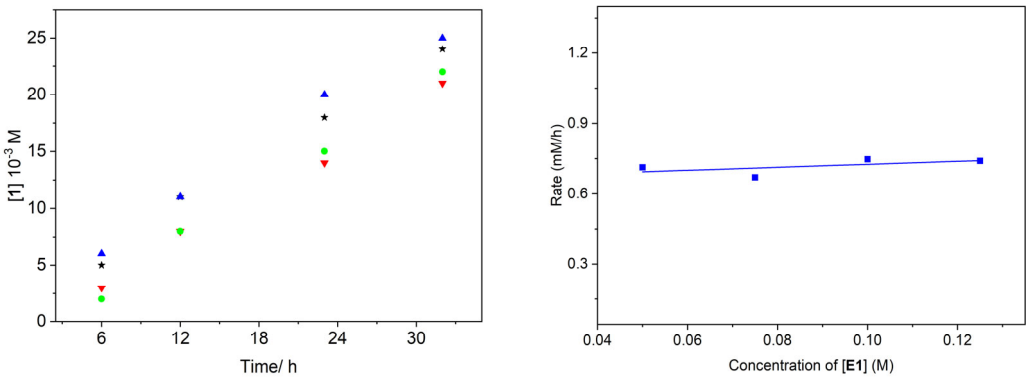
Under argon atmosphere, an oven-dried resealable Schlenk tube equipped with a magnetic stir bar was charged with **L*17** (17.4 mg, 15 mol%), Cu(OTf)·tol$_{1/2}$ (5.19 mg, 10 mol%), K_3PO_4 (159 mg, 0.75 mmol, 3.0 equiv.), α-tertiary haloamide **E1** (0.15–0.30 mmol, 0.5–1.25 equiv.). Then *tert*-butanol **A1** (278 mg, 3.75 mmol, 15.0 equiv.) and anhydrous DCE (2.5 mL) were sequentially added into the mixture and the reaction mixture was stirred at –10 °C. Aliquots (~500 μL) were taken from reaction mixture at various reaction times, the product was filtered off and washed by CH_2Cl_2 and EtOAc for three times. The combined organic solvent was concentrated to afford crude product. The yield of **1** was analyzed by ^{1}H NMR spectroscopy using 1,3,5-trimethoxybenzene as an internal standard.

Supplementary Table 10. The molar concentration of product **1** ([**1**]/M) with different initial concentrations of α-tertiary haloamide **E1** ([**E1**]/M]) at different time intervals.

Time (h)	0.050 M [**E1**]	0.075 M [**E1**]	0.100 M [**E1**]	0.125 M [**E1**]
6 h	0.005	0.003	0.002	0.006
12 h	0.011	0.008	0.008	0.011
23 h	0.018	0.014	0.015	0.020
32 h	0.024	0.021	0.022	0.035

Supplementary Table 11. The rate values at different initial concentrations of α-tertiary haloamide **E1**.

[**E1**] (M)	0.050	0.075	0.100	0.125
Rate	0.7124	0.6700	0.7467	0.7399



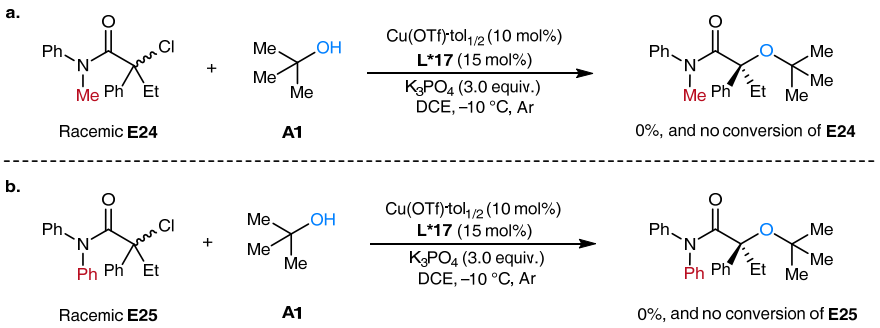
Supplementary Figure 18. The kinetic study on concentration of haloamide **E1**.

Computational Studies

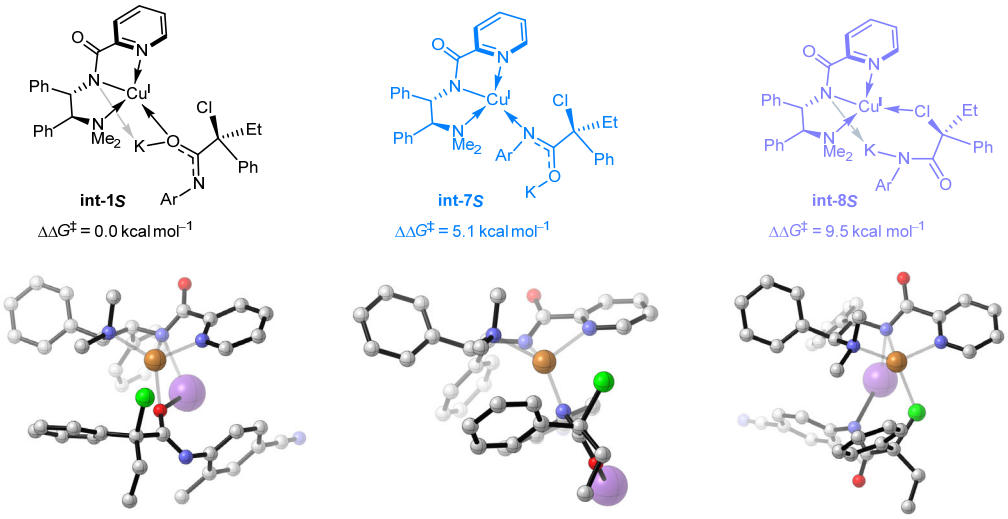
Computational Methods

All of the DFT calculations were carried out with the Gaussian 16 series of programs[6]. The B3LYP-D3 functional[7,8] with D3 version of Grimme's dispersion correctionst[9] with a Becke-Johnson (BJ) damping function[10] and the standard 6-31G(d) basis set (SDD basis set[11–13] for Cu atom) was used for geometry optimizations. Harmonic vibrational frequency calculations were performed for all stationary points to determine whether they are local minima or transition structures and to derive thermochemical corrections for the enthalpies and free energies. The M06-L[14] functional with the 6-311+G(d,P) basis set (SDD basis set for Cu atom) was used to calculate the single-point energies and give more accurate energy information. The solvent effects were considered by single-point calculations of the gas-phase stationary points with the SMD solvation model[15] in dichloroethane solvent. The energies reported in this paper are the M06-L calculated Gibbs free energies in dichloroethane solvent. Atom-in-molecule (AIM)[16] analyses were plotted using Multiwfn 3.8[17]. The calculation and visualization of Atom-in-molecule (AIM) analyses results are presented with VMD[18] visualization software.The 3D diagrams of molecules were generated using CYLView[19].

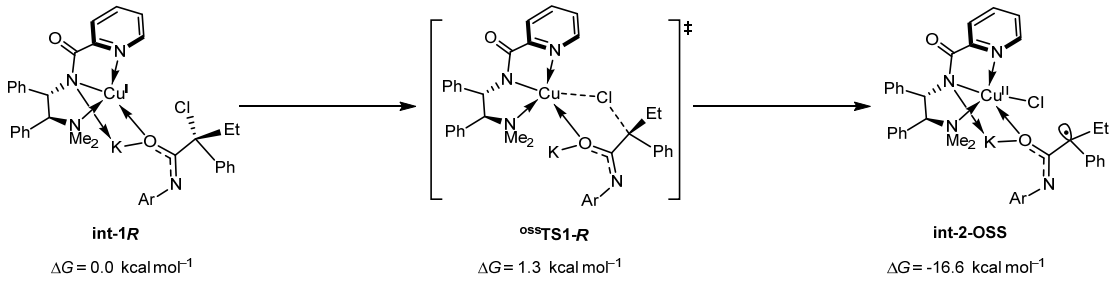
Supplementary Figures for DFT



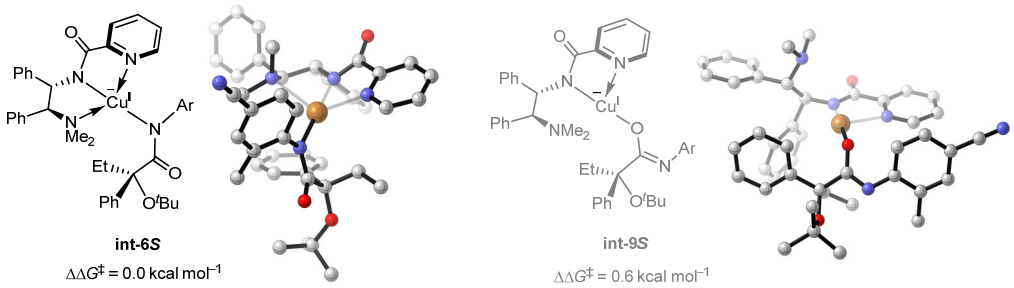
Supplementary Figure 19. The results of *N*-protected α-tertiary haloamides under standard reaction conditions. We tested the *N*-methyl and *N*-phenyl protected substrates under the standard reaction conditions and found that the substrates had no conversion and most remained recovered (Supplementary Figs. 11a and 11b). Particularly, in our DFT calculations, if the NH substrate is not deprotonated, the corresponding transition state cannot be located on the potential energy surface after many attempts. Based on the experimental results and DFT calculations, we hypothesize that the deprotonation allows the substrate with NH group to coordinate with copper catalyst, thus facilitating the chlorine atom transfer process. Overall, these results support the hypothesis that deprotonation and copper coordination can promote the transfer of chlorine atoms.



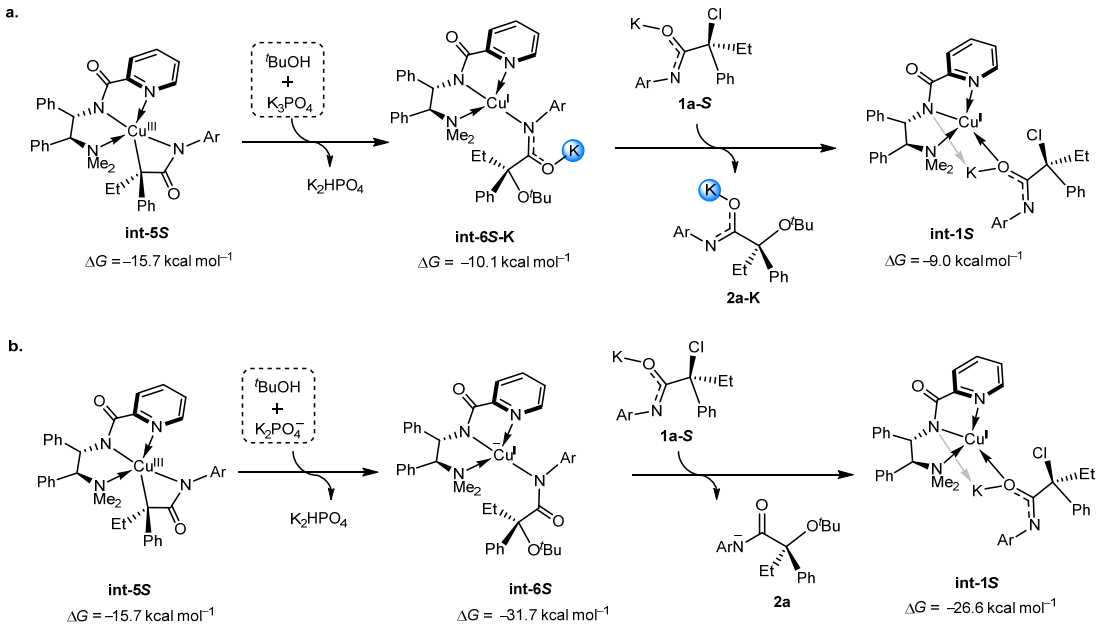
Supplementary Figure 20. Thermodynamic stability of the complex of Cu(I)L* and E1. We adopted **int-1*S*** mainly based on the thermodynamic stability of this complex compared with other complexes. The calculated thermodynamic stability of the complex formed by Cu(I)L* and **E1** showed that the O-bound complex **int-1*S*** is 5.1 kcal mol^{-1} more stable than the *N*-bound complex **int-7*S*** and 9.5 kcal mol^{-1} more stable than the Cl-bound complex **int-8*S***.



Supplementary Figure 21. DFT calculations for the energy profile of the chlorine atom transfer process of *R*-configuration. We have also performed additional DFT calculations for the chlorine atom transfer process for the *R*-configured reactant. The results indicate that the free energy barrier of the chlorine atom transfer process for the *R*-configured reactant is 1.3 kcal mol^{-1} with respect to **int-1*R***, which was very close to that for the *S*-configured reactant.



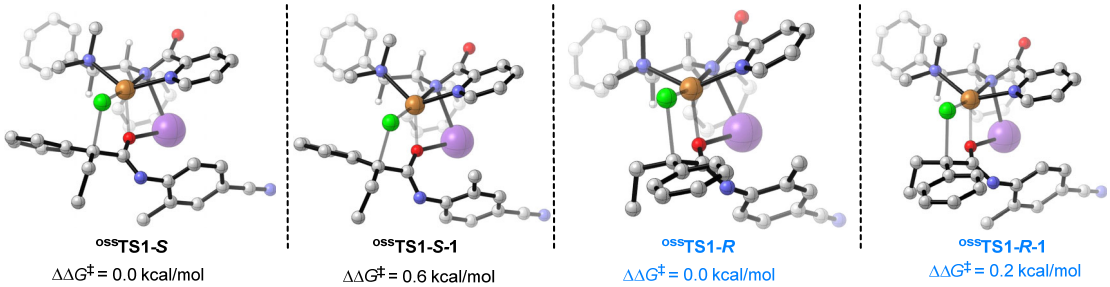
Supplementary Figure 22. Thermodynamic stability of *N*- and O-bound complexes int-6*S* and int-9*S*. In analogy, the *N*-bound complex **int-6*S*** is 0.6 kcal mol^{-1} more stable than the O-bound complex **int-9*S***, despite a smaller magnitude of this difference.



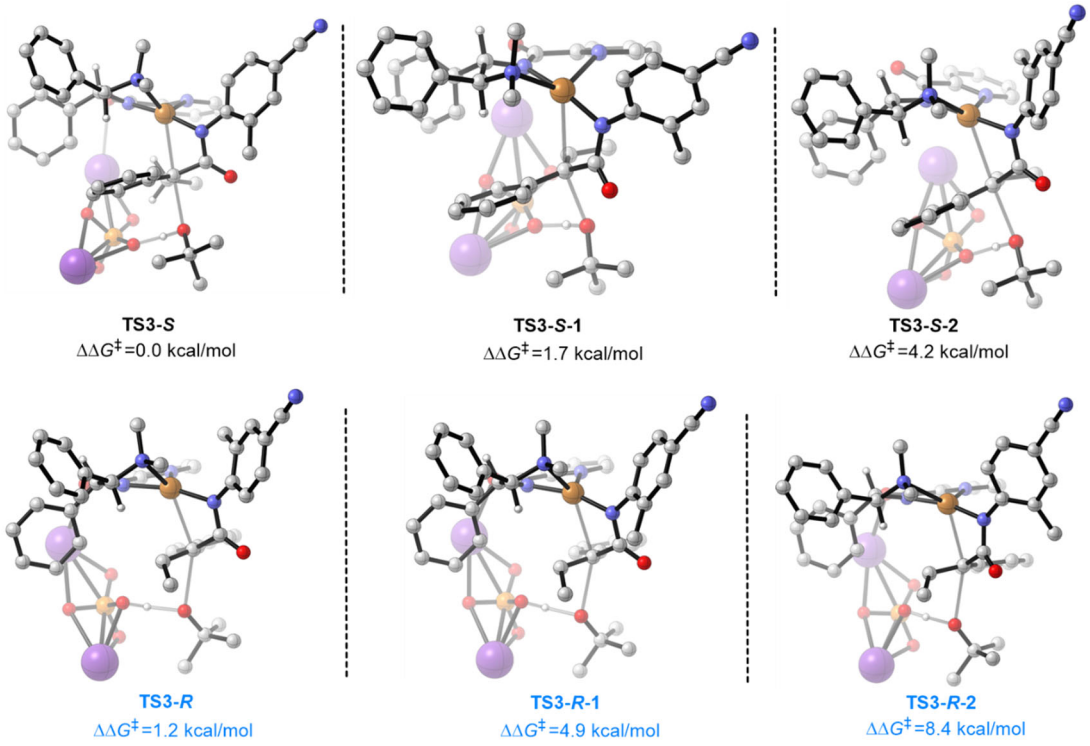
Supplementary Figure 23. The comparison between int-6*S*-K (neutral form) and int-6*S*. We performed the calculation using **int-6*S*-K**, the neutral form of **int-6*S***, but found that the transformation of **int-5*S*** to **int-6*S*-K** is endergonic by 5.6 kcal mol^{-1} (Supplementary Fig. 15a). In contrast, the thermodynamic driving force for the formation of anionic **int-6*S*** is –16.0 kcal mol^{-1}. Therefore, we tentatively proposed that the original sequence for the conversion of **int-5*S*** to **int-6*S*** and further to **int-1*S*** is energetically more favorable (Supplementary Fig. 15b).

Comparison of different conformations of the transition states for ^{oss}TS1-*S*, ^{oss}TS1- *R*, TS3-*S*, TS3-*R*, TS4-*S* and TS4-*R*

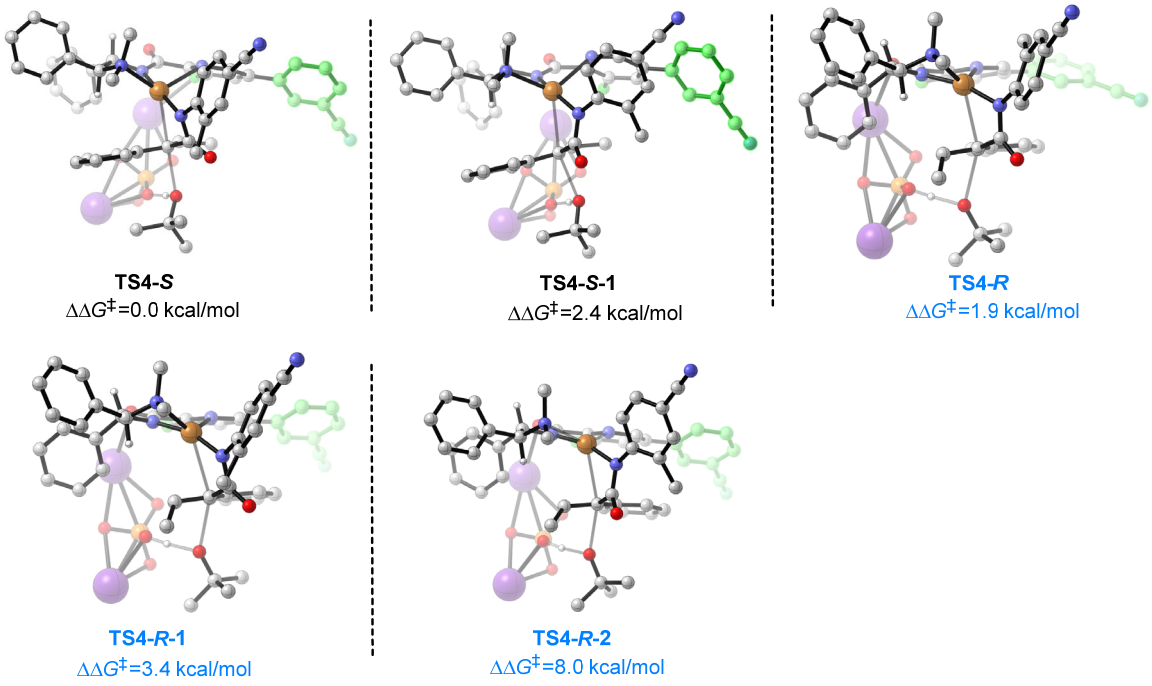
The exploration of conformations are important, especially for the investigation of selectivity-related problems. We have considered various configurations and conformations for the key transition states to ensure that they represent the corresponding lowest energy conformations.



Supplementary Figure 24. Different conformations of the transition states ^{oss}TS1-*S* and ^{oss}TS1-*R*.

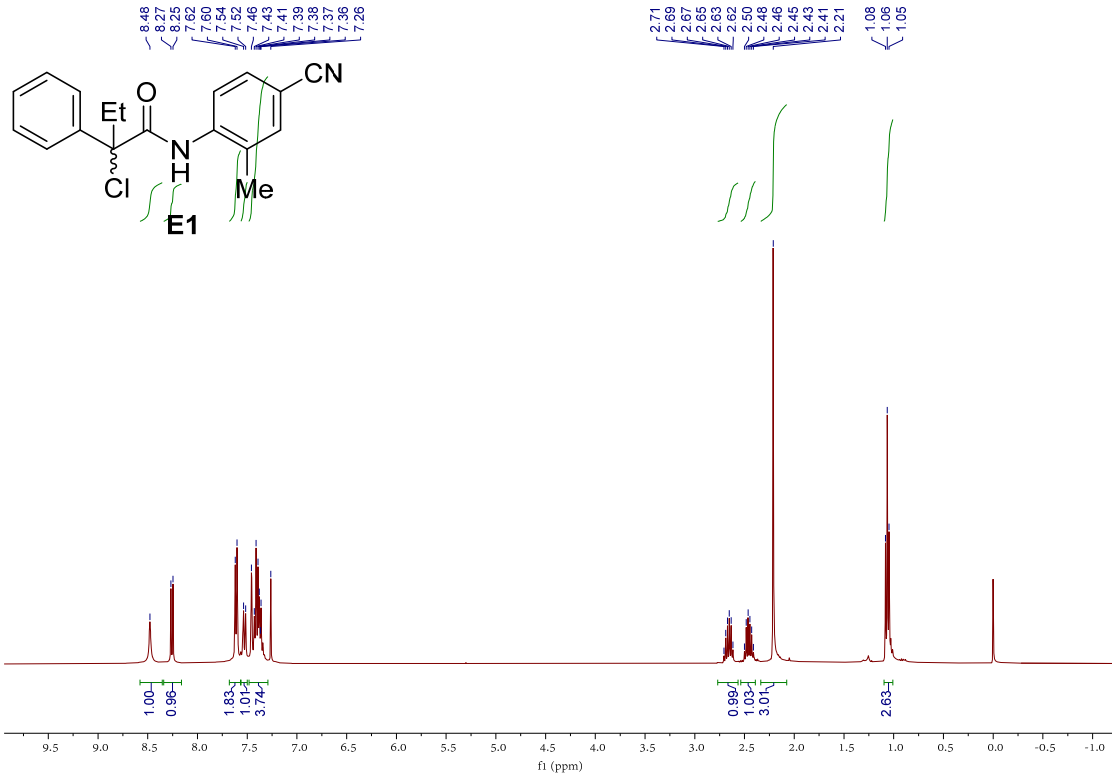


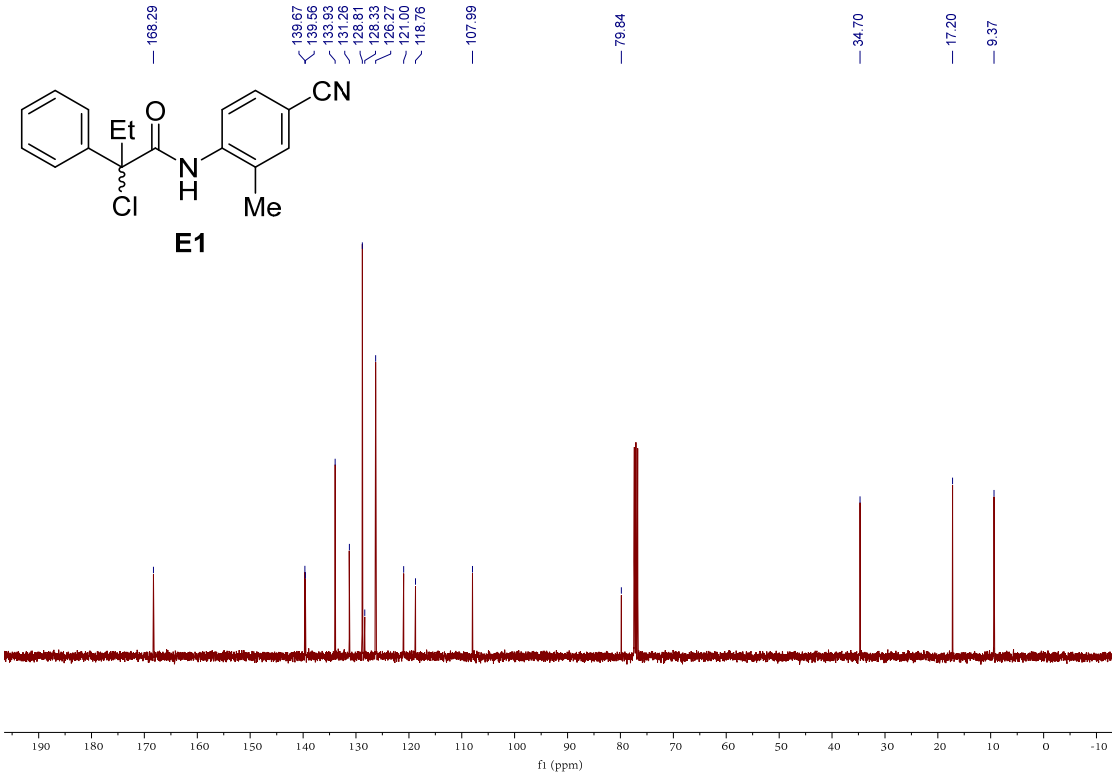
Supplementary Figure 25. Different conformations of the transition states **TS3-*S*** and **TS3-*R*.**

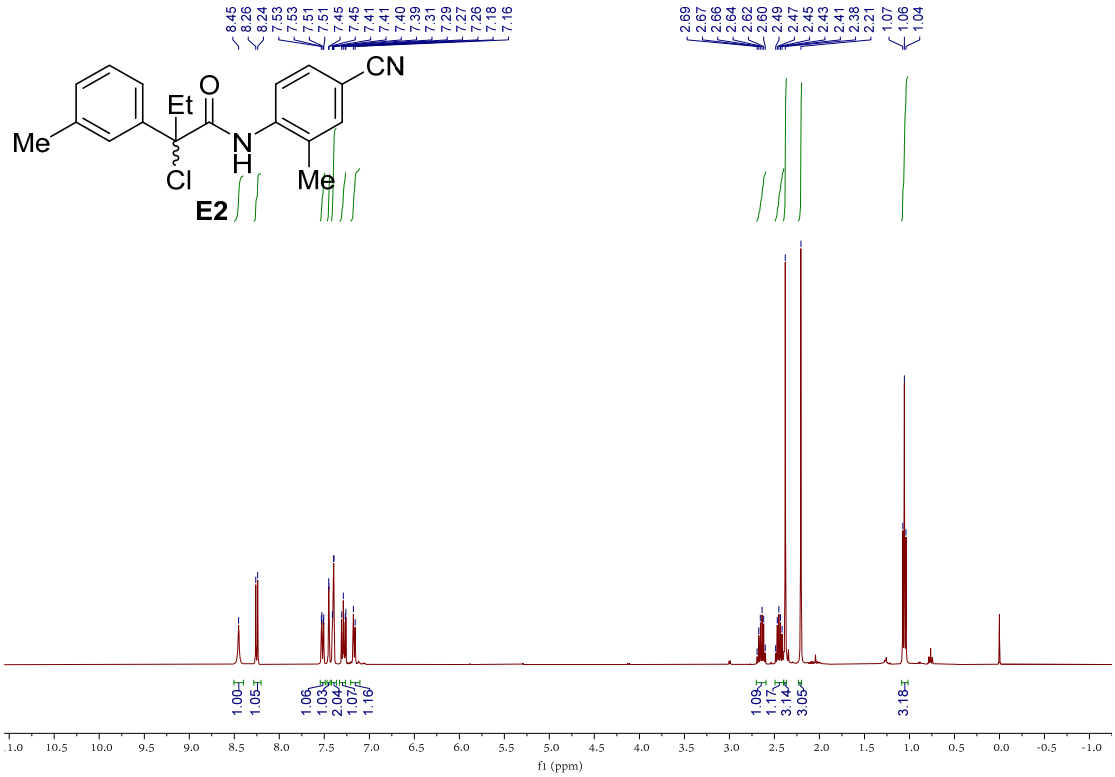


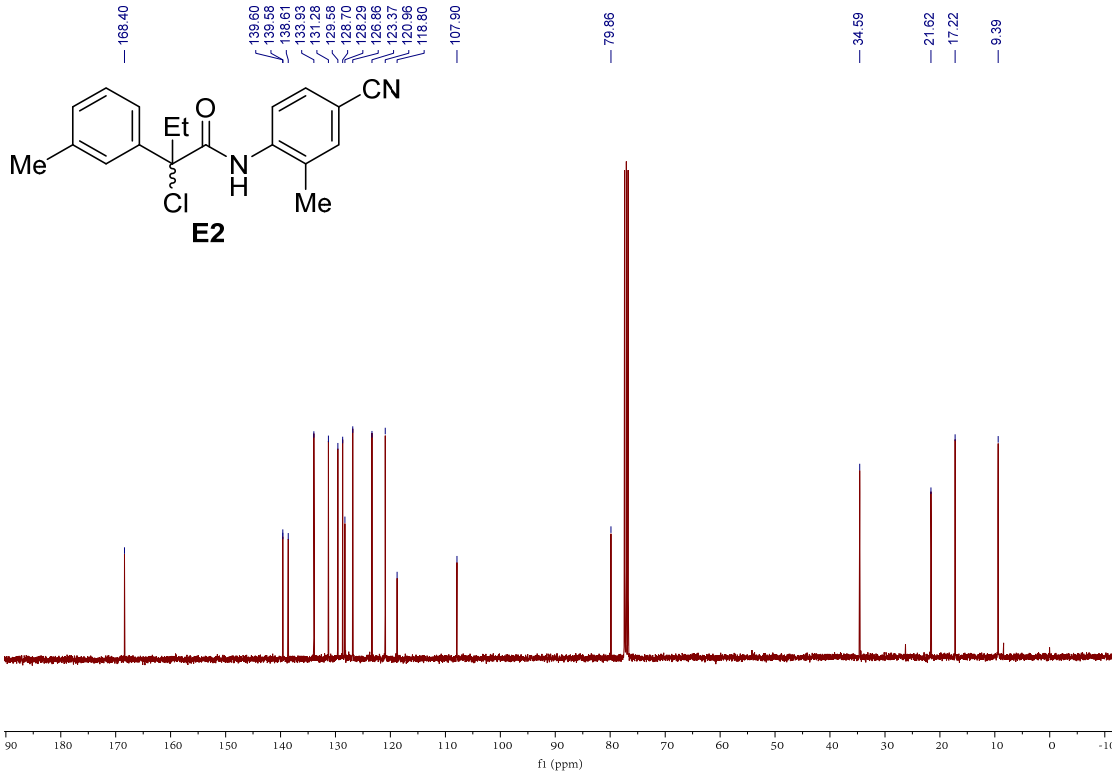
Supplementary Figure 26. Different conformations of the transition states **TS4-*S*** and **TS4-*R***.

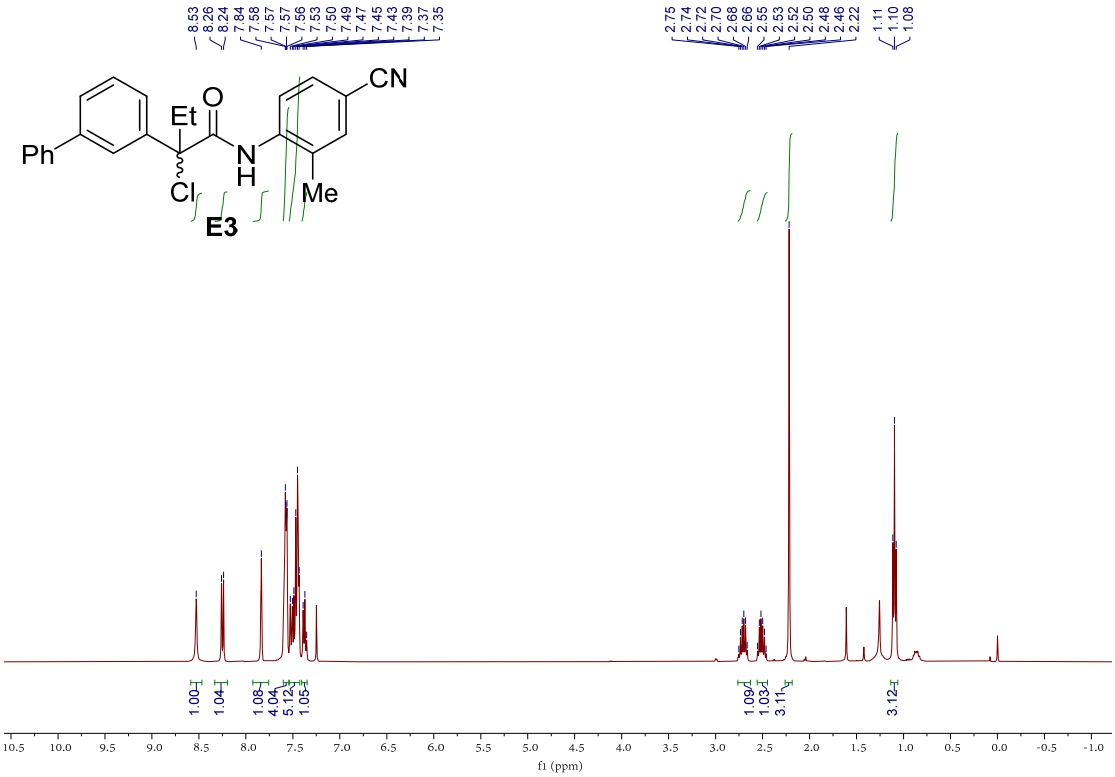
NMR Spectra

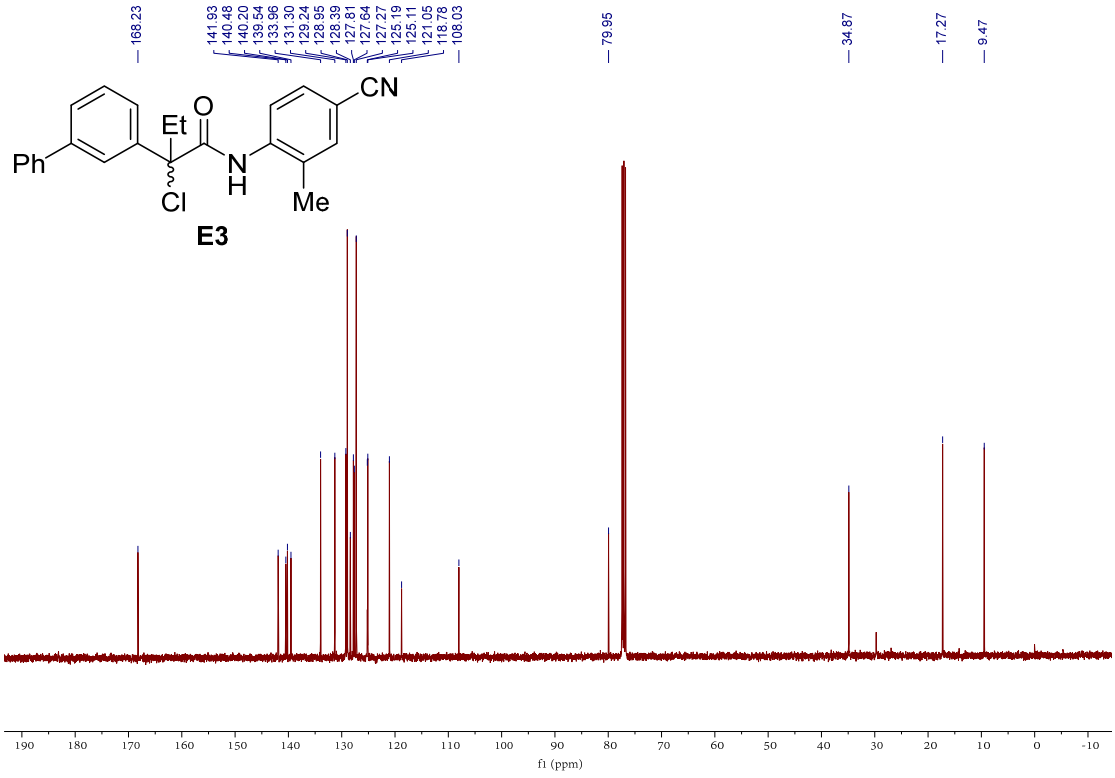

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f1 (ppm)

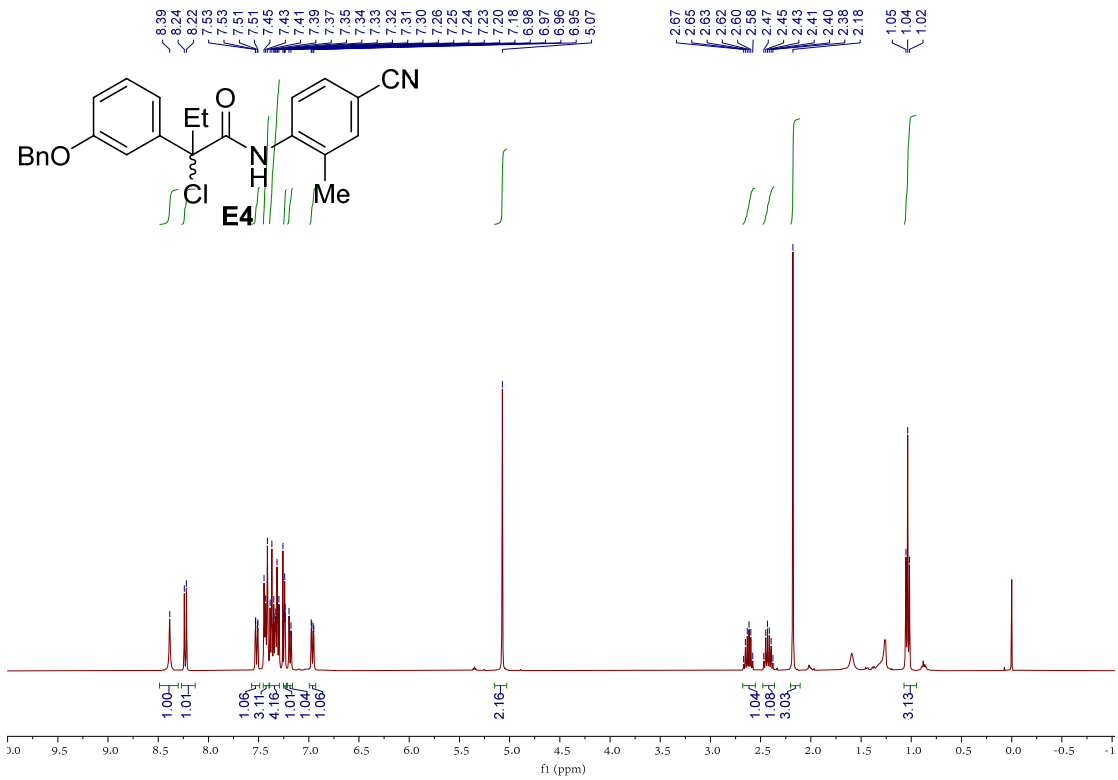

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E1
f1 (ppm)

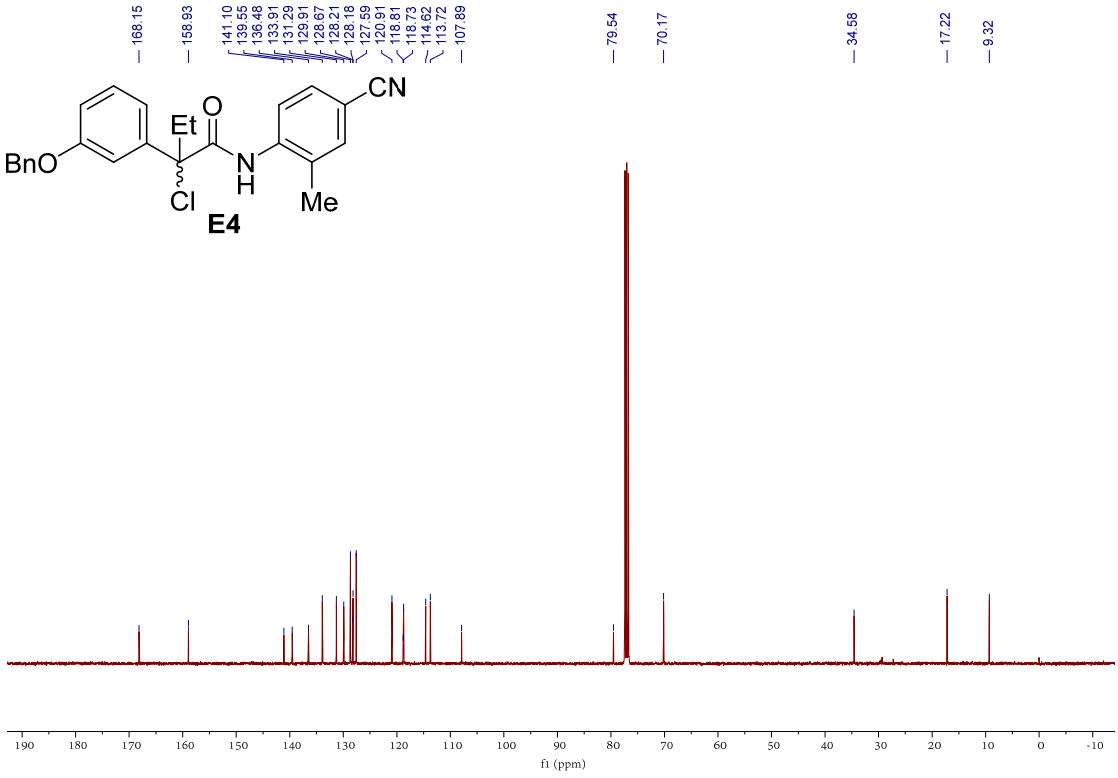

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f1 (ppm)

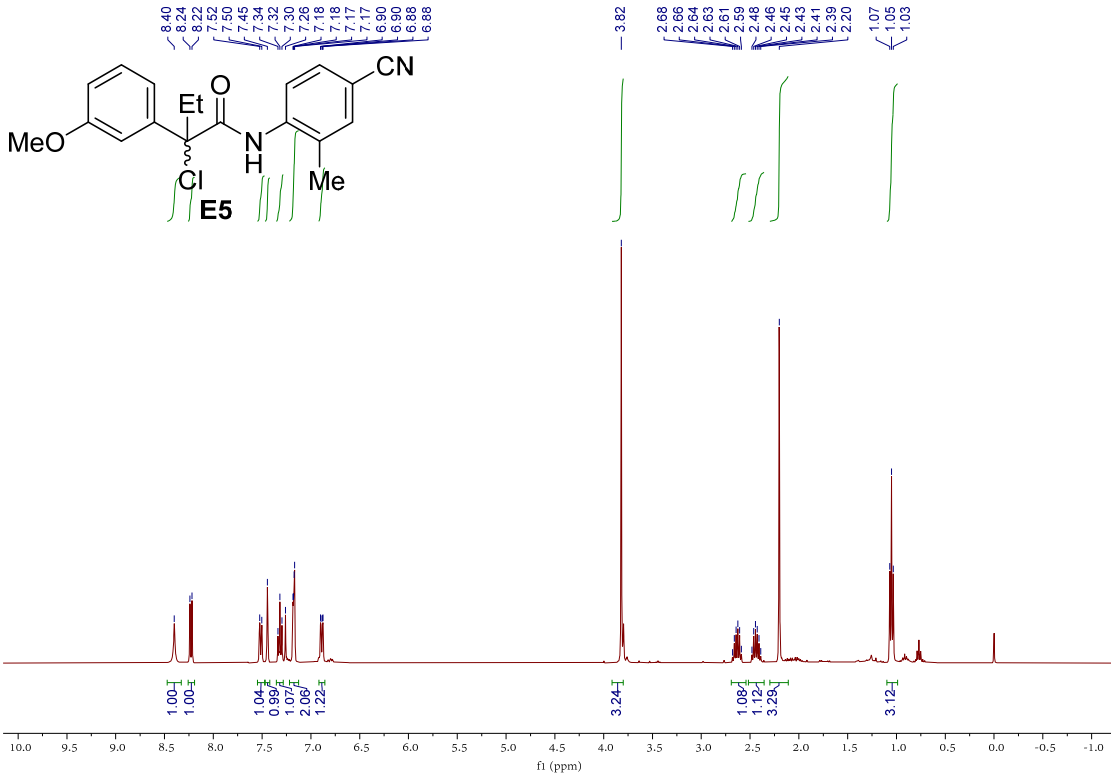

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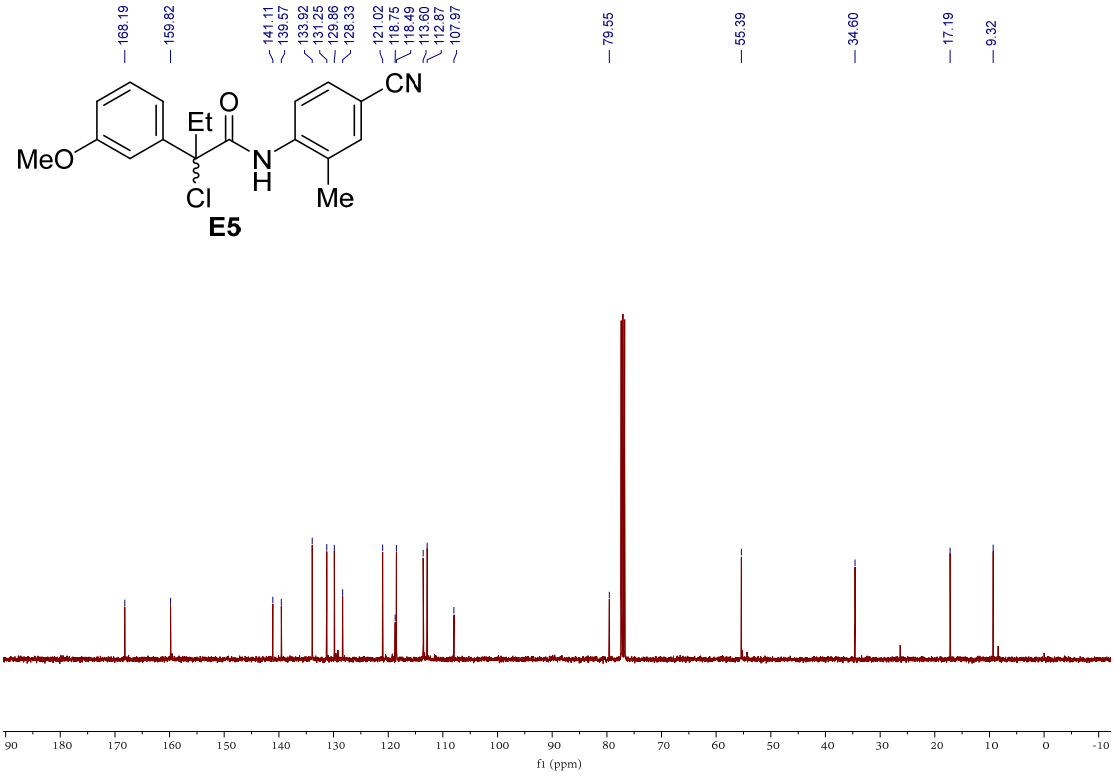

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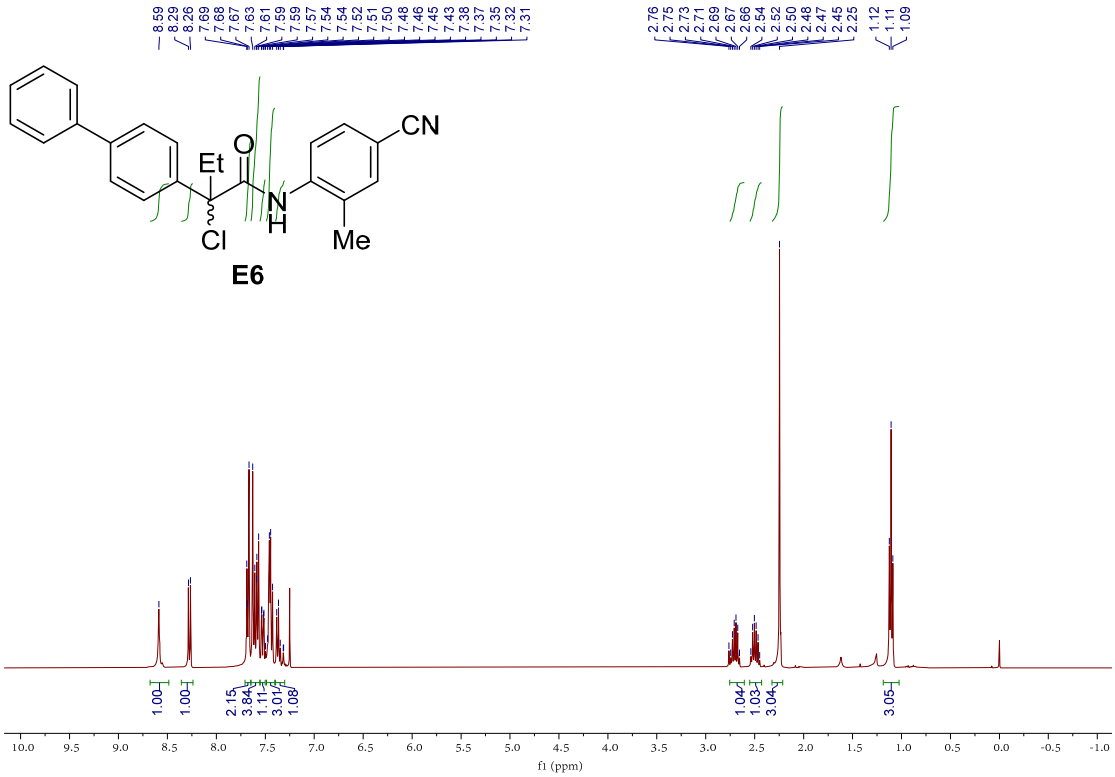

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Me
E3
f1 (ppm)

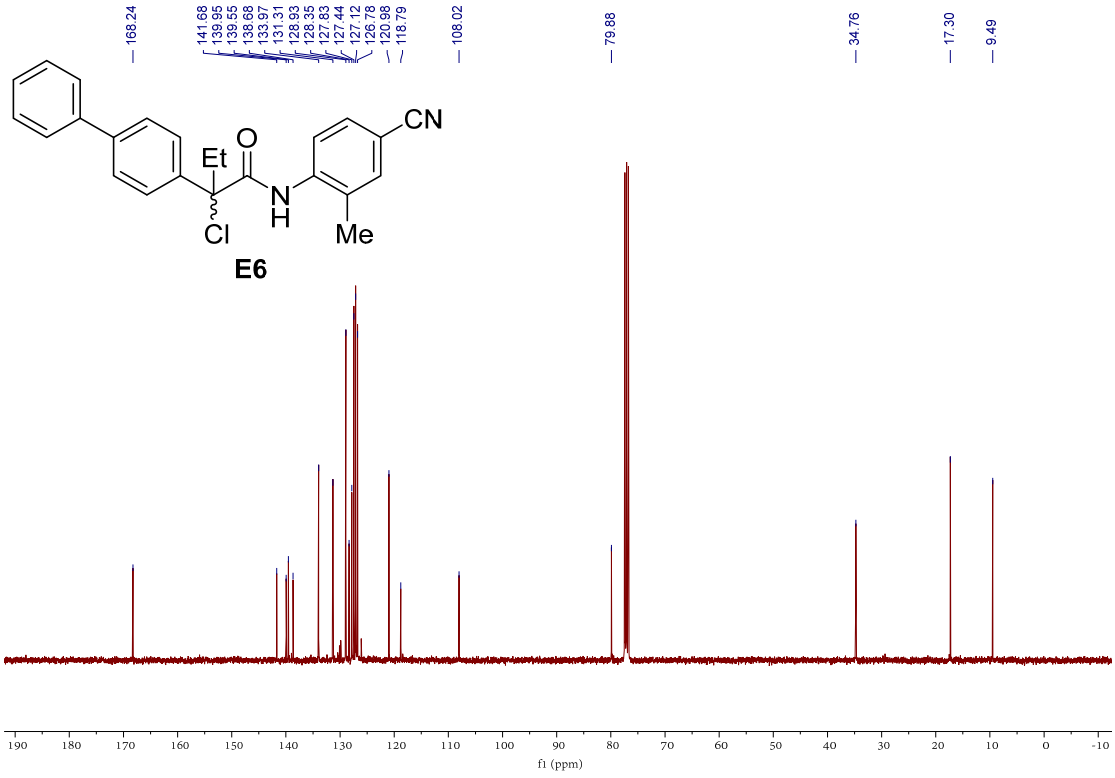

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6.96
6.95
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3.13
f1 (ppm)

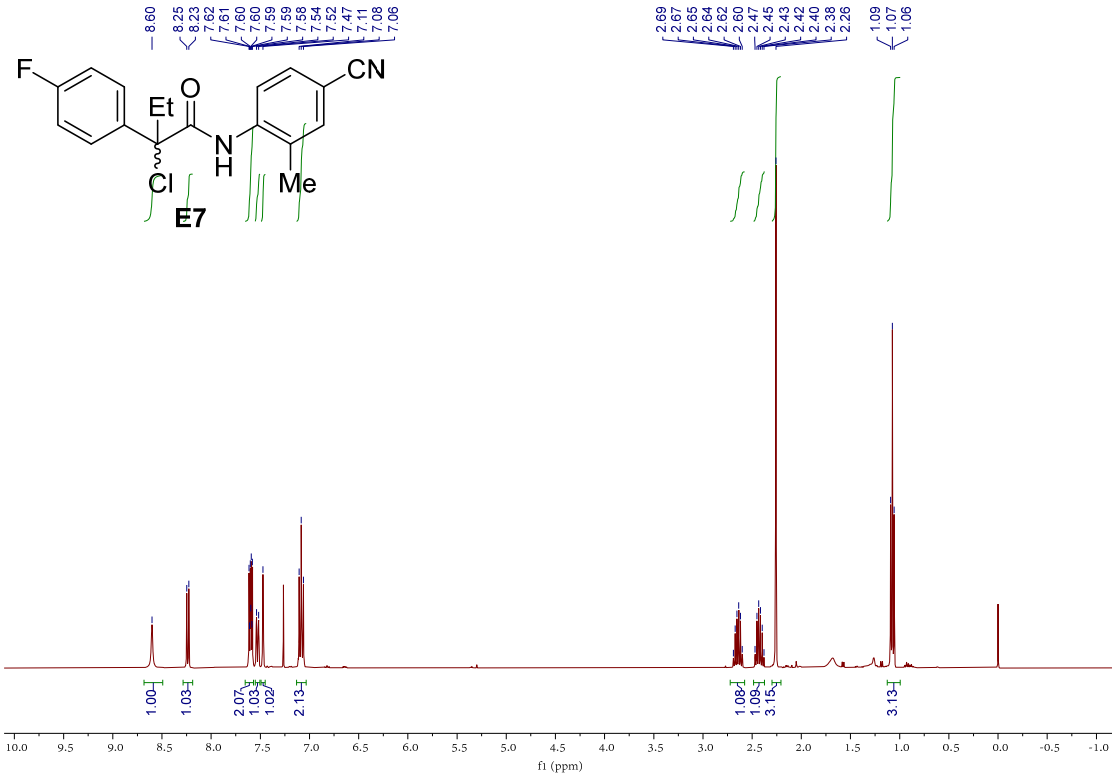

168.15
158.93
141.10
139.55
136.48
133.91
131.29
129.91
128.67
128.21
128.18
127.59
120.91
118.81
118.73
114.62
113.72
107.89
79.54
70.17
34.58
17.22
9.32
BnO
Et
O
N
H
Cl
Me
CN
E4
f1 (ppm)

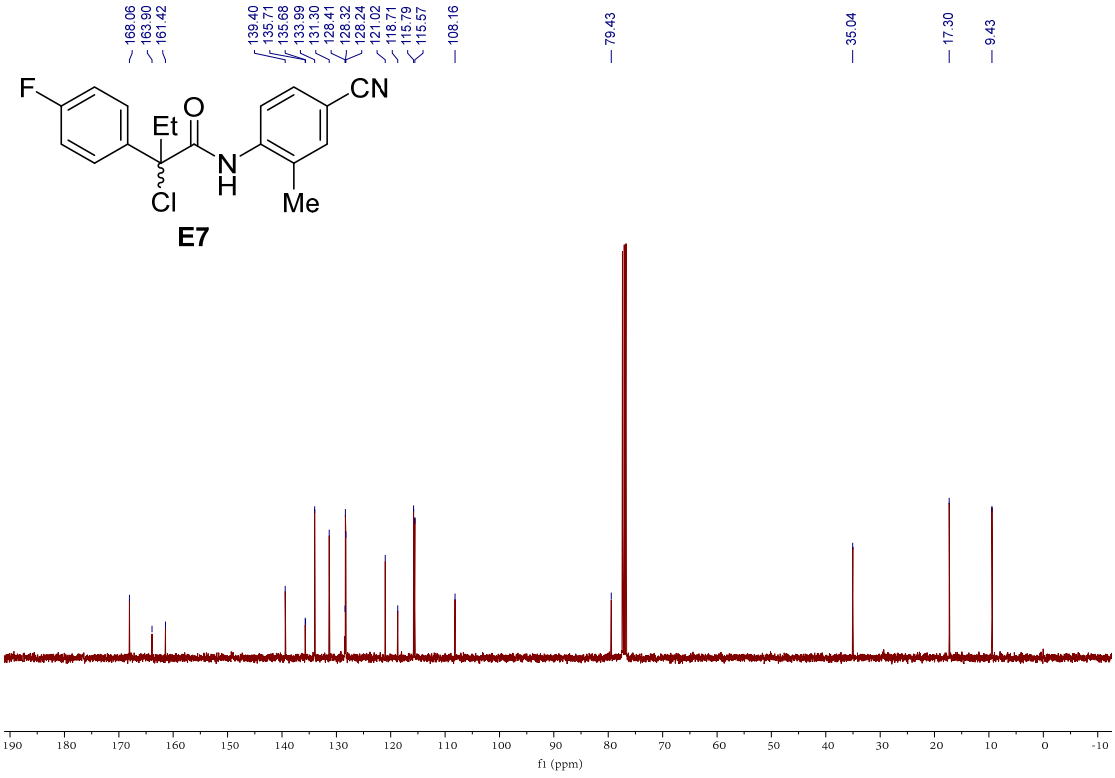

8.40
8.24
8.22
7.52
7.50
7.45
7.34
7.32
7.30
7.26
7.18
7.18
7.17
7.17
6.90
6.90
6.88
6.88
3.82
2.68
2.66
2.64
2.63
2.61
2.59
2.48
2.46
2.45
2.43
2.41
2.39
2.20
1.07
1.05
1.03
CN
Et
O
MeO
N
H
Cl
Me
E5
1.00
1.00
1.04
0.99
1.07
2.06
1.22
3.24
1.08
1.12
3.29
3.12
f1 (ppm)

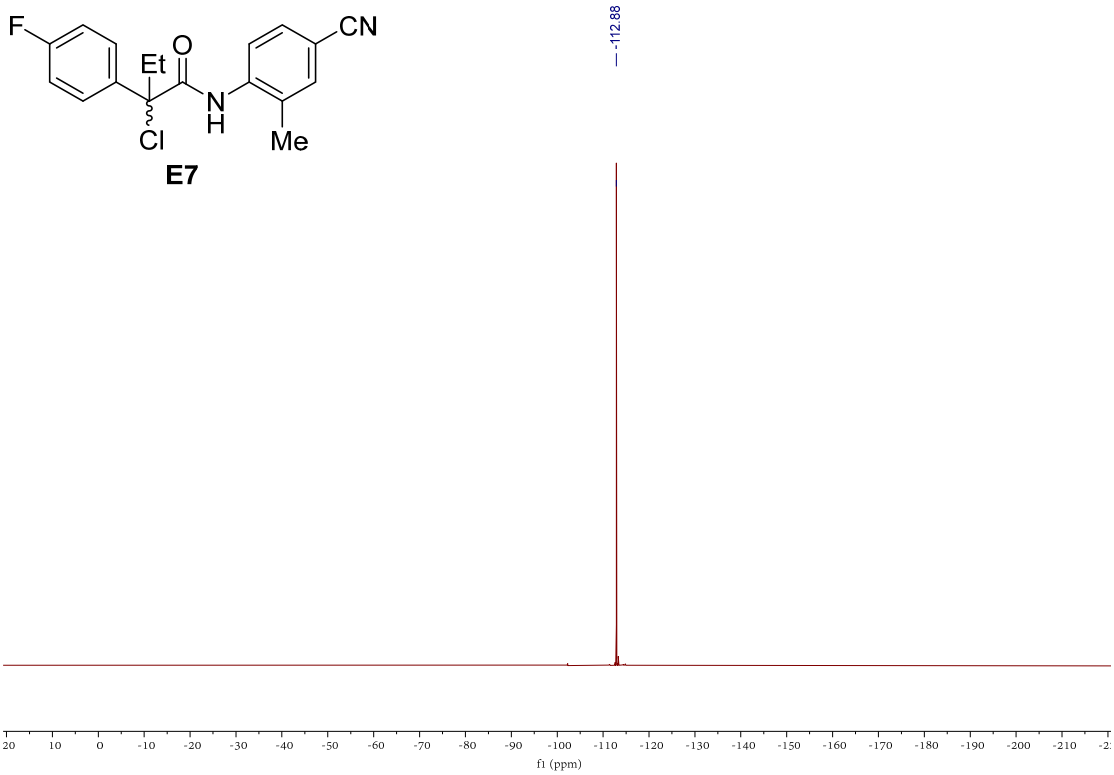

168.19
159.82
141.11
139.57
133.92
131.25
129.86
128.33
121.02
118.75
118.49
113.60
112.87
107.97
79.55
55.39
34.60
17.19
9.32
CN
Et
O
MeO
N
H
Cl
Me
E5
f1 (ppm)


8.59
8.29
8.26
7.69
7.68
7.67
7.63
7.61
7.59
7.59
7.57
7.54
7.54
7.52
7.51
7.50
7.48
7.46
7.45
7.43
7.38
7.37
7.35
7.32
7.31
2.76
2.75
2.73
2.71
2.69
2.67
2.66
2.54
2.52
2.50
2.48
2.47
2.45
2.25
1.12
1.11
1.09
Et
O
N
H
CN
Cl
Me
E6
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3.04
3.05
f1 (ppm)

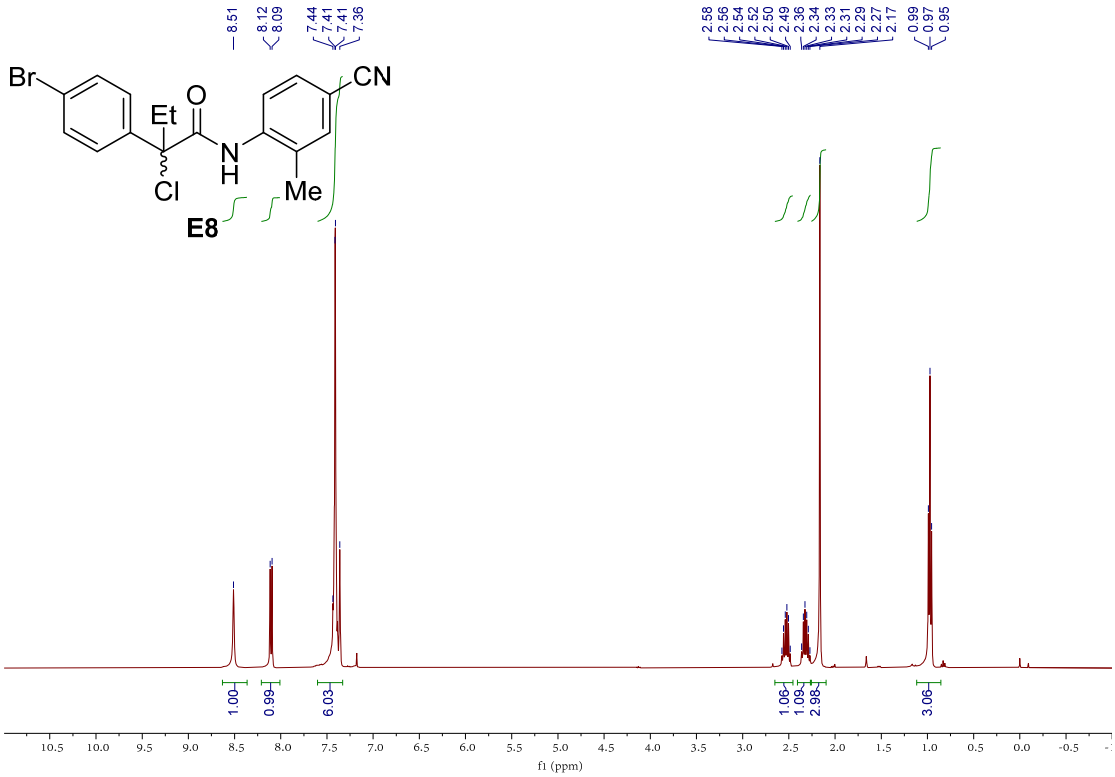

168.24
141.68
139.95
139.55
138.68
133.97
131.31
128.93
128.35
127.83
127.44
127.12
126.78
120.98
118.79
108.02
79.88
34.76
17.30
9.49
Et
O
N
H
CN
Cl
Me
E6
f1 (ppm)

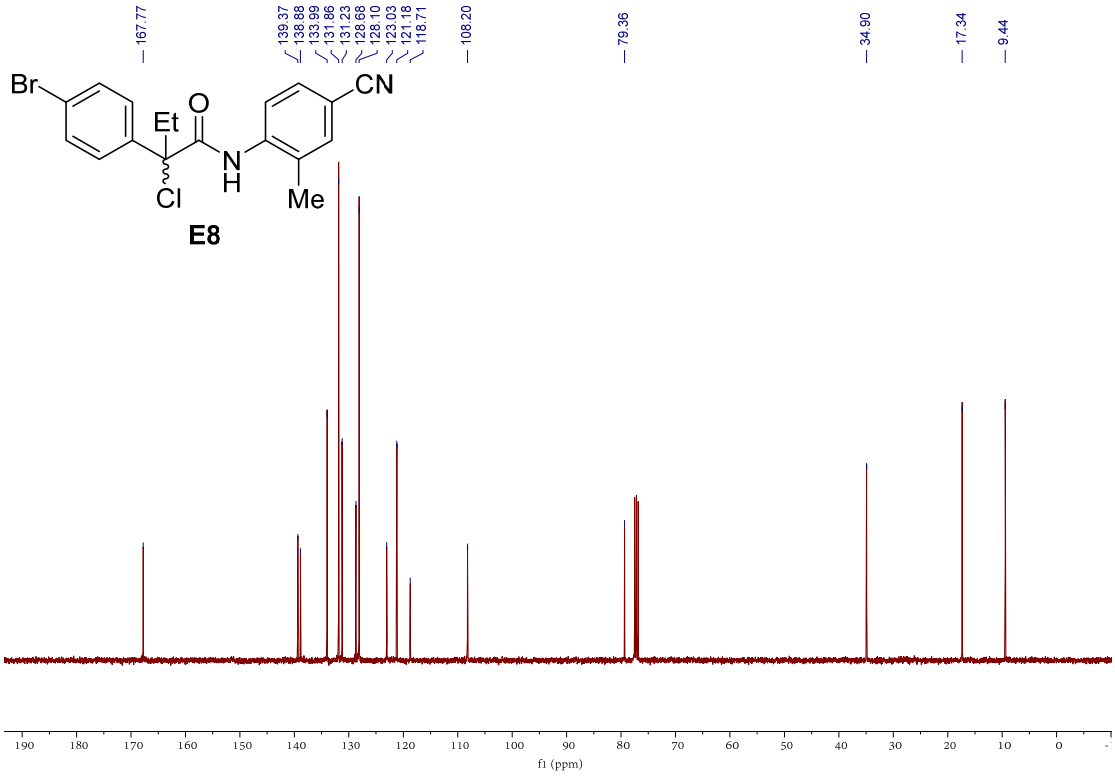

8.60
8.25
8.23
7.62
7.61
7.60
7.60
7.59
7.59
7.58
7.54
7.52
7.47
7.11
7.08
7.06
2.69
2.67
2.65
2.64
2.62
2.60
2.47
2.45
2.43
2.42
2.40
2.38
2.26
1.09
1.07
1.06
F
Et
O
CN
N
H
Cl
Me
E7
1.00
1.03
2.07
1.03
1.02
2.13
1.08
1.09
3.15
3.13
f1 (ppm)

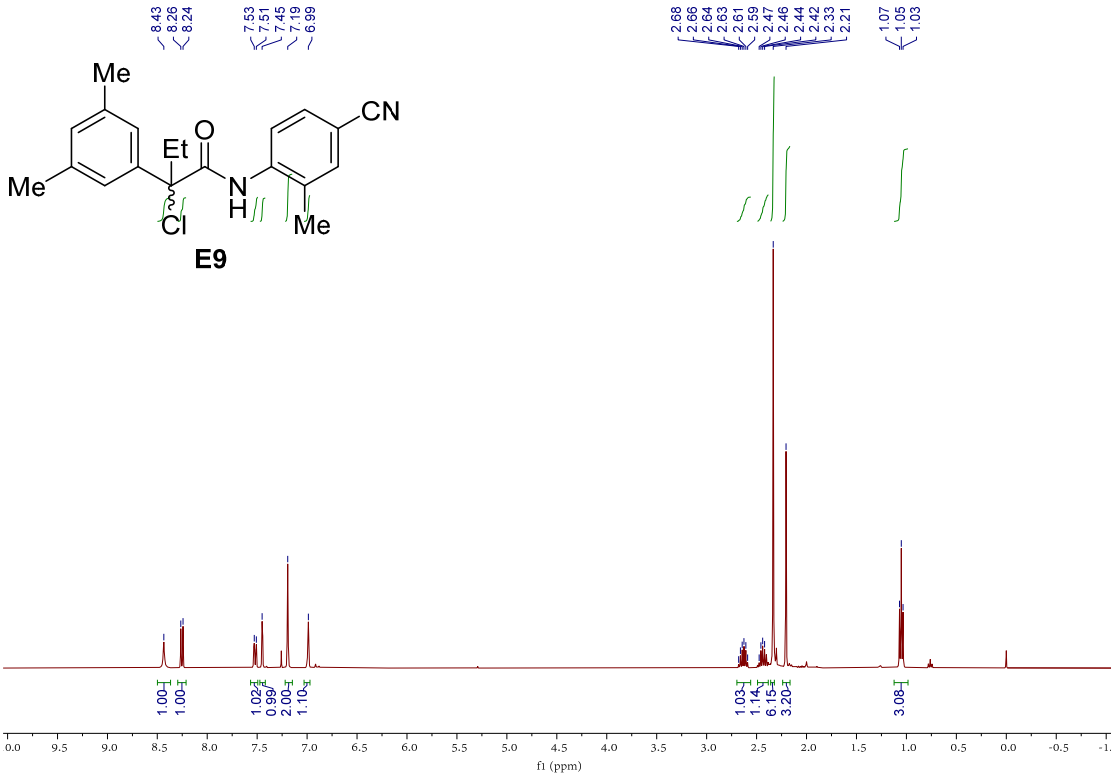

168.06
163.90
161.42
139.40
135.71
135.68
133.99
131.30
128.41
128.32
128.24
121.02
118.71
115.79
115.57
108.16
79.43
35.04
17.30
9.43
F
Et
O
CN
N
H
Cl
Me
E7
f1 (ppm)


F
Et
O
CN
N
H
Cl
Me
-112.88
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

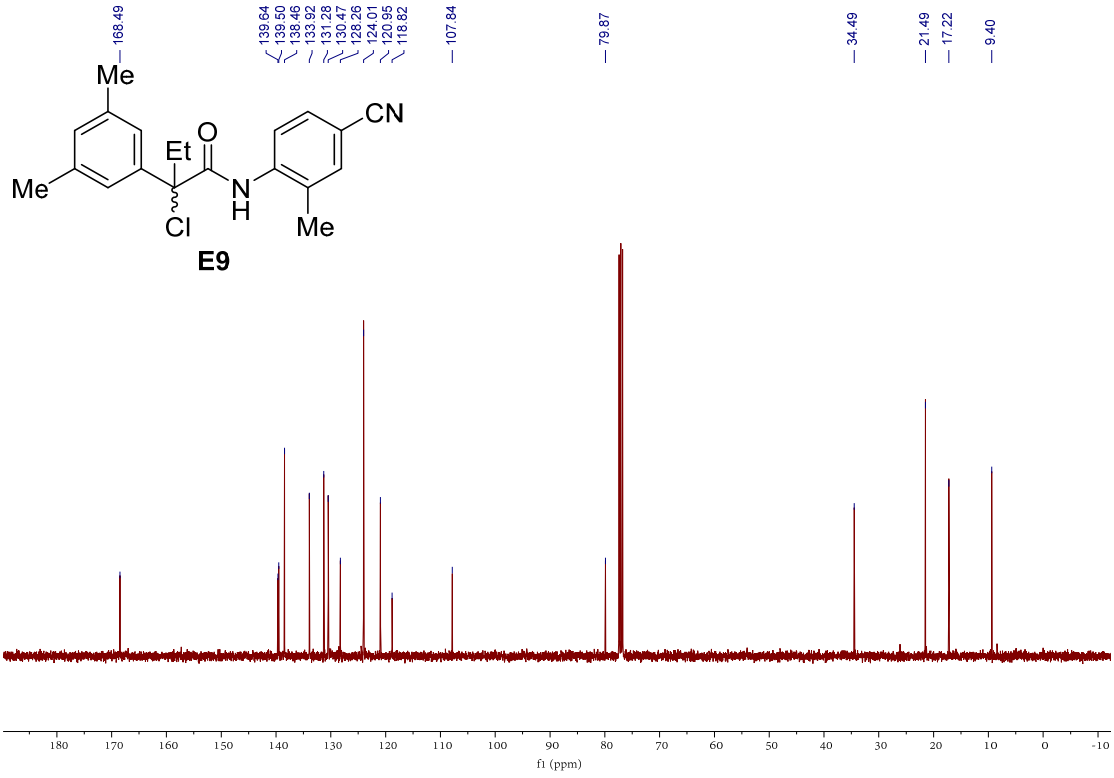
E7


8.51
8.12
8.09
7.44
7.41
7.41
7.36
2.58
2.56
2.54
2.52
2.50
2.49
2.36
2.34
2.33
2.31
2.29
2.27
2.17
0.99
0.97
0.95
Br
Et
O
N
H
CN
Cl
Me
E8
1.00
0.99
6.03
1.06
1.09
2.98
3.06
f1 (ppm)

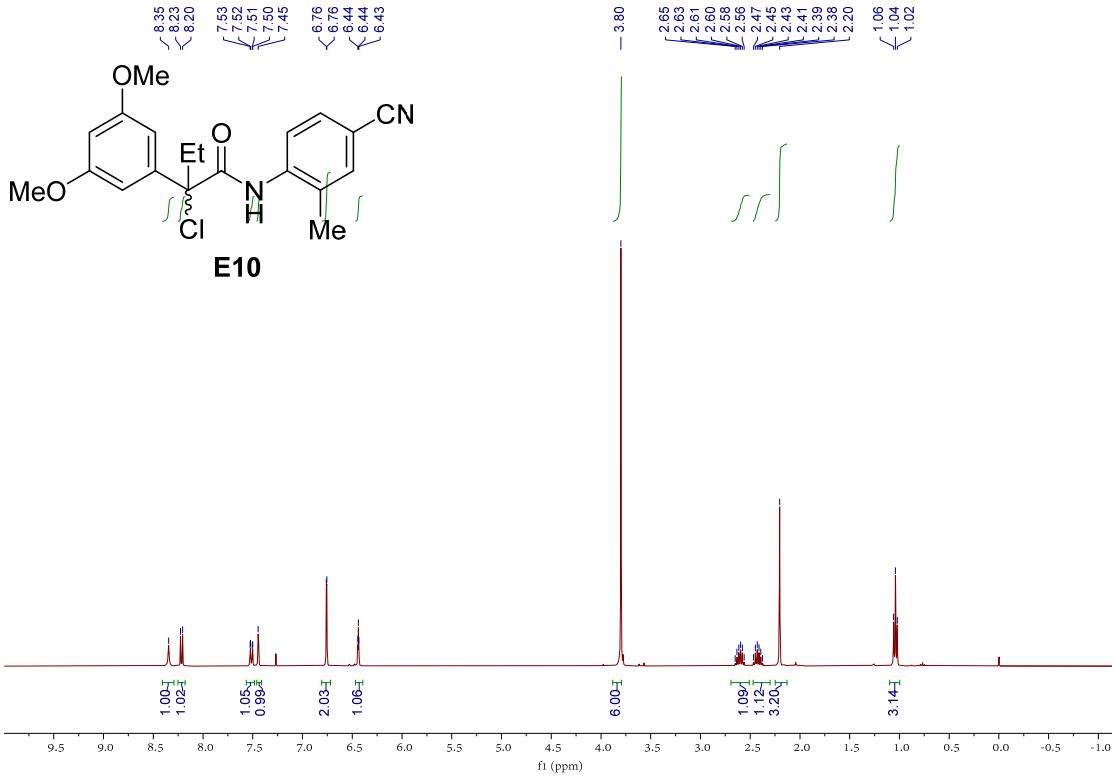

167.77
139.37
138.88
133.99
131.86
131.23
128.68
128.10
123.03
121.18
118.71
108.20
79.36
34.90
17.34
9.44
Br
Et
O
N
H
CN
Cl
Me
E8
f1 (ppm)

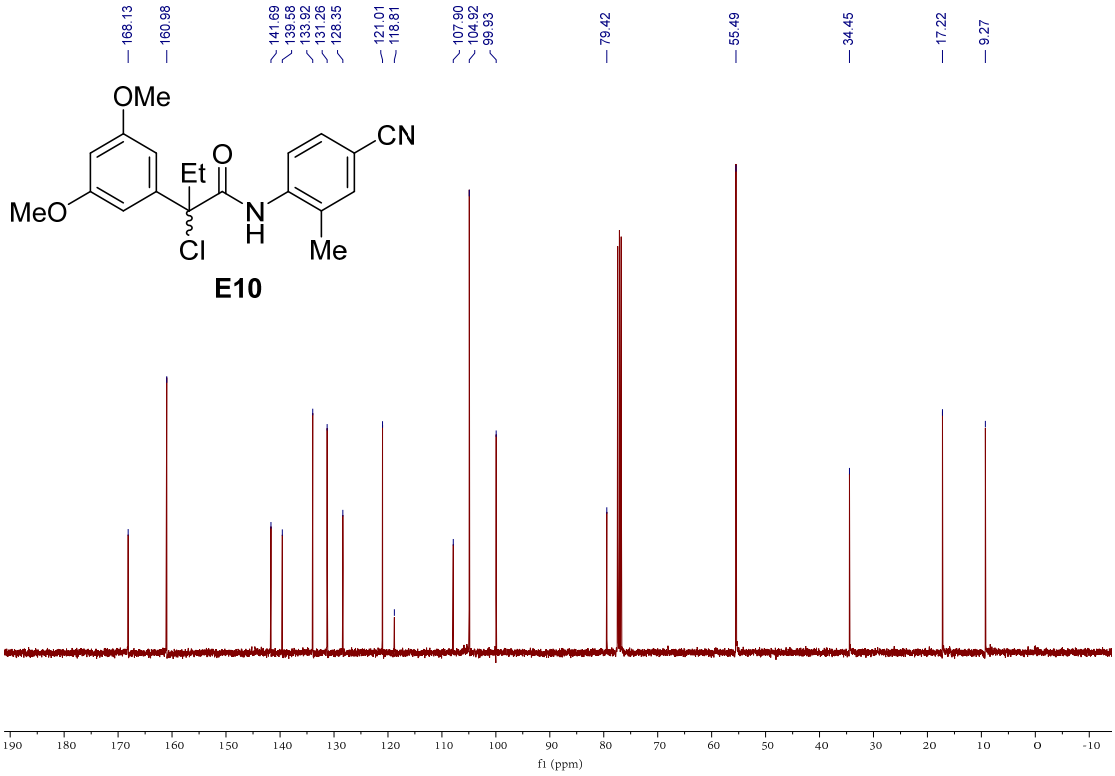

8.43
8.26
8.24
7.53
7.51
7.45
7.19
6.99
2.68
2.66
2.64
2.63
2.61
2.59
2.47
2.46
2.44
2.42
2.33
2.21
1.07
1.05
1.03
Me
Et
O
CN
Me
N
H
Cl
Me
1.00
1.00
1.02
0.99
2.00
1.10
1.03
1.14
6.15
3.20
3.08
f1 (ppm)

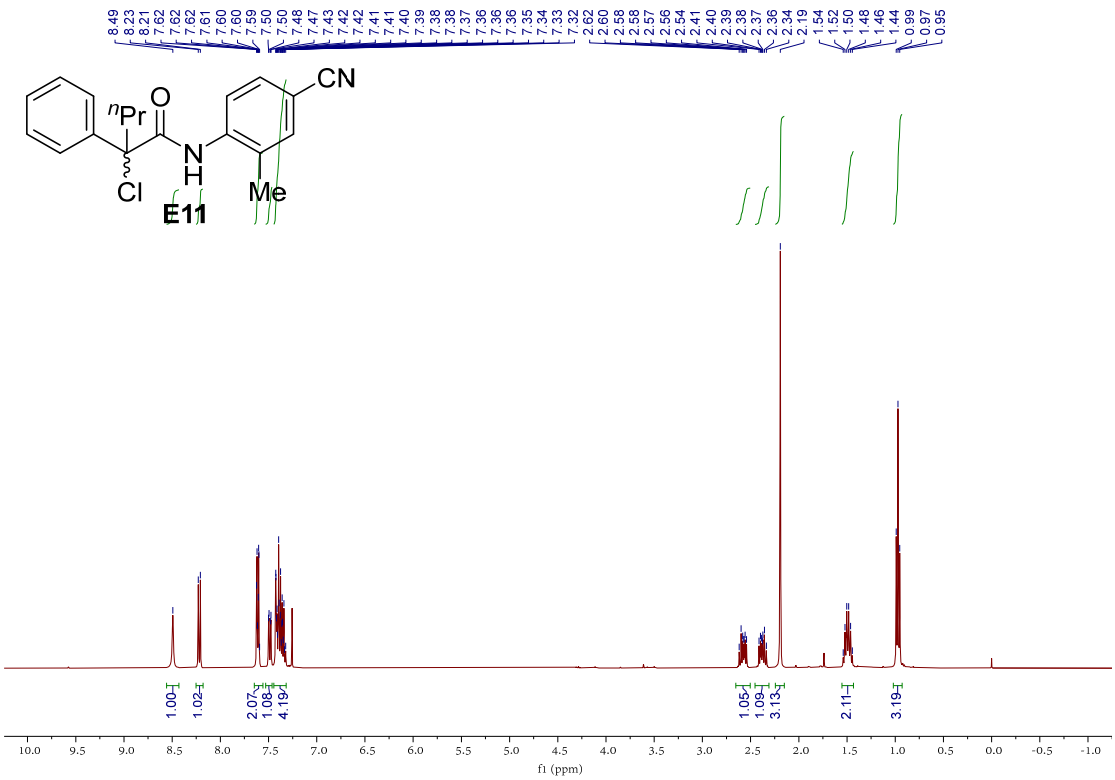
E9

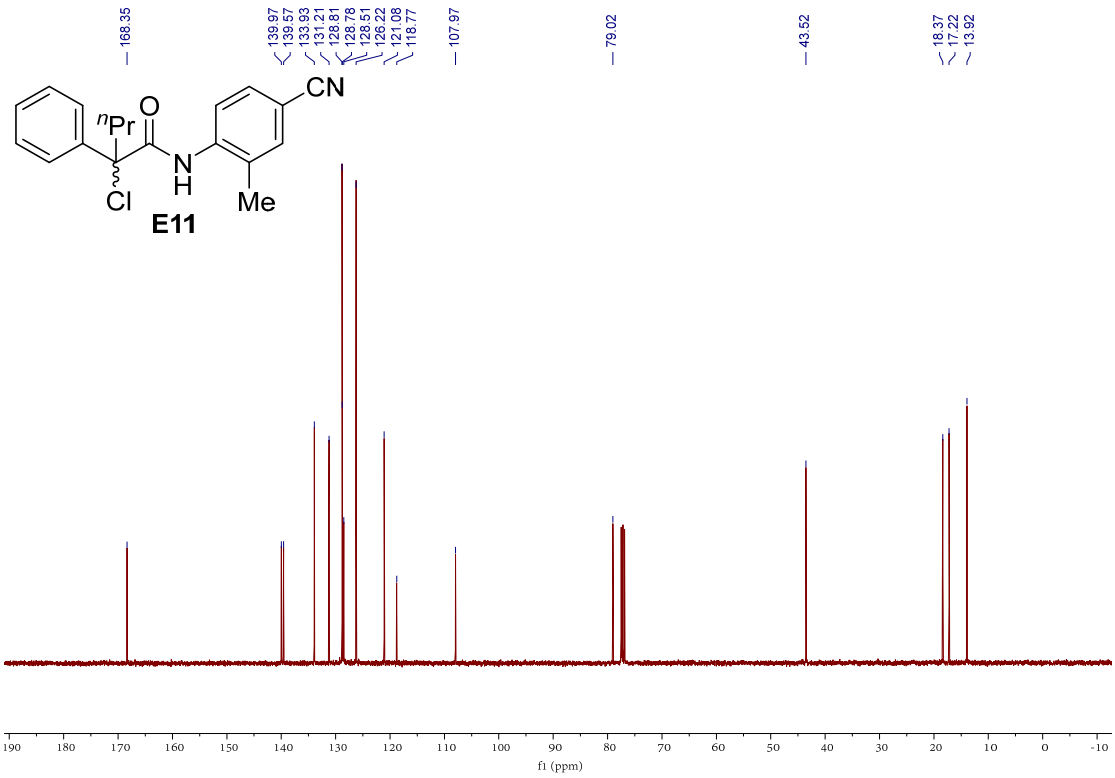

168.49
139.64
139.50
138.46
133.92
131.28
130.47
128.26
124.01
120.95
118.82
107.84
79.87
34.49
21.49
17.22
9.40
Me
Et
O
CN
Me
N
H
Cl
Me
f1 (ppm)

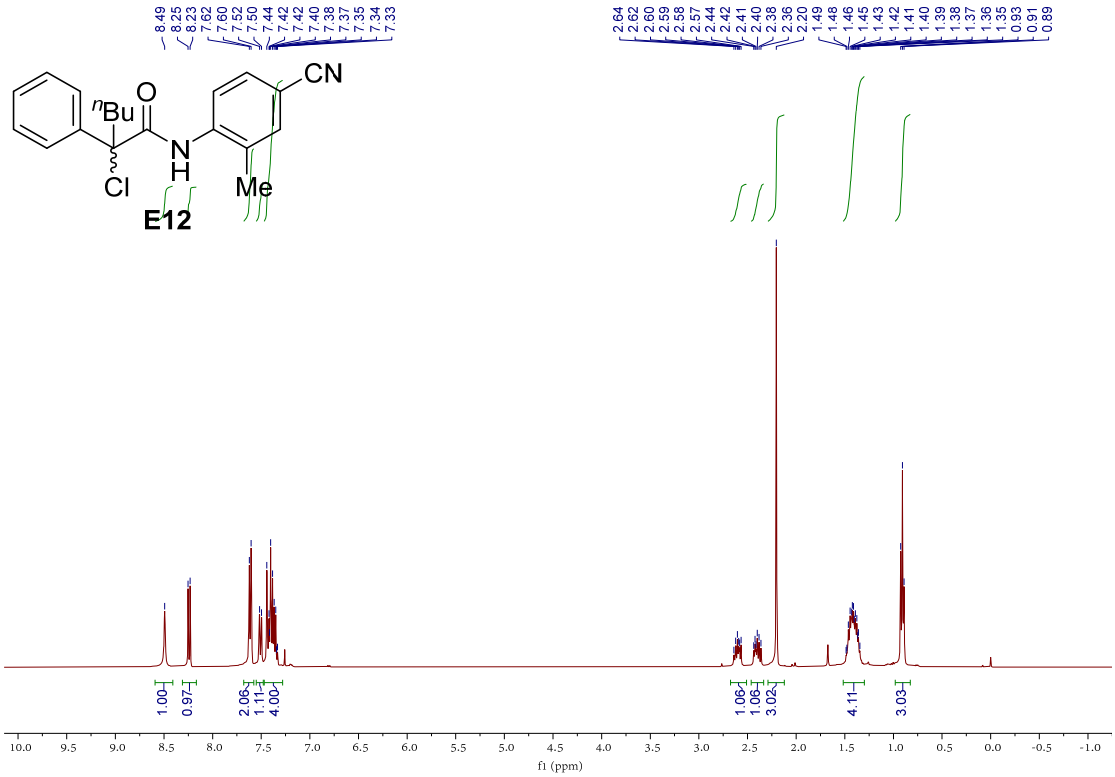
E9

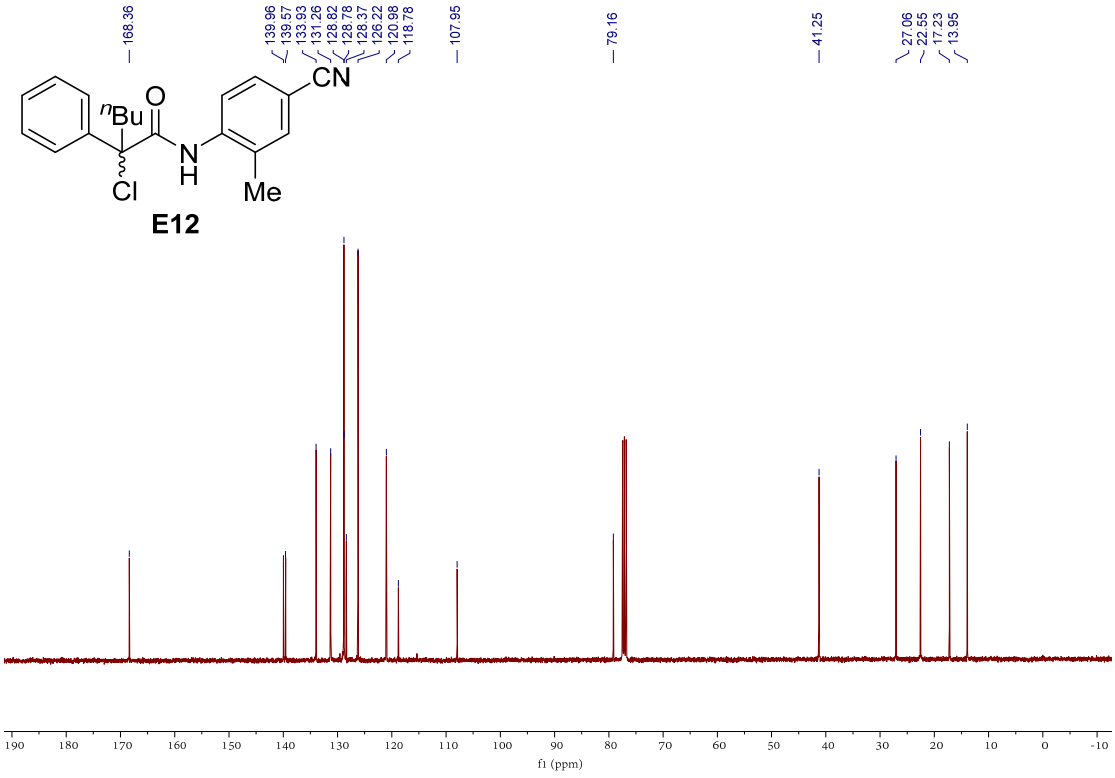

8.35
8.23
8.20
7.53
7.52
7.51
7.50
7.45
6.76
6.76
6.44
6.44
6.43
3.80
2.65
2.63
2.61
2.60
2.58
2.56
2.47
2.45
2.43
2.41
2.39
2.38
2.20
1.06
1.04
1.02
OMe
MeO
Et
O
N
H
Cl
CN
Me
E10
1.00
1.02
1.05
0.99
2.03
1.06
6.00
1.09
1.12
3.20
3.14
f1 (ppm)

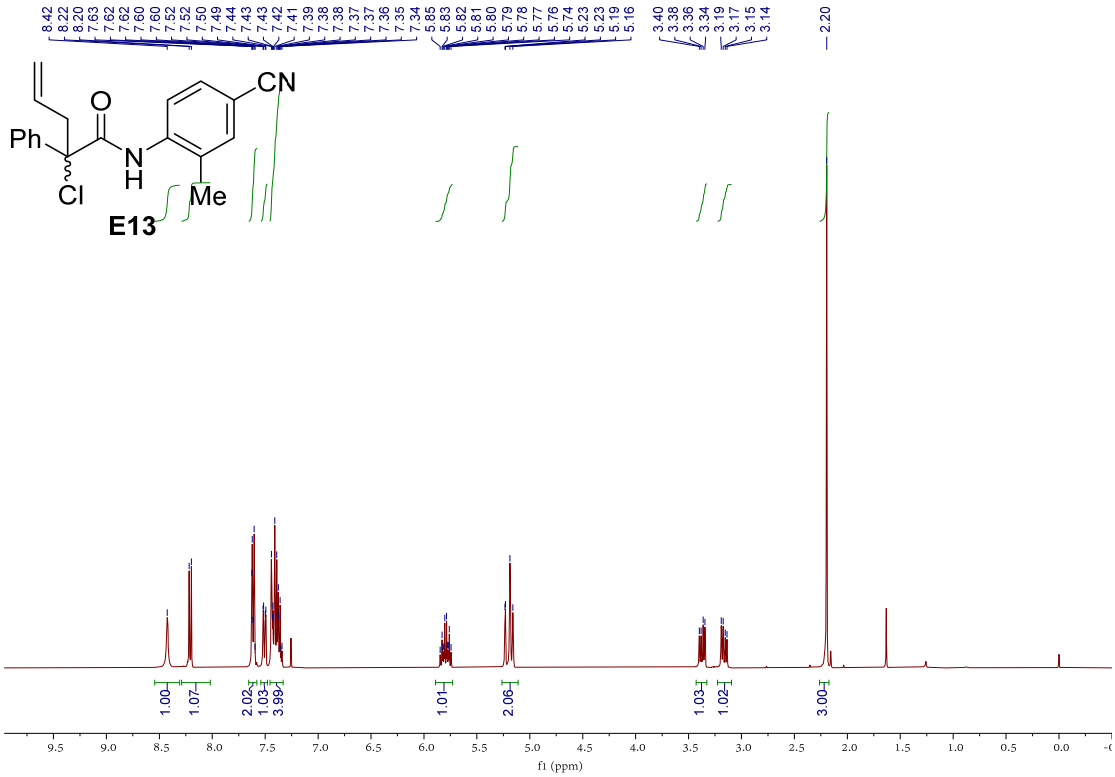

168.13
160.98
141.69
139.58
133.92
131.26
128.35
121.01
118.81
107.90
104.92
99.93
79.42
55.49
34.45
17.22
9.27
OMe
MeO
Et
O
N
H
Cl
CN
Me
E10
f1 (ppm)

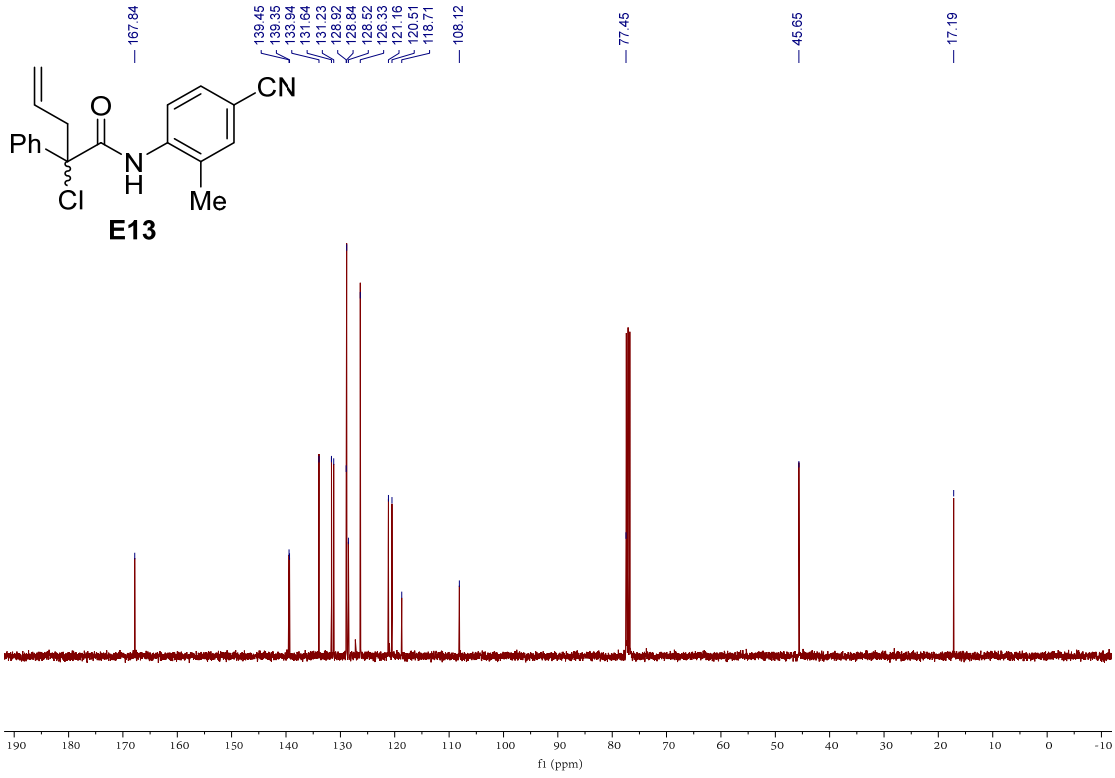

8.49 8.23 8.21 7.62 7.62 7.62 7.61 7.60 7.60 7.59 7.50 7.50 7.48 7.47 7.43 7.42 7.42 7.41 7.41 7.40 7.39 7.38 7.38 7.37 7.36 7.36 7.36 7.35 7.34 7.33 7.32 2.62 2.60 2.58 2.58 2.57 2.56 2.54 2.41 2.40 2.39 2.38 2.37 2.36 2.34 2.19 1.54 1.52 1.50 1.48 1.46 1.44 0.99 0.97 0.95
nPr
O
N
H
Cl
Me
CN
E11
1.00
1.02
2.07
1.08
4.19
1.05
1.09
3.13
2.11
3.19
f1 (ppm)

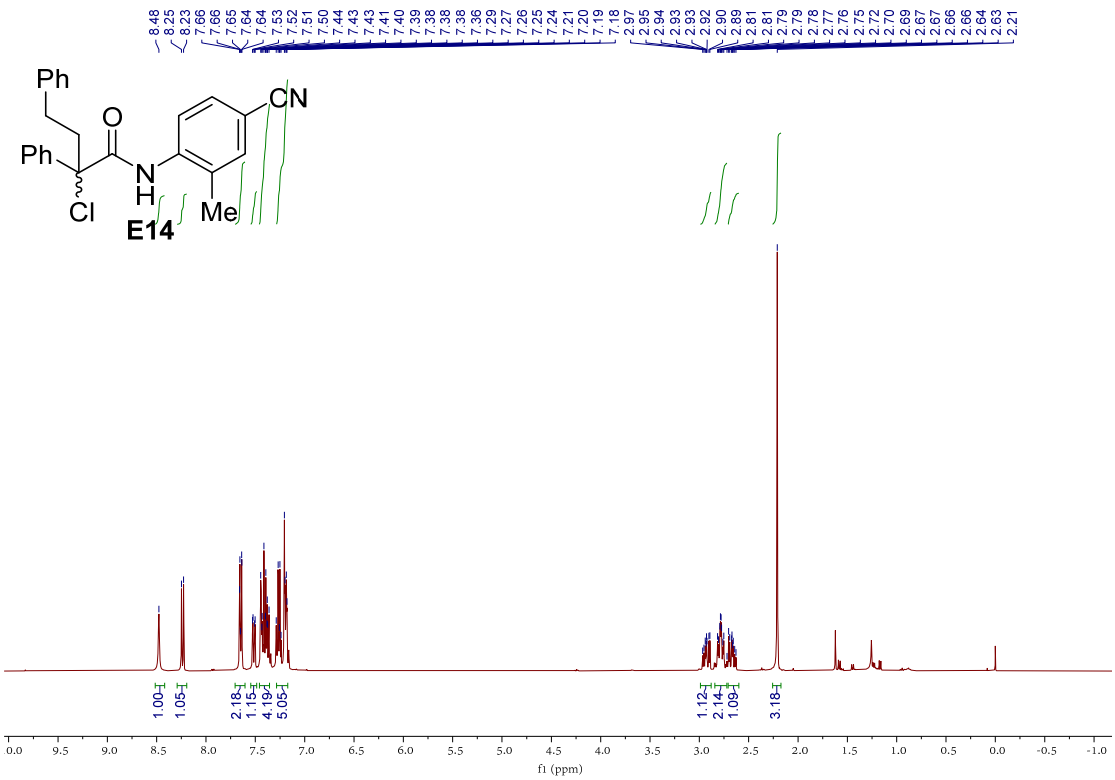

168.35
139.97
139.57
133.93
131.21
128.81
128.78
128.51
126.22
121.08
118.77
107.97
79.02
43.52
18.37
17.22
13.92
nPr
O
N
H
Cl
Me
CN
E11
f1 (ppm)

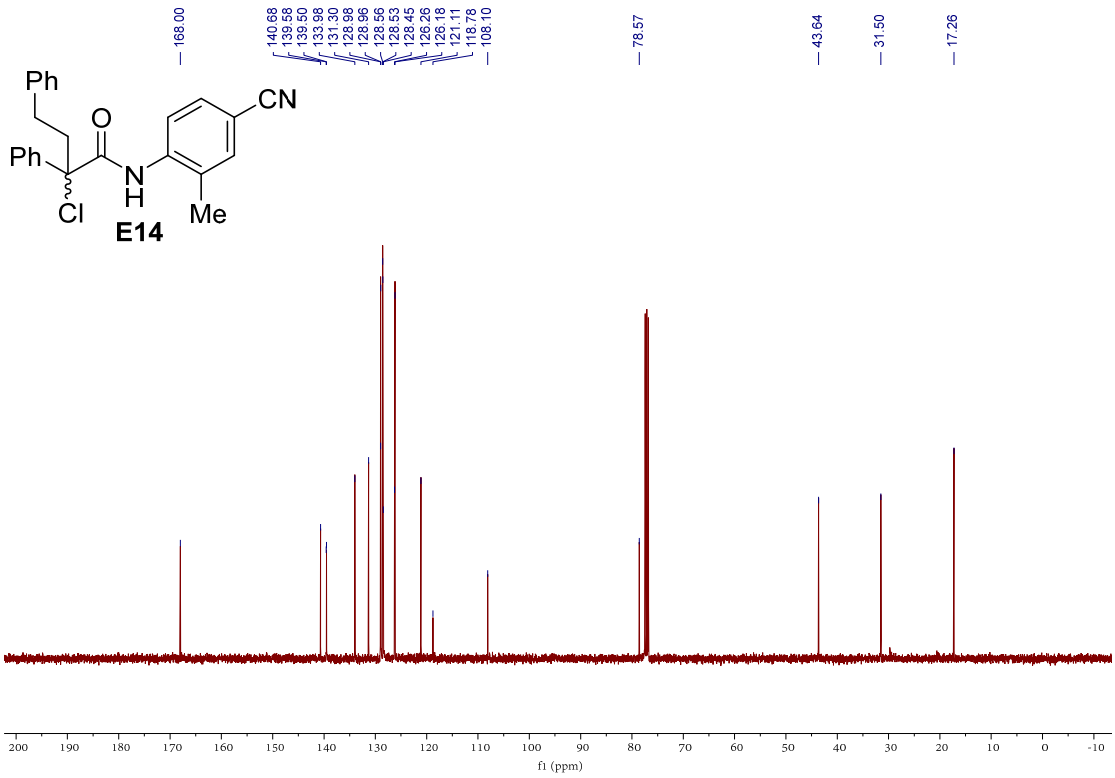

8.49
8.25
8.23
7.62
7.60
7.52
7.50
7.44
7.42
7.42
7.40
7.38
7.37
7.35
7.34
7.33
2.64
2.62
2.60
2.59
2.58
2.57
2.44
2.42
2.41
2.40
2.38
2.36
2.20
1.49
1.48
1.46
1.45
1.43
1.42
1.41
1.40
1.39
1.38
1.37
1.36
1.35
0.93
0.91
0.89
nBu
O
N
H
Cl
CN
Me
E12
1.00
0.97
2.06
1.11
4.00
1.06
1.06
3.02
4.11
3.03
f1 (ppm)

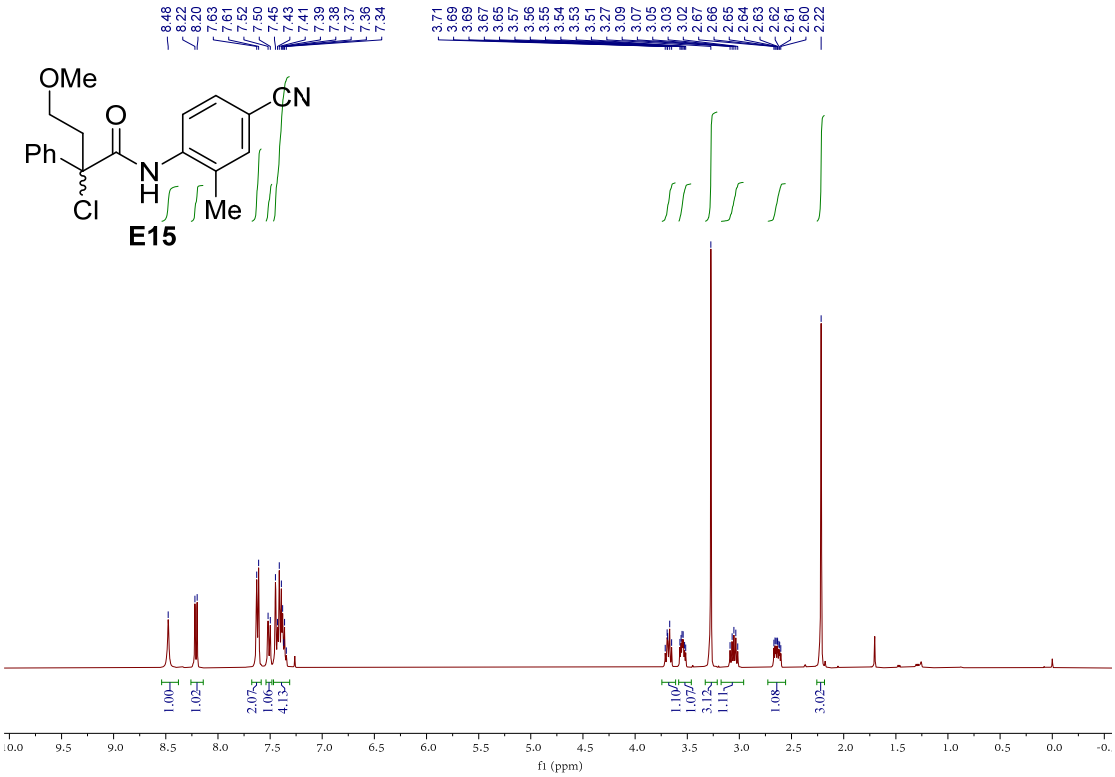

168.36
139.96
139.57
133.93
131.26
128.82
128.78
128.37
126.22
120.98
118.78
107.95
79.16
41.25
27.06
22.55
17.23
13.95
nBu
O
N
H
Cl
CN
Me
E12
f1 (ppm)

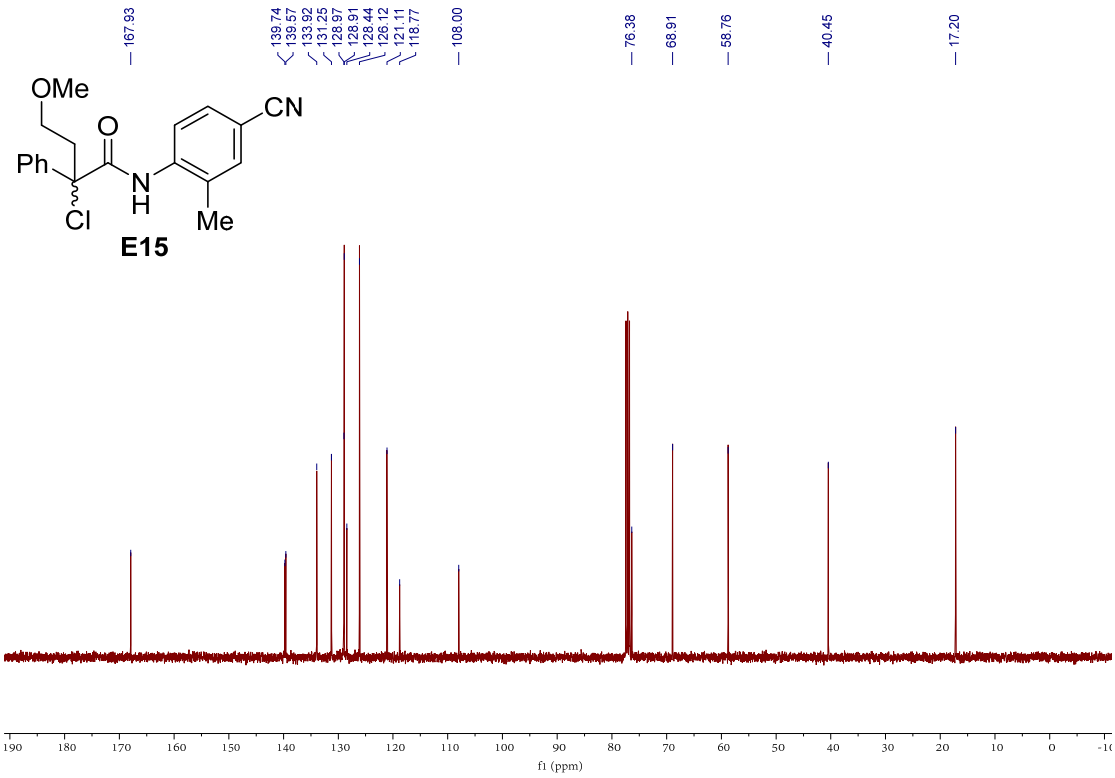

8.42 8.22 8.20 7.63 7.62 7.62 7.60 7.60 7.52 7.52 7.50 7.49 7.44 7.43 7.43 7.42 7.41 7.39 7.38 7.38 7.37 7.37 7.36 7.35 7.34 5.85 5.83 5.82 5.81 5.80 5.79 5.78 5.77 5.76 5.74 5.23 5.23 5.19 5.16 3.40 3.38 3.36 3.34 3.19 3.17 3.15 3.14 2.20
O
Ph
N
H
Cl
Me
CN
E13
1.00 1.07 2.02 1.03 3.99 1.01 2.06 1.03 1.02 3.00
f1 (ppm)

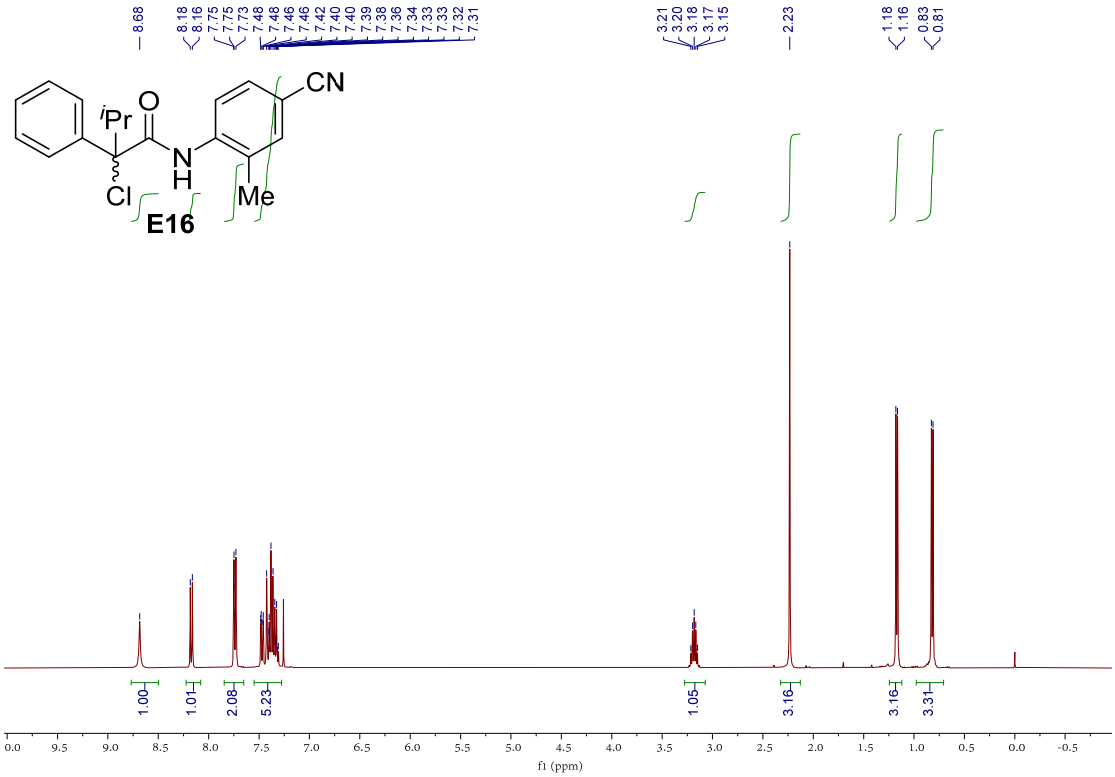

167.84 139.45 139.35 133.94 131.64 131.23 128.92 128.84 128.52 126.33 121.16 120.51 118.71 108.12 77.45 45.65 17.19
O
Ph
N
H
Cl
Me
CN
E13
f1 (ppm)

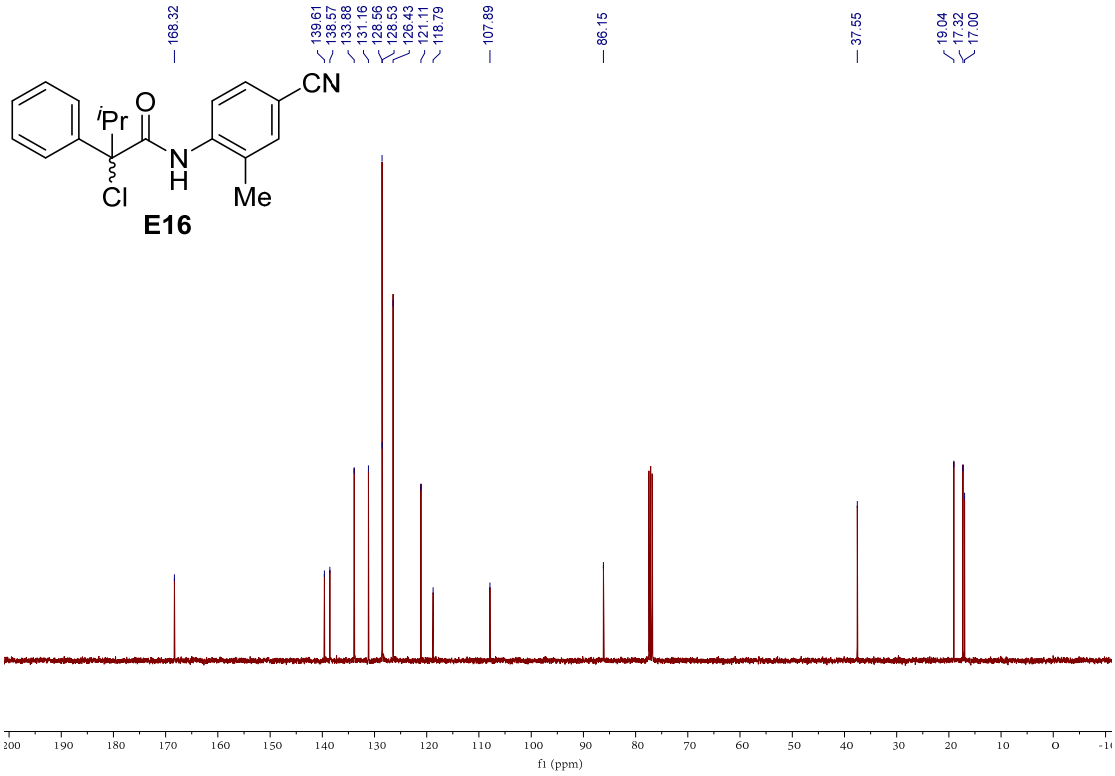

Ph
Ph
O
N
H
Cl
Me
CN
E14
f1 (ppm)

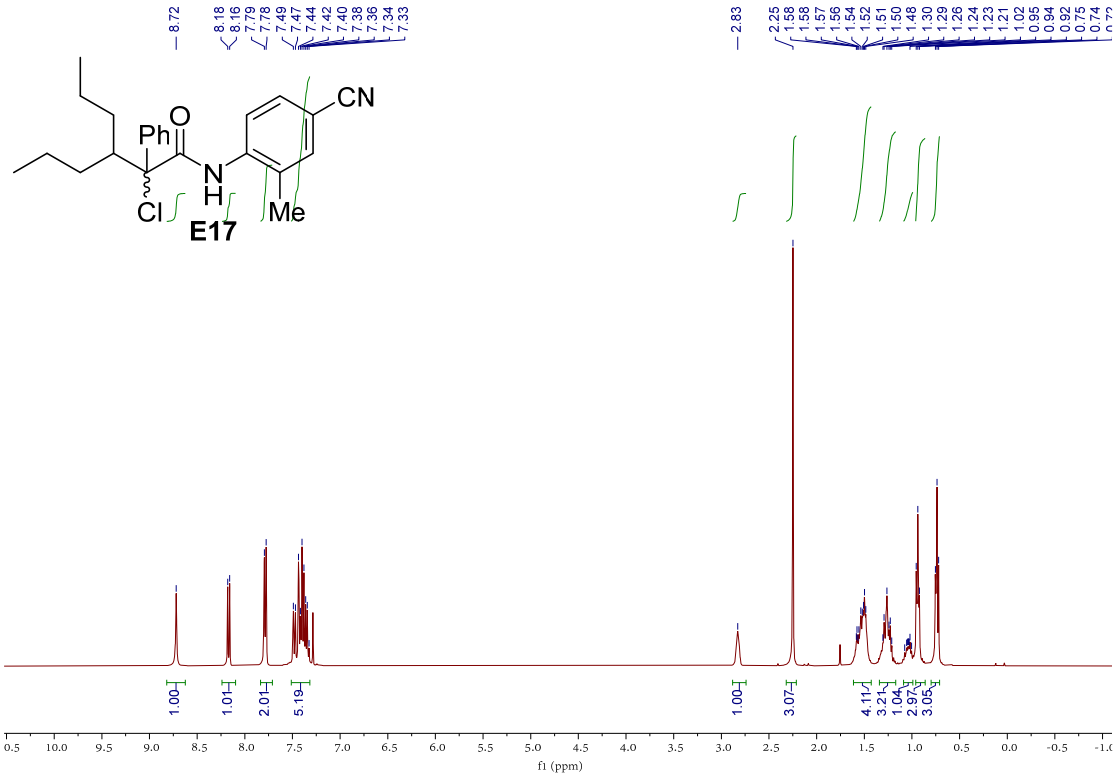

Ph
Ph
O
N
H
Cl
Me
CN
E14
f1 (ppm)

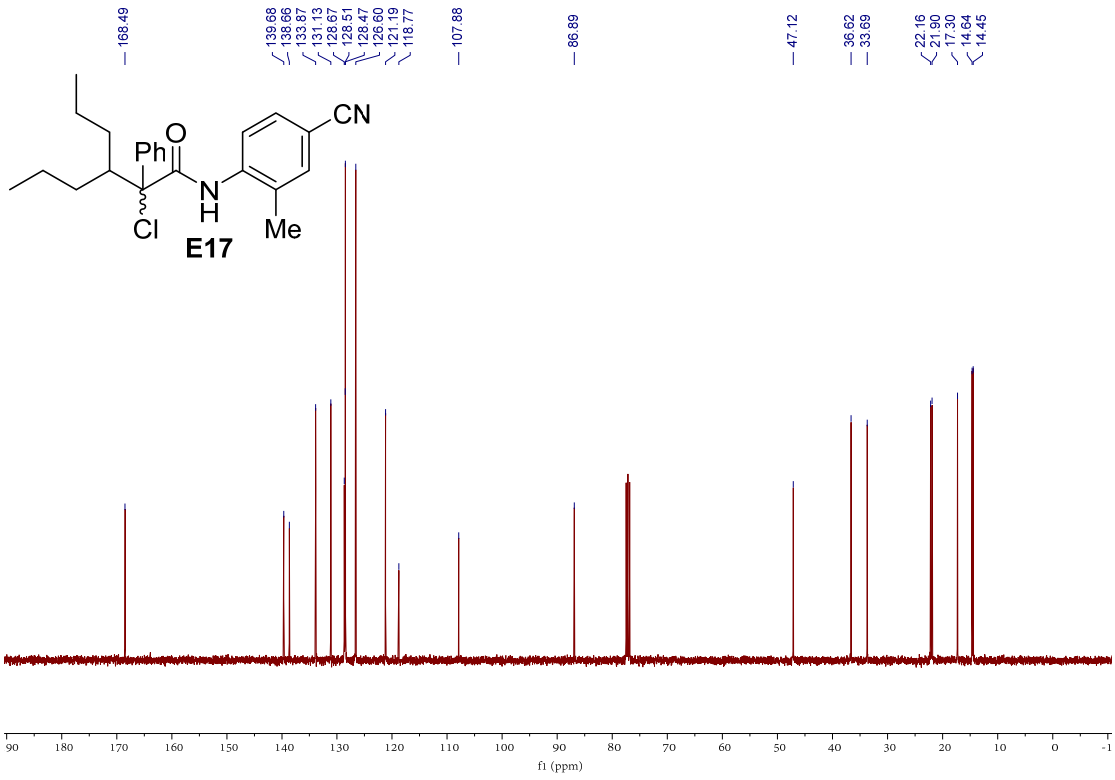

8.48
8.22
8.20
7.63
7.61
7.52
7.50
7.45
7.43
7.41
7.39
7.38
7.37
7.36
7.34
3.71
3.69
3.69
3.67
3.65
3.57
3.56
3.55
3.54
3.53
3.51
3.27
3.09
3.07
3.05
3.03
3.02
2.67
2.66
2.65
2.64
2.63
2.62
2.61
2.60
2.22
OMe
O
CN
Ph
N
H
Cl
Me
E15
1.00
1.02
2.07
1.06
4.13
1.10
1.07
3.12
1.11
1.08
3.02
f1 (ppm)

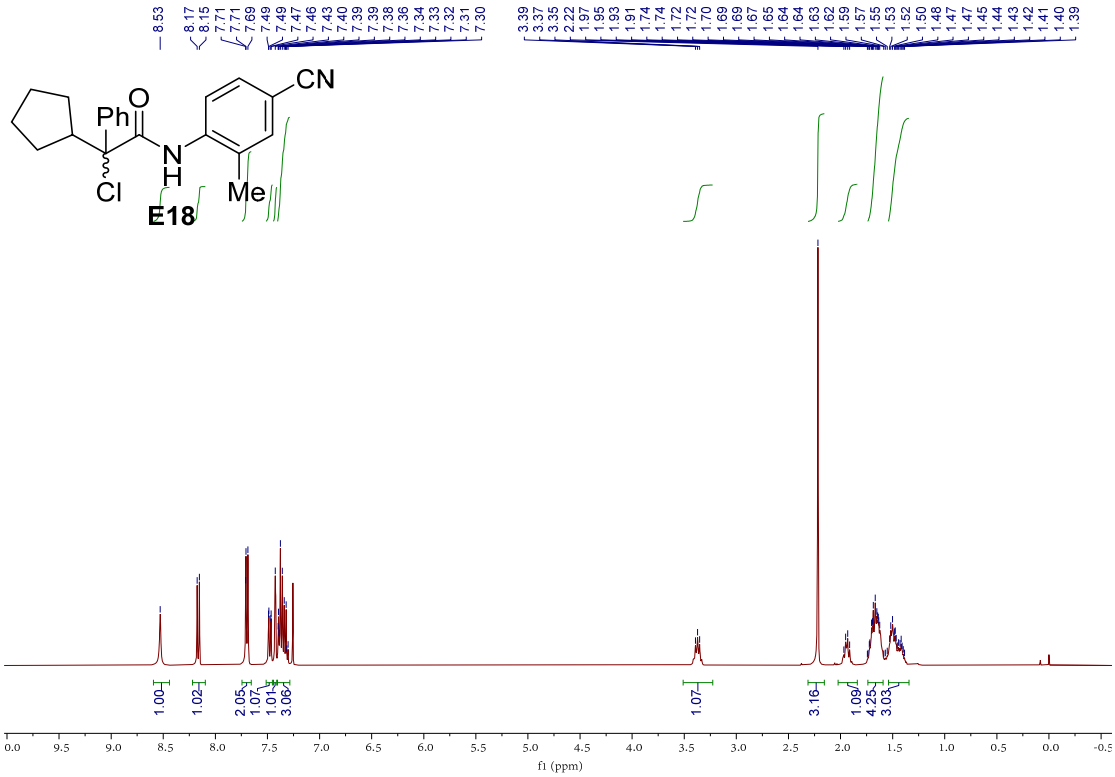

167.93
139.74
139.57
133.92
131.25
128.97
128.91
128.44
126.12
121.11
118.77
108.00
76.38
68.91
58.76
40.45
17.20
OMe
O
CN
Ph
N
H
Cl
Me
E15
f1 (ppm)

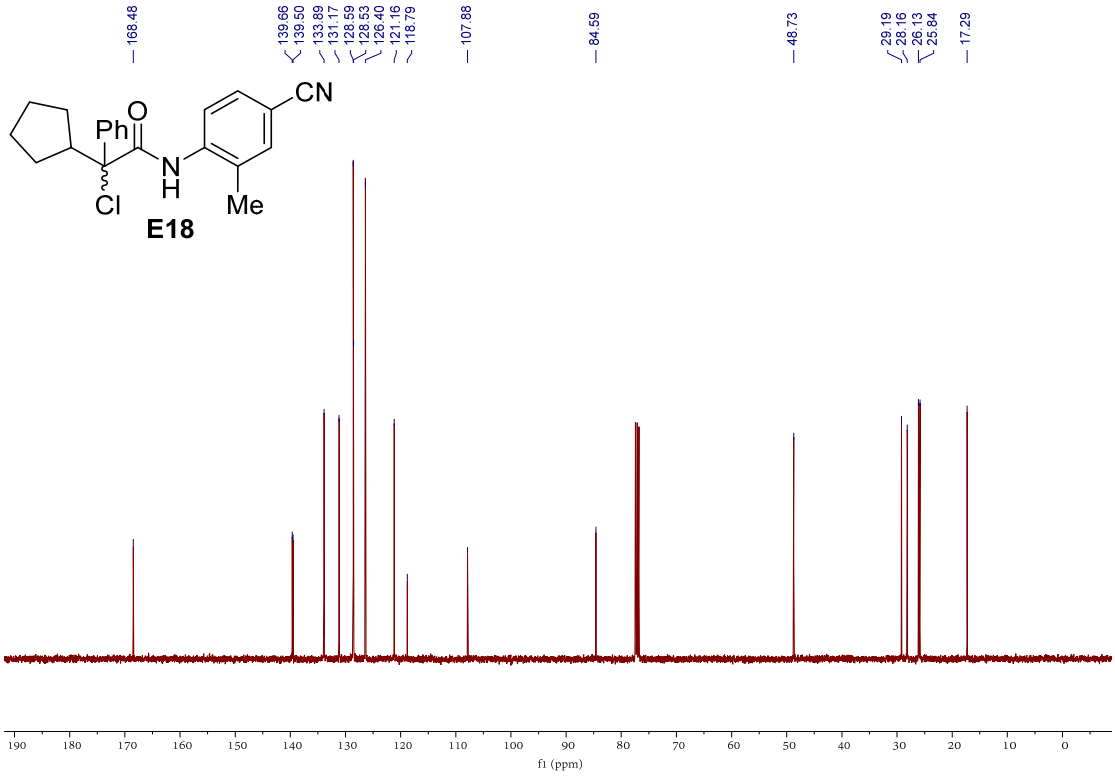

8.68
8.18
8.16
7.75
7.75
7.73
7.48
7.48
7.46
7.46
7.42
7.40
7.40
7.39
7.38
7.36
7.34
7.33
7.33
7.32
7.31
3.21
3.20
3.18
3.17
3.15
2.23
1.18
1.16
0.83
0.81
CN
iPr
O
N
H
Cl
Me
E16
1.00
1.01
2.08
5.23
1.05
3.16
3.16
3.31
f1 (ppm)

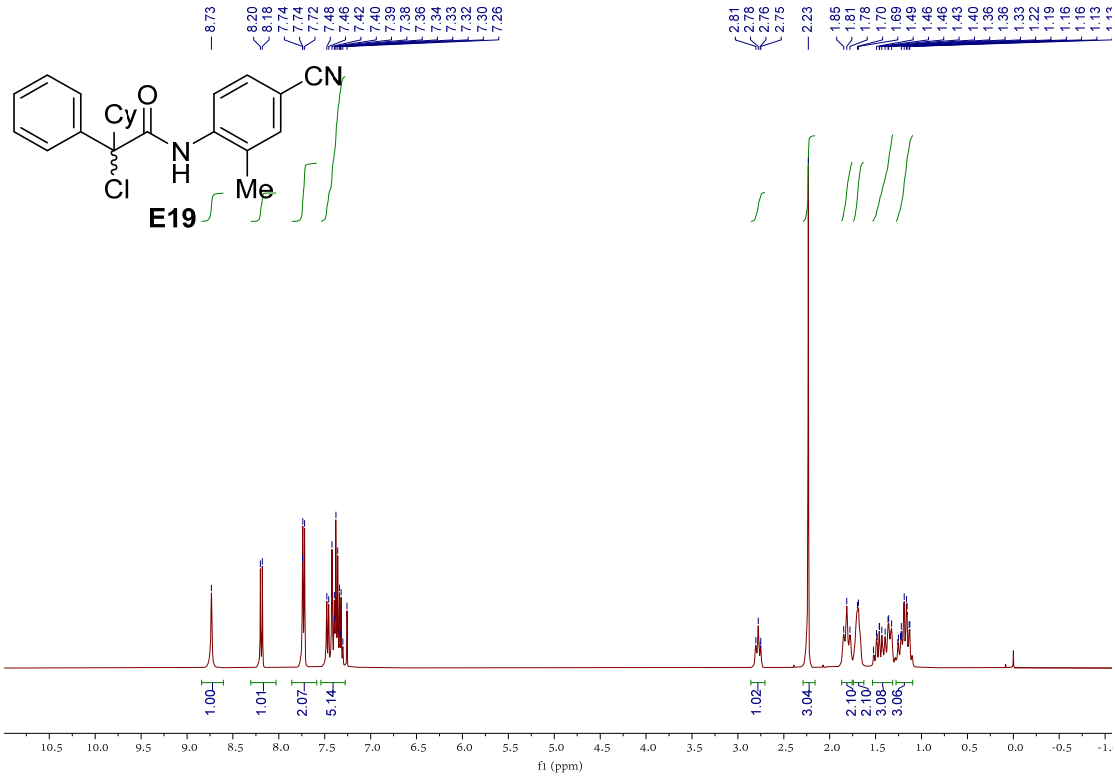

168.32
139.61
138.57
133.88
131.16
128.56
128.53
126.43
121.11
118.79
107.89
86.15
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iPr
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N
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Cl
Me
E16
f1 (ppm)

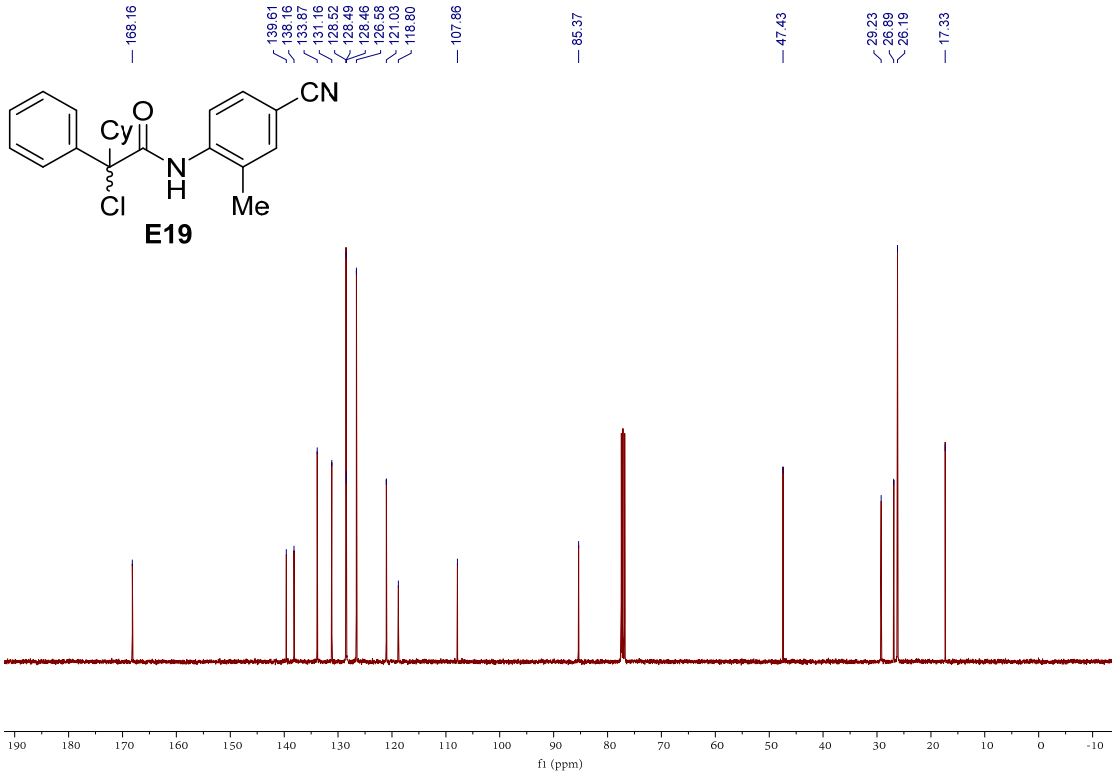

8.72
8.18
8.16
7.79
7.78
7.49
7.47
7.44
7.42
7.40
7.38
7.36
7.34
7.33
2.83
2.25
1.58
1.58
1.57
1.56
1.54
1.52
1.51
1.50
1.48
1.30
1.29
1.26
1.24
1.23
1.21
1.02
0.95
0.94
0.92
0.75
0.74
O
Ph
N
H
Cl
Me
CN
E17
1.00
1.01
2.01
5.19
1.00
3.07
4.11
3.21
1.04
2.97
3.05
f1 (ppm)

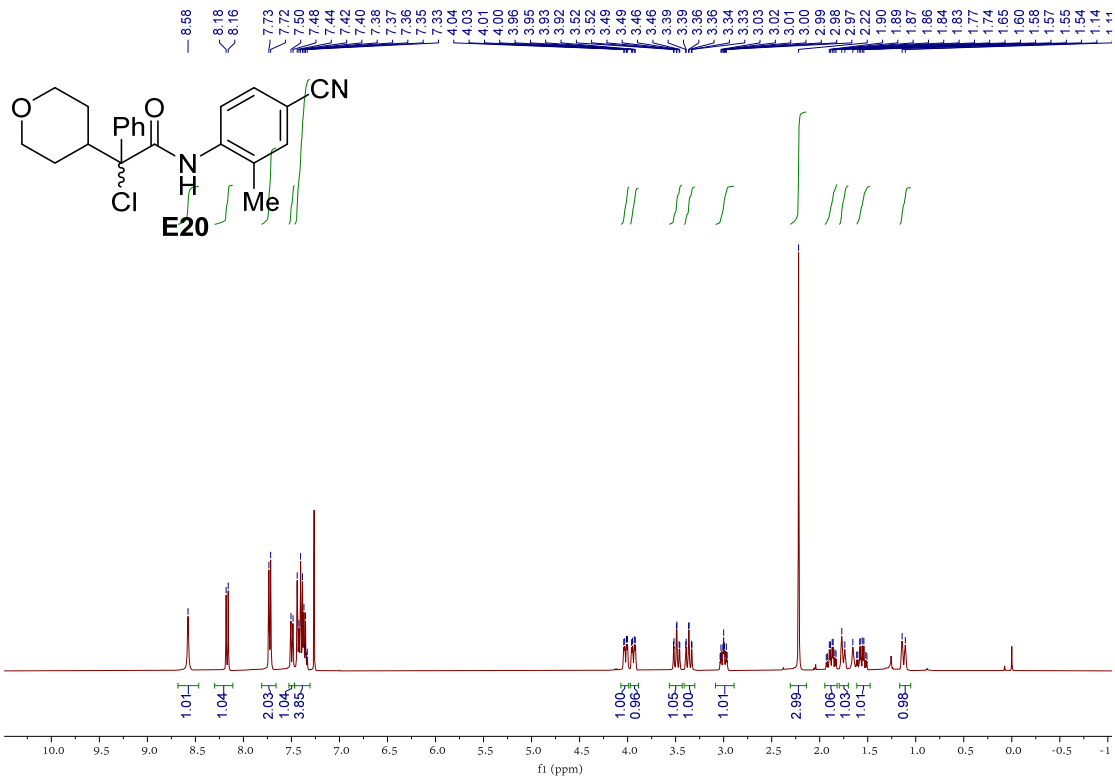

168.49
139.68
138.66
133.87
131.13
128.67
128.51
128.47
126.60
121.19
118.77
107.88
86.89
47.12
36.62
33.69
22.16
21.90
17.30
14.64
14.45
O
Ph
N
H
Cl
Me
CN
E17
f1 (ppm)

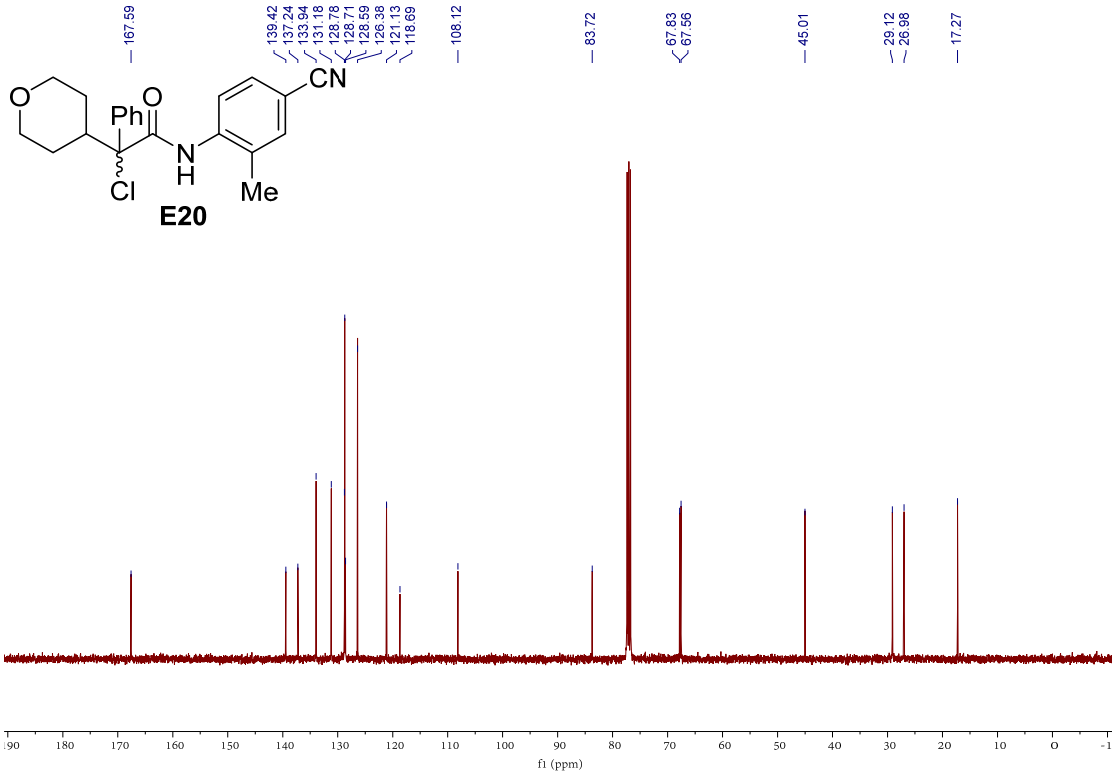

8.53
8.17
8.15
7.71
7.71
7.69
7.49
7.47
7.46
7.43
7.40
7.39
7.39
7.38
7.36
7.34
7.33
7.32
7.31
7.30
3.39
3.37
3.35
2.22
1.97
1.95
1.93
1.91
1.74
1.74
1.72
1.72
1.70
1.69
1.69
1.67
1.65
1.64
1.64
1.63
1.62
1.59
1.57
1.55
1.53
1.52
1.50
1.48
1.47
1.47
1.45
1.44
1.43
1.42
1.41
1.40
1.39
Ph
O
N
H
Cl
Me
CN
E18
1.00
1.02
2.05
1.07
1.01
3.06
1.07
3.16
1.09
4.25
3.03
f1 (ppm)

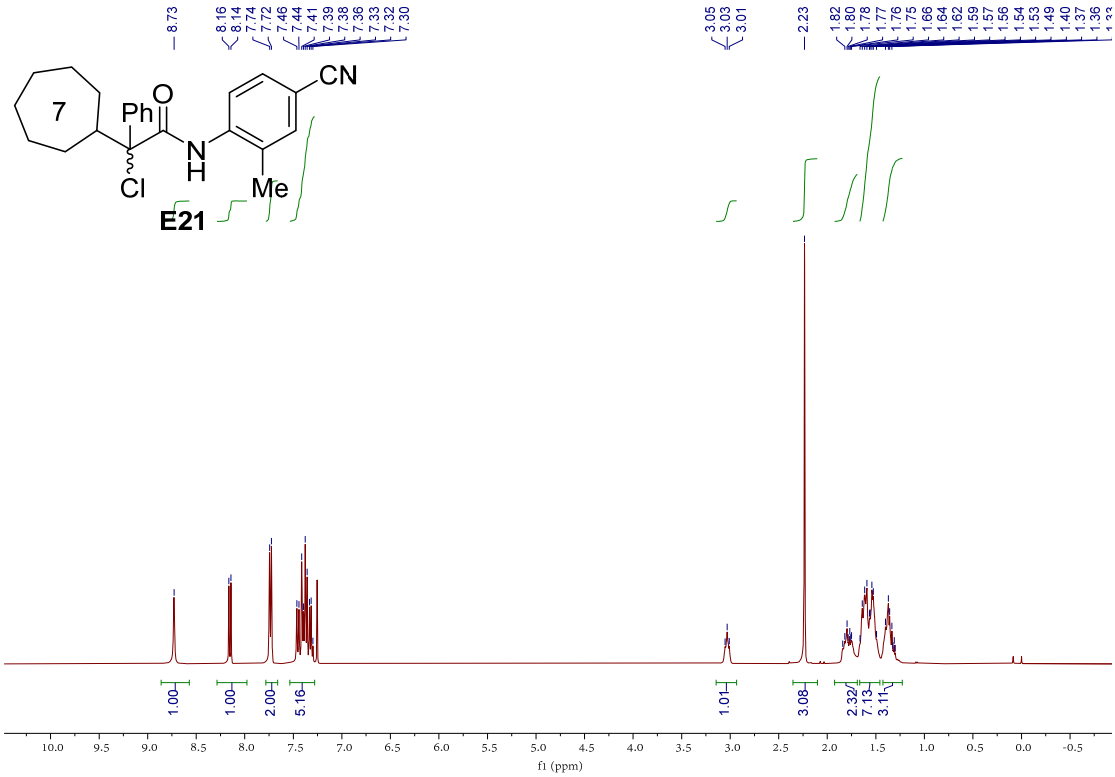

168.48
139.66
139.50
133.89
131.17
128.59
128.53
126.40
121.16
118.79
107.88
84.59
48.73
29.19
28.16
26.13
25.84
17.29
Ph
O
N
H
Cl
Me
CN
E18
f1 (ppm)

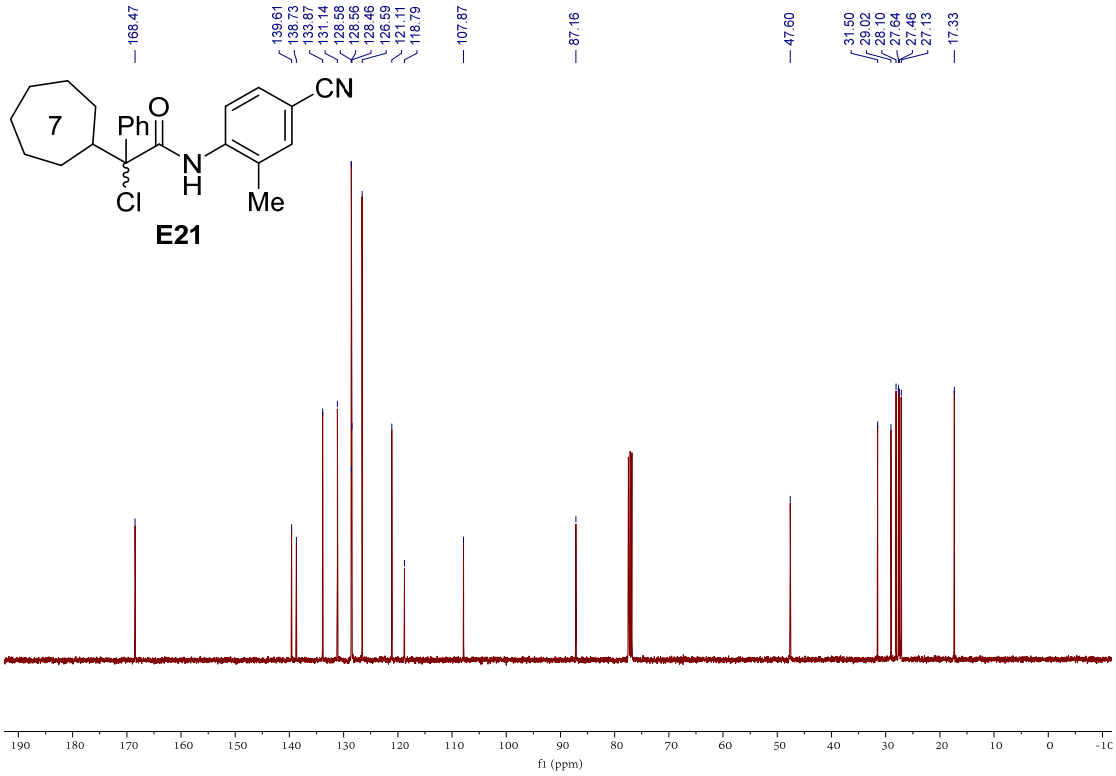

8.73
8.20
8.18
7.74
7.74
7.72
7.48
7.46
7.42
7.40
7.39
7.38
7.36
7.34
7.33
7.32
7.30
7.26
2.81
2.78
2.76
2.75
2.23
1.85
1.81
1.78
1.70
1.69
1.49
1.46
1.46
1.43
1.40
1.36
1.36
1.33
1.22
1.19
1.16
1.16
1.13
Cy
O
N
H
Cl
Me
CN
E19
1.00
1.01
2.07
5.14
1.02
3.04
2.10
2.10
3.08
3.06
f1 (ppm)

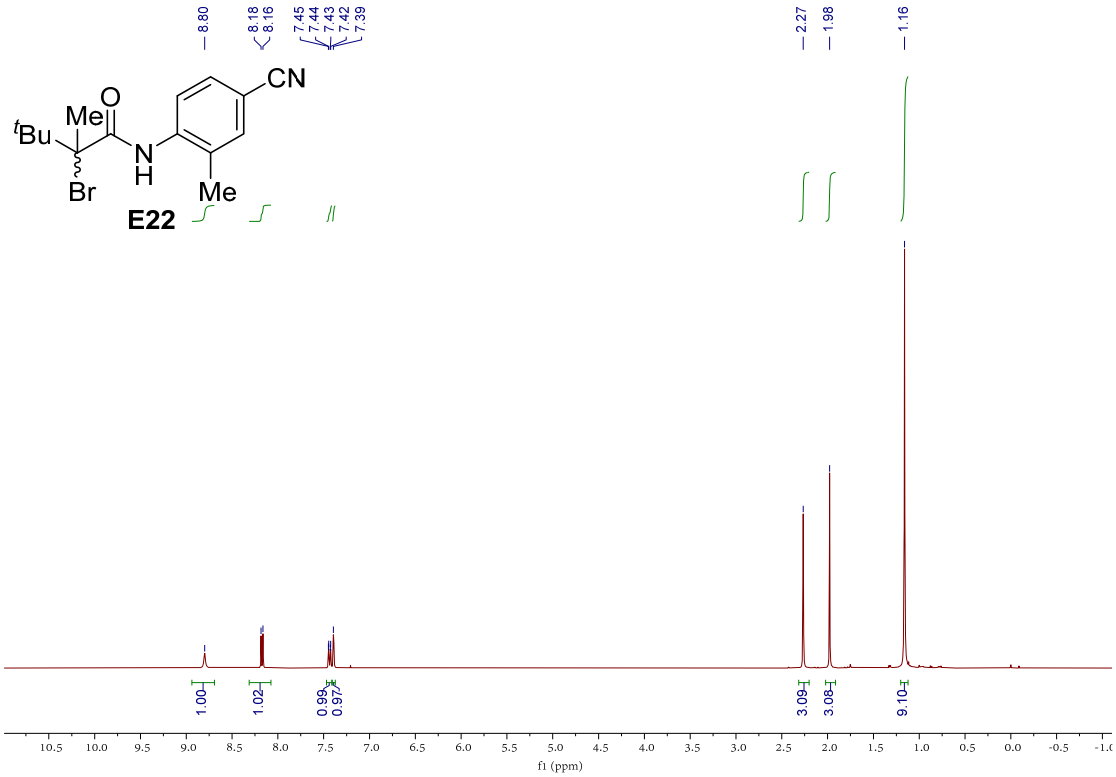

168.16
139.61
138.16
133.87
131.16
128.52
128.49
128.46
126.58
121.03
118.80
107.86
85.37
47.43
29.23
26.89
26.19
17.33
Cy
O
N
H
Cl
Me
CN
E19
f1 (ppm)

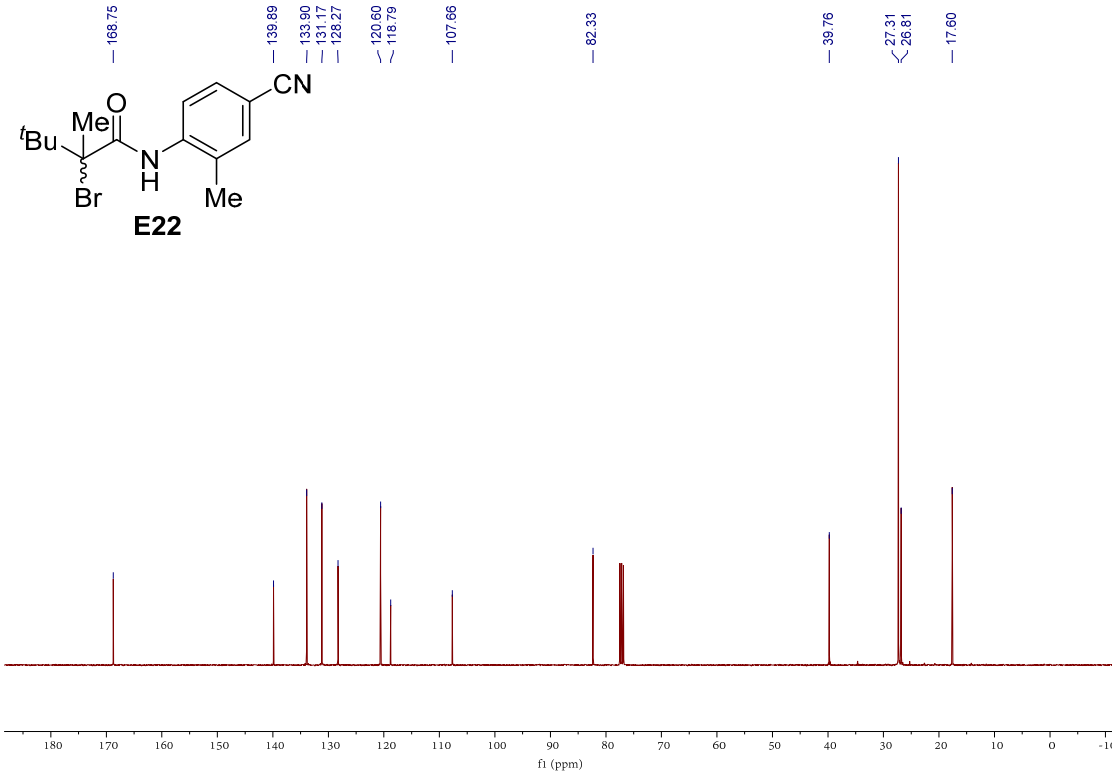

8.58
8.18
8.16
7.73
7.72
7.50
7.48
7.44
7.42
7.40
7.38
7.37
7.36
7.35
7.33
4.04
4.03
4.01
4.00
3.96
3.95
3.93
3.92
3.52
3.52
3.49
3.49
3.46
3.46
3.39
3.39
3.36
3.36
3.34
3.33
3.03
3.02
3.01
3.00
2.99
2.98
2.97
2.22
1.90
1.89
1.87
1.86
1.84
1.83
1.77
1.74
1.65
1.60
1.58
1.57
1.55
1.54
1.14
1.11
O
Ph
O
N
H
Cl
Me
CN
E20
1.01
1.04
2.03
1.04
3.85
1.00
0.96
1.05
1.00
1.01
2.99
1.06
1.03
1.01
0.98
f1 (ppm)

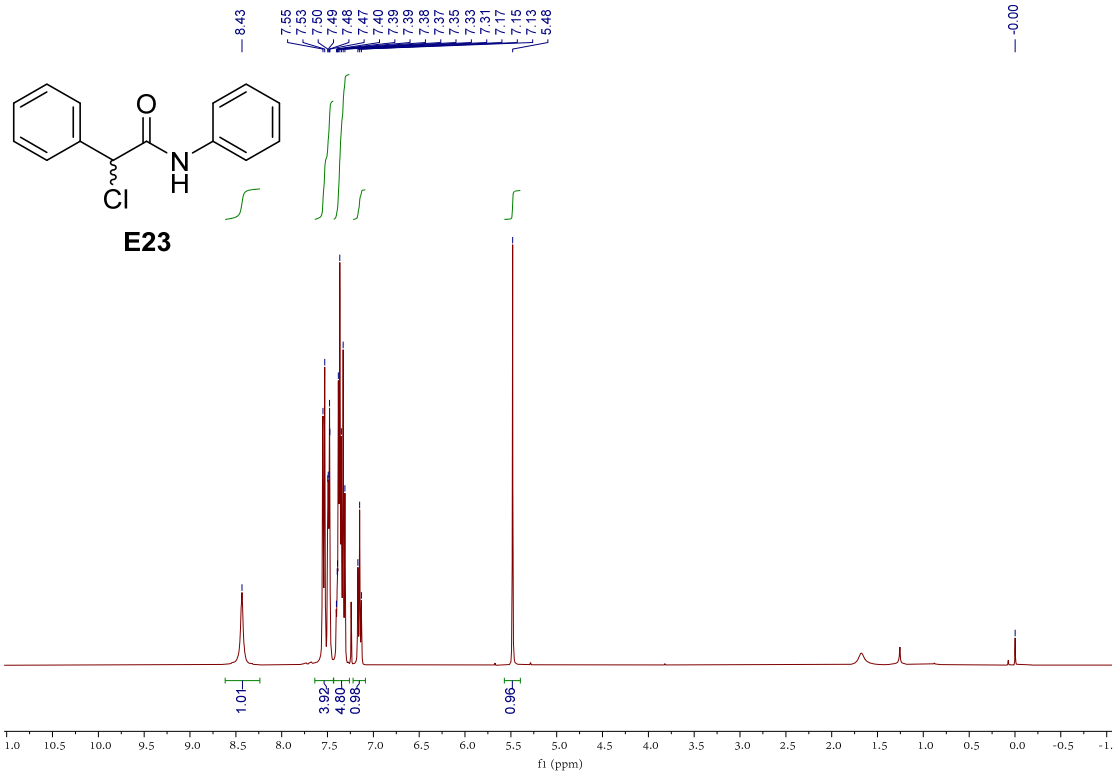

167.59
139.42
137.24
133.94
131.18
128.78
128.71
128.59
128.38
121.13
118.69
108.12
83.72
67.83
67.56
45.01
29.12
26.98
17.27
O
Ph
O
N
H
Cl
Me
CN
E20
f1 (ppm)

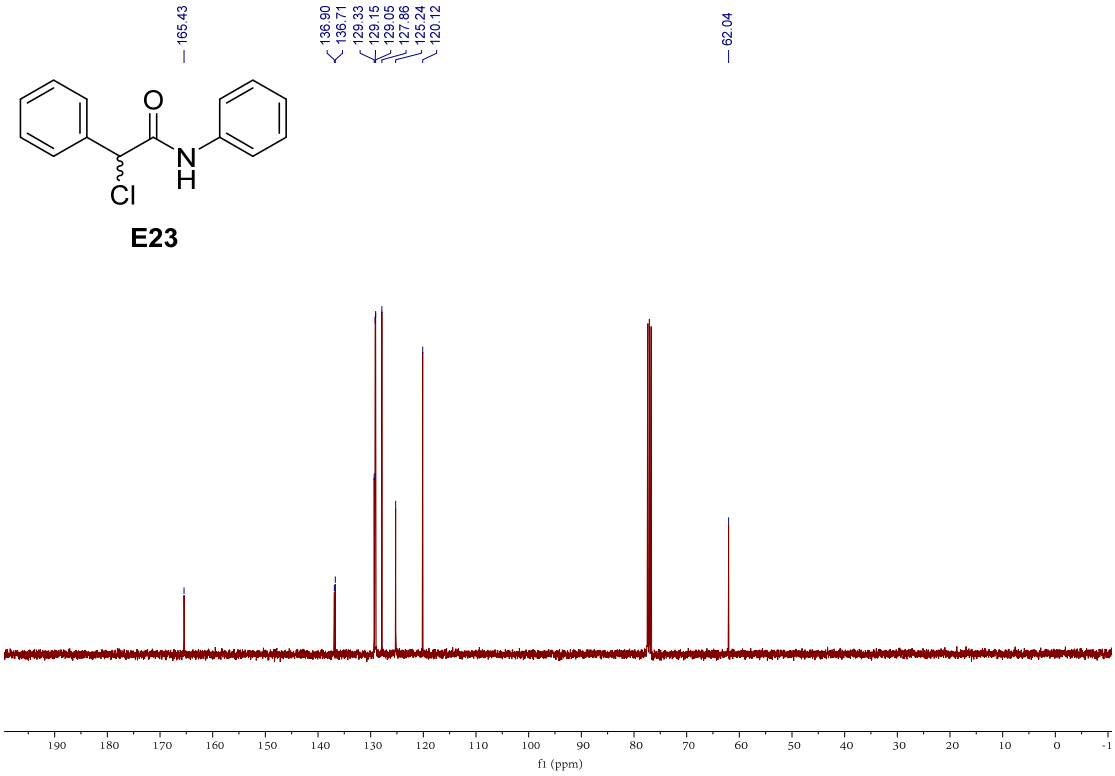

8.73
8.16
8.14
7.74
7.72
7.46
7.44
7.41
7.39
7.38
7.36
7.33
7.32
7.30
3.05
3.03
3.01
2.23
1.82
1.80
1.78
1.77
1.76
1.75
1.66
1.64
1.62
1.59
1.57
1.56
1.54
1.53
1.49
1.40
1.37
1.36
7
Ph
O
N
H
Cl
Me
CN
E21
1.00
1.00
2.00
5.16
1.01
3.08
2.32
7.13
3.11
f1 (ppm)


168.47
139.61
138.73
133.87
131.14
128.58
128.56
128.46
126.59
121.11
118.79
107.87
87.16
47.60
31.50
29.02
28.10
27.64
27.46
27.13
17.33
7
Ph
O
N
H
Cl
Me
CN
E21
f1 (ppm)


8.80
8.18
8.16
7.45
7.44
7.43
7.42
7.39
2.27
1.98
1.16
CN
Me
O
tBu
N
H
Br
Me
E22
1.00
1.02
0.99
0.97
3.09
3.08
9.10
f1 (ppm)

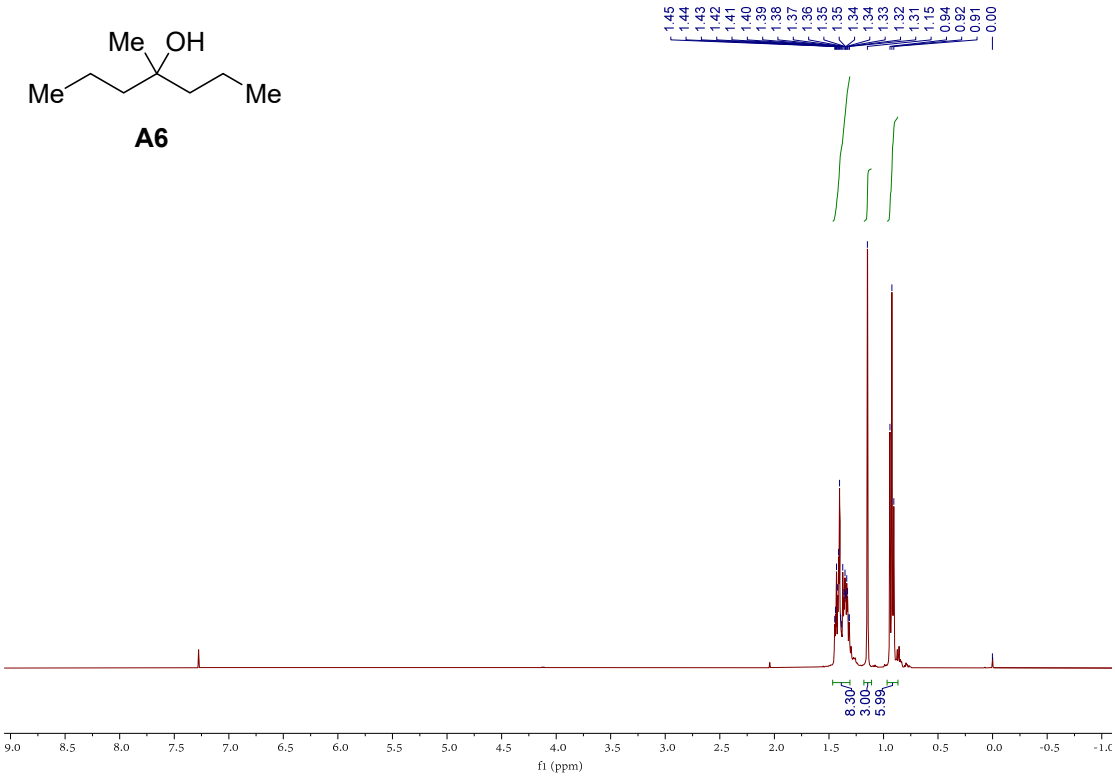

168.75
139.89
133.90
131.17
128.27
120.60
118.79
107.66
82.33
39.76
27.31
26.81
17.60
CN
Me
O
tBu
N
H
Br
Me
E22
f1 (ppm)


8.43
7.55
7.53
7.50
7.49
7.48
7.47
7.40
7.39
7.39
7.38
7.37
7.35
7.33
7.31
7.17
7.15
7.13
5.48
-0.00
O
N
H
Cl
E23
1.01
3.92
4.80
0.98
0.96
f1 (ppm)


165.43
136.90
136.71
129.33
129.15
129.05
127.86
125.24
120.12
62.04
O
N
H
Cl
E23
f1 (ppm)

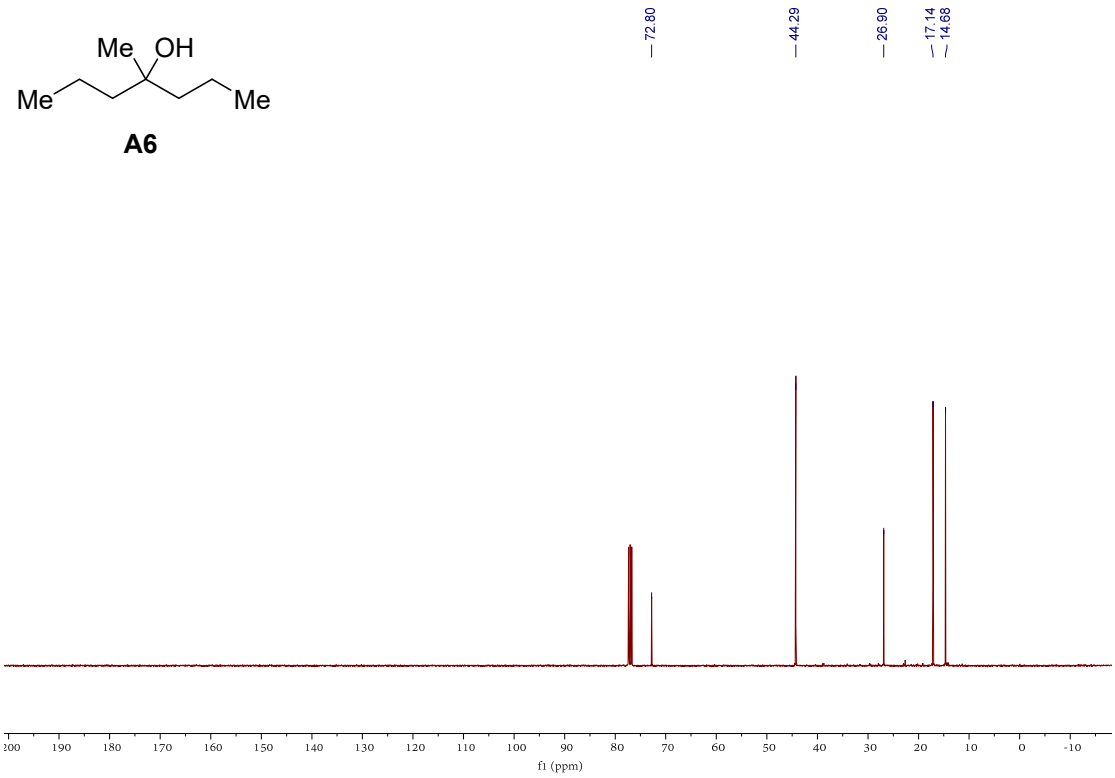
Me
OH
Me
Me

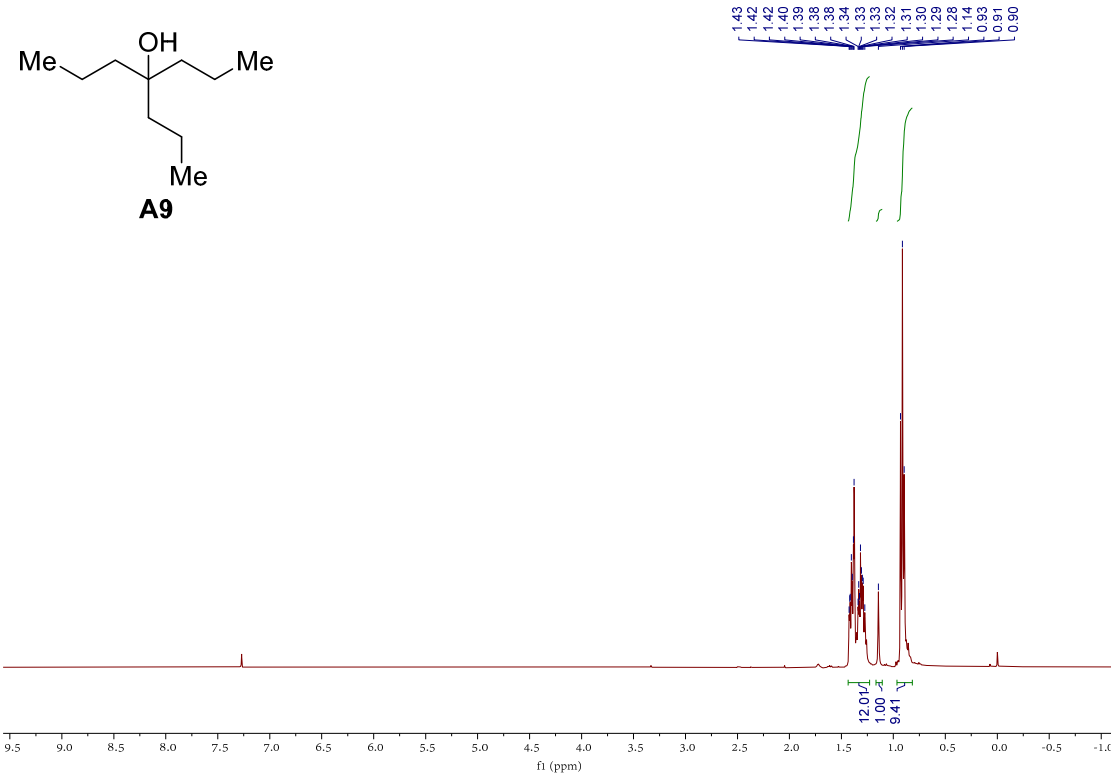
A6

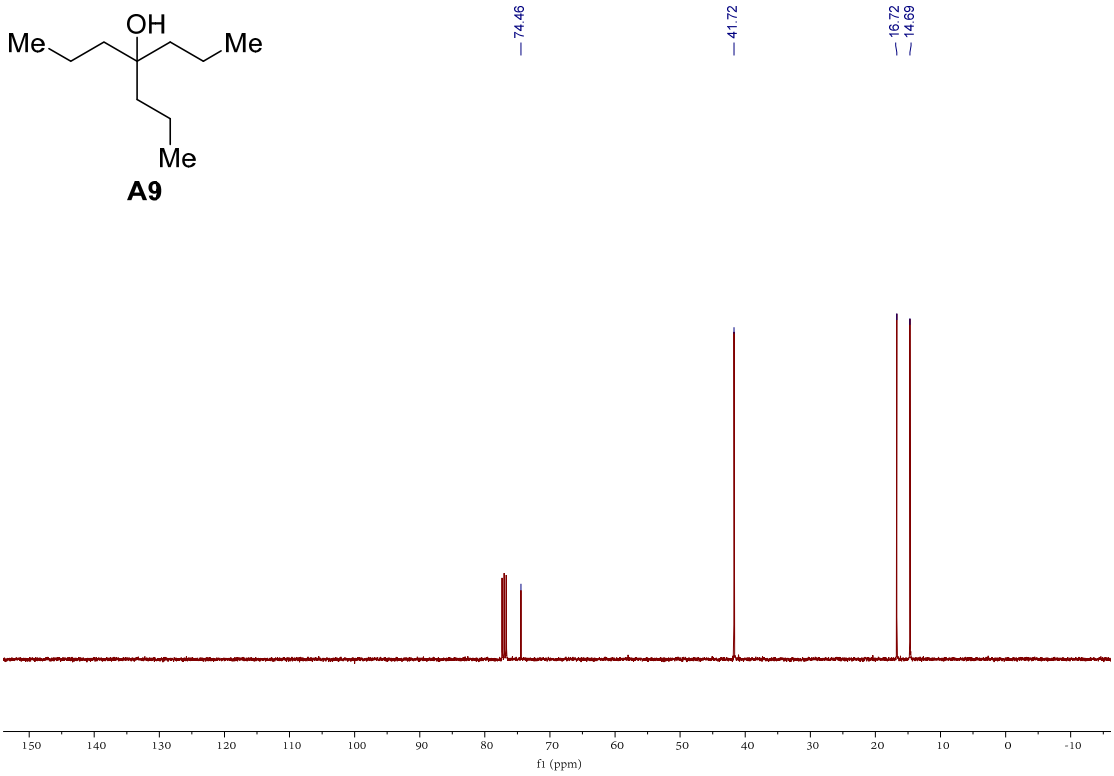

1.45
1.44
1.43
1.42
1.41
1.40
1.39
1.38
1.37
1.36
1.35
1.35
1.34
1.34
1.33
1.32
1.31
1.15
0.94
0.92
0.91
0.00
8.30
3.00
5.99
f1 (ppm)

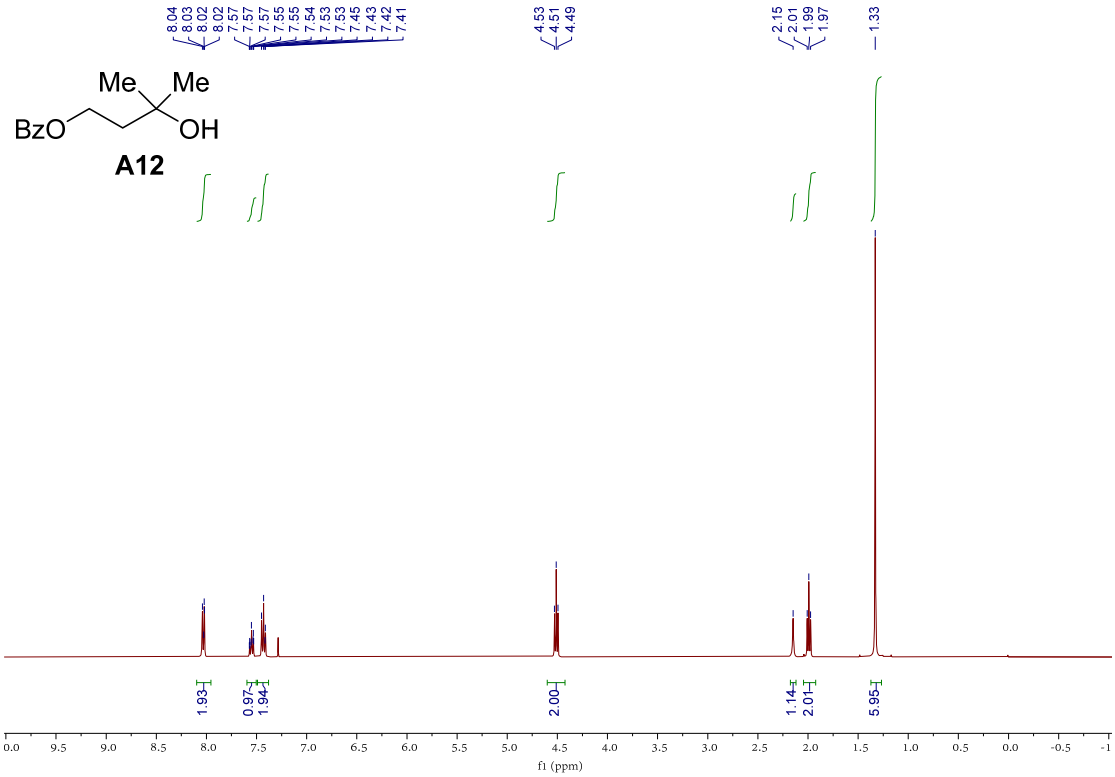
Me
OH
Me
Me

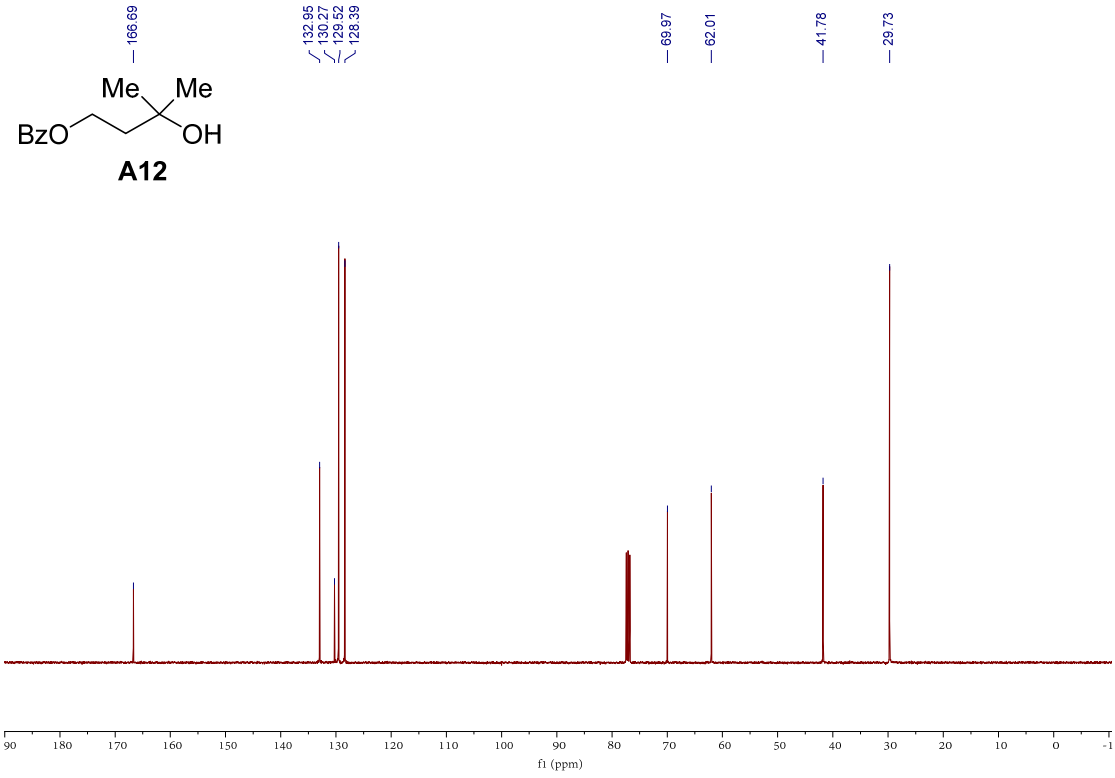
A6

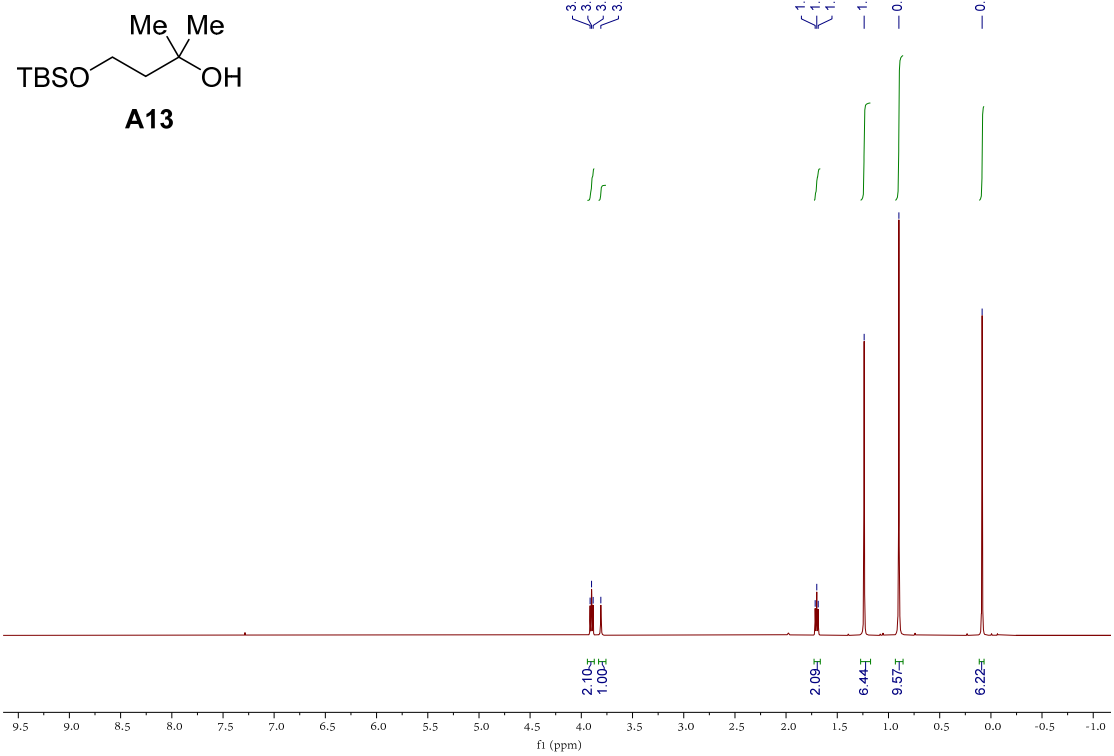

72.80
44.29
26.90
17.14
14.68
f1 (ppm)

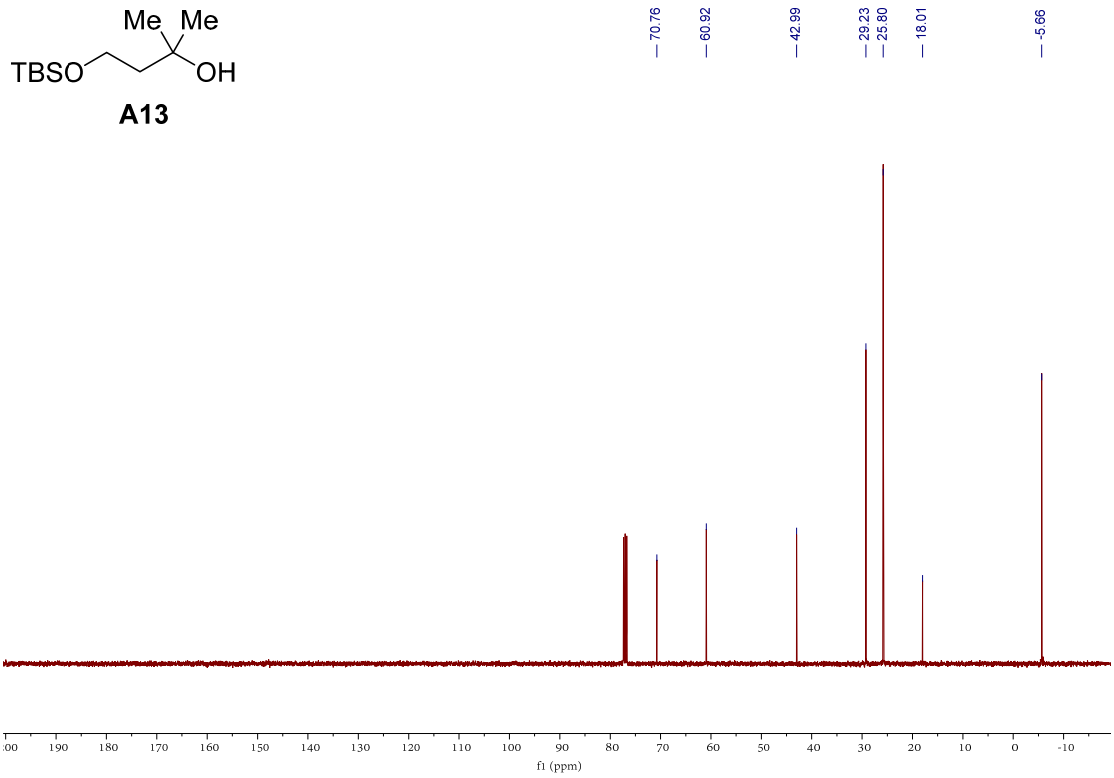

OH
Me
Me
Me
A9
1.43
1.42
1.42
1.40
1.39
1.38
1.38
1.34
1.33
1.33
1.32
1.31
1.30
1.29
1.28
1.14
0.93
0.91
0.90
12.01
1.00
9.41
f1 (ppm)

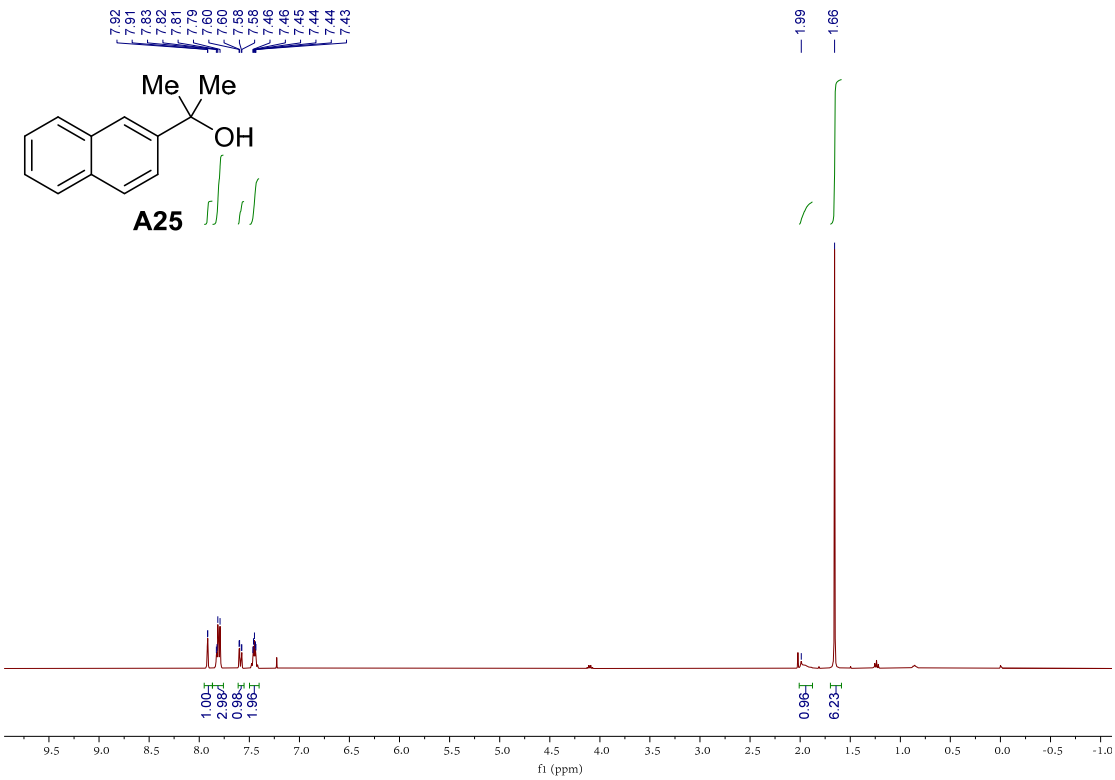

OH
Me
Me
Me
A9
74.46
41.72
16.72
14.69
f1 (ppm)

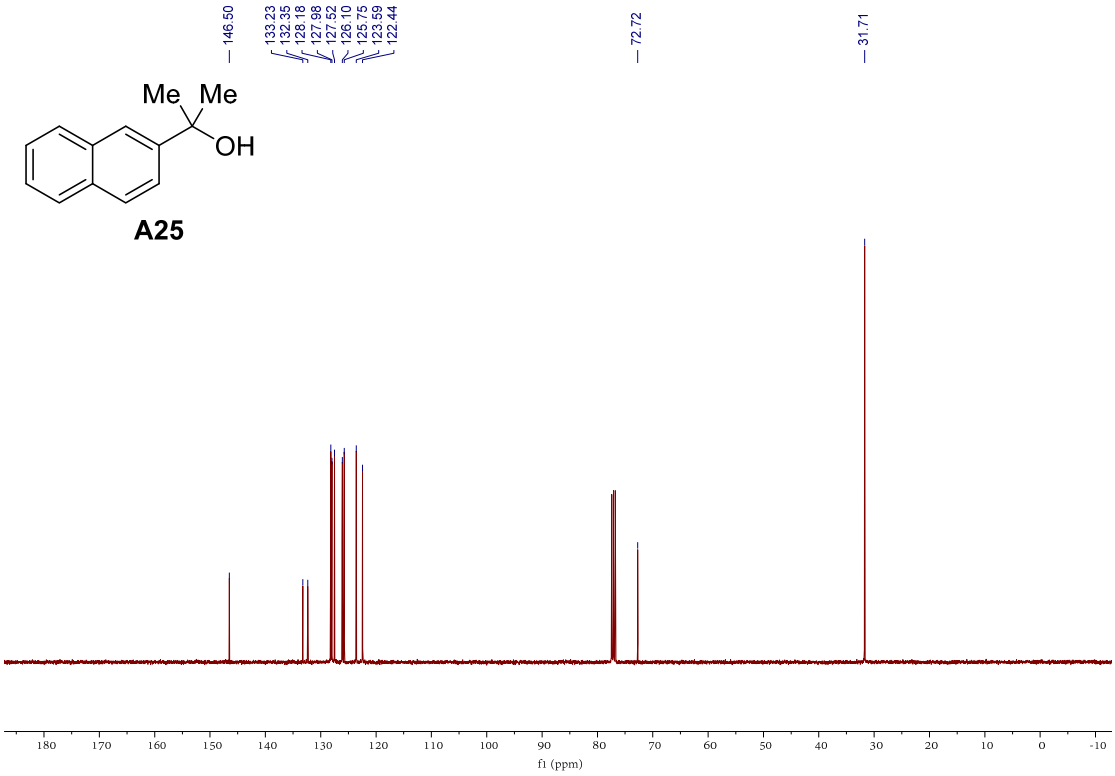

8.04
8.03
8.02
8.02
7.57
7.57
7.57
7.55
7.55
7.54
7.53
7.53
7.45
7.43
7.42
7.41
4.53
4.51
4.49
2.15
2.01
1.99
1.97
1.33
Me
Me
BzO
OH
A12
1.93
0.97
1.94
2.00
1.14
2.01
5.95
f1 (ppm)

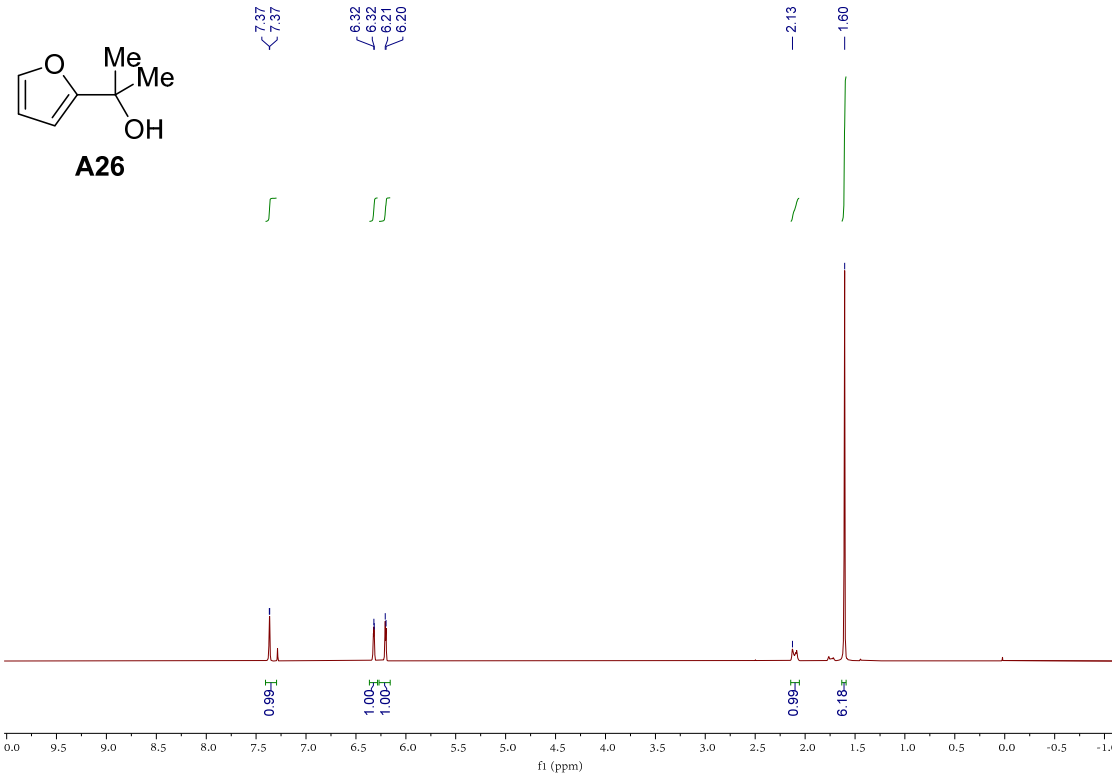

166.69
132.95
130.27
129.52
128.39
69.97
62.01
41.78
29.73
Me
Me
BzO
OH
A12
f1 (ppm)

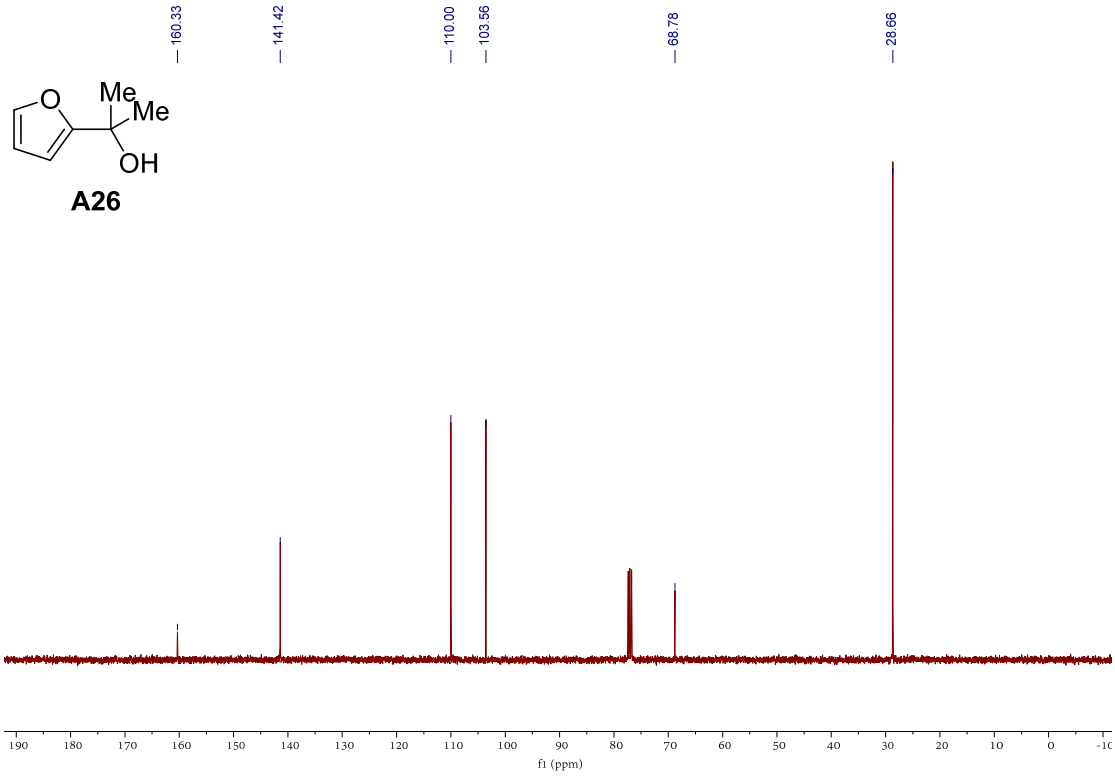

Me Me
TBSO
OH
A13
3.91
3.90
3.89
3.81
1.72
1.70
1.69
1.24
0.90
0.09
2.10
1.00
2.09
6.44
9.57
6.22
f1 (ppm)

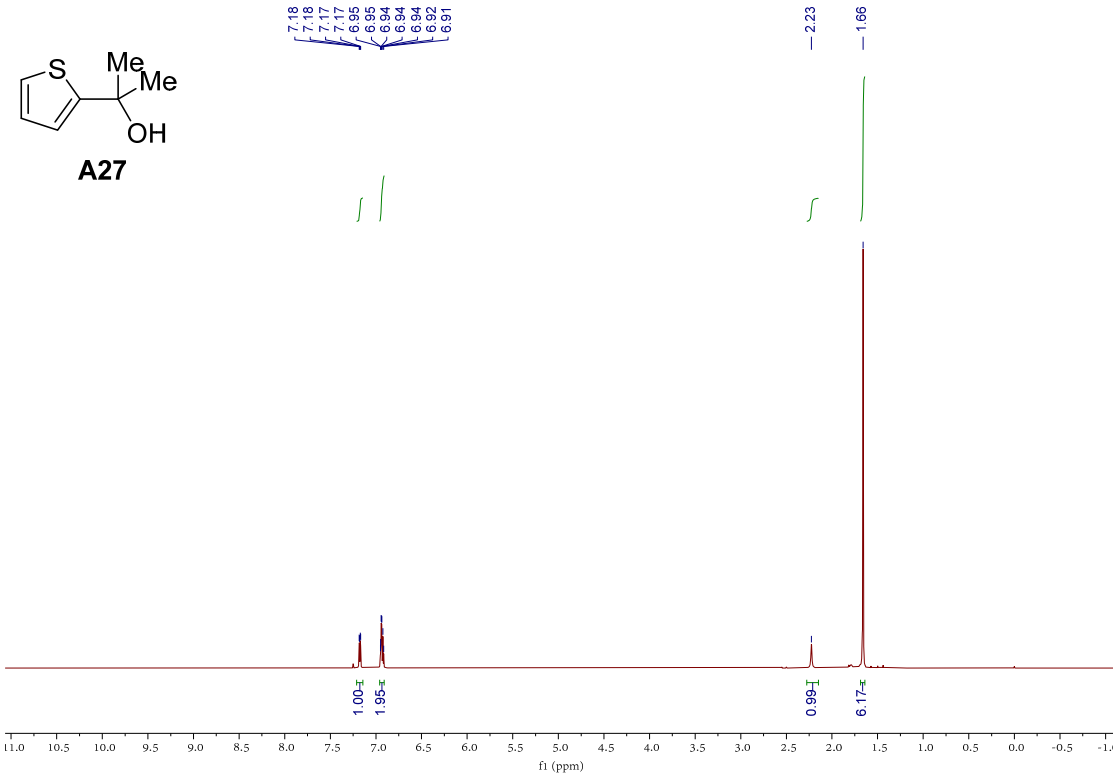

Me Me
TBSO
OH
A13
70.76
60.92
42.99
29.23
25.80
18.01
-5.66
f1 (ppm)

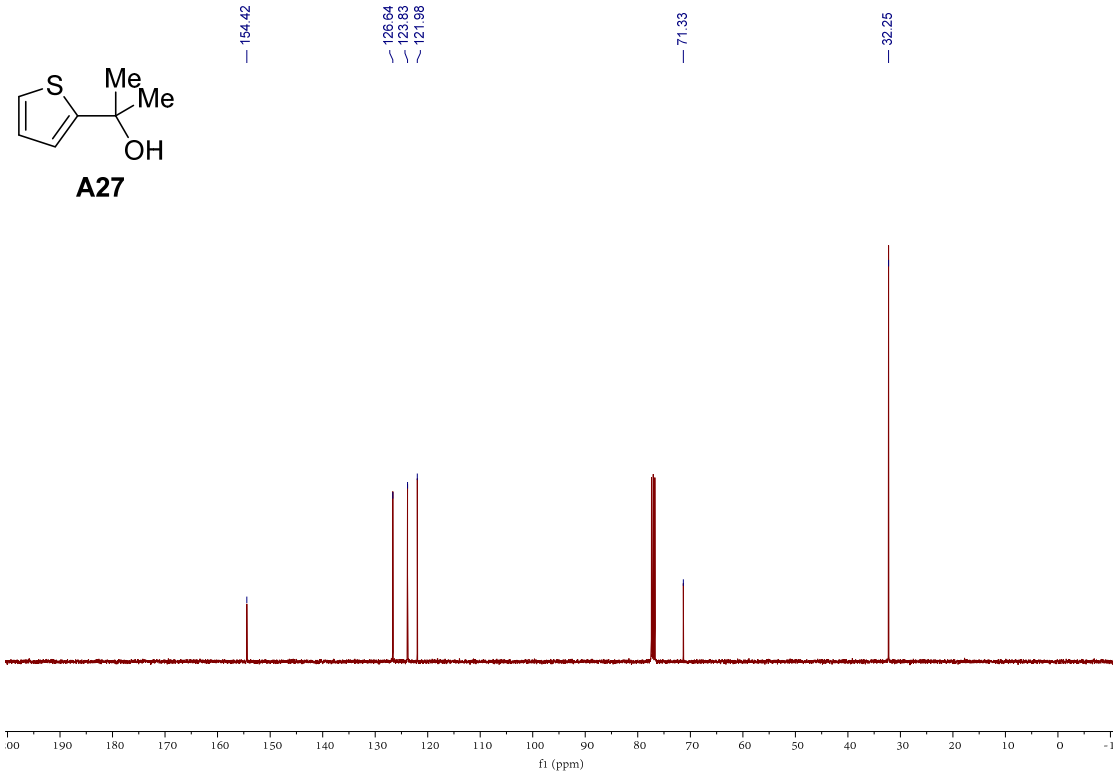

7.92
7.91
7.83
7.82
7.81
7.79
7.60
7.60
7.58
7.58
7.46
7.46
7.45
7.44
7.44
7.43
1.99
1.66
Me Me
OH
A25
1.00
2.98
0.98
1.96
0.96
6.23
f1 (ppm)

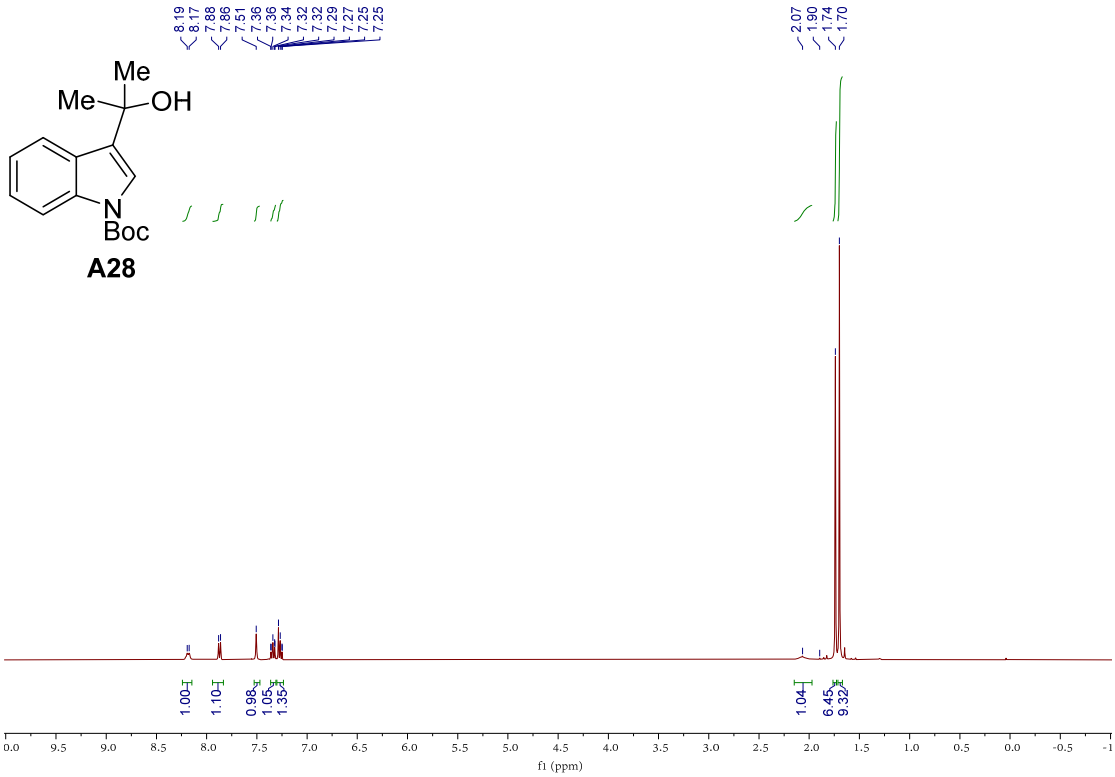

146.50
133.23
132.35
128.18
127.98
127.52
126.10
125.75
123.59
122.44
72.72
31.71
Me Me
OH
A25
f1 (ppm)

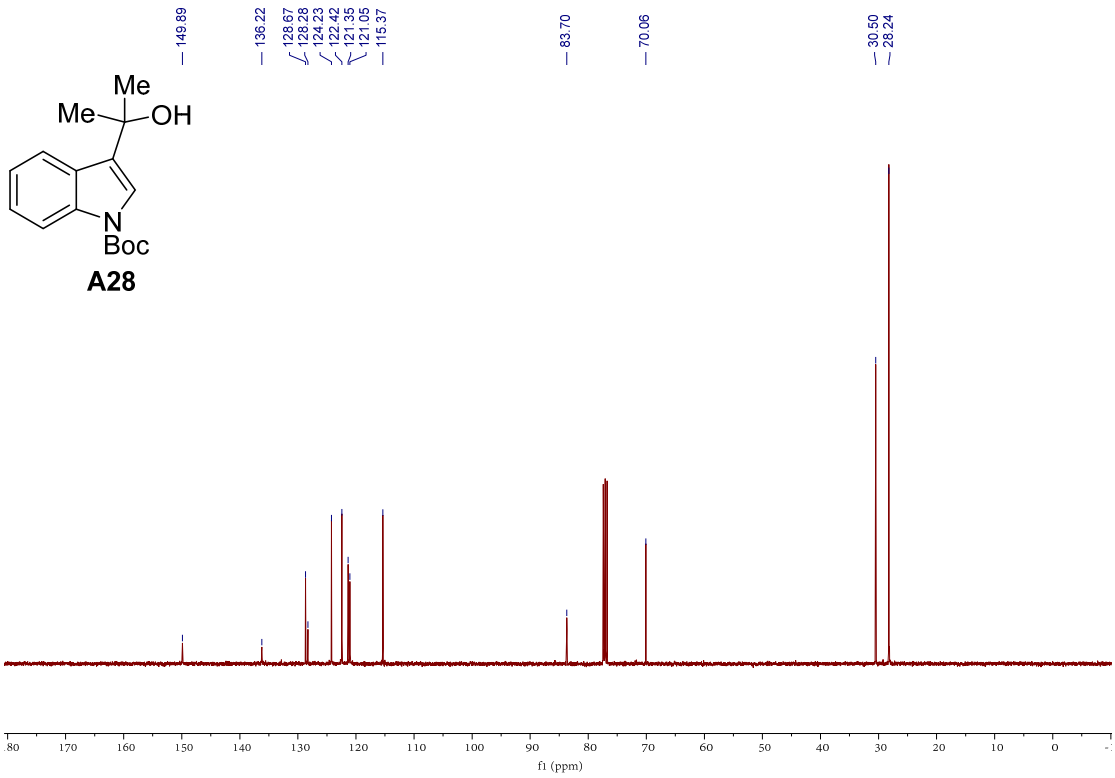

A26
7.37
7.37
6.32
6.32
6.21
6.20
2.13
1.60
0.99
1.00
1.00
0.99
6.18
f1 (ppm)

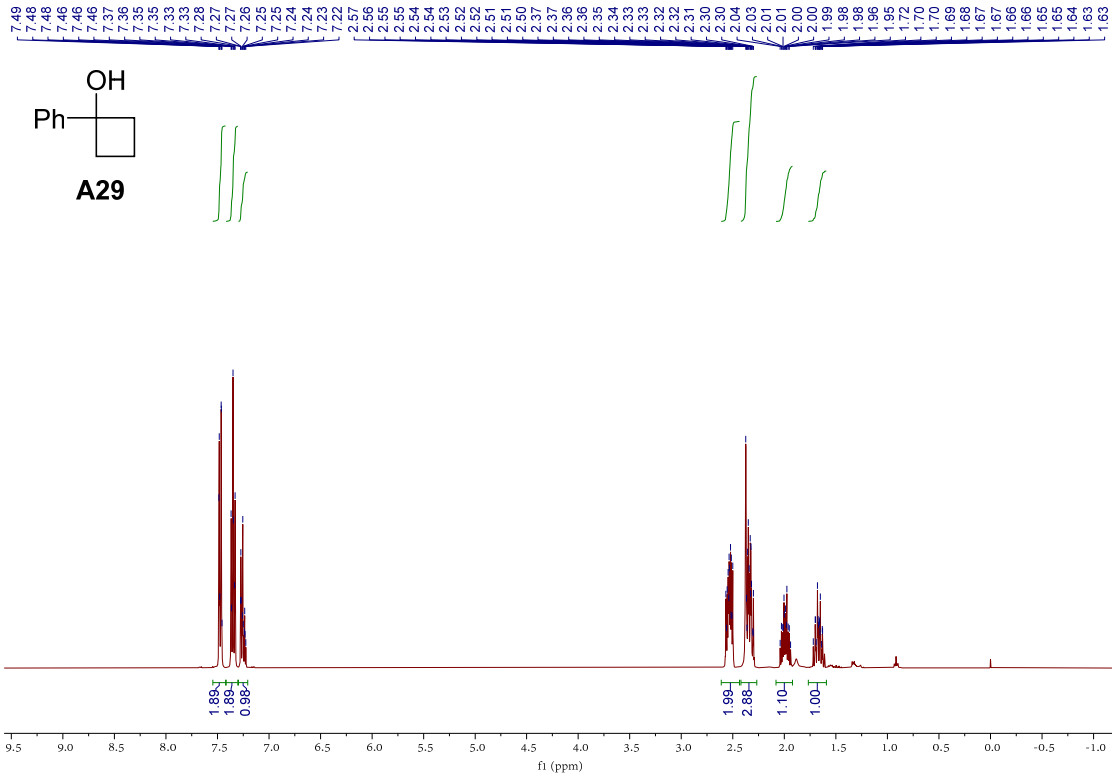

A26
160.33
141.42
110.00
103.56
68.78
28.66
f1 (ppm)

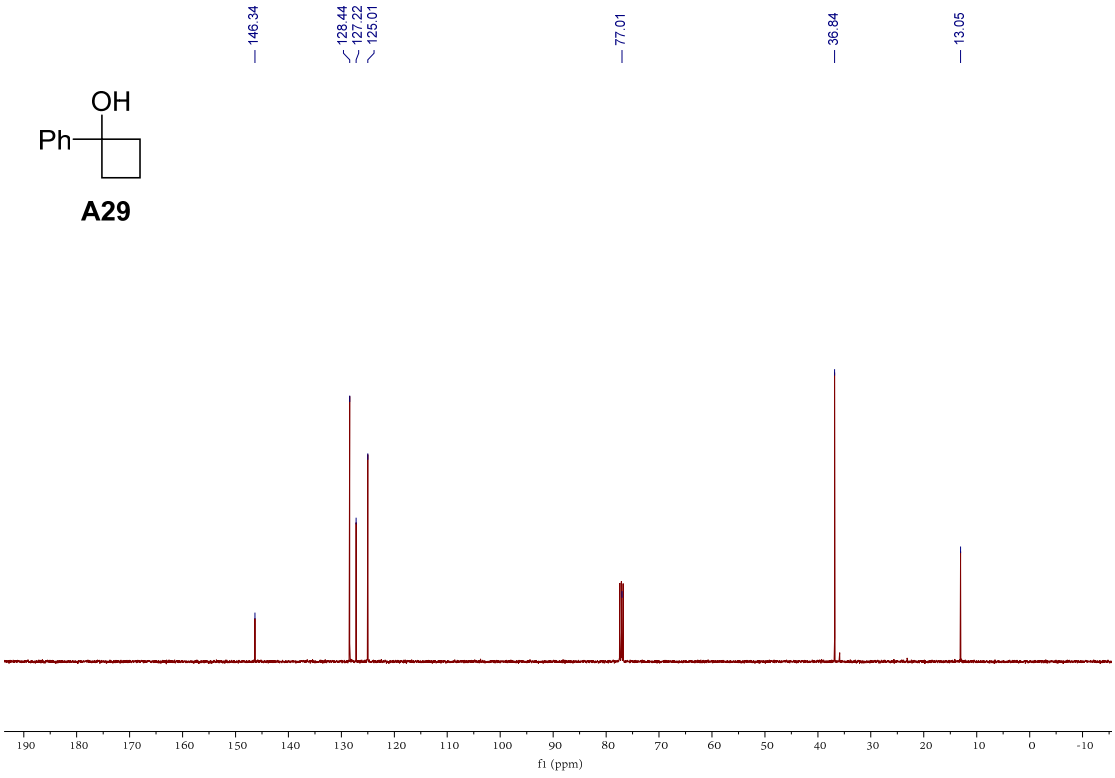

7.18
7.18
7.17
7.17
6.95
6.94
6.94
6.94
6.92
6.91
2.23
1.66
S
Me
Me
OH
A27
1.00
1.95
0.99
6.17
f1 (ppm)

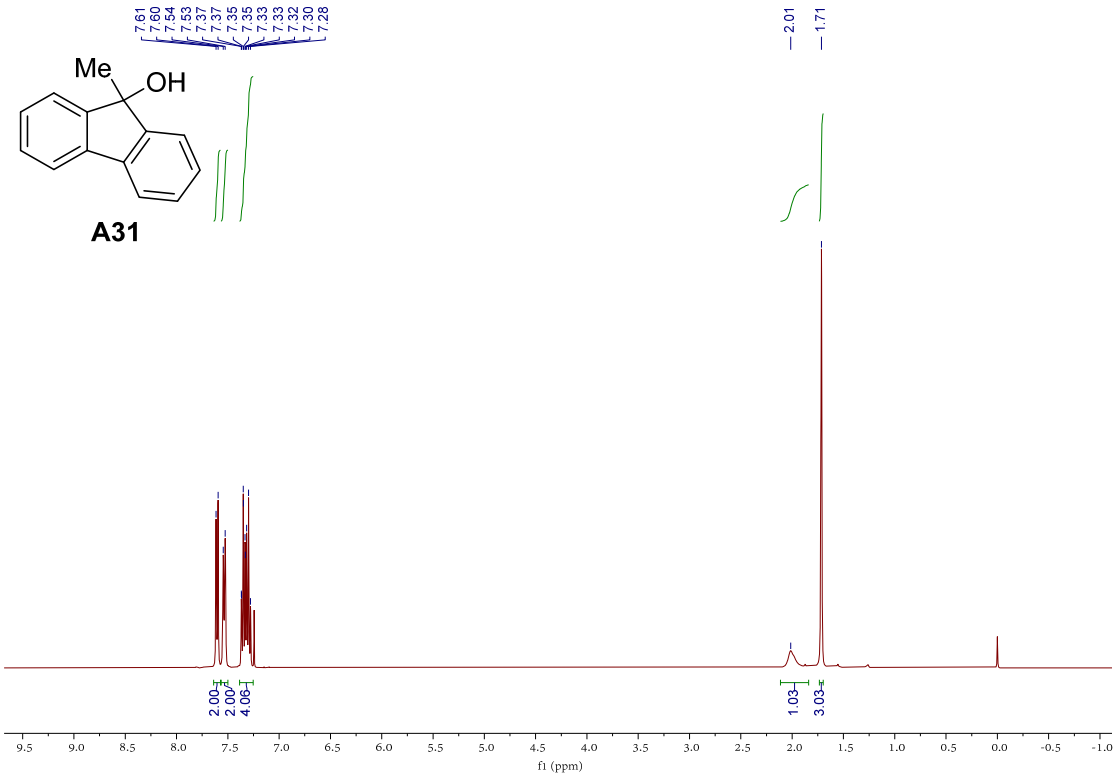

154.42
126.64
123.83
121.98
71.33
32.25
S
Me
Me
OH
A27
f1 (ppm)

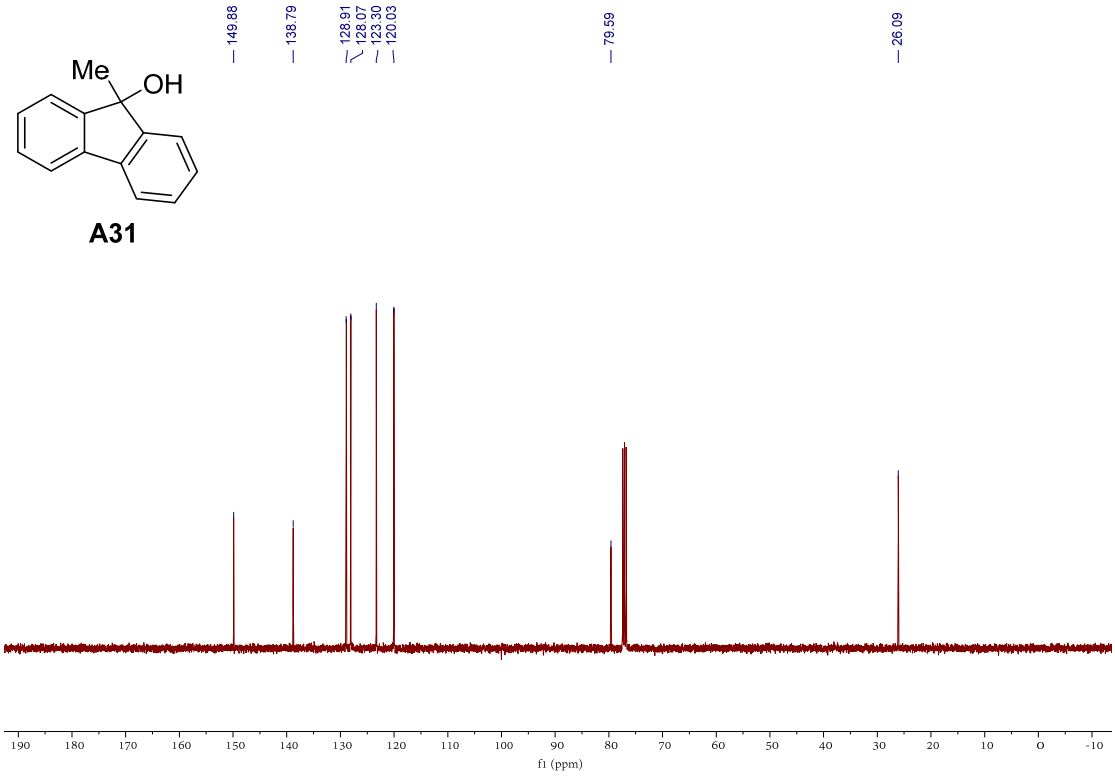

8.19
8.17
7.88
7.86
7.51
7.36
7.36
7.34
7.32
7.32
7.29
7.27
7.25
7.25
2.07
1.90
1.74
1.70
Me
Me
OH
N
Boc
A28
1.00
1.10
0.98
1.05
1.35
1.04
6.45
9.32
f1 (ppm)

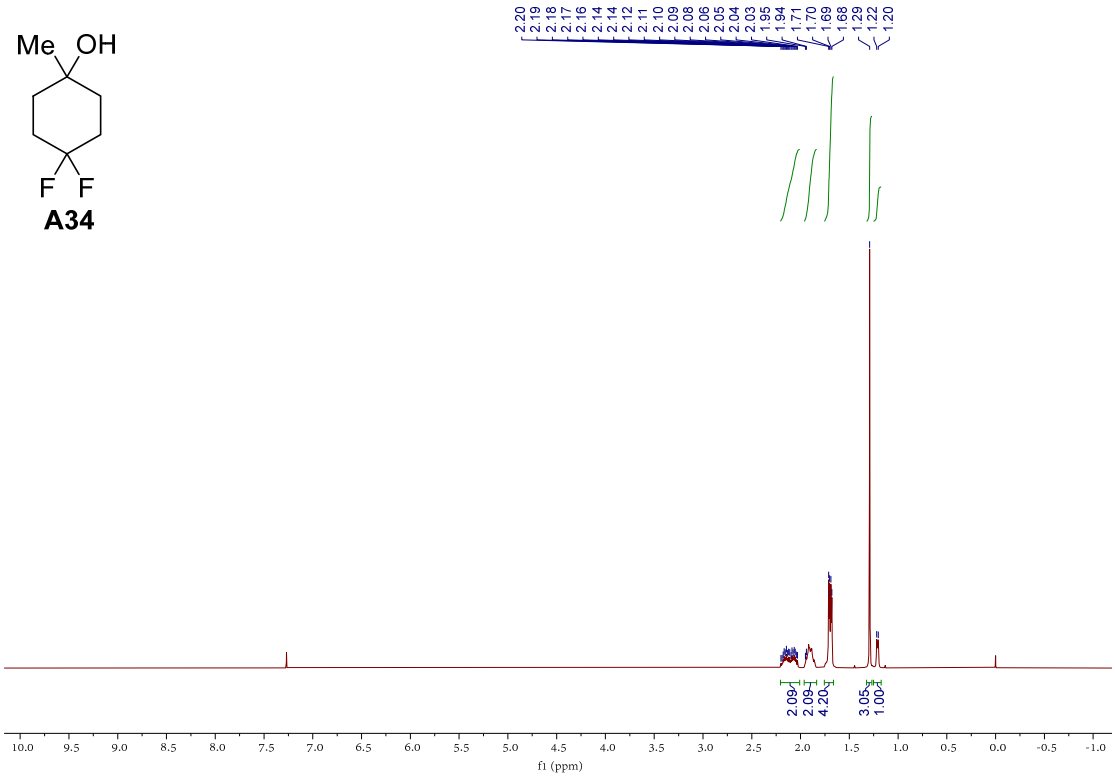

149.89
136.22
128.67
128.28
124.23
122.42
121.35
121.05
115.37
83.70
70.06
30.50
28.24
Me
Me
OH
N
Boc
A28
f1 (ppm)

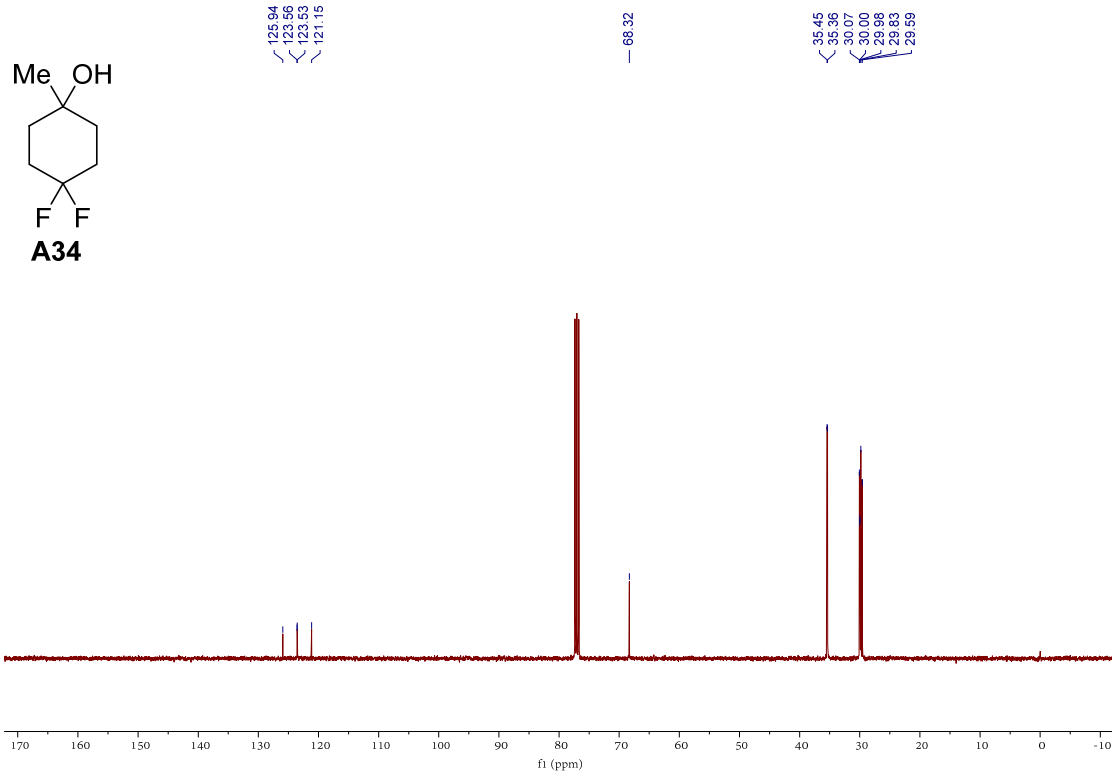

OH
Ph
A29
1.89
1.89
0.98
1.99
2.88
1.10
1.00
f1 (ppm)

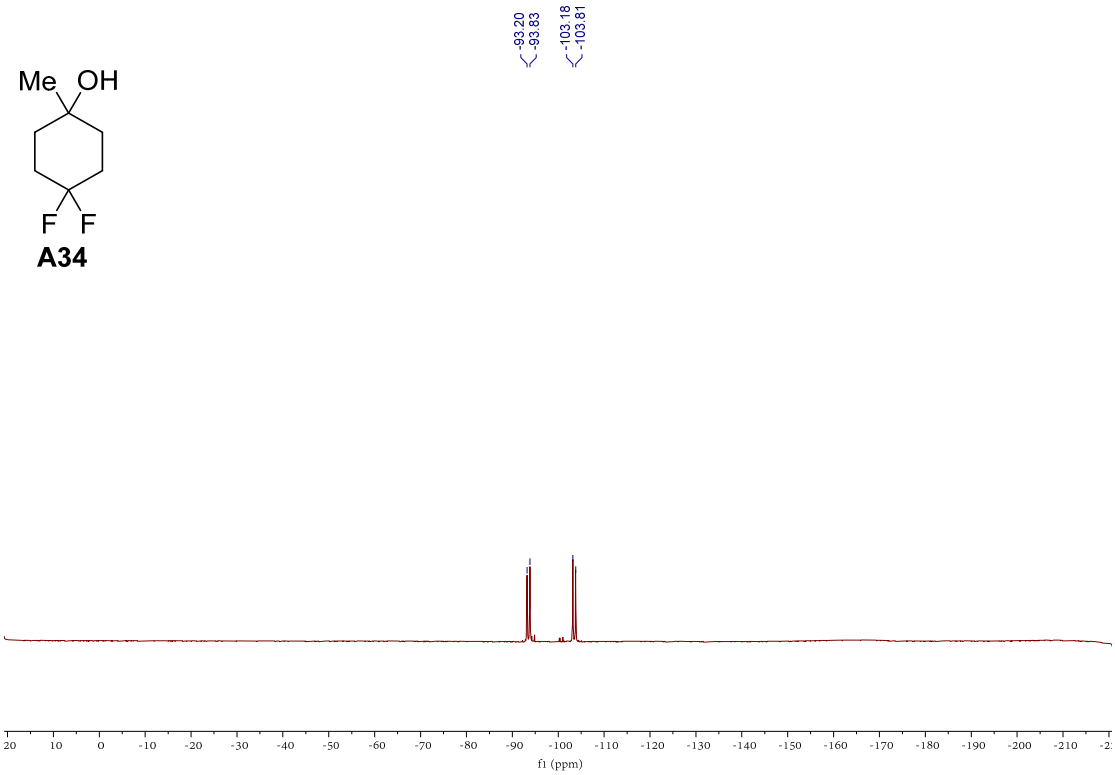

146.34
128.44
127.22
125.01
77.01
36.84
13.05
OH
Ph
A29
f1 (ppm)


7.61
7.60
7.54
7.53
7.37
7.37
7.35
7.35
7.33
7.33
7.32
7.30
7.28
2.01
1.71
Me
OH
A31
2.00
2.00
4.06
1.03
3.03
f1 (ppm)

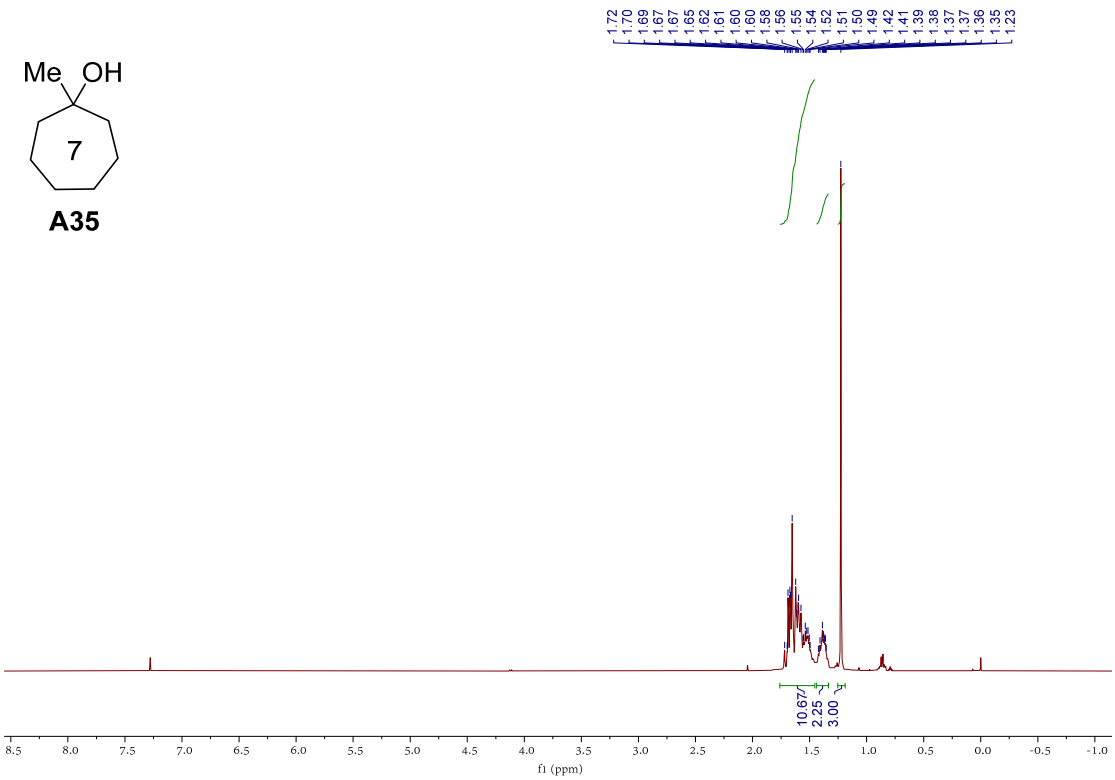

149.88
138.79
128.91
128.07
123.30
120.03
79.59
26.09
Me
OH
A31
f1 (ppm)

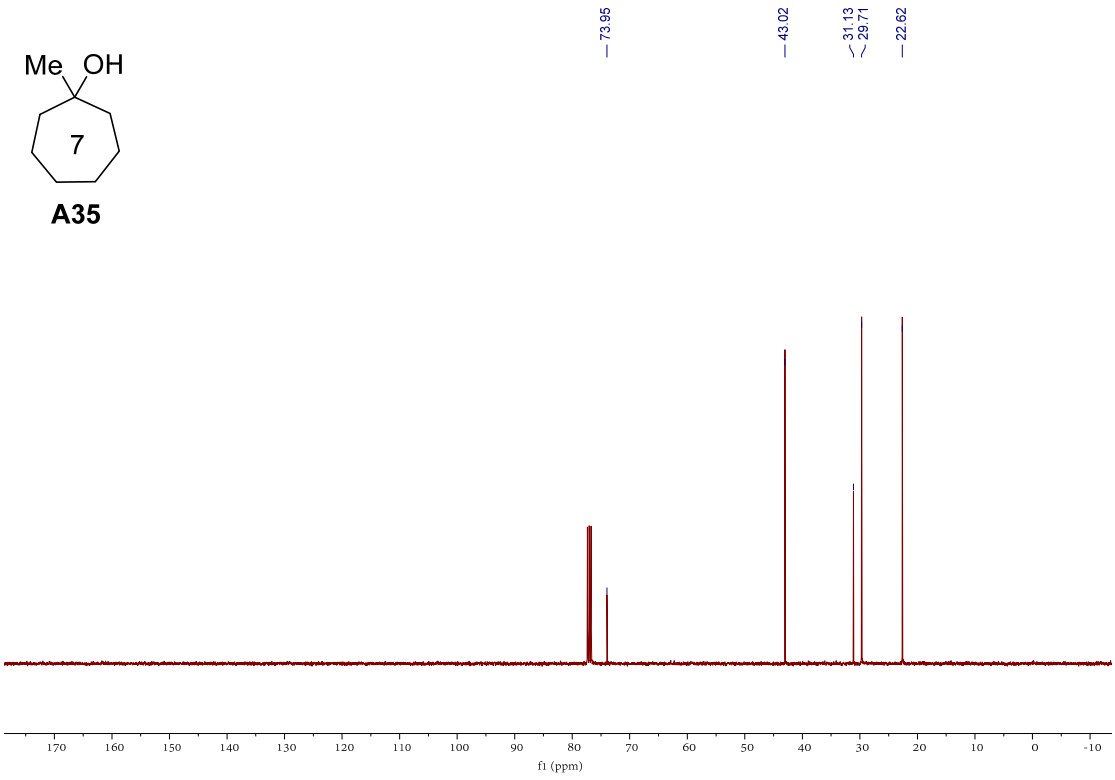

Me OH
F F
A34
2.20
2.19
2.18
2.17
2.16
2.14
2.14
2.12
2.11
2.10
2.09
2.08
2.06
2.05
2.04
2.03
1.95
1.94
1.71
1.70
1.69
1.68
1.29
1.22
1.20
2.09
2.09
4.20
3.05
1.00
f1 (ppm)

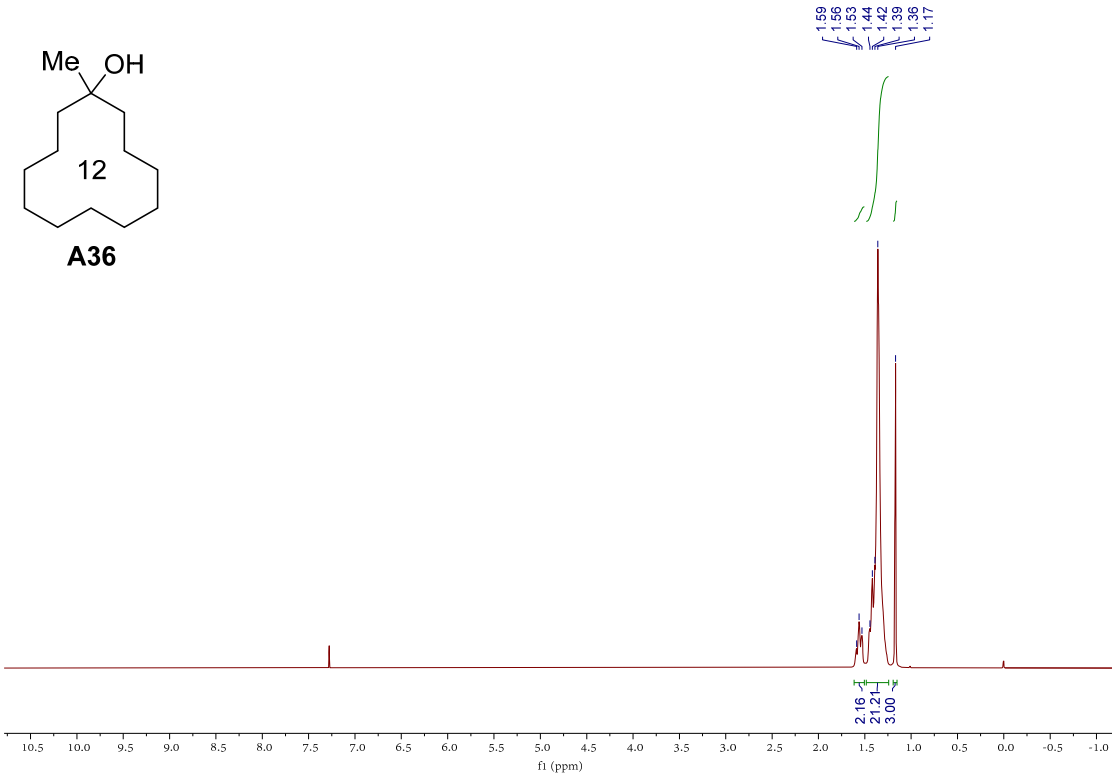

Me OH
F F
A34
125.94
123.56
123.53
121.15
68.32
35.45
35.36
30.07
30.00
29.98
29.83
29.59
f1 (ppm)

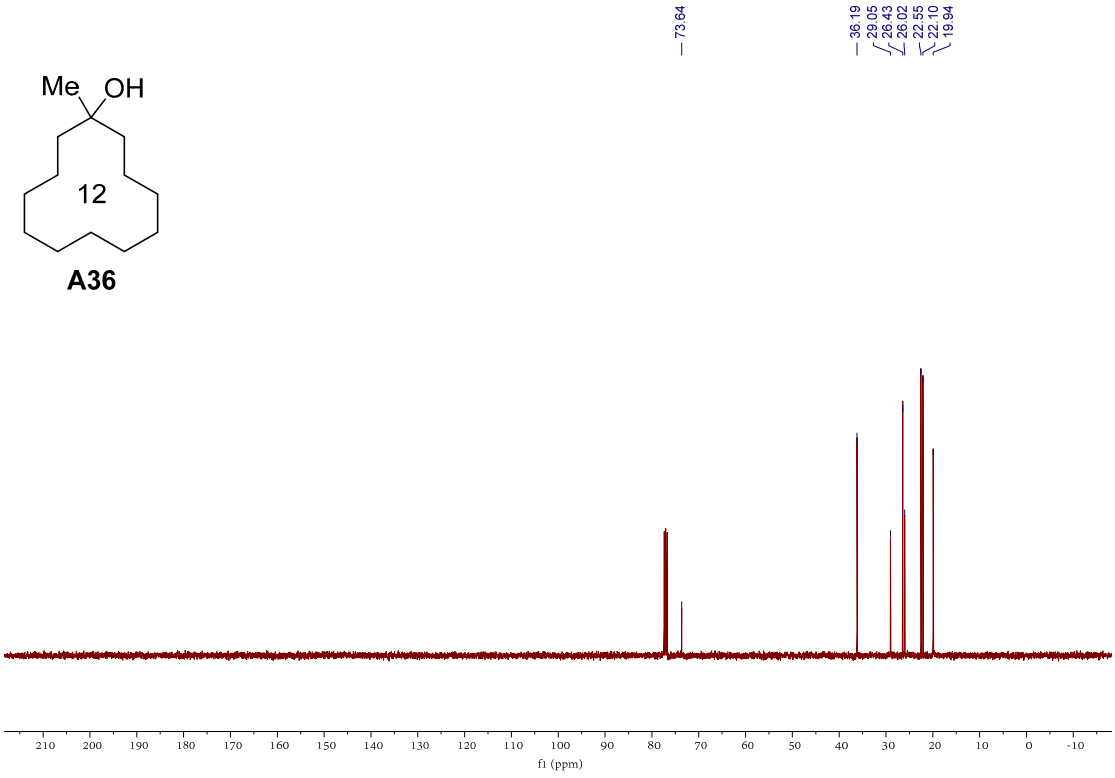

-93.20
-93.83
-103.18
-103.81
Me
OH
F
F
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

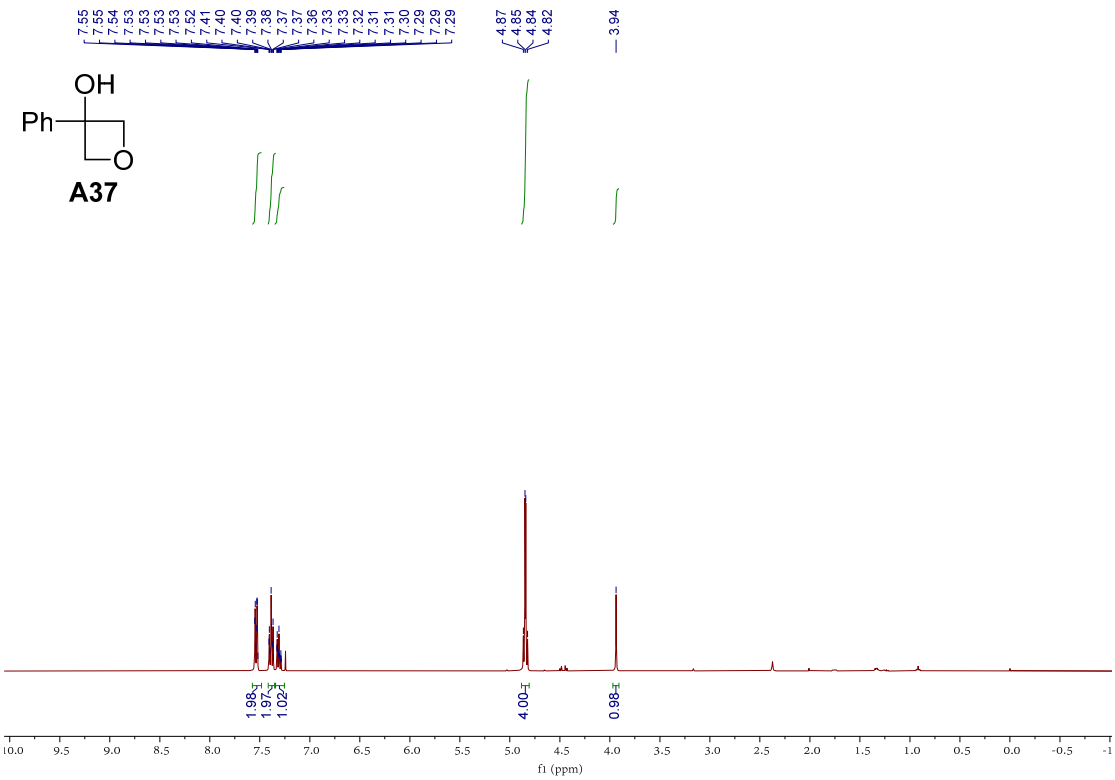
A34

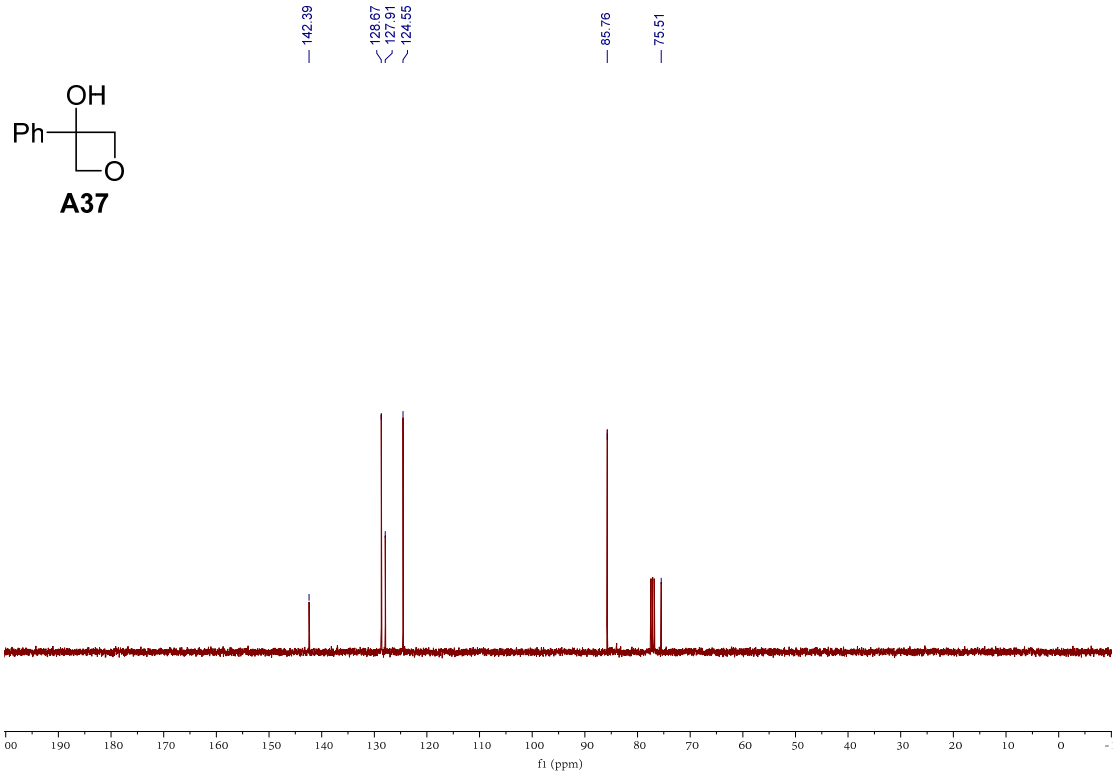

Me OH
7
A35
1.72
1.70
1.69
1.67
1.67
1.65
1.62
1.61
1.60
1.60
1.58
1.56
1.55
1.54
1.52
1.51
1.50
1.49
1.42
1.41
1.39
1.38
1.37
1.37
1.36
1.35
1.23
10.67
2.25
3.00
f1 (ppm)

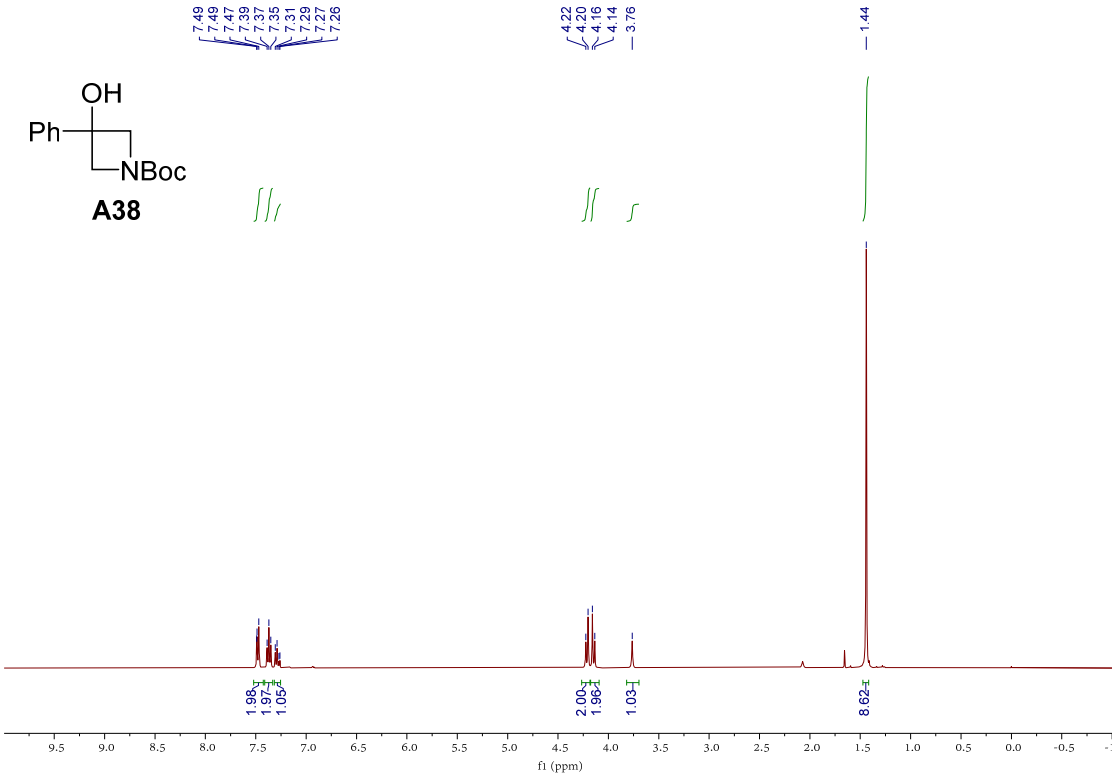

Me OH
7
A35
73.95
43.02
31.13
29.71
22.62
f1 (ppm)

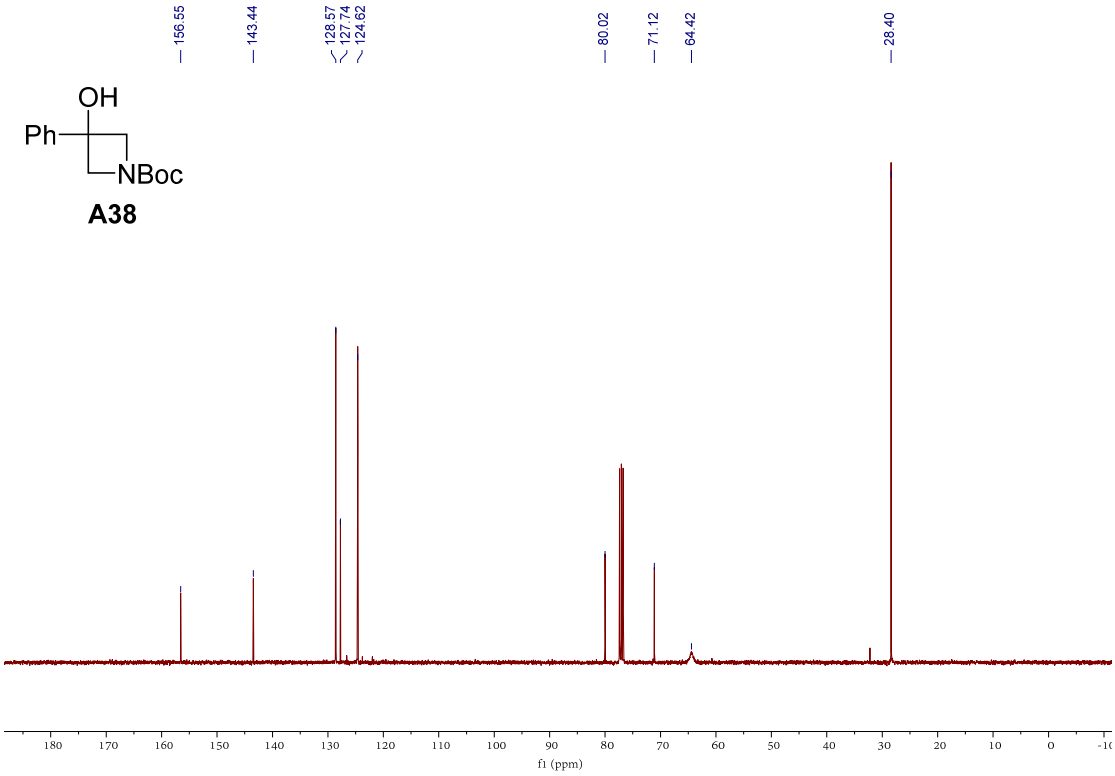

Me
OH
12
A36
1.59
1.56
1.53
1.44
1.42
1.39
1.36
1.17
2.16
21.21
3.00
f1 (ppm)

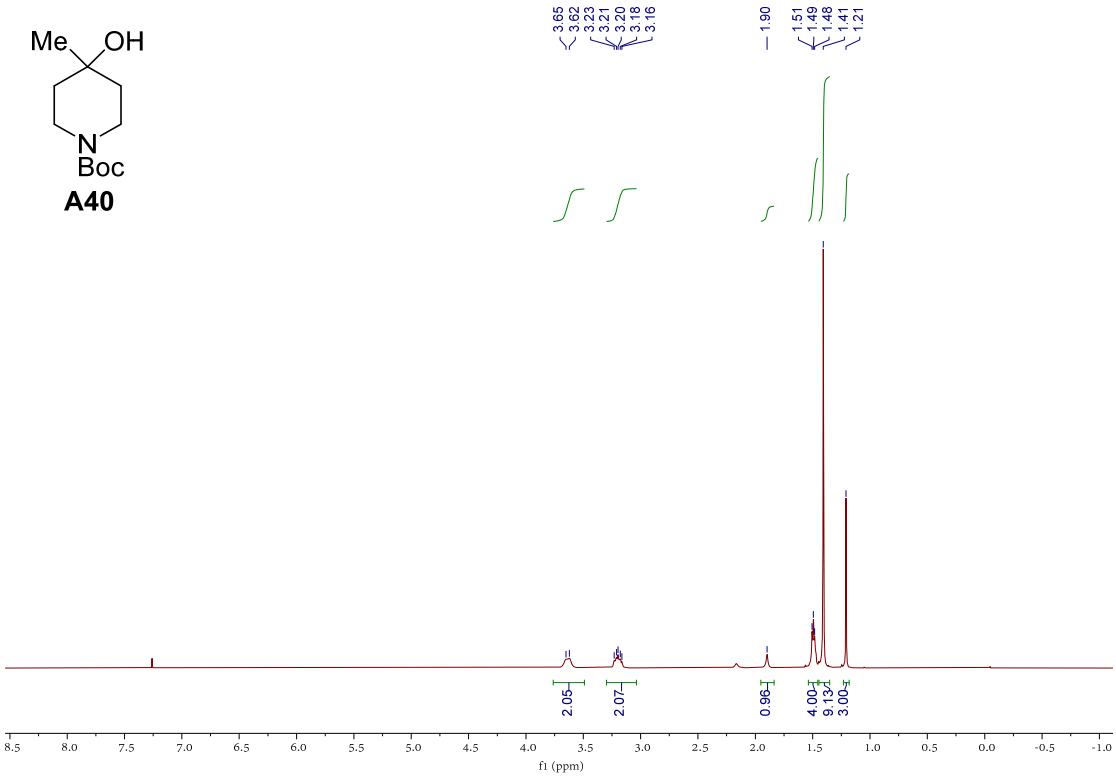

Me
OH
12
A36
73.64
36.19
29.05
26.43
26.02
22.55
22.10
19.94
f1 (ppm)

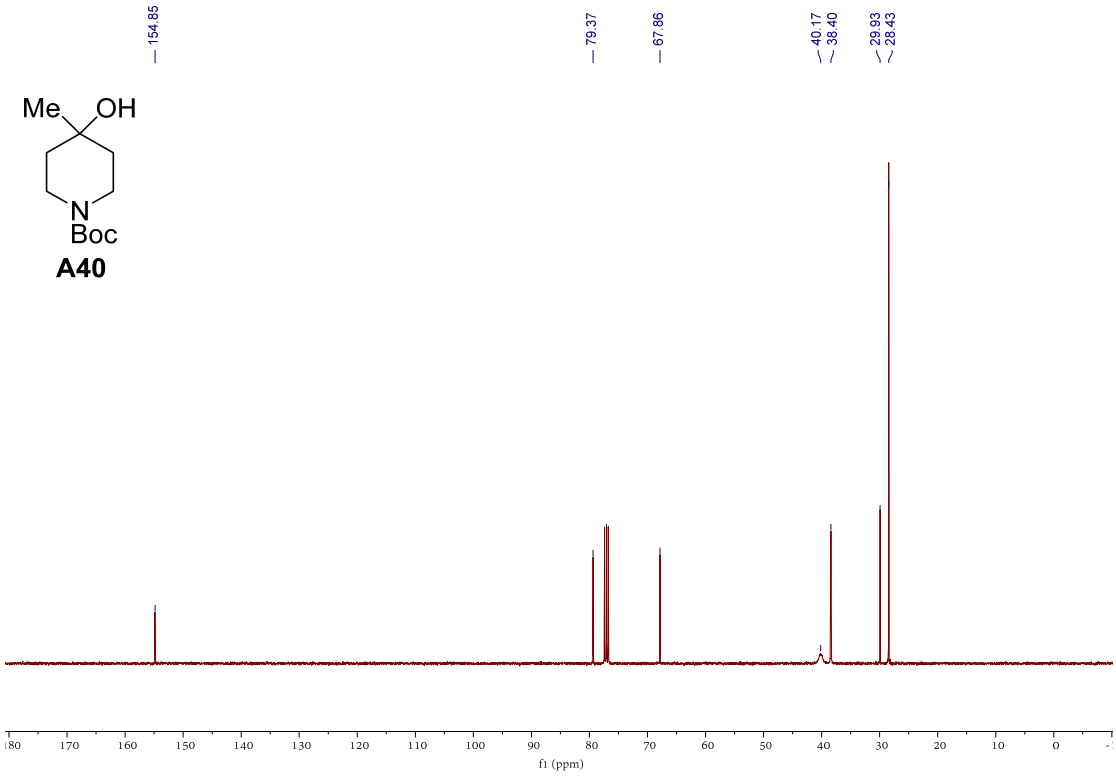

7.55
7.55
7.54
7.53
7.53
7.53
7.53
7.52
7.41
7.40
7.40
7.39
7.38
7.37
7.37
7.36
7.33
7.33
7.32
7.31
7.31
7.30
7.29
7.29
7.29
4.87
4.85
4.84
4.82
3.94
OH
Ph
O
A37
1.98
1.97
1.02
4.00
0.98
f1 (ppm)

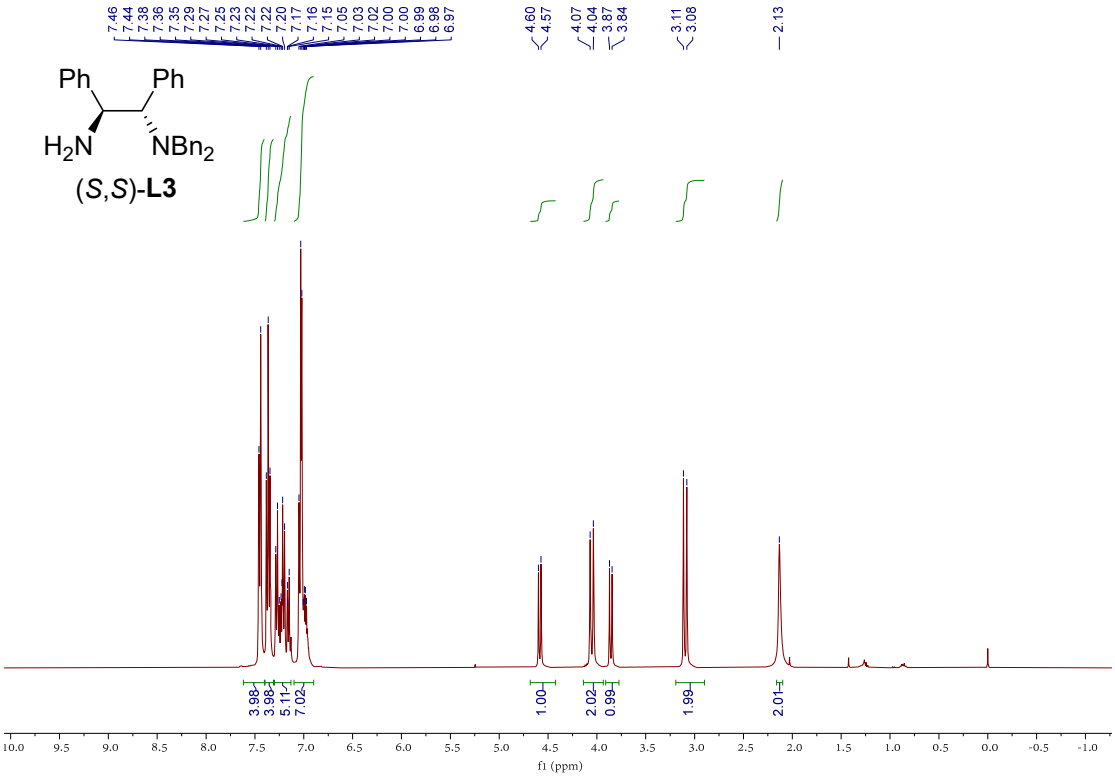

142.39
128.67
127.91
124.55
85.76
75.51
OH
Ph
O
A37
f1 (ppm)

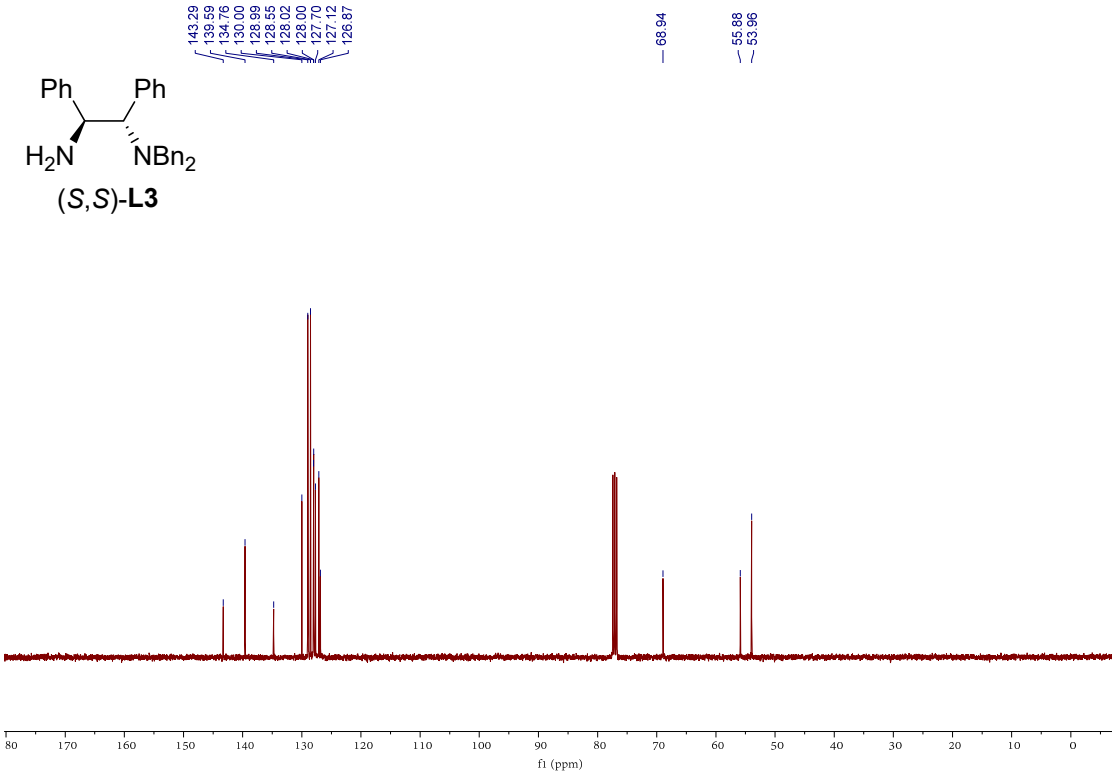

7.49
7.49
7.47
7.39
7.37
7.35
7.31
7.29
7.27
7.26
4.22
4.20
4.16
4.14
3.76
1.44
OH
Ph
NBoc
A38
1.98
1.97
1.05
2.00
1.96
1.03
8.62
f1 (ppm)

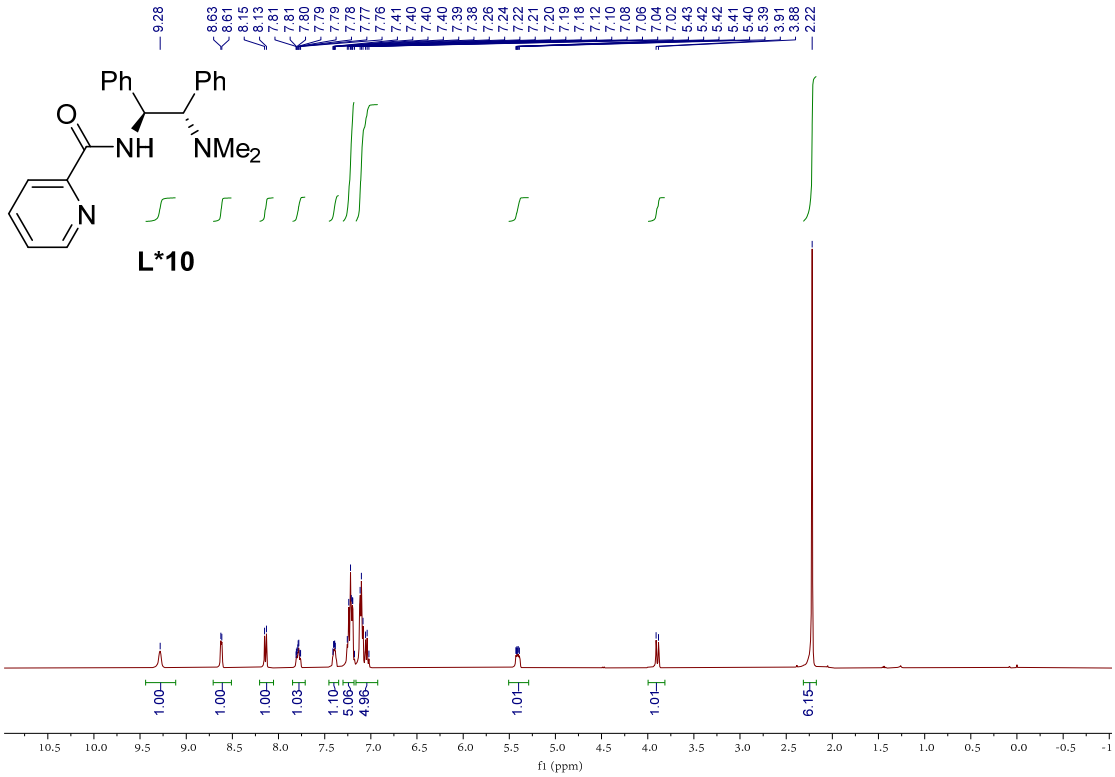

156.55
143.44
128.57
127.74
124.62
80.02
71.12
64.42
28.40
OH
Ph
NBoc
A38
f1 (ppm)

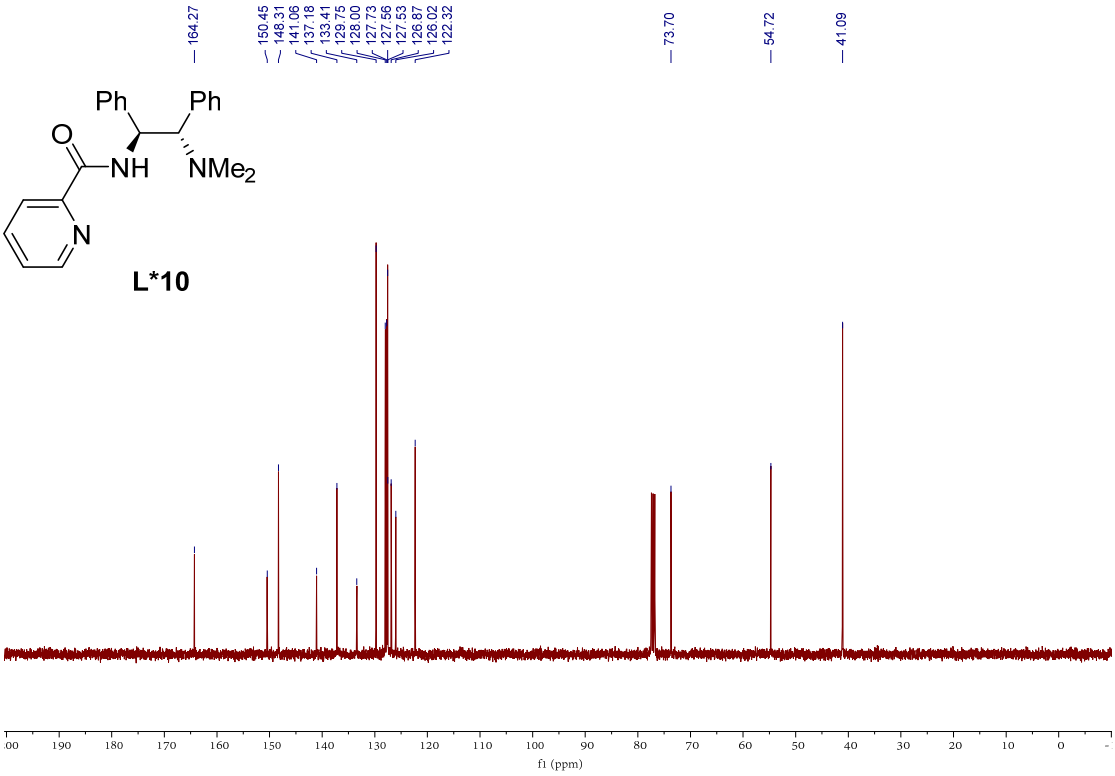

Me
OH
N
Boc
A40
3.65
3.62
3.23
3.21
3.20
3.18
3.16
1.90
1.51
1.49
1.48
1.41
1.21
2.05
2.07
0.96
4.00
9.13
3.00
f1 (ppm)

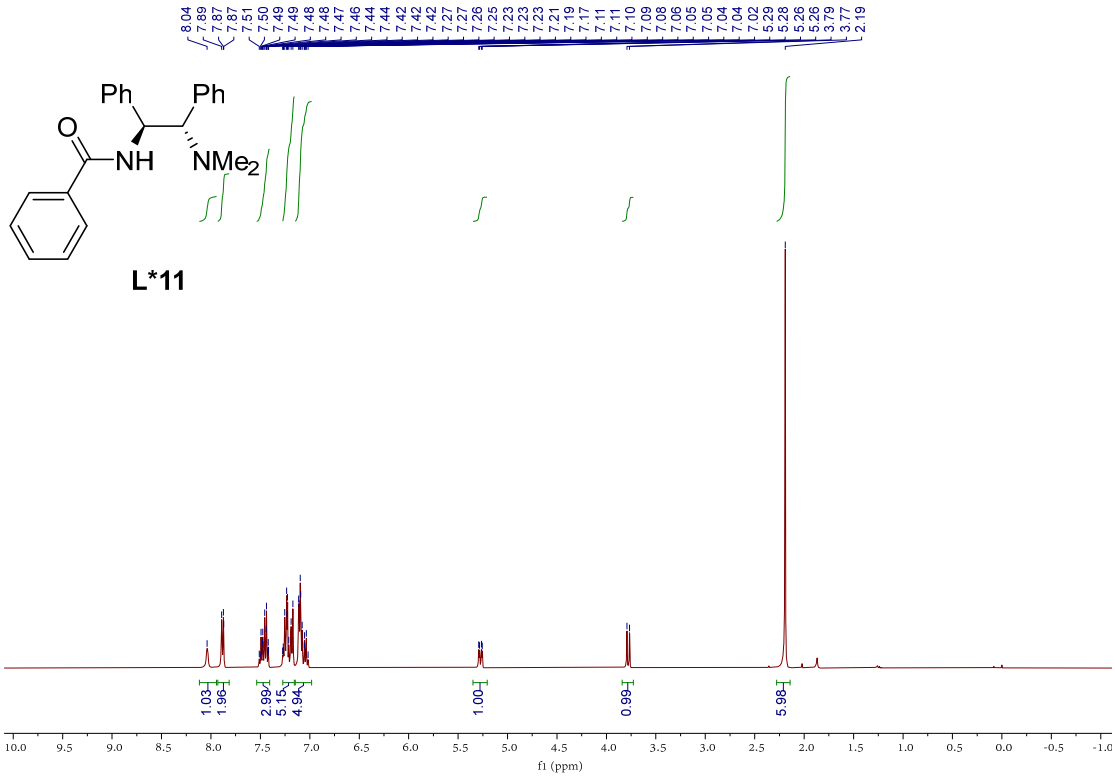

Me
OH
N
Boc
A40
154.85
79.37
67.86
40.17
38.40
29.93
28.43
f1 (ppm)

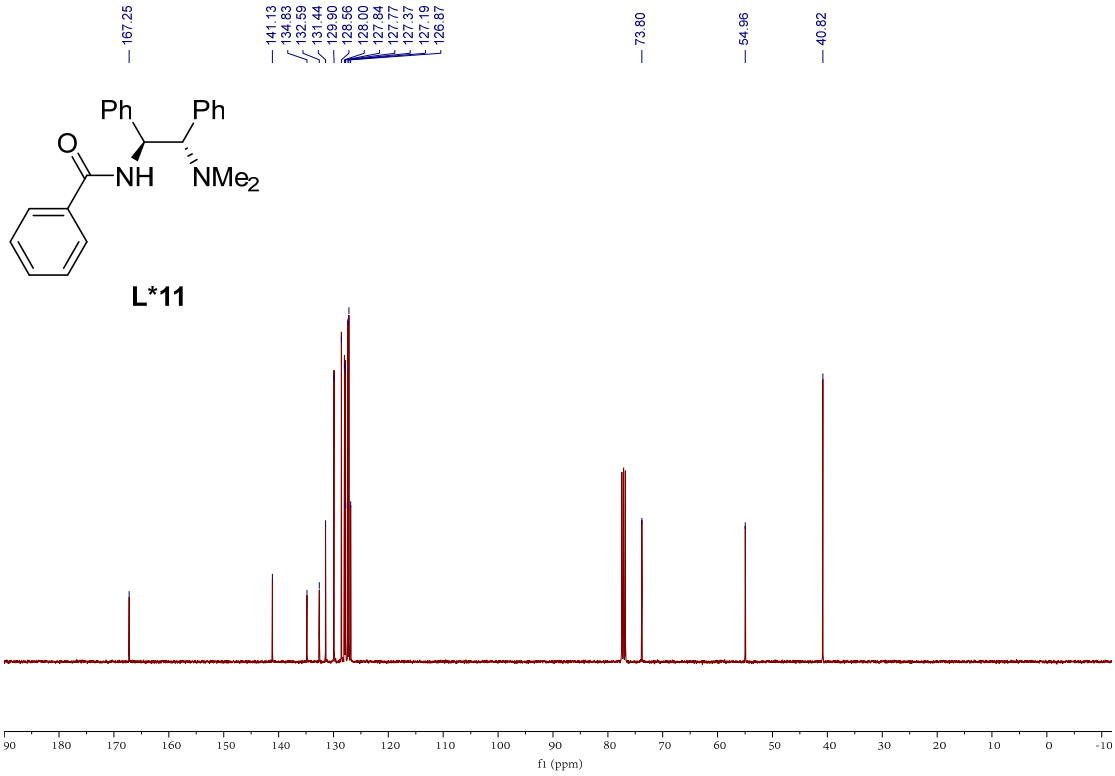

7.46
7.44
7.38
7.36
7.35
7.29
7.27
7.25
7.23
7.22
7.22
7.20
7.17
7.16
7.15
7.05
7.03
7.02
7.00
7.00
6.99
6.98
6.97
4.60
4.57
4.07
4.04
3.87
3.84
3.11
3.08
2.13
Ph
Ph
H2N
NBn2
(S,S)-L3
3.98
3.98
5.11
7.02
1.00
2.02
0.99
1.99
2.01
f1 (ppm)

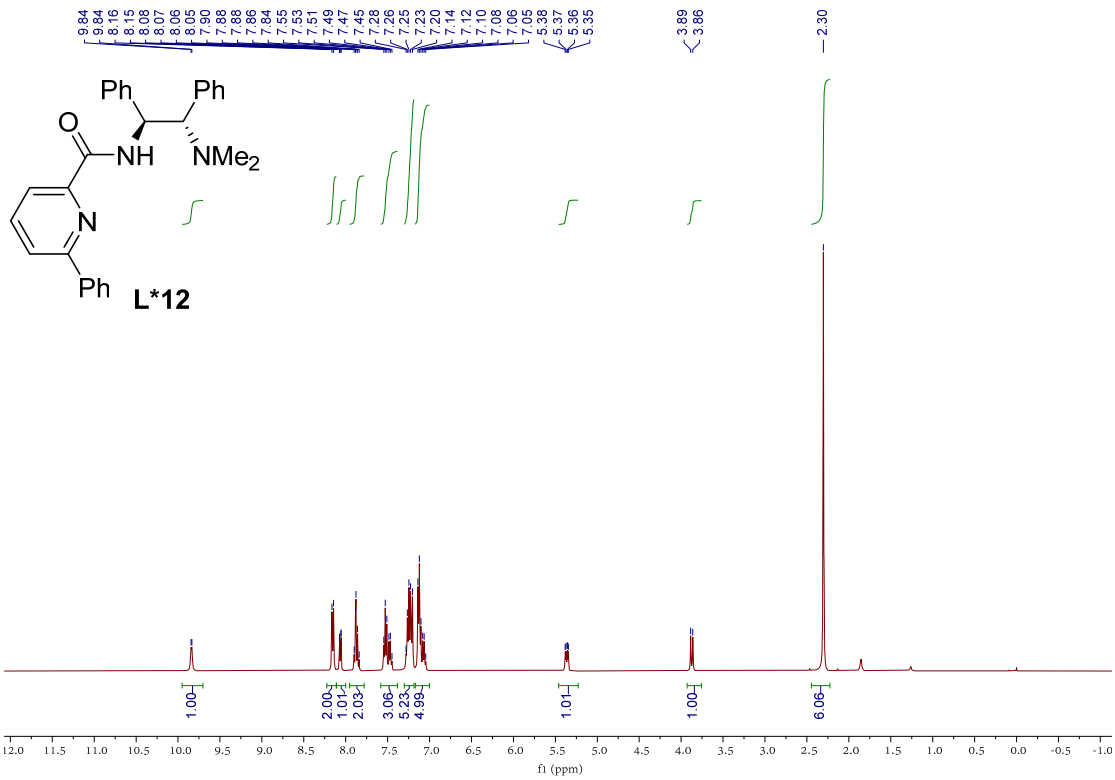

143.29
139.59
134.76
130.00
128.99
128.55
128.02
128.00
127.70
127.12
126.87
68.94
55.88
53.96
Ph
Ph
H2N
NBn2
(S,S)-L3
f1 (ppm)

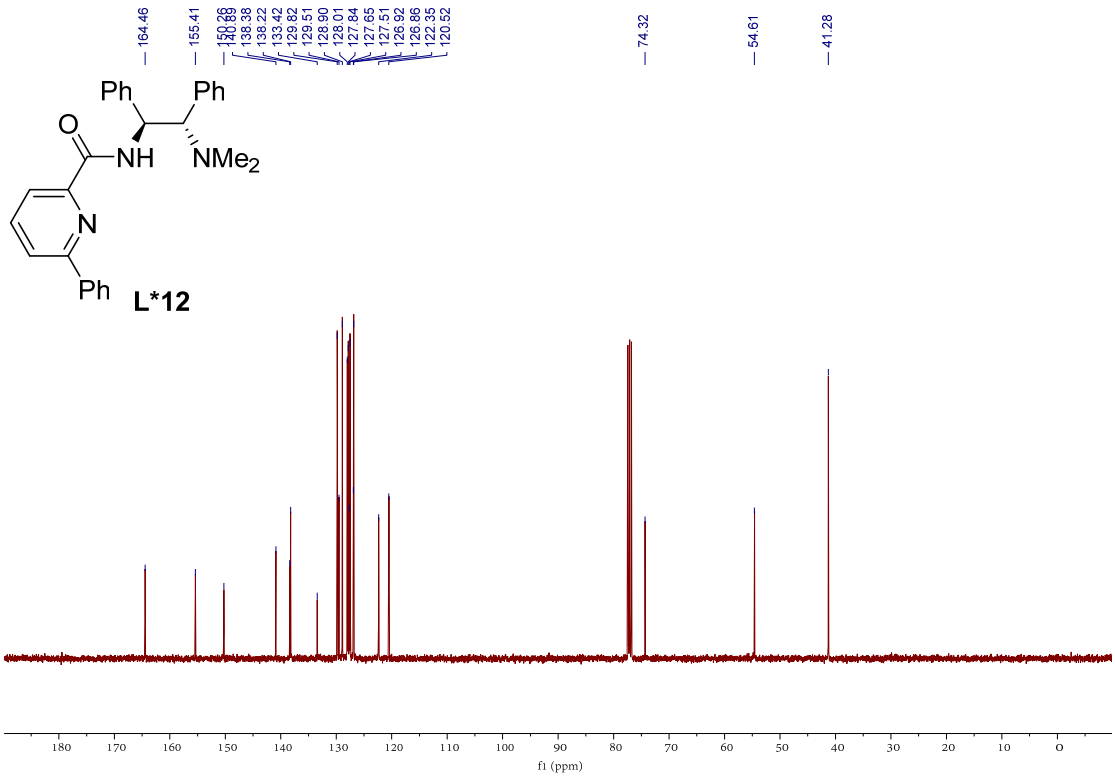

9.28
8.63
8.61
8.15
8.13
7.81
7.80
7.79
7.78
7.77
7.76
7.41
7.40
7.39
7.38
7.26
7.24
7.22
7.21
7.20
7.19
7.18
7.12
7.10
7.08
7.06
7.04
7.02
5.43
5.42
5.41
5.40
5.39
3.91
3.88
2.22
Ph
Ph
O
NH
NMe2
N
L*10
1.00
1.00
1.00
1.03
1.10
5.06
4.96
1.01
1.01
6.15
f1 (ppm)

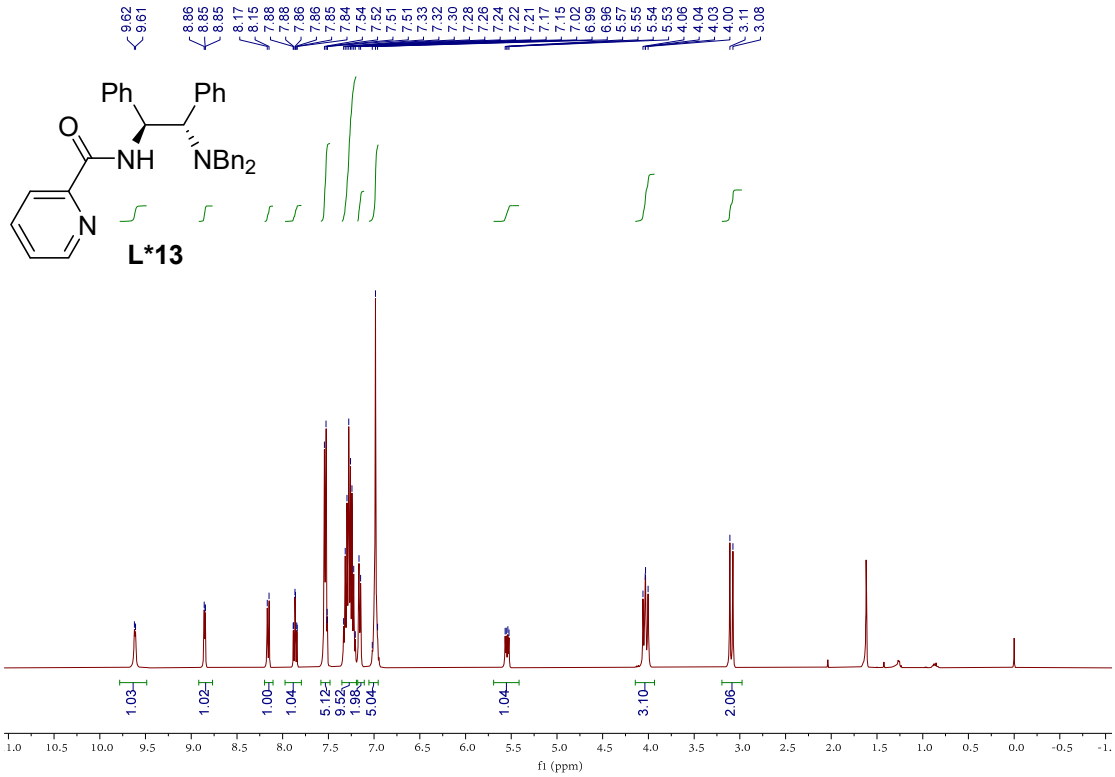

164.27
150.45
148.31
141.06
137.18
133.41
129.75
128.00
127.73
127.56
127.53
126.87
126.02
122.32
73.70
54.72
41.09
Ph
Ph
O
NH
NMe2
N
L*10
f1 (ppm)

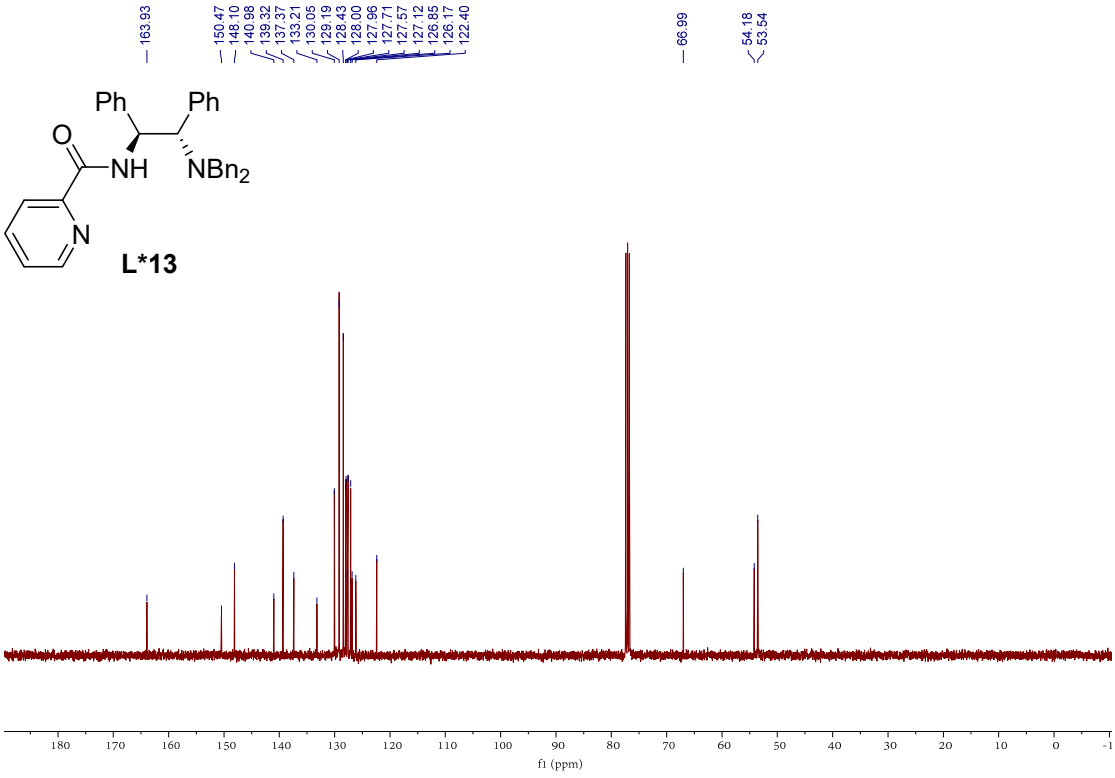

Ph
Ph
O
NH
NMe2
L*11
f1 (ppm)

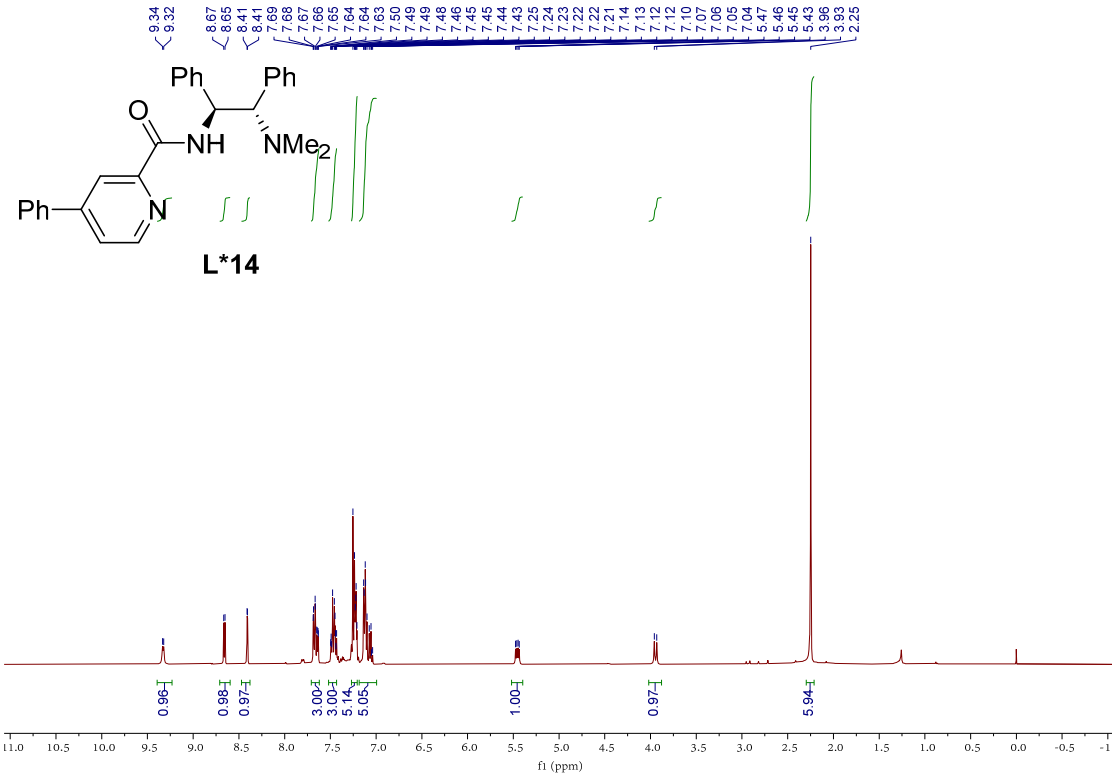

Ph
Ph
O
NH
NMe2
L*11
f1 (ppm)

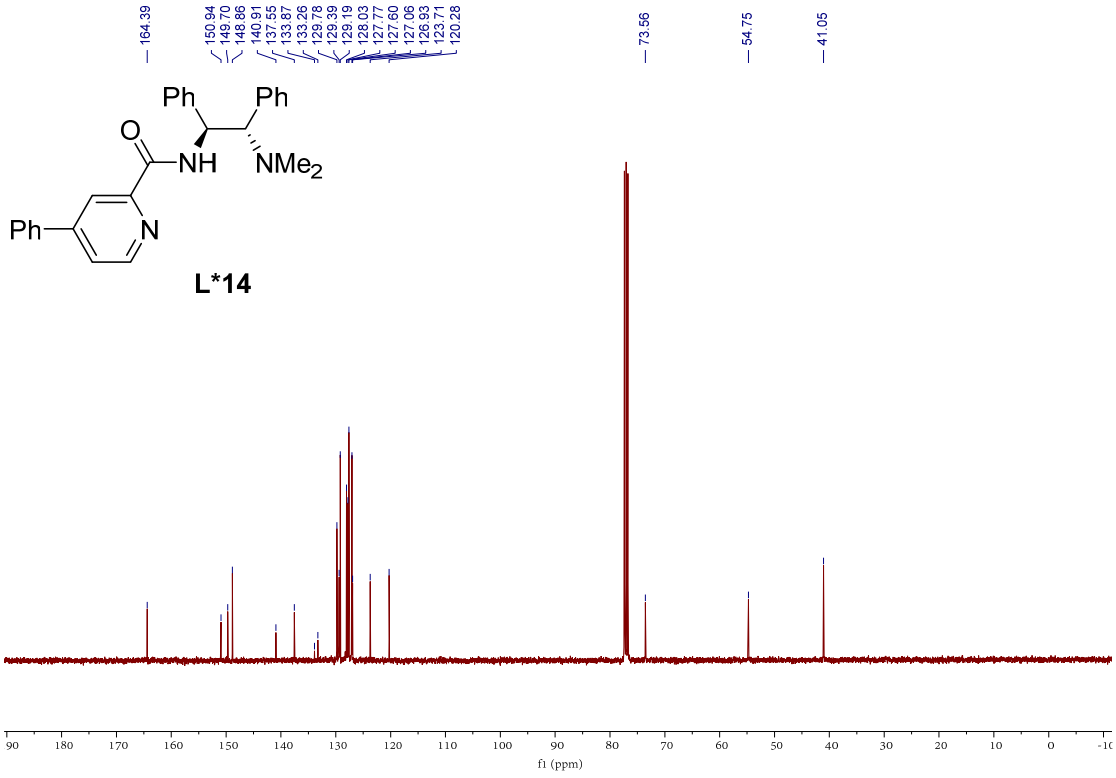

9.84
9.84
8.16
8.15
8.08
8.07
8.06
8.05
7.90
7.88
7.88
7.86
7.84
7.55
7.53
7.51
7.49
7.47
7.45
7.28
7.26
7.25
7.23
7.20
7.14
7.12
7.10
7.08
7.06
7.05
5.38
5.37
5.36
5.35
3.89
3.86
2.30
Ph
Ph
O
NH
NMe2
N
Ph
L*12
1.00
2.00
1.01
2.03
3.06
5.23
4.99
1.01
1.00
6.06
f1 (ppm)

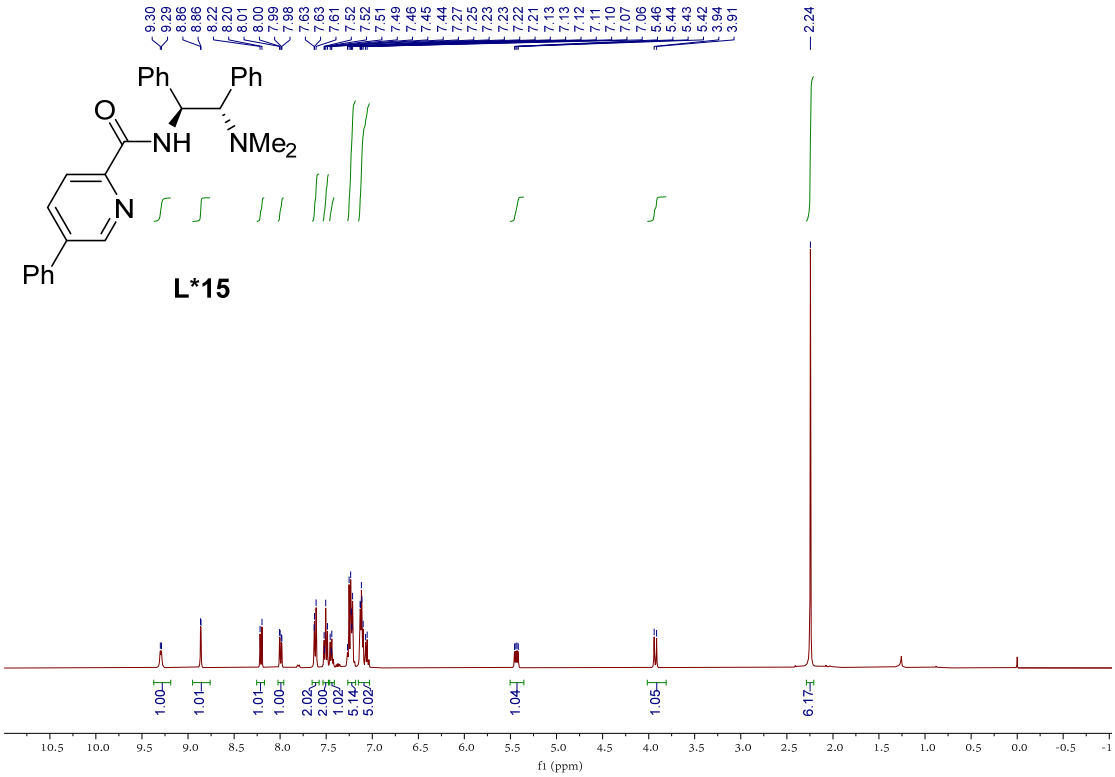

164.46
155.41
150.26
140.89
138.38
138.22
133.42
129.82
129.51
128.90
128.01
127.84
127.65
127.51
126.92
126.86
122.35
120.52
74.32
54.61
41.28
Ph
Ph
O
NH
NMe2
N
Ph
L*12
f1 (ppm)

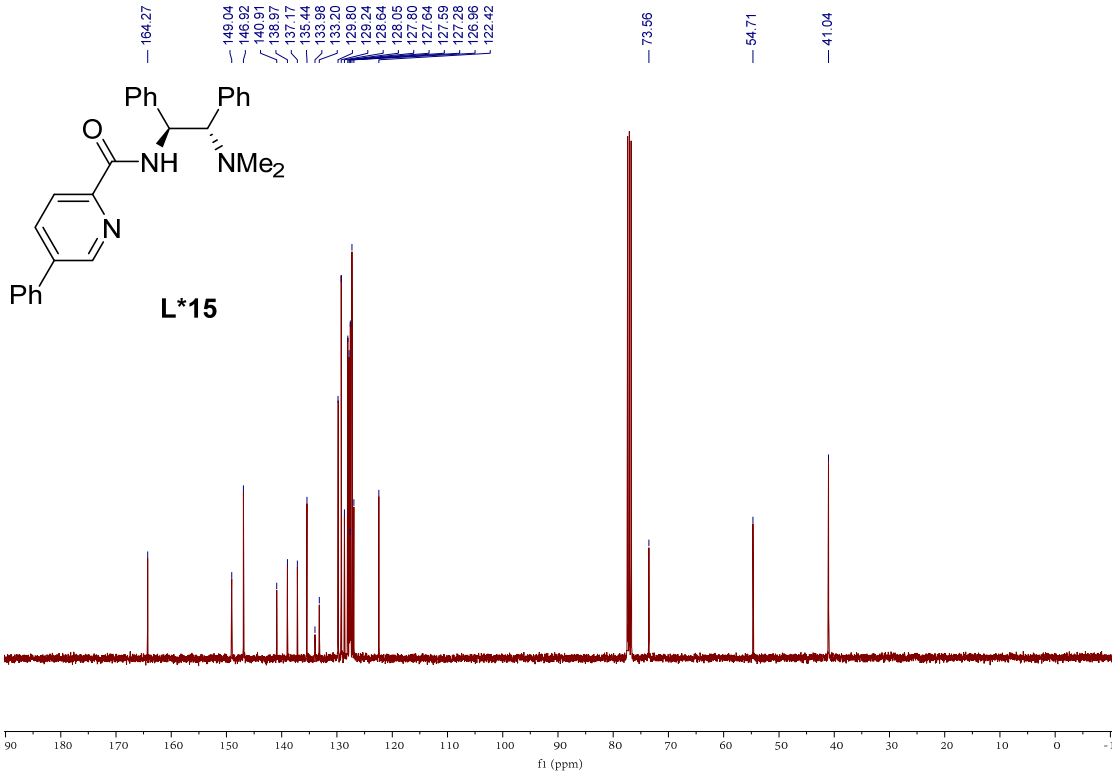

9.62
9.61
8.86
8.85
8.85
8.17
8.15
7.88
7.88
7.86
7.86
7.85
7.84
7.54
7.52
7.51
7.51
7.33
7.32
7.30
7.28
7.26
7.24
7.22
7.21
7.17
7.15
7.02
6.99
6.96
5.57
5.55
5.54
5.53
4.06
4.04
4.03
4.00
3.11
3.08
Ph
Ph
O
NH
NBn2
N
L*13
1.03
1.02
1.00
1.04
5.12
9.52
1.98
5.04
1.04
3.10
2.06
f1 (ppm)

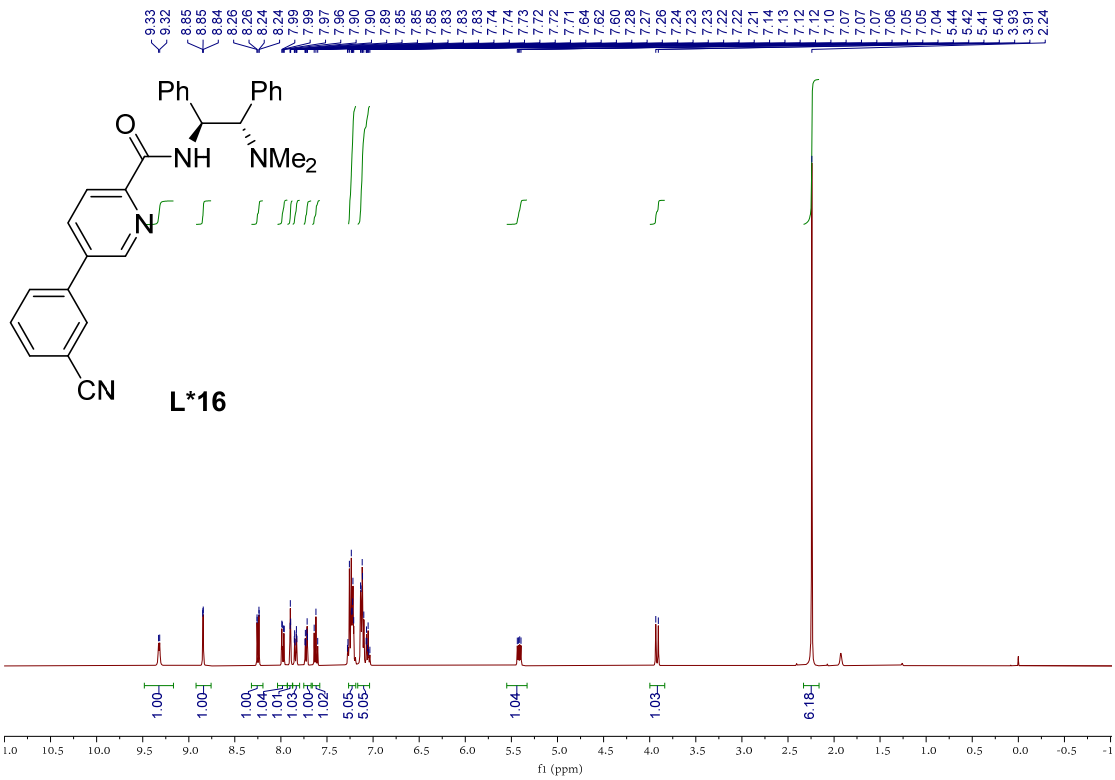

163.93
150.47
148.10
140.98
139.32
137.37
133.21
130.05
129.19
128.43
128.00
127.96
127.71
127.57
127.12
126.85
126.17
122.40
66.99
54.18
53.54
Ph
Ph
O
NH
NBn2
N
L*13
f1 (ppm)

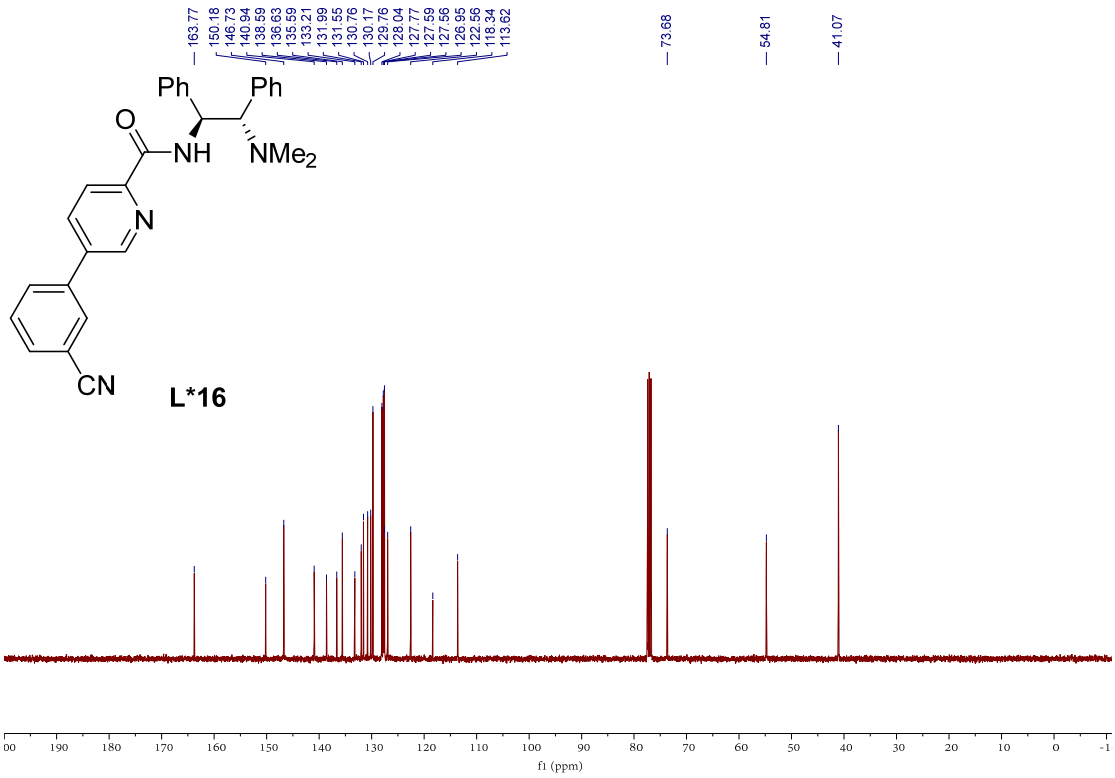

Ph
Ph
O
NH
NMe2
Ph
N
L*14
f1 (ppm)

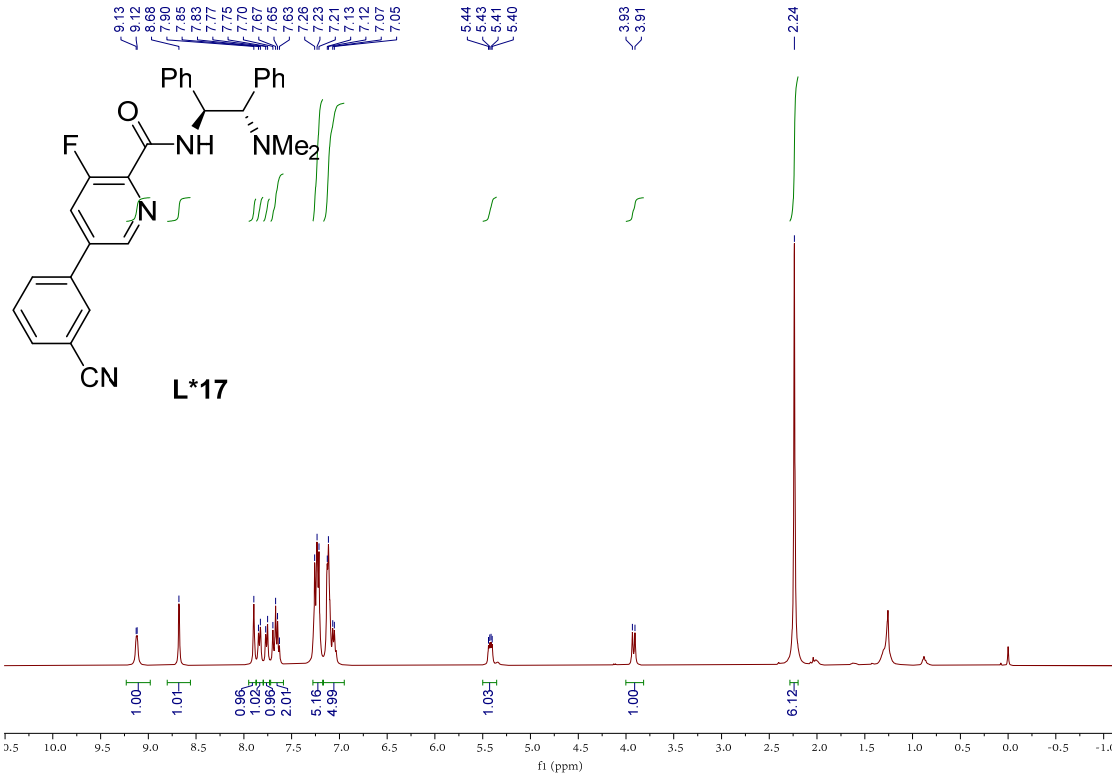

Ph
Ph
O
NH
NMe2
Ph
N
L*14
f1 (ppm)

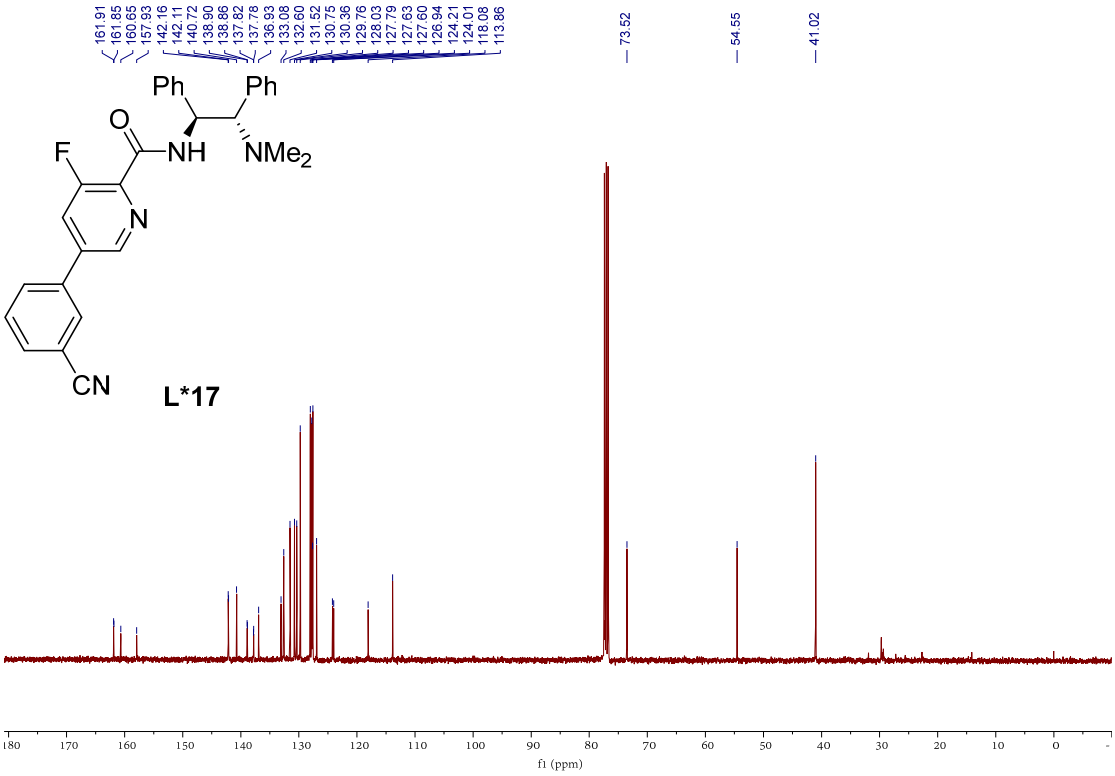

9.30
9.29
8.86
8.86
8.22
8.20
8.01
8.00
7.99
7.98
7.63
7.63
7.61
7.52
7.52
7.51
7.49
7.46
7.45
7.44
7.27
7.25
7.23
7.23
7.22
7.21
7.13
7.13
7.12
7.11
7.10
7.07
7.06
5.46
5.44
5.43
5.42
3.94
3.91
2.24
Ph
Ph
O
NH
NMe2
N
Ph
L*15
1.00
1.01
1.01
1.00
2.02
2.00
1.02
5.14
5.02
1.04
1.05
6.17
f1 (ppm)

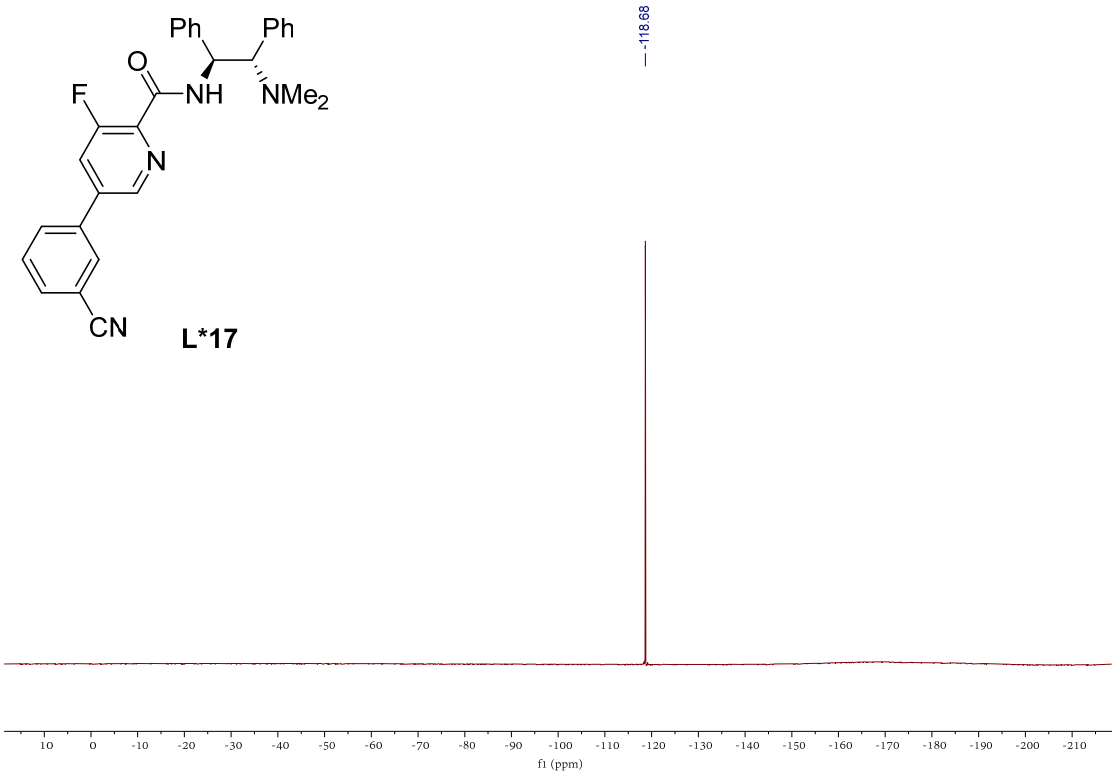

164.27
149.04
146.92
140.91
138.97
137.17
135.44
133.98
133.20
129.80
129.24
128.64
128.05
127.80
127.64
127.59
127.28
126.96
122.42
73.56
54.71
41.04
Ph
Ph
O
NH
NMe2
N
Ph
L*15
f1 (ppm)

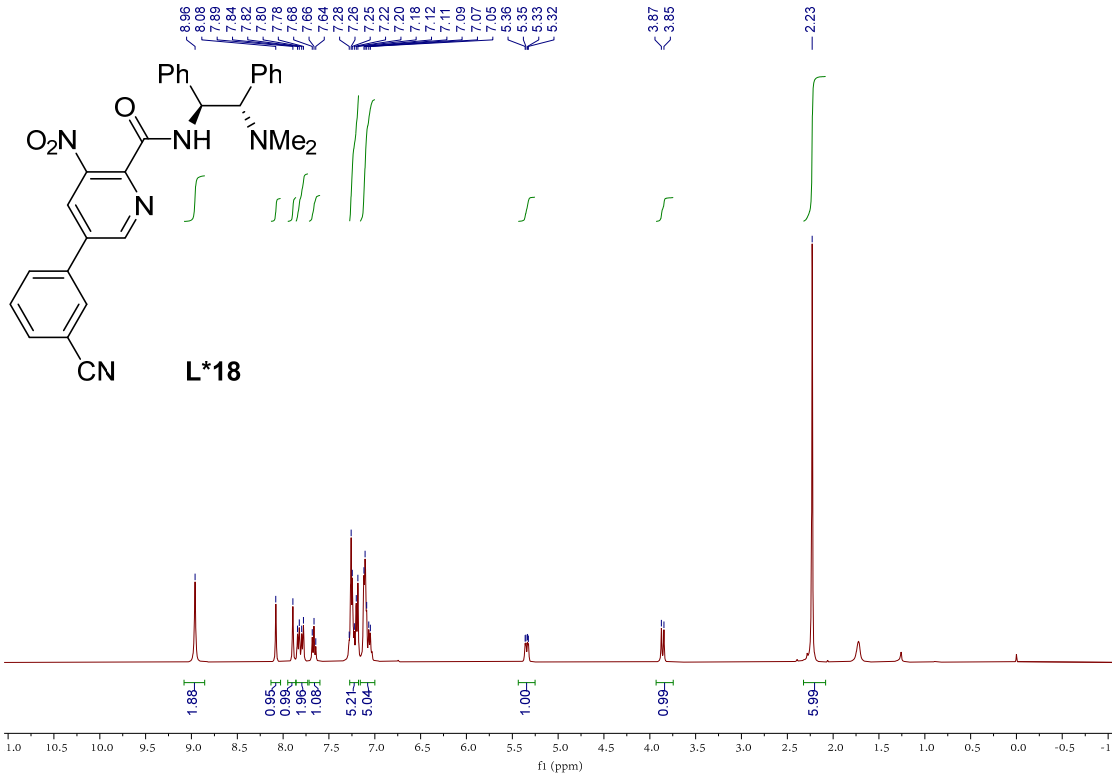

Ph
Ph
O
NH
NMe2
N
CN
L*16
f1 (ppm)

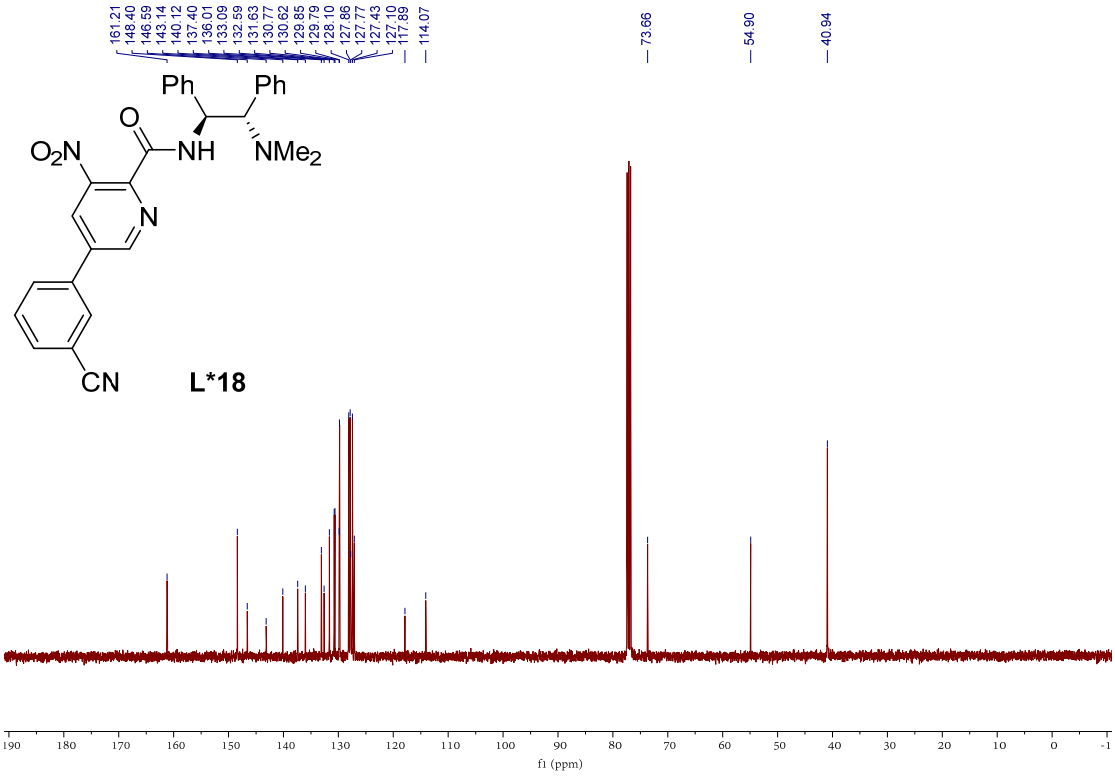

Ph
Ph
O
NH
NMe2
N
CN
L*16
f1 (ppm)

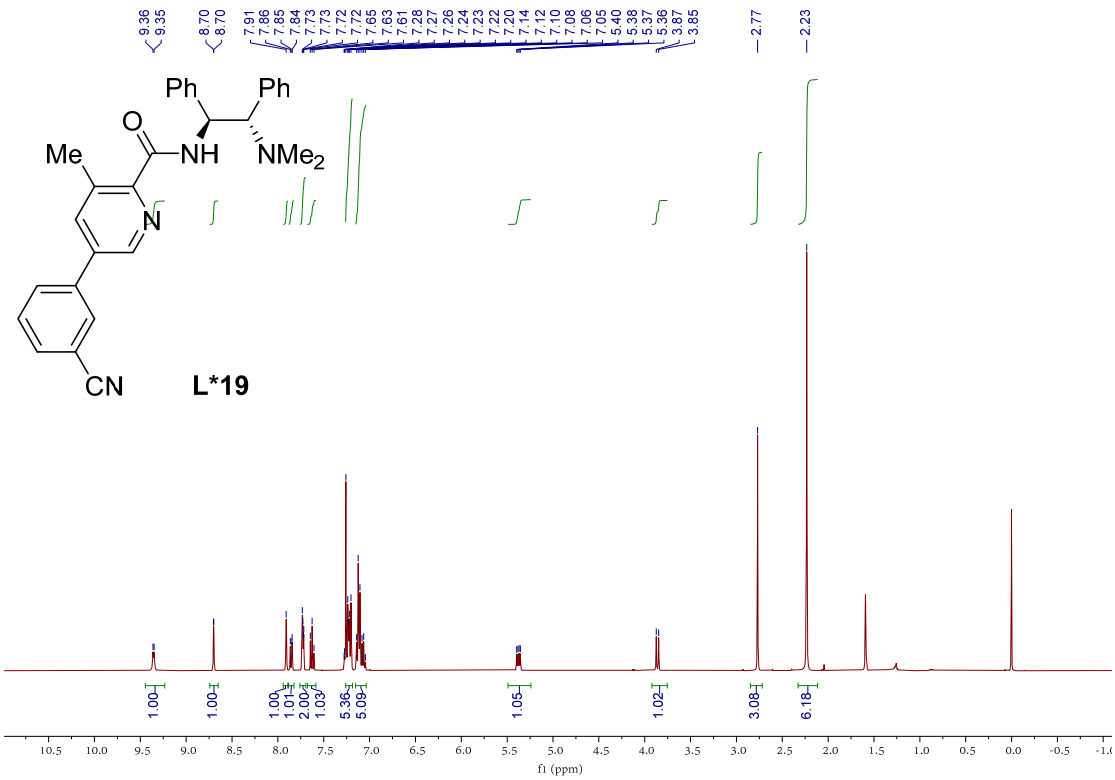

9.13
9.12
8.68
7.90
7.85
7.83
7.77
7.75
7.70
7.67
7.65
7.63
7.26
7.23
7.21
7.13
7.12
7.07
7.05
5.44
5.43
5.41
5.40
3.93
3.91
2.24
Ph
Ph
O
NH
NMe2
F
N
CN
L*17
1.00
1.01
0.95
1.02
0.96
2.01
5.16
4.99
1.03
1.00
6.12
f1 (ppm)

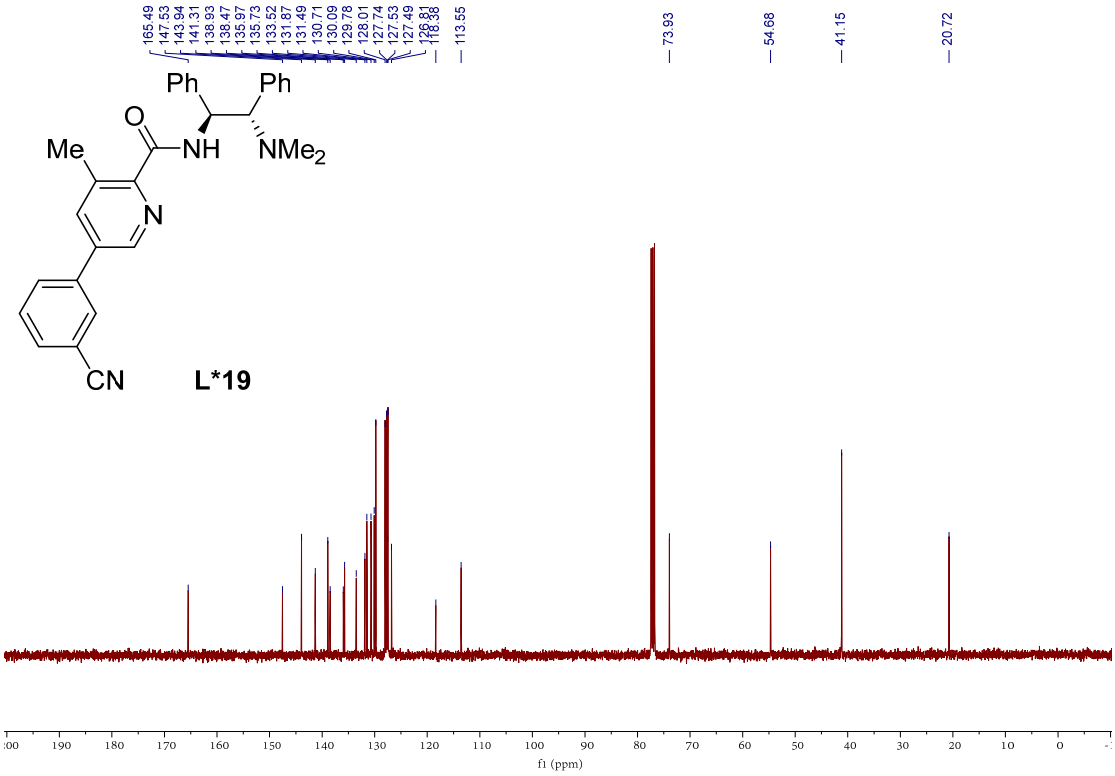

161.91
161.85
160.65
157.93
142.16
142.11
140.72
138.90
138.86
137.82
137.78
136.93
133.08
132.60
131.52
130.75
130.36
129.76
128.03
127.79
127.63
127.60
126.94
124.21
124.01
118.08
113.86
73.52
54.55
41.02
Ph
Ph
O
NH
NMe2
F
N
CN
L*17
f1 (ppm)

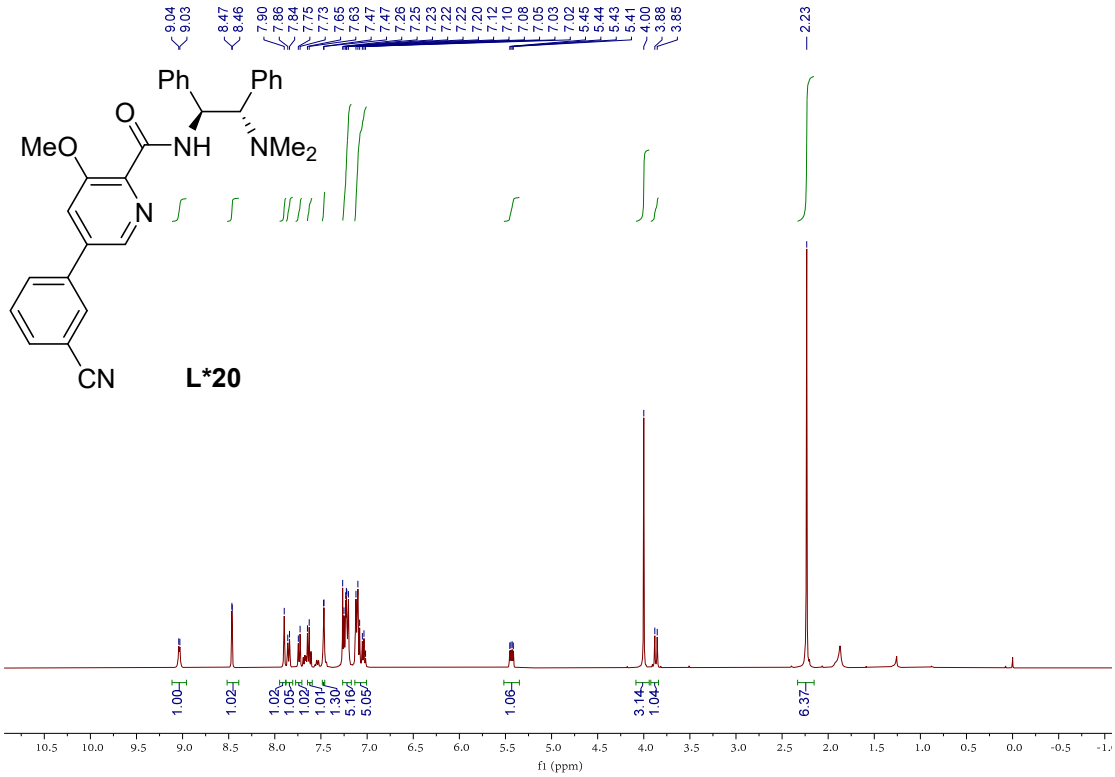

Ph
Ph
O
NH
NMe2
F
N
CN
L*17
-118.68
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

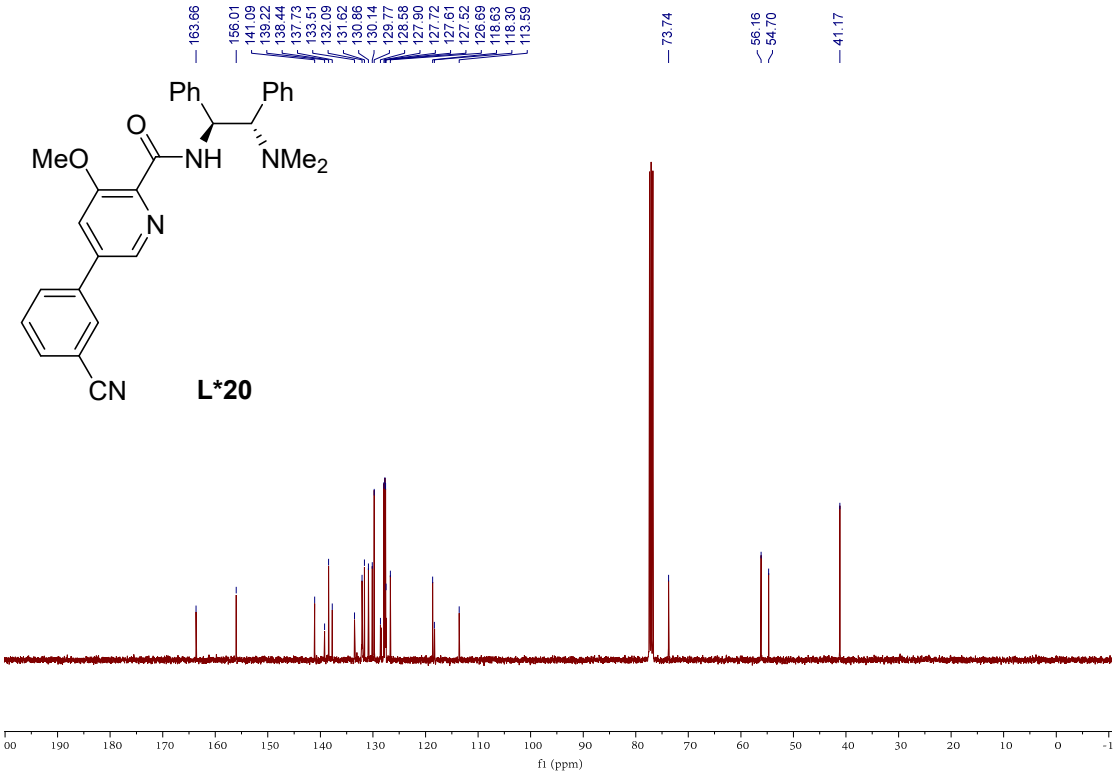

8.96
8.08
7.89
7.84
7.82
7.80
7.78
7.68
7.66
7.64
7.28
7.26
7.25
7.22
7.20
7.18
7.12
7.11
7.09
7.07
7.05
5.36
5.35
5.33
5.32
3.87
3.85
2.23
Ph
Ph
O
NH
NMe2
O2N
N
CN
L*18
1.88
0.95
0.99
1.96
1.08
5.21
5.04
1.00
0.99
5.99
f1 (ppm)

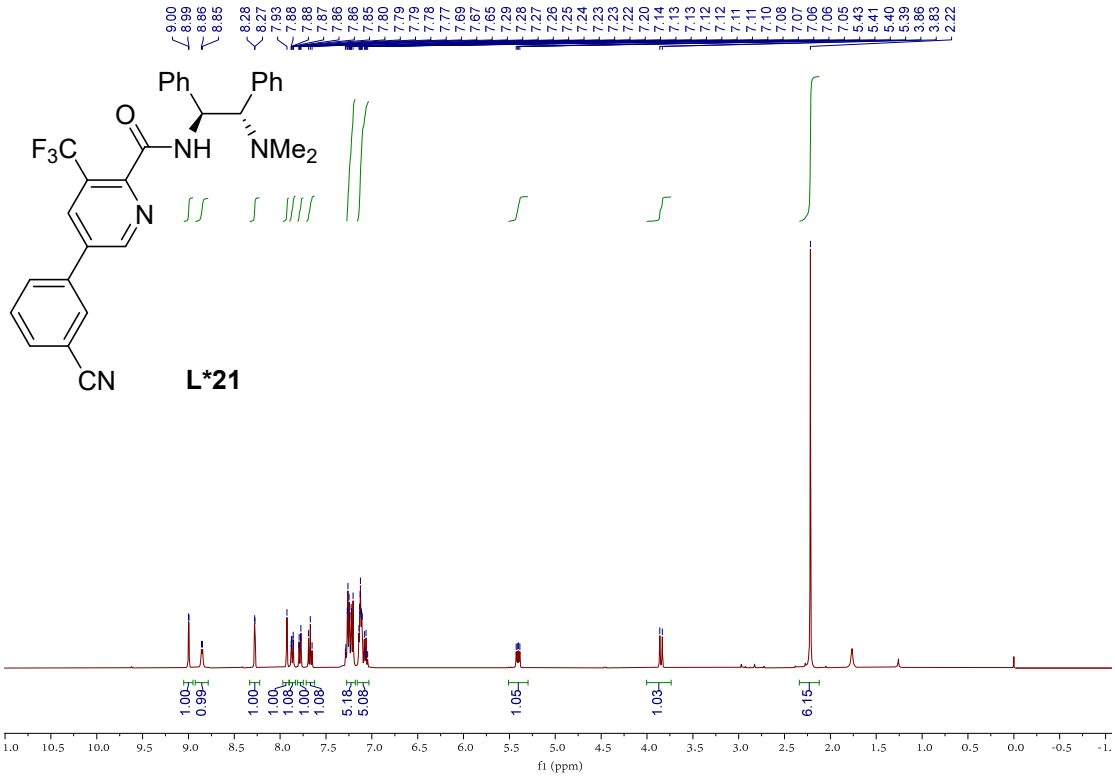

161.21
148.40
146.59
143.14
140.12
137.40
136.01
133.09
132.59
131.63
130.77
130.62
129.85
129.79
128.10
127.86
127.77
127.43
127.10
117.89
114.07
73.66
54.90
40.94
Ph
Ph
O
NH
NMe2
O2N
N
CN
L*18
f1 (ppm)

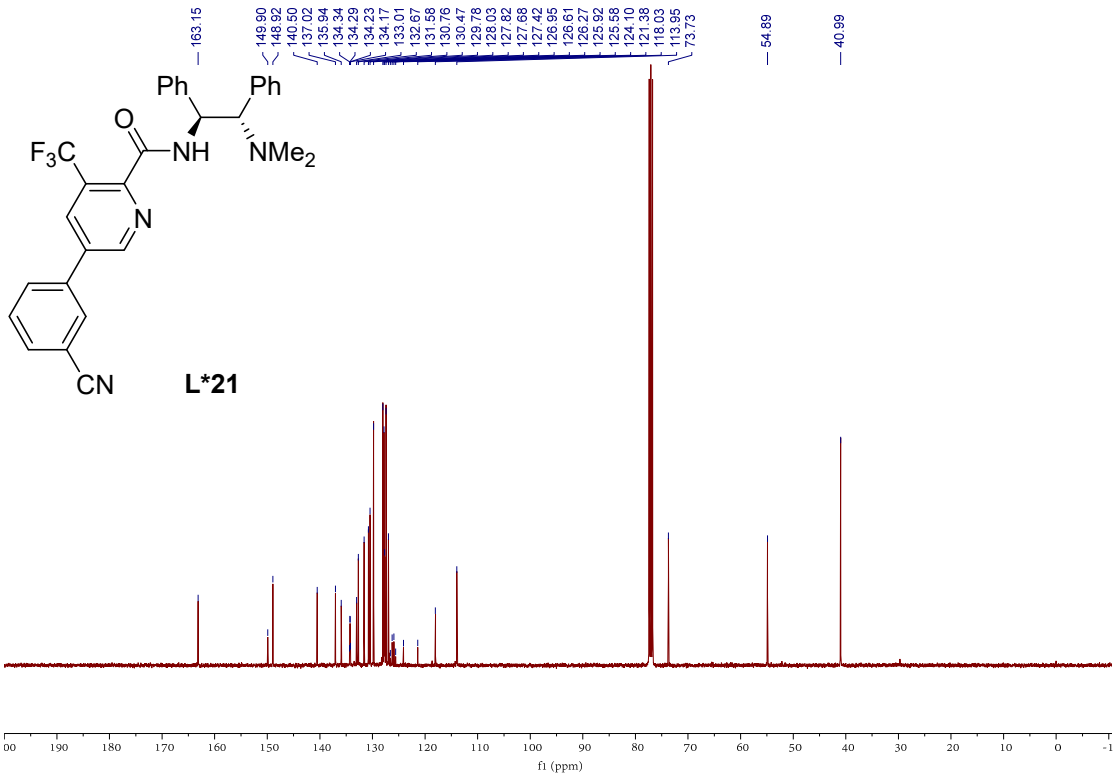

Ph
Ph
O
NH
NMe2
Me
N
CN
L*19
f1 (ppm)

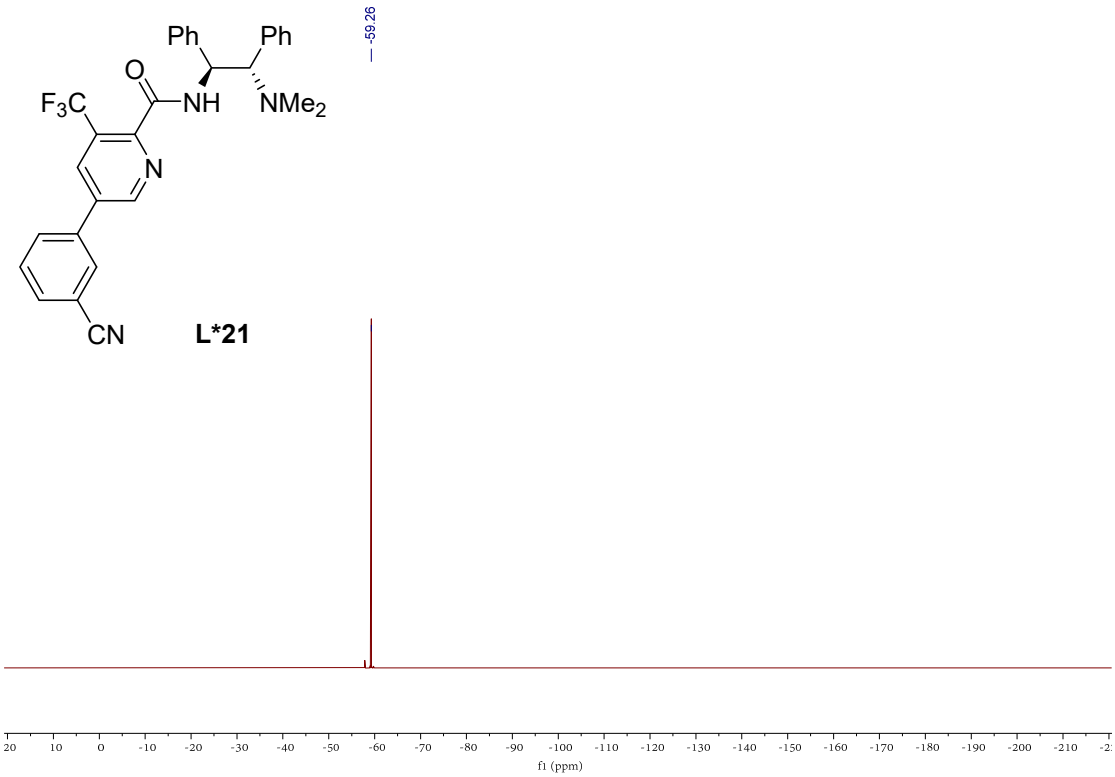

Ph
Ph
O
NH
NMe2
Me
N
CN
L*19
f1 (ppm)

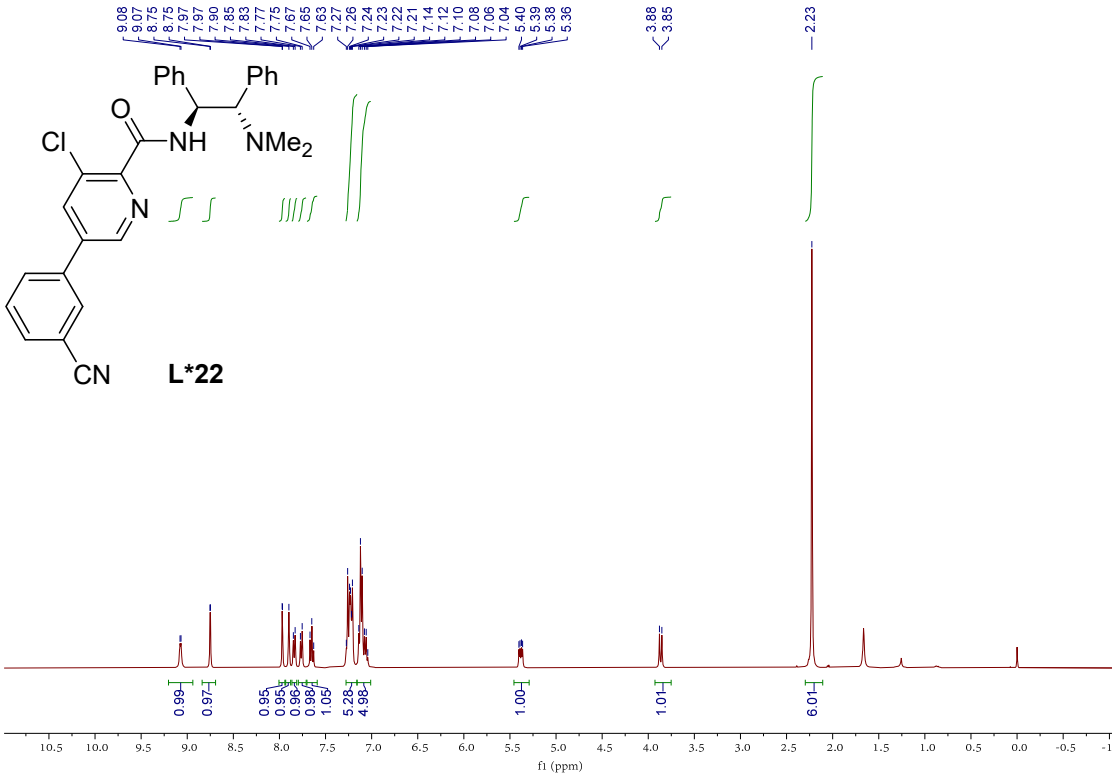

9.04
9.03
8.47
8.46
7.90
7.86
7.84
7.75
7.73
7.65
7.63
7.47
7.26
7.25
7.23
7.22
7.22
7.20
7.12
7.10
7.08
7.05
7.03
7.02
5.45
5.44
5.43
5.41
4.00
3.88
3.85
2.23
Ph
Ph
O
NH
NMe2
MeO
N
CN
L*20
1.00
1.02
1.02
1.05
1.02
1.01
1.30
5.16
5.05
1.06
3.14
1.04
6.37
f1 (ppm)

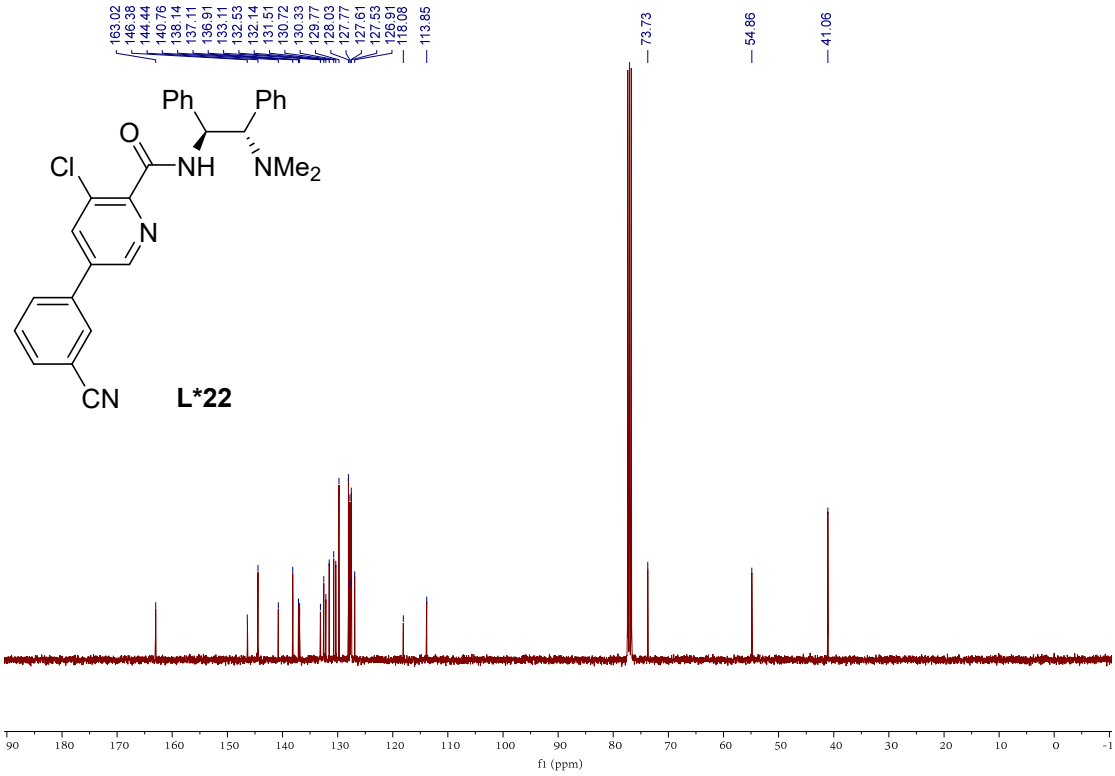

163.66
156.01
141.09
139.22
138.44
137.73
133.51
132.09
131.62
130.86
130.14
129.77
128.58
127.90
127.72
127.61
127.52
126.69
118.63
118.30
113.59
73.74
56.16
54.70
41.17
Ph
Ph
O
NH
NMe2
MeO
N
CN
L*20
f1 (ppm)

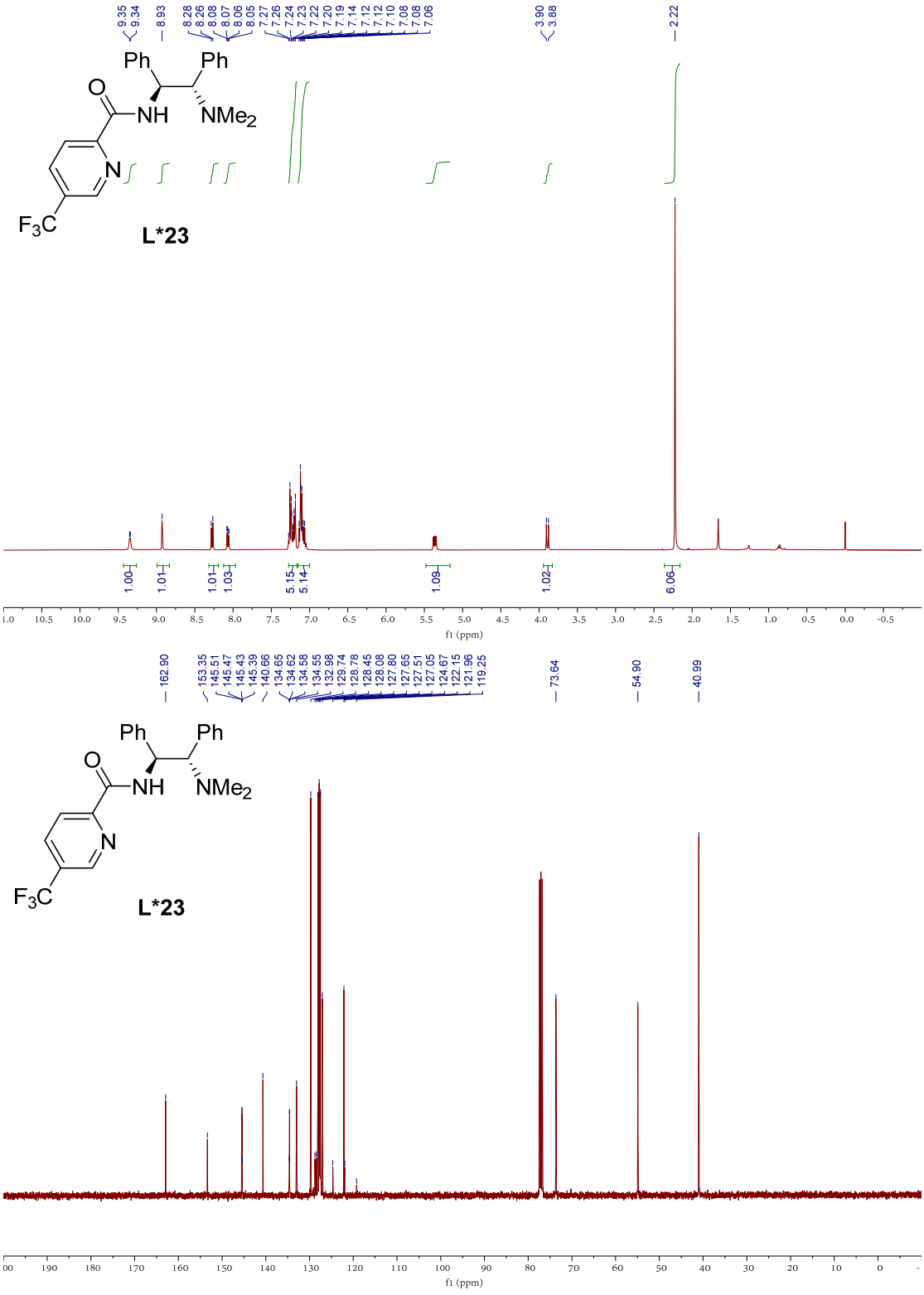

Ph
Ph
O
NH
NMe2
F3C
N
CN
L*21
f1 (ppm)

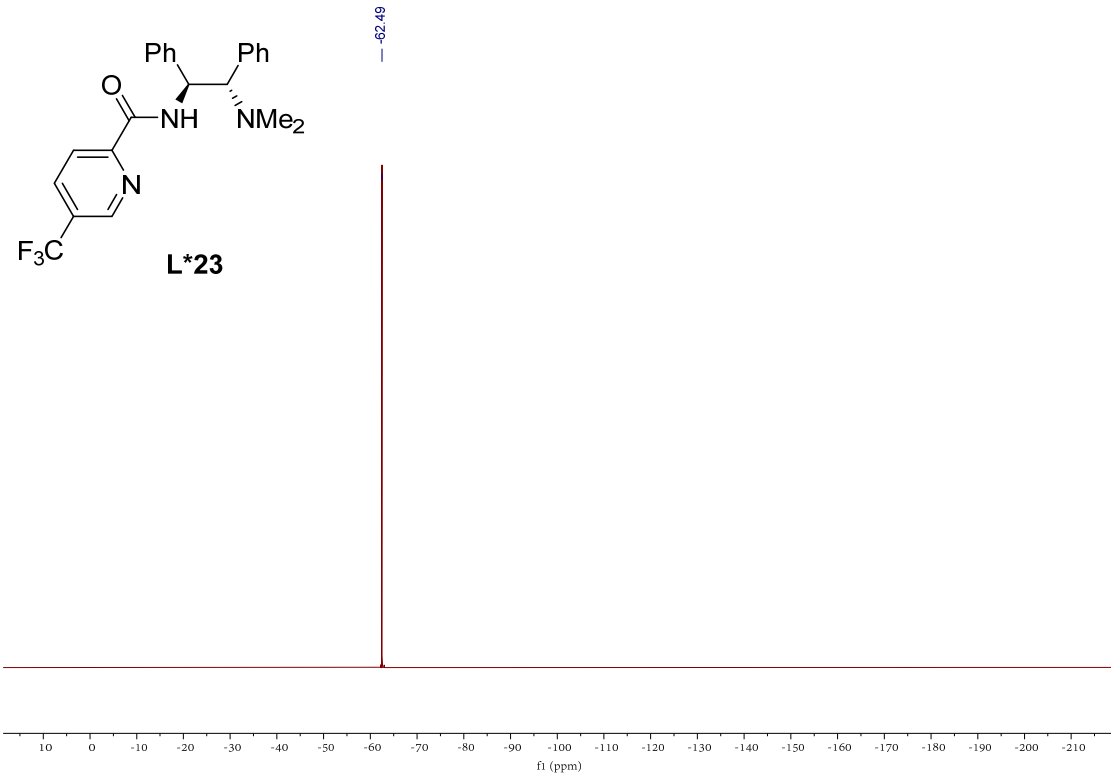

Ph
Ph
O
NH
NMe2
F3C
N
CN
L*21
f1 (ppm)

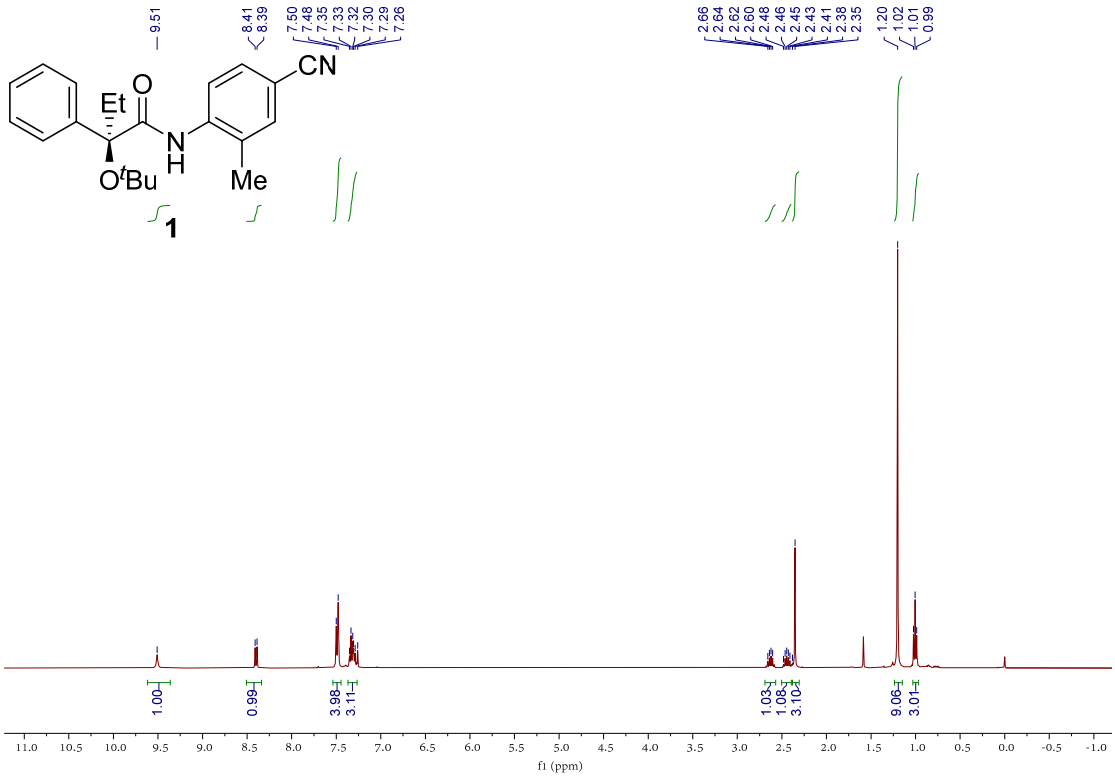

Ph
Ph
O
NH
NMe2
F3C
N
CN
L*21
-59.26
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

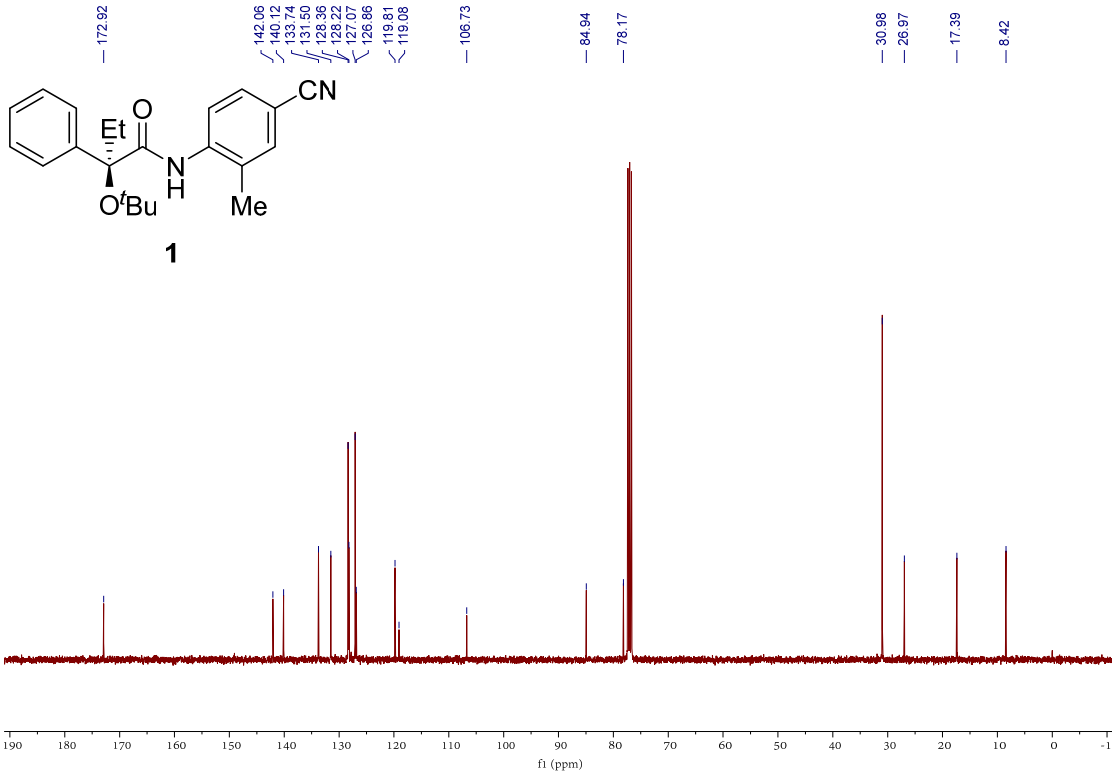

9.08
9.07
8.75
8.75
7.97
7.97
7.90
7.85
7.83
7.77
7.75
7.67
7.65
7.63
7.27
7.26
7.24
7.23
7.22
7.21
7.14
7.12
7.10
7.08
7.06
7.04
5.40
5.39
5.38
5.36
3.88
3.85
2.23
Ph
Ph
O
NH
NMe2
Cl
N
CN
L*22
0.99
0.97
0.95
0.95
0.96
0.98
1.05
5.28
4.98
1.00
1.01
6.01
f1 (ppm)

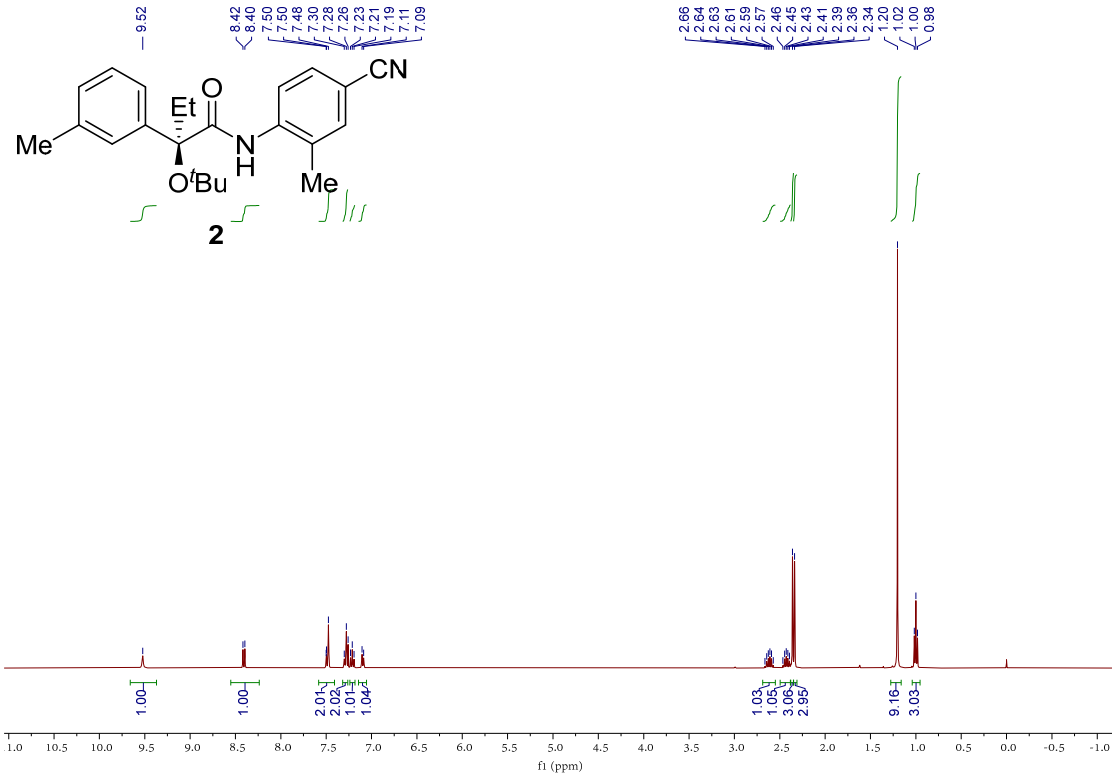

163.02
146.38
144.44
140.76
138.14
137.11
136.91
133.11
132.53
132.14
131.51
130.72
130.33
129.77
128.03
127.77
127.61
127.53
126.91
118.08
113.85
73.73
54.86
41.06
Ph
Ph
O
NH
NMe2
Cl
N
CN
L*22
f1 (ppm)


9.35
9.34
8.93
8.28
8.26
8.08
8.07
8.06
8.05
7.27
7.26
7.24
7.23
7.22
7.20
7.19
7.14
7.12
7.12
7.10
7.08
7.08
7.06
3.90
3.88
2.22
Ph
Ph
O
NH
NMe2
N
F3C
L*23
1.00
1.01
1.01
1.03
5.15
5.14
1.09
1.02
6.06
f1 (ppm)
162.90
153.35
145.51
145.47
145.43
145.39
140.66
134.65
134.62
134.58
134.55
132.98
129.74
128.78
128.45
128.08
127.80
127.65
127.51
127.05
124.67
122.15
121.96
119.25
73.64
54.90
40.99
Ph
Ph
O
NH
NMe2
N
F3C
L*23
f1 (ppm)

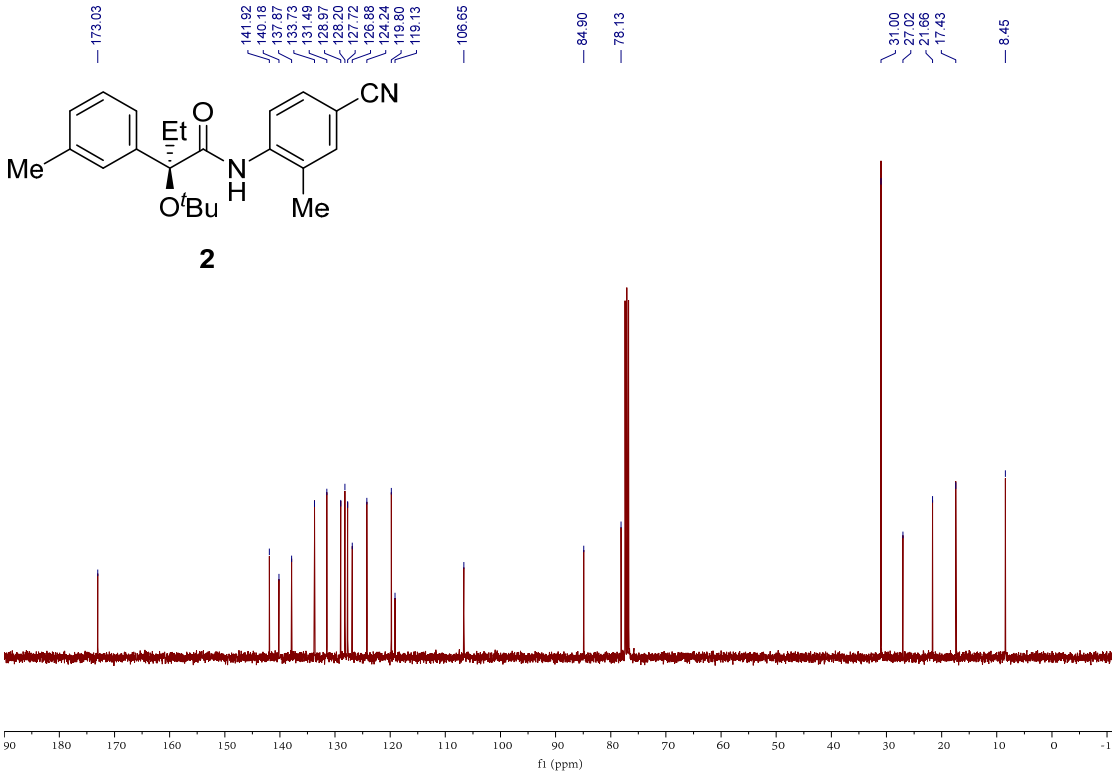

-62.49
Ph
Ph
O
NH
NMe2
N
F3C
L*23
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)


9.51
8.41
8.39
7.50
7.48
7.35
7.33
7.32
7.30
7.29
7.26
2.66
2.64
2.62
2.60
2.48
2.46
2.45
2.43
2.41
2.38
2.35
1.20
1.02
1.01
0.99
CN
Et
O
N
H
O^{t}Bu
Me
1
1.00
0.99
3.98
3.11
1.03
1.08
3.10
9.06
3.01
f1 (ppm)

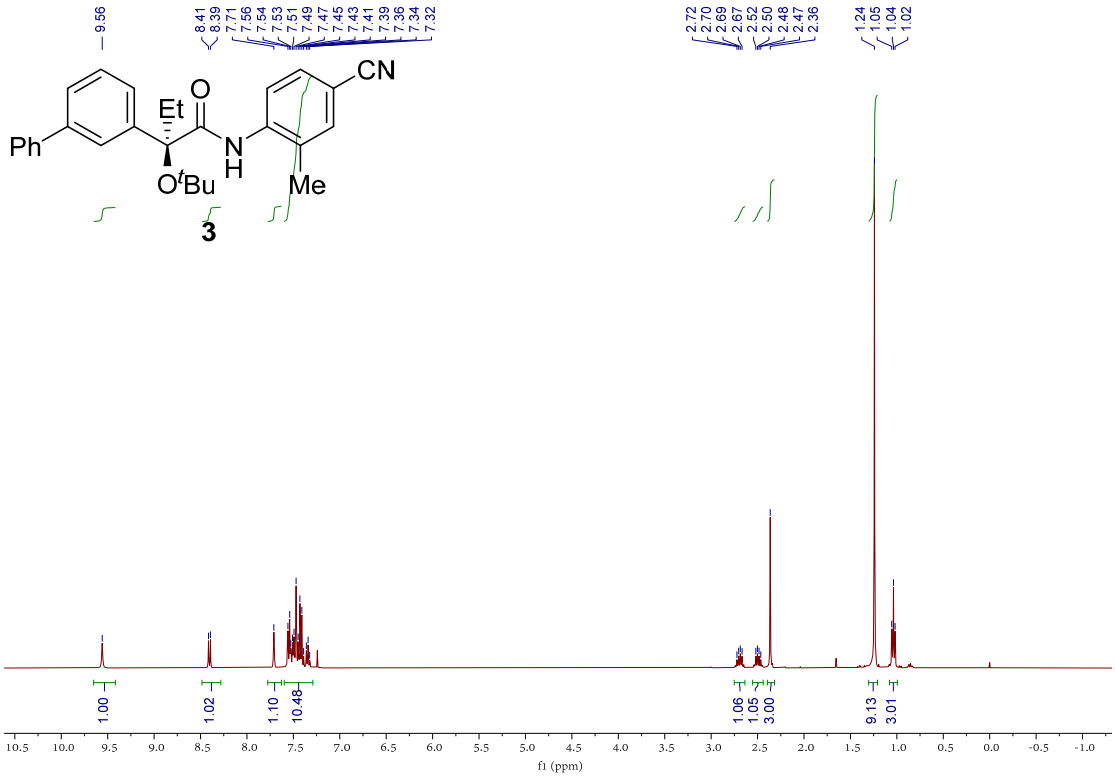

172.92
142.06
140.12
133.74
131.50
128.36
128.22
127.07
126.86
119.81
119.08
106.73
84.94
78.17
30.98
26.97
17.39
8.42
CN
Et
O
N
H
O^{t}Bu
Me
1
f1 (ppm)

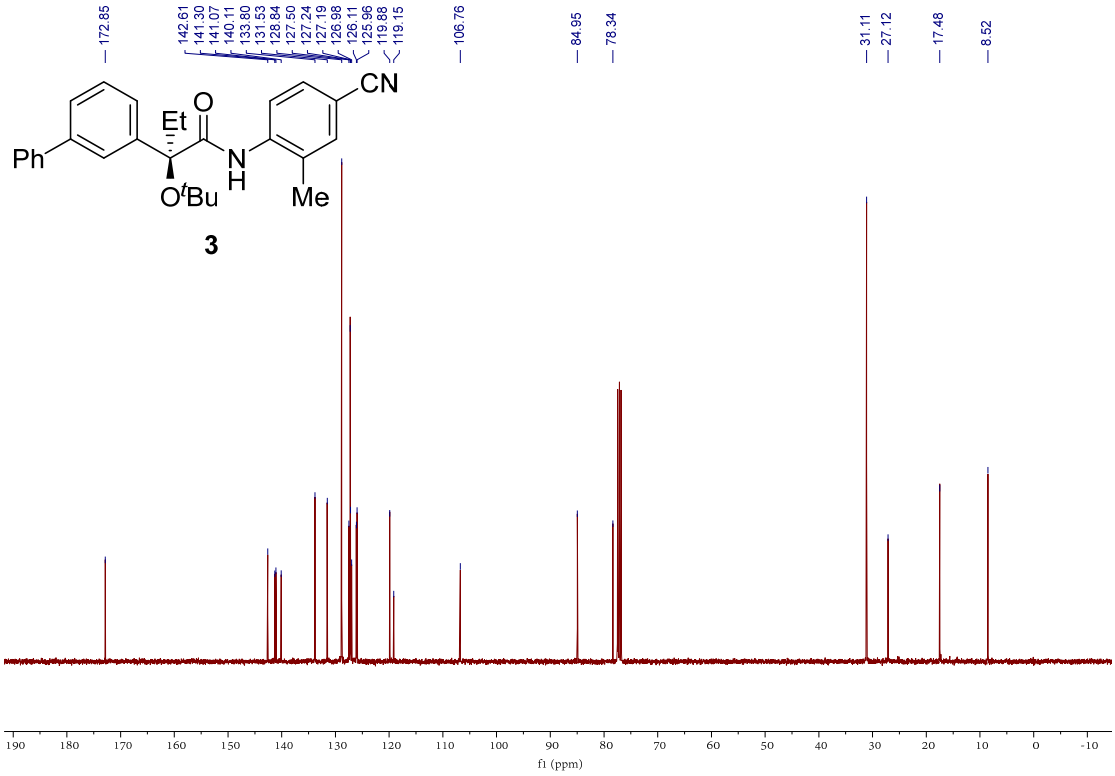

9.52
8.42
8.40
7.50
7.50
7.48
7.30
7.28
7.26
7.23
7.21
7.19
7.11
7.09
2.66
2.64
2.63
2.61
2.59
2.57
2.46
2.45
2.43
2.41
2.39
2.36
2.34
1.20
1.02
1.00
0.98
Et
O
N
H
Me
CN
O^{t}Bu
Me
1.00
1.00
2.01
2.02
1.01
1.04
1.03
1.05
3.06
2.95
9.16
3.03
f1 (ppm)

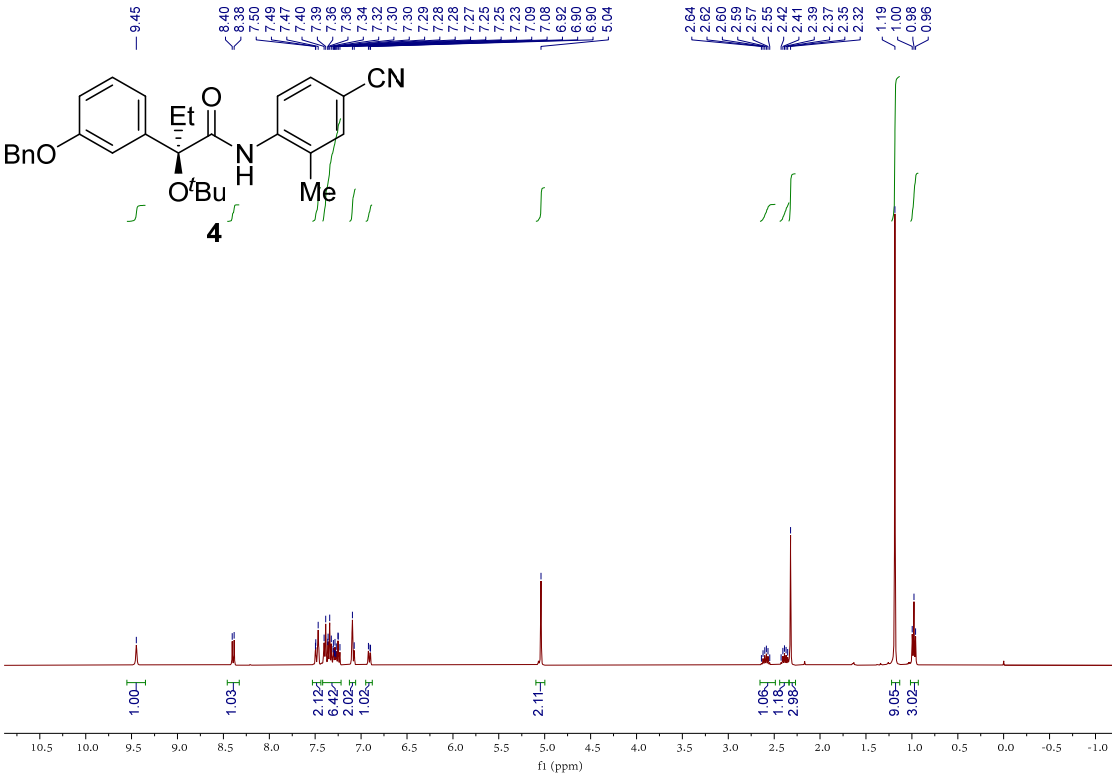
2

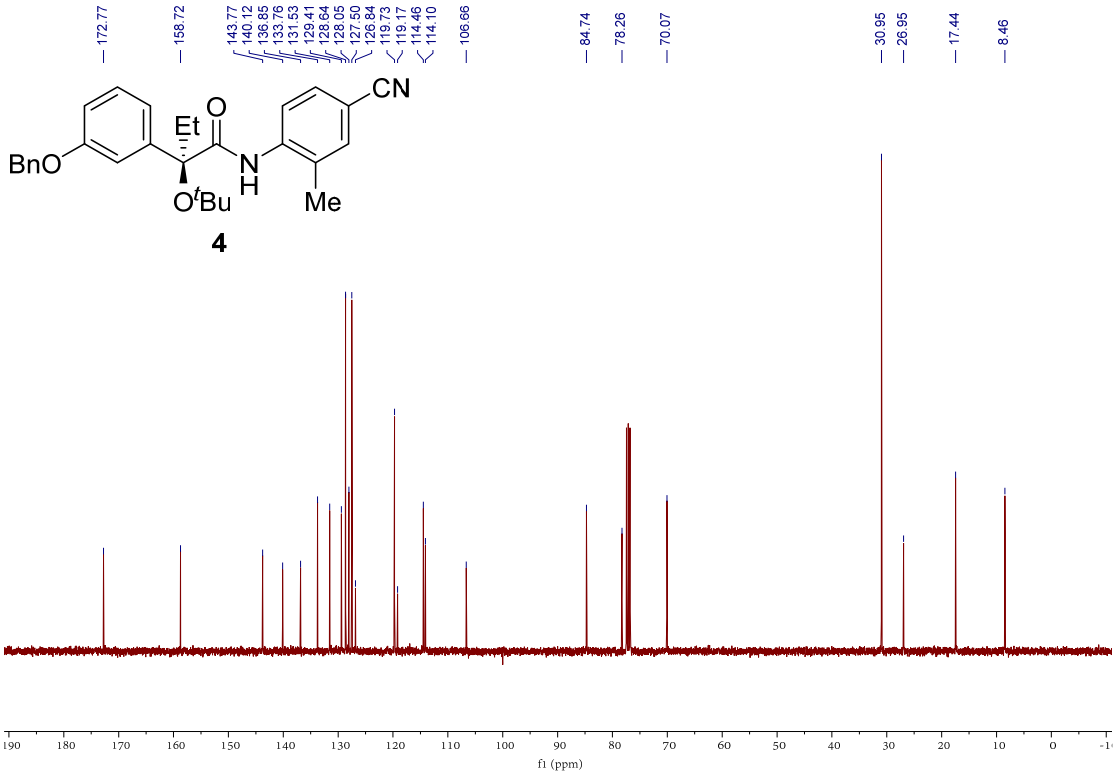

173.03
141.92
140.18
137.87
133.73
131.49
128.97
128.20
127.72
126.88
124.24
119.80
119.13
106.65
84.90
78.13
31.00
27.02
21.66
17.43
8.45
Et
O
N
H
Me
CN
O^{t}Bu
Me
f1 (ppm)

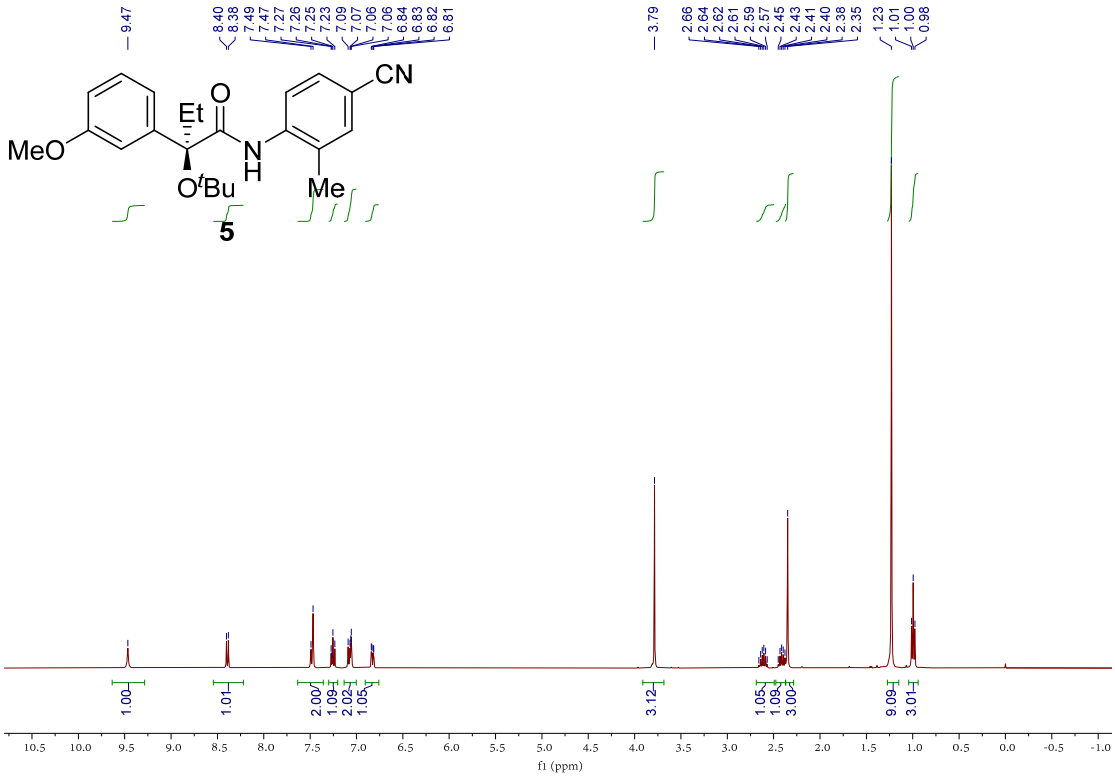
2

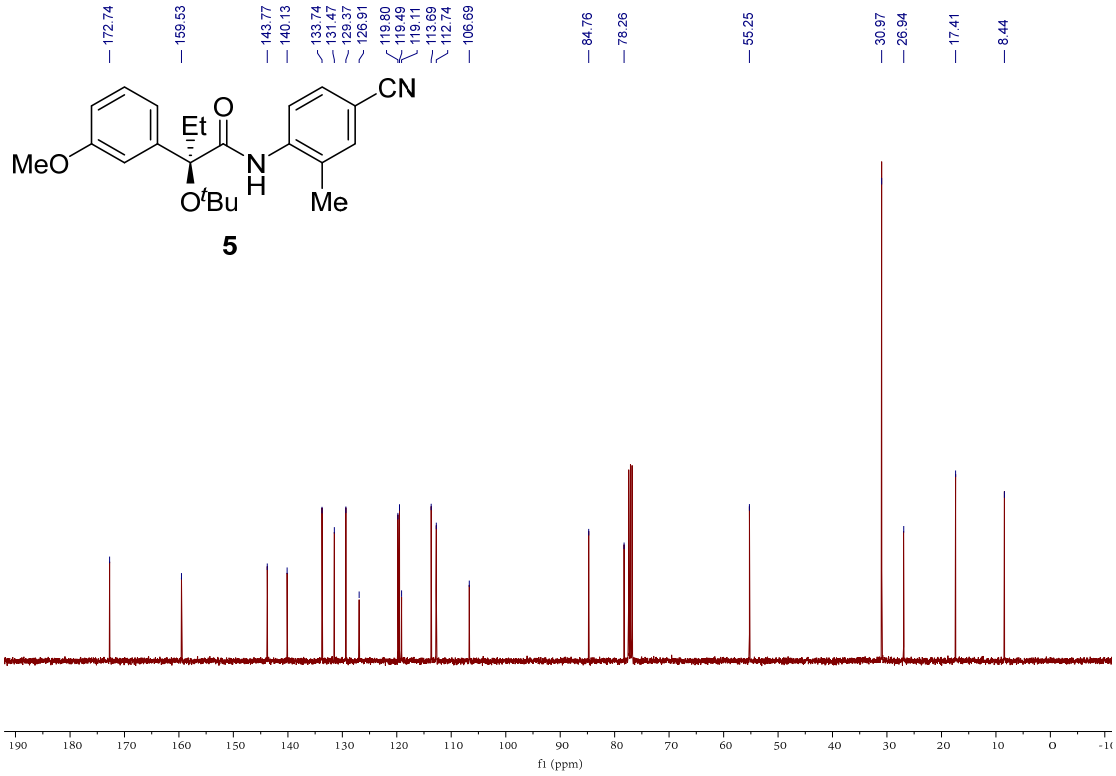

9.56
8.41
8.39
7.71
7.56
7.54
7.53
7.51
7.49
7.47
7.45
7.43
7.41
7.39
7.36
7.34
7.32
2.72
2.70
2.69
2.67
2.52
2.50
2.48
2.47
2.36
1.24
1.05
1.04
1.02
Ph
Et
O
N
H
CN
O^{t}Bu
Me
3
1.00
1.02
1.10
10.48
1.06
1.05
3.00
9.13
3.01
f1 (ppm)

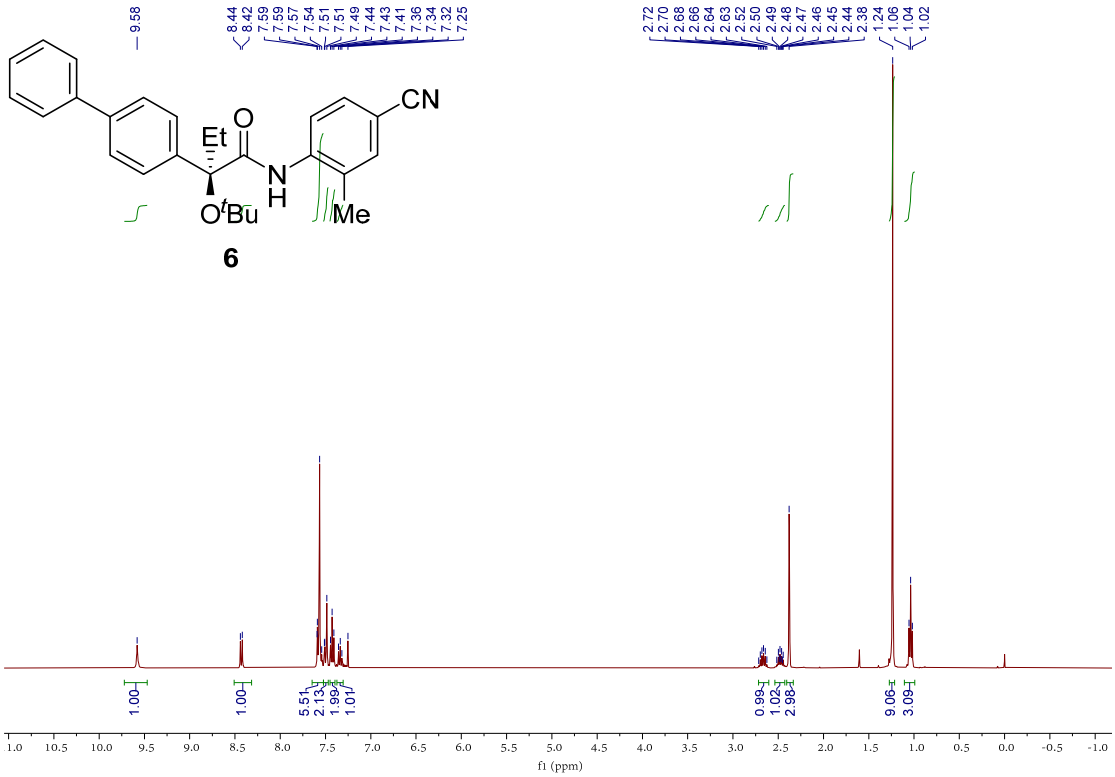

172.85
142.61
141.30
141.07
140.11
133.80
131.53
128.84
127.50
127.24
127.19
126.98
126.11
125.96
119.88
119.15
106.76
84.95
78.34
31.11
27.12
17.48
8.52
Ph
Et
O
N
H
CN
O^{t}Bu
Me
3
f1 (ppm)

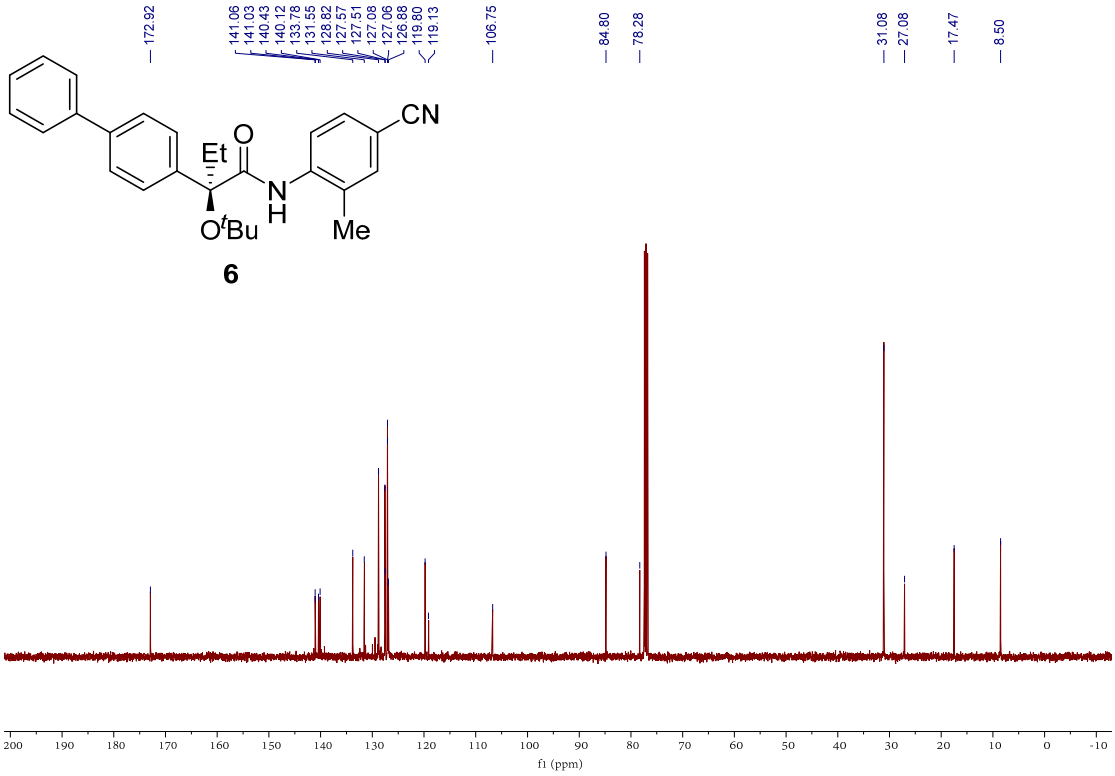

9.45
8.40
8.38
7.50
7.49
7.47
7.40
7.39
7.36
7.36
7.34
7.32
7.30
7.30
7.29
7.28
7.28
7.27
7.25
7.25
7.23
7.09
7.08
6.92
6.90
6.90
5.04
2.64
2.62
2.60
2.59
2.57
2.55
2.42
2.41
2.39
2.37
2.35
2.32
1.19
1.00
0.98
0.96
BnO
Et
O
N
H
O^{t}Bu
Me
CN
4
1.00
1.03
2.12
6.42
2.02
1.02
2.11
1.06
1.18
2.98
9.05
3.02
f1 (ppm)

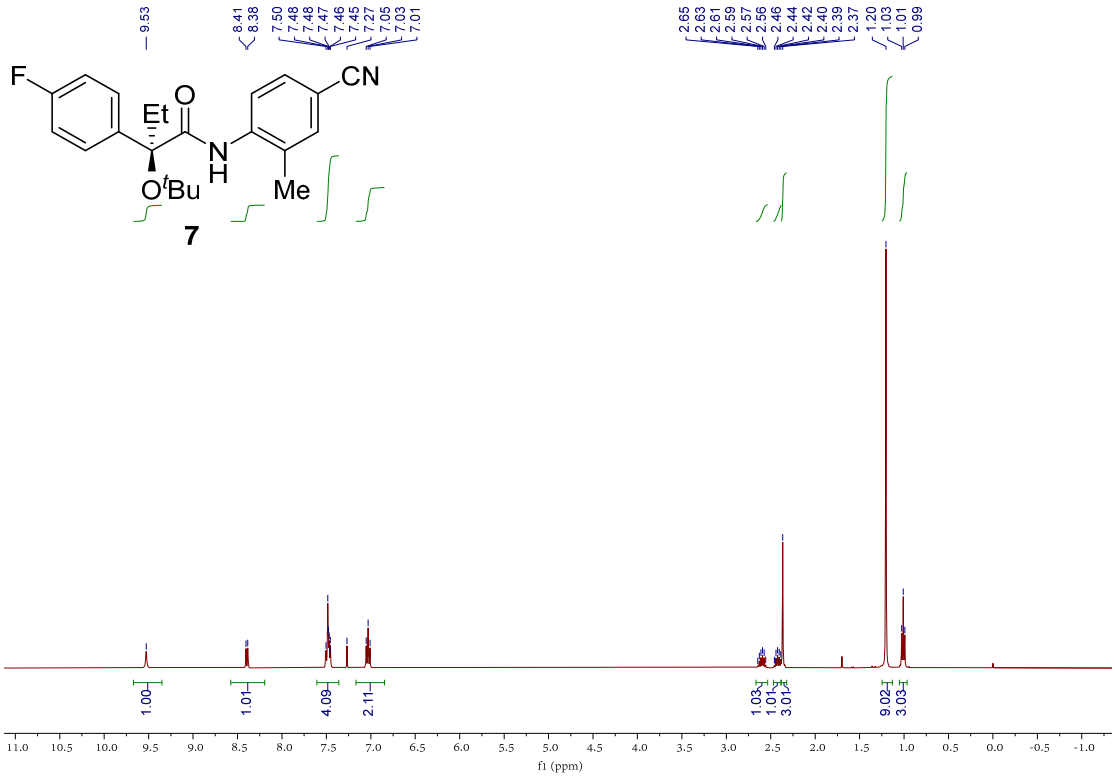

172.77
158.72
143.77
140.12
136.85
133.76
131.53
129.41
128.84
128.05
127.50
126.84
119.73
119.17
114.46
114.10
106.66
84.74
78.26
70.07
30.95
26.95
17.44
8.46
BnO
Et
O
N
H
O^{t}Bu
Me
CN
4
f1 (ppm)

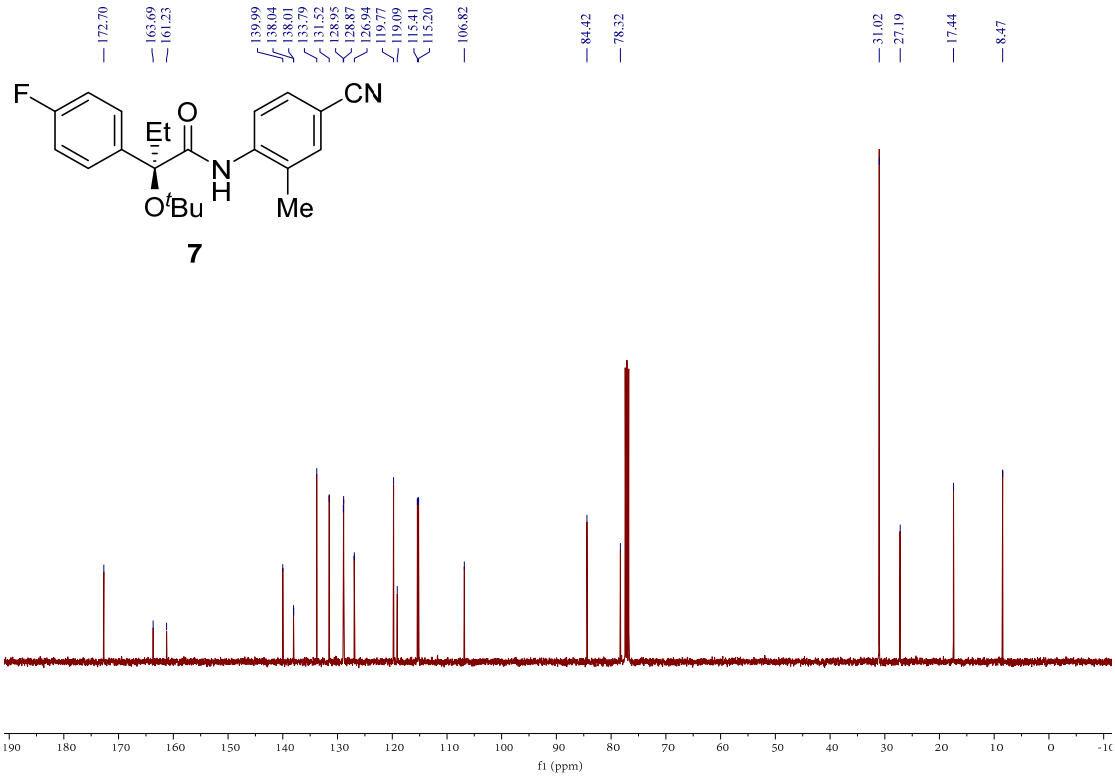

9.47
8.40
8.38
7.49
7.47
7.27
7.26
7.25
7.23
7.09
7.07
7.06
7.06
6.84
6.83
6.82
6.81
3.79
2.66
2.64
2.62
2.61
2.59
2.57
2.45
2.43
2.41
2.40
2.38
2.35
1.23
1.01
1.00
0.98
MeO
Et
O
N
H
O^{t}Bu
CN
Me
5
1.00
1.01
2.00
1.09
2.02
1.05
3.12
1.05
1.09
3.00
9.09
3.01
f1 (ppm)

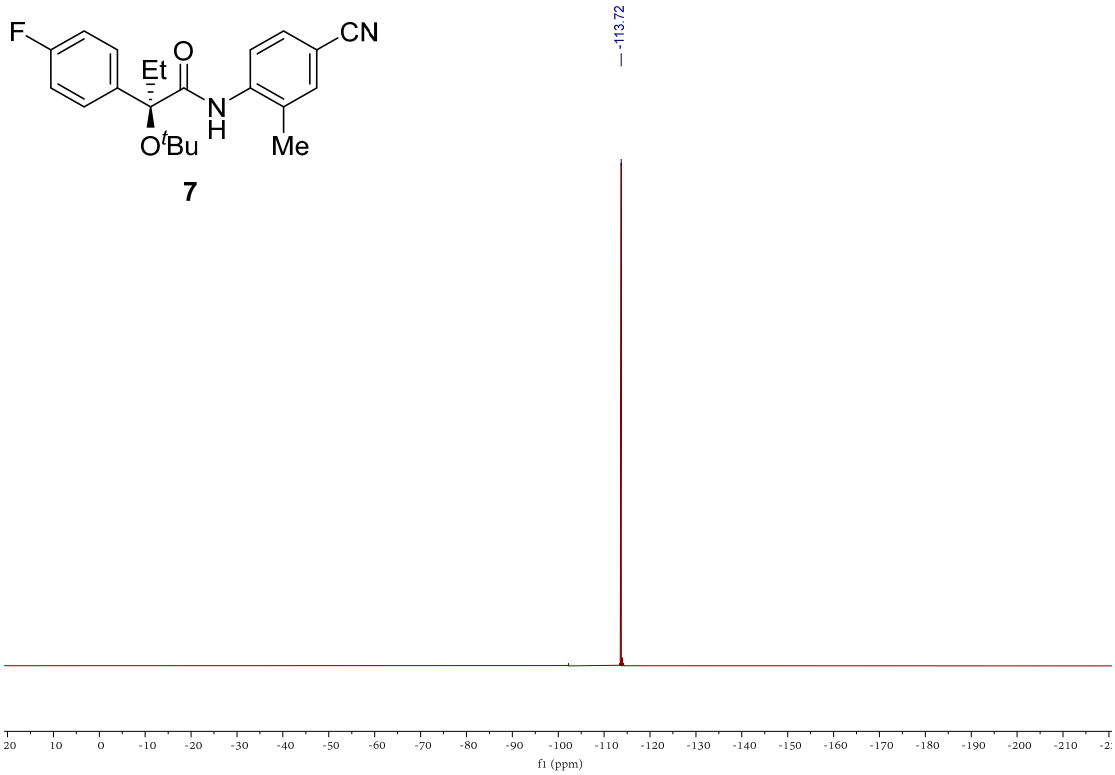

172.74
159.53
143.77
140.13
133.74
131.47
129.37
126.91
119.80
119.49
119.11
113.69
112.74
106.69
84.76
78.26
55.25
30.97
26.94
17.41
8.44
MeO
Et
O
N
H
O^{t}Bu
CN
Me
5
f1 (ppm)


9.58
8.44
8.42
7.59
7.57
7.54
7.51
7.51
7.49
7.44
7.43
7.41
7.36
7.34
7.32
7.25
2.72
2.70
2.68
2.66
2.64
2.63
2.52
2.50
2.49
2.48
2.47
2.46
2.45
2.44
2.38
1.24
1.06
1.04
1.02
CN
Et
O
N
H
O
tBu
Me
6
1.00
1.00
5.51
2.13
1.99
1.01
0.99
1.02
2.98
9.06
3.09
f1 (ppm)

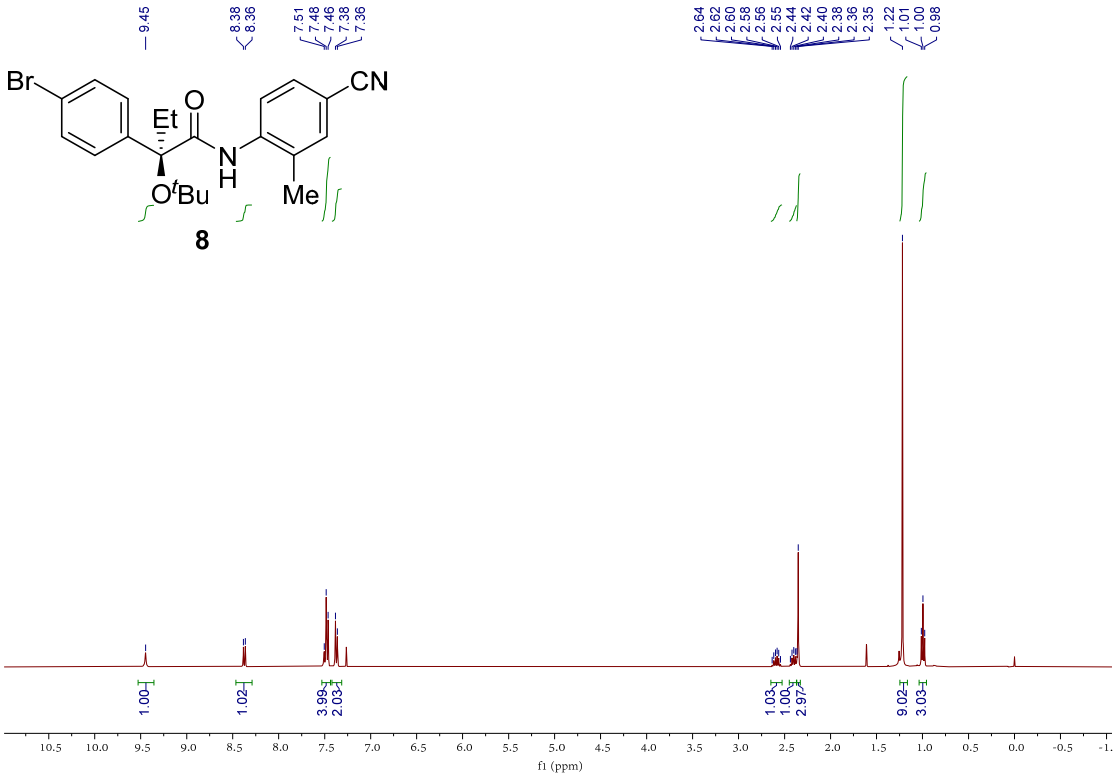

172.92
141.06
141.03
140.43
140.12
133.78
131.55
128.82
127.57
127.51
127.08
127.06
126.88
119.80
119.13
106.75
84.80
78.28
31.08
27.08
17.47
8.50
CN
Et
O
N
H
O
tBu
Me
6
f1 (ppm)


9.53
8.41
8.38
7.50
7.48
7.48
7.47
7.46
7.45
7.27
7.05
7.03
7.01
2.65
2.63
2.61
2.59
2.57
2.56
2.46
2.44
2.42
2.40
2.39
2.37
1.20
1.03
1.01
0.99
F
Et
O
N
H
CN
O^{t}Bu
Me
7
1.00
1.01
4.09
2.11
1.03
1.01
3.01
9.02
3.03
f1 (ppm)

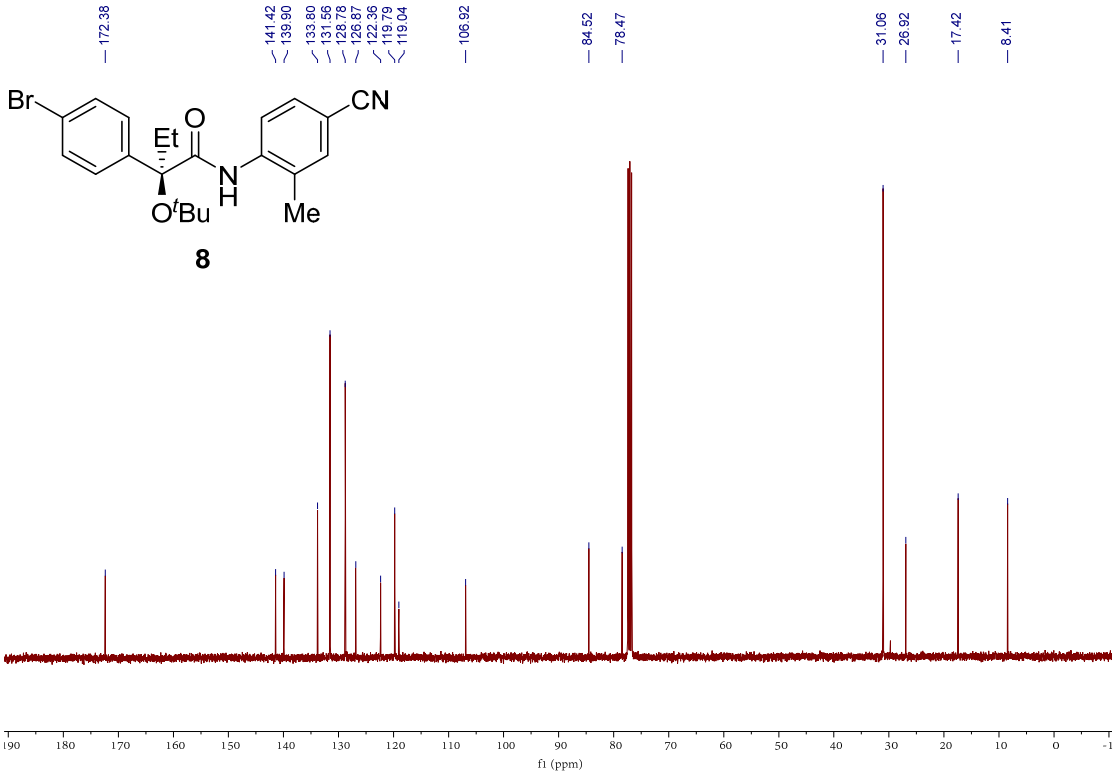

172.70
163.69
161.23
139.99
138.04
138.01
133.79
131.52
128.95
128.87
126.94
119.77
119.09
115.41
115.20
106.82
84.42
78.32
31.02
27.19
17.44
8.47
F
Et
O
N
H
CN
O^{t}Bu
Me
7
f1 (ppm)


F
O
Et
N
H
CN
O^{t}Bu
Me
-113.72
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

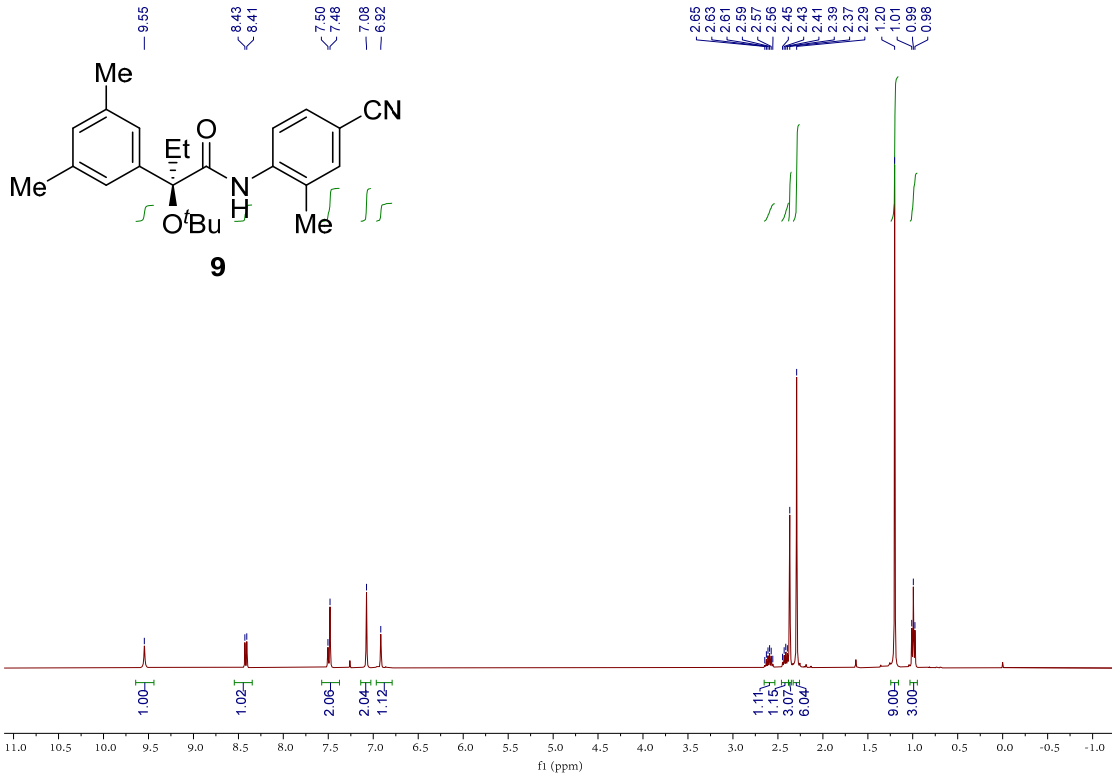
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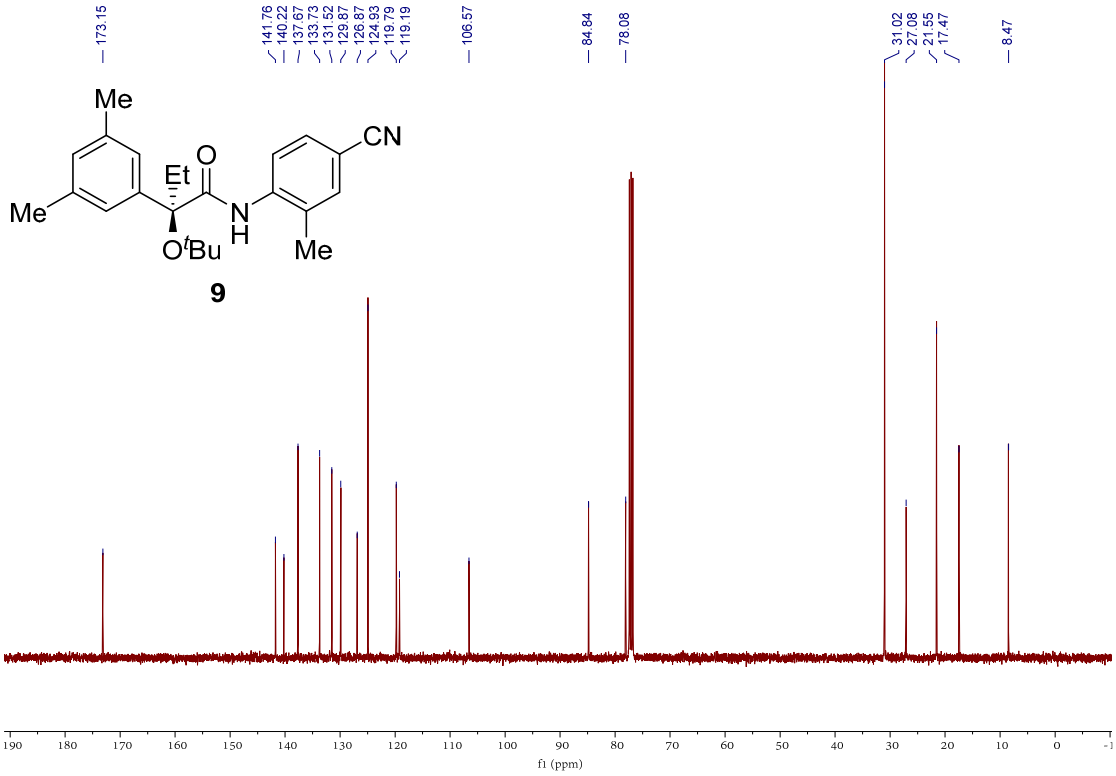

9.45
8.38
8.36
7.51
7.48
7.46
7.38
7.36
2.64
2.62
2.60
2.58
2.56
2.55
2.44
2.42
2.40
2.38
2.36
2.35
1.22
1.01
1.00
0.98
Br
Et
O
N
H
CN
O^{t}Bu
Me
1.00
1.02
3.99
2.03
1.03
1.00
2.97
9.02
3.03
f1 (ppm)

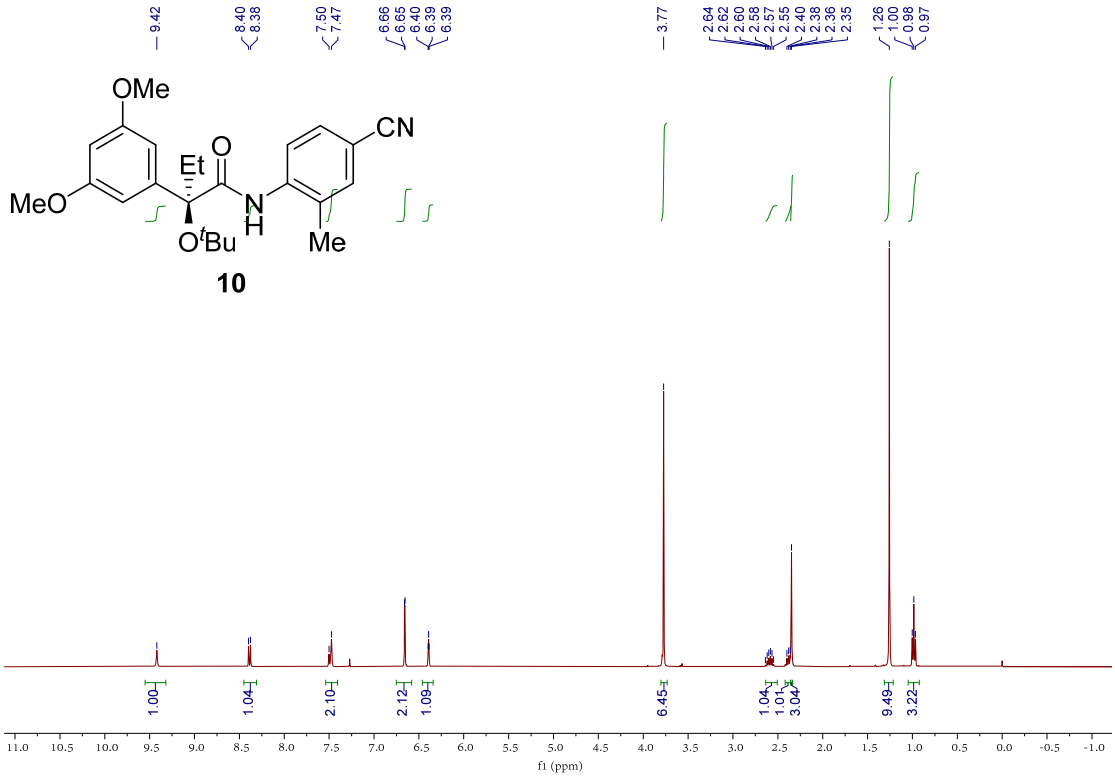
8


172.38
141.42
139.90
133.80
131.56
128.78
126.87
122.36
119.79
119.04
106.92
84.52
78.47
31.06
26.92
17.42
8.41
Br
Et
O
N
H
CN
O^{t}Bu
Me
f1 (ppm)

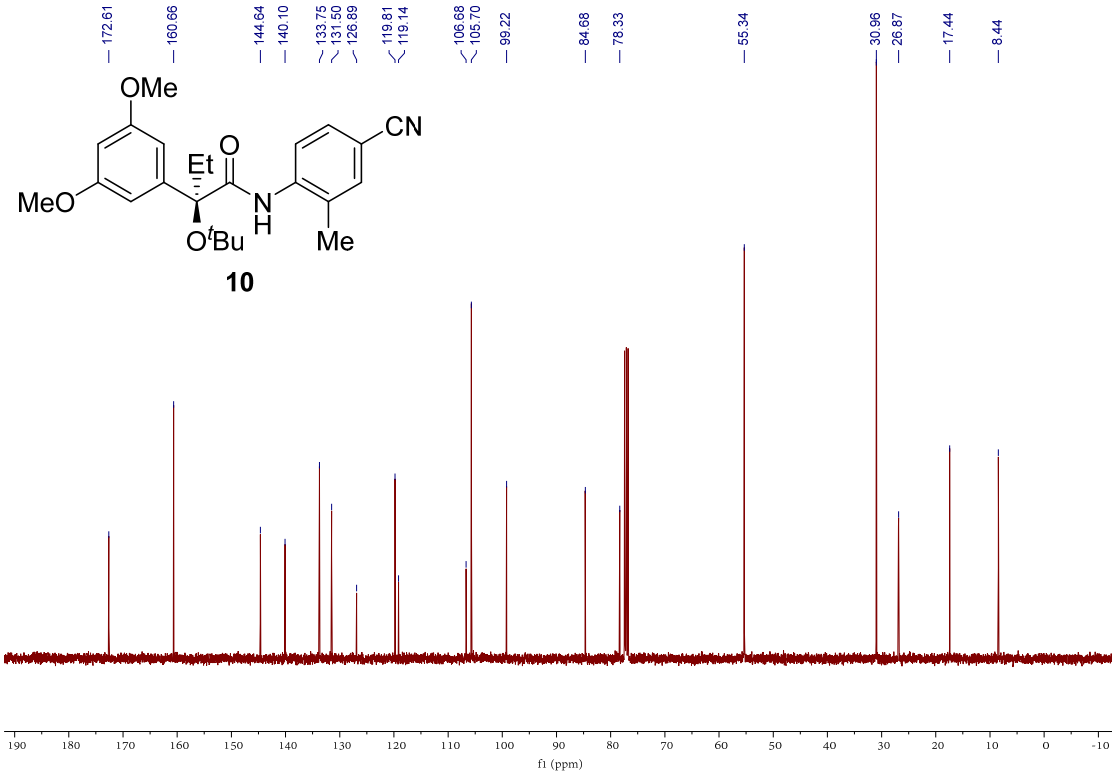
8


9.55
8.43
8.41
7.50
7.48
7.08
6.92
2.65
2.63
2.61
2.59
2.57
2.56
2.45
2.43
2.41
2.39
2.37
2.29
1.20
1.01
0.99
0.98
Me
Et
O
CN
Me
N
H
O^{t}Bu
Me
9
1.00
1.02
2.06
2.04
1.12
1.11
1.15
3.07
6.04
9.00
3.00
f1 (ppm)

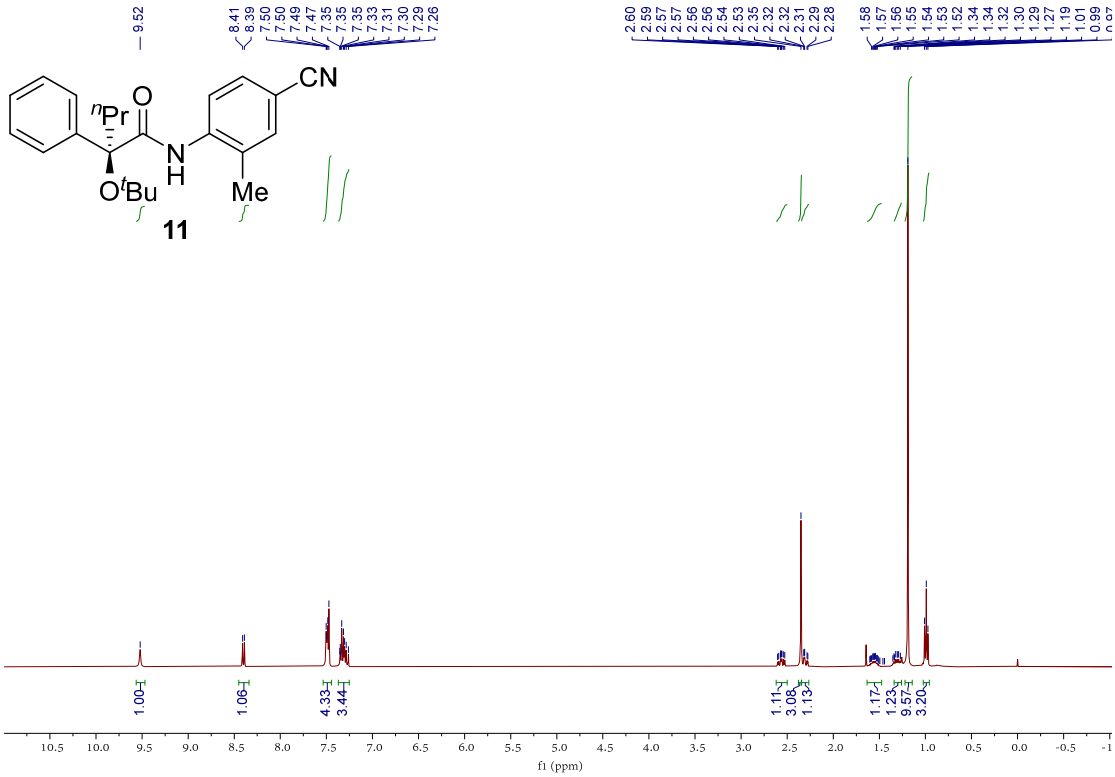

173.15
141.76
140.22
137.67
133.73
131.52
129.87
126.87
124.93
119.79
119.19
106.57
84.84
78.08
31.02
27.08
21.55
17.47
8.47
Me
Et
O
CN
Me
N
H
O^{t}Bu
Me
9
f1 (ppm)

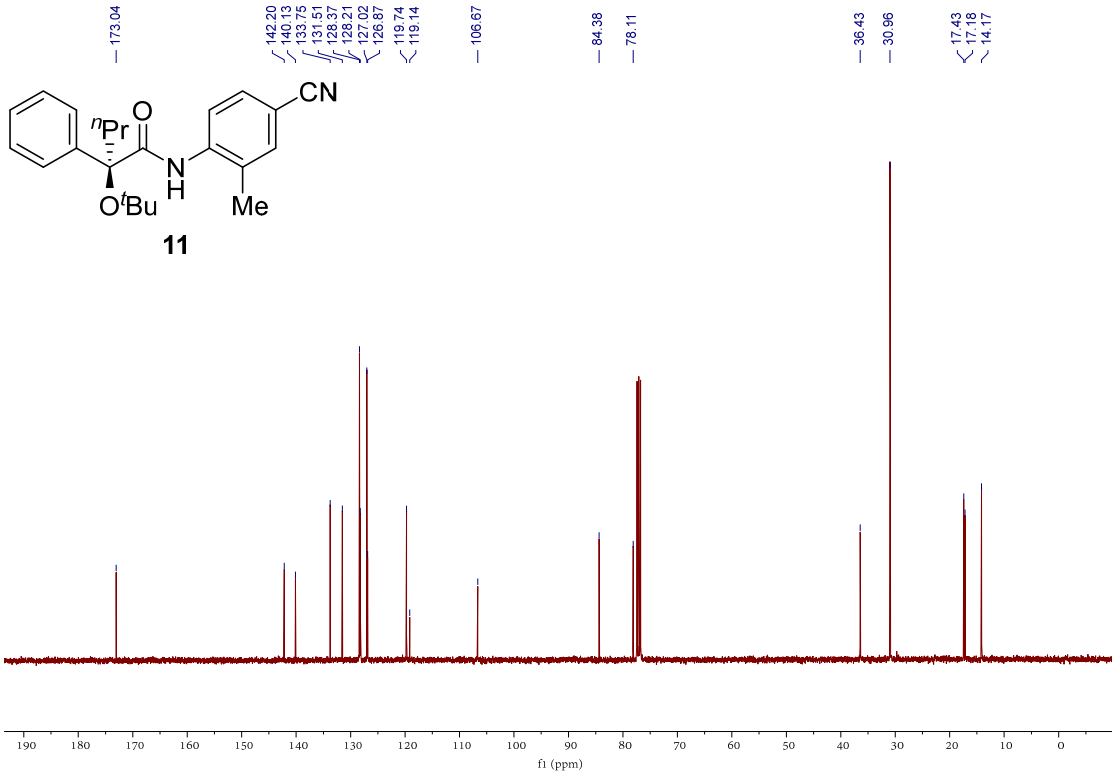

9.42
8.40
8.38
7.50
7.47
6.66
6.65
6.40
6.39
6.39
3.77
2.64
2.62
2.60
2.58
2.57
2.55
2.40
2.38
2.36
2.35
1.26
1.00
0.98
0.97
OMe
CN
Et
O
MeO
N
H
O'Bu
Me
1.00
1.04
2.10
2.12
1.09
6.45
1.04
1.01
3.04
9.49
3.22
f1 (ppm)

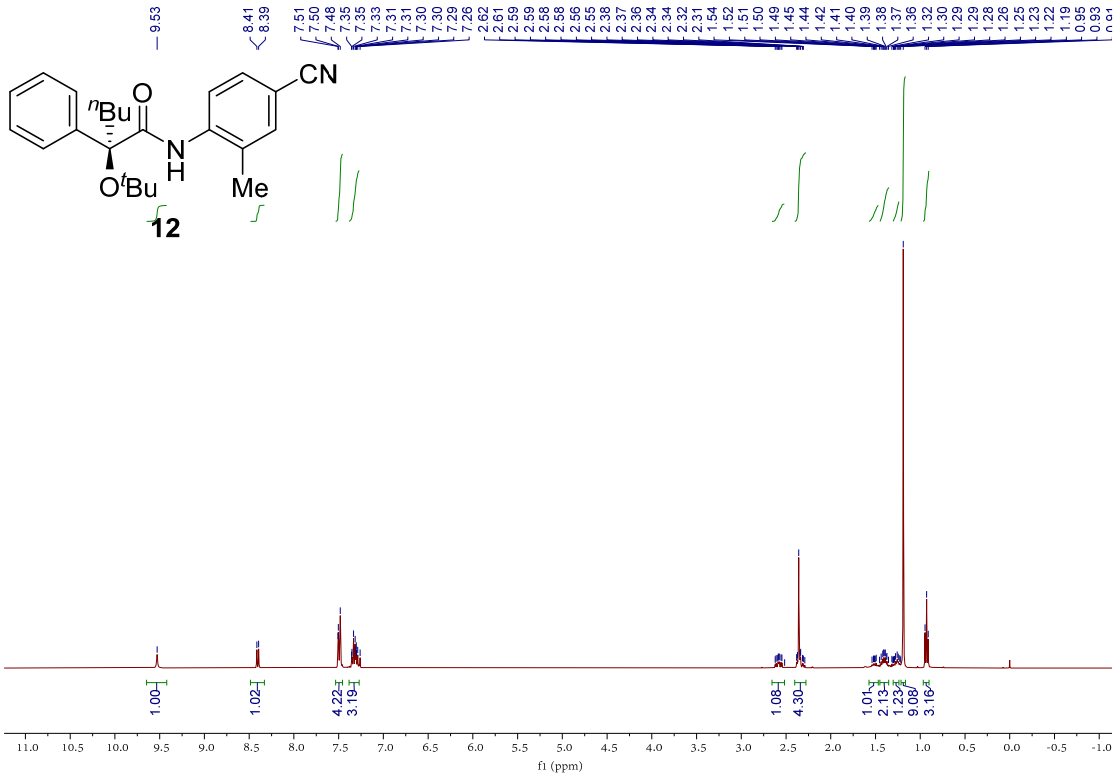
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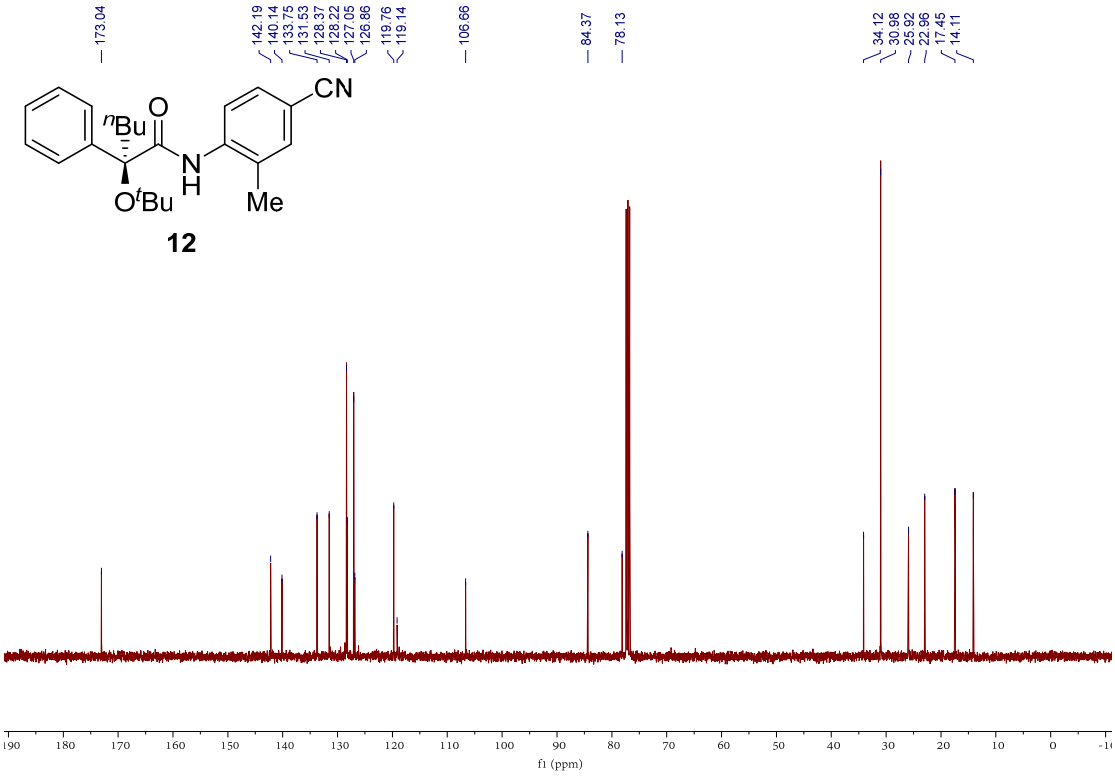

172.61
160.66
144.64
140.10
133.75
131.50
126.89
119.81
119.14
106.68
105.70
99.22
84.68
78.33
55.34
30.96
26.87
17.44
8.44
OMe
CN
Et
O
MeO
N
H
O'Bu
Me
f1 (ppm)

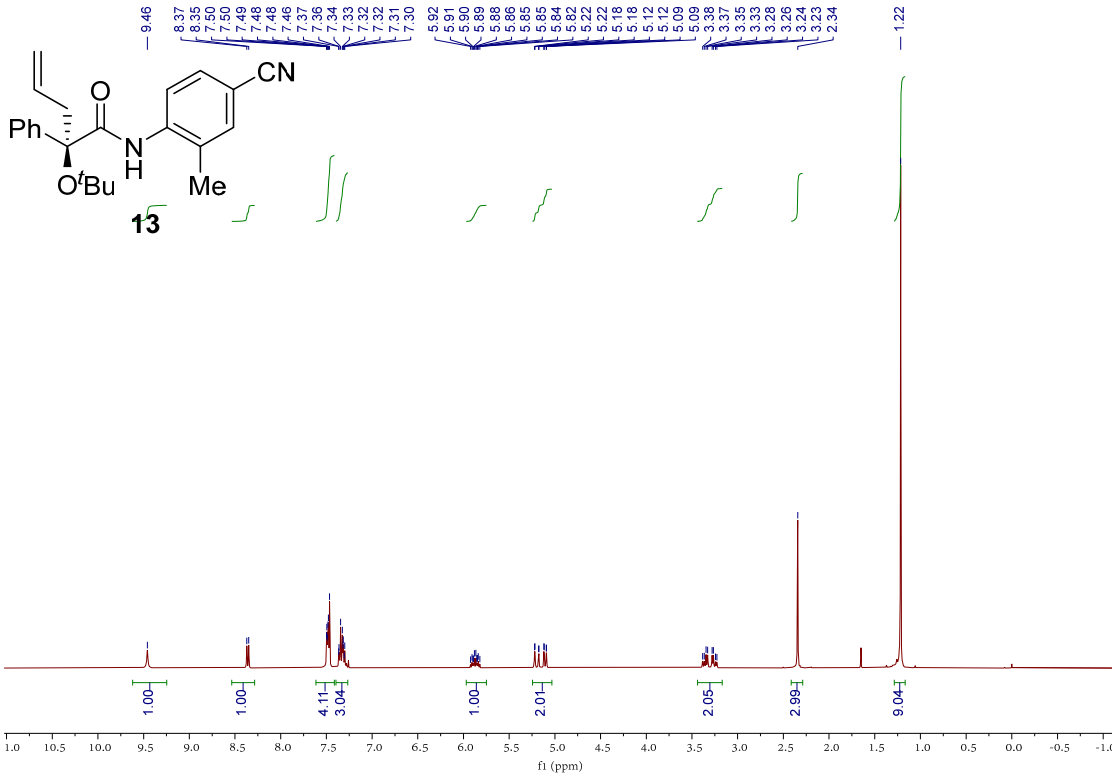
10

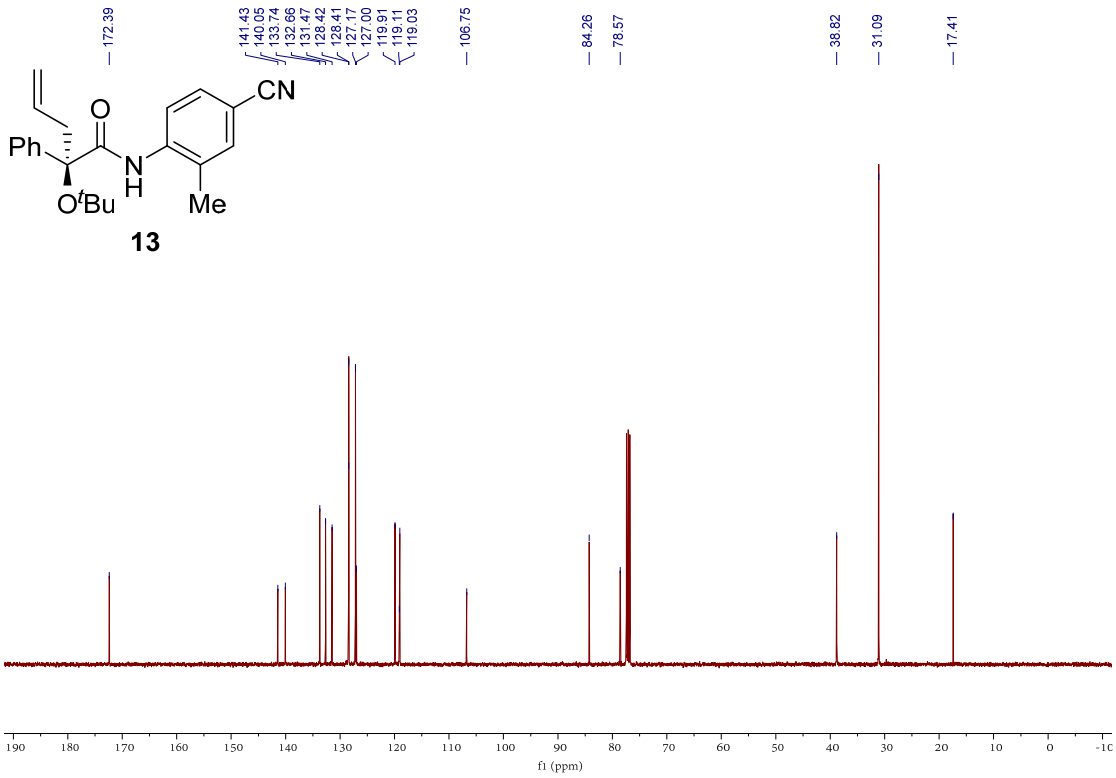

9.52
8.41
8.39
7.50
7.50
7.49
7.47
7.35
7.35
7.33
7.31
7.30
7.29
7.26
2.60
2.59
2.57
2.57
2.56
2.56
2.54
2.53
2.35
2.32
2.31
2.29
2.28
1.58
1.57
1.56
1.55
1.54
1.53
1.52
1.34
1.34
1.32
1.30
1.29
1.27
1.19
1.01
0.99
0.97
CN
nPr
O
N
H
OtBu
Me
11
1.00
1.06
4.33
3.44
1.11
3.08
1.13
1.17
1.23
9.57
3.20
f1 (ppm)

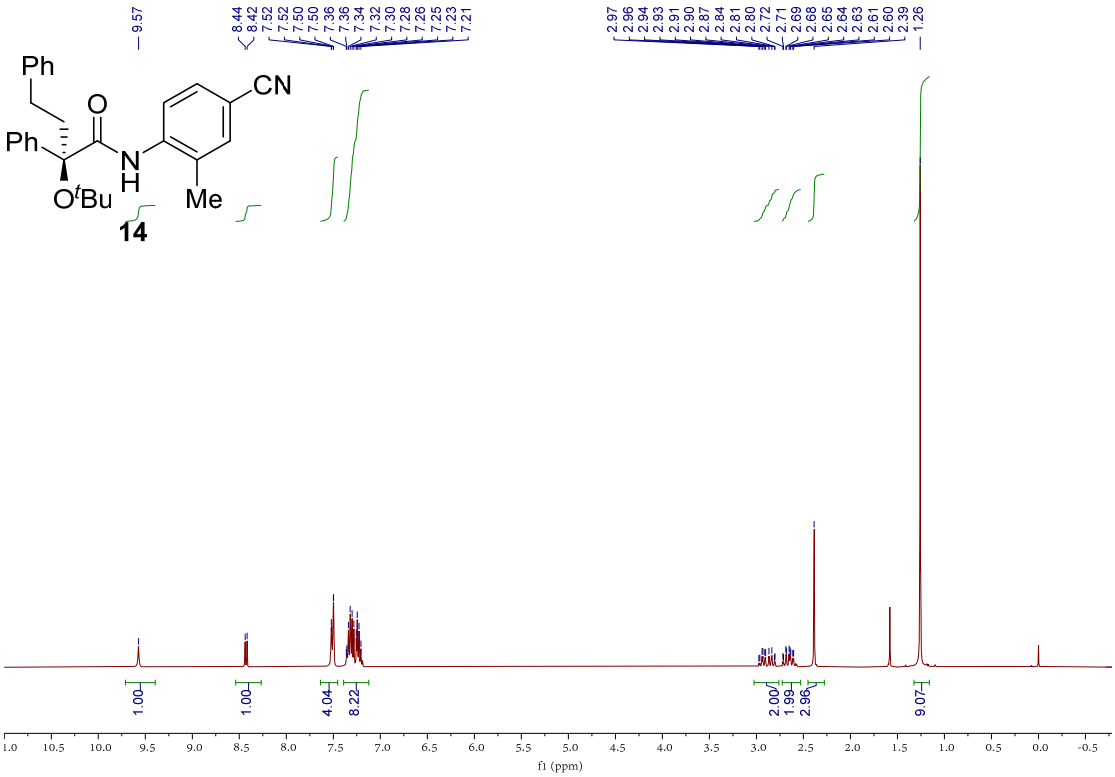

173.04
142.20
140.13
133.75
131.51
128.37
128.21
127.02
126.87
119.74
119.14
106.67
84.38
78.11
36.43
30.96
17.43
17.18
14.17
CN
nPr
O
N
H
OtBu
Me
11
f1 (ppm)

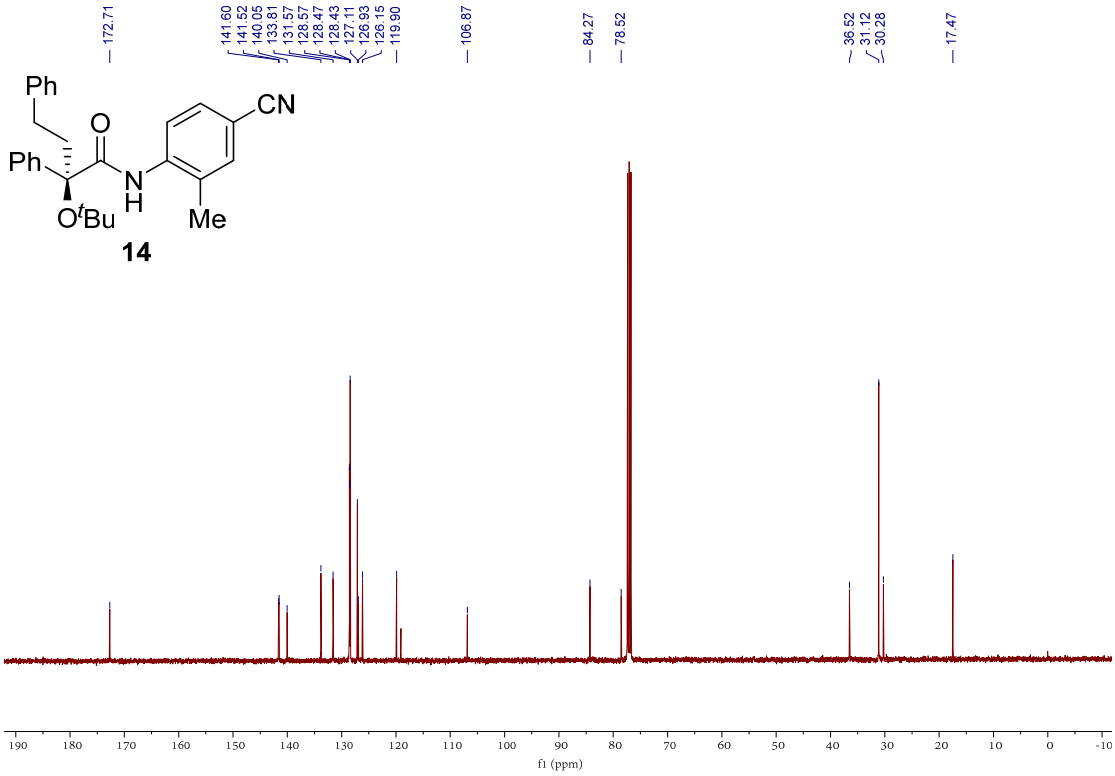

9.53
8.41
8.39
7.51
7.50
7.48
7.35
7.33
7.31
7.31
7.30
7.30
7.29
7.26
2.62
2.61
2.59
2.59
2.58
2.58
2.56
2.55
2.38
2.37
2.36
2.34
2.34
2.32
2.31
1.54
1.52
1.51
1.50
1.49
1.45
1.44
1.42
1.41
1.40
1.39
1.38
1.37
1.36
1.32
1.30
1.29
1.29
1.28
1.26
1.25
1.23
1.22
1.19
0.95
0.93
CN
O
nBu
N
H
OtBu
Me
12
1.00
1.02
4.22
3.19
1.08
4.30
1.01
2.13
1.23
9.08
3.16
f1 (ppm)

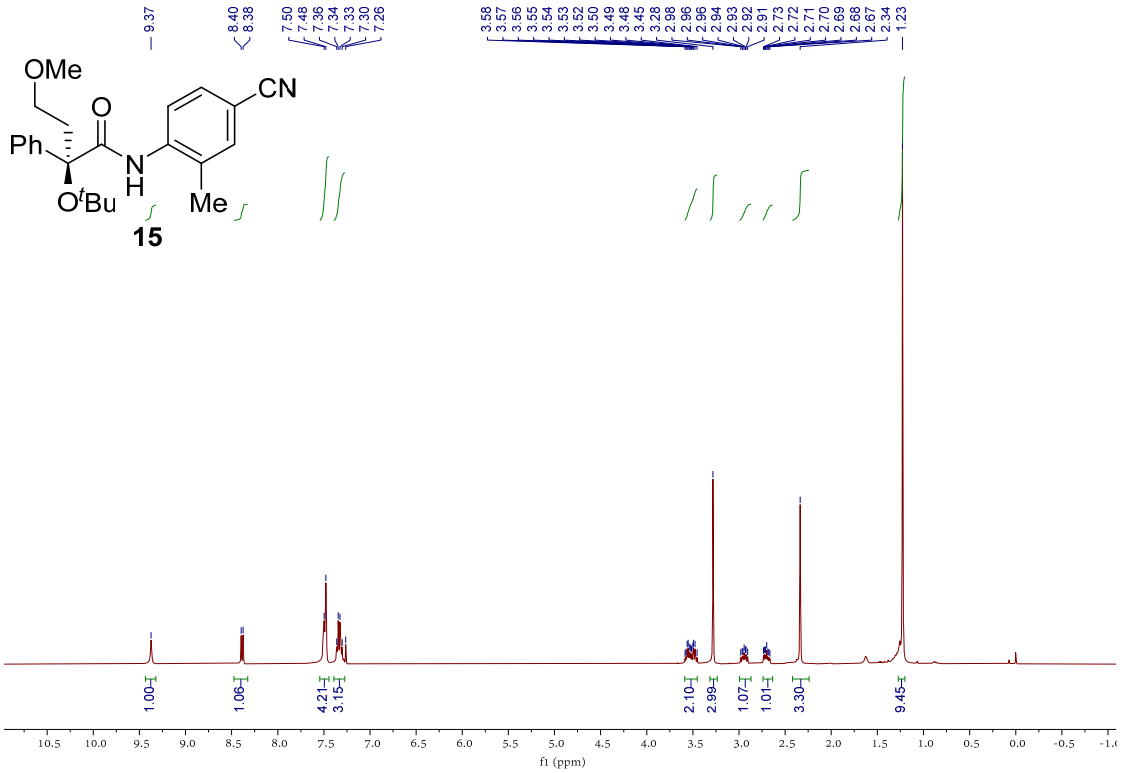

173.04
142.19
140.14
133.75
131.53
128.37
128.22
127.05
126.86
119.76
119.14
106.66
84.37
78.13
34.12
30.98
25.92
22.96
17.45
14.11
CN
O
nBu
N
H
OtBu
Me
12
f1 (ppm)

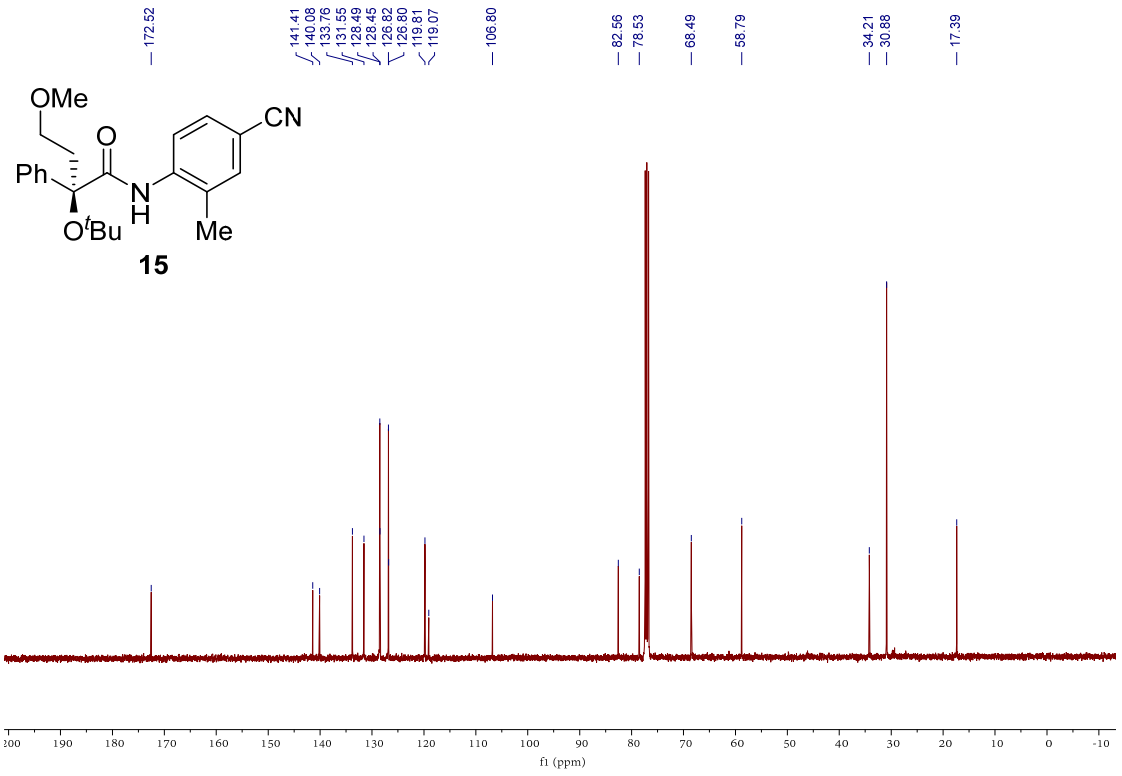

9.46
8.37
8.35
7.50
7.50
7.49
7.48
7.48
7.46
7.37
7.36
7.34
7.33
7.32
7.32
7.31
7.30
5.92
5.91
5.90
5.89
5.88
5.86
5.85
5.85
5.84
5.82
5.22
5.22
5.18
5.18
5.12
5.12
5.09
5.09
3.38
3.37
3.35
3.33
3.28
3.26
3.24
3.23
2.34
1.22
CN
O
Ph
N
H
O^{t}Bu
Me
13
1.00
1.00
4.11
3.04
1.00
2.01
2.05
2.99
9.04
f1 (ppm)

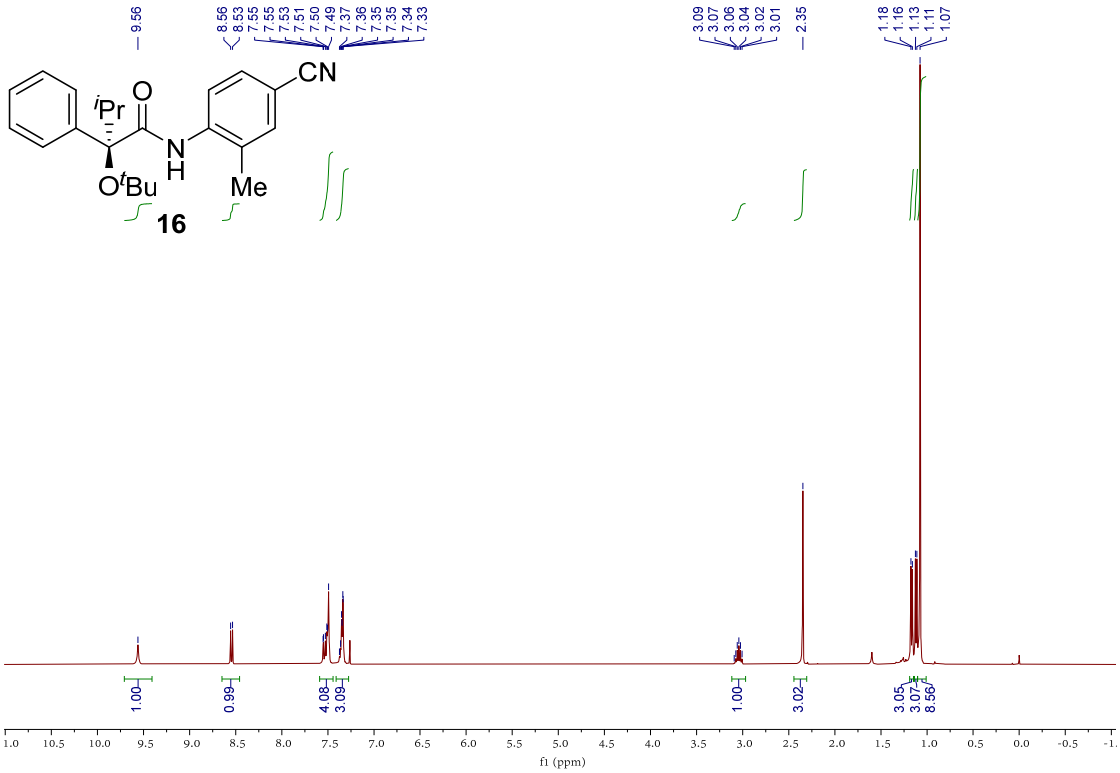

172.39
141.43
140.05
133.74
132.66
131.47
128.42
128.41
127.17
127.00
119.91
119.11
119.03
106.75
84.26
78.57
38.82
31.09
17.41
CN
O
Ph
N
H
O^{t}Bu
Me
13
f1 (ppm)

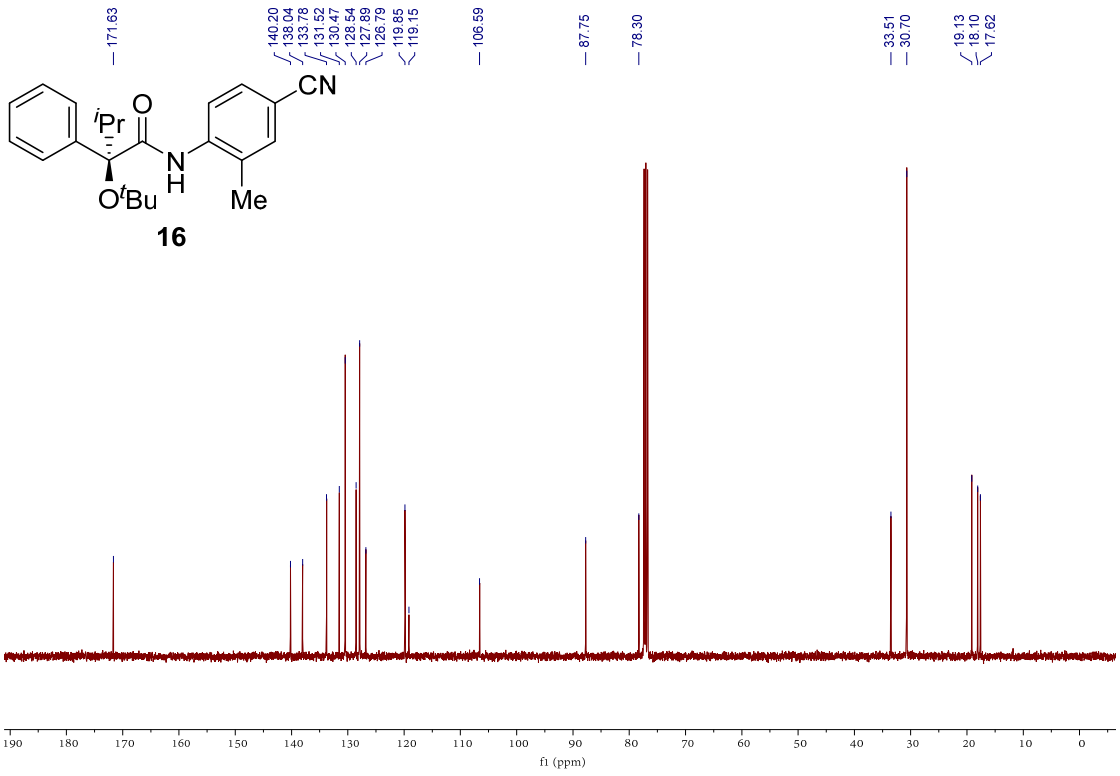

9.57
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8.42
7.52
7.52
7.50
7.50
7.36
7.36
7.34
7.32
7.30
7.28
7.26
7.25
7.23
7.21
2.97
2.96
2.94
2.93
2.91
2.90
2.87
2.84
2.81
2.80
2.72
2.71
2.69
2.68
2.65
2.64
2.63
2.61
2.60
2.39
1.26
Ph
O
Ph
N
H
CN
O^{t}Bu
Me
14
1.00
1.00
4.04
8.22
2.00
1.99
2.96
9.07
f1 (ppm)

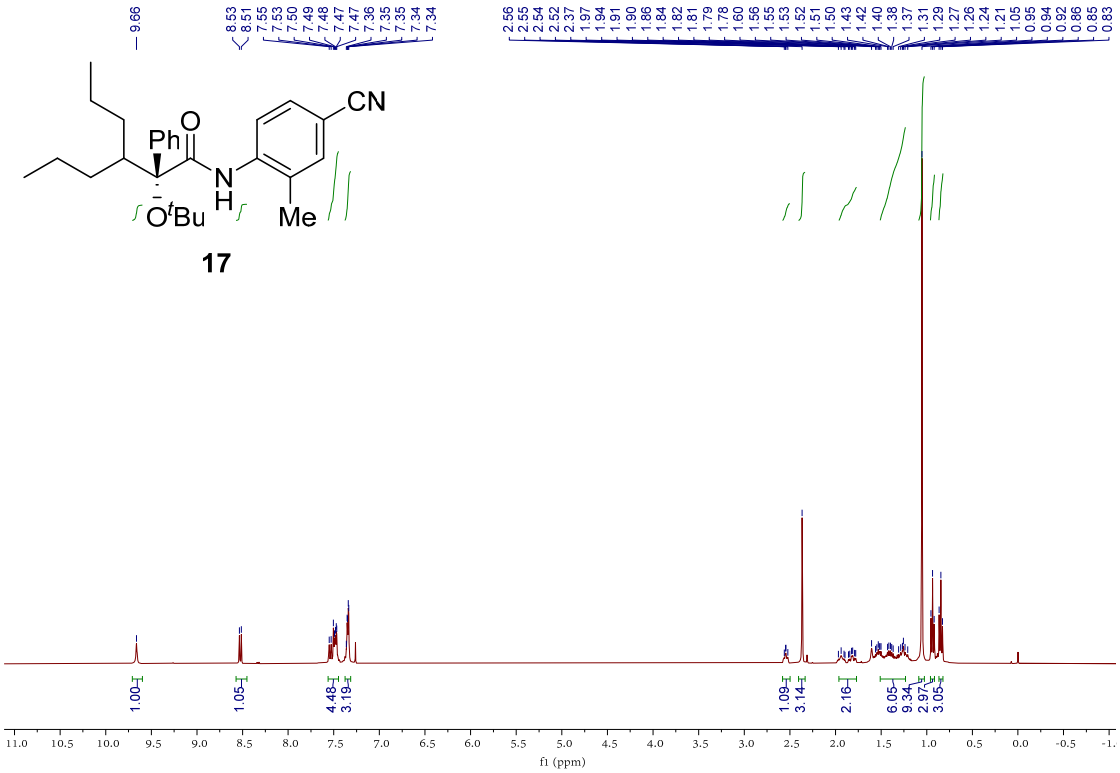

172.71
141.60
141.52
140.05
133.81
131.57
128.57
128.47
128.43
127.11
126.93
126.15
119.90
106.87
84.27
78.52
36.52
31.12
30.28
17.47
Ph
O
Ph
N
H
CN
O^{t}Bu
Me
14
f1 (ppm)

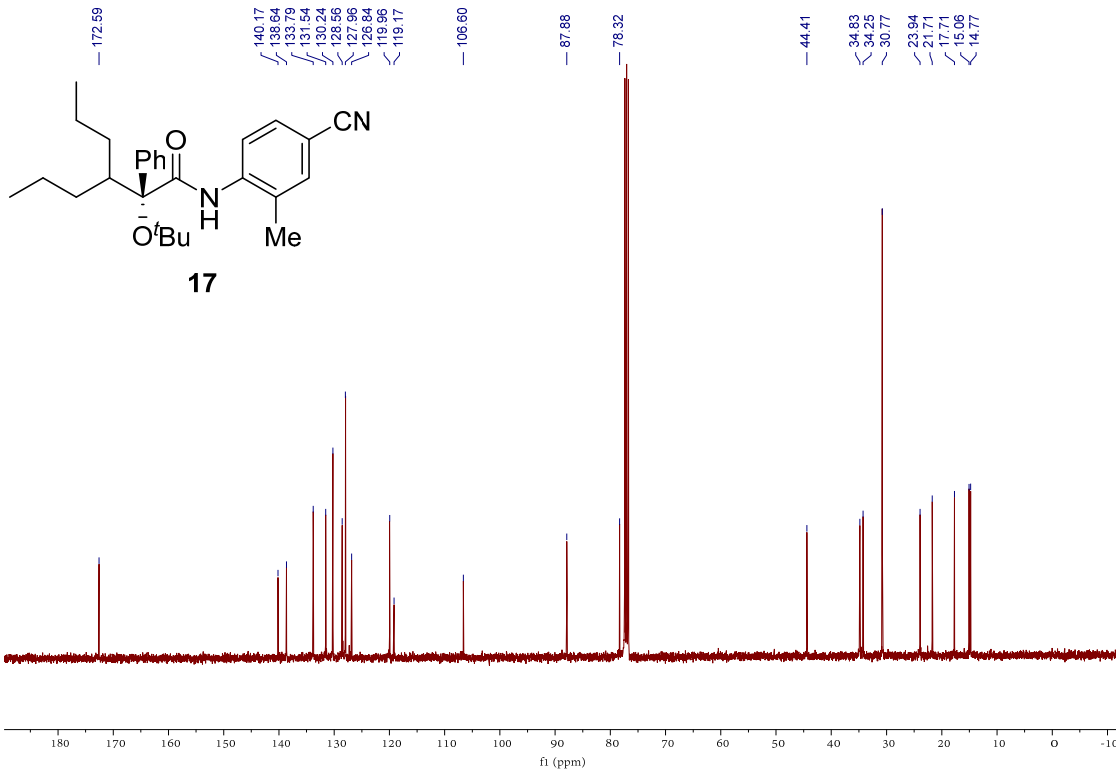

OMe
O
Ph
N
H
O^{t}Bu
Me
CN
15
9.37
8.40
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7.50
7.48
7.36
7.34
7.33
7.30
7.26
3.58
3.57
3.56
3.55
3.54
3.53
3.52
3.50
3.49
3.48
3.45
3.28
2.98
2.96
2.96
2.94
2.93
2.92
2.91
2.73
2.72
2.71
2.70
2.69
2.68
2.67
2.34
1.23
1.00
1.06
4.21
3.15
2.10
2.99
1.07
1.01
3.30
9.45
f1 (ppm)

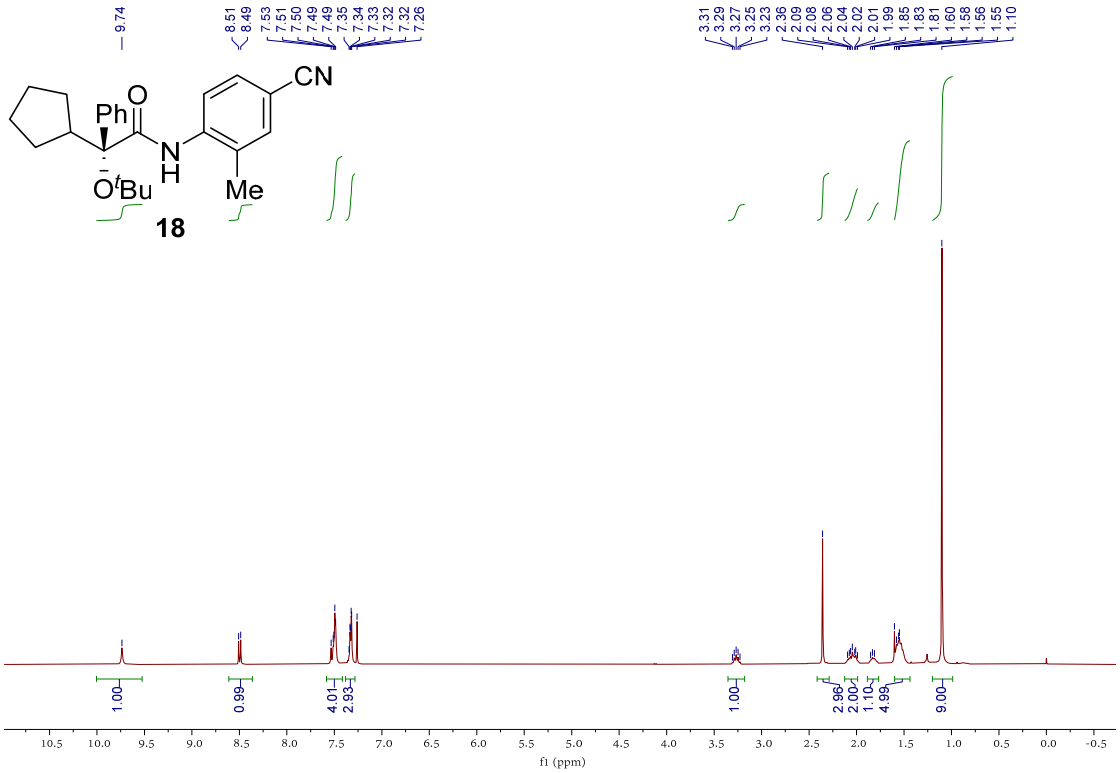

OMe
O
Ph
N
H
O^{t}Bu
Me
CN
15
172.52
141.41
140.08
133.76
131.55
128.49
128.45
126.82
126.80
119.81
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106.80
82.56
78.53
68.49
58.79
34.21
30.88
17.39
f1 (ppm)

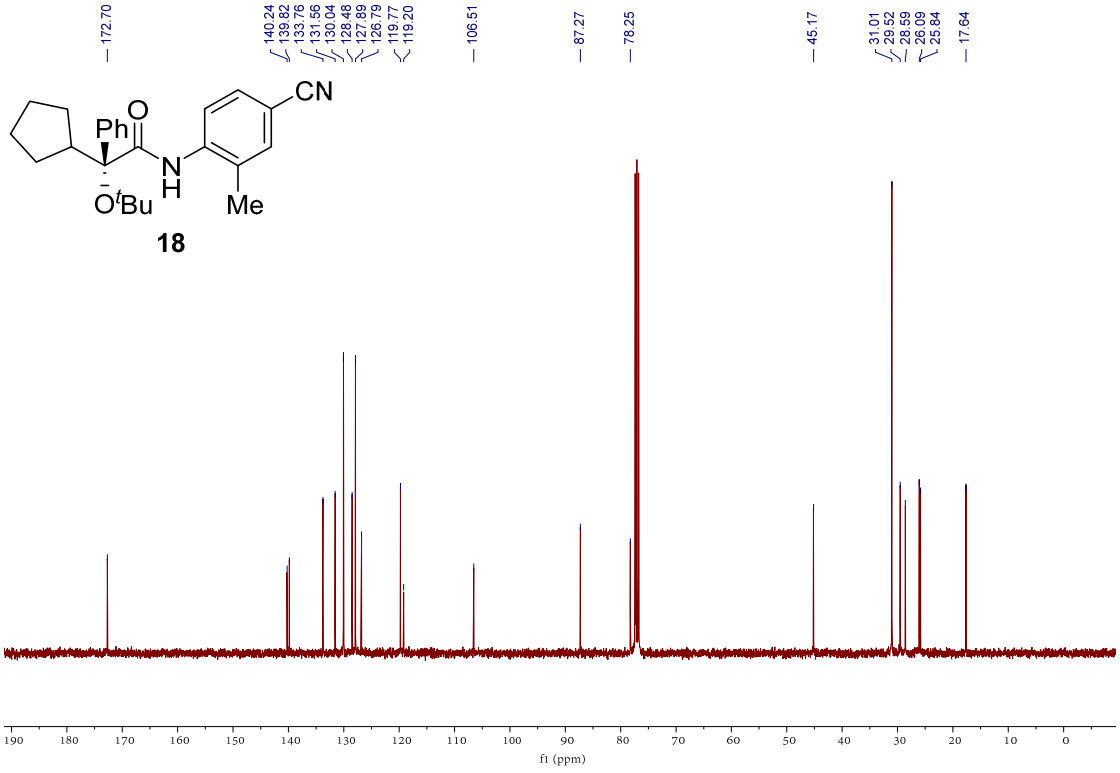

9.56
8.56
8.53
7.55
7.53
7.51
7.50
7.49
7.37
7.36
7.35
7.35
7.34
7.33
3.09
3.07
3.06
3.04
3.02
3.01
2.35
1.18
1.16
1.13
1.11
1.07
CN
iPr
O
N
H
OtBu
Me
16
1.00
0.99
4.08
3.09
1.00
3.02
3.05
3.07
8.56
f1 (ppm)

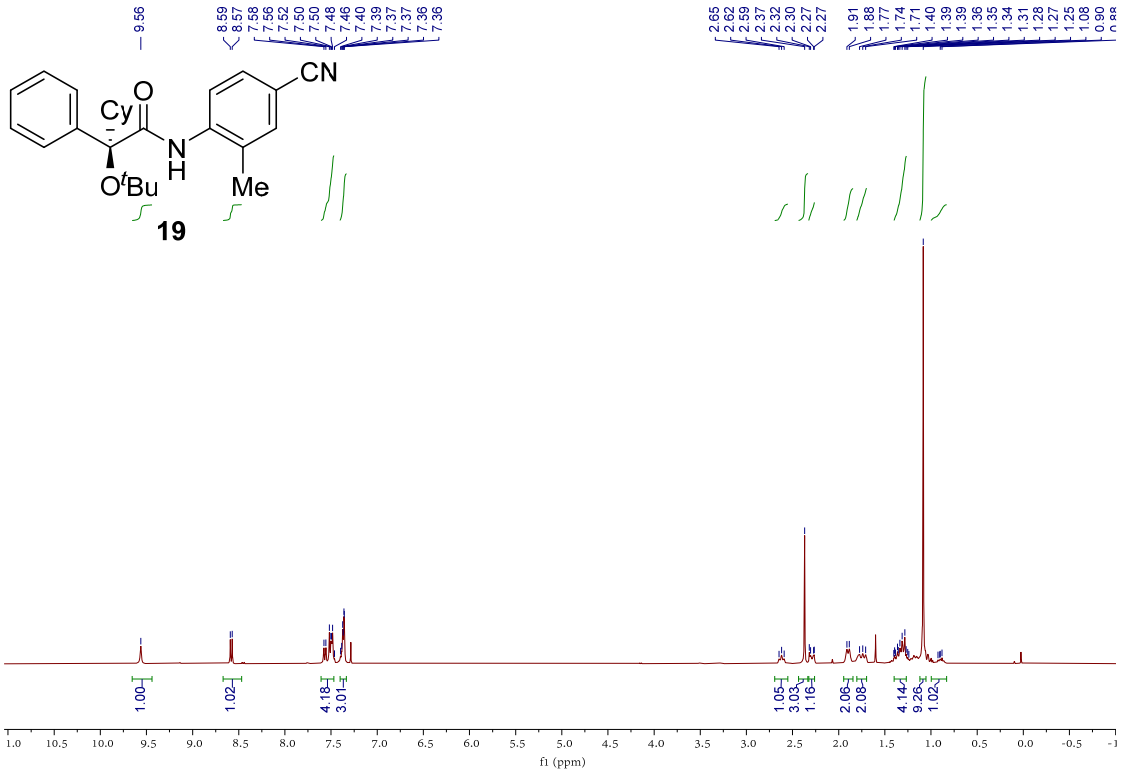

171.63
140.20
138.04
133.78
131.52
130.47
128.54
127.89
126.79
119.85
119.15
106.59
87.75
78.30
33.51
30.70
19.13
18.10
17.62
CN
iPr
O
N
H
OtBu
Me
16
f1 (ppm)

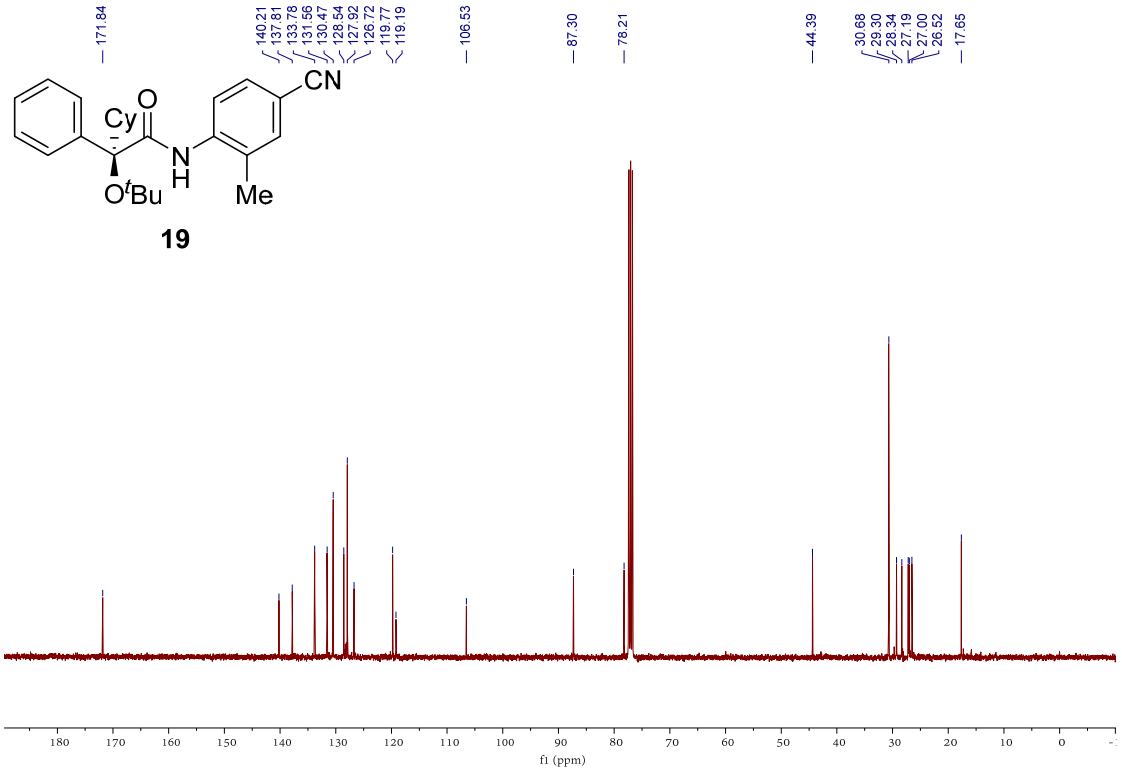

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8.51
7.55
7.53
7.50
7.49
7.48
7.47
7.47
7.36
7.35
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7.34
7.34
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1.94
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1.82
1.81
1.79
1.78
1.60
1.56
1.55
1.53
1.52
1.51
1.50
1.43
1.42
1.40
1.38
1.37
1.31
1.29
1.27
1.26
1.24
1.21
1.05
0.95
0.94
0.92
0.86
0.85
0.83
Ph
O
N
H
CN
Me
O'Bu
17
1.00
1.05
4.48
3.19
1.09
3.14
2.16
6.05
9.34
2.97
3.05
f1 (ppm)

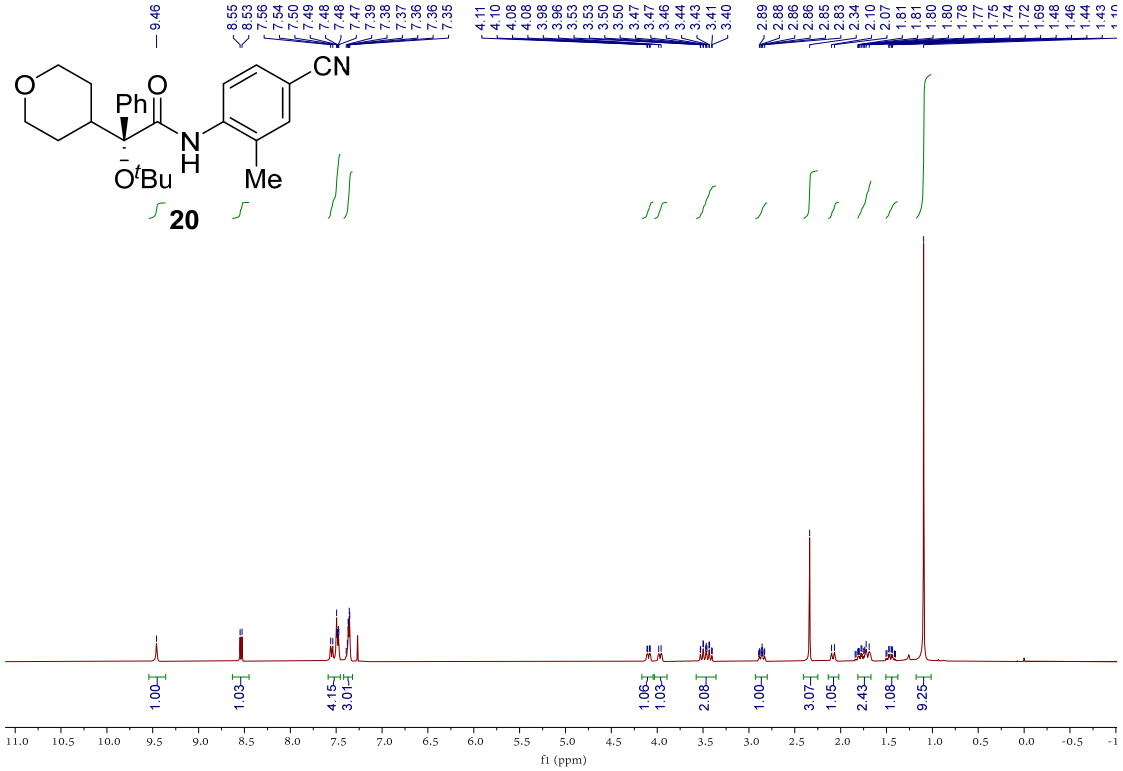

172.59
140.17
138.64
133.79
131.54
130.24
128.56
127.96
126.84
119.96
119.17
106.60
87.88
78.32
44.41
34.83
34.25
30.77
23.94
21.71
17.71
15.06
14.77
Ph
O
N
H
CN
Me
O'Bu
17
f1 (ppm)

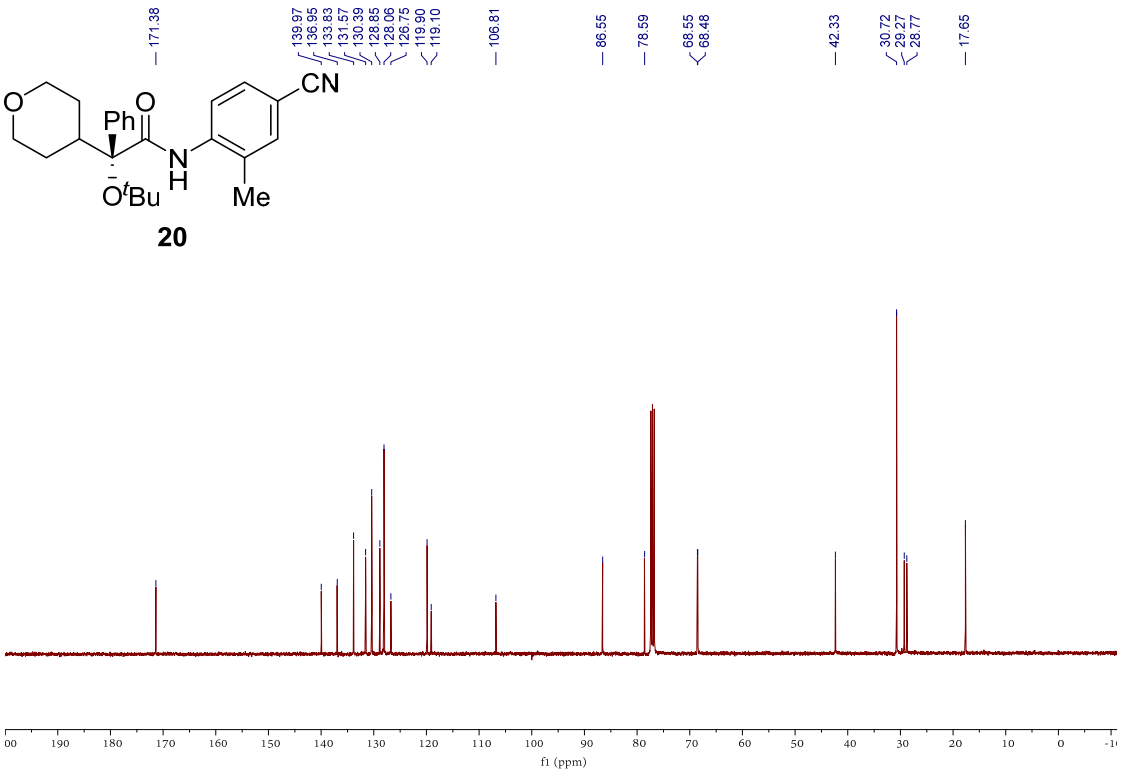

9.74
8.51
8.49
7.53
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7.50
7.49
7.49
7.35
7.34
7.33
7.32
7.32
7.26
3.31
3.29
3.27
3.25
3.23
2.36
2.09
2.08
2.06
2.04
2.02
2.01
1.99
1.85
1.83
1.81
1.60
1.58
1.56
1.55
1.10
Ph
O
N
H
CN
Me
O^{t}Bu
18
1.00
0.99
4.01
2.93
1.00
2.96
2.00
1.10
4.99
9.00
f1 (ppm)

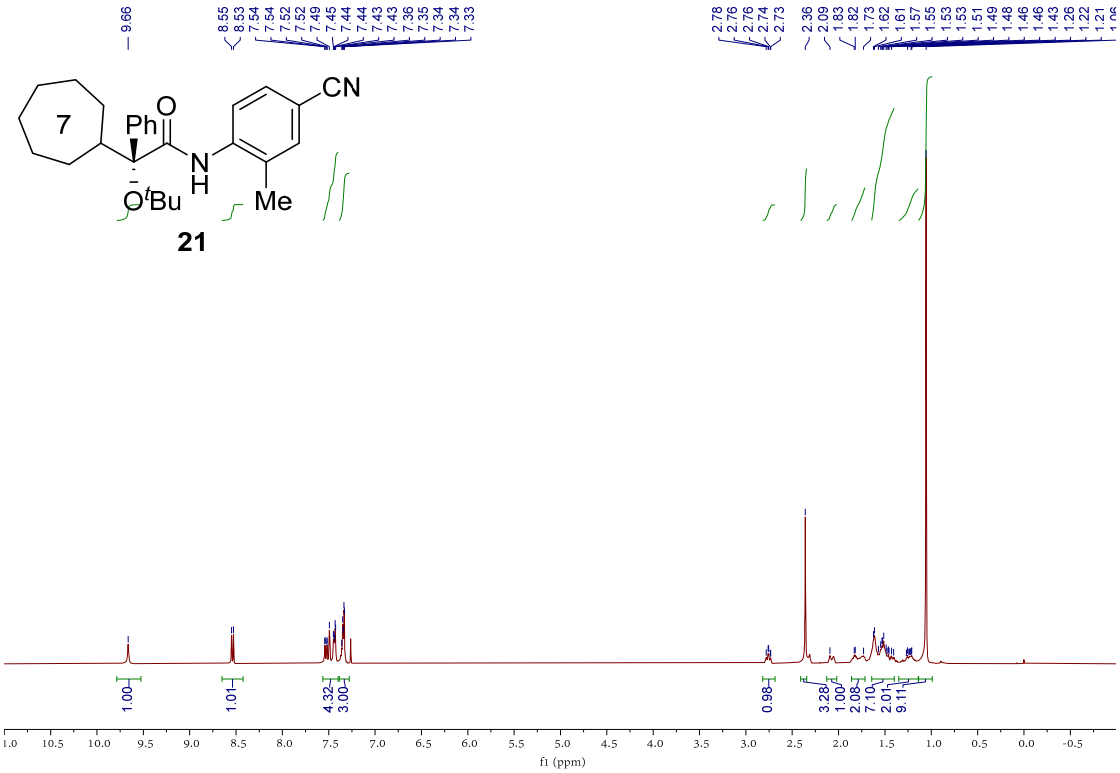

172.70
140.24
139.82
133.76
131.56
130.04
128.48
127.89
126.79
119.77
119.20
106.51
87.27
78.25
45.17
31.01
29.52
28.59
26.09
25.84
17.64
Ph
O
N
H
CN
Me
O^{t}Bu
18
f1 (ppm)

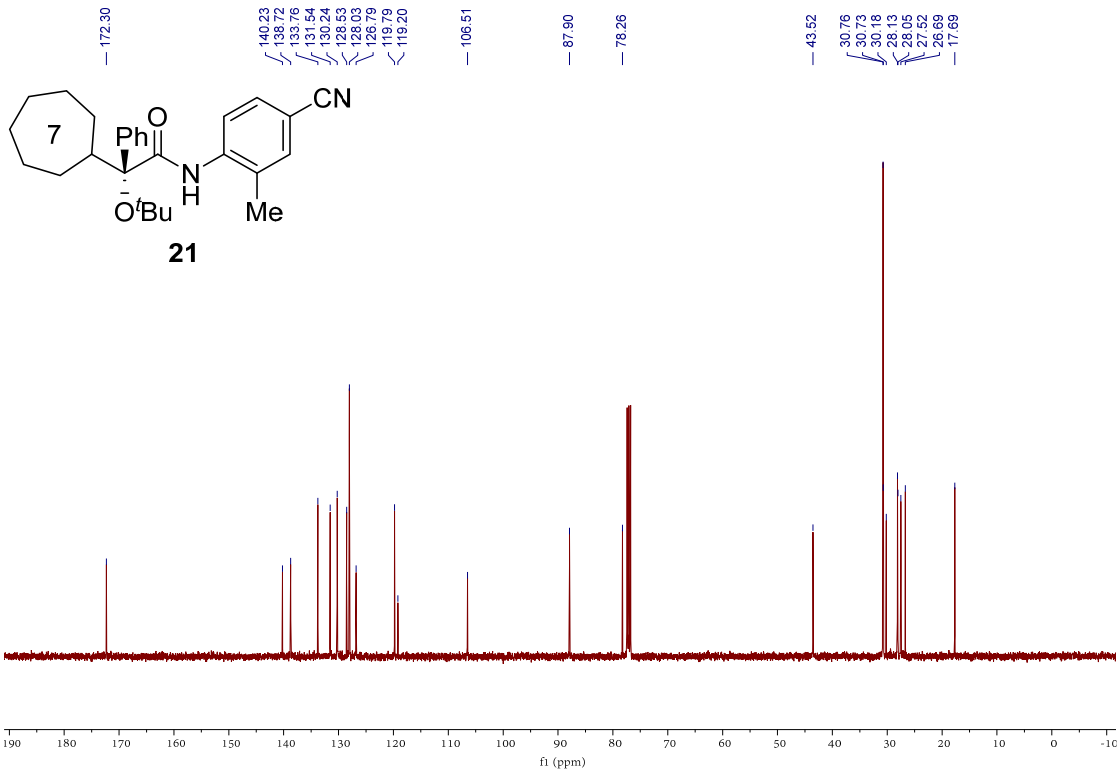

9.56
8.59
8.57
7.58
7.56
7.52
7.50
7.50
7.48
7.46
7.40
7.39
7.37
7.37
7.36
7.36
2.65
2.62
2.59
2.37
2.32
2.30
2.27
2.27
1.91
1.88
1.77
1.74
1.71
1.40
1.39
1.39
1.36
1.35
1.34
1.31
1.28
1.27
1.25
1.08
0.90
Cy
O
N
H
CN
Me
O^{t}Bu
19
1.00
1.02
4.18
3.01
1.05
3.03
1.16
2.06
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9.26
1.02
f1 (ppm)

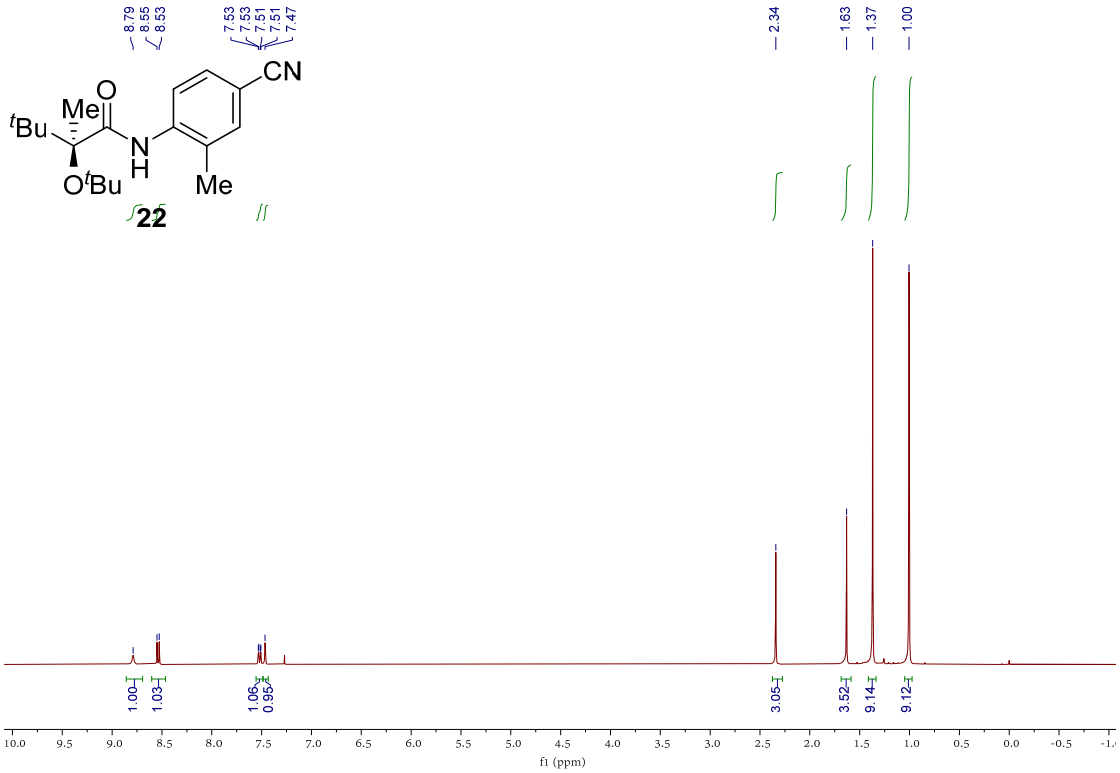

171.84
140.21
137.81
133.78
131.56
130.47
128.54
127.92
126.72
119.77
119.19
106.53
87.30
78.21
44.39
30.68
29.30
28.34
27.19
27.00
26.52
17.65
Cy
O
N
H
CN
Me
O^{t}Bu
19
f1 (ppm)

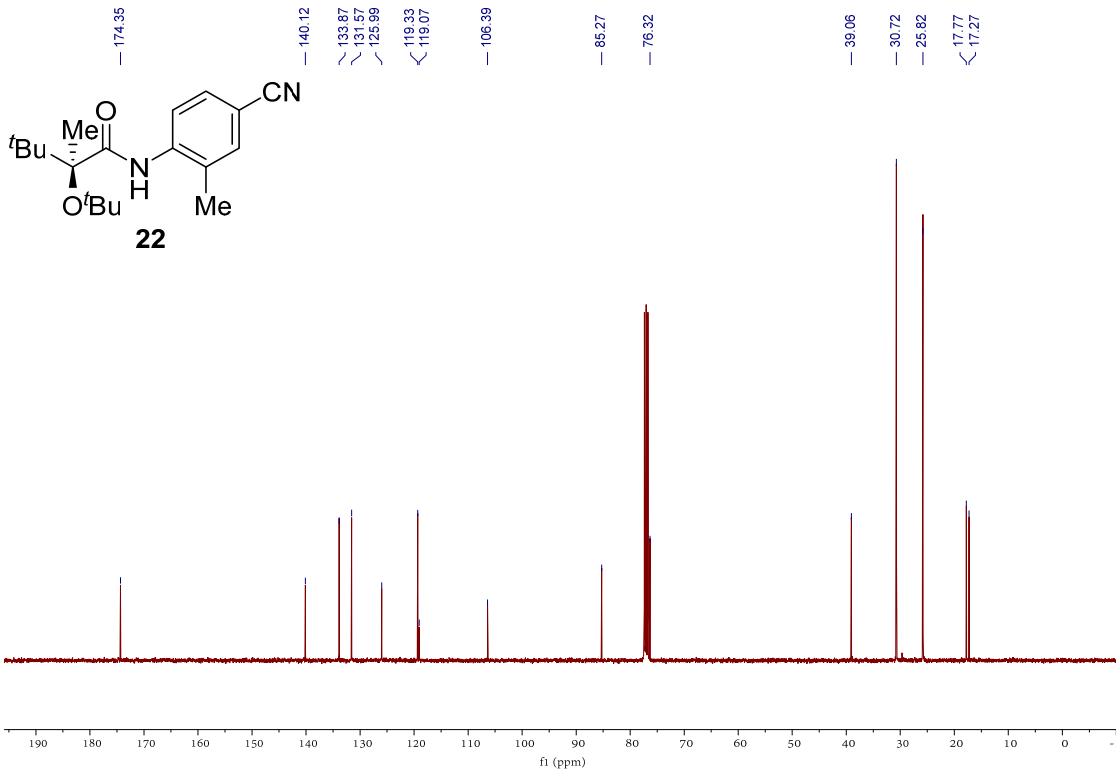

9.46
8.55
8.53
7.56
7.54
7.50
7.49
7.48
7.48
7.47
7.39
7.38
7.37
7.36
7.36
7.35
4.11
4.10
4.08
4.08
3.98
3.96
3.53
3.53
3.50
3.50
3.47
3.47
3.46
3.44
3.43
3.41
3.40
2.89
2.88
2.86
2.86
2.85
2.83
2.34
2.10
2.07
1.81
1.81
1.80
1.80
1.78
1.77
1.75
1.74
1.72
1.69
1.48
1.46
1.44
1.43
O
Ph
O
N
H
O^{t}Bu
CN
Me
20
1.00
1.03
4.15
3.01
1.06
1.03
2.08
1.00
3.07
1.05
2.43
1.08
9.25
f1 (ppm)

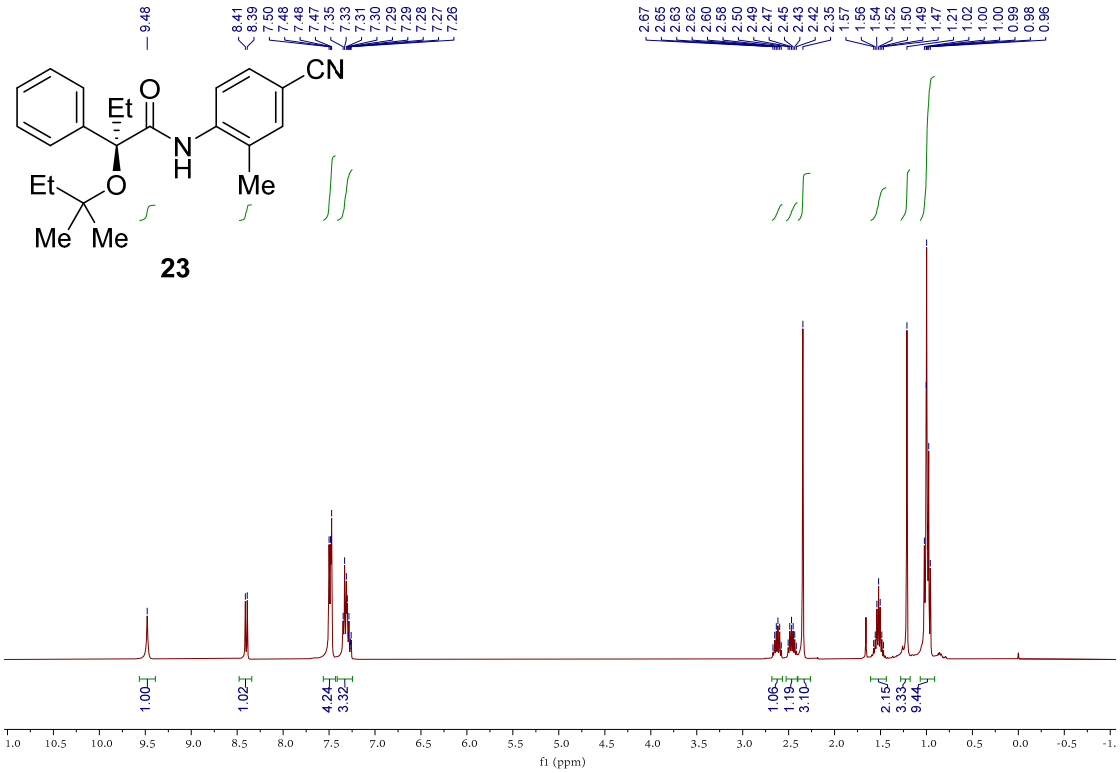

171.38
139.97
136.95
133.83
131.57
130.39
128.85
128.06
126.75
119.90
119.10
106.81
86.55
78.59
68.55
68.48
42.33
30.72
29.27
28.77
17.65
O
Ph
O
N
H
O^{t}Bu
CN
Me
20
f1 (ppm)

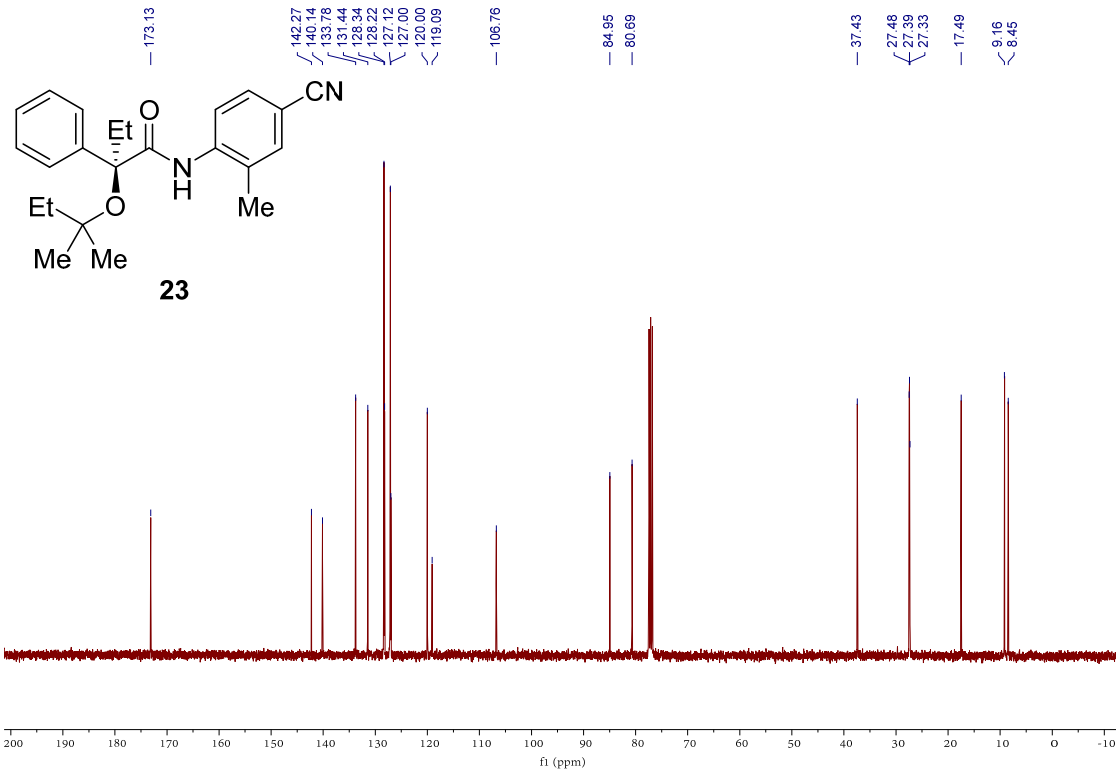

9.66
8.55
8.53
7.54
7.52
7.49
7.45
7.44
7.43
7.36
7.35
7.34
7.33
2.78
2.76
2.74
2.73
2.36
2.09
1.83
1.82
1.73
1.62
1.61
1.57
1.55
1.53
1.51
1.49
1.48
1.46
1.43
1.26
1.22
1.21
7
Ph
O
N
H
CN
Me
O^{t}Bu
21
1.00
1.01
4.32
3.00
0.98
3.28
1.00
2.08
7.10
2.01
9.11
f1 (ppm)

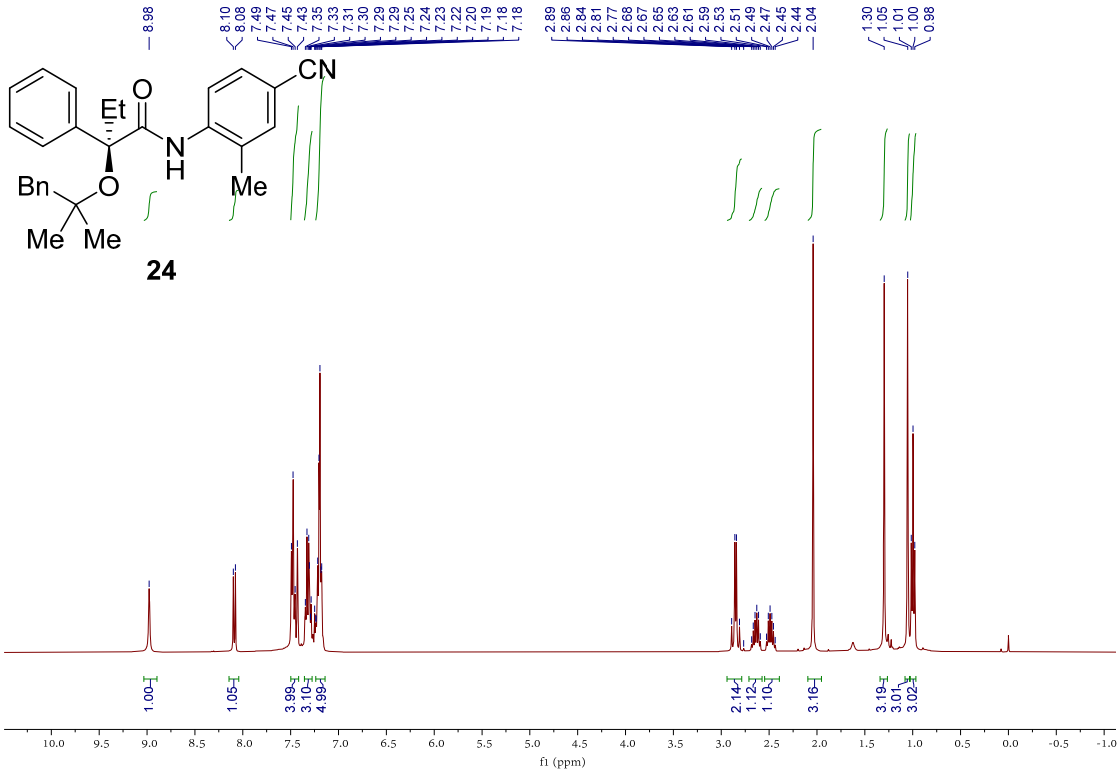

172.30
140.23
138.72
133.76
131.54
130.24
128.53
128.03
126.79
119.79
119.20
106.51
87.90
78.26
43.52
30.76
30.73
30.18
28.13
28.05
27.52
26.69
17.69
7
Ph
O
N
H
CN
Me
O^{t}Bu
21
f1 (ppm)

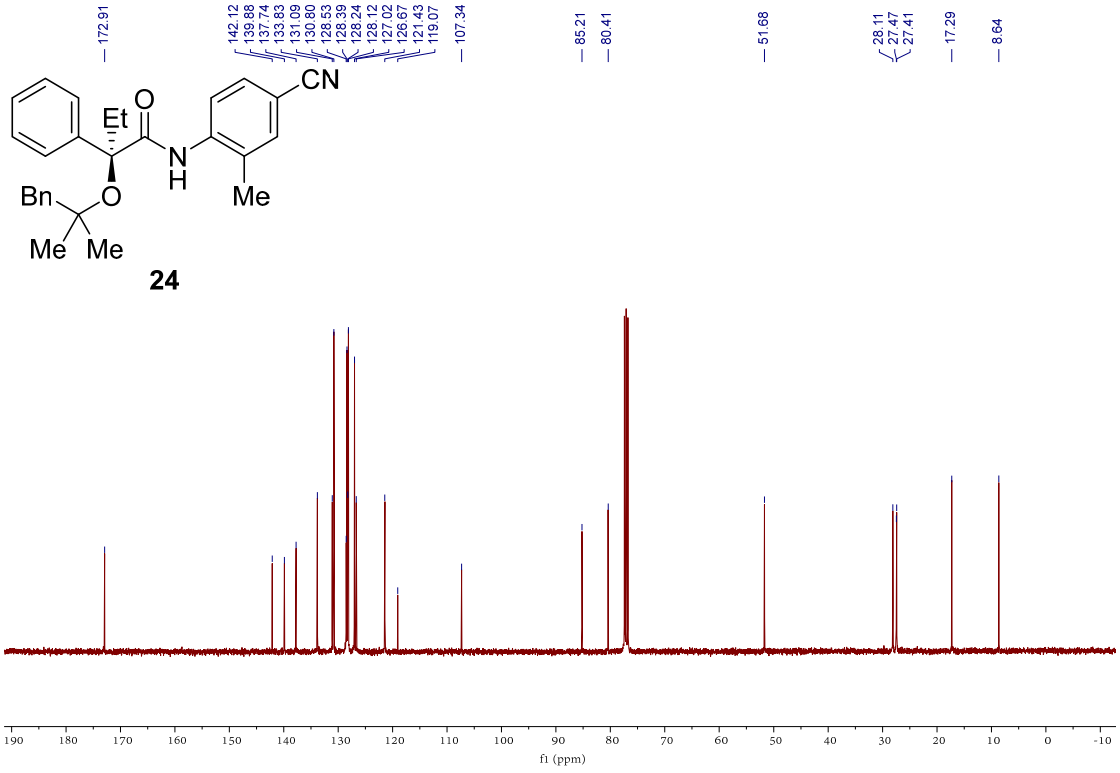

8.79
8.55
8.53
7.53
7.53
7.51
7.51
7.47
2.34
1.63
1.37
1.00
CN
Me
O
tBu
N
H
OtBu
Me
22
1.00
1.03
1.06
0.95
3.05
3.52
9.14
9.12
f1 (ppm)

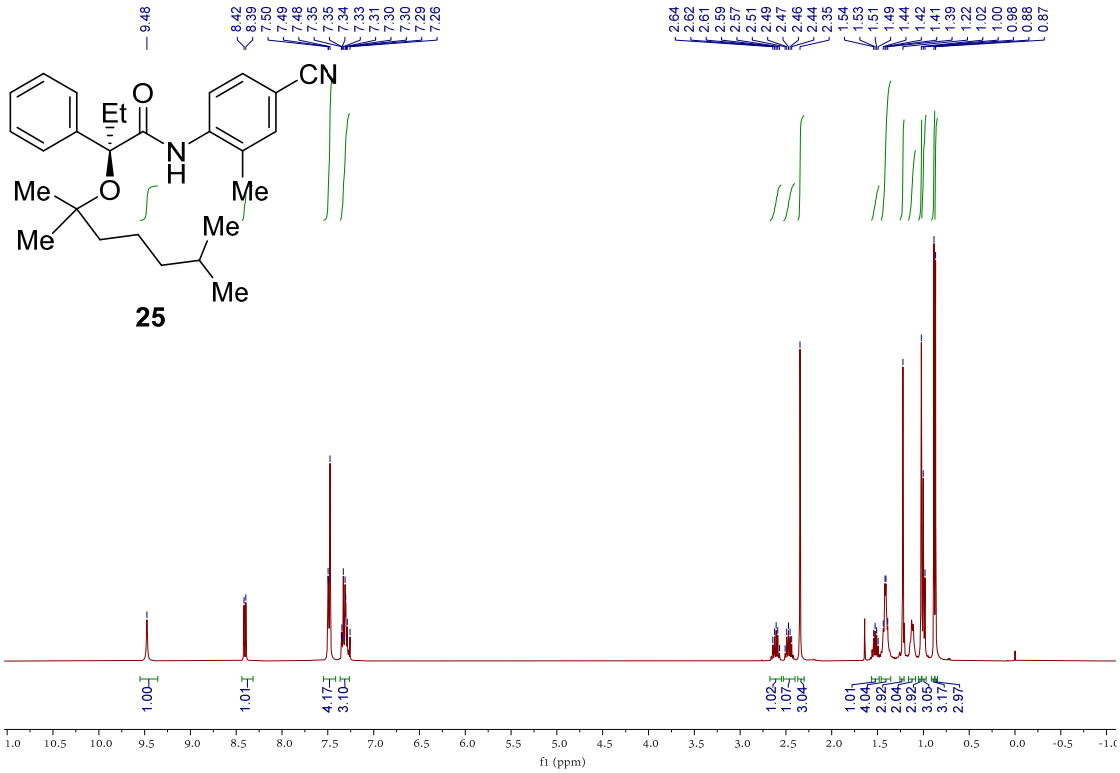

174.35
140.12
133.87
131.57
125.99
119.33
119.07
106.39
85.27
76.32
39.06
30.72
25.82
17.77
17.27
CN
Me
O
tBu
N
H
OtBu
Me
22
f1 (ppm)

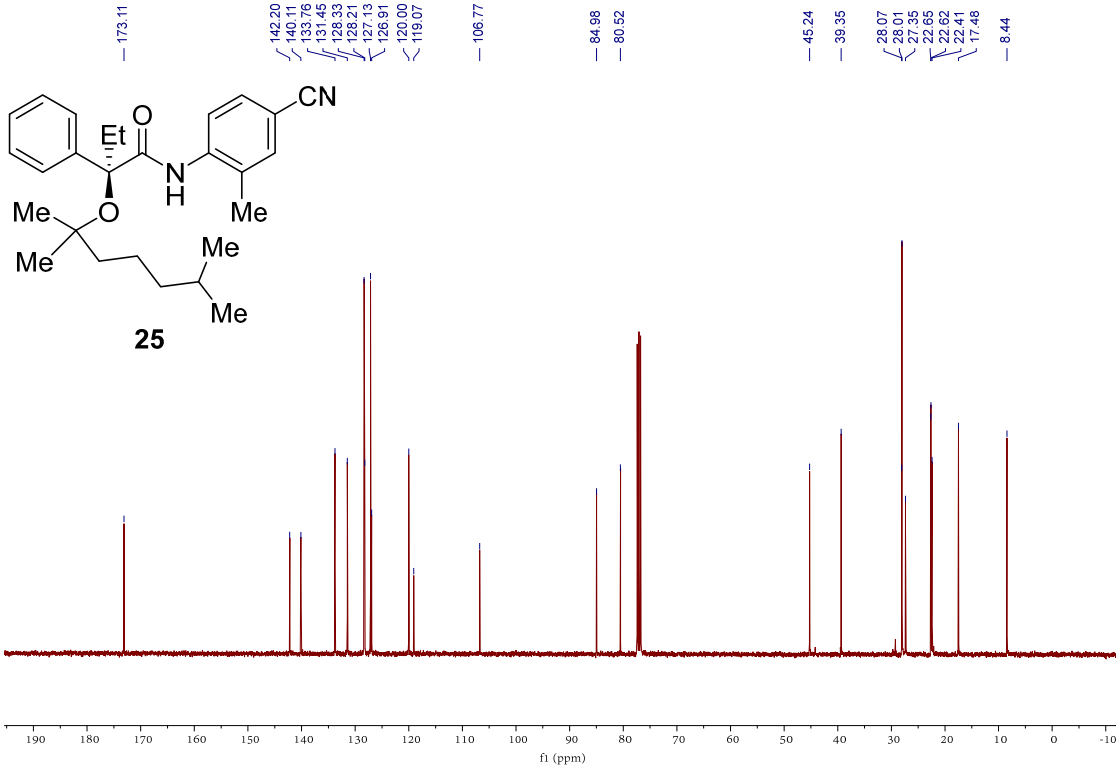

9.48
8.41
8.39
7.50
7.48
7.48
7.47
7.35
7.33
7.31
7.30
7.29
7.29
7.28
7.27
7.26
2.67
2.65
2.63
2.62
2.60
2.58
2.50
2.49
2.47
2.45
2.43
2.42
2.35
1.57
1.56
1.54
1.52
1.50
1.49
1.47
1.21
1.02
1.00
1.00
0.99
0.98
0.96
CN
O
Et
N
H
Me
Et
O
Me
Me
23
1.00
1.02
4.24
3.32
1.06
1.19
3.10
2.15
3.33
9.44
f1 (ppm)

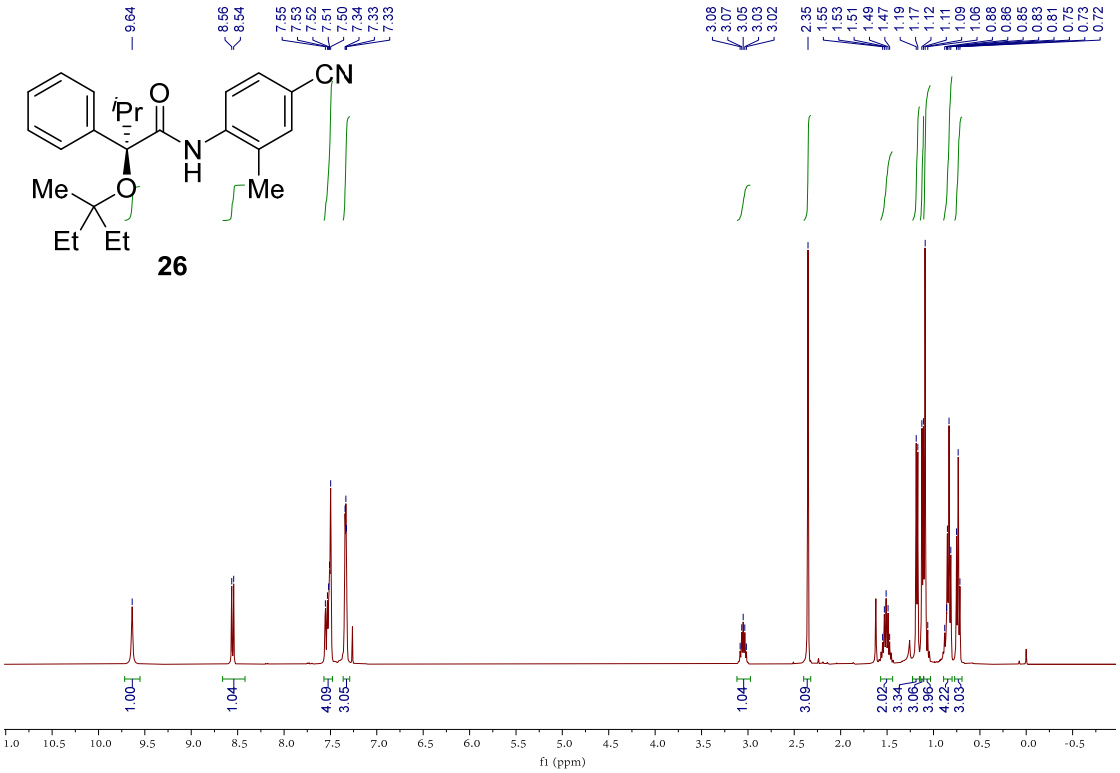

173.13
142.27
140.14
133.78
131.44
128.34
128.22
127.12
127.00
120.00
119.09
106.76
84.95
80.69
37.43
27.48
27.39
27.33
17.49
9.16
8.45
CN
O
Et
N
H
Me
Et
O
Me
Me
23
f1 (ppm)

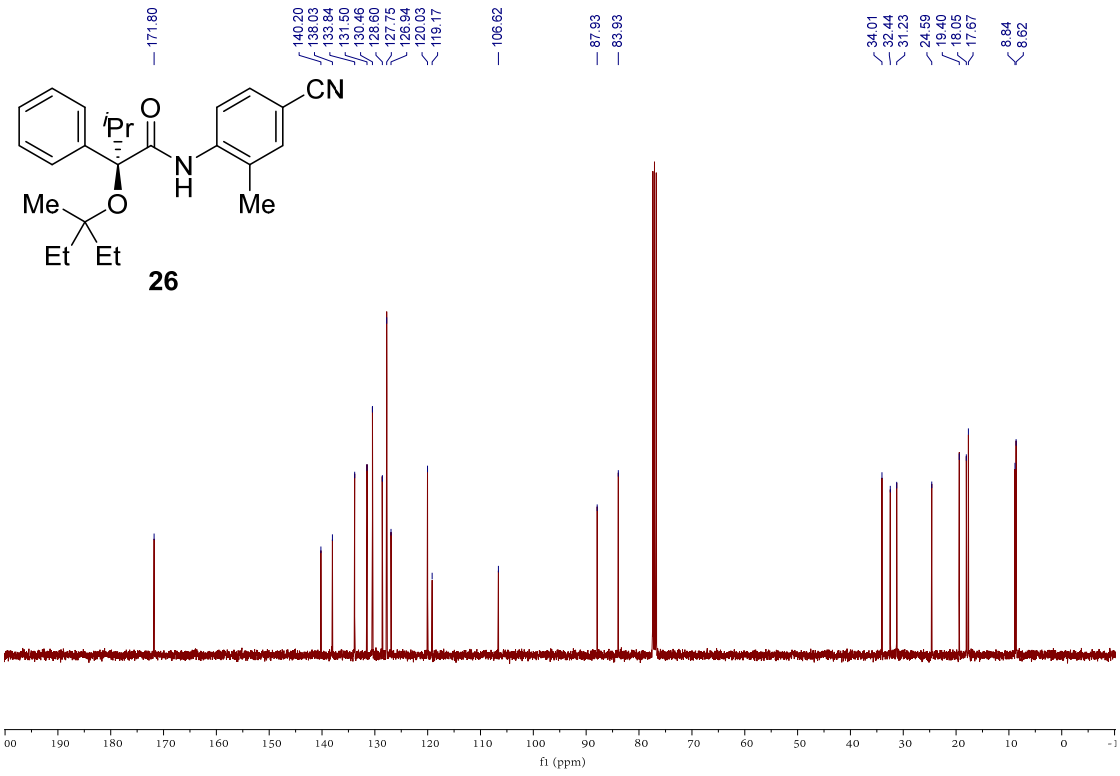

8.98
8.10
8.08
7.49
7.47
7.45
7.43
7.35
7.33
7.31
7.30
7.29
7.29
7.25
7.24
7.23
7.22
7.20
7.19
7.18
7.18
2.89
2.86
2.84
2.81
2.77
2.68
2.67
2.65
2.63
2.61
2.59
2.53
2.51
2.49
2.47
2.45
2.44
2.04
1.30
1.05
1.01
1.00
0.98
CN
O
Et
N
H
Bn
O
Me
Me
Me
24
1.00
1.05
3.99
3.10
4.99
2.14
1.12
1.10
3.16
3.19
3.01
3.02
f1 (ppm)

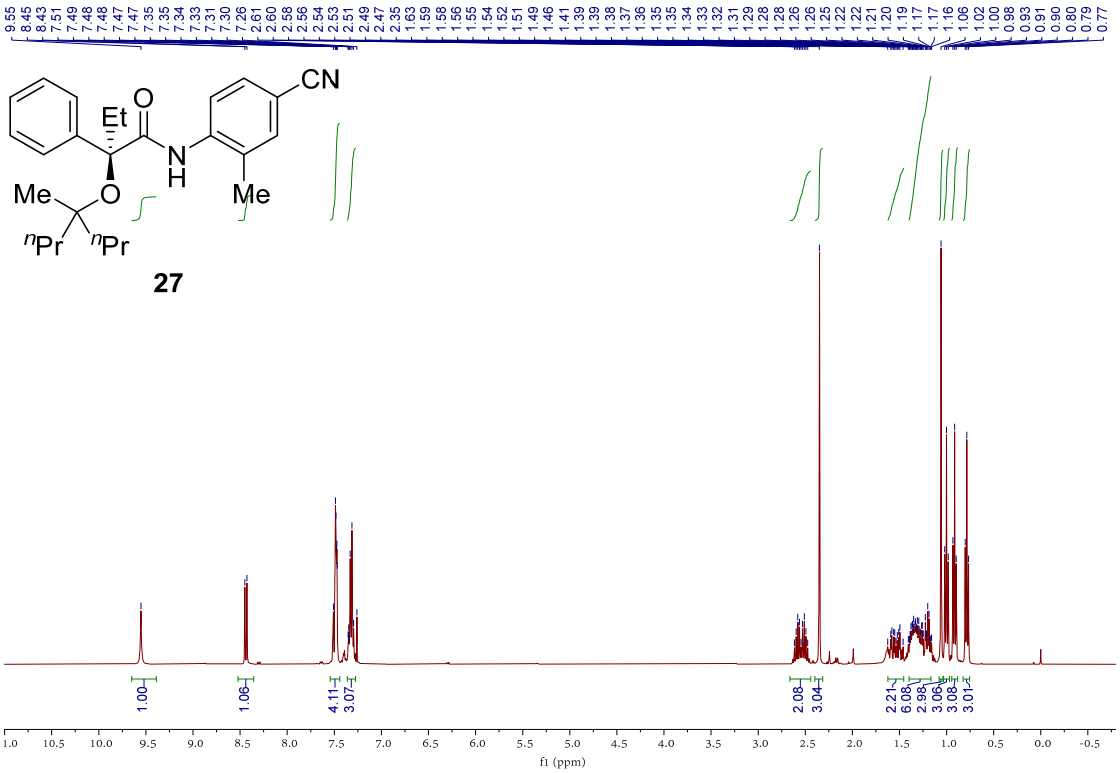

172.91
142.12
139.88
137.74
133.83
131.09
130.80
128.53
128.39
128.24
128.12
127.02
126.67
121.43
119.07
107.34
85.21
80.41
51.68
28.11
27.47
27.41
17.29
8.64
CN
O
Et
N
H
Bn
O
Me
Me
Me
24
f1 (ppm)


9.48
8.42
8.39
7.50
7.49
7.48
7.35
7.35
7.34
7.33
7.31
7.30
7.30
7.29
7.26
2.64
2.62
2.61
2.59
2.57
2.51
2.49
2.47
2.46
2.44
2.35
1.54
1.53
1.51
1.49
1.44
1.42
1.41
1.39
1.22
1.02
1.00
0.98
0.88
0.87
Et
O
N
H
CN
Me
O
Me
Me
Me
Me
25
1.00
1.01
4.17
3.10
1.02
1.07
3.04
1.01
4.04
2.92
2.04
2.92
3.05
3.17
2.97
f1 (ppm)

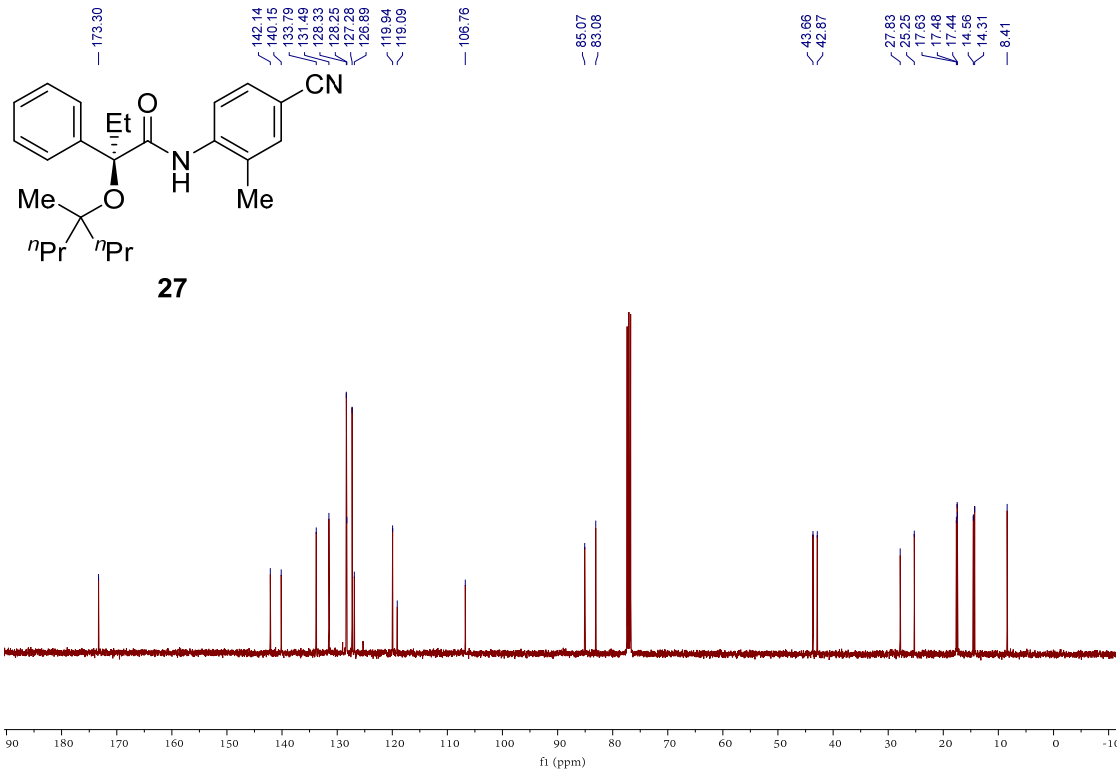

173.11
142.20
140.11
133.76
131.45
128.33
128.21
127.13
126.91
120.00
119.07
106.77
84.98
80.52
45.24
39.35
28.07
28.01
27.35
22.65
22.62
22.41
17.48
8.44
Et
O
N
H
CN
Me
O
Me
Me
Me
Me
25
f1 (ppm)


9.64
8.56
8.54
7.55
7.53
7.52
7.51
7.50
7.34
7.33
7.33
3.08
3.07
3.05
3.03
3.02
2.35
1.55
1.53
1.51
1.49
1.47
1.19
1.17
1.12
1.11
1.09
1.06
0.88
0.86
0.85
0.83
0.81
0.75
0.73
0.72
CN
iPr
O
N
H
Me
O
Me
Et
Et
26
1.00
1.04
4.09
3.05
1.04
3.09
2.02
3.34
3.06
3.96
4.22
3.03
f1 (ppm)

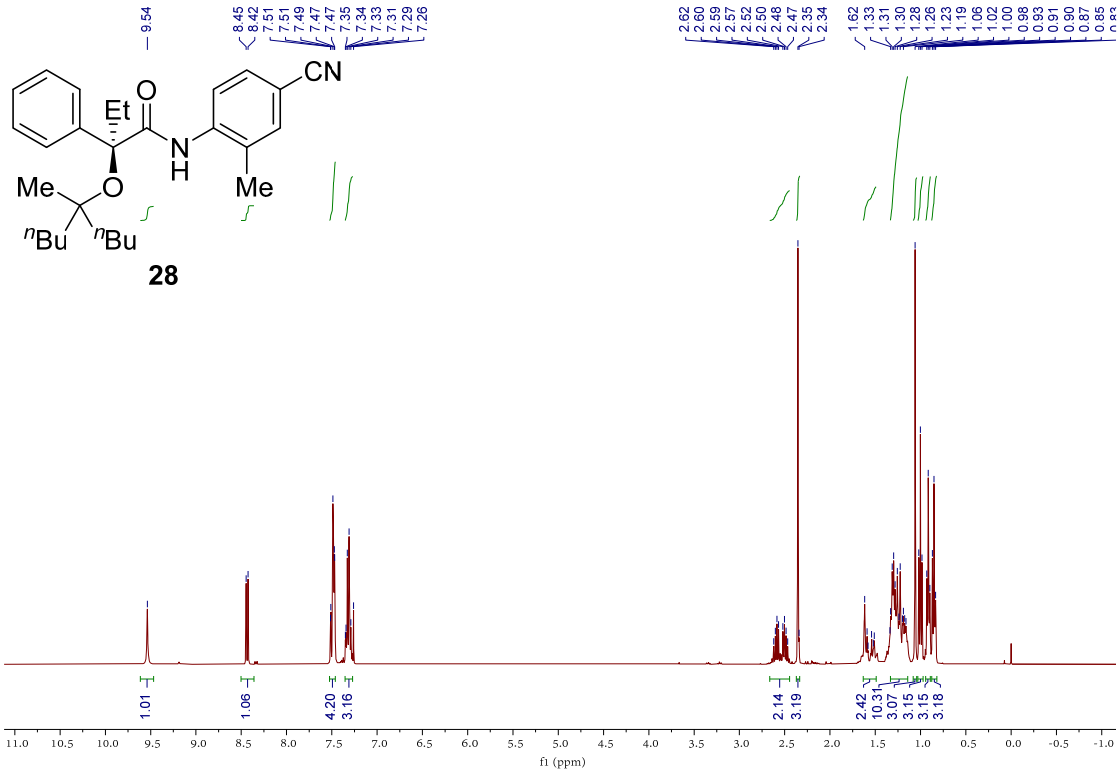

171.80
140.20
138.03
133.84
131.50
130.46
128.60
127.75
126.94
120.03
119.17
106.62
87.93
83.93
34.01
32.44
31.23
24.59
19.40
18.05
17.67
8.84
8.62
CN
iPr
O
N
H
Me
O
Me
Et
Et
26
f1 (ppm)


9.55 8.45 8.43 7.51 7.49 7.48 7.48 7.47 7.47 7.35 7.35 7.34 7.33 7.31 7.30 7.26 2.61 2.60 2.58 2.56 2.54 2.53 2.51 2.49 2.47 2.35 1.63 1.59 1.58 1.56 1.55 1.54 1.52 1.51 1.49 1.46 1.41 1.39 1.39 1.38 1.37 1.36 1.35 1.34 1.33 1.32 1.31 1.29 1.28 1.28 1.26 1.26 1.25 1.22 1.22 1.21 1.20 1.19 1.17 1.17 1.16 1.06 1.02 1.00 0.98 0.93 0.91 0.90 0.80 0.79 0.77
Et
O
N
H
CN
Me
O
Me
nPr
nPr
1.00 1.06 4.11 3.07 2.08 3.04 2.21 6.08 2.98 3.06 3.08 3.01
f1 (ppm)

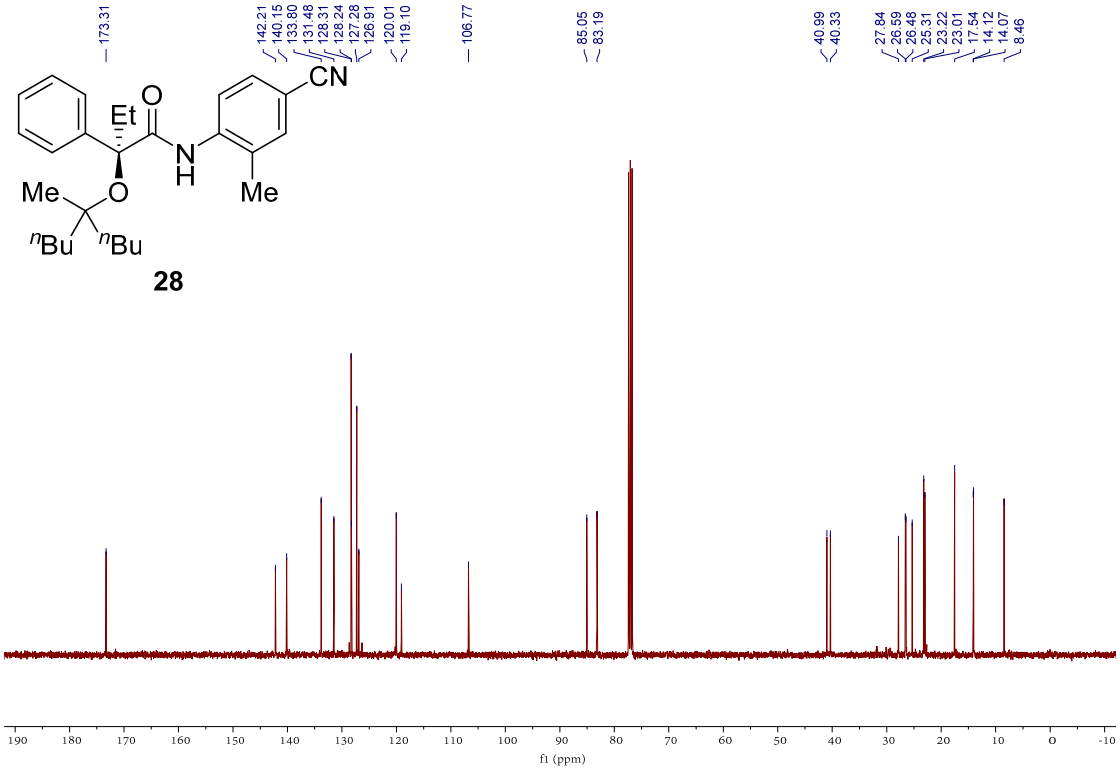
27


173.30
142.14 140.15 133.79 131.49 128.33 128.25 127.28 126.89 119.94 119.09
106.76
85.07 83.08
43.66 42.87
27.83 25.25 17.63 17.48 17.44 14.56 14.31
8.41
Et
O
N
H
CN
Me
O
Me
nPr
nPr
f1 (ppm)

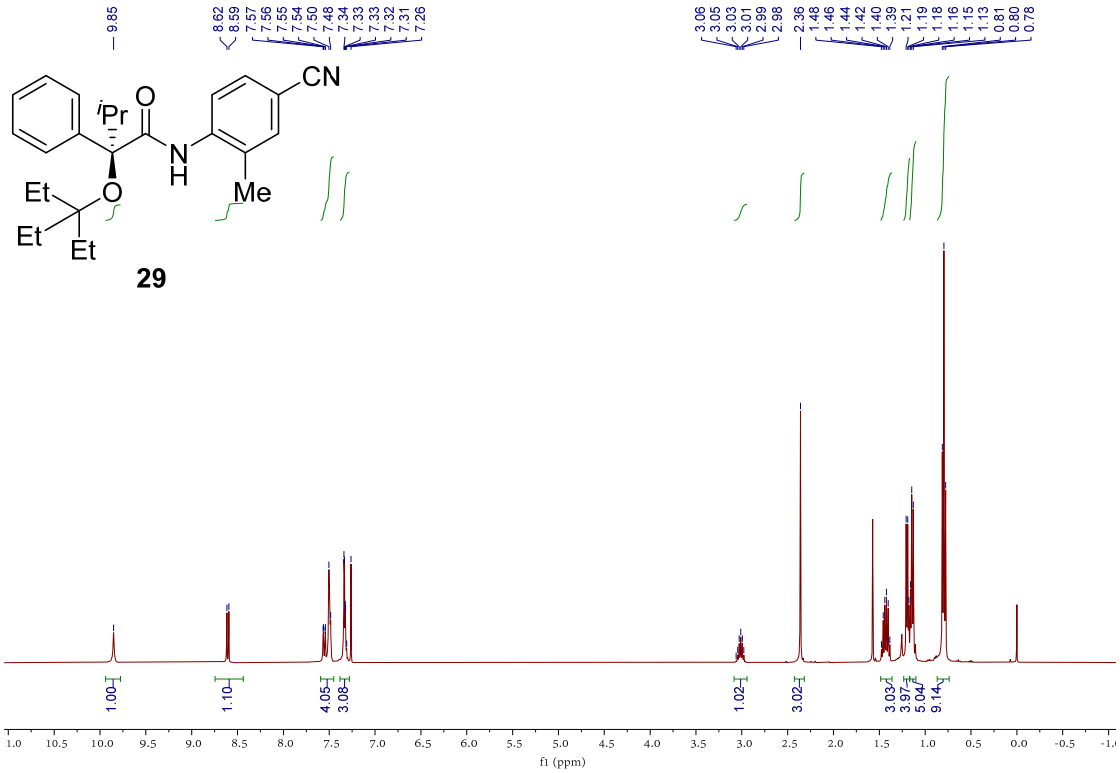
27

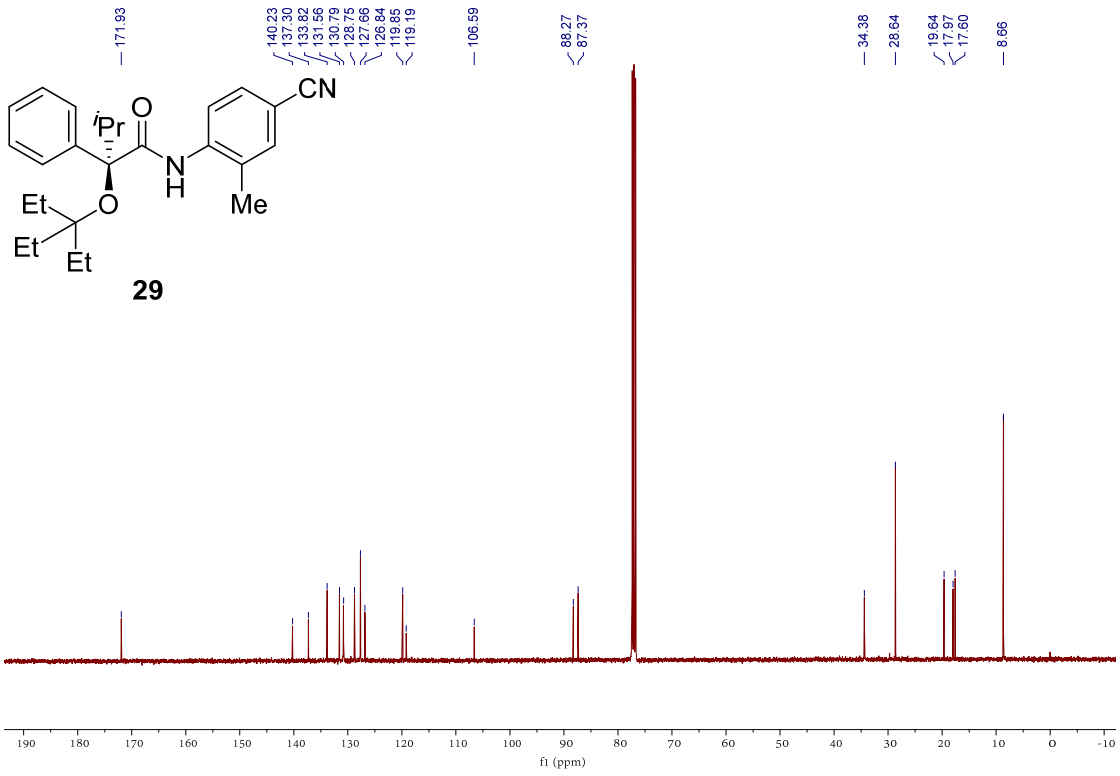

9.54
8.45
8.42
7.51
7.51
7.49
7.47
7.47
7.35
7.34
7.33
7.31
7.29
7.26
2.62
2.60
2.59
2.57
2.52
2.50
2.48
2.47
2.35
2.34
1.62
1.33
1.31
1.30
1.28
1.26
1.23
1.19
1.06
1.02
1.00
0.98
0.93
0.91
0.90
0.87
0.85
Et
O
N
H
CN
Me
O
Me
nBu
nBu
1.01
1.06
4.20
3.16
2.14
3.19
2.42
10.31
3.07
3.15
3.15
3.18
f1 (ppm)

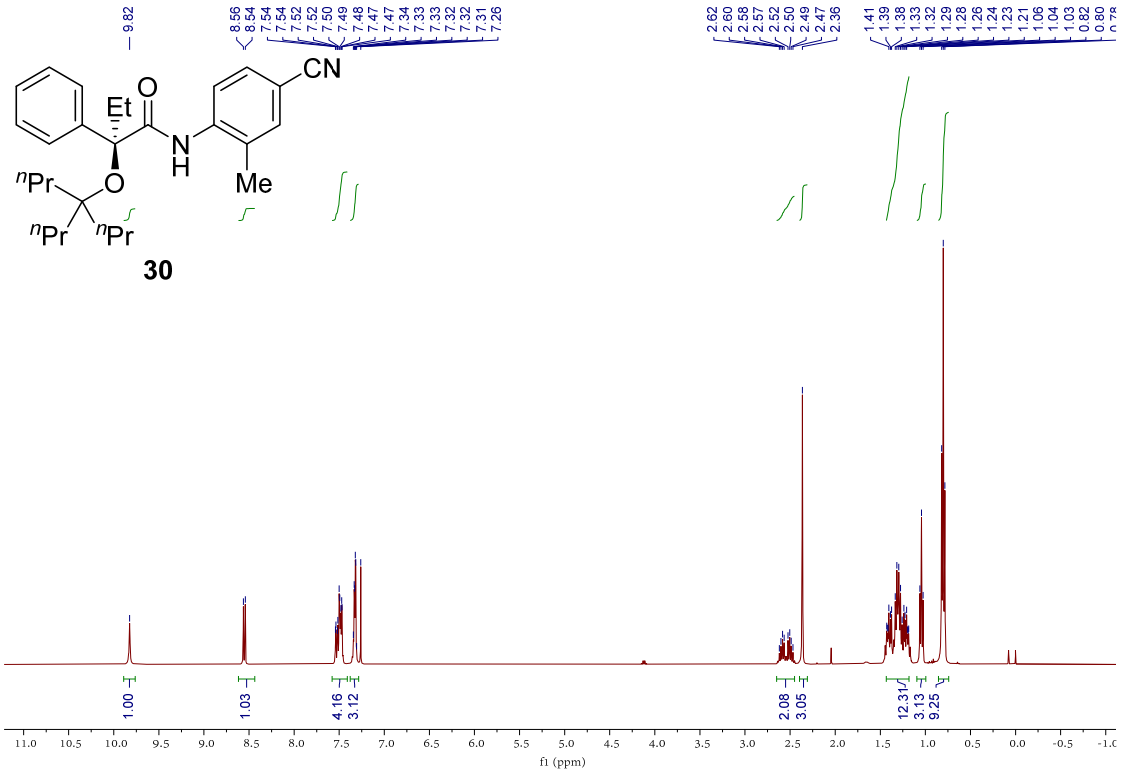
28

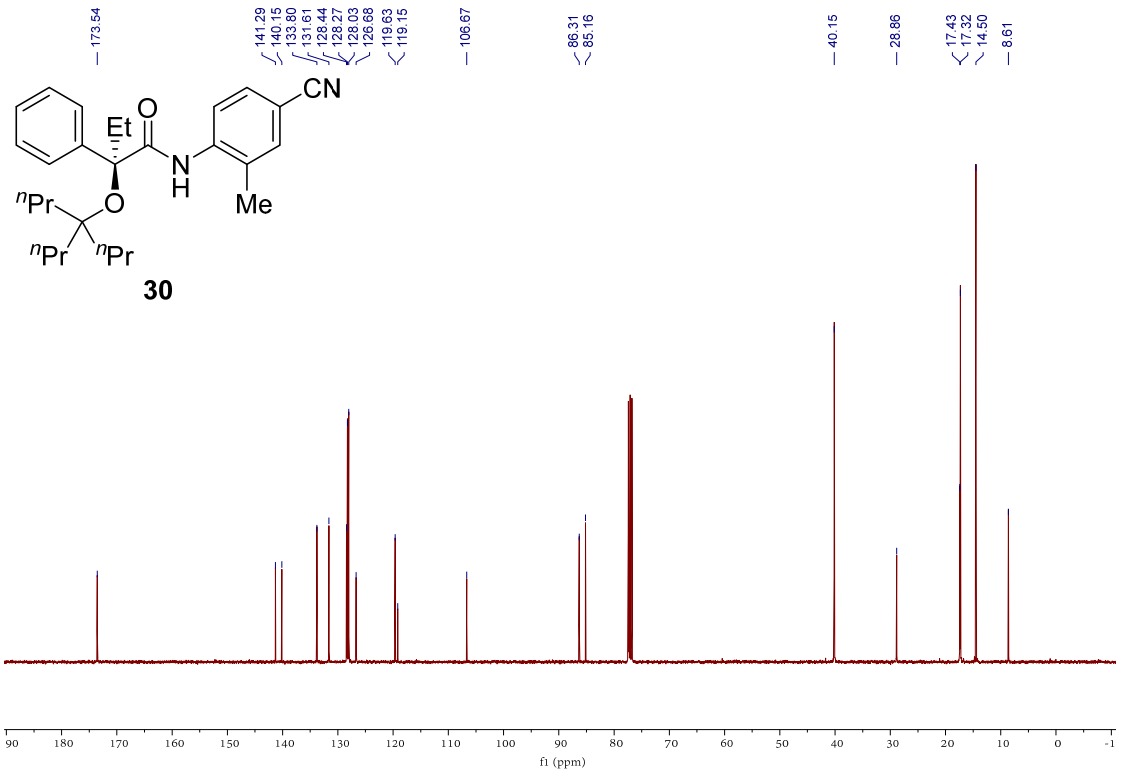

173.31
142.21
140.15
133.80
131.48
128.31
128.24
127.28
126.91
120.01
119.10
106.77
85.05
83.19
40.99
40.33
27.84
26.59
26.48
25.31
23.22
23.01
17.54
14.12
14.07
8.46
Et
O
N
H
CN
Me
O
Me
nBu
nBu
f1 (ppm)

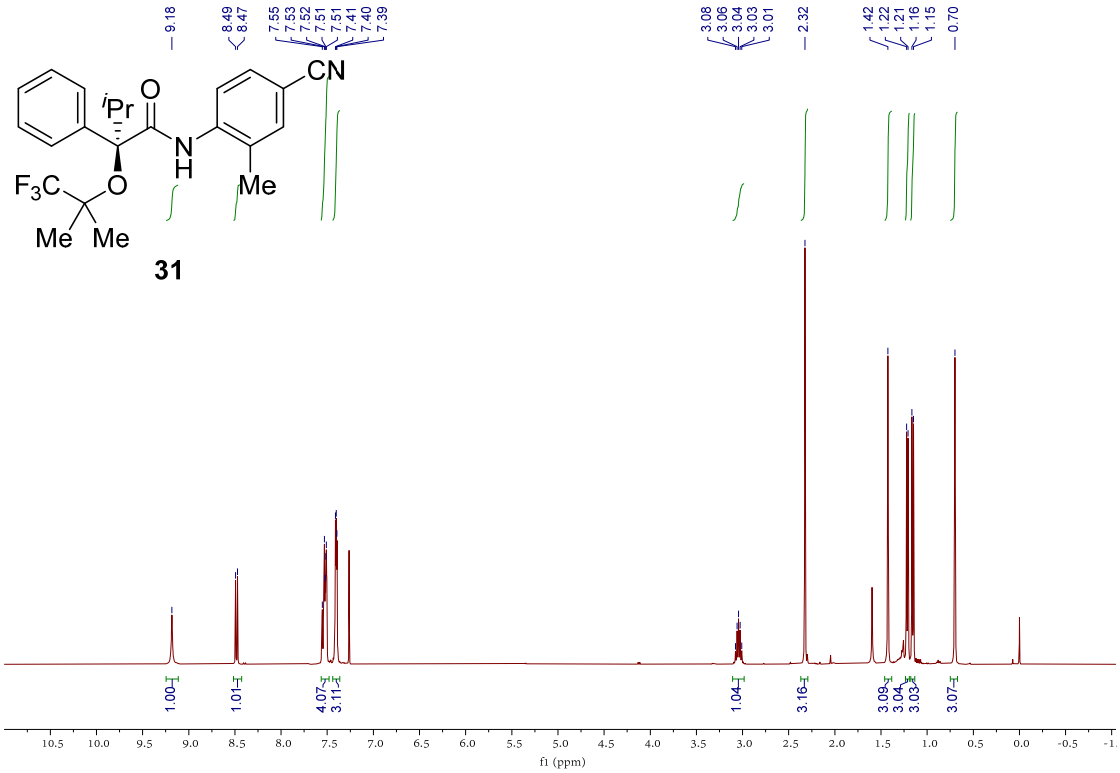
28

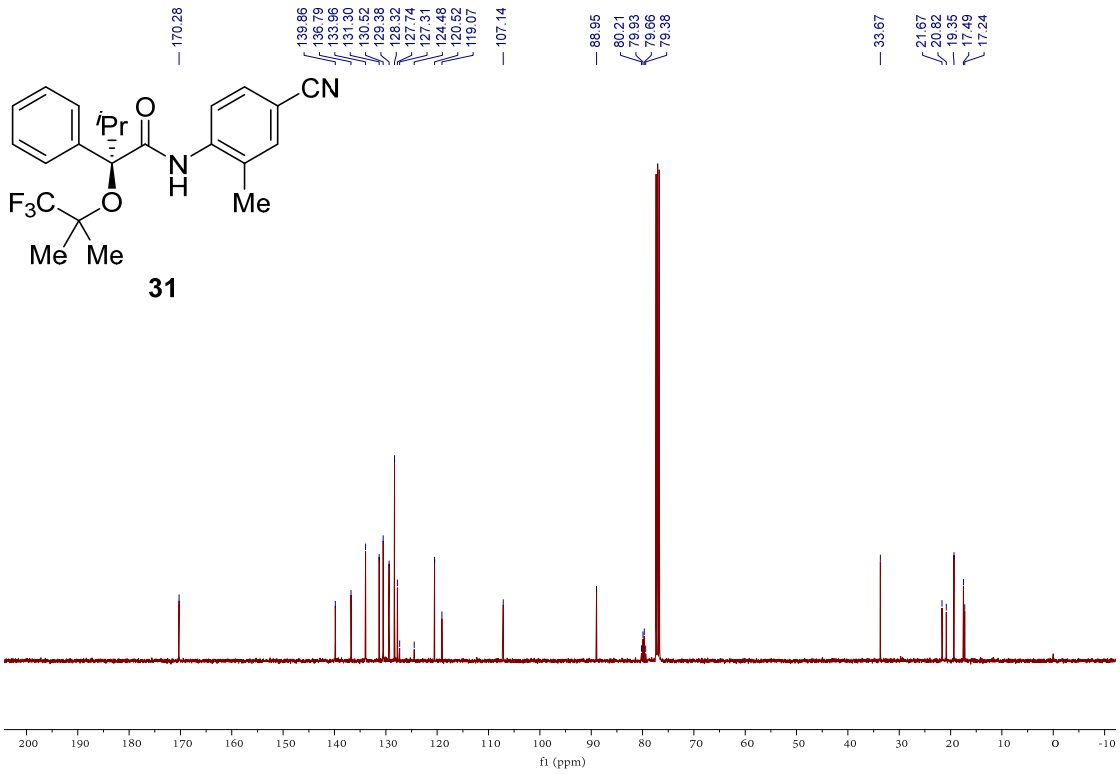

9.85
8.62
8.59
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7.56
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7.54
7.50
7.48
7.34
7.33
7.33
7.32
7.31
7.26
3.06
3.05
3.03
3.01
2.99
2.98
2.36
1.48
1.46
1.44
1.42
1.40
1.39
1.21
1.19
1.18
1.16
1.15
1.13
0.81
0.80
0.78
CN
iPr
O
N
H
Me
Et
O
Et
Et
29
1.00
1.10
4.05
3.08
1.02
3.02
3.03
3.97
5.04
9.14
f1 (ppm)


171.93
140.23
137.30
133.82
131.56
130.79
128.75
127.66
126.84
119.85
119.19
106.59
88.27
87.37
34.38
28.64
19.64
17.97
17.60
8.66
CN
iPr
O
N
H
Me
Et
O
Et
Et
29
f1 (ppm)


9.82
8.56
8.54
7.54
7.54
7.52
7.52
7.50
7.49
7.48
7.47
7.47
7.34
7.33
7.33
7.32
7.32
7.31
7.26
2.62
2.60
2.58
2.57
2.52
2.50
2.49
2.47
2.36
1.41
1.39
1.38
1.33
1.32
1.29
1.28
1.26
1.24
1.23
1.21
1.06
1.04
1.03
0.82
0.80
Et
O
N
H
CN
Me
nPr
O
nPr
nPr
30
1.00
1.03
4.16
3.12
2.08
3.05
12.31
3.13
9.25
f1 (ppm)

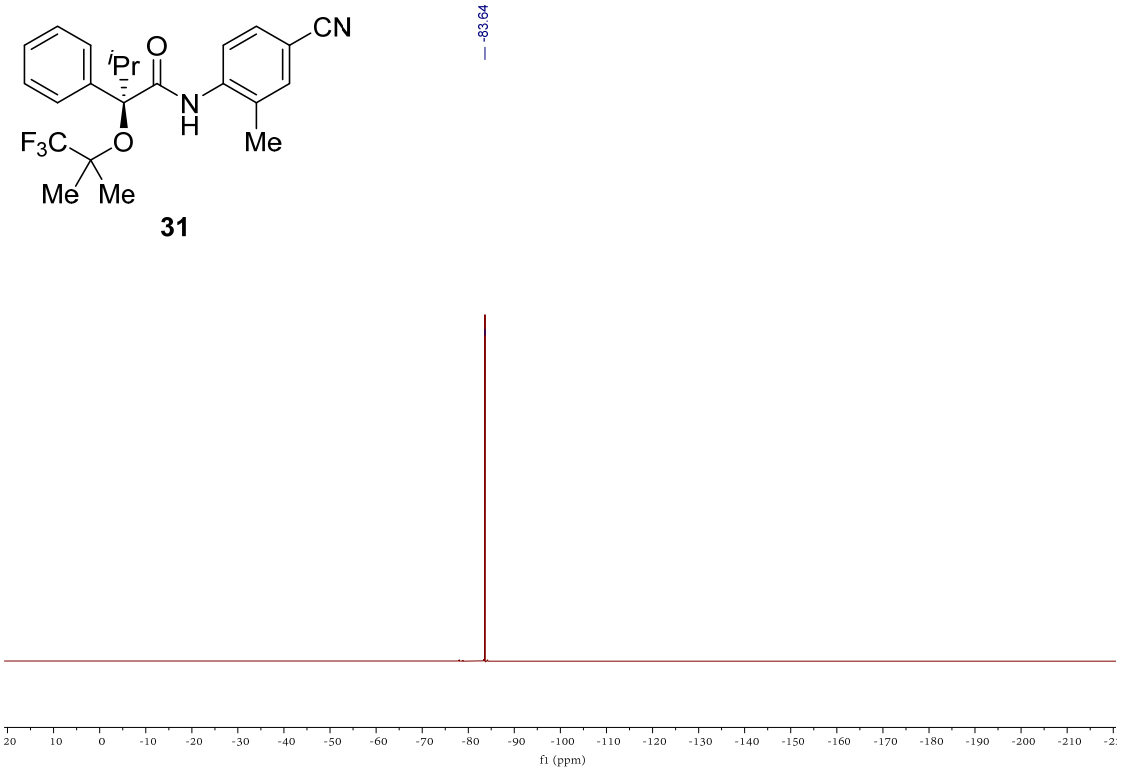

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133.80
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128.44
128.27
128.03
126.68
119.63
119.15
106.67
86.31
85.16
40.15
28.86
17.43
17.32
14.50
8.61
Et
O
N
H
CN
Me
nPr
O
nPr
nPr
30
f1 (ppm)

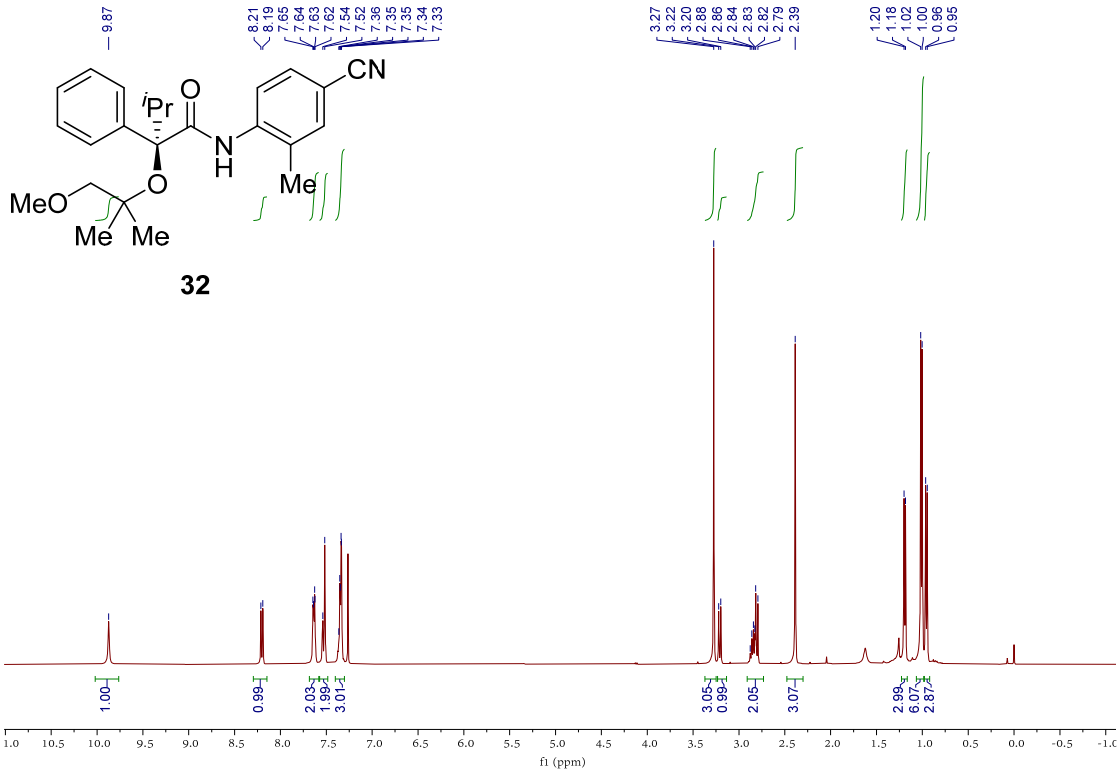

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8.49
8.47
7.55
7.53
7.52
7.51
7.51
7.41
7.40
7.39
3.08
3.06
3.04
3.03
3.01
2.32
1.42
1.22
1.21
1.16
1.15
0.70
CN
iPr
O
N
H
F3C
O
Me
Me
Me
31
1.00
1.01
4.07
3.11
1.04
3.16
3.09
3.04
3.03
3.07
f1 (ppm)


170.28
139.86
136.79
133.96
131.30
130.52
129.38
128.32
127.74
127.31
124.48
120.52
119.07
107.14
88.95
80.21
79.93
79.66
79.38
33.67
21.67
20.82
19.35
17.49
17.24
CN
iPr
O
N
H
F3C
O
Me
Me
Me
31
f1 (ppm)

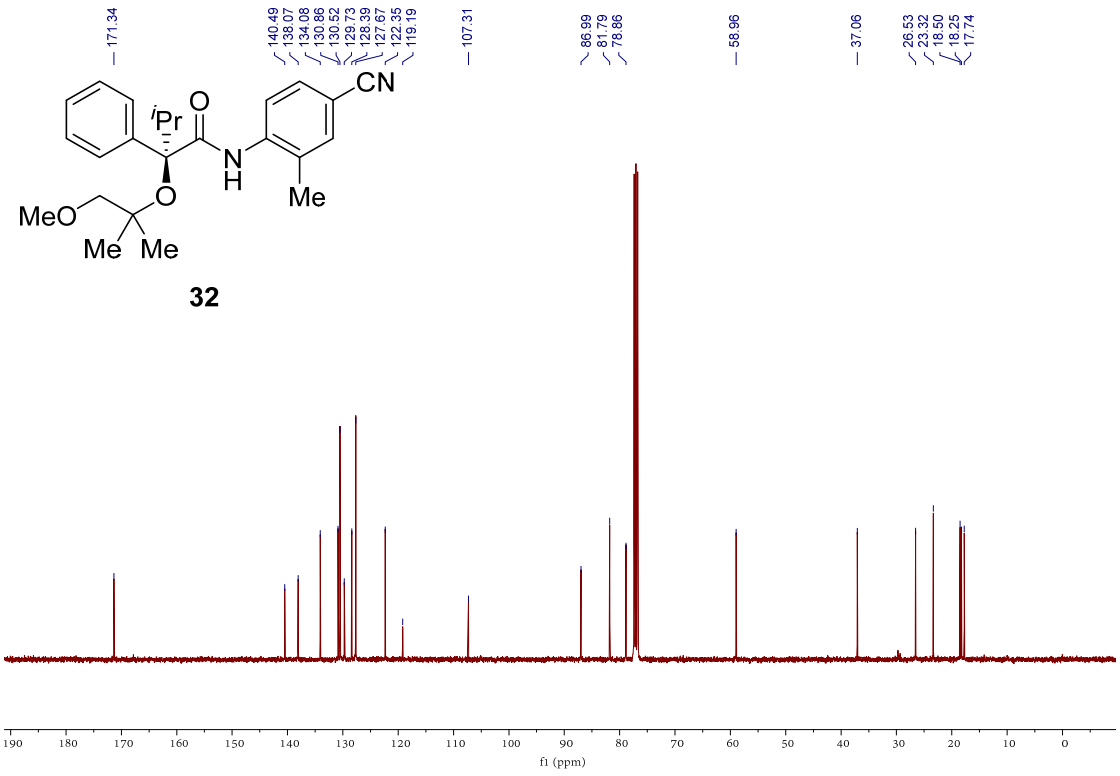
CN
O
iPr
N
H
F3C
O
Me
Me
Me

31

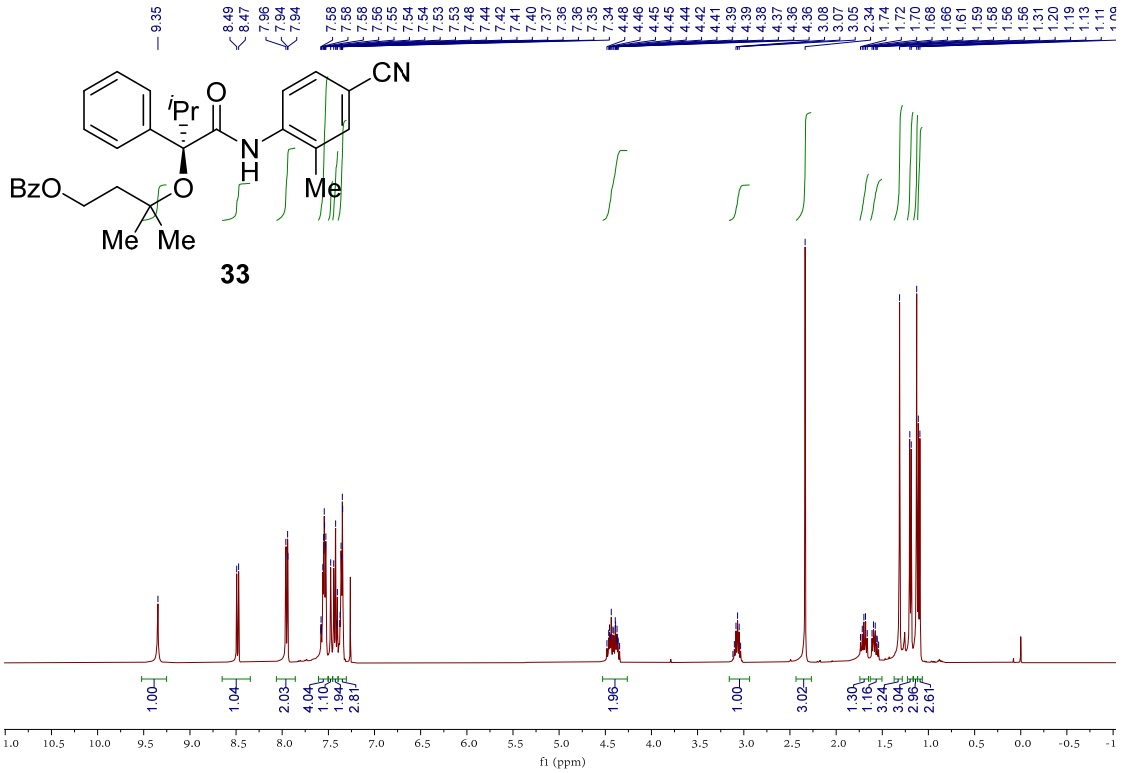

-83.64
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

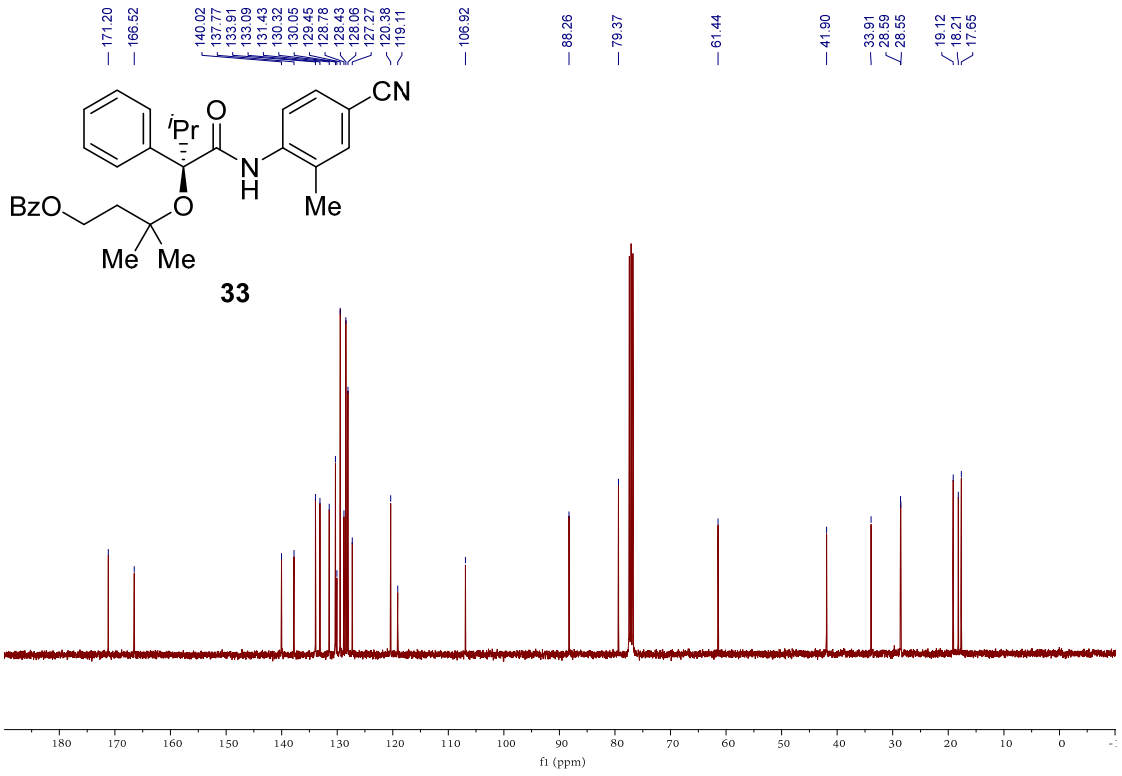

9.87
8.21
8.19
7.65
7.64
7.63
7.62
7.54
7.52
7.36
7.35
7.35
7.34
7.33
3.27
3.22
3.20
2.88
2.86
2.84
2.83
2.82
2.79
2.39
1.20
1.18
1.02
1.00
0.96
0.95
CN
iPr
O
N
H
Me
MeO
O
Me Me
1.00
0.99
2.03
1.99
3.01
3.05
0.99
2.05
3.07
2.99
6.07
2.87
f1 (ppm)

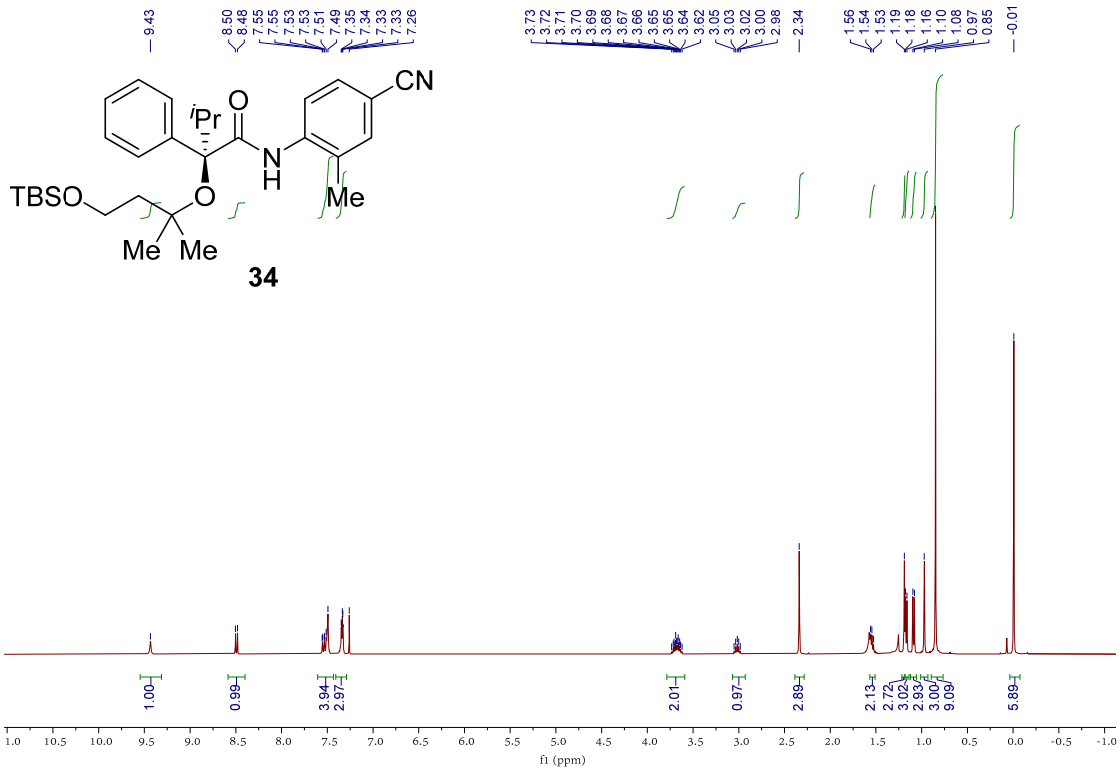
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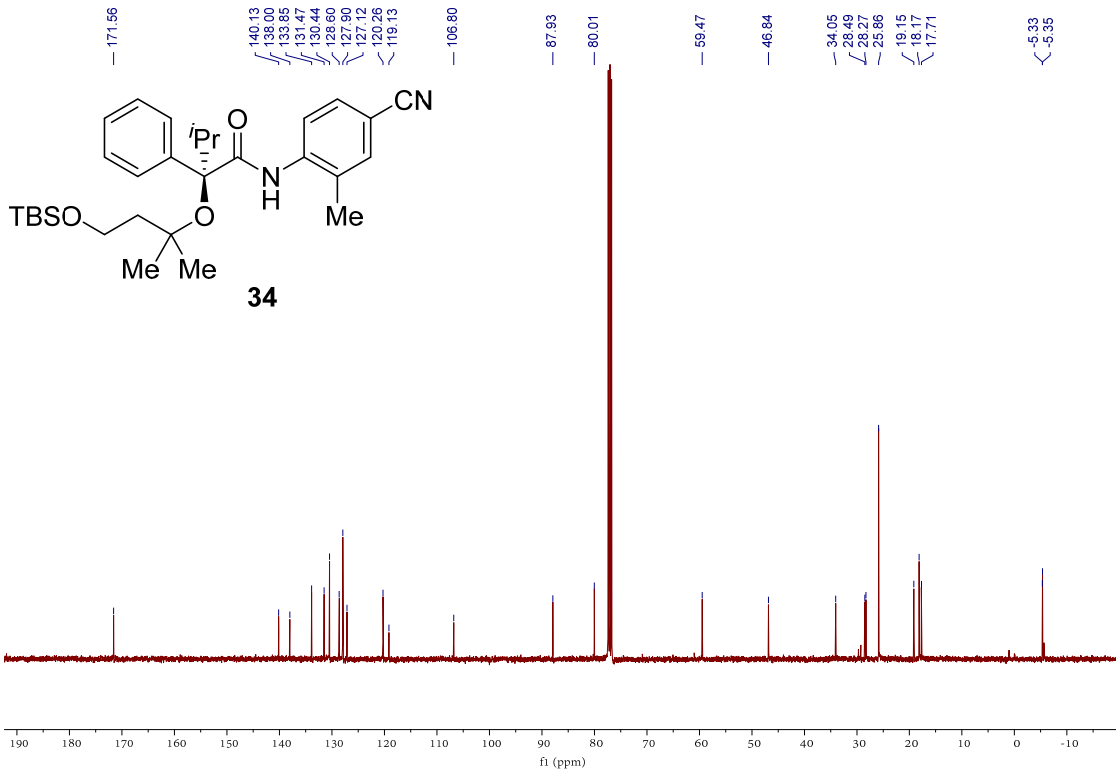

171.34
140.49
138.07
134.08
130.86
130.52
129.73
128.39
127.67
122.35
119.19
107.31
86.99
81.79
78.86
58.96
37.06
26.53
23.32
18.50
18.25
17.74
CN
iPr
O
N
H
Me
MeO
O
Me Me
f1 (ppm)

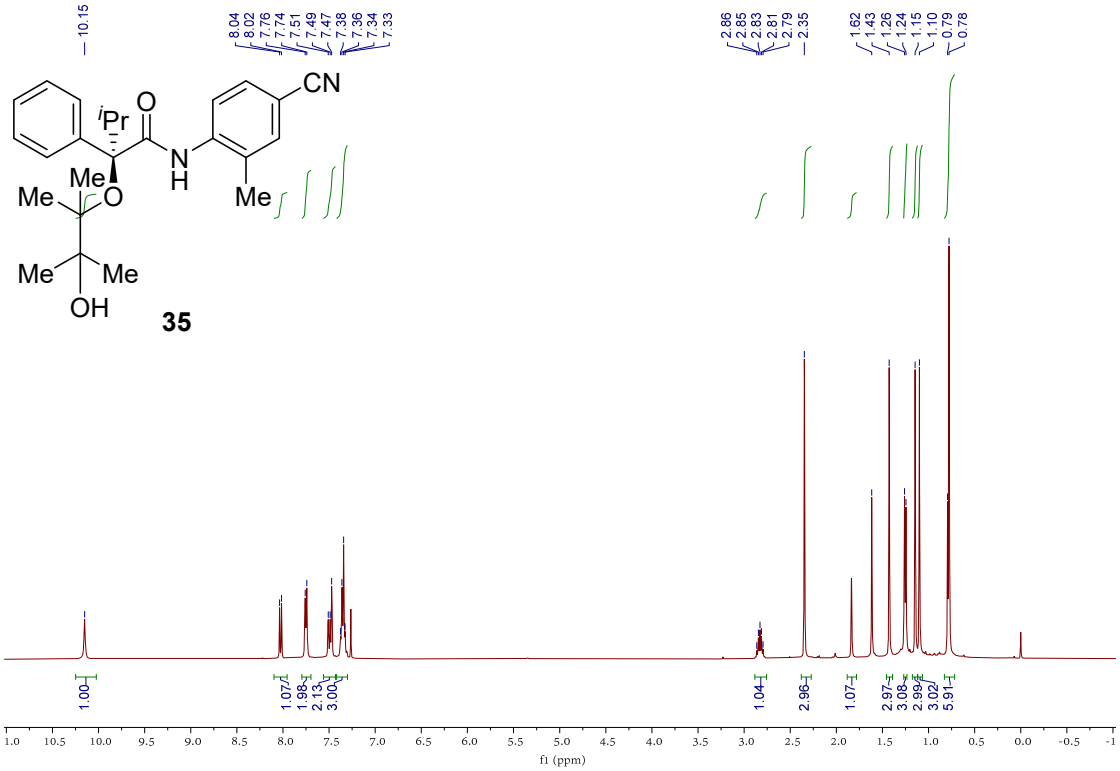
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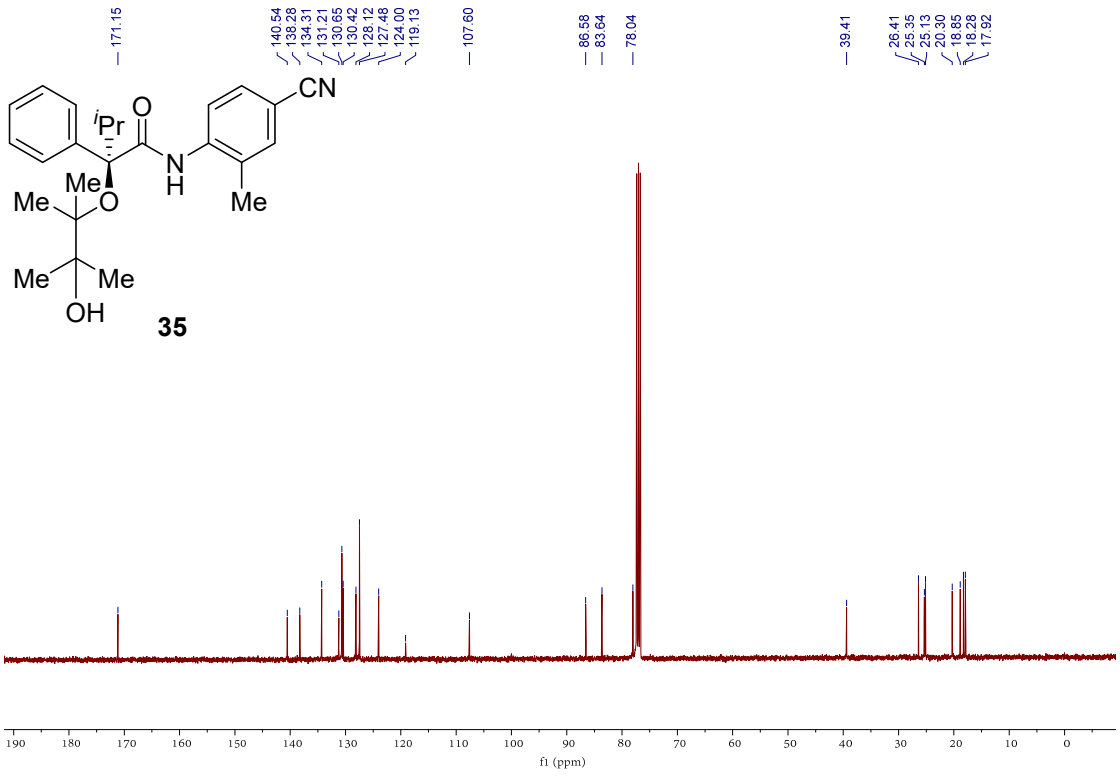

9.35
8.49
8.47
7.96
7.94
7.94
7.58
7.58
7.58
7.56
7.55
7.54
7.54
7.53
7.53
7.48
7.44
7.42
7.41
7.40
7.37
7.36
7.36
7.35
7.34
4.48
4.46
4.45
4.45
4.44
4.42
4.41
4.39
4.39
4.38
4.37
4.36
4.36
3.08
3.07
3.05
2.34
1.74
1.72
1.70
1.68
1.66
1.61
1.59
1.58
1.56
1.56
1.31
1.20
1.19
1.13
1.11
CN
iPr
O
N
H
Me
BzO
O
Me Me
33
1.00
1.04
2.03
4.04
1.10
1.94
2.81
1.96
1.00
3.02
1.30
1.16
3.24
3.04
2.96
2.61
f1 (ppm)

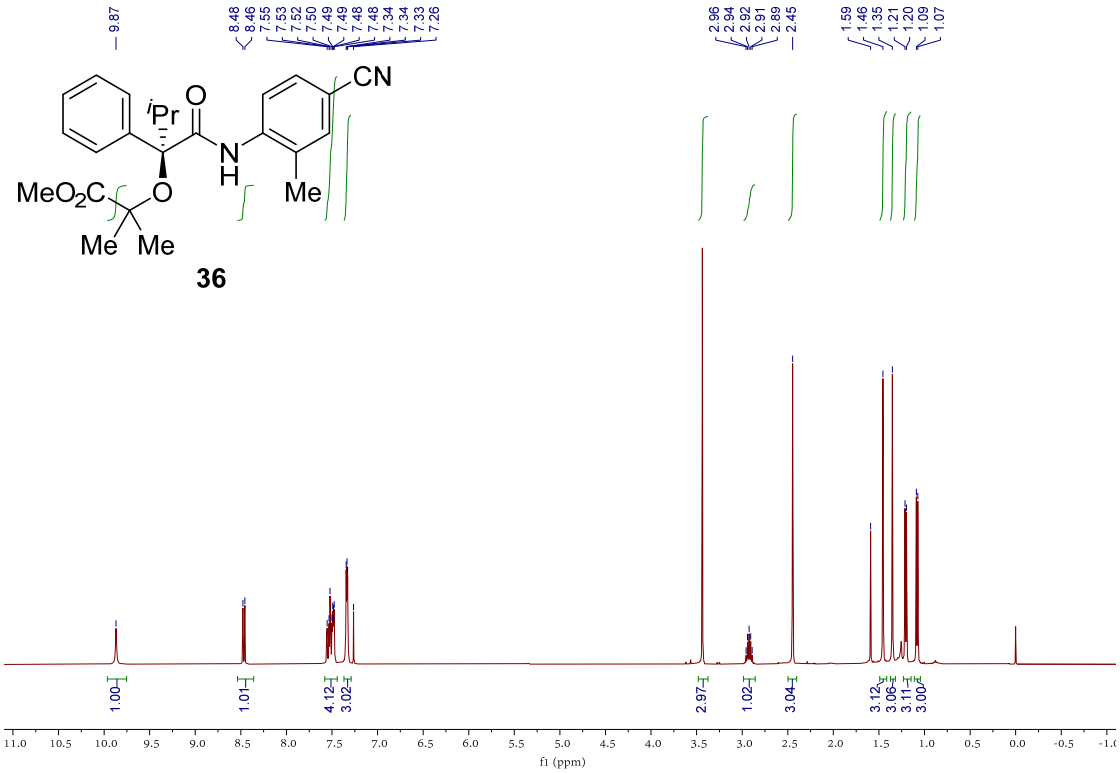

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166.52
140.02
137.77
133.91
133.09
131.43
130.32
130.05
129.45
128.78
128.43
128.06
127.27
120.38
119.11
106.92
88.26
79.37
61.44
41.90
33.91
28.59
28.55
19.12
18.21
17.65
CN
iPr
O
N
H
Me
BzO
O
Me Me
33
f1 (ppm)


9.43
8.50
8.48
7.55
7.53
7.51
7.49
7.35
7.34
7.33
7.26
3.73
3.72
3.71
3.70
3.69
3.68
3.67
3.66
3.65
3.64
3.62
3.05
3.03
3.02
3.00
2.98
2.34
1.56
1.54
1.53
1.19
1.18
1.16
1.10
1.08
0.97
0.85
0.01
CN
iPr
O
N
H
Me
TBSO
O
Me Me
34
1.00
0.99
3.94
2.97
2.01
0.97
2.89
2.13
2.72
3.02
2.93
3.00
9.09
5.89
f1 (ppm)

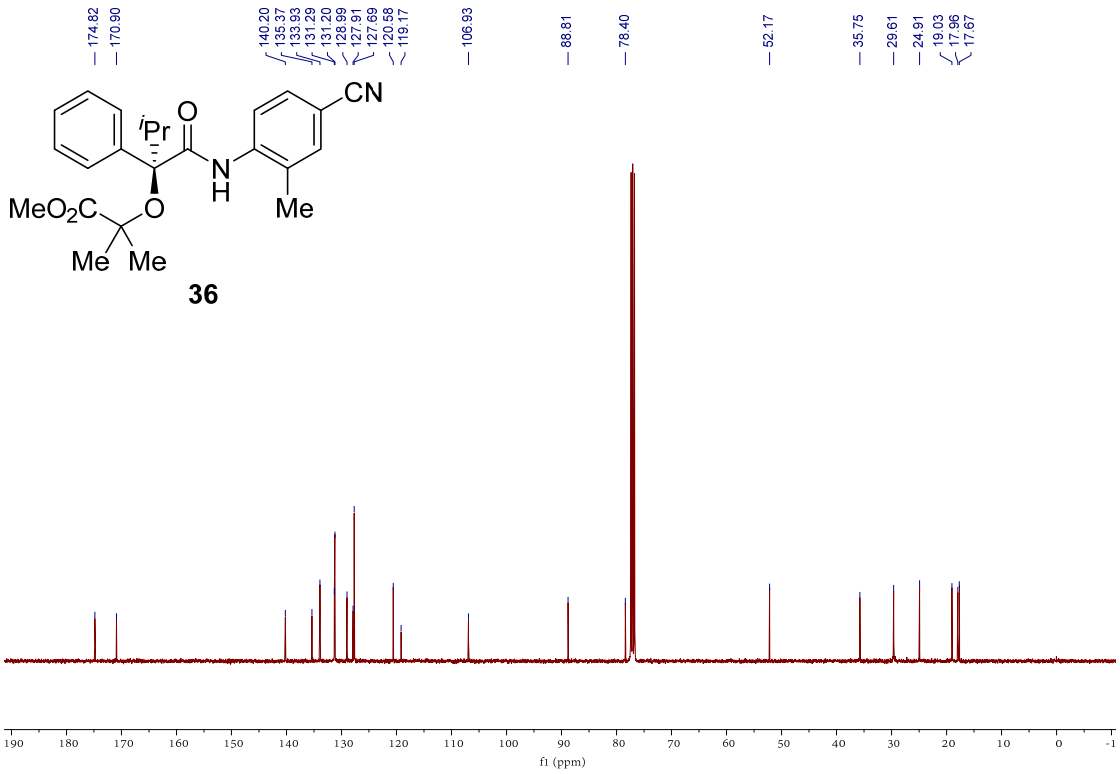

171.56
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133.85
131.47
130.44
128.60
127.90
127.12
120.26
119.13
106.80
87.93
80.01
59.47
46.84
34.05
28.49
28.27
25.86
19.15
18.17
17.71
5.33
5.35
CN
iPr
O
N
H
Me
TBSO
O
Me Me
34
f1 (ppm)


10.15
8.04
8.02
7.76
7.74
7.51
7.49
7.47
7.38
7.36
7.34
7.33
2.86
2.85
2.83
2.81
2.79
2.35
1.62
1.43
1.26
1.24
1.15
1.10
0.79
0.78
CN
iPr
O
N
H
Me
Me
O
Me
Me
Me
OH
35
1.00
1.07
1.98
2.13
3.00
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3.02
5.91
f1 (ppm)

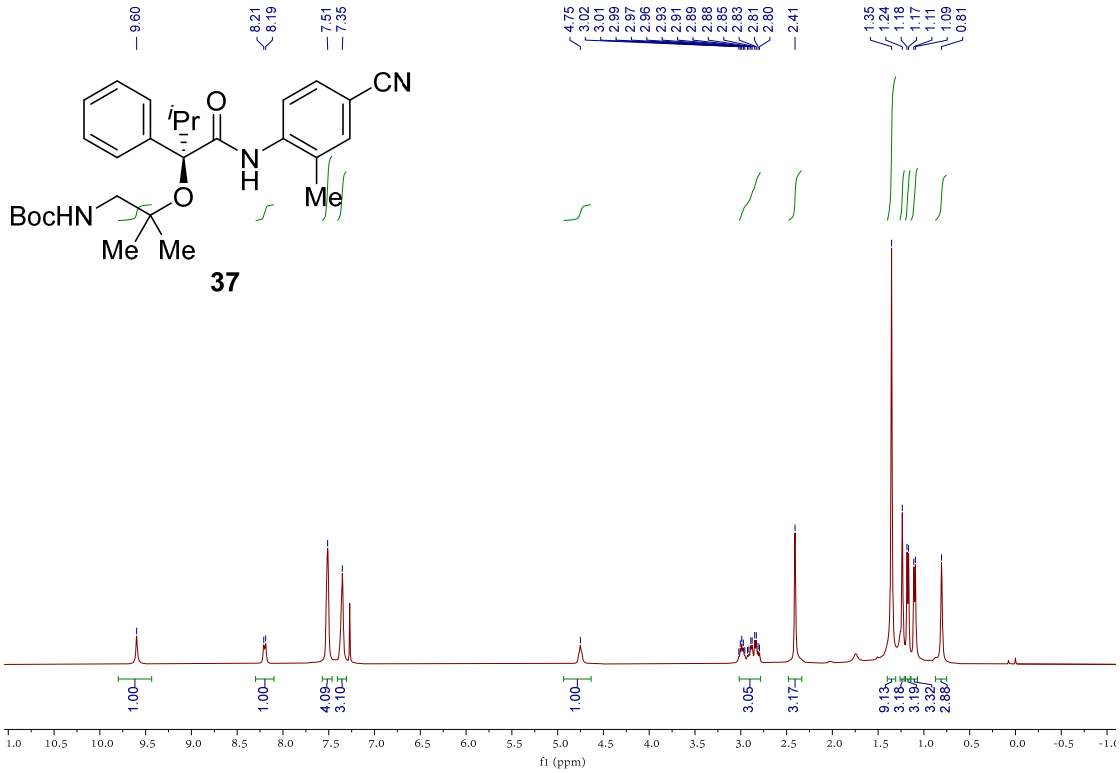

171.15
140.54
138.28
134.31
131.21
130.65
130.42
128.12
127.48
124.00
119.13
107.60
86.58
83.64
78.04
39.41
26.41
25.35
25.13
20.30
18.85
18.28
17.92
CN
iPr
O
N
H
Me
Me
O
Me
Me
Me
OH
35
f1 (ppm)


9.87
8.48
8.46
7.55
7.53
7.52
7.50
7.49
7.49
7.48
7.48
7.34
7.34
7.33
7.26
2.96
2.94
2.92
2.91
2.89
2.45
1.59
1.46
1.35
1.21
1.20
1.09
1.07
CN
iPr
O
N
H
MeO2C
O
Me
Me
Me
1.00
1.01
4.12
3.02
2.97
1.02
3.04
3.12
3.06
3.11
3.00
f1 (ppm)

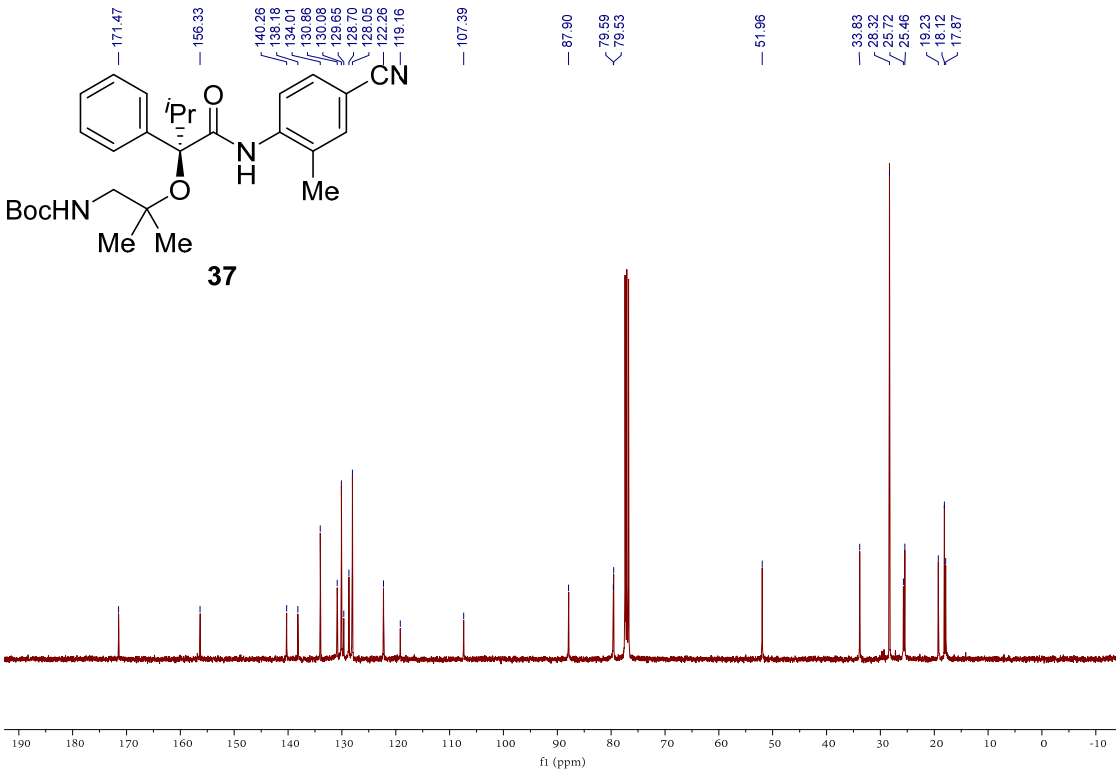
36


174.82
170.90
140.20
135.37
133.93
131.29
131.20
128.99
127.91
127.69
120.58
119.17
106.93
88.81
78.40
52.17
35.75
29.61
24.91
19.03
17.96
17.87
CN
iPr
O
N
H
MeO2C
O
Me
Me
Me
f1 (ppm)

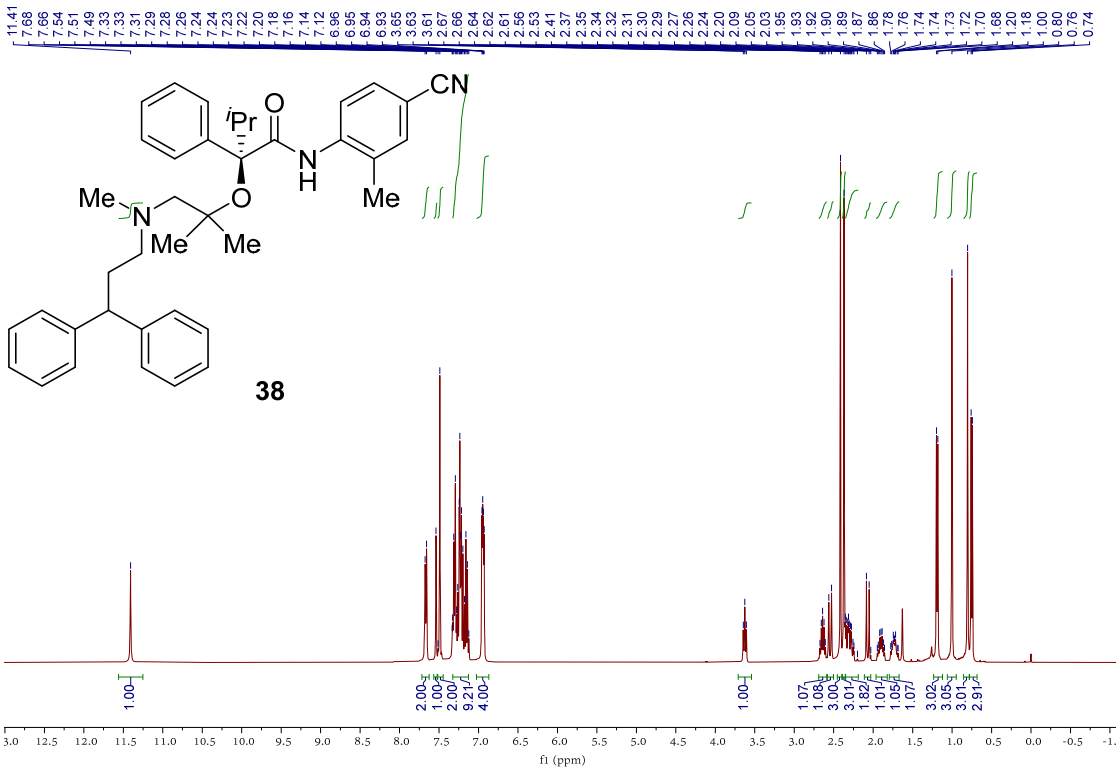
36

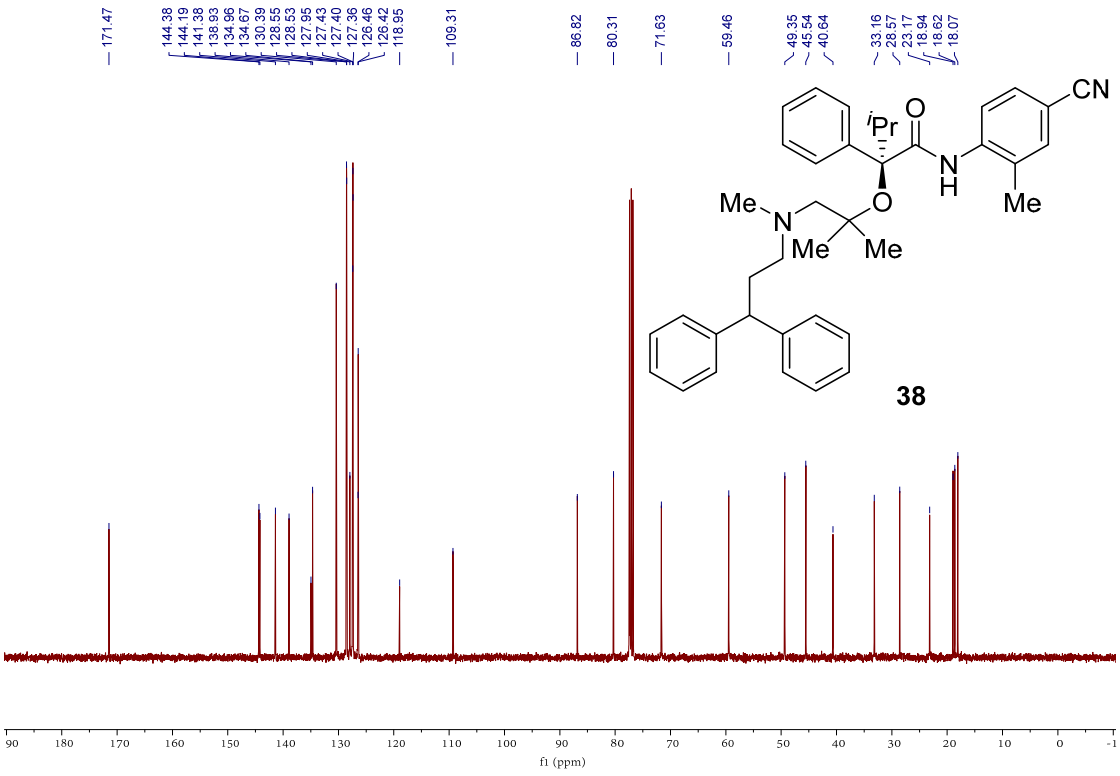

9.60
8.21
8.19
7.51
7.35
4.75
3.02
3.01
2.99
2.97
2.96
2.93
2.91
2.89
2.88
2.85
2.83
2.81
2.80
2.41
1.35
1.24
1.18
1.17
1.11
1.09
0.81
CN
iPr
O
N
H
Me
BocHN
O
Me Me
1.00
1.00
4.09
3.10
1.00
3.05
3.17
9.13
3.18
3.19
3.32
2.88
f1 (ppm)

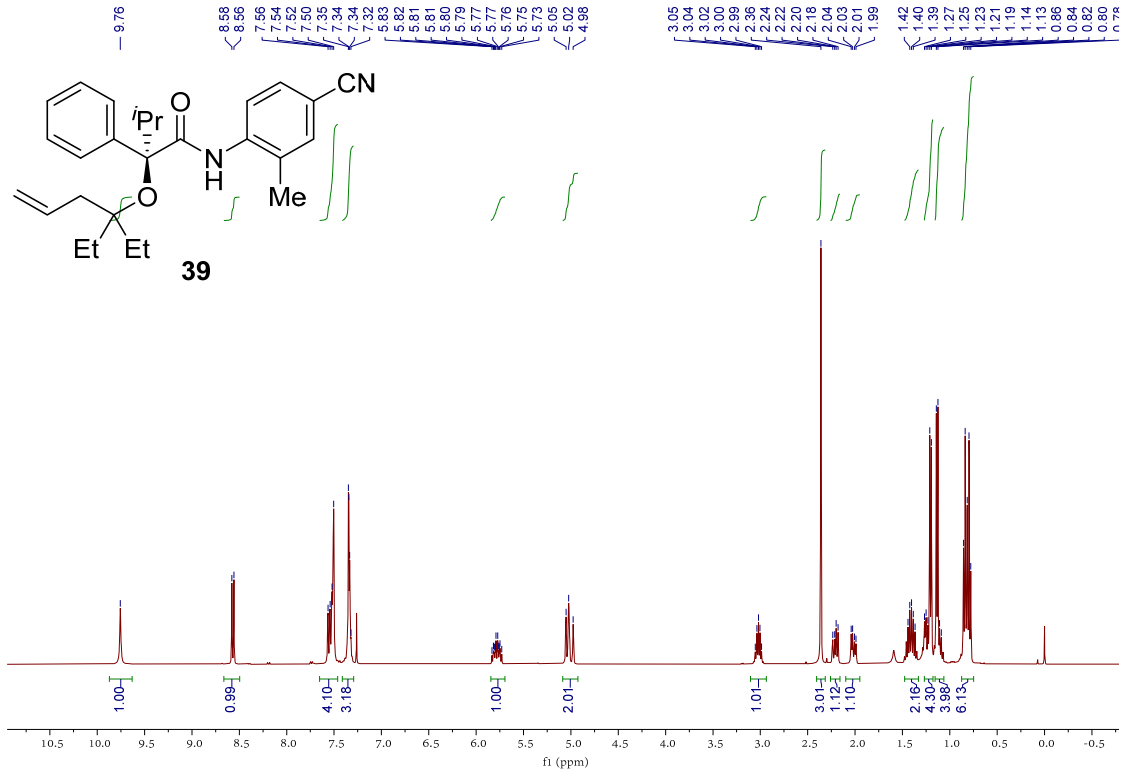
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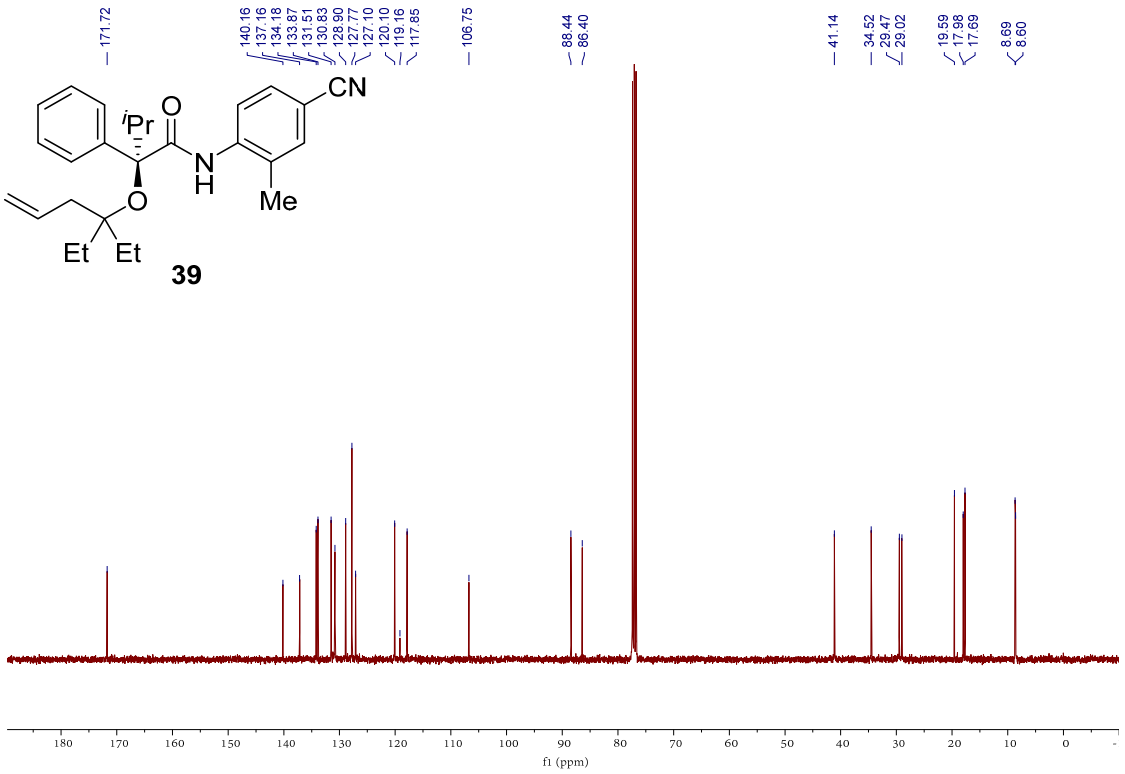

171.47
156.33
140.26
138.18
134.01
130.86
130.08
129.65
128.70
128.05
122.26
119.16
107.39
87.90
79.59
79.53
51.96
33.83
28.32
25.72
25.46
19.23
18.12
17.87
CN
iPr
O
N
H
Me
BocHN
O
Me Me
f1 (ppm)

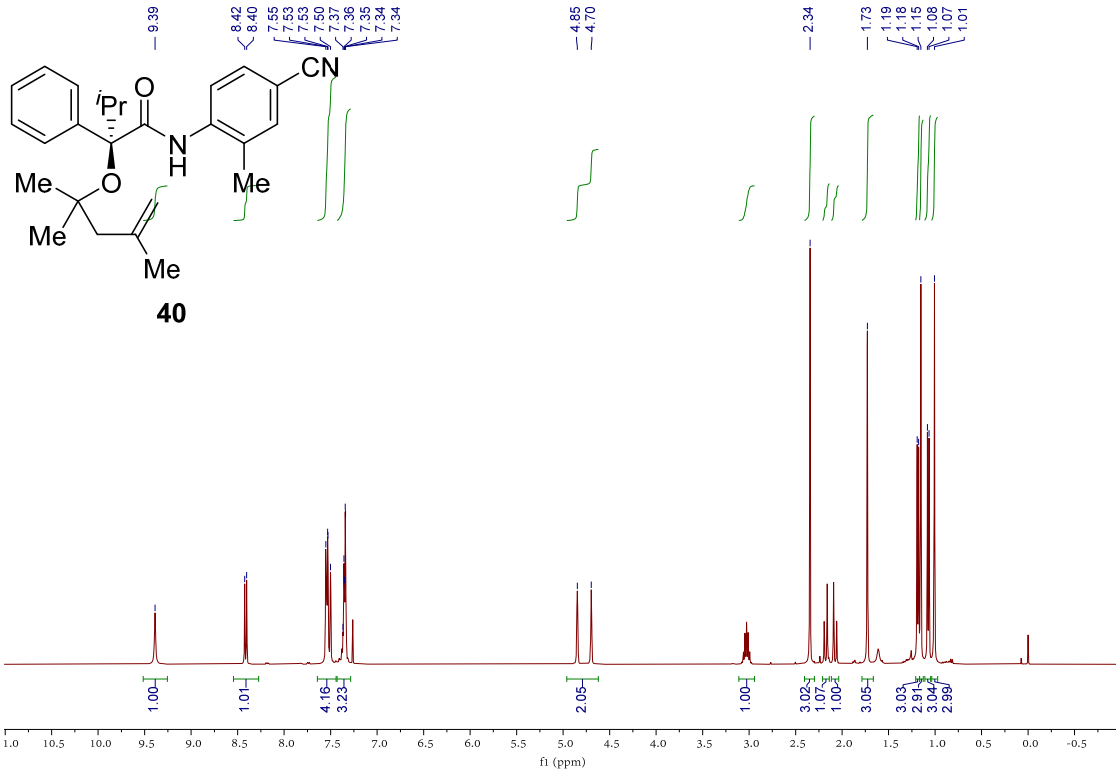
37


11.41 7.68 7.66 7.54 7.51 7.49 7.33 7.33 7.31 7.29 7.28 7.26 7.24 7.24 7.23 7.22 7.20 7.18 7.16 7.14 7.12 6.96 6.95 6.94 6.93 3.65 3.63 3.61 2.67 2.66 2.64 2.62 2.61 2.56 2.53 2.41 2.37 2.35 2.34 2.32 2.31 2.30 2.29 2.27 2.26 2.24 2.20 2.09 2.05 2.03 1.95 1.93 1.92 1.90 1.89 1.87 1.86 1.78 1.76 1.74 1.74 1.73 1.72 1.70 1.68 1.20 1.18 1.00 0.80 0.76 0.74
iPr
O
N
H
CN
Me
Me
N
Me
Me
O
Me
38
1.00 2.00 1.00 2.00 9.21 4.00 1.00 1.07 1.08 3.00 3.01 1.82 1.01 1.05 1.07 3.02 3.05 3.01 2.91
f1 (ppm)

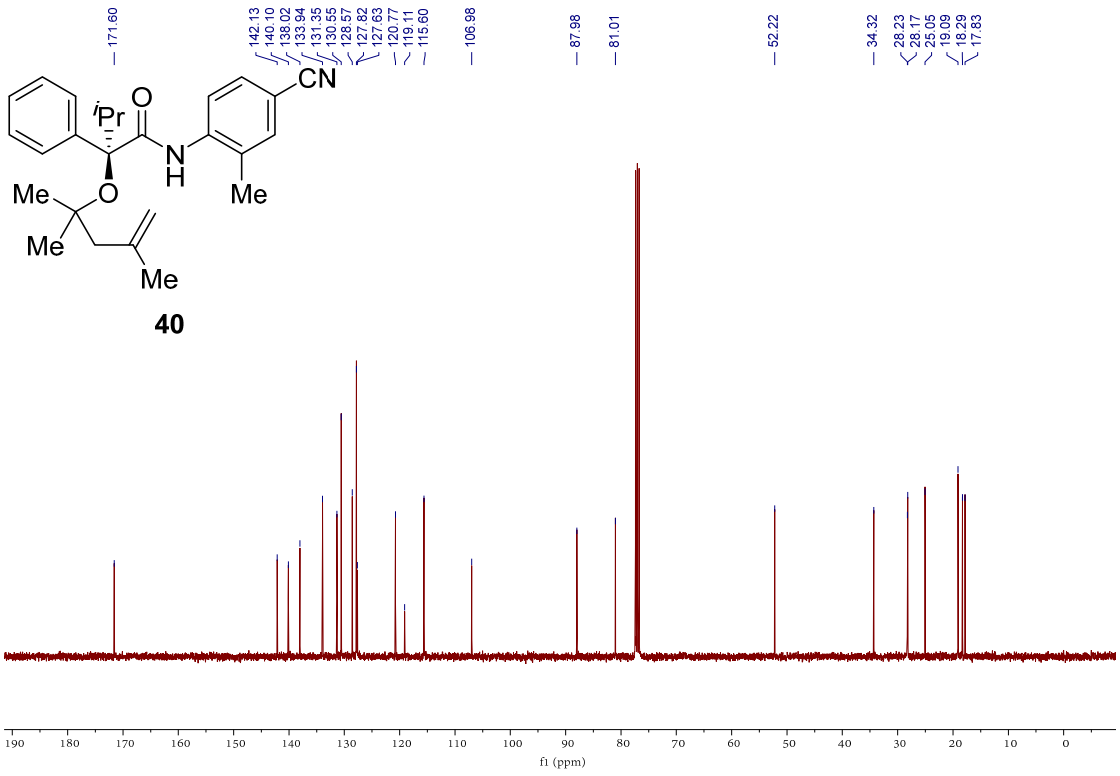

171.47 144.38 144.19 141.38 138.93 134.96 134.67 130.39 128.55 128.53 127.95 127.43 127.40 127.36 126.46 126.42 118.95 109.31 86.82 80.31 71.63 59.46 49.35 45.54 40.64 33.16 28.57 23.17 18.94 18.62 18.07
iPr
O
N
H
CN
Me
Me
N
Me
Me
O
Me
38
f1 (ppm)


9.76
8.58
8.56
7.56
7.54
7.52
7.50
7.35
7.34
7.34
7.32
5.83
5.82
5.81
5.81
5.80
5.79
5.77
5.77
5.76
5.75
5.73
5.05
5.02
4.98
3.05
3.04
3.02
3.00
2.99
2.36
2.24
2.22
2.20
2.18
2.04
2.03
2.01
1.99
1.42
1.40
1.39
1.27
1.25
1.23
1.21
1.19
1.14
1.13
0.86
0.84
0.82
0.80
iPr
O
N
H
CN
Me
O
Et
Et
39
1.00
0.99
4.10
3.18
1.00
2.01
1.01
3.01
1.12
1.10
2.16
4.30
3.98
6.13
f1 (ppm)

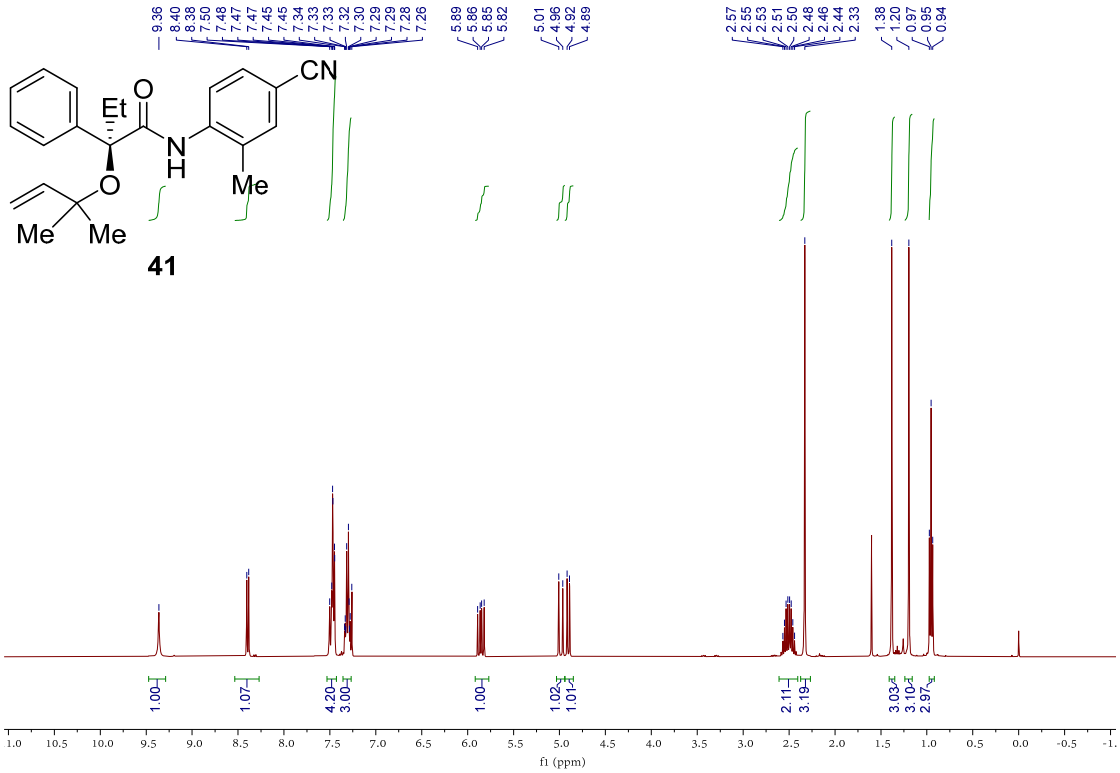

171.72
140.16
137.16
134.18
133.87
131.51
130.83
128.90
127.77
127.10
120.10
119.16
117.85
106.75
88.44
86.40
41.14
34.52
29.47
29.02
19.59
17.98
17.69
8.69
8.60
iPr
O
N
H
CN
Me
O
Et
Et
39
f1 (ppm)

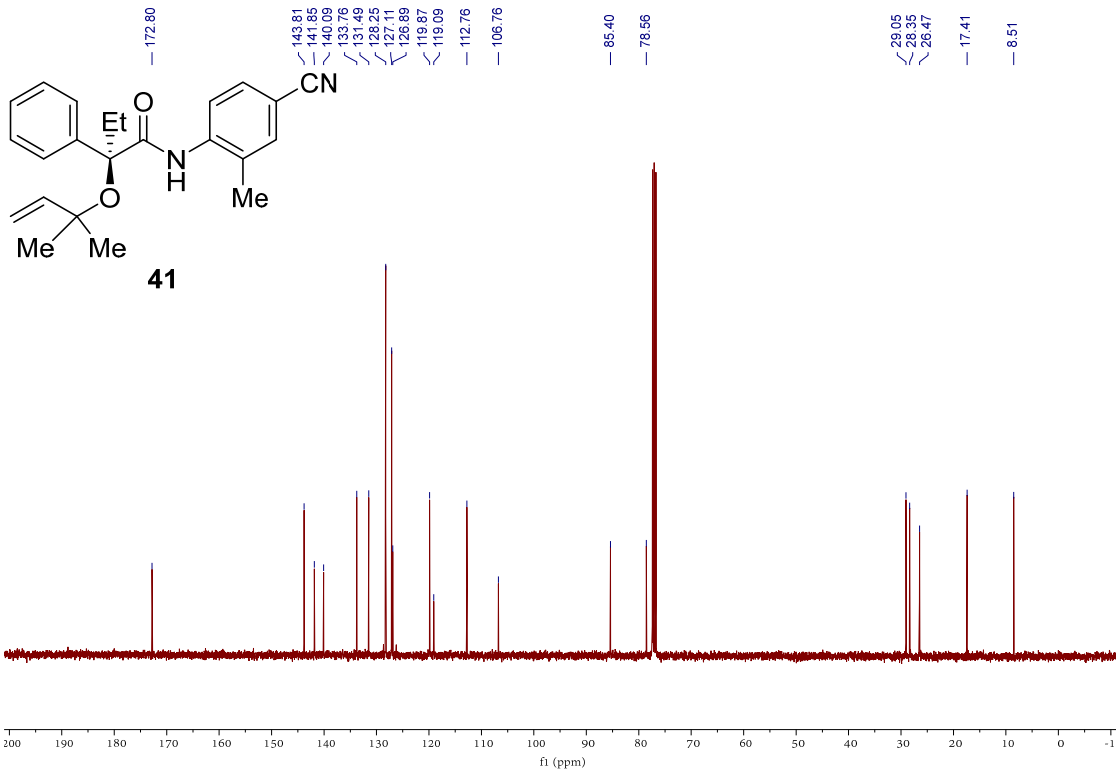

9.39
8.42
8.40
7.55
7.53
7.53
7.50
7.37
7.36
7.35
7.34
7.34
4.85
4.70
2.34
1.73
1.19
1.18
1.15
1.08
1.07
1.01
CN
iPr
O
N
H
Me
O
Me
Me
Me
1.00
1.01
4.16
3.23
2.05
1.00
3.02
1.07
1.00
3.05
3.03
2.91
3.04
2.99
f1 (ppm)

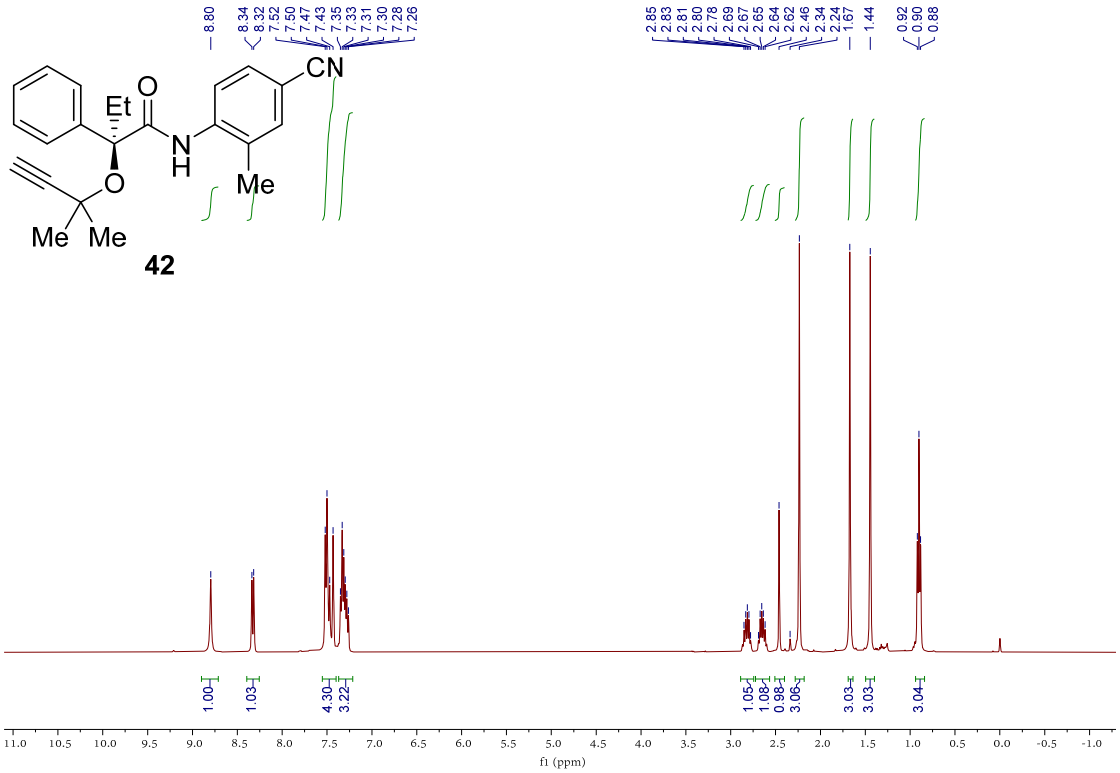
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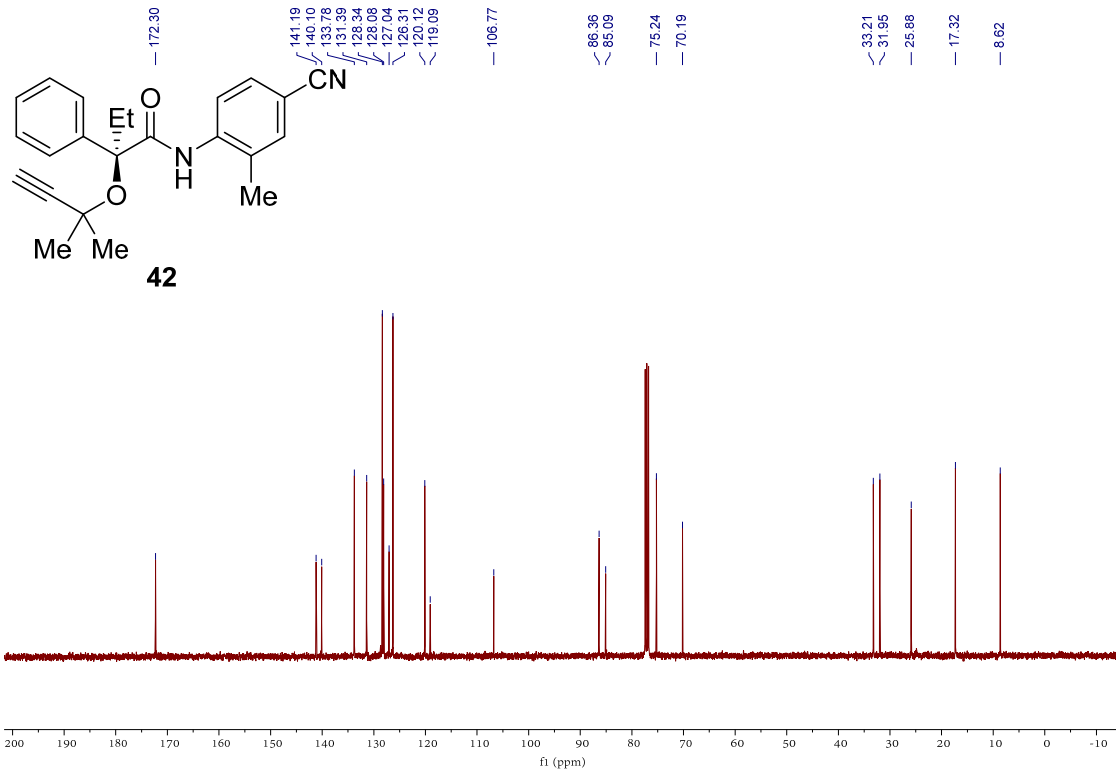

171.60
142.13
140.10
138.02
133.94
131.35
130.55
128.57
127.82
127.63
120.77
119.11
115.60
106.98
87.98
81.01
52.22
34.32
28.23
28.17
25.05
19.09
18.29
17.83
CN
iPr
O
N
H
Me
O
Me
Me
Me
f1 (ppm)

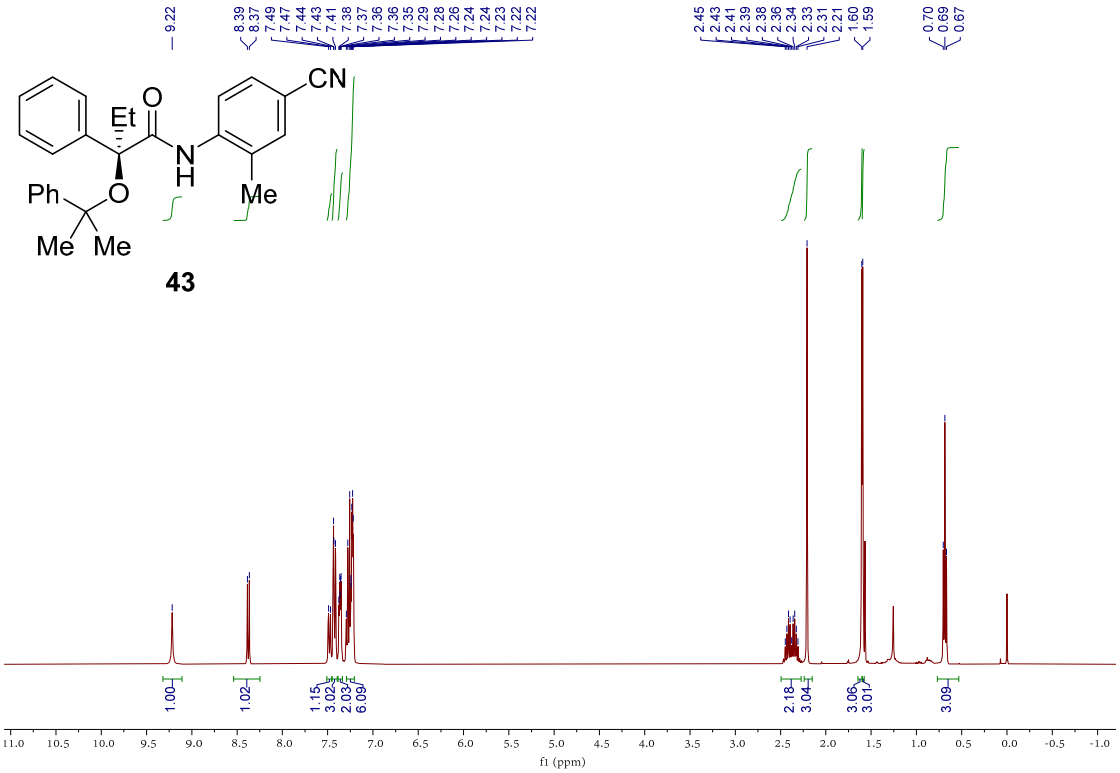
40


9.36
8.40
8.38
7.50
7.48
7.47
7.47
7.45
7.45
7.34
7.33
7.33
7.32
7.30
7.29
7.29
7.28
7.26
5.89
5.86
5.85
5.82
5.01
4.96
4.92
4.89
2.57
2.55
2.53
2.51
2.50
2.48
2.46
2.44
2.33
1.38
1.20
0.97
0.95
0.94
Et
O
N
H
CN
Me
O
Me
Me
41
1.00
1.07
4.20
3.00
1.00
1.02
1.01
2.11
3.19
3.03
3.10
2.97
f1 (ppm)

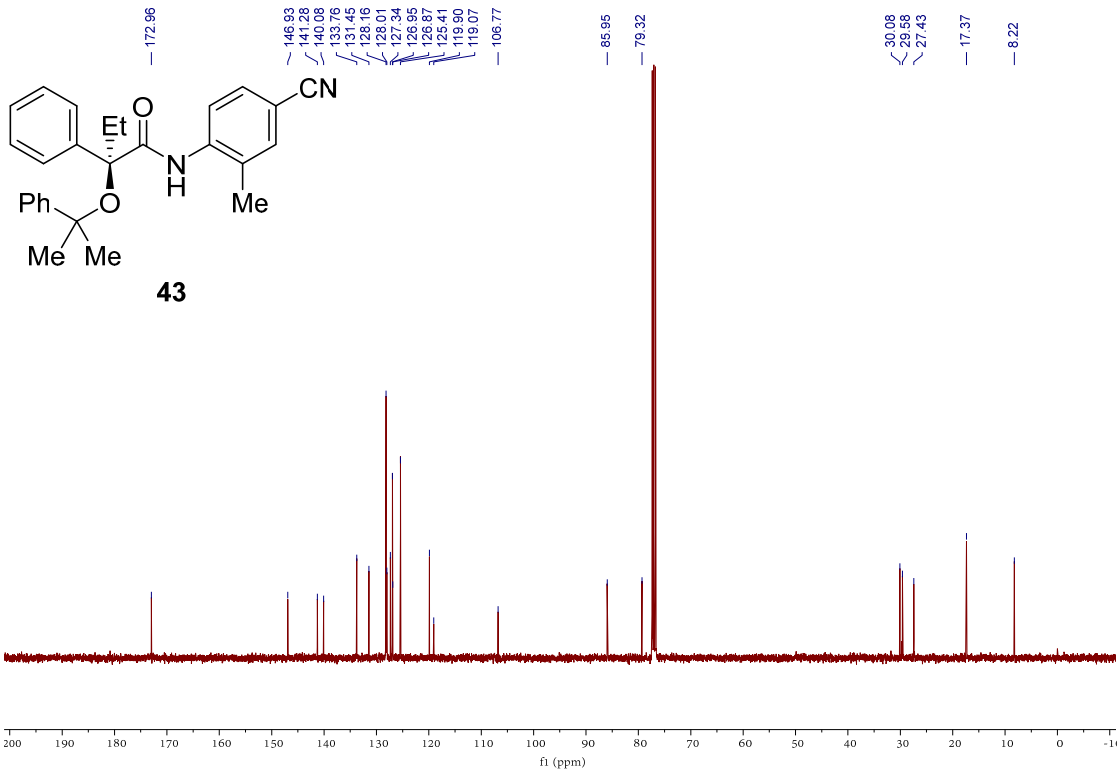

172.80
143.81
141.85
140.09
133.76
131.49
128.25
127.11
126.89
119.87
119.09
112.76
106.76
85.40
78.56
29.05
28.35
26.47
17.41
8.51
Et
O
N
H
CN
Me
O
Me
Me
41
f1 (ppm)


8.80
8.34
8.32
7.52
7.50
7.47
7.43
7.35
7.33
7.31
7.30
7.28
7.26
2.85
2.83
2.81
2.80
2.78
2.69
2.67
2.65
2.64
2.62
2.46
2.34
2.24
1.67
1.44
0.92
0.90
0.88
Et
O
N
H
CN
Me
O
Me Me
42
1.00
1.03
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3.22
1.05
1.08
0.98
3.06
3.03
3.03
3.04
f1 (ppm)

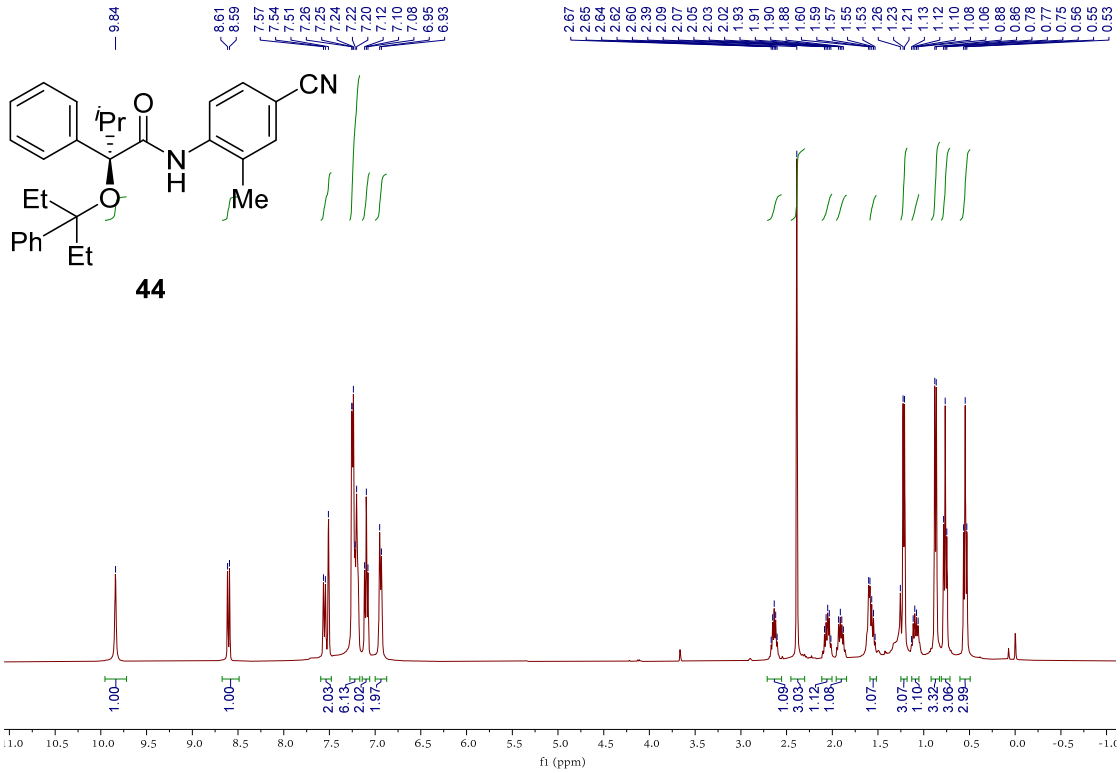

172.30
141.19
140.10
133.78
131.39
128.34
128.08
127.04
126.31
120.12
119.09
106.77
86.36
85.09
75.24
70.19
33.21
31.95
25.88
17.32
8.62
Et
O
N
H
CN
Me
O
Me Me
42
f1 (ppm)

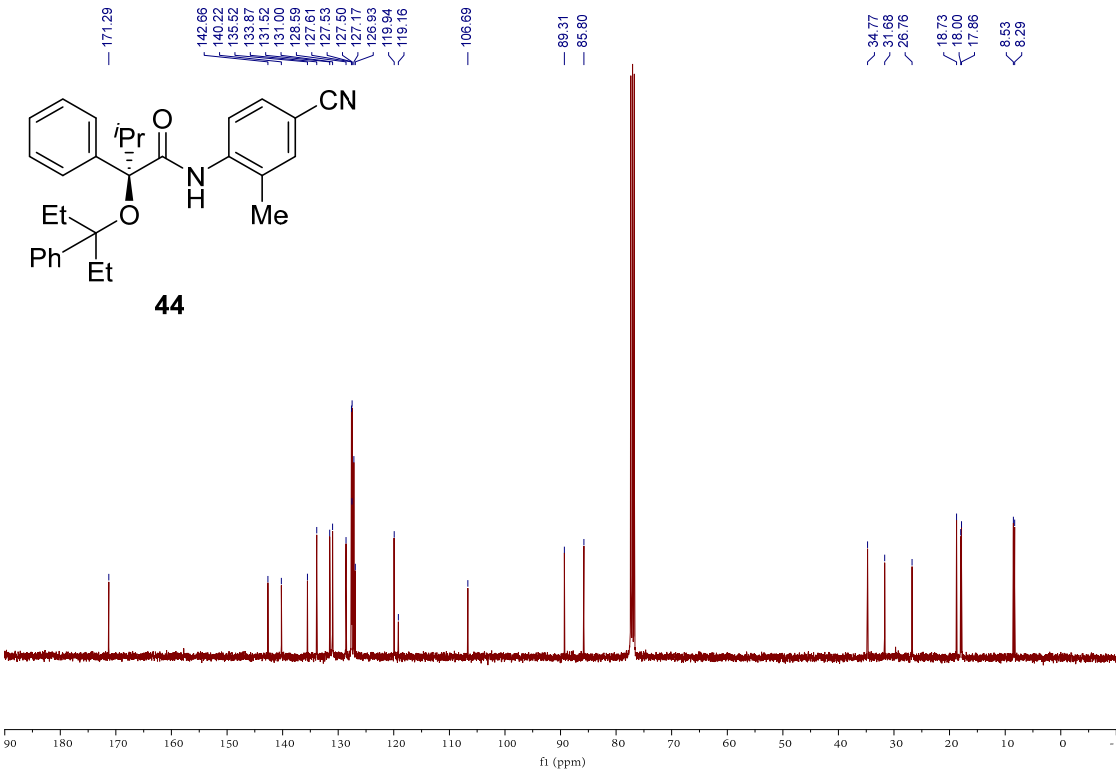

9.22
8.39
8.37
7.49
7.47
7.44
7.43
7.41
7.38
7.37
7.36
7.36
7.35
7.29
7.28
7.26
7.24
7.24
7.23
7.22
7.22
2.45
2.43
2.41
2.39
2.38
2.36
2.34
2.33
2.31
2.21
1.60
1.59
0.70
0.69
0.67
CN
Et
O
N
H
Ph
O
Me
Me
Me
1.00
1.02
1.15
3.02
2.03
6.09
2.18
3.04
3.06
3.01
3.09
f1 (ppm)

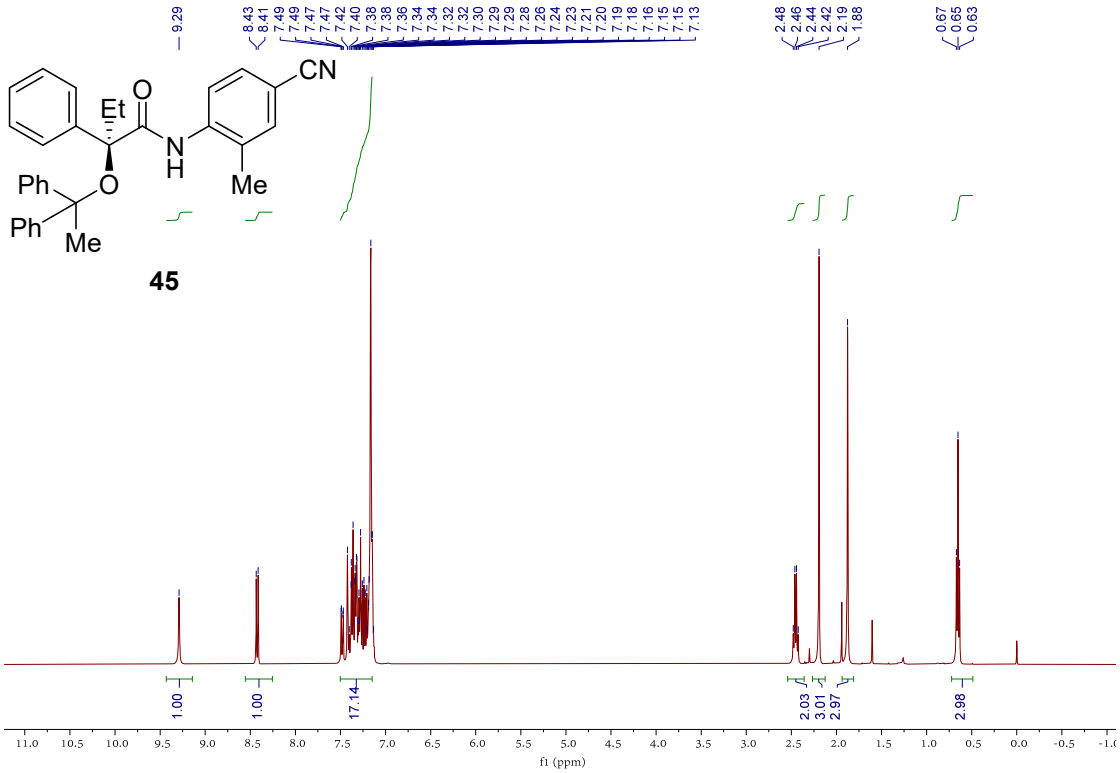
43

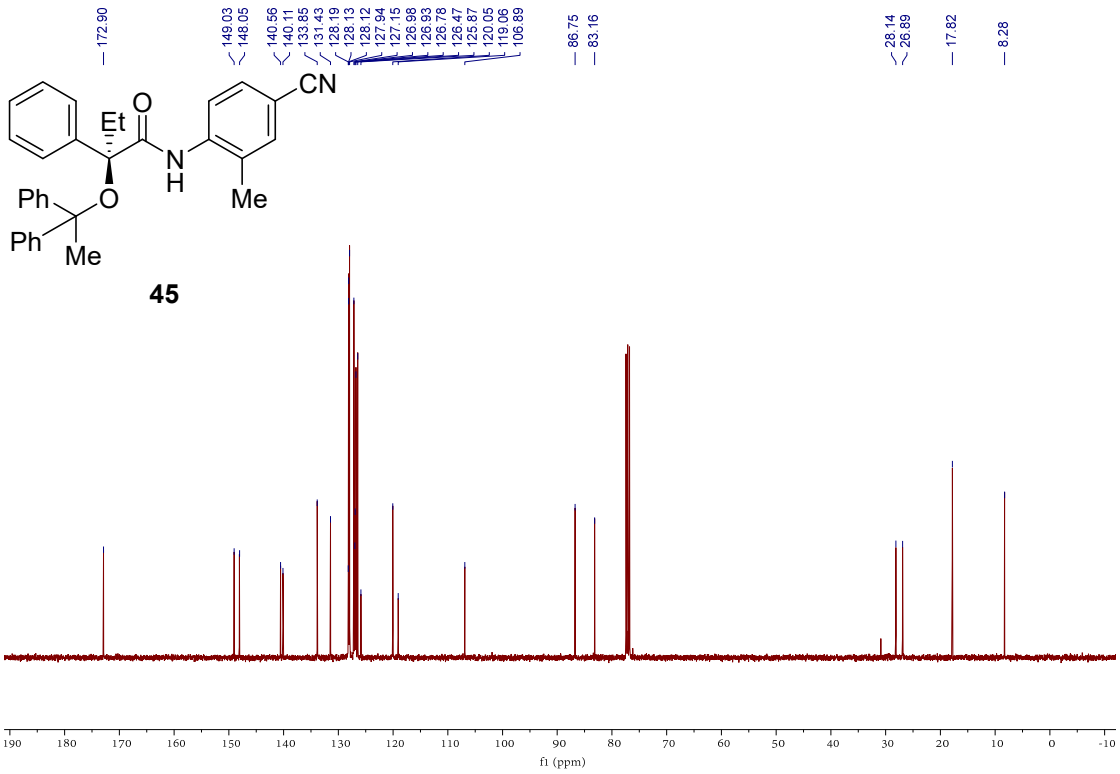

172.96
146.93
141.28
140.08
133.76
131.45
128.16
128.01
127.34
126.95
126.87
125.41
119.90
119.07
106.77
85.95
79.32
30.08
29.58
27.43
17.37
8.22
CN
Et
O
N
H
Ph
O
Me
Me
Me
f1 (ppm)

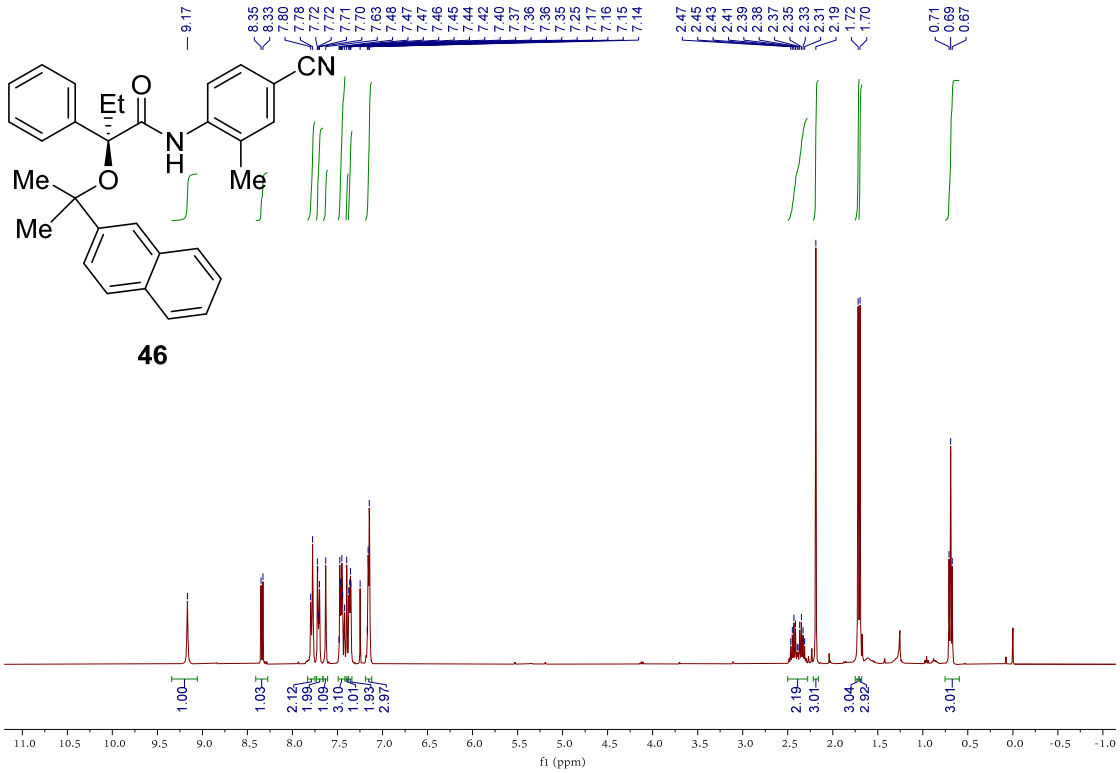
43


9.84
8.61
8.59
7.57
7.54
7.51
7.26
7.25
7.24
7.22
7.20
7.12
7.10
7.08
6.95
6.93
2.67
2.65
2.64
2.62
2.60
2.39
2.09
2.07
2.05
2.03
2.02
1.93
1.91
1.90
1.88
1.60
1.59
1.57
1.55
1.53
1.26
1.23
1.21
1.13
1.12
1.10
1.08
1.06
0.88
0.86
0.78
0.77
0.75
0.56
0.55
0.53
CN
O
iPr
N
H
Me
Et
O
Ph
Et
44
1.00
1.00
2.03
6.13
2.02
1.97
1.09
3.03
1.12
1.08
1.07
3.07
1.10
3.32
3.06
2.99
f1 (ppm)

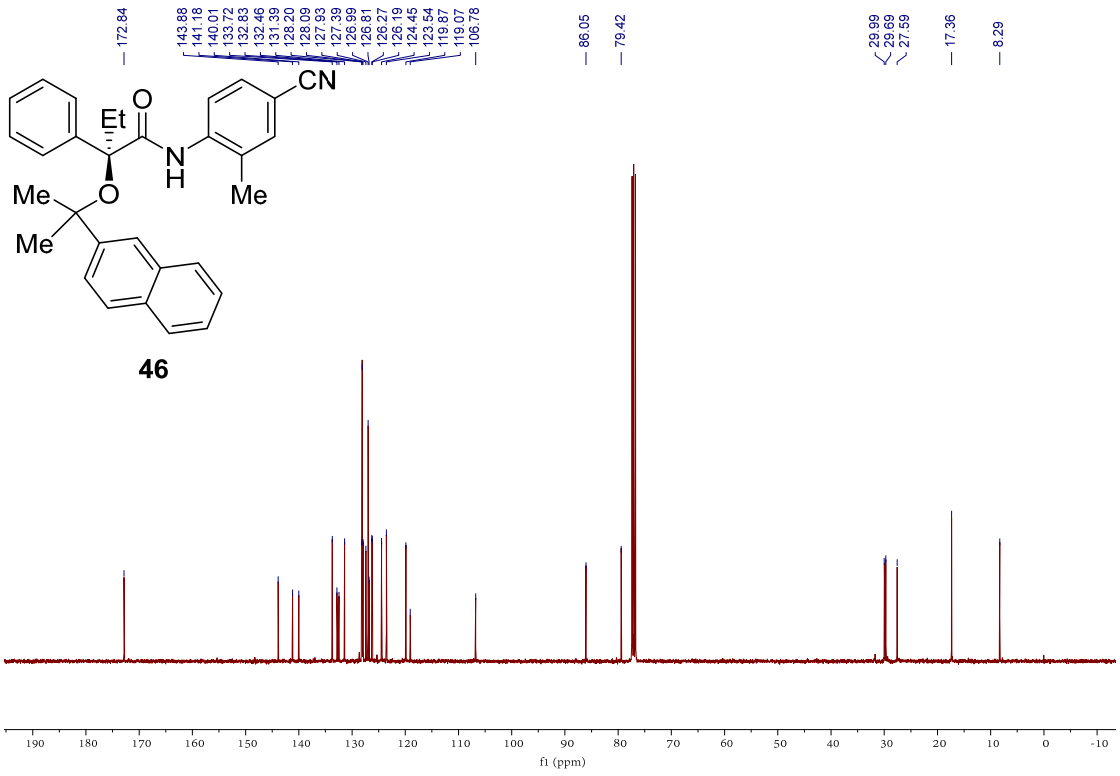

171.29
142.66
140.22
135.52
133.87
131.52
131.00
128.59
127.61
127.53
127.50
127.17
126.93
119.94
119.16
106.69
89.31
85.80
34.77
31.68
26.76
18.73
18.00
17.86
8.53
8.29
CN
O
iPr
N
H
Me
Et
O
Ph
Et
44
f1 (ppm)


9.29
8.43
8.41
7.49
7.49
7.47
7.47
7.42
7.40
7.38
7.38
7.36
7.34
7.34
7.32
7.32
7.30
7.29
7.29
7.28
7.26
7.24
7.23
7.21
7.20
7.19
7.18
7.16
7.15
7.15
7.13
2.48
2.46
2.44
2.42
2.19
1.88
0.67
0.65
0.63
Et
O
N
H
CN
Me
Ph
O
Ph
Me
45
1.00
1.00
17.14
2.03
3.01
2.97
2.98
f1 (ppm)

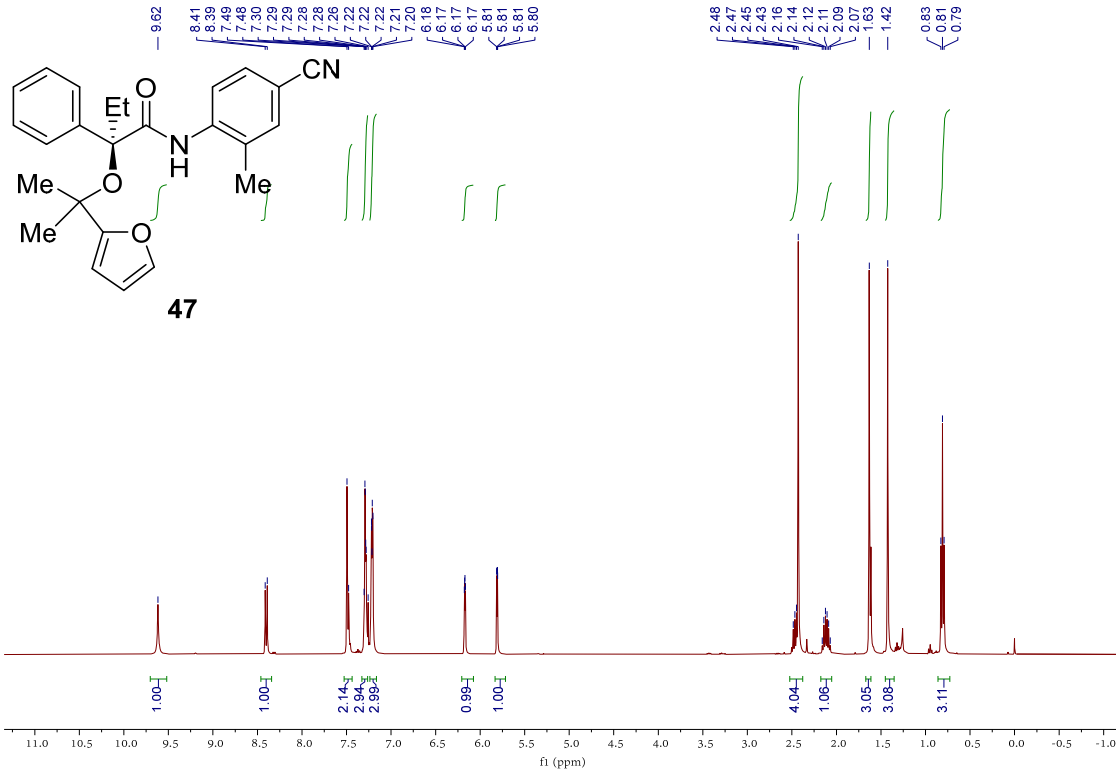

172.90
149.03
148.05
140.56
140.11
133.85
131.43
128.19
128.13
128.12
127.94
127.15
126.98
126.93
126.78
126.47
125.87
120.05
119.06
106.89
86.75
83.16
28.14
26.89
17.82
8.28
Et
O
N
H
CN
Me
Ph
O
Ph
Me
45
f1 (ppm)

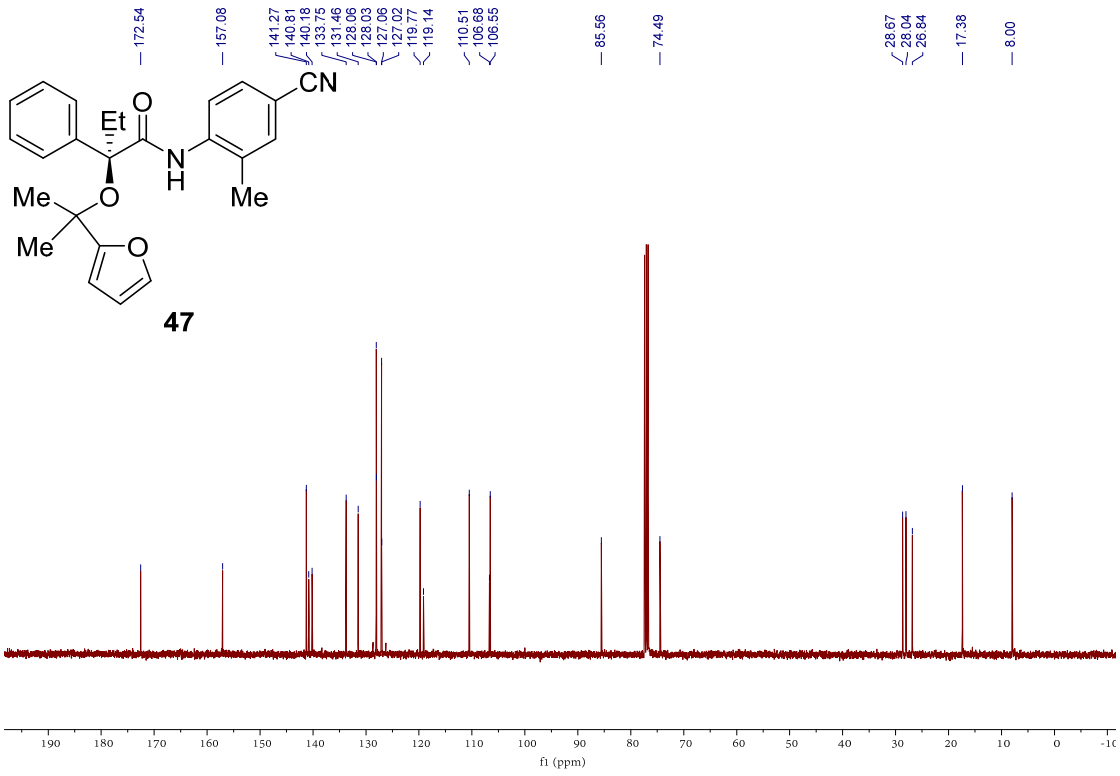

9.17
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7.80
7.78
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7.72
7.71
7.70
7.63
7.48
7.47
7.47
7.46
7.45
7.44
7.42
7.40
7.37
7.36
7.36
7.35
7.25
7.17
7.16
7.15
7.14
2.47
2.45
2.43
2.41
2.39
2.38
2.37
2.35
2.33
2.31
2.19
1.72
1.70
0.71
0.69
0.67
CN
Et
O
N
H
Me
O
Me
Me
1.00
1.03
2.12
1.99
1.09
3.10
1.01
1.93
2.97
2.19
3.01
3.04
2.92
3.01
f1 (ppm)

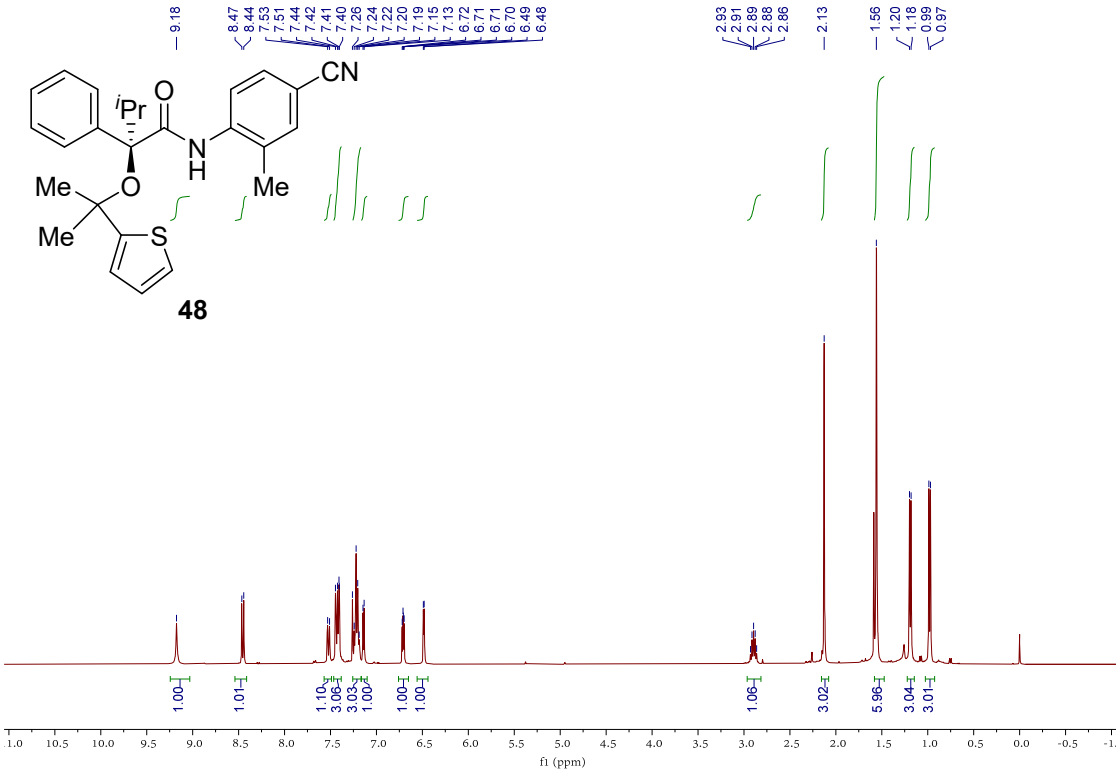
46

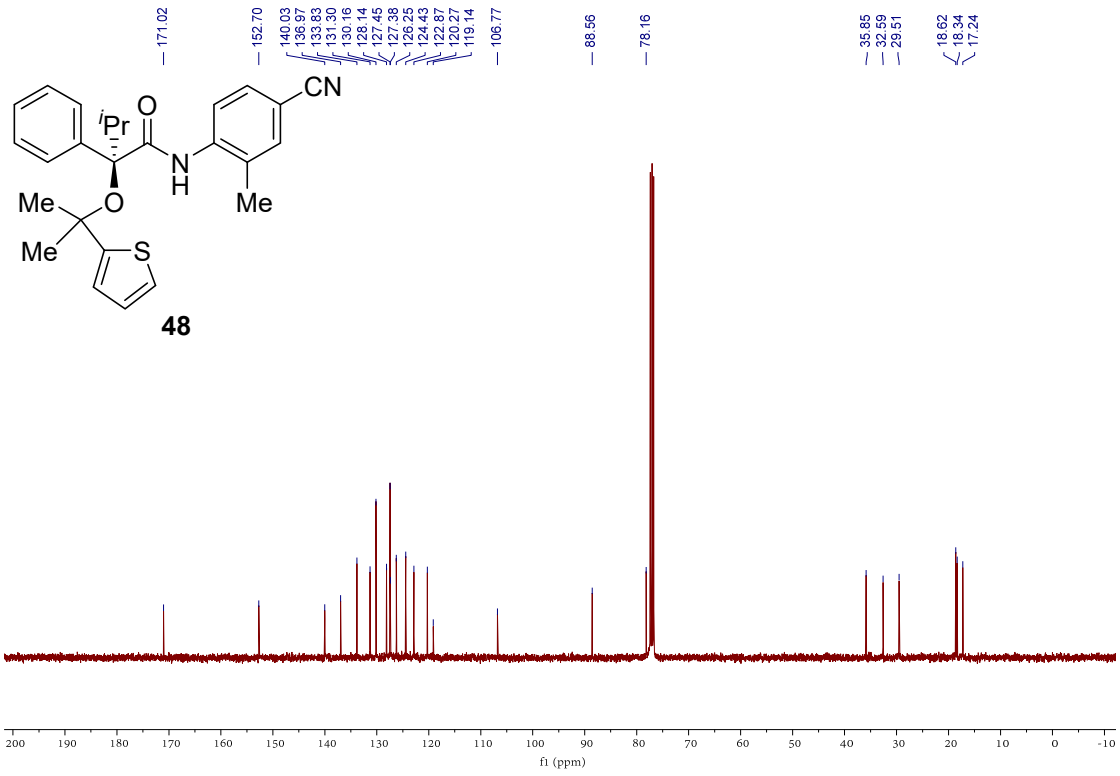

172.84
143.88
141.18
140.01
133.72
132.83
132.46
131.39
128.20
128.09
127.93
127.39
126.99
126.81
126.27
126.19
124.45
123.54
119.87
119.07
106.78
86.05
79.42
29.99
29.69
27.59
17.36
8.29
CN
Et
O
N
H
Me
O
Me
Me
f1 (ppm)

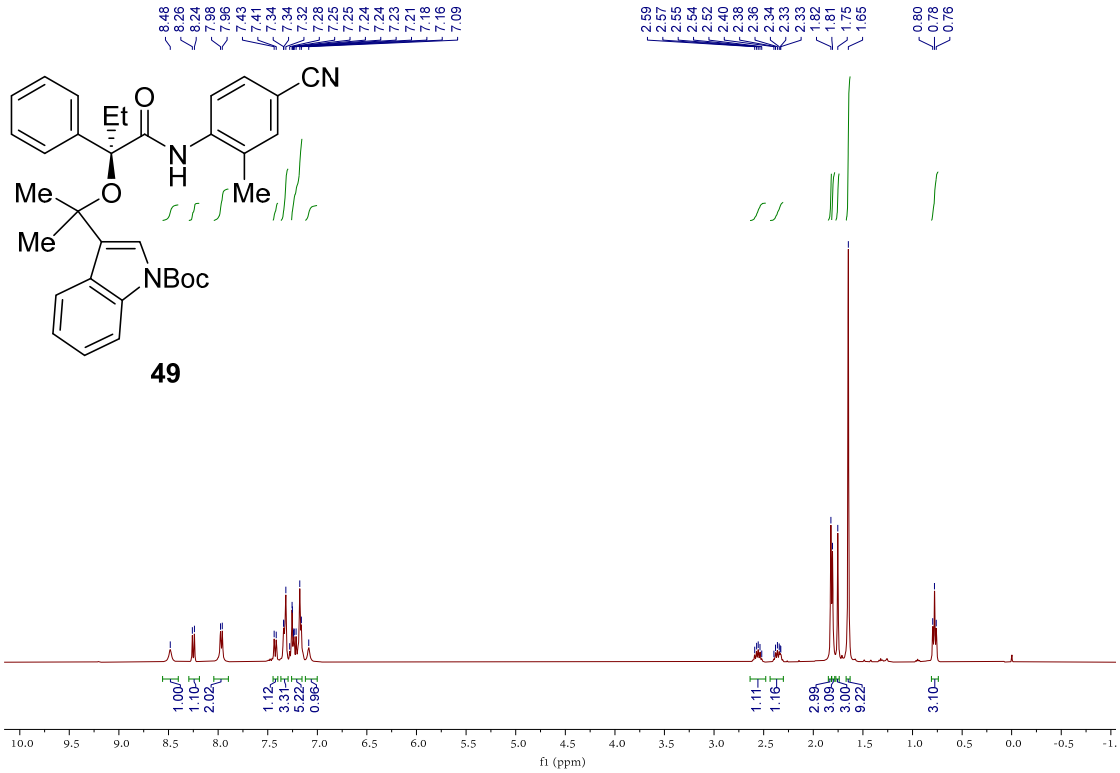
46

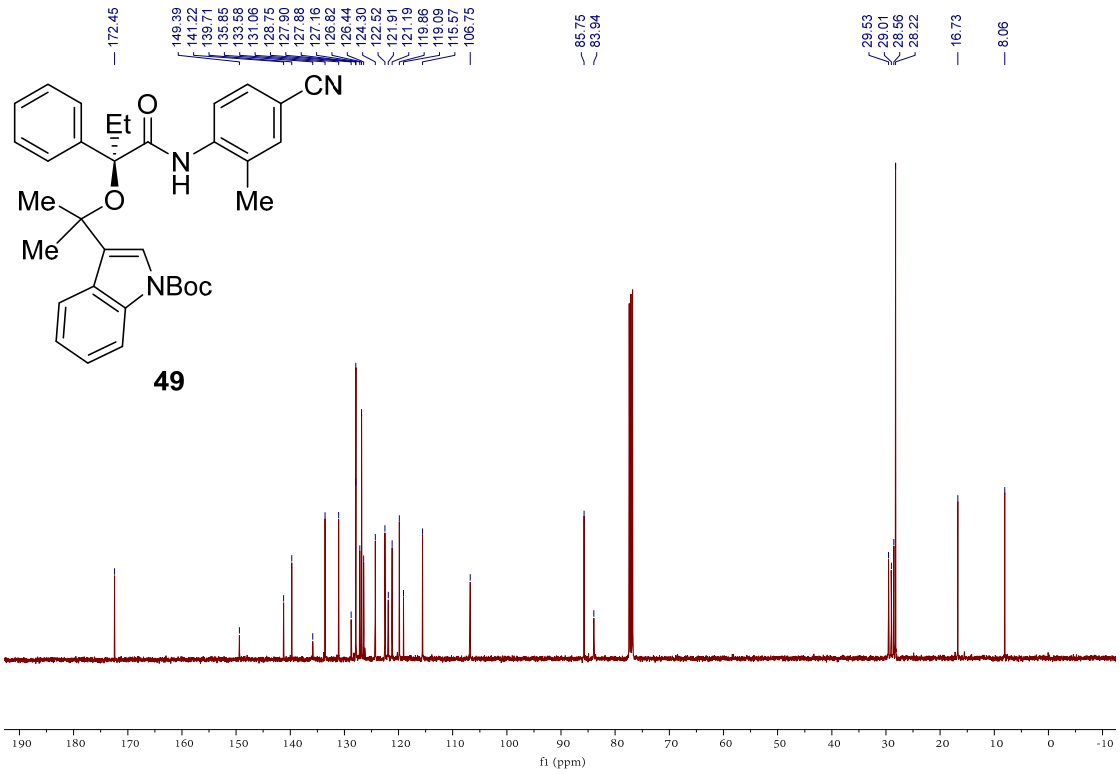

9.62
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7.49
7.48
7.30
7.29
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7.28
7.28
7.26
7.22
7.22
7.22
7.21
7.20
6.18
6.17
6.17
6.17
5.81
5.81
5.81
5.80
2.48
2.47
2.45
2.43
2.16
2.14
2.12
2.11
2.09
2.07
1.63
1.42
0.83
0.81
0.79
Et
O
N
H
CN
Me
O
Me
Me
O
47
1.00
1.00
2.14
2.94
2.99
0.99
1.00
4.04
1.06
3.05
3.08
3.11
f1 (ppm)

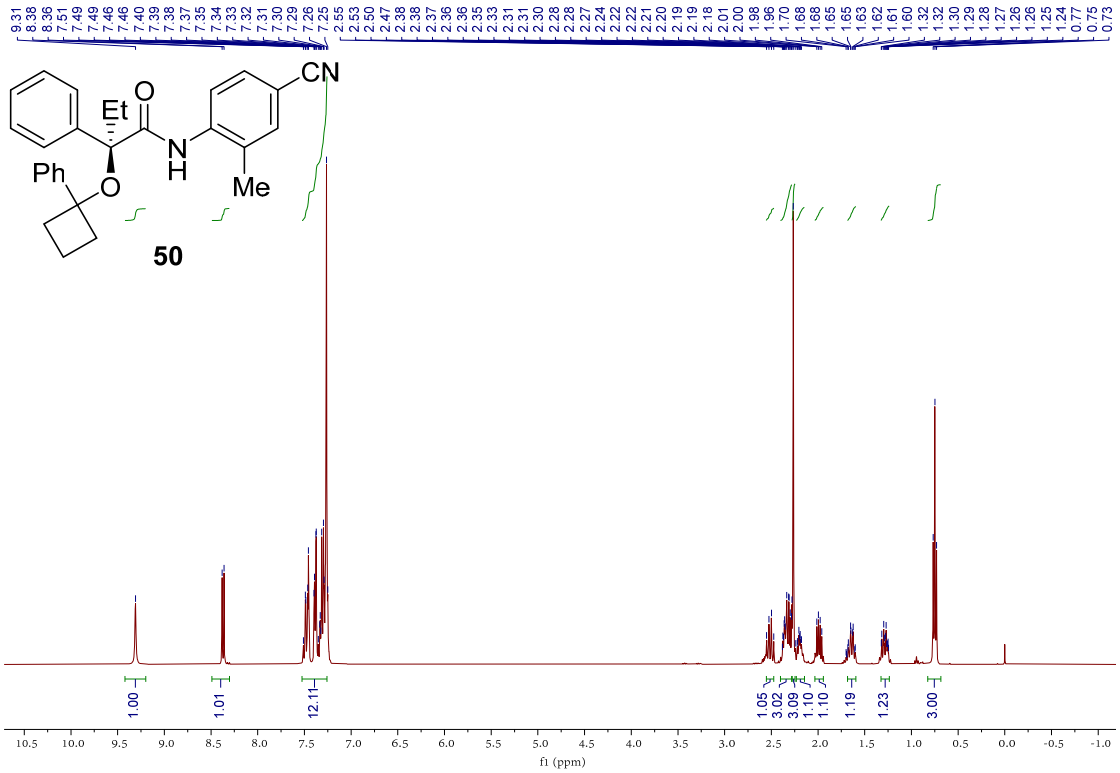

172.54
157.08
141.27
140.81
140.18
133.75
131.46
128.06
128.03
127.06
127.02
119.77
119.14
110.51
106.68
106.55
85.56
74.49
28.67
28.04
26.84
17.38
8.00
Et
O
N
H
CN
Me
O
Me
Me
O
47
f1 (ppm)

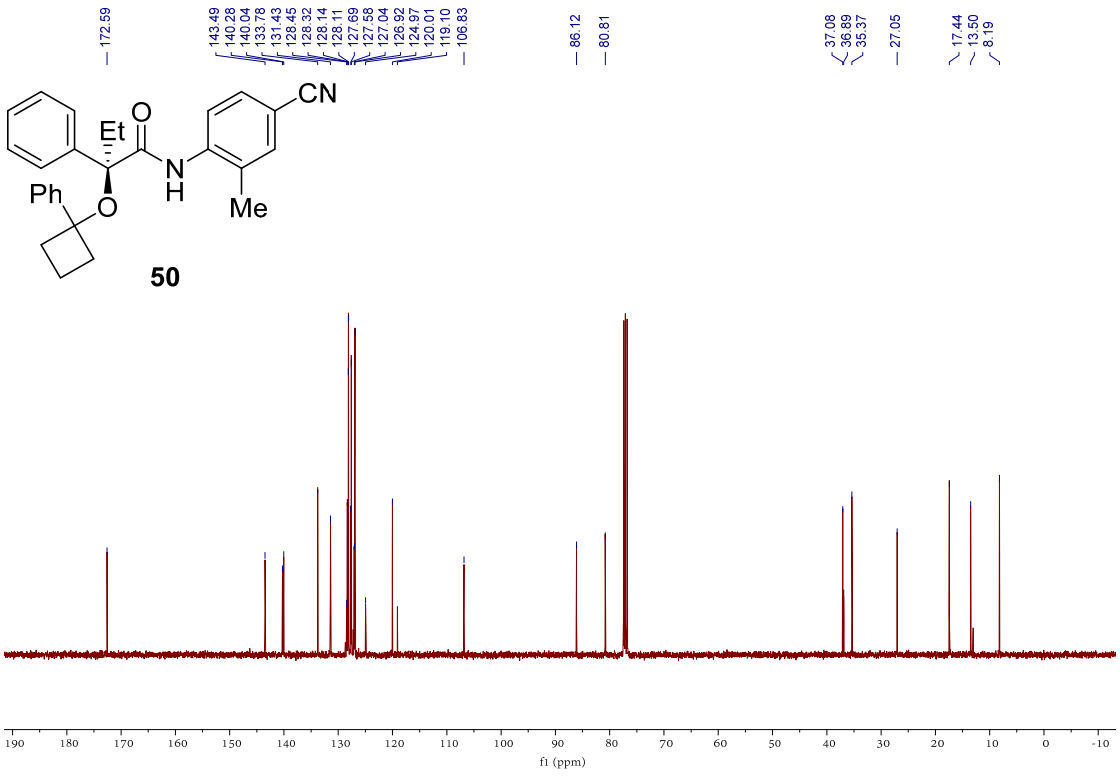

9.18
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8.44
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7.51
7.44
7.42
7.41
7.40
7.26
7.24
7.22
7.20
7.19
7.15
7.13
6.72
6.71
6.71
6.70
6.49
6.48
2.93
2.91
2.89
2.88
2.86
2.13
1.56
1.20
1.18
0.99
0.97
CN
iPr
O
N
H
Me
O
Me
Me
S
48
1.00
1.01
1.10
3.06
3.03
1.00
1.00
1.00
1.06
3.02
5.96
3.04
3.01
f1 (ppm)

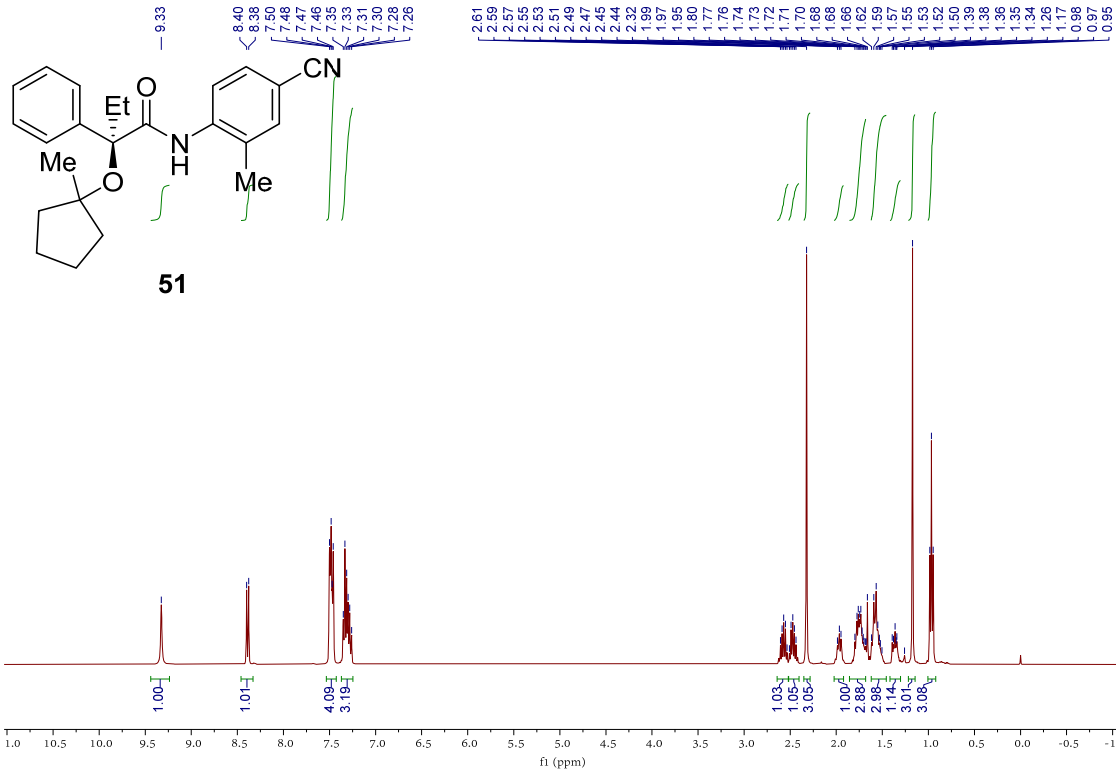

171.02
152.70
140.03
136.97
133.83
131.30
130.16
128.14
127.45
127.38
126.25
124.43
122.87
120.27
119.14
106.77
88.56
78.16
35.85
32.59
29.51
18.62
18.34
17.24
CN
iPr
O
N
H
Me
O
Me
Me
S
48
f1 (ppm)

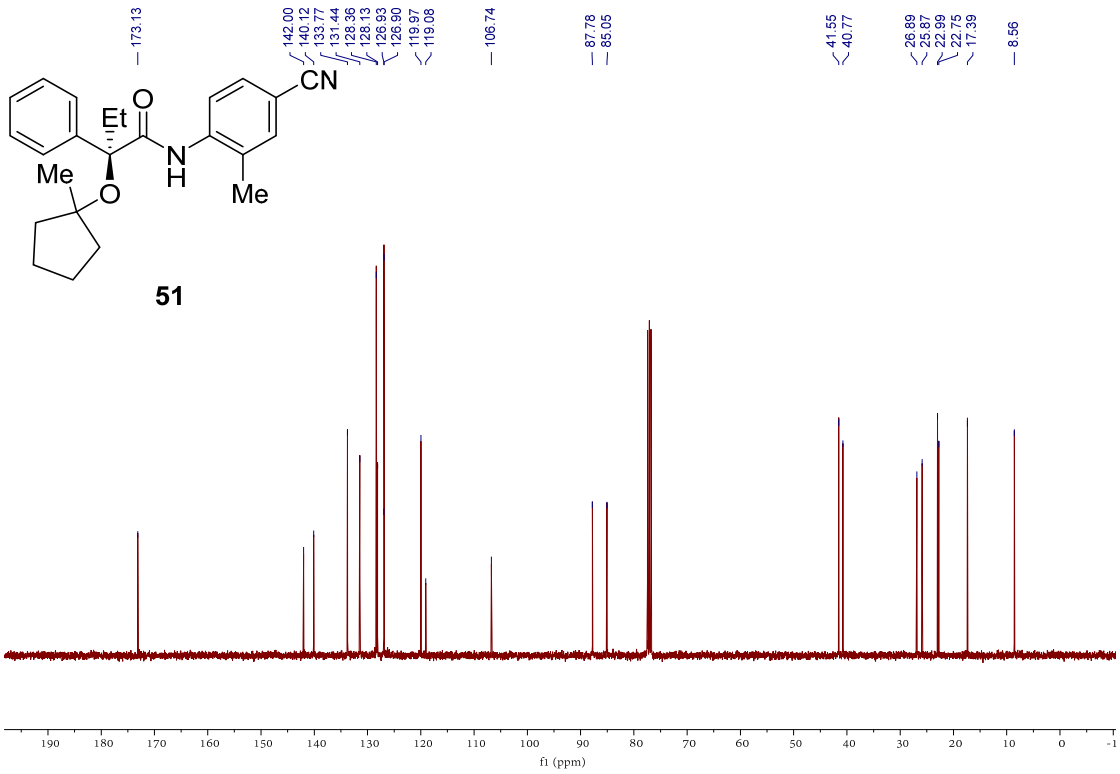

8.48
8.26
8.24
7.98
7.96
7.43
7.41
7.34
7.34
7.32
7.28
7.25
7.25
7.24
7.24
7.23
7.21
7.18
7.16
7.09
2.59
2.57
2.55
2.54
2.52
2.40
2.38
2.36
2.34
2.33
1.82
1.81
1.75
1.65
0.80
0.78
0.76
Et
O
N
H
CN
Me
O
Me
Me
NBoc
49
1.00
1.10
2.02
1.12
3.31
5.22
0.96
1.11
1.16
2.99
3.09
3.00
9.22
3.10
f1 (ppm)

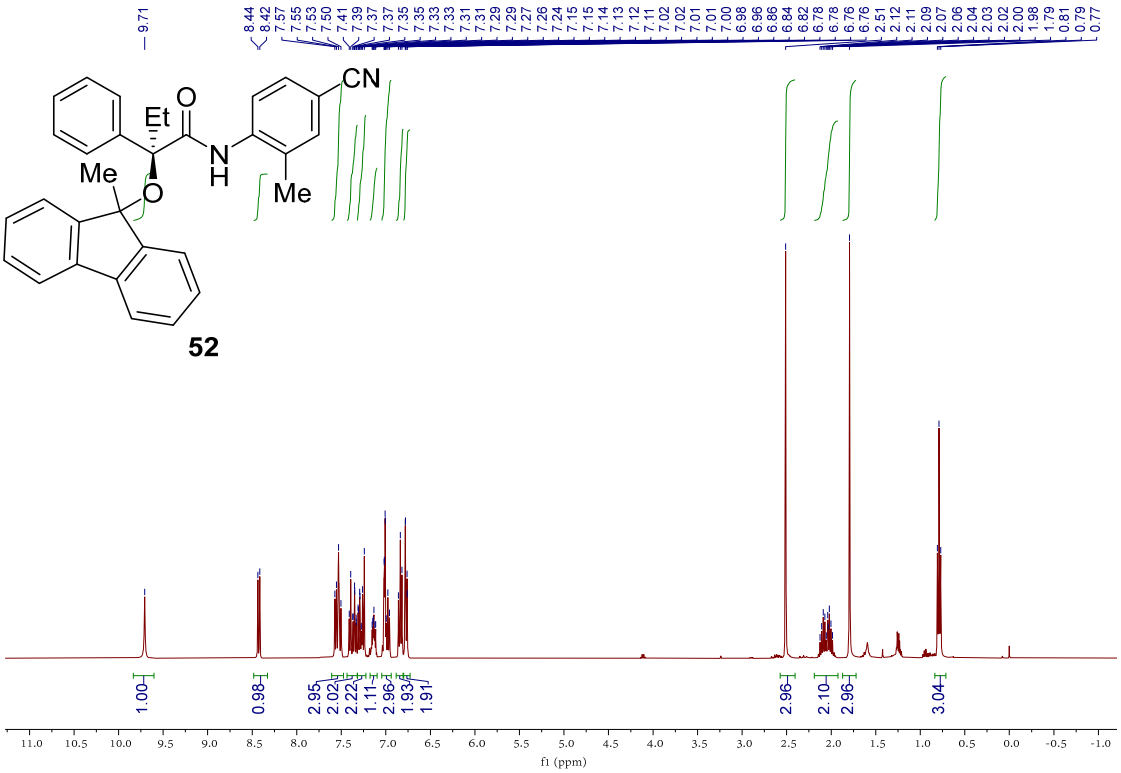

172.45
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139.71
135.85
133.58
131.06
128.75
127.90
127.88
127.16
126.82
126.44
124.30
122.52
121.91
121.19
119.86
119.09
115.57
106.75
85.75
83.94
29.53
29.01
28.56
28.22
16.73
8.06
Et
O
N
H
CN
Me
O
Me
Me
NBoc
49
f1 (ppm)

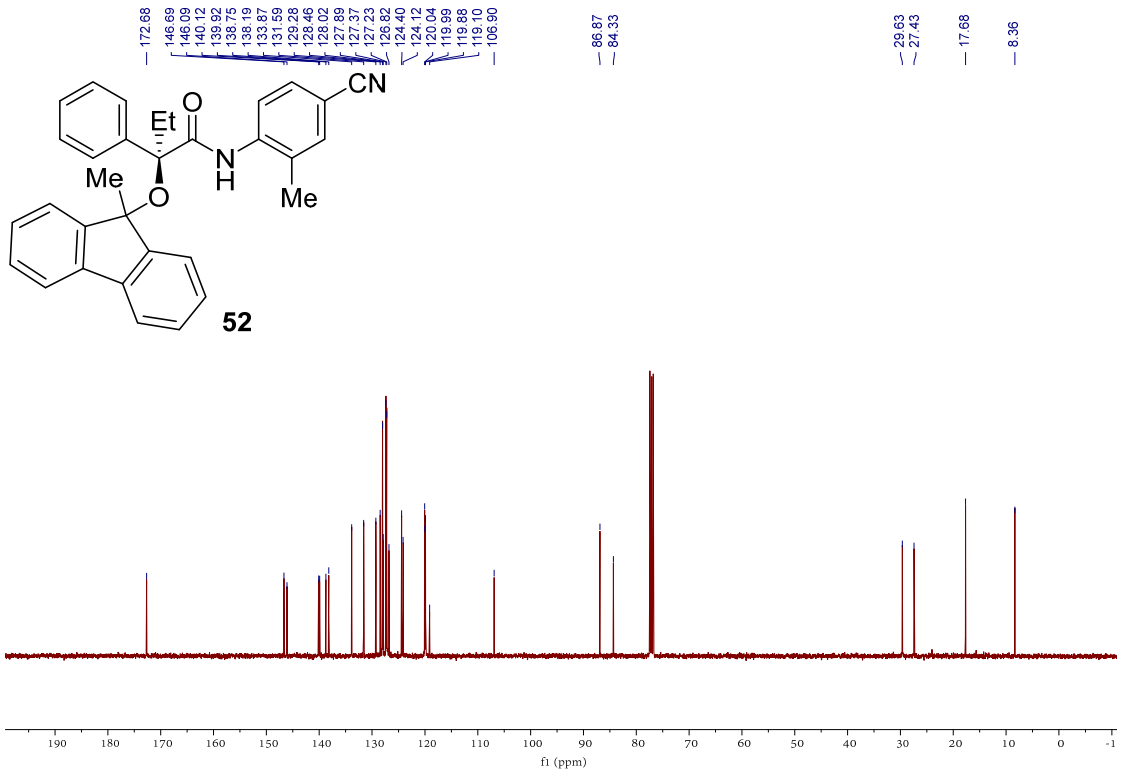

9.31 8.38 8.36 7.51 7.49 7.49 7.46 7.46 7.40 7.39 7.38 7.37 7.35 7.34 7.33 7.32 7.31 7.30 7.29 7.26 7.25 2.55 2.53 2.50 2.47 2.38 2.38 2.37 2.36 2.36 2.35 2.33 2.31 2.31 2.30 2.28 2.28 2.27 2.24 2.22 2.22 2.21 2.20 2.19 2.19 2.18 2.01 2.00 1.98 1.96 1.70 1.68 1.68 1.65 1.65 1.63 1.62 1.61 1.60 1.32 1.32 1.30 1.29 1.28 1.27 1.26 1.26 1.25 1.24 0.77 0.75 0.73
Et
O
N
H
Ph
O
Me
CN
50
1.00
1.01
12.11
1.05
3.02
3.09
1.10
1.10
1.19
1.23
3.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

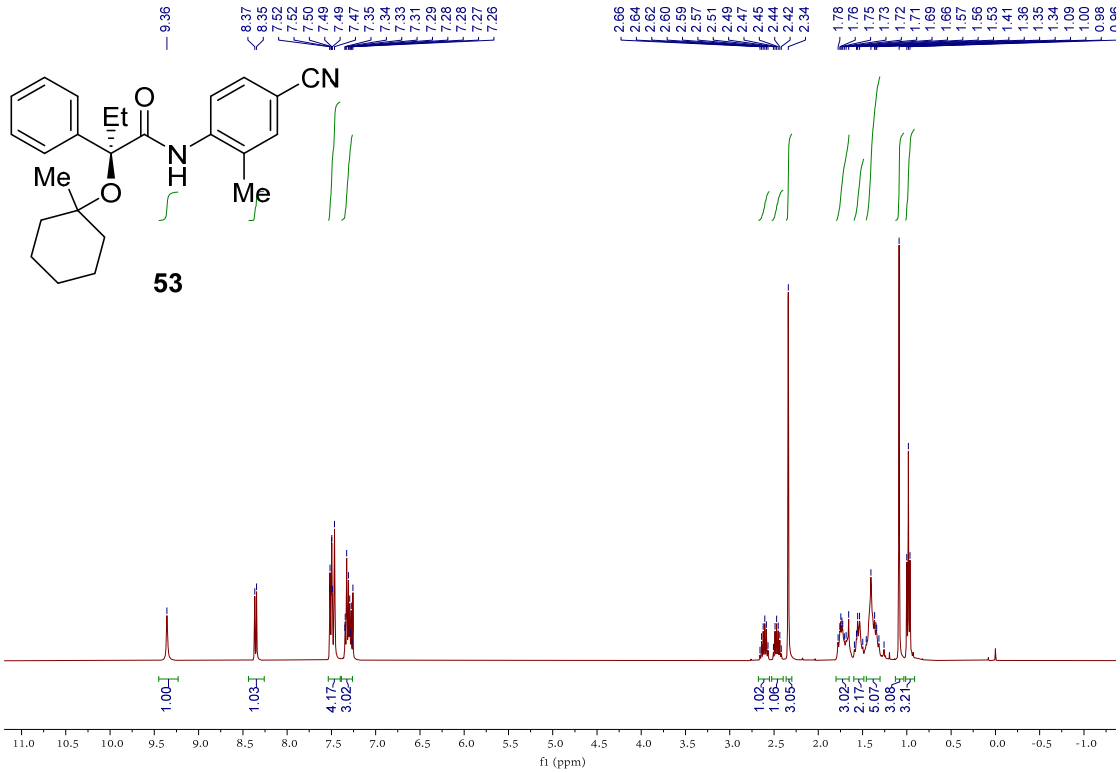

172.59
143.49 140.28 140.04 133.78 131.43 128.45 128.32 128.14 128.11 127.69 127.58 127.04 126.92 124.97 120.01 119.10 106.83
86.12 80.81
37.08 36.89 35.37 27.05 17.44 13.50 8.19
Et
O
N
H
Ph
O
Me
CN
50
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

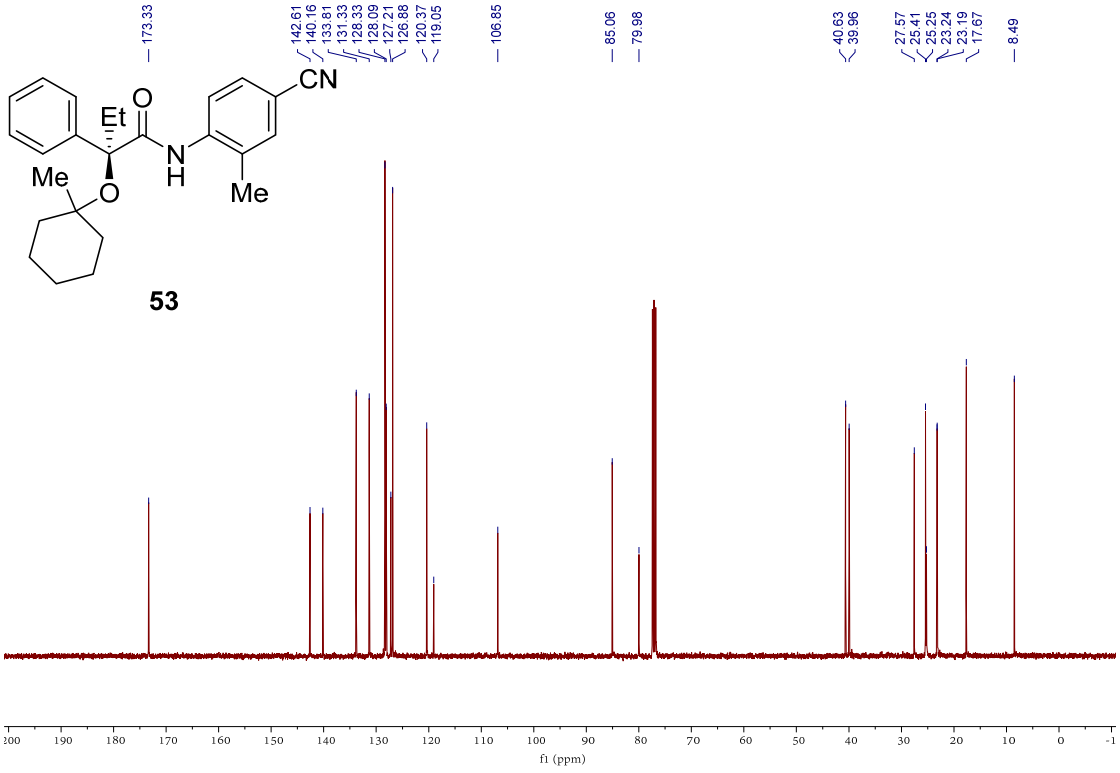

9.33
8.40
8.38
7.50
7.48
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7.35
7.33
7.31
7.30
7.28
7.26
2.61
2.59
2.57
2.55
2.53
2.51
2.49
2.47
2.45
2.44
2.32
1.99
1.97
1.95
1.80
1.77
1.76
1.74
1.73
1.72
1.71
1.70
1.68
1.66
1.62
1.59
1.57
1.55
1.53
1.52
1.50
1.39
1.38
1.36
1.35
1.34
1.26
1.17
0.98
0.97
0.95
CN
Et
O
N
H
Me
O
Me
51
1.00
1.01
4.09
3.19
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1.05
3.05
1.00
2.88
2.98
1.14
3.01
3.08
f1 (ppm)

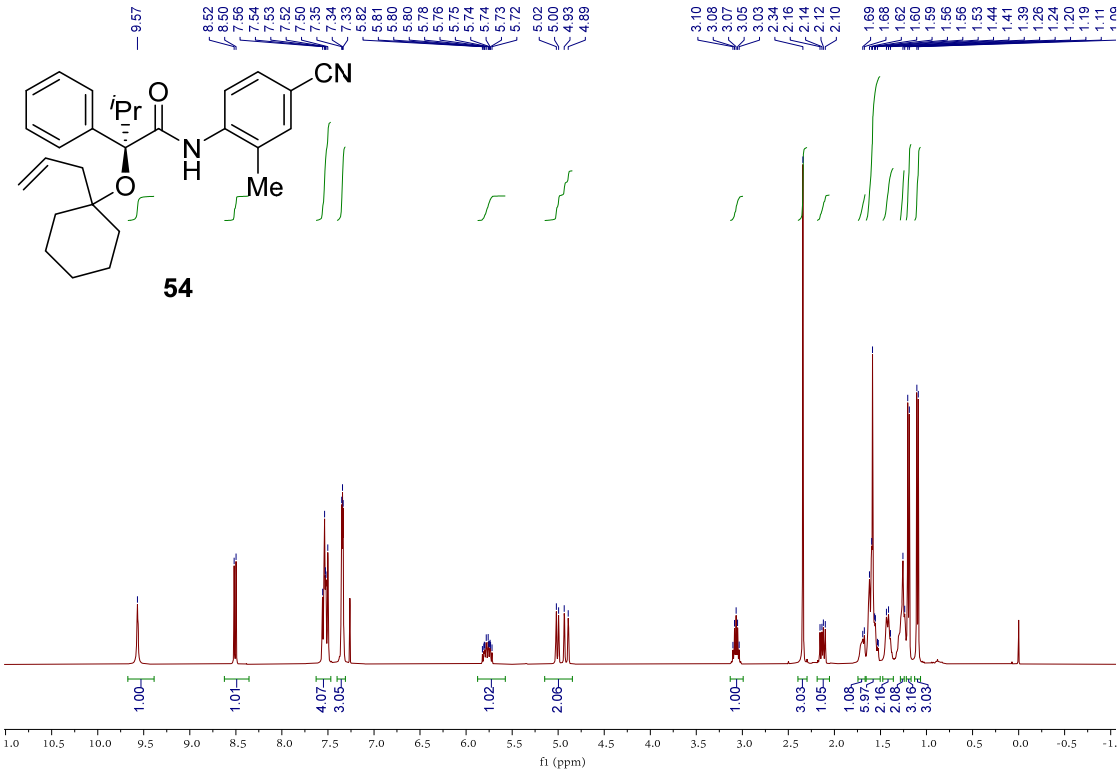

173.13
142.00
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133.77
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128.36
128.13
126.93
126.90
119.97
119.08
106.74
87.78
85.05
41.55
40.77
26.89
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22.75
17.39
8.56
CN
Et
O
N
H
Me
O
Me
51
f1 (ppm)

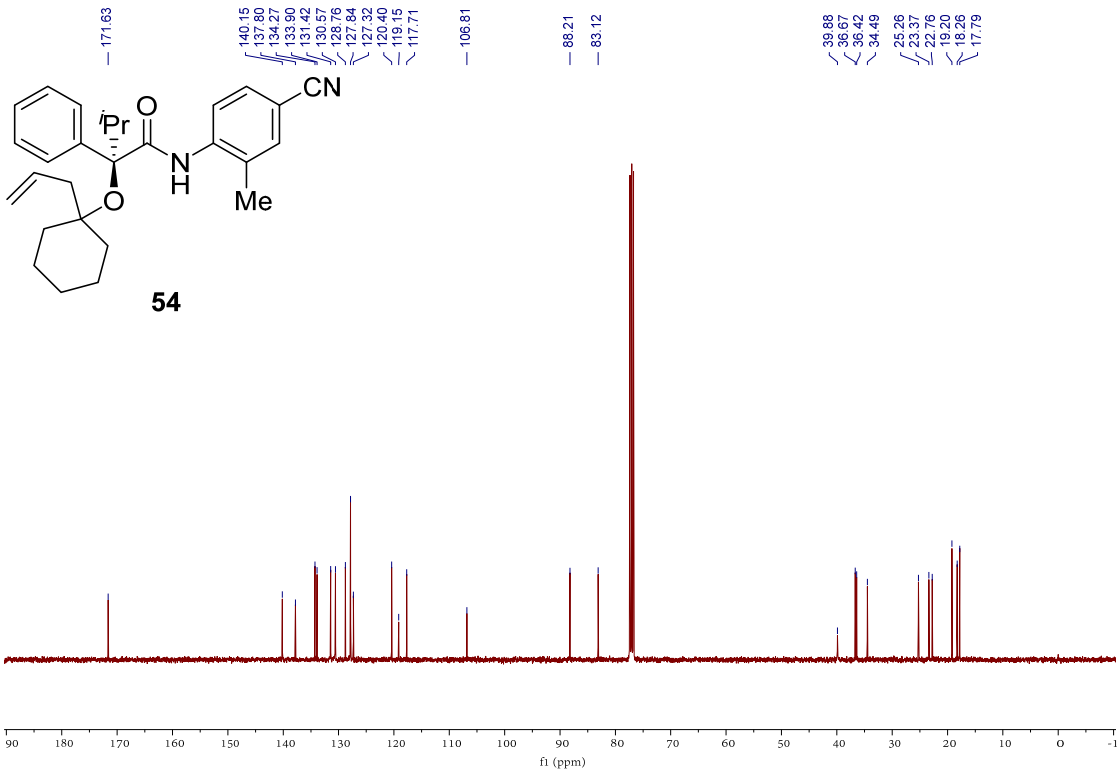

9.71
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7.53
7.50
7.41
7.39
7.37
7.37
7.35
7.35
7.33
7.33
7.31
7.31
7.29
7.29
7.27
7.26
7.24
7.15
7.15
7.14
7.13
7.12
7.11
7.02
7.02
7.01
7.01
7.00
6.98
6.96
6.86
6.84
6.82
6.78
6.76
6.76
2.51
2.12
2.11
2.09
2.07
2.06
2.04
2.03
2.02
2.00
1.98
1.79
0.81
0.79
0.77
CN
Et
O
N
H
Me
O
Me
52
1.00
0.98
2.95
2.02
2.22
1.11
2.96
1.93
1.91
2.96
2.10
2.96
3.04
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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2.5
2.0
1.5
1.0
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-1.0
f1 (ppm)

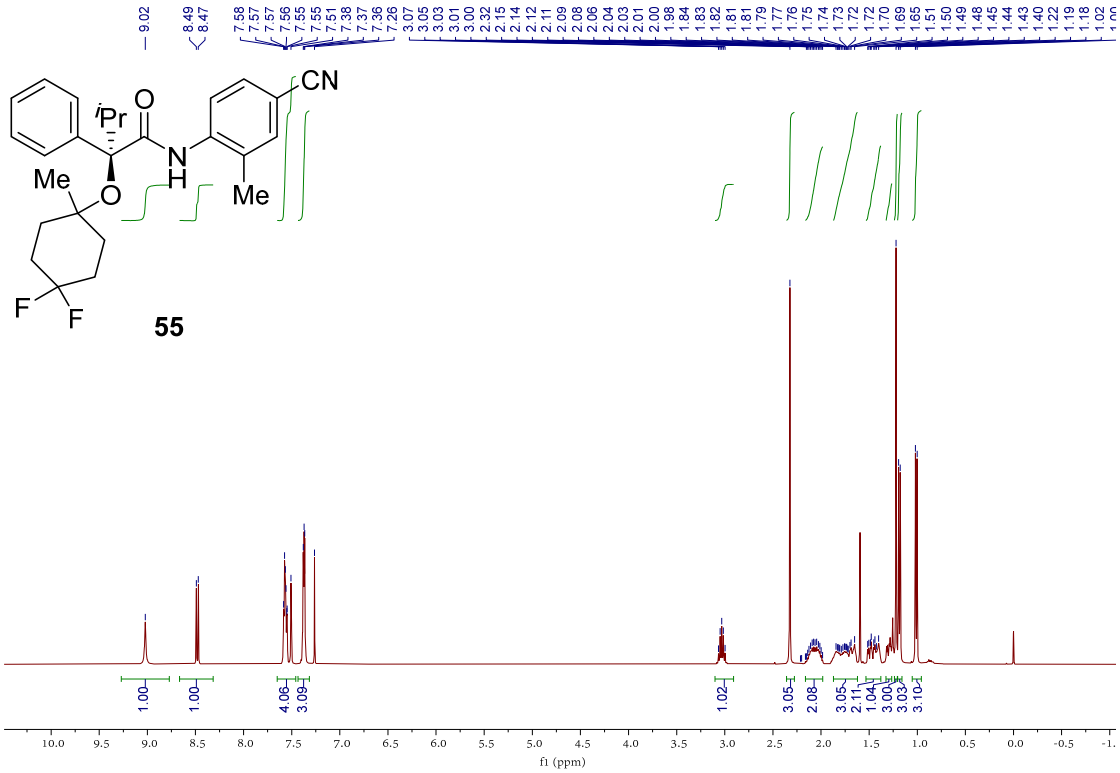

172.68
146.69
146.09
140.12
139.92
138.75
138.19
133.87
131.59
129.28
128.46
128.02
127.89
127.37
127.23
126.82
124.40
124.12
120.04
119.99
119.88
119.10
106.90
86.87
84.33
29.63
27.43
17.68
8.36
CN
Et
O
N
H
Me
O
Me
52
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-1
f1 (ppm)

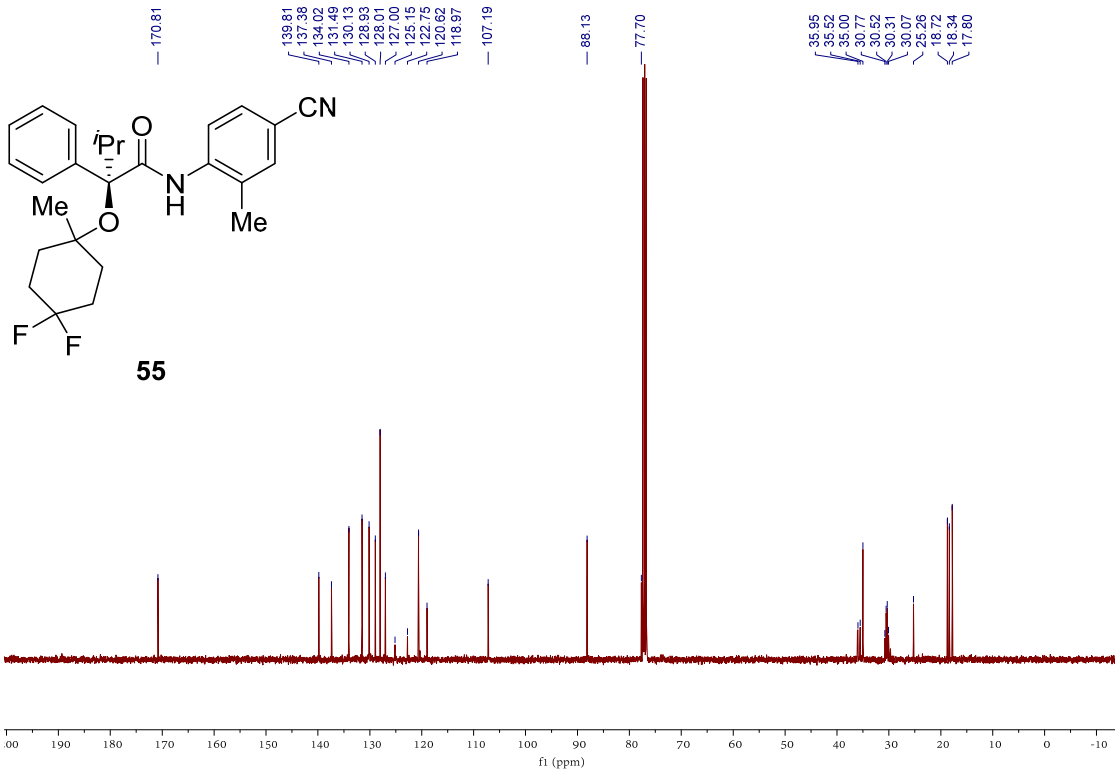

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8.37
8.35
7.52
7.52
7.50
7.49
7.49
7.47
7.35
7.34
7.33
7.31
7.29
7.28
7.28
7.27
7.26
2.66
2.64
2.62
2.60
2.59
2.57
2.51
2.49
2.47
2.45
2.44
2.42
2.34
1.78
1.76
1.75
1.73
1.72
1.71
1.69
1.66
1.57
1.56
1.53
1.41
1.36
1.35
1.34
1.09
1.00
0.98
Et
O
N
H
CN
Me
O
Me
53
1.00
1.03
4.17
3.02
1.02
1.06
3.05
3.02
2.17
5.07
3.08
3.21
f1 (ppm)

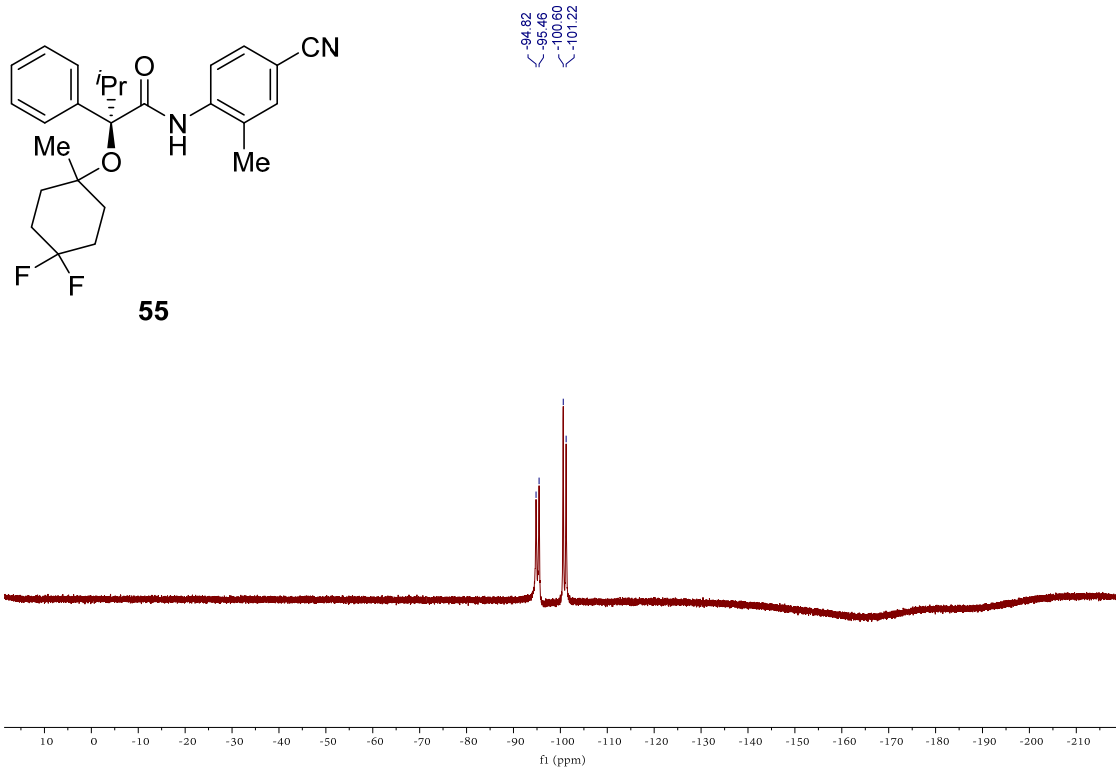

173.33
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85.06
79.98
40.63
39.96
27.57
25.41
25.25
23.24
23.19
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8.49
Et
O
N
H
CN
Me
O
Me
53
f1 (ppm)


54
f1 (ppm)

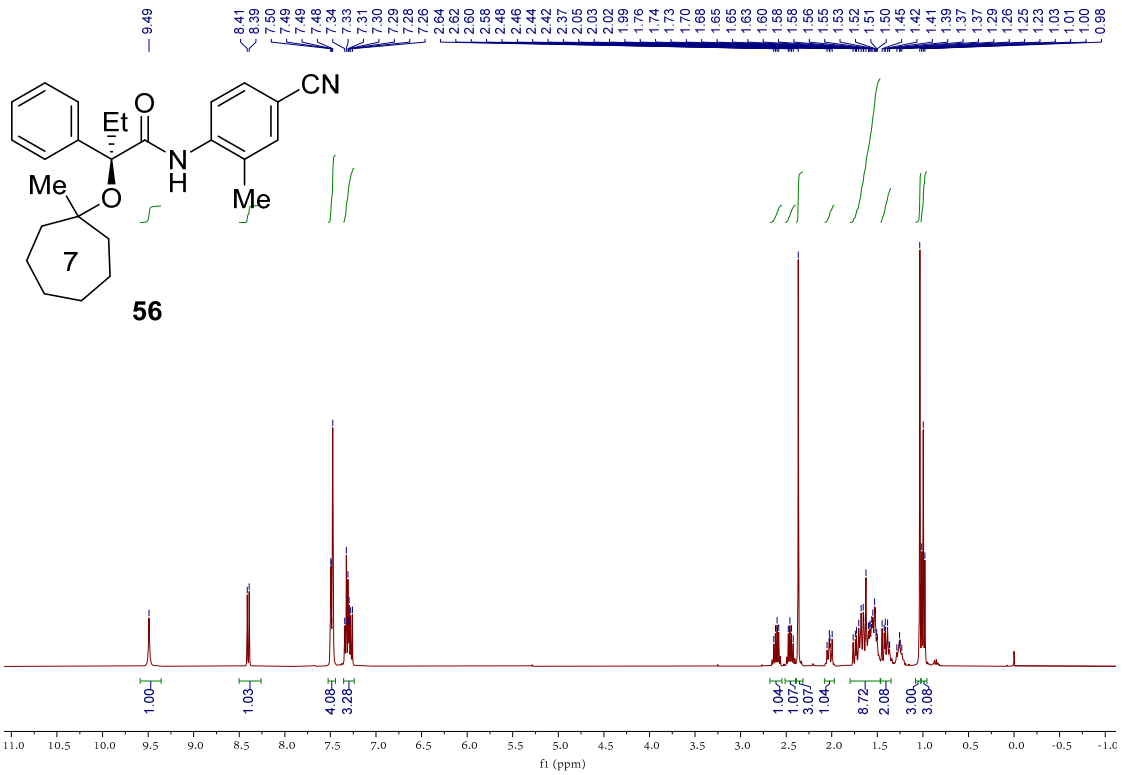

54
f1 (ppm)

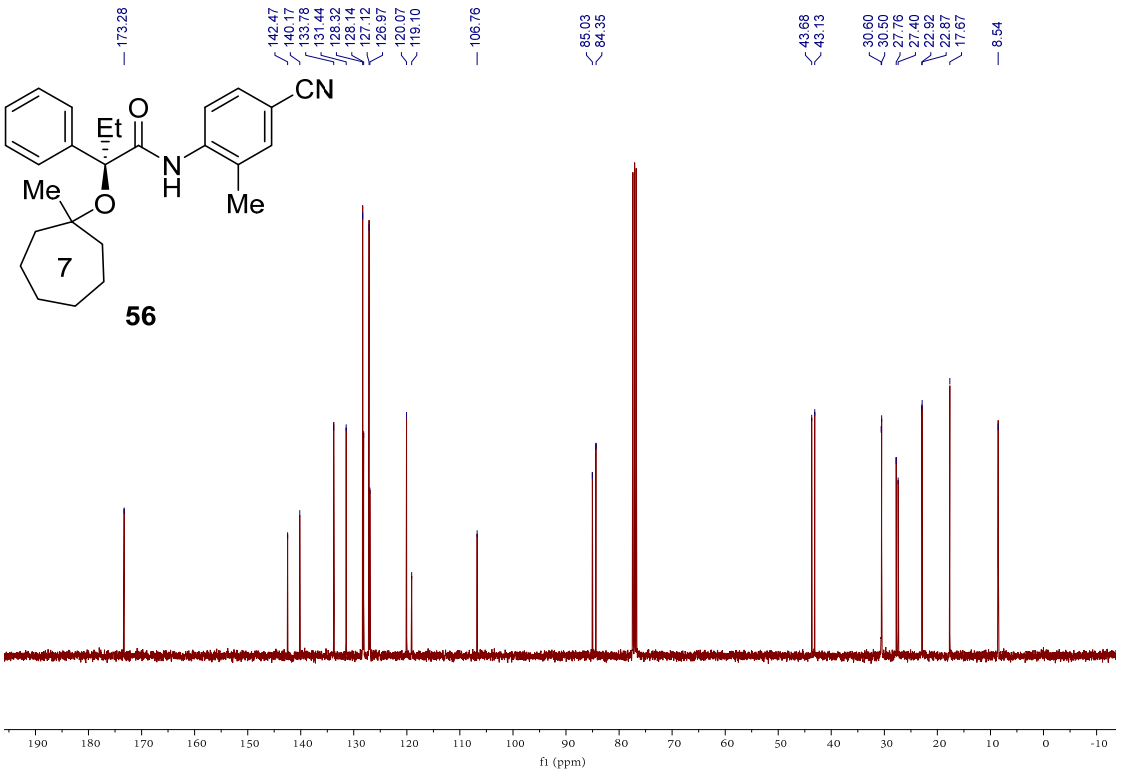

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7.55
7.55
7.51
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7.37
7.36
7.26
3.07
3.05
3.03
3.01
3.00
2.32
2.15
2.14
2.12
2.11
2.09
2.08
2.06
2.04
2.03
2.01
2.00
1.98
1.84
1.83
1.82
1.81
1.81
1.79
1.77
1.76
1.75
1.74
1.73
1.72
1.72
1.70
1.69
1.65
1.51
1.50
1.49
1.48
1.45
1.44
1.43
1.40
1.22
1.19
1.18
1.02
CN
iPr
O
N
H
Me
O
Me
F
F
55
1.00
1.00
4.06
3.09
1.02
3.05
2.08
3.05
2.11
1.04
3.00
3.03
3.10
f1 (ppm)

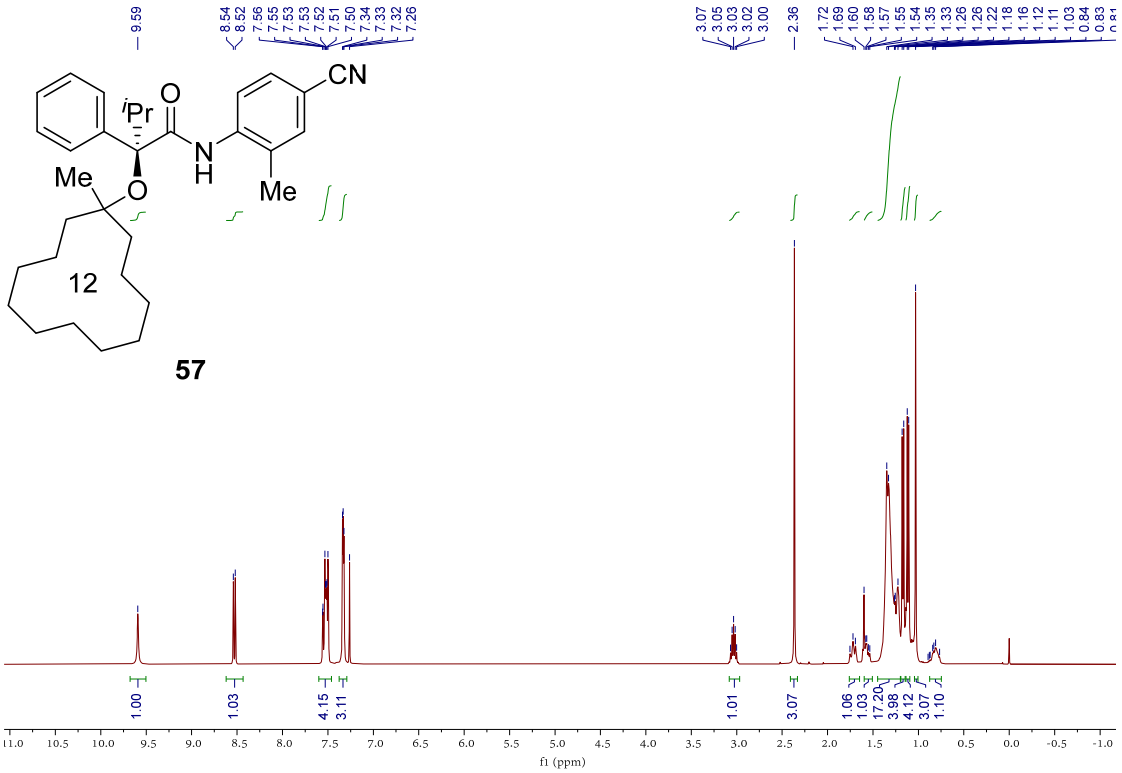

170.81
139.81
137.38
134.02
131.49
130.13
128.93
128.01
127.00
125.15
122.75
120.62
118.97
107.19
88.13
77.70
35.95
35.52
35.00
30.77
30.52
30.31
30.07
25.26
18.72
18.34
17.80
CN
iPr
O
N
H
Me
O
Me
F
F
55
f1 (ppm)

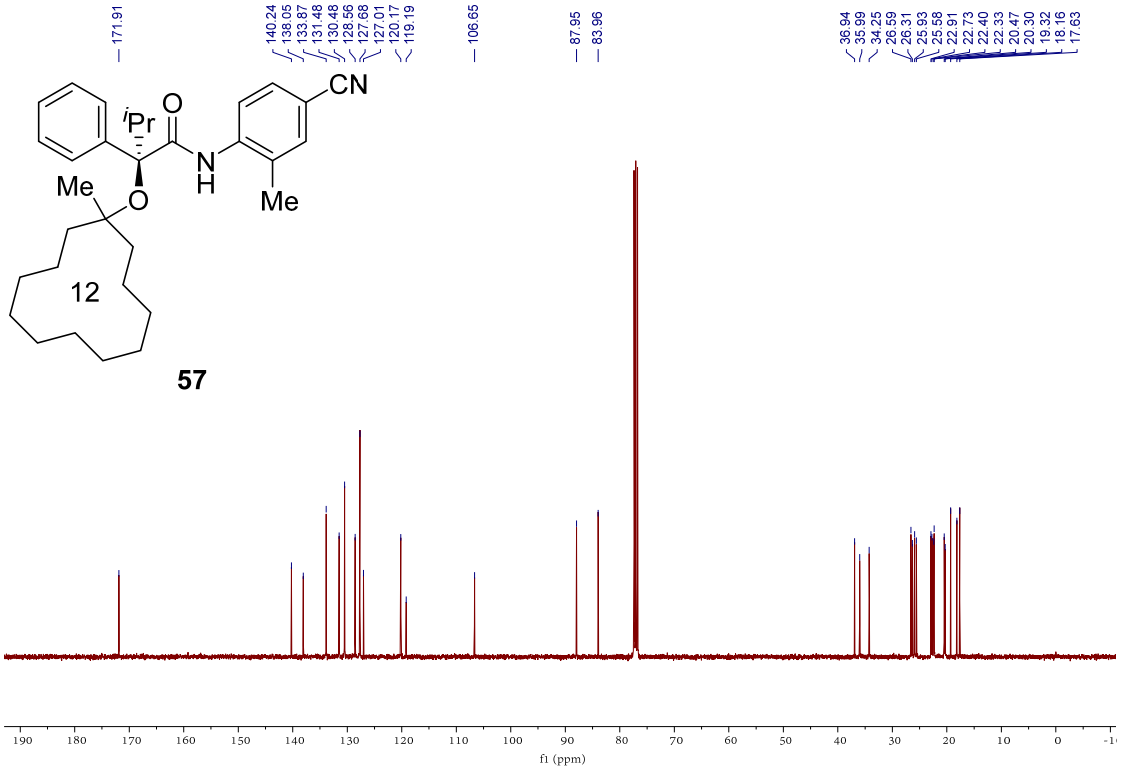

-94.82
-95.46
-100.60
-101.22
CN
iPr
O
N
H
Me
O
Me
F
F
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
f1 (ppm)

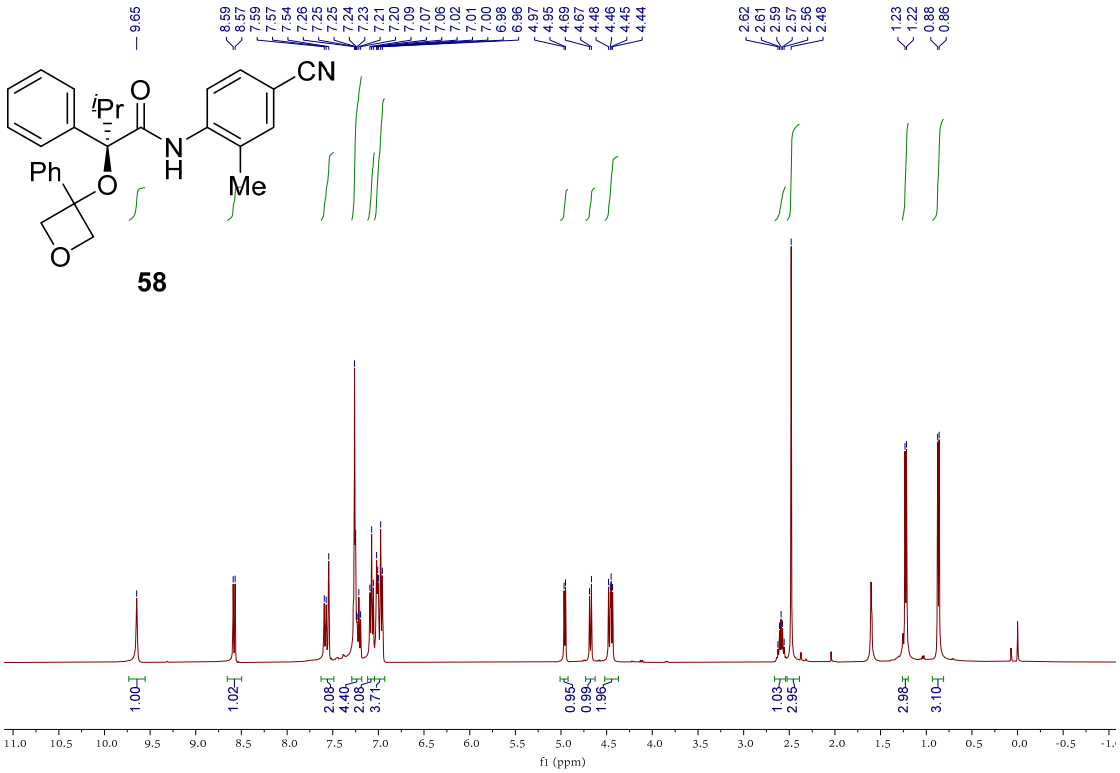
55

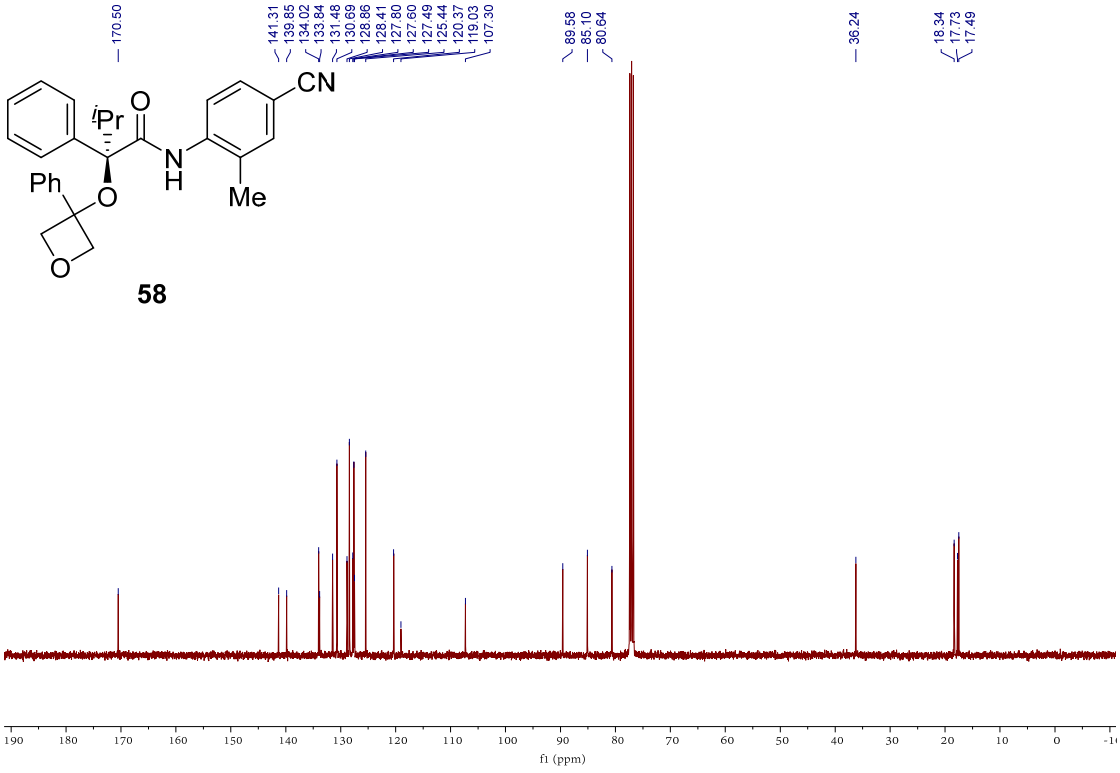

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7.31
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7.28
7.26
2.64
2.62
2.60
2.58
2.48
2.46
2.44
2.42
2.37
2.05
2.03
2.02
1.99
1.76
1.74
1.73
1.70
1.68
1.65
1.65
1.63
1.60
1.58
1.58
1.56
1.55
1.53
1.52
1.51
1.50
1.45
1.42
1.41
1.39
1.37
1.37
1.29
1.26
1.25
1.23
1.03
1.01
1.00
0.98
Et
O
N
H
CN
Me
O
Me
7
56
1.00
1.03
4.08
3.28
1.04
1.07
3.07
1.04
8.72
2.08
3.00
3.08
f1 (ppm)

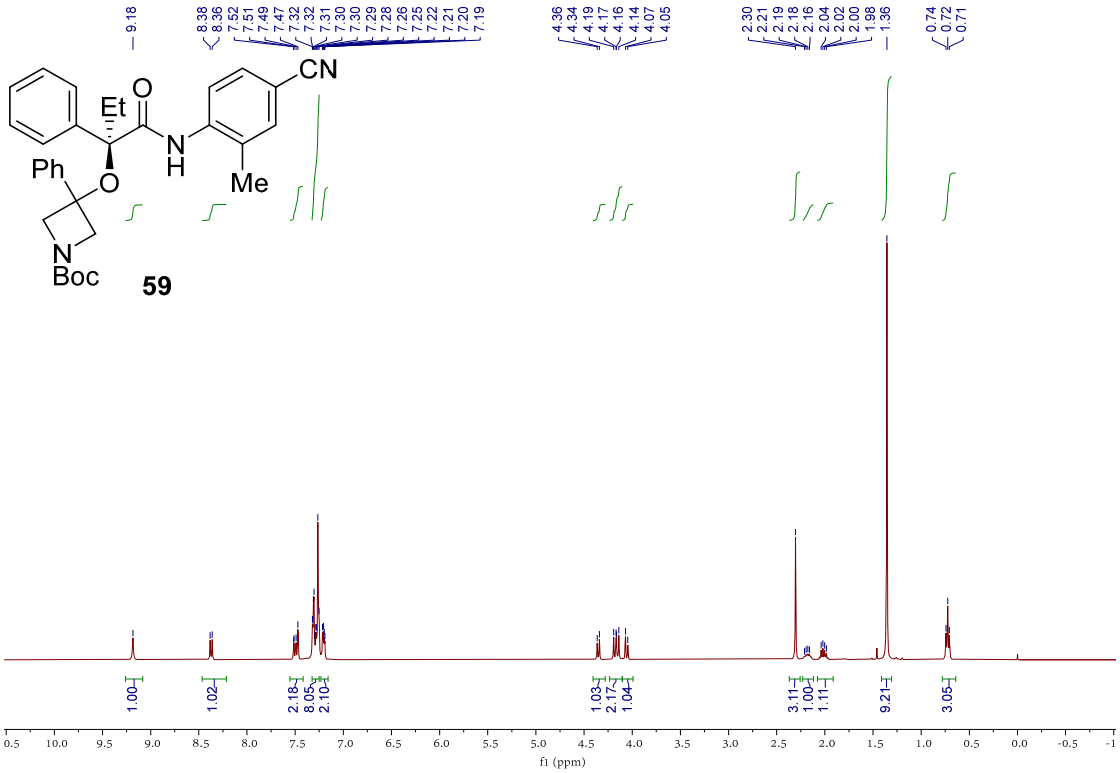

173.28
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127.12
126.97
120.07
119.10
106.76
85.03
84.35
43.68
43.13
30.60
30.50
27.76
27.40
22.92
22.87
17.67
8.54
Et
O
N
H
CN
Me
O
Me
7
56
f1 (ppm)

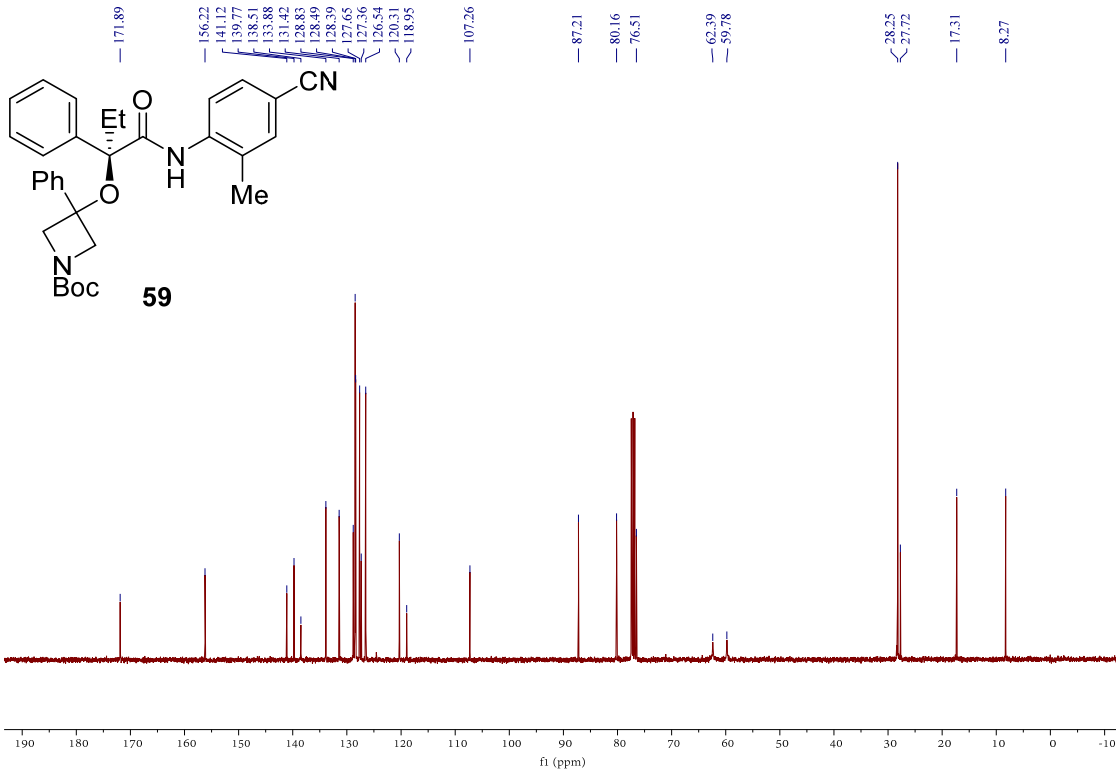

9.59
8.54
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7.52
7.51
7.50
7.34
7.33
7.32
7.26
3.07
3.05
3.03
3.02
3.00
2.36
1.72
1.69
1.60
1.58
1.57
1.55
1.54
1.35
1.33
1.26
1.26
1.22
1.18
1.16
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1.11
1.03
0.84
0.83
CN
O
iPr
N
H
Me
O
Me
12
57
1.00
1.03
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3.11
1.01
3.07
1.06
1.03
17.20
3.98
4.12
3.07
1.10
f1 (ppm)

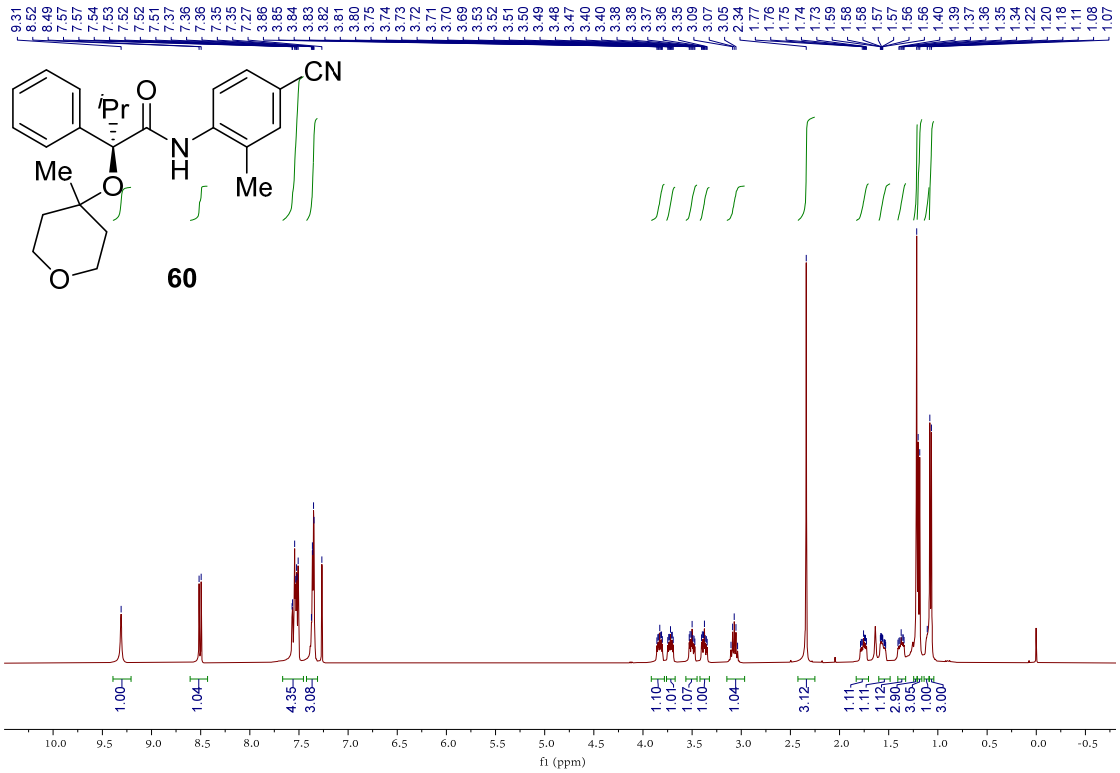

171.91
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133.87
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127.68
127.01
120.17
119.19
106.65
87.95
83.96
36.94
35.99
34.25
26.59
26.31
25.93
25.58
22.91
22.73
22.40
22.33
20.47
20.30
19.32
18.16
17.63
CN
O
iPr
N
H
Me
O
Me
12
57
f1 (ppm)

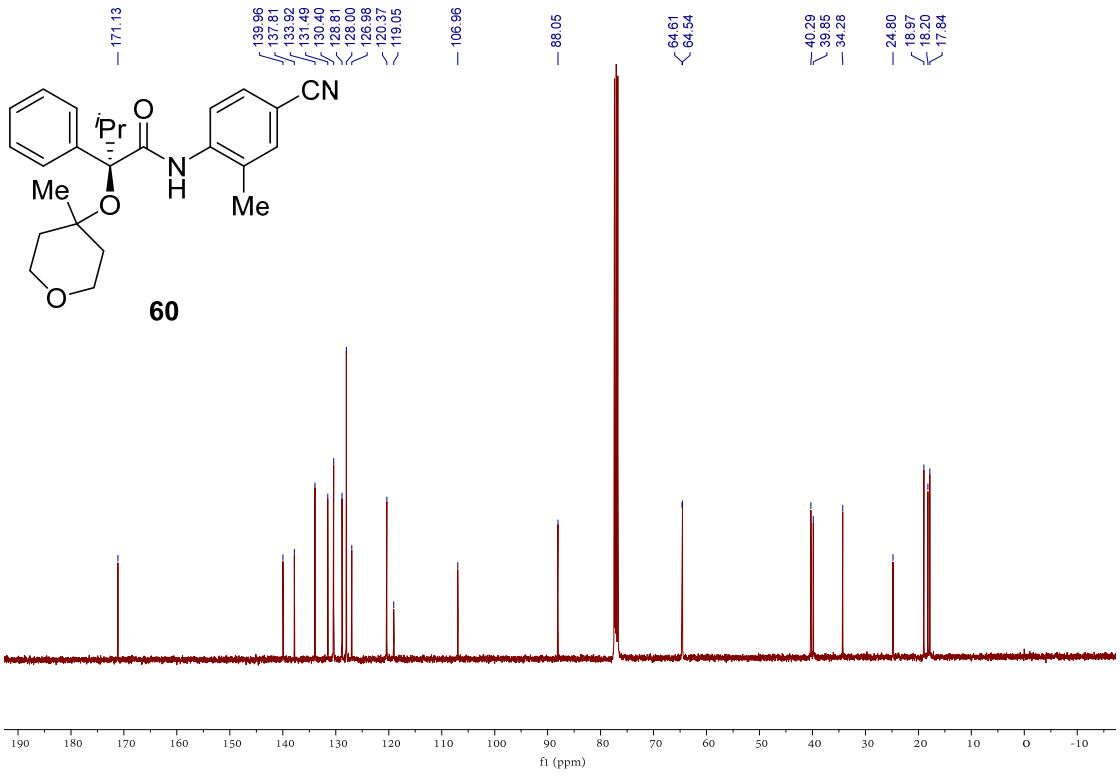

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7.59
7.57
7.54
7.26
7.25
7.25
7.24
7.23
7.21
7.20
7.09
7.07
7.06
7.02
7.01
7.00
6.98
6.96
4.97
4.95
4.69
4.67
4.48
4.46
4.45
4.44
2.62
2.61
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2.57
2.56
2.48
1.23
1.22
0.88
0.86
iPr
O
N
H
CN
Me
Ph
O
O
58
1.00
1.02
2.08
4.40
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3.71
0.95
0.99
1.96
1.03
2.95
2.98
3.10
f1 (ppm)

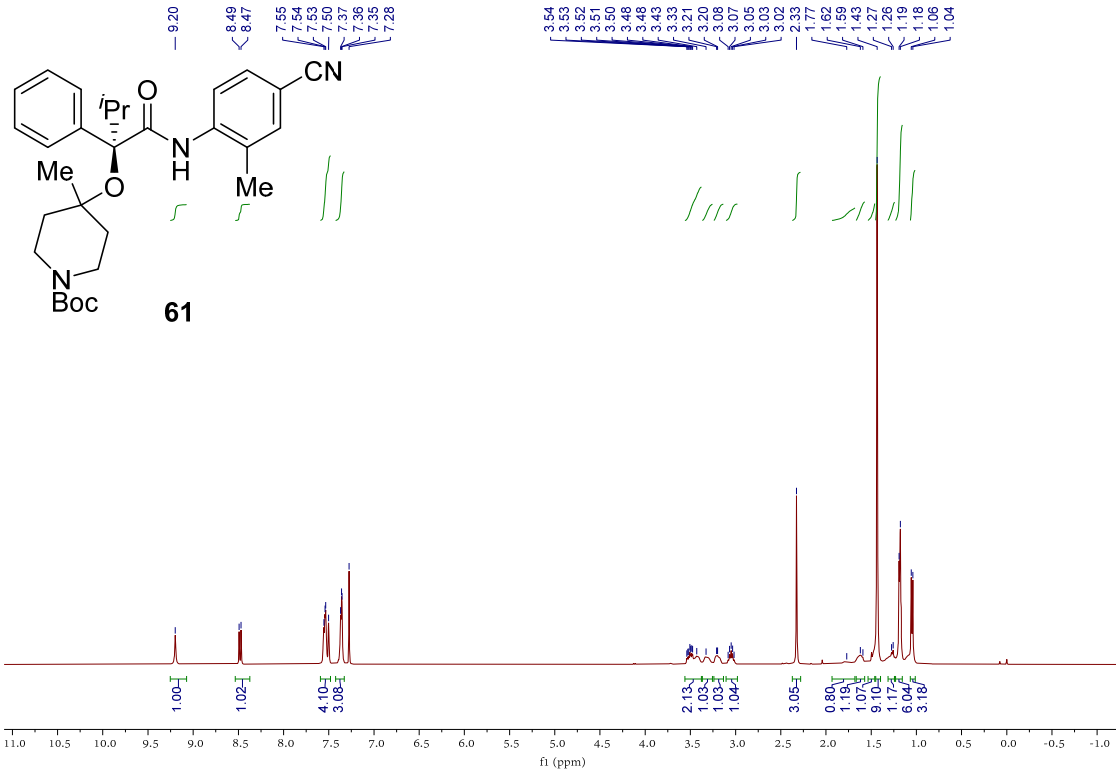

170.50
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131.48
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128.41
127.80
127.60
127.49
125.44
120.37
119.03
107.30
89.58
85.10
80.64
36.24
18.34
17.73
17.49
iPr
O
N
H
CN
Me
Ph
O
O
58
f1 (ppm)

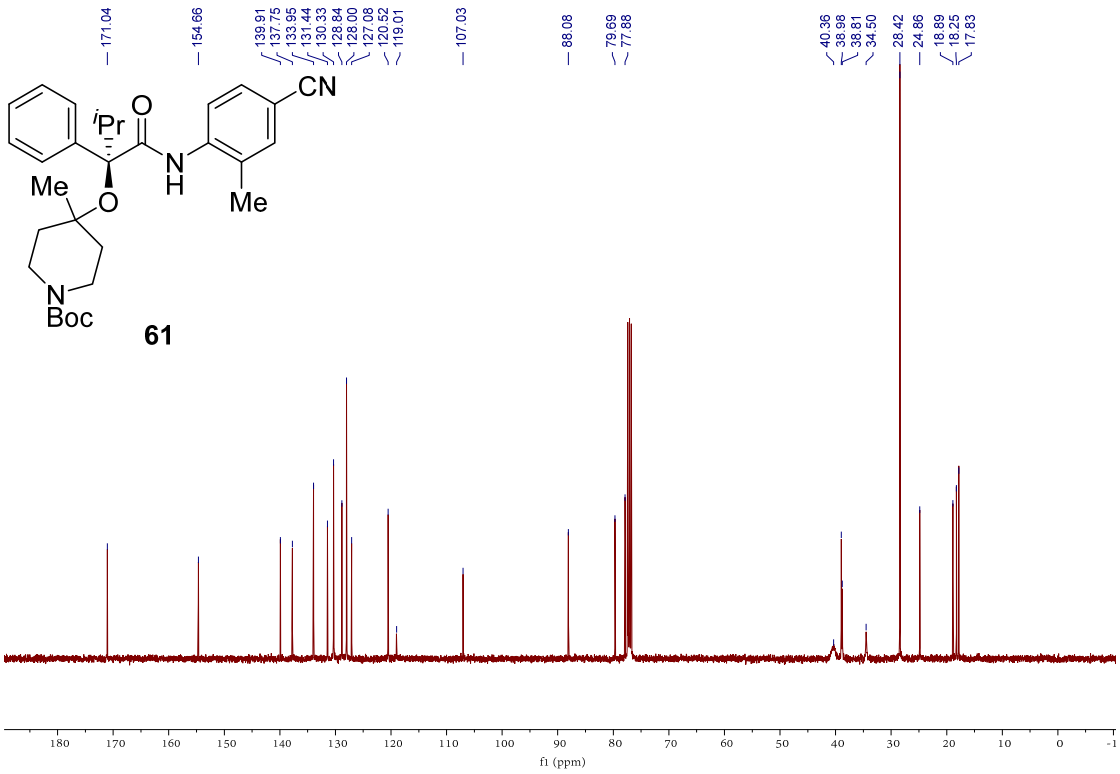

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7.47
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7.31
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7.30
7.29
7.28
7.26
7.25
7.22
7.21
7.20
7.19
4.36
4.34
4.19
4.17
4.16
4.14
4.07
4.05
2.30
2.21
2.19
2.18
2.16
2.04
2.02
2.00
1.98
1.36
0.74
0.72
0.71
Et
O
N
H
CN
Me
Ph
O
N
Boc
59
1.00
1.02
2.18
8.05
2.10
1.03
2.17
1.04
3.11
1.00
1.11
9.21
3.05
f1 (ppm)

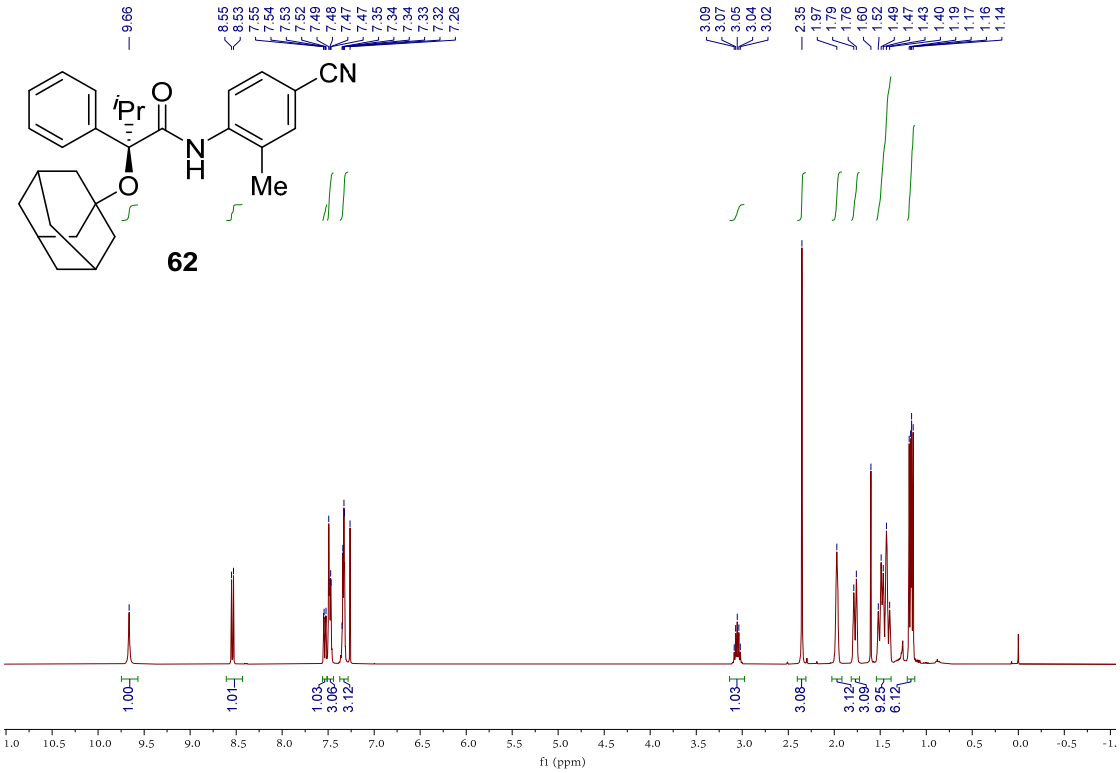

171.89
156.22
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139.77
138.51
133.88
131.42
128.83
128.49
128.39
127.65
127.36
126.54
120.31
118.95
107.26
87.21
80.16
76.51
62.39
59.78
28.25
27.72
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8.27
Et
O
N
H
CN
Me
Ph
O
N
Boc
59
f1 (ppm)

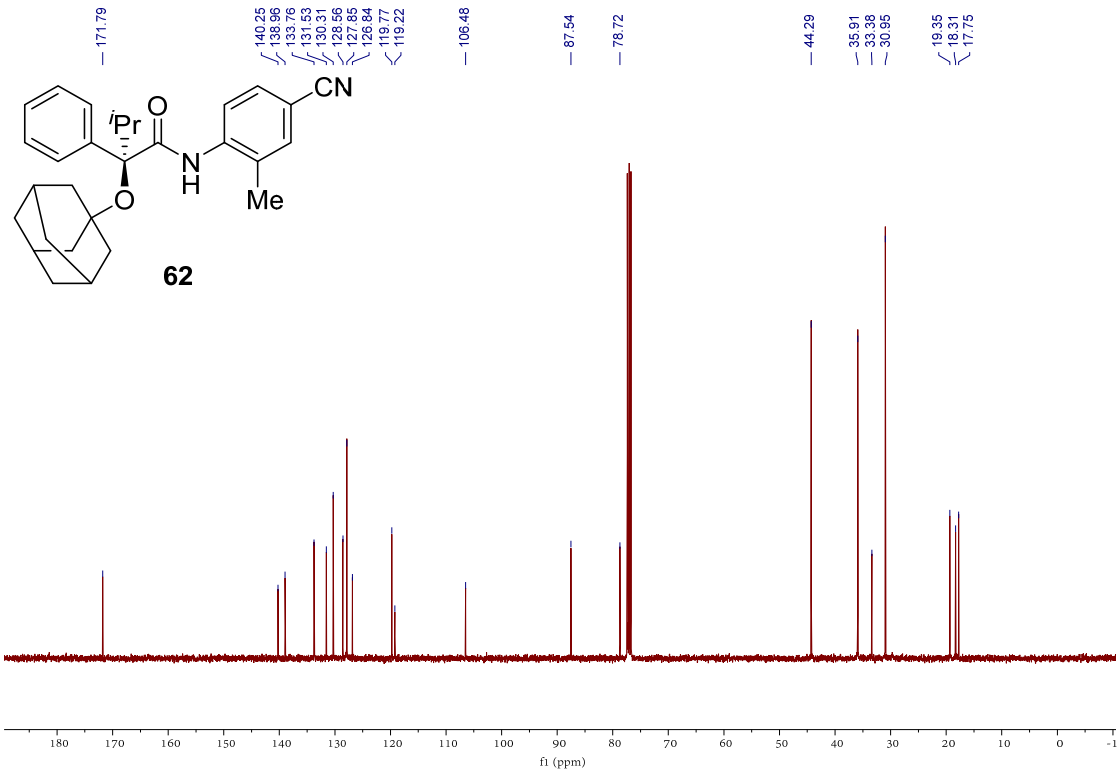

9.31 8.52 8.49 7.57 7.57 7.54 7.53 7.52 7.52 7.51 7.37 7.36 7.36 7.35 7.35 7.27 3.86 3.85 3.84 3.83 3.82 3.81 3.80 3.75 3.74 3.73 3.72 3.71 3.70 3.69 3.53 3.52 3.51 3.50 3.49 3.48 3.47 3.40 3.40 3.38 3.38 3.37 3.36 3.35 3.09 3.07 3.05 2.34 1.77 1.76 1.75 1.74 1.73 1.59 1.58 1.58 1.57 1.57 1.56 1.56 1.40 1.39 1.37 1.36 1.35 1.34 1.22 1.20 1.18 1.11 1.08 1.07
CN
iPr
O
N
H
Me
O
Me
O
60
1.00 1.04 4.35 3.08 1.10 1.01 1.07 1.00 1.04 3.12 1.11 1.11 1.12 2.90 3.05 1.00 3.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

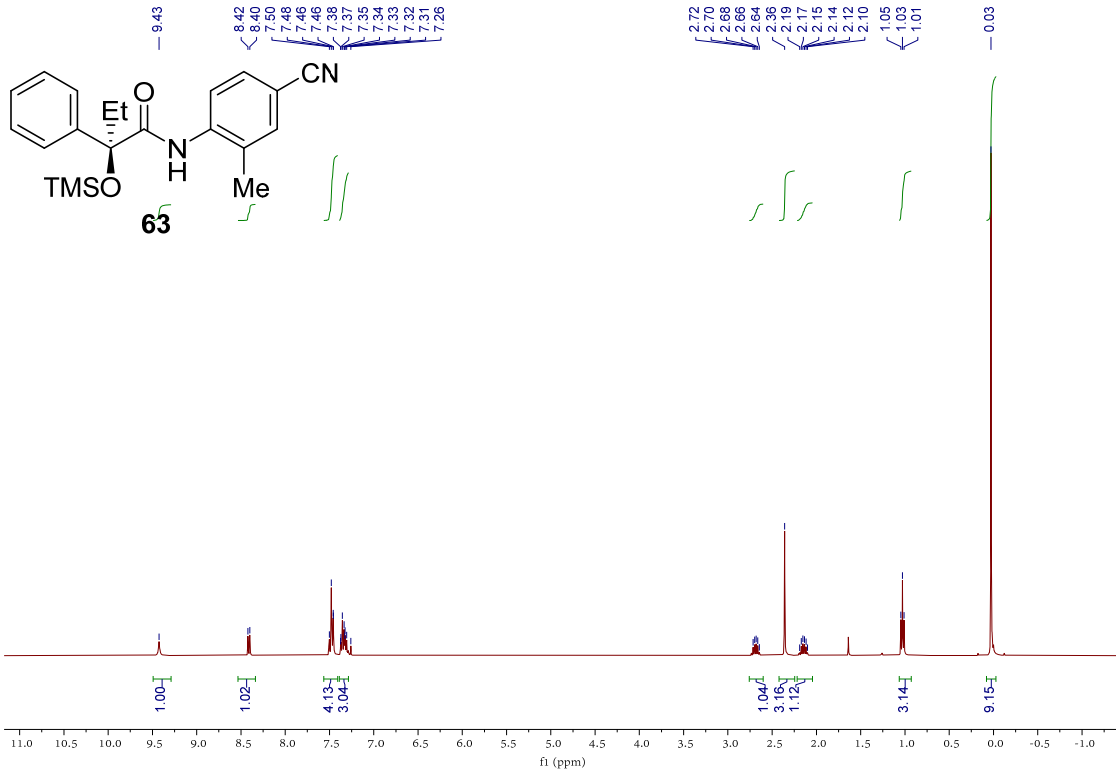

171.13 139.96 137.81 133.92 131.49 130.40 128.81 128.00 126.98 120.37 119.05 106.96 88.05 64.61 64.54 40.29 39.85 34.28 24.80 18.97 18.20 17.84
CN
iPr
O
N
H
Me
O
Me
O
60
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

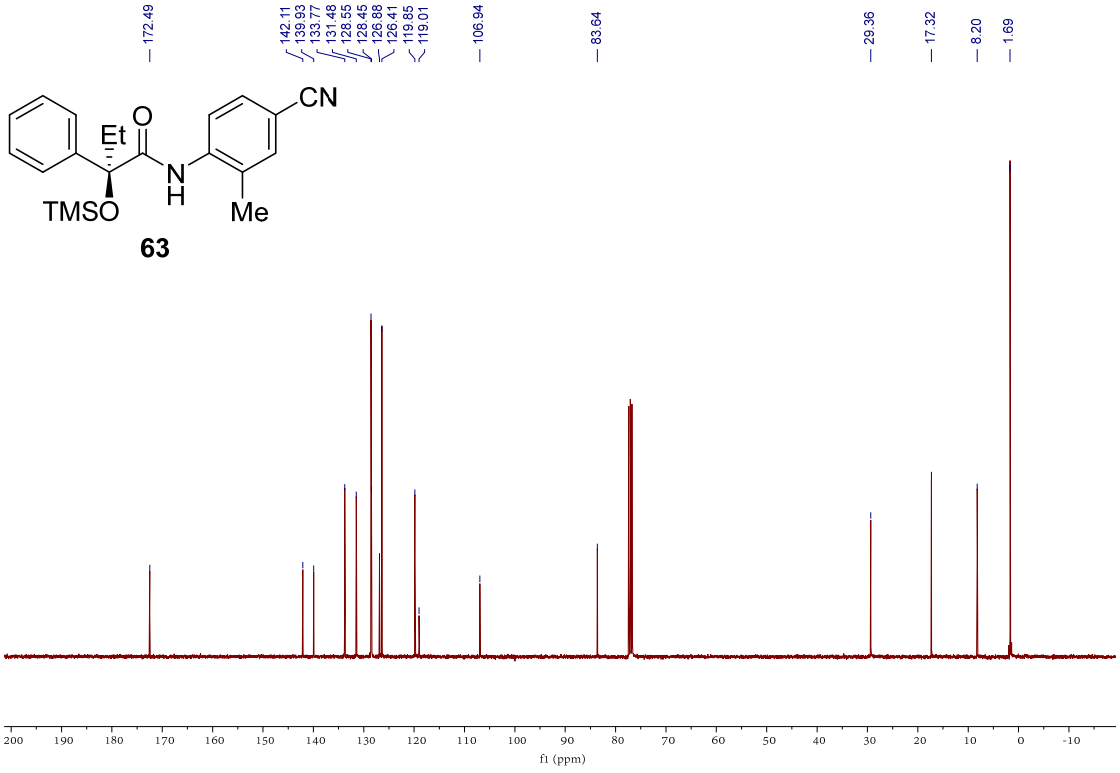

9.20
8.49
8.47
7.55
7.54
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7.50
7.37
7.36
7.35
7.28
3.54
3.53
3.52
3.51
3.50
3.48
3.48
3.43
3.33
3.21
3.20
3.08
3.07
3.05
3.03
3.02
2.33
1.77
1.62
1.59
1.43
1.27
1.26
1.19
1.18
1.06
1.04
CN
iPr
O
N
H
Me
O
Me
N
Boc
61
1.00
1.02
4.10
3.08
2.13
1.03
1.03
1.04
3.05
0.80
1.19
1.07
9.10
1.17
6.04
3.18
f1 (ppm)

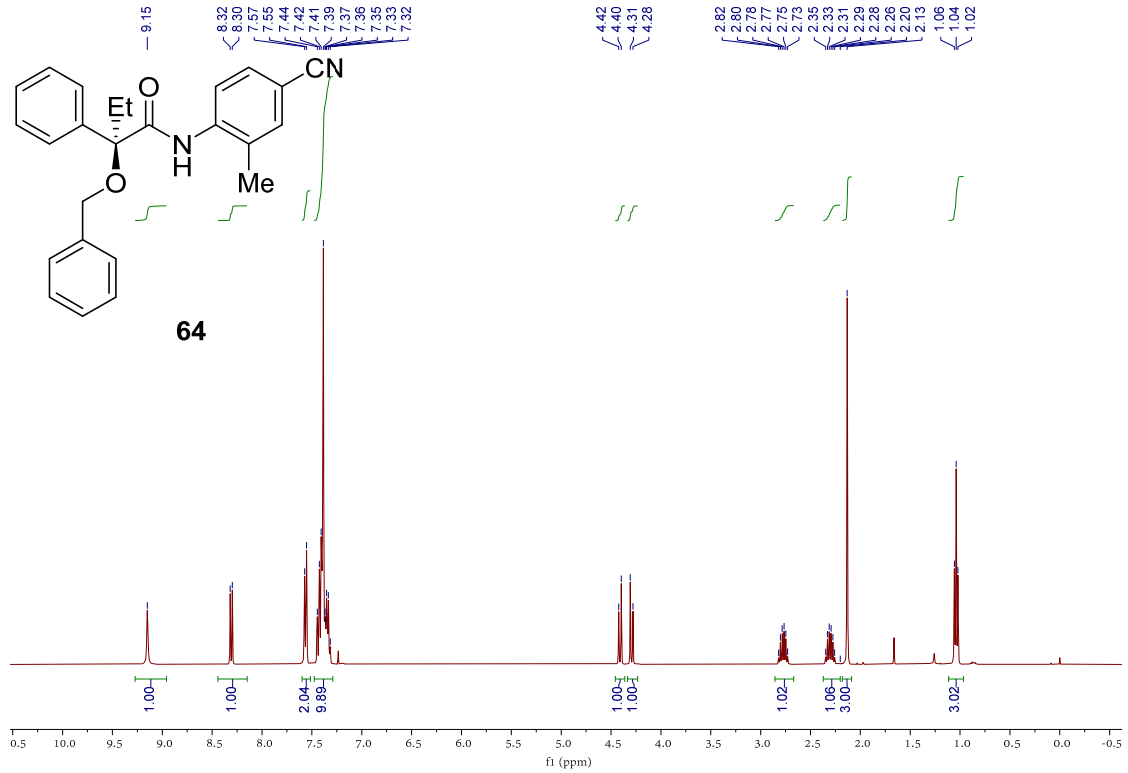

171.04
154.66
139.91
137.75
133.95
131.44
130.33
128.84
128.00
127.08
120.52
119.01
107.03
88.08
79.69
77.88
40.36
38.98
38.81
34.50
28.42
24.86
18.89
18.25
17.83
CN
iPr
O
N
H
Me
O
Me
N
Boc
61
f1 (ppm)

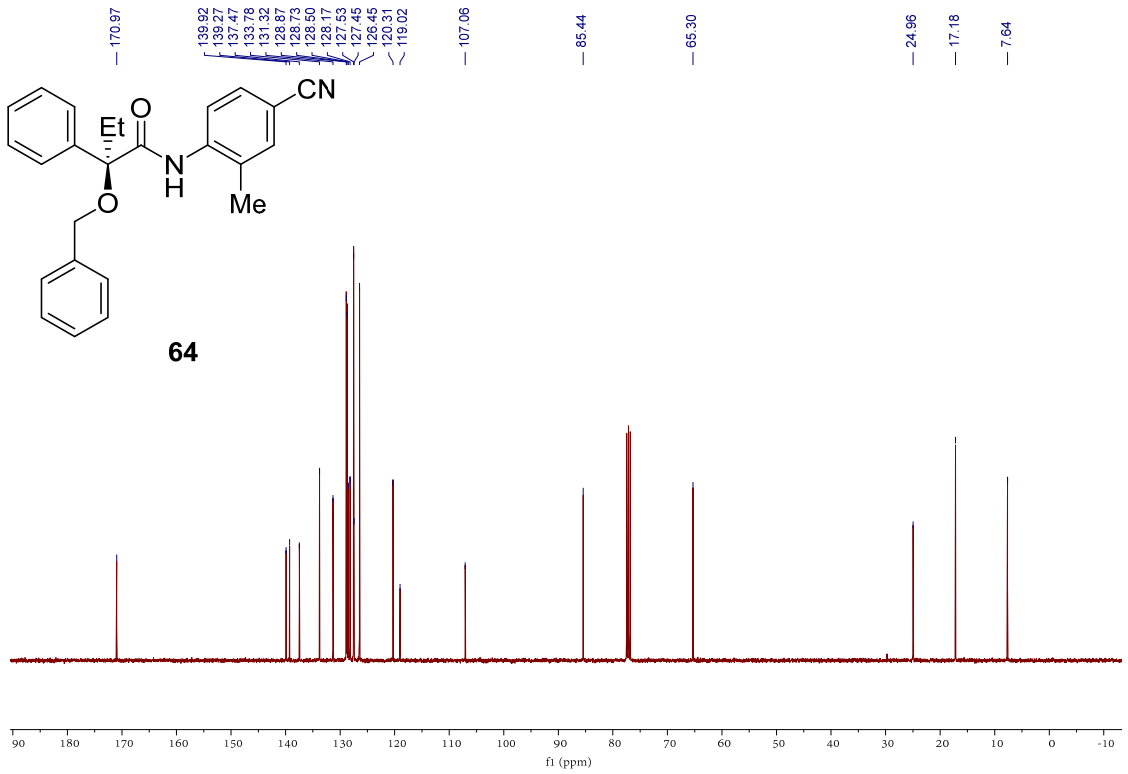

9.66
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7.54
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7.52
7.49
7.48
7.47
7.47
7.35
7.34
7.34
7.33
7.32
7.26
3.09
3.07
3.05
3.04
3.02
2.35
1.97
1.79
1.76
1.60
1.52
1.49
1.47
1.43
1.40
1.19
1.17
1.16
1.14
CN
iPr
O
N
H
Me
O
62
1.00
1.01
1.03
3.06
3.12
1.03
3.08
3.12
3.09
9.25
6.12
f1 (ppm)

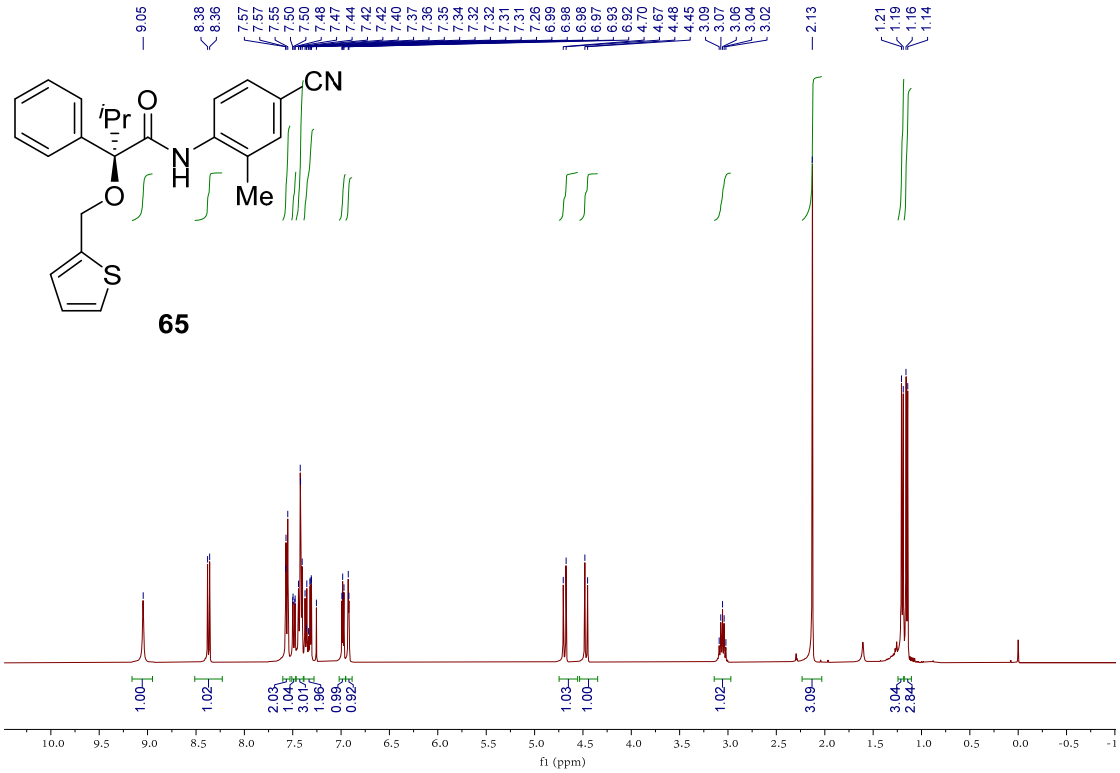

171.79
140.25
138.96
133.76
131.53
130.31
128.56
127.85
126.84
119.77
119.22
106.48
87.54
78.72
44.29
35.91
33.38
30.95
19.35
18.31
17.75
CN
iPr
O
N
H
Me
O
62
f1 (ppm)

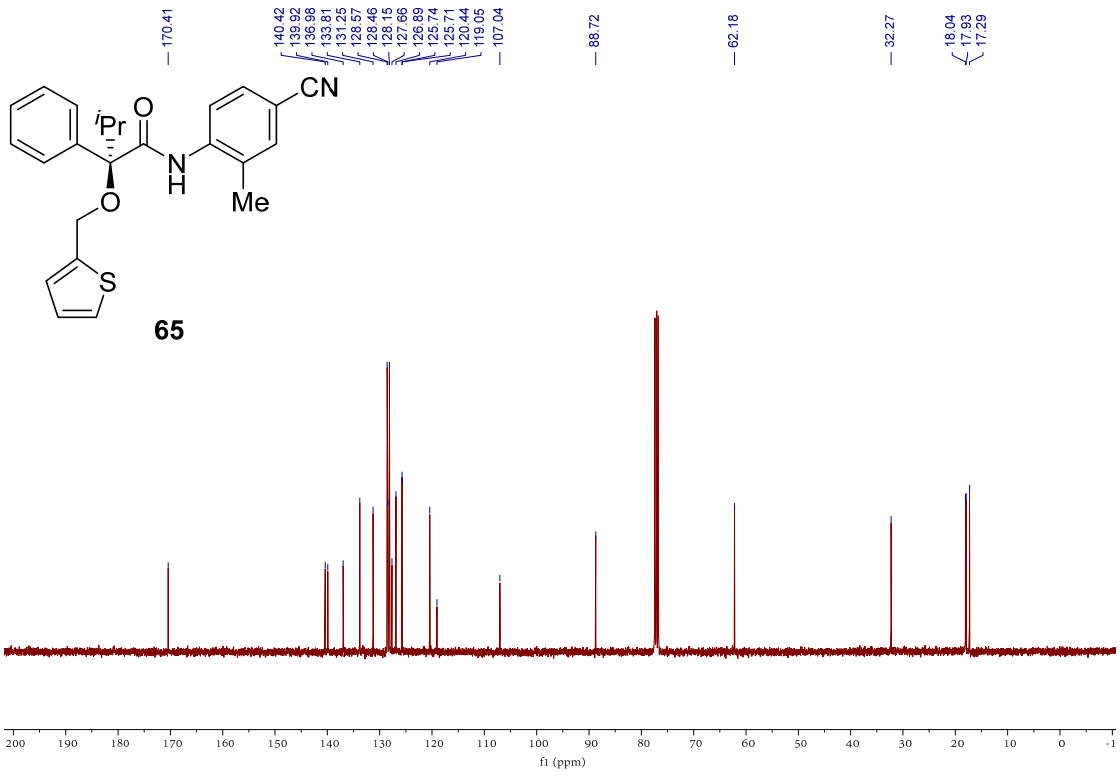

9.43
8.42
8.40
7.50
7.48
7.46
7.46
7.38
7.37
7.35
7.34
7.33
7.32
7.31
7.26
2.72
2.70
2.68
2.66
2.64
2.36
2.19
2.17
2.15
2.14
2.12
2.10
1.05
1.03
1.01
0.03
Et
O
N
H
CN
TMSO
Me
63
1.00
1.02
4.13
3.04
1.04
3.16
1.12
3.14
9.15
f1 (ppm)

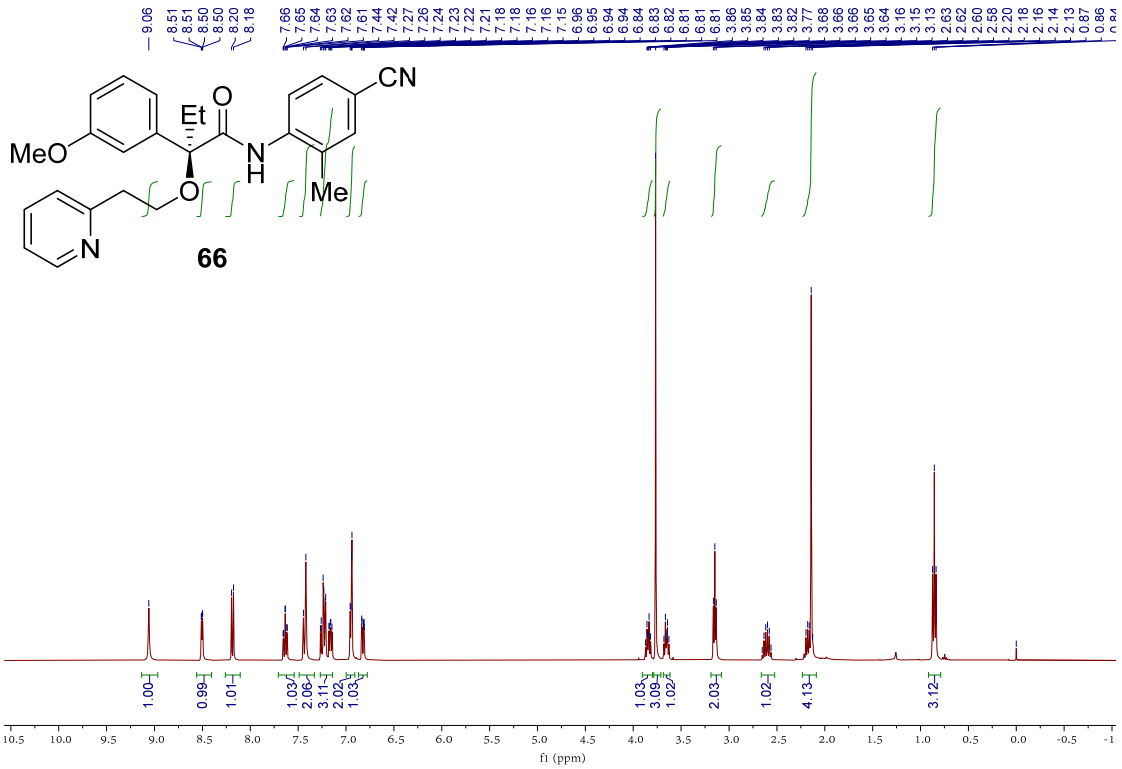

172.49
142.11
139.93
133.77
131.48
128.55
128.45
126.88
126.41
119.85
119.01
106.94
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17.32
8.20
1.69
Et
O
N
H
CN
TMSO
Me
63
f1 (ppm)

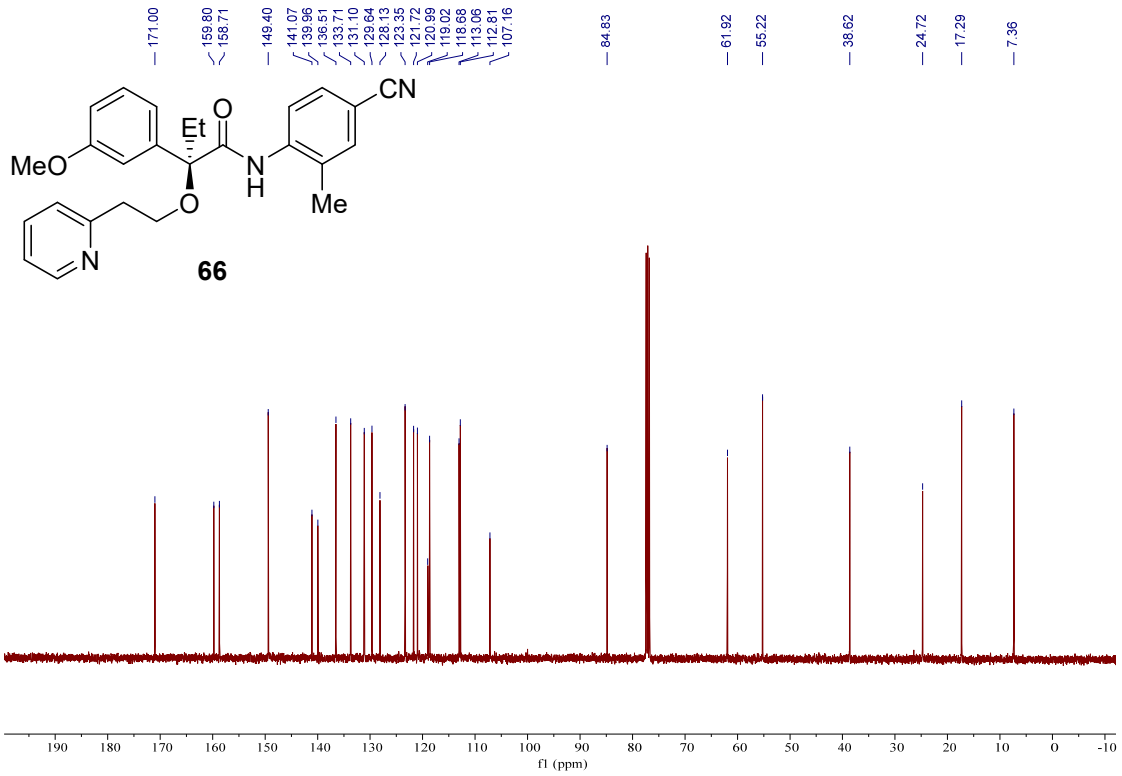

9.15
8.32
8.30
7.57
7.55
7.44
7.42
7.41
7.39
7.37
7.36
7.35
7.33
7.32
4.42
4.40
4.31
4.28
2.82
2.80
2.78
2.77
2.75
2.73
2.35
2.33
2.31
2.29
2.28
2.26
2.20
2.13
1.06
1.04
1.02
Et
O
N
H
O
CN
Me
64
1.00
1.00
2.04
9.89
1.00
1.00
1.02
1.06
3.00
3.02
f1 (ppm)

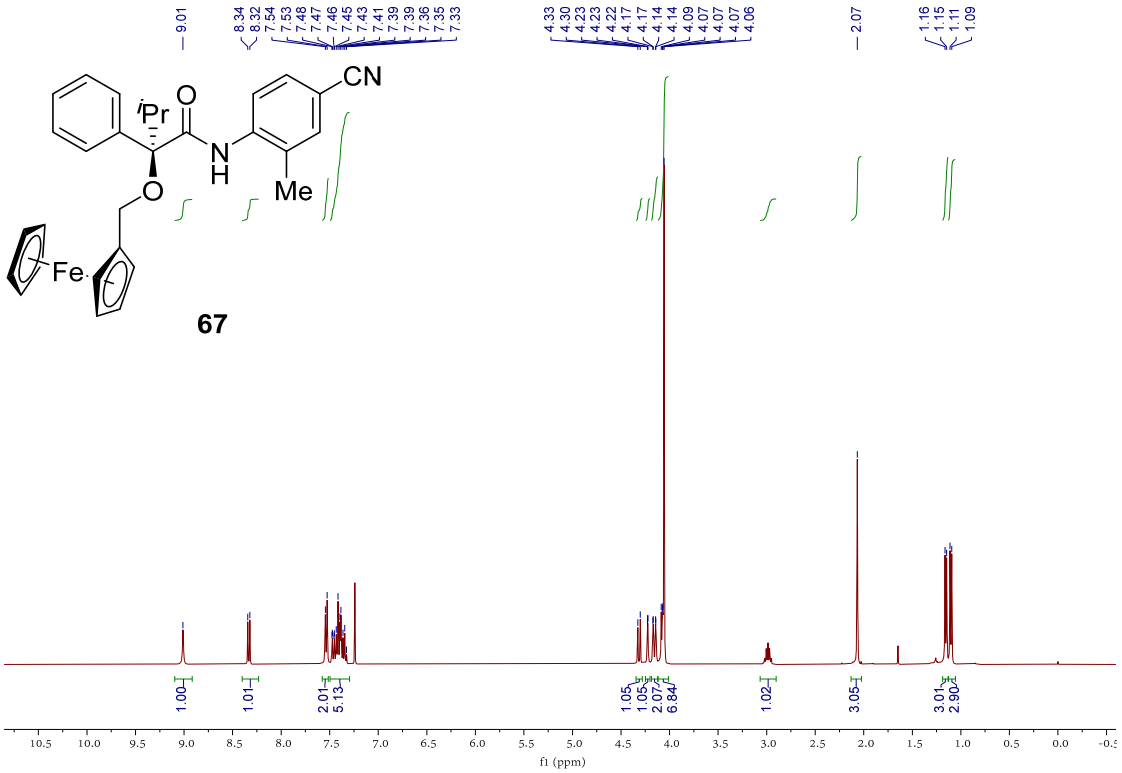

170.97
139.92
139.27
137.47
133.78
131.32
128.87
128.73
128.50
128.17
127.53
127.45
126.45
120.31
119.02
107.06
85.44
65.30
24.96
17.18
7.64
Et
O
N
H
O
CN
Me
64
f1 (ppm)

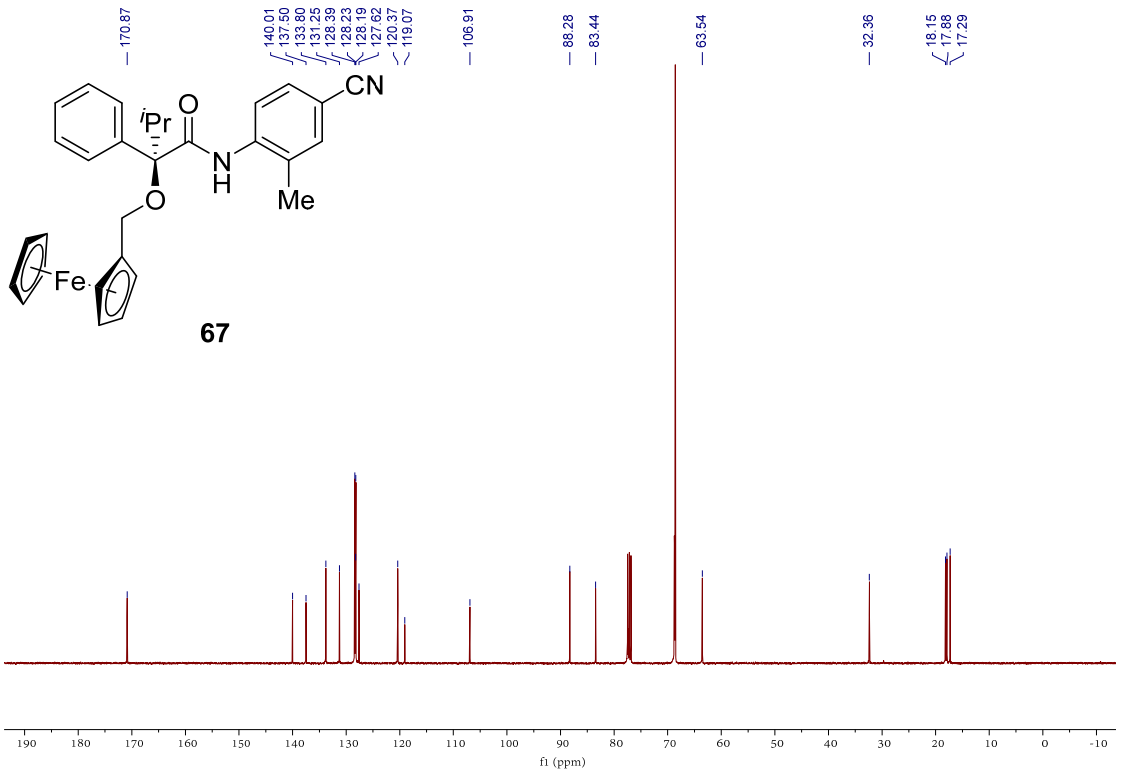

9.05
8.38
8.36
7.57
7.57
7.55
7.50
7.50
7.48
7.47
7.44
7.42
7.42
7.40
7.37
7.36
7.35
7.34
7.32
7.32
7.31
7.31
7.26
6.99
6.98
6.98
6.97
6.93
6.92
4.70
4.67
4.48
4.45
3.09
3.07
3.06
3.04
3.02
2.13
1.21
1.19
1.16
1.14
CN
iPr
O
N
H
Me
O
S
65
1.00
1.02
2.03
1.04
3.01
1.96
0.99
0.92
1.03
1.00
1.02
3.09
3.04
2.84
f1 (ppm)

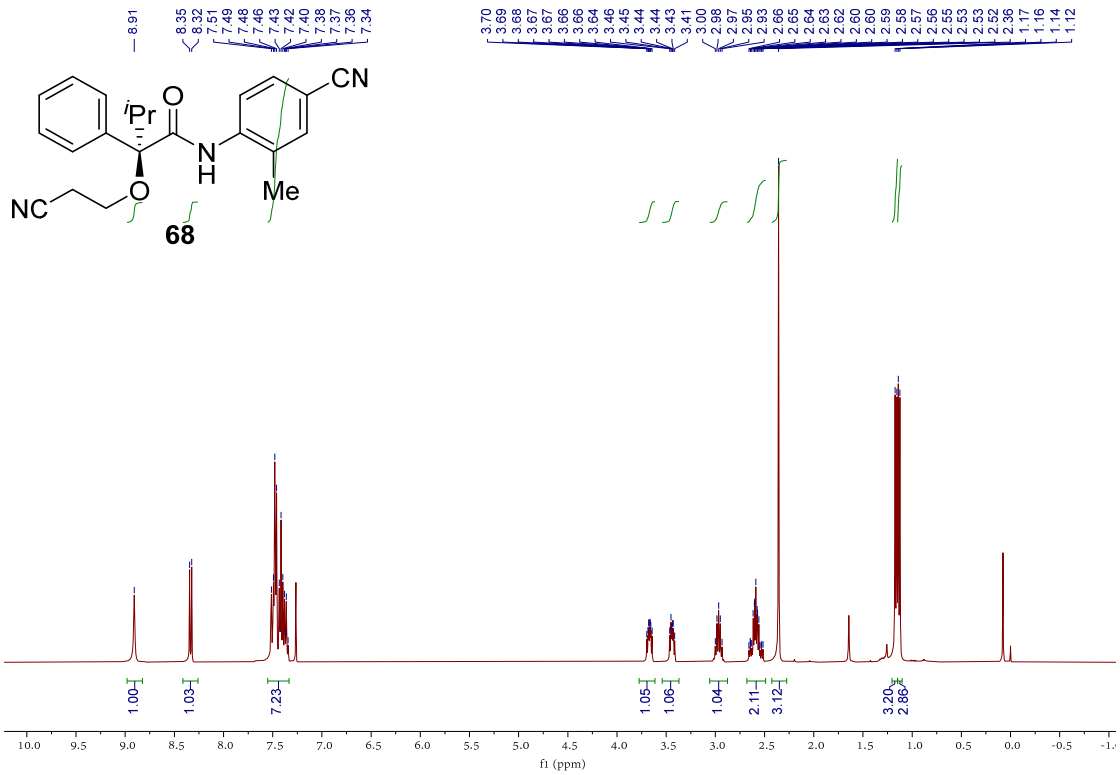

170.41
140.42
139.92
136.98
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131.25
128.57
128.46
128.15
127.66
126.89
125.74
125.71
120.44
119.05
107.04
88.72
62.18
32.27
18.04
17.93
17.29
CN
iPr
O
N
H
Me
O
S
65
f1 (ppm)

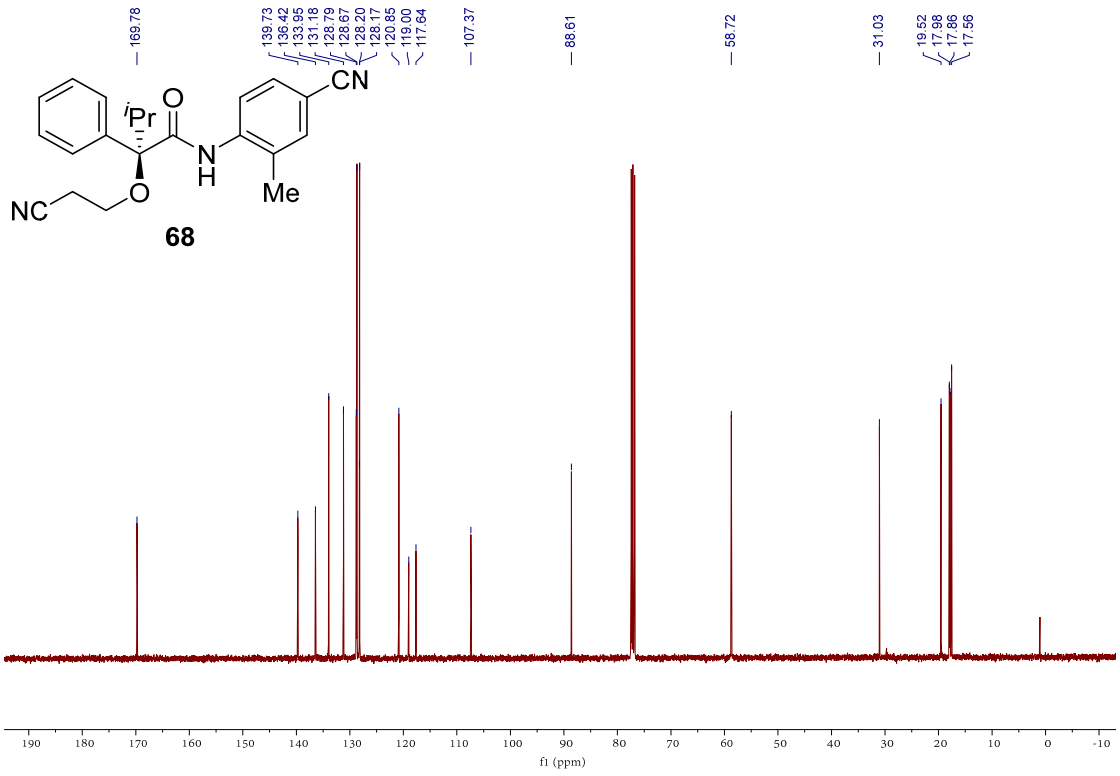

MeO
Et
O
N
H
CN
Me
N
O
66
f1 (ppm)

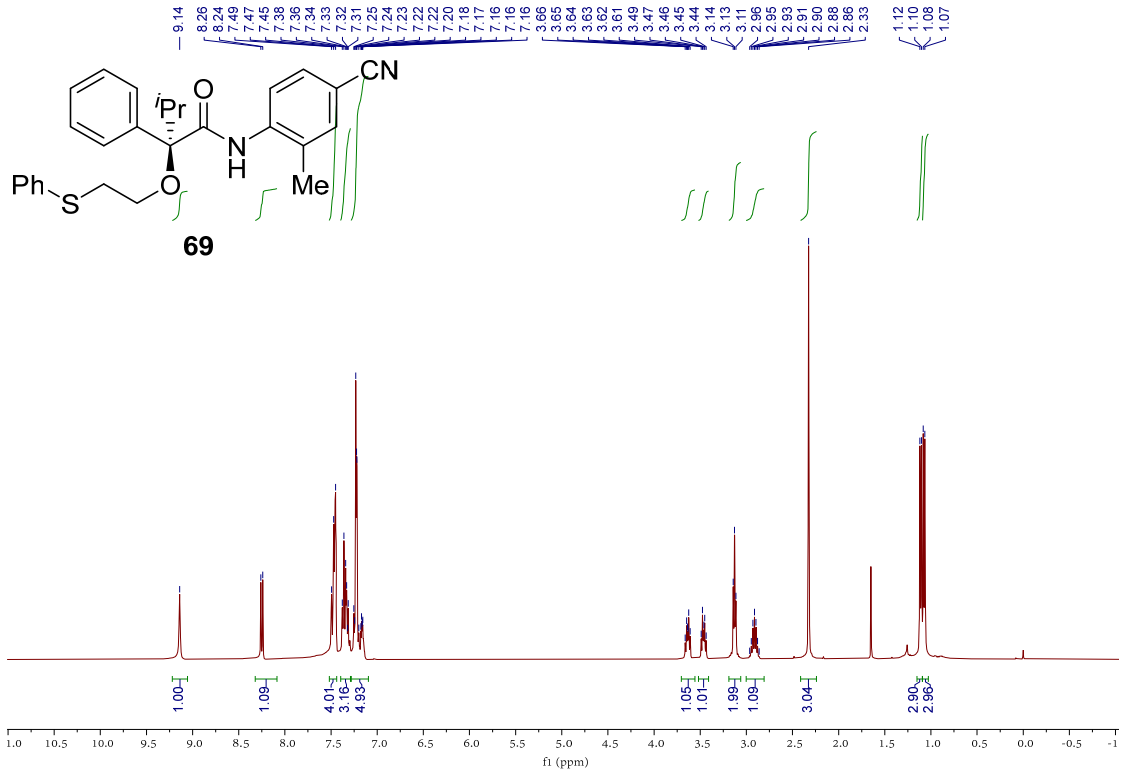

MeO
Et
O
N
H
CN
Me
N
O
66
f1 (ppm)

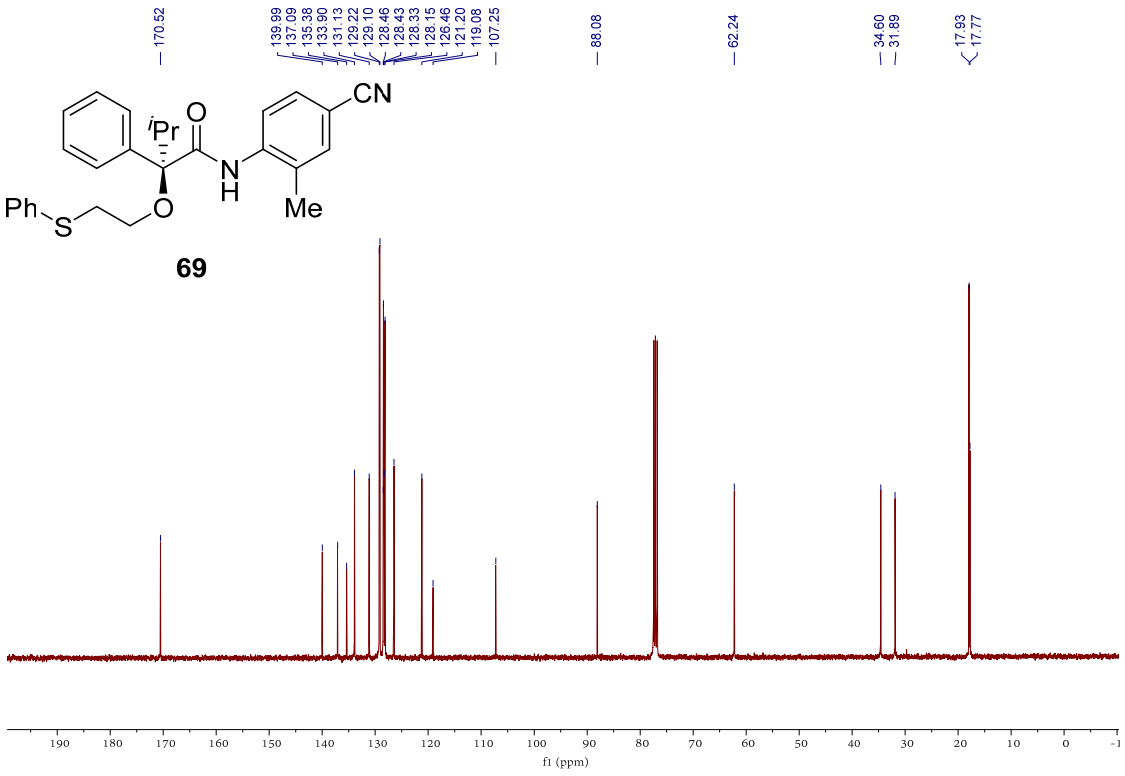

9.01
8.34
8.32
7.54
7.53
7.48
7.47
7.46
7.45
7.43
7.41
7.39
7.36
7.35
7.33
4.33
4.30
4.23
4.23
4.22
4.17
4.17
4.14
4.14
4.09
4.07
4.07
4.07
4.06
2.07
1.16
1.15
1.11
1.09
CN
iPr
O
N
H
Me
O
Fe
67
1.00
1.01
2.01
5.13
1.05
1.05
2.07
6.84
1.02
3.05
3.01
2.90
f1 (ppm)

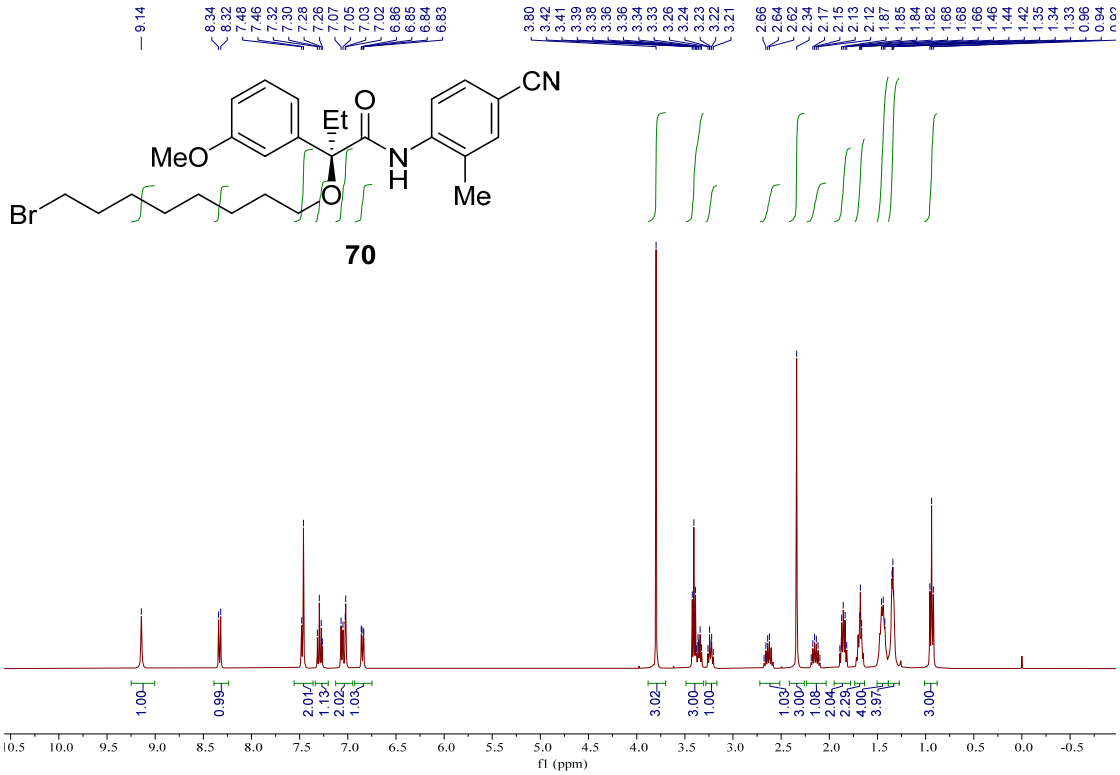

170.87
140.01
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131.25
128.39
128.23
128.19
127.62
120.37
119.07
106.91
88.28
83.44
63.54
32.36
18.15
17.88
17.29
CN
iPr
O
N
H
Me
O
Fe
67
f1 (ppm)

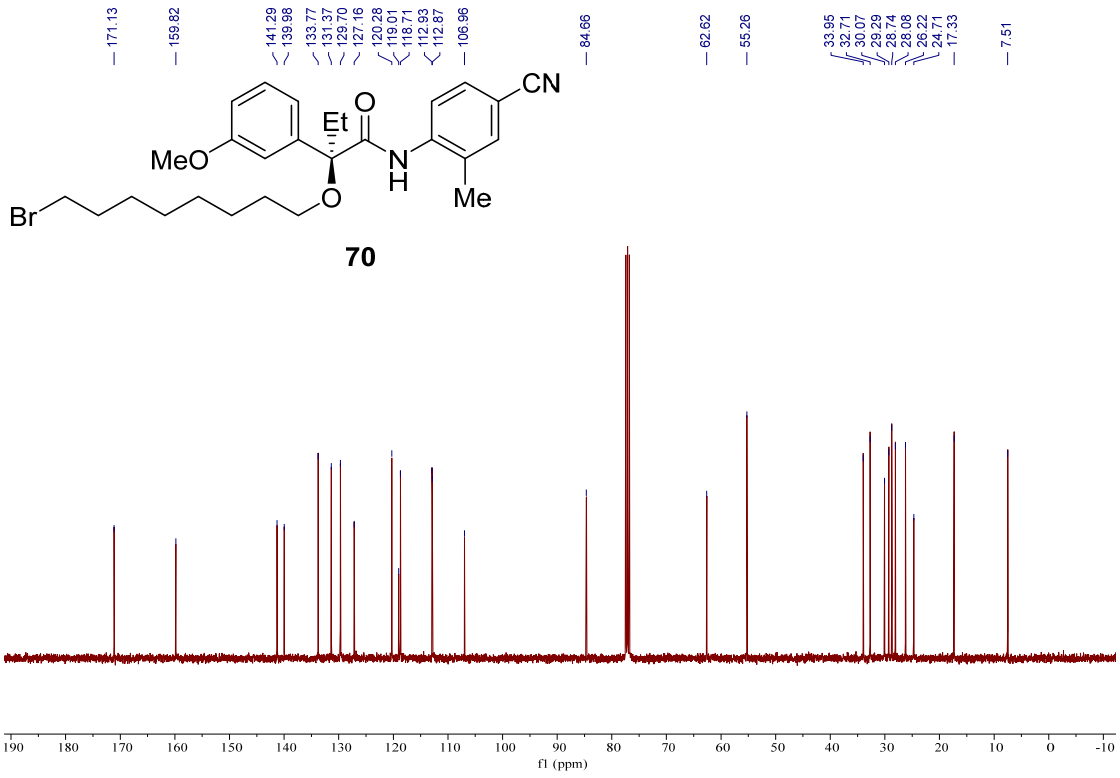

8.91
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7.48
7.46
7.43
7.42
7.40
7.38
7.37
7.36
7.34
3.70
3.69
3.68
3.67
3.67
3.66
3.66
3.64
3.46
3.45
3.44
3.44
3.43
3.41
3.00
2.98
2.97
2.95
2.93
2.66
2.65
2.64
2.63
2.62
2.60
2.60
2.59
2.58
2.57
2.56
2.55
2.53
2.53
2.52
2.36
1.17
1.16
1.14
1.12
iPr
O
N
H
CN
Me
NC
O
68
1.00
1.03
7.23
1.05
1.06
1.04
2.11
3.12
3.20
2.86
f1 (ppm)

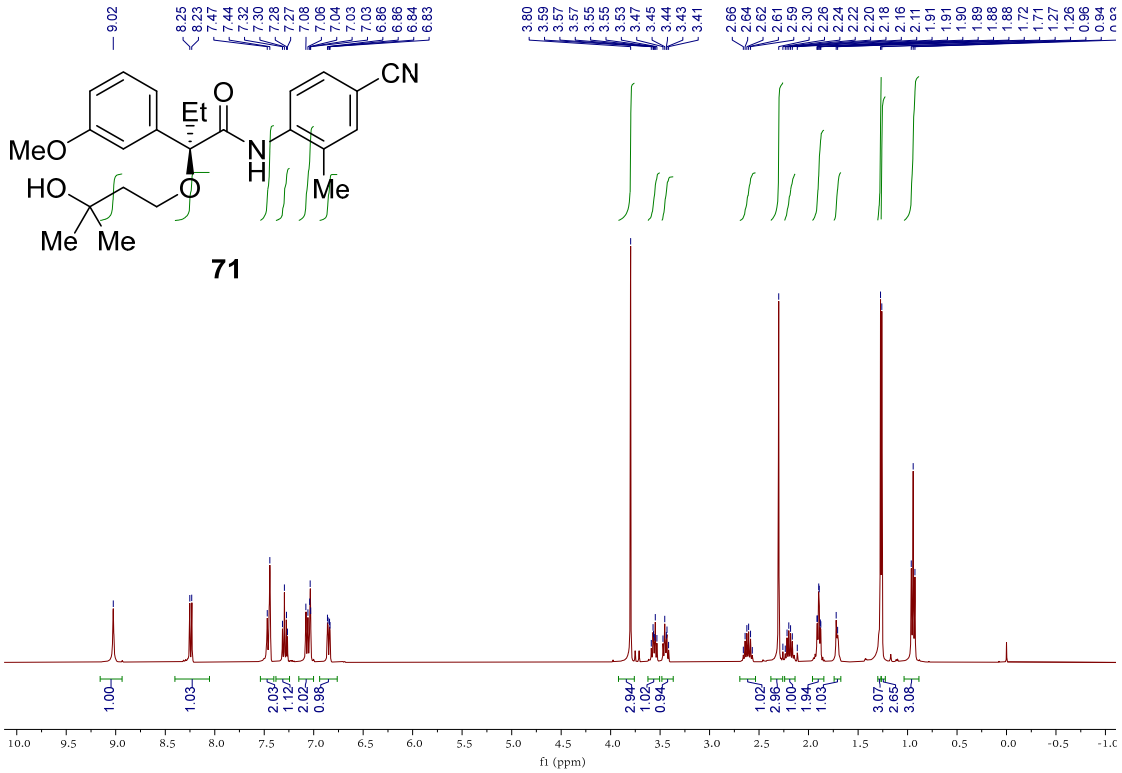

169.78
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133.95
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128.79
128.67
128.20
128.17
120.85
119.00
117.64
107.37
88.61
58.72
31.03
19.52
17.98
17.86
17.56
iPr
O
N
H
CN
Me
NC
O
68
f1 (ppm)

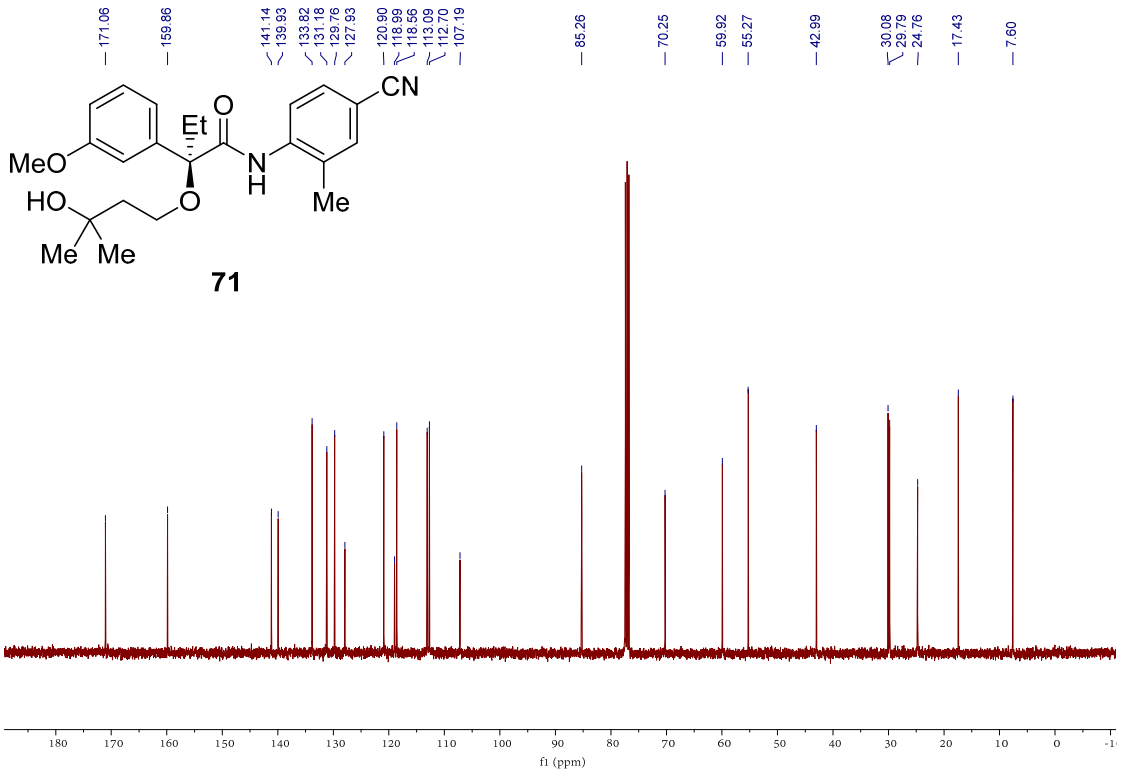

9.14
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7.36
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7.33
7.32
7.31
7.25
7.24
7.23
7.22
7.22
7.20
7.18
7.17
7.16
7.16
7.16
3.66
3.65
3.64
3.63
3.62
3.61
3.49
3.47
3.46
3.45
3.44
3.14
3.13
3.11
2.96
2.95
2.93
2.91
2.90
2.88
2.86
2.33
1.12
1.10
1.08
1.07
CN
O
iPr
N
H
Me
Ph
S
O
69
1.00
1.09
4.01
3.16
4.93
1.05
1.01
1.99
1.09
3.04
2.90
2.96
f1 (ppm)

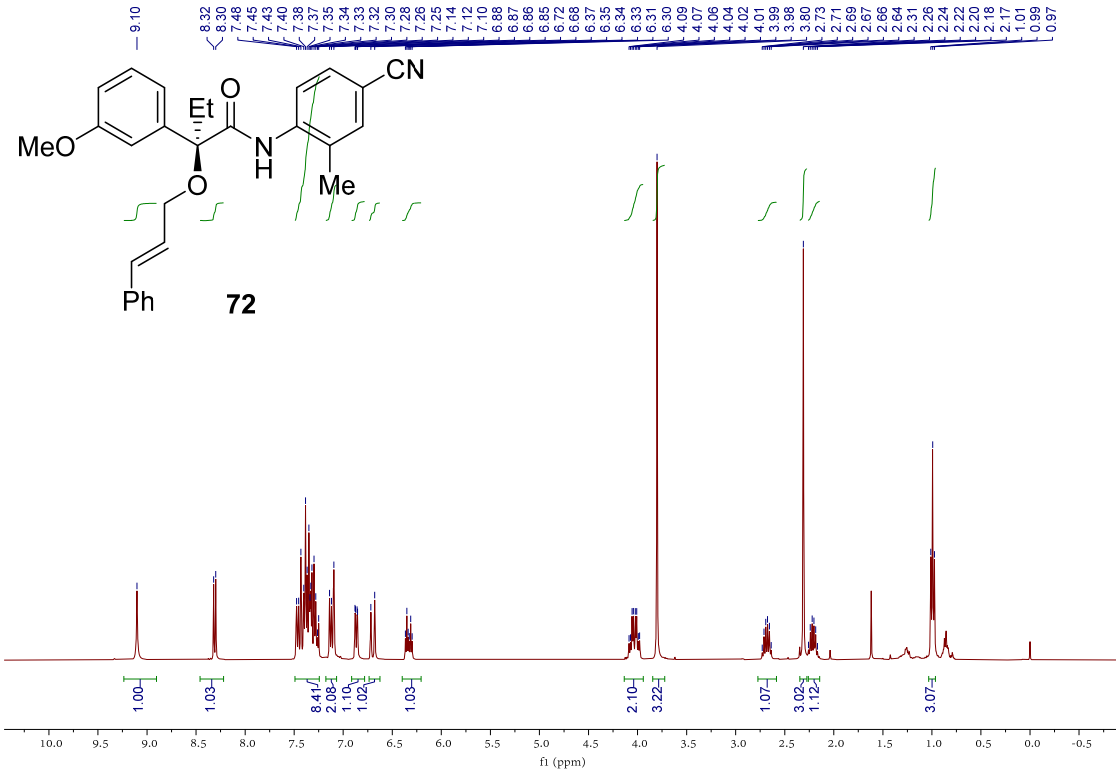

170.52
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135.38
133.90
131.13
129.22
128.10
128.46
128.43
128.33
128.15
126.46
121.20
119.08
107.25
88.08
62.24
34.60
31.89
17.93
17.77
CN
O
iPr
N
H
Me
Ph
S
O
69
f1 (ppm)

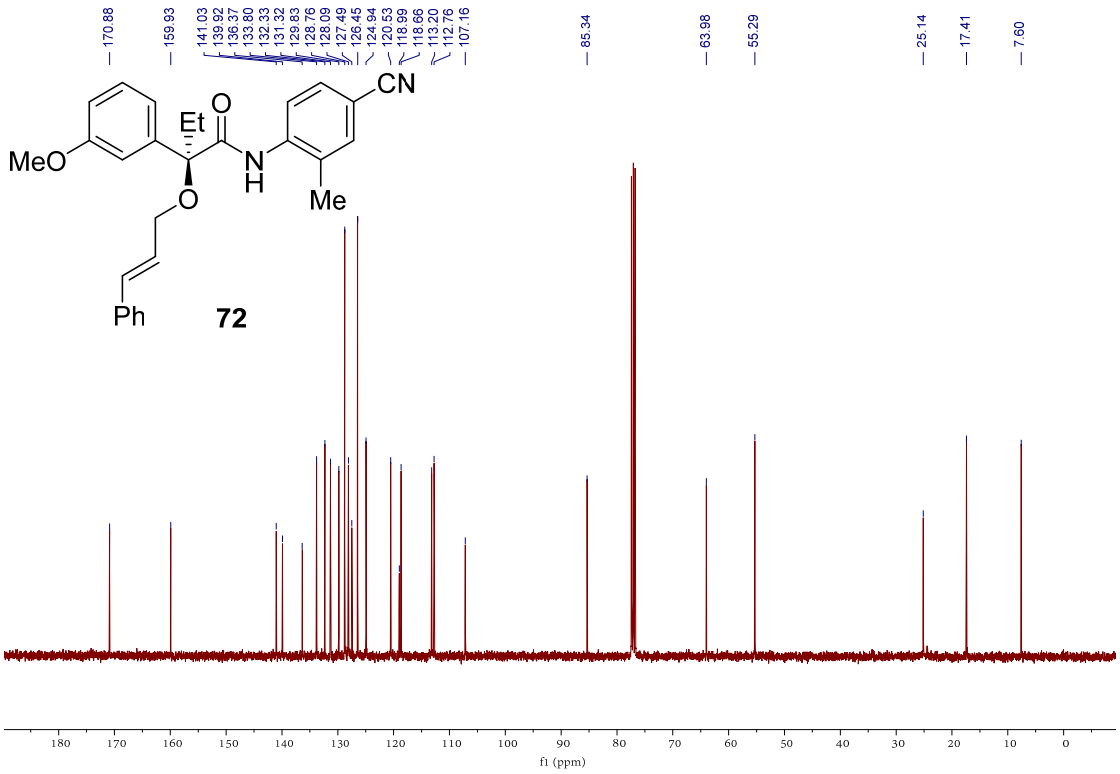

9.14
8.34
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7.48
7.46
7.32
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7.28
7.26
7.07
7.05
7.03
7.02
6.86
6.85
6.84
6.83
3.80
3.42
3.41
3.39
3.38
3.36
3.34
3.33
3.26
3.24
3.23
3.22
3.21
2.66
2.64
2.62
2.34
2.17
2.15
2.13
2.12
1.87
1.85
1.84
1.82
1.68
1.68
1.66
1.46
1.44
1.42
1.35
1.34
1.33
0.96
0.94
CN
O
Et
MeO
N
H
Me
Br
O
70
1.00
0.99
2.01
1.13
2.02
1.03
3.02
3.00
1.00
1.03
3.00
1.08
2.04
2.29
4.00
3.97
3.00
f1 (ppm)

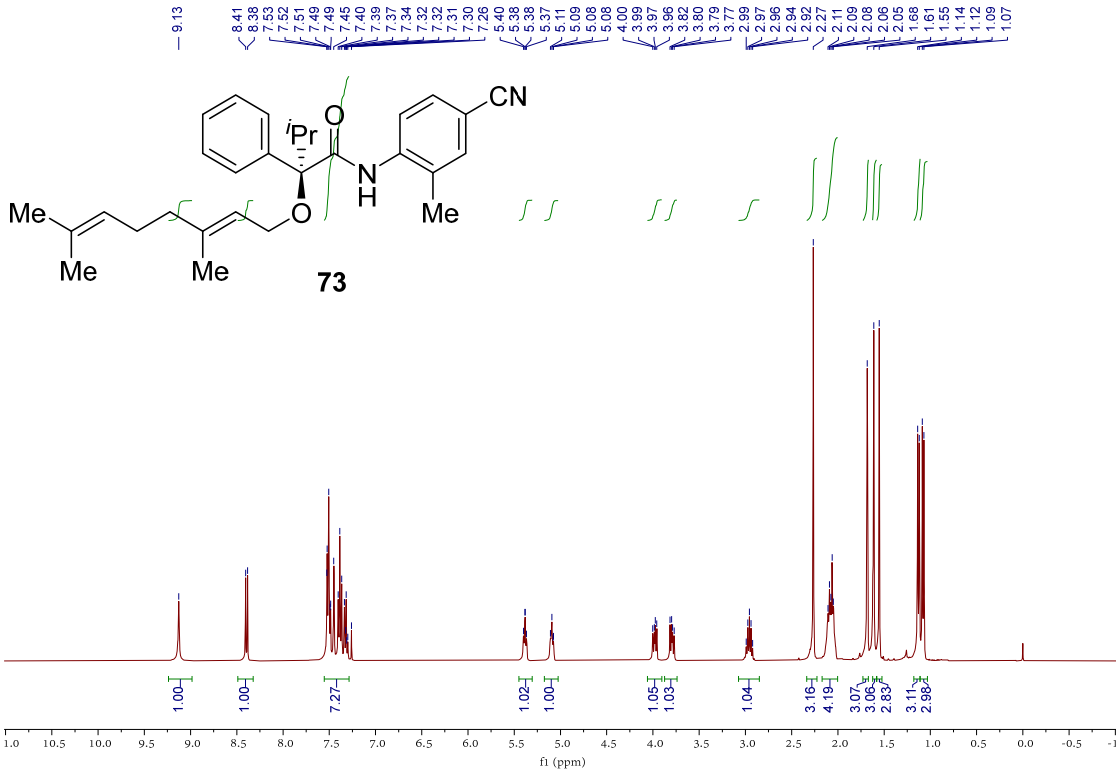

171.13
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131.37
129.70
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119.01
118.71
112.93
112.87
106.96
84.66
62.62
55.26
33.95
32.71
30.07
29.29
28.74
28.08
26.22
24.71
17.33
7.51
CN
O
Et
MeO
N
H
Me
Br
O
70
f1 (ppm)

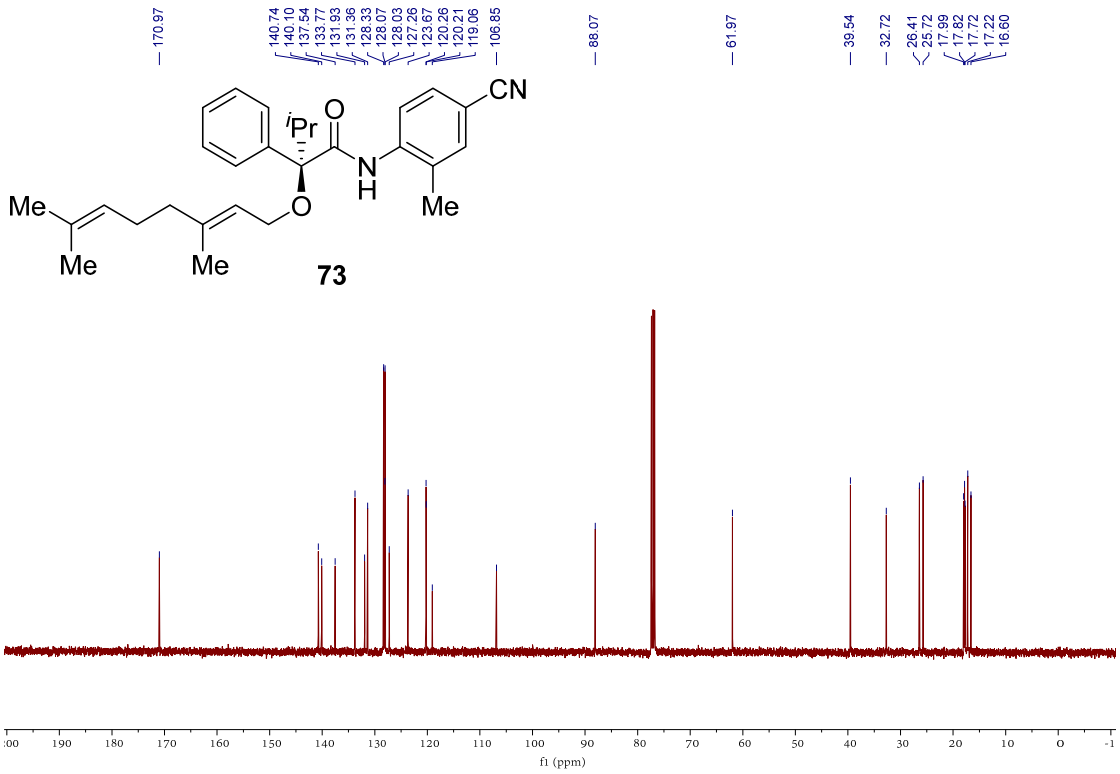

9.02
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7.44
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7.08
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7.04
7.03
7.03
6.86
6.84
6.83
3.80
3.59
3.57
3.57
3.55
3.55
3.53
3.47
3.45
3.44
3.43
3.41
2.66
2.64
2.62
2.61
2.59
2.30
2.26
2.24
2.22
2.20
2.18
2.16
2.11
1.91
1.91
1.90
1.89
1.88
1.88
1.72
1.71
1.27
1.26
0.96
0.94
Et
O
N
H
CN
MeO
HO
O
Me
Me
Me
71
1.00
1.03
2.03
1.12
2.02
0.98
2.94
1.02
0.94
1.02
2.96
1.00
1.94
1.03
3.07
2.65
3.08
f1 (ppm)

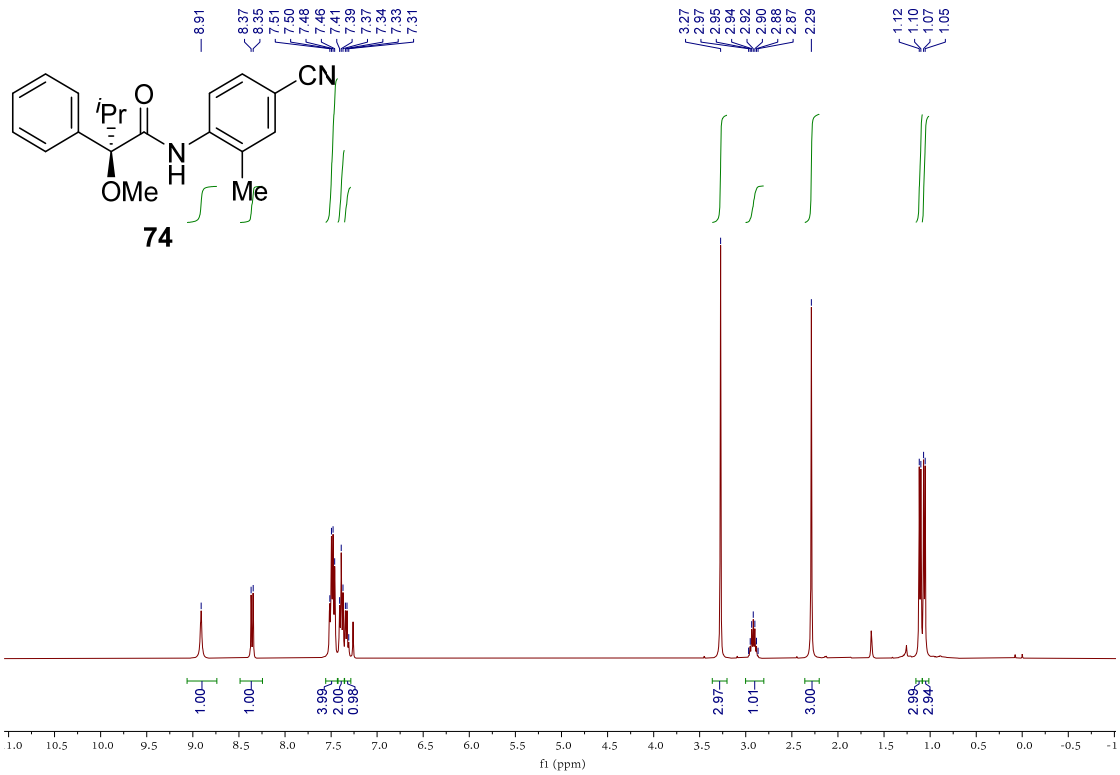

171.06
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131.18
129.76
127.93
120.90
118.99
118.56
113.09
112.70
107.19
85.26
70.25
59.92
55.27
42.99
30.08
29.79
24.76
17.43
7.60
Et
O
N
H
CN
MeO
HO
O
Me
Me
Me
71
f1 (ppm)

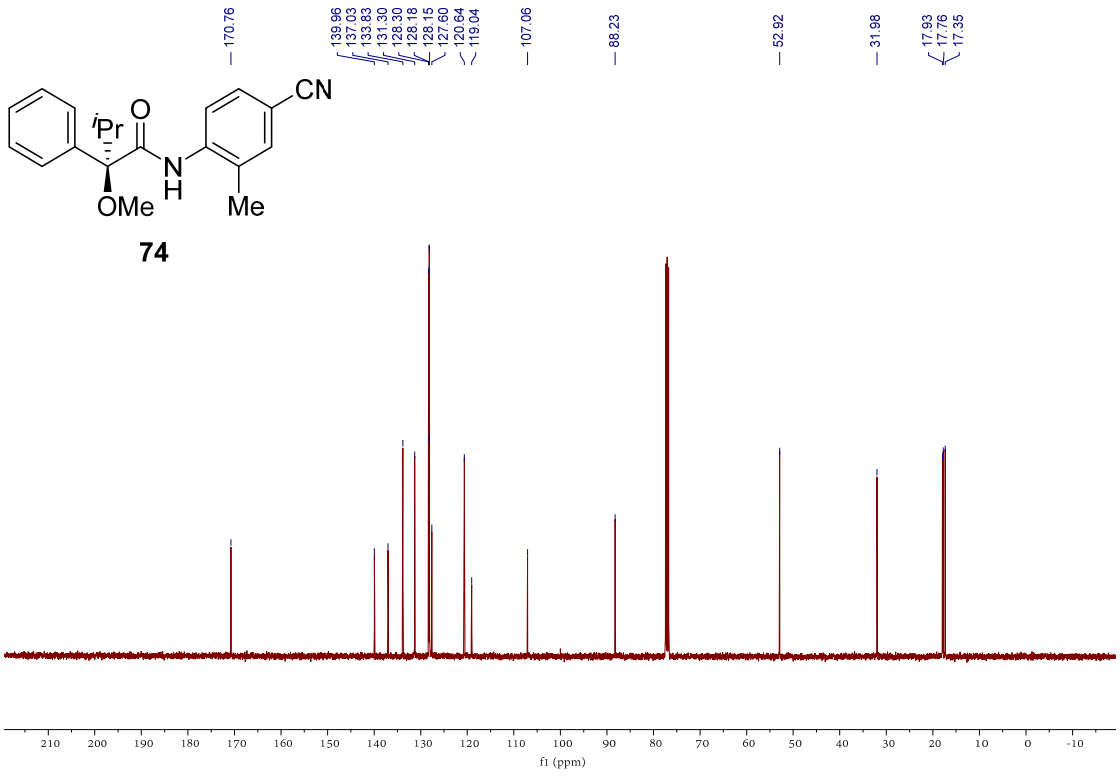

MeO
Et
O
N
H
CN
Me
O
Ph
72
f1 (ppm)

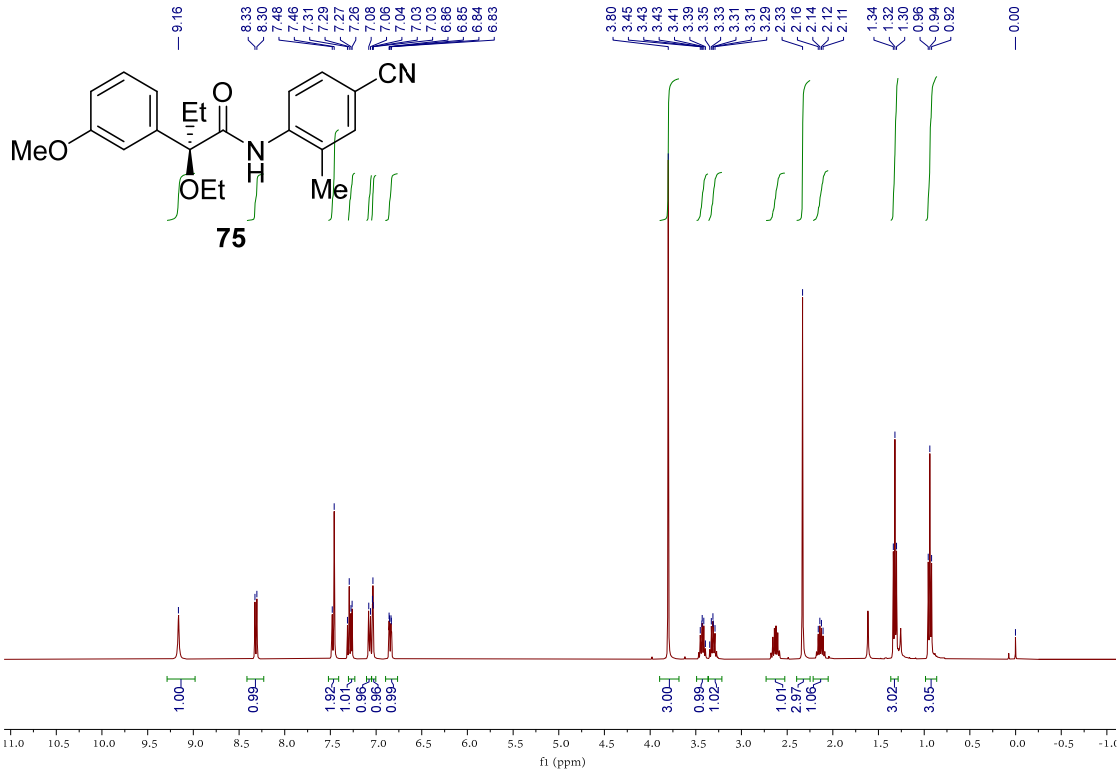

MeO
Et
O
N
H
CN
Me
O
Ph
72
f1 (ppm)

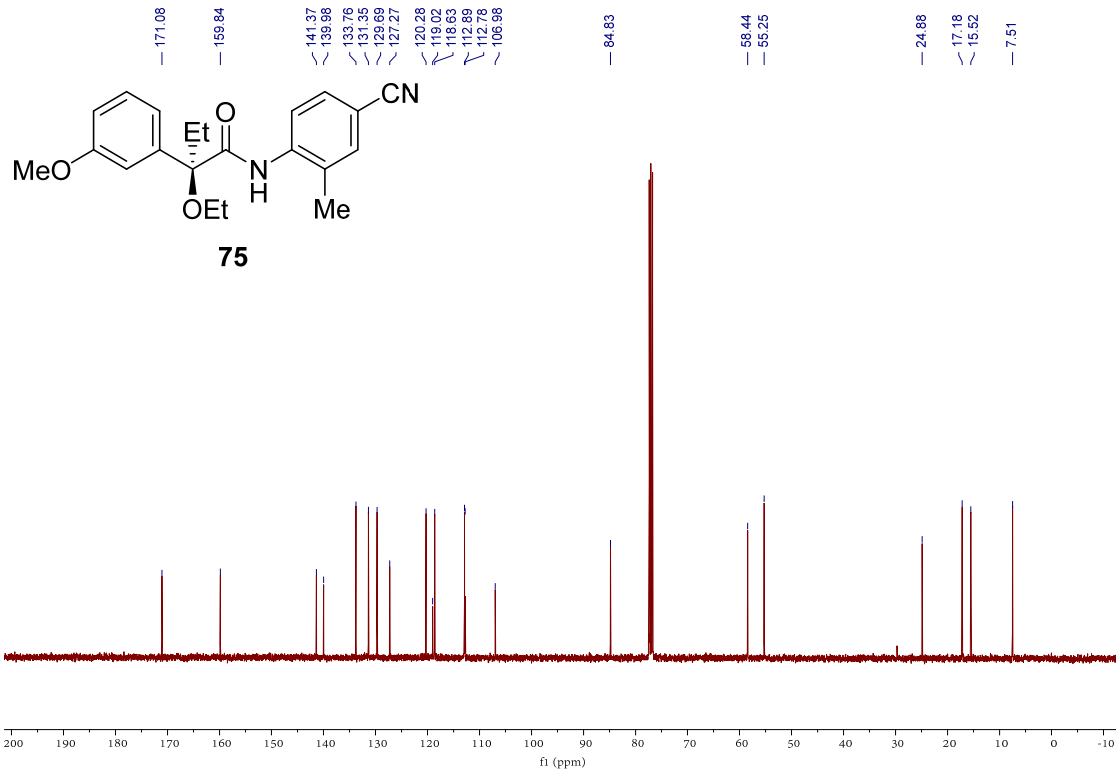

9.13
8.41
8.38
7.53
7.52
7.51
7.49
7.49
7.45
7.40
7.39
7.37
7.34
7.32
7.31
7.30
7.26
5.40
5.38
5.38
5.37
5.11
5.09
5.08
5.08
4.00
3.99
3.97
3.96
3.82
3.80
3.79
3.77
2.99
2.97
2.96
2.94
2.92
2.27
2.11
2.09
2.08
2.06
2.05
1.68
1.61
1.55
1.14
1.12
1.09
1.07
iPr
O
N
H
CN
Me
Me
Me
O
73
1.00
1.00
7.27
1.02
1.00
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1.04
3.16
4.19
3.07
3.06
2.83
3.11
2.98
f1 (ppm)

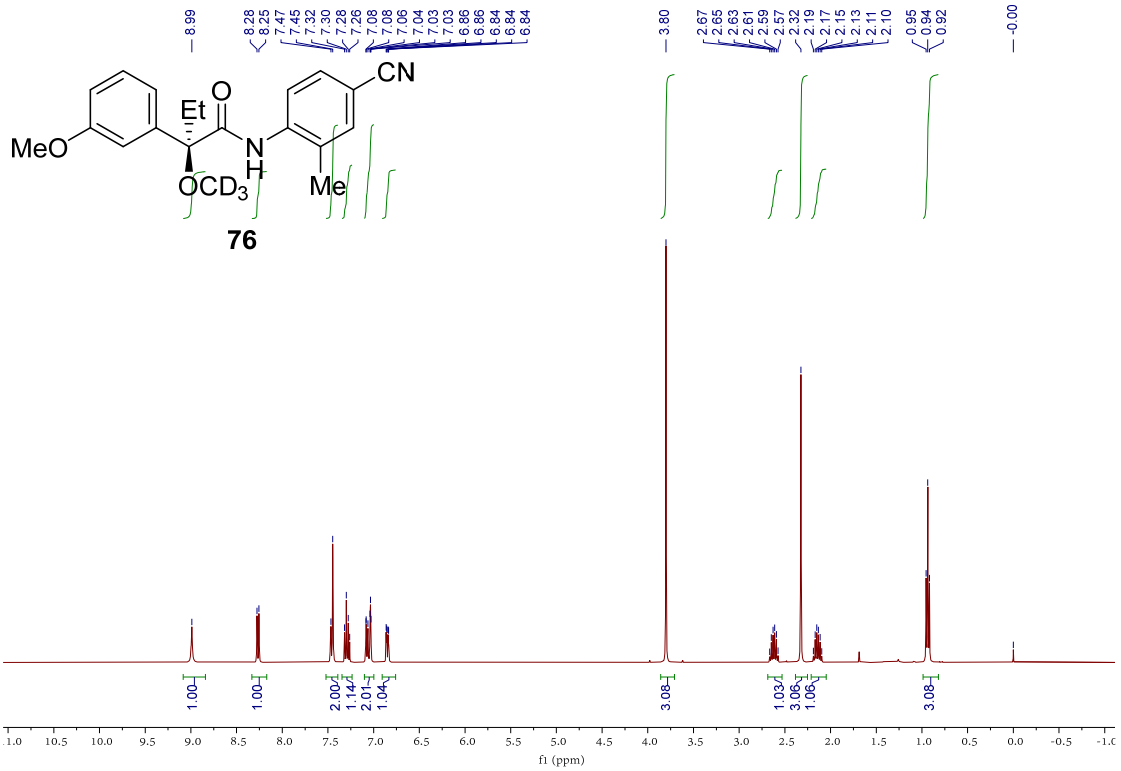

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140.74
140.10
137.54
133.77
131.93
131.36
128.33
128.07
128.03
127.26
123.67
120.26
120.21
119.06
106.85
88.07
61.97
39.54
32.72
26.41
25.72
17.99
17.82
17.72
17.22
16.60
iPr
O
N
H
CN
Me
Me
Me
O
73
f1 (ppm)


8.91
8.37
8.35
7.51
7.50
7.48
7.46
7.41
7.39
7.37
7.34
7.33
7.31
3.27
2.97
2.95
2.94
2.92
2.90
2.88
2.87
2.29
1.12
1.10
1.07
1.05
CN
O
iPr
N
H
OMe
Me
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2.00
0.98
2.97
1.01
3.00
2.99
2.94
f1 (ppm)

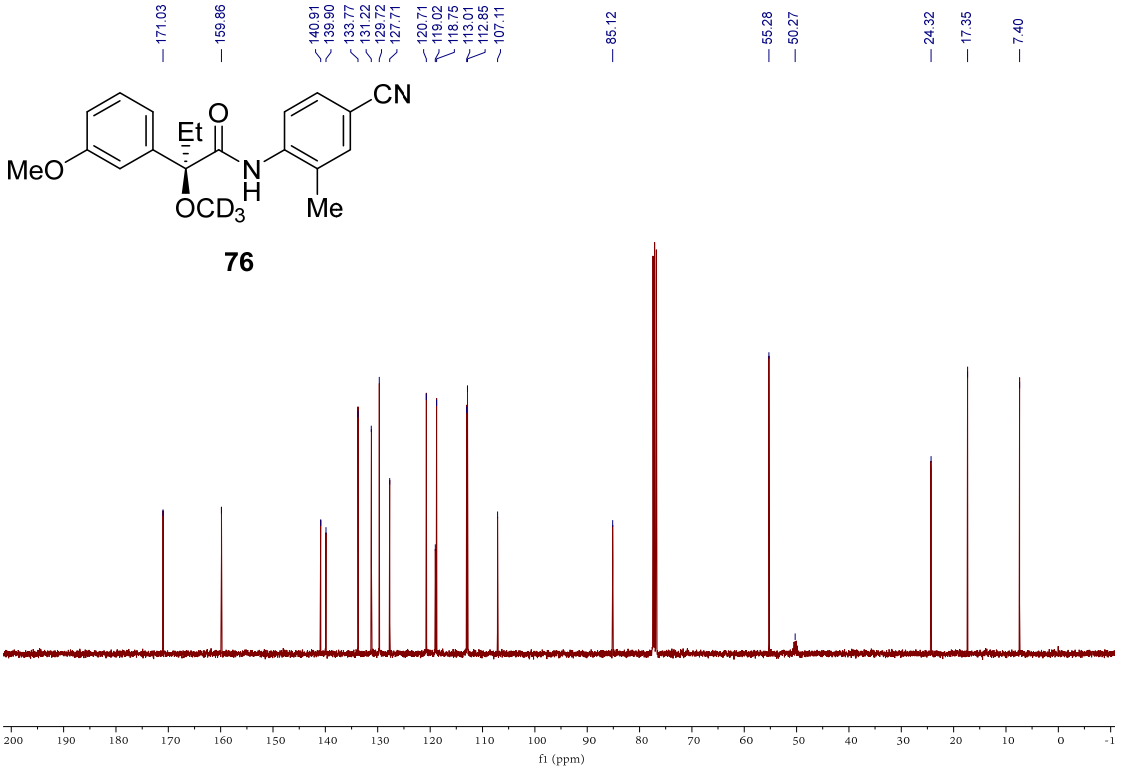

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133.83
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128.30
128.18
128.15
127.60
120.64
119.04
107.06
88.23
52.92
31.98
17.93
17.76
17.35
CN
O
iPr
N
H
OMe
Me
74
f1 (ppm)


9.16
8.33
8.30
7.48
7.46
7.31
7.29
7.27
7.26
7.08
7.06
7.04
7.03
7.03
6.86
6.85
6.84
6.83
3.80
3.45
3.43
3.43
3.41
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3.31
3.29
2.33
2.16
2.14
2.12
2.11
1.34
1.32
1.30
0.96
0.94
0.92
0.00
CN
O
Et
MeO
N
H
OEt
Me
75
1.00
0.99
1.92
1.01
0.96
0.96
0.99
3.00
0.99
1.02
1.01
2.97
1.06
3.02
3.05
f1 (ppm)

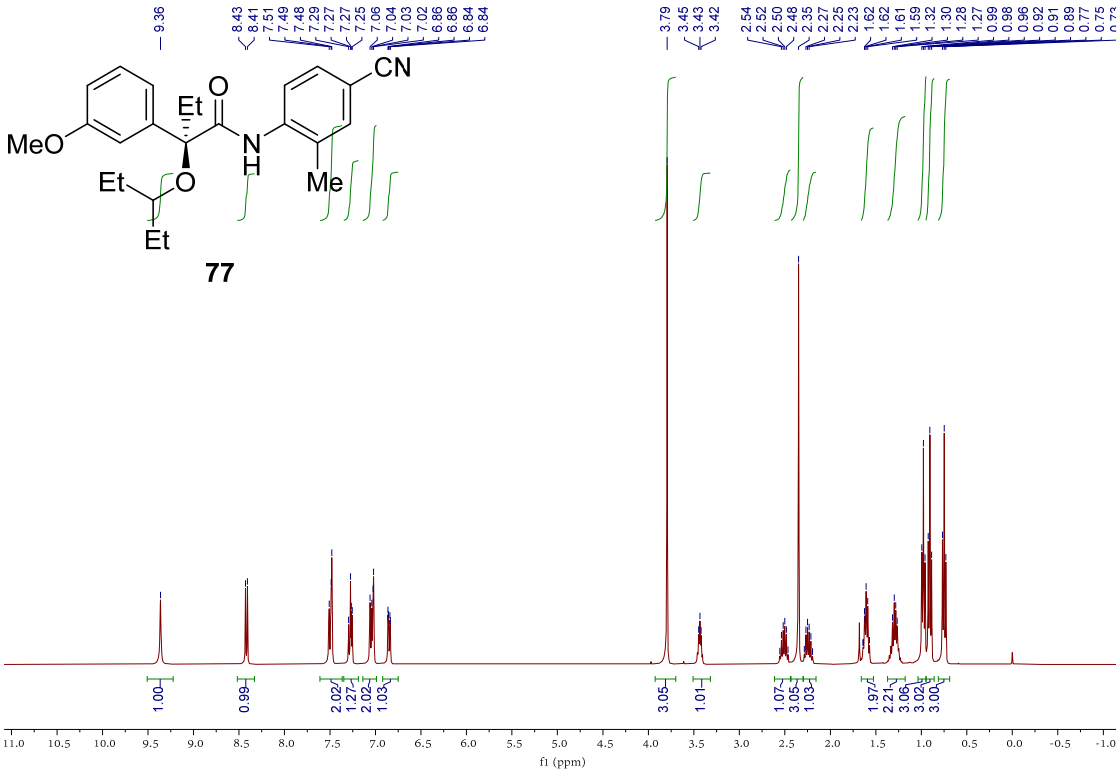

171.08
159.84
141.37
139.98
133.76
131.35
129.69
127.27
120.28
119.02
118.63
112.89
112.78
106.98
84.83
58.44
55.25
24.88
17.18
15.52
7.51
CN
O
Et
MeO
N
H
OEt
Me
75
f1 (ppm)

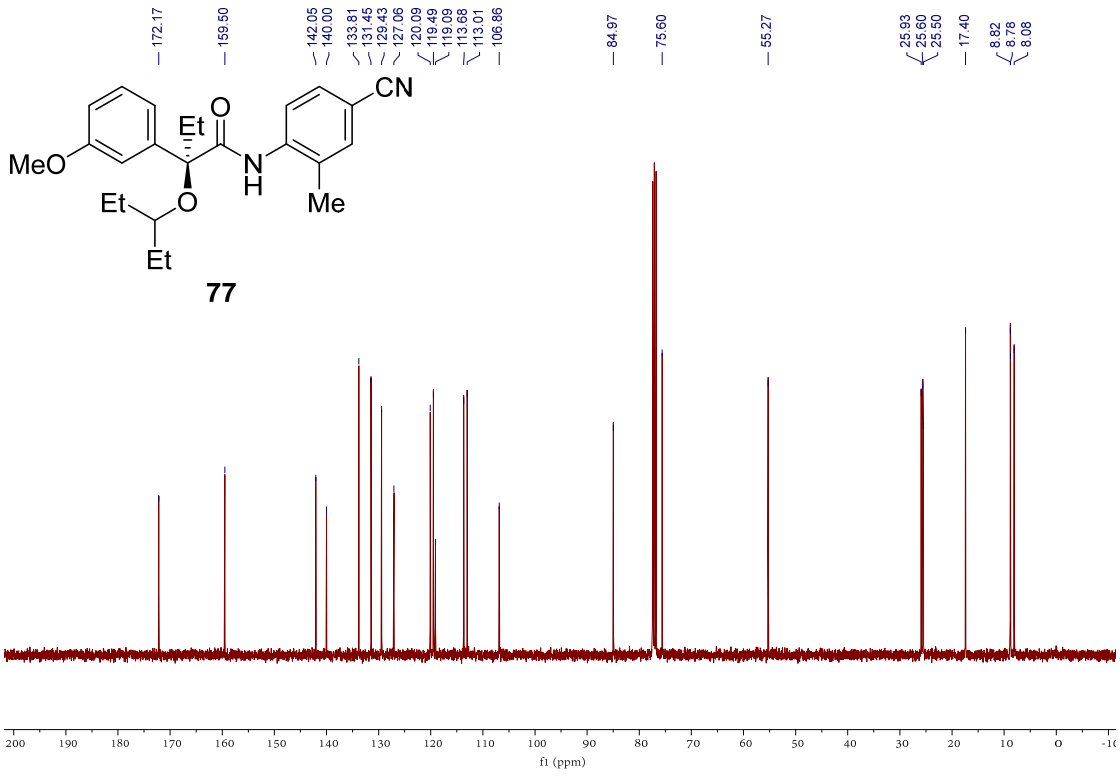

8.99
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7.30
7.28
7.26
7.08
7.08
7.06
7.04
7.03
7.03
6.86
6.86
6.84
6.84
6.84
3.80
2.67
2.65
2.63
2.61
2.59
2.57
2.32
2.19
2.17
2.15
2.13
2.11
2.10
0.95
0.94
0.92
-0.00
CN
Et
O
MeO
N
H
OCD3
Me
1.00
1.00
2.00
1.14
2.01
1.04
3.08
1.03
3.06
1.06
3.08
f1 (ppm)

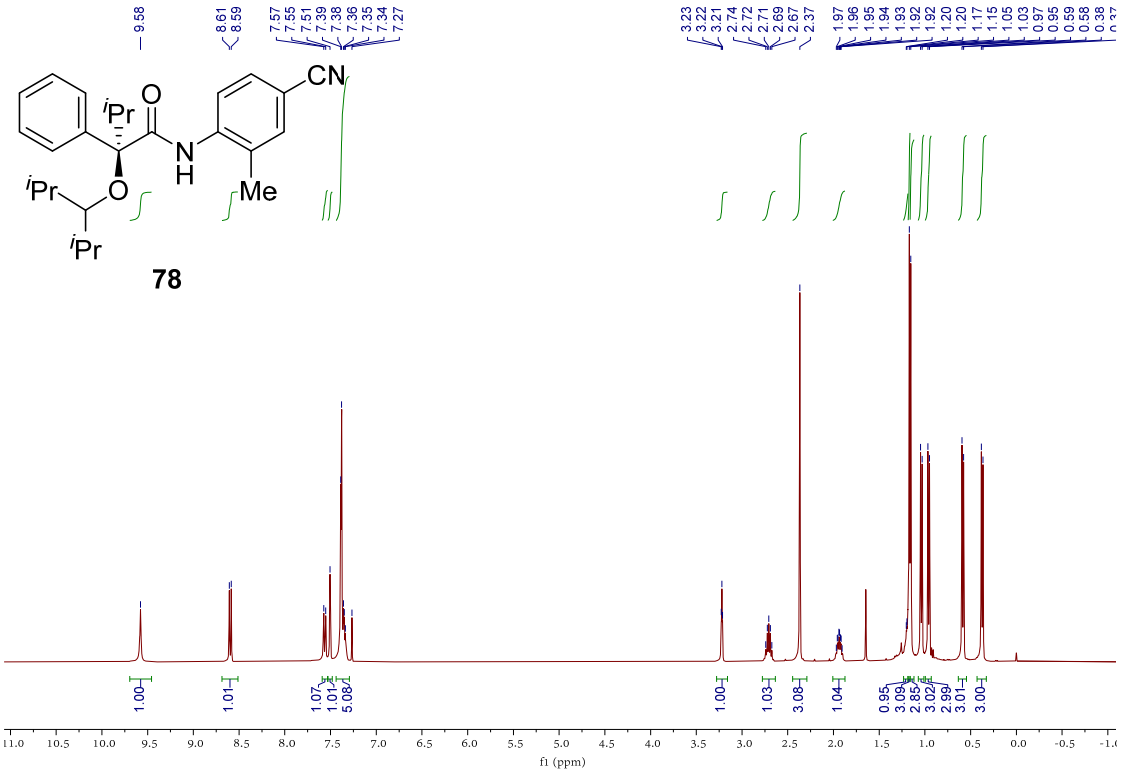
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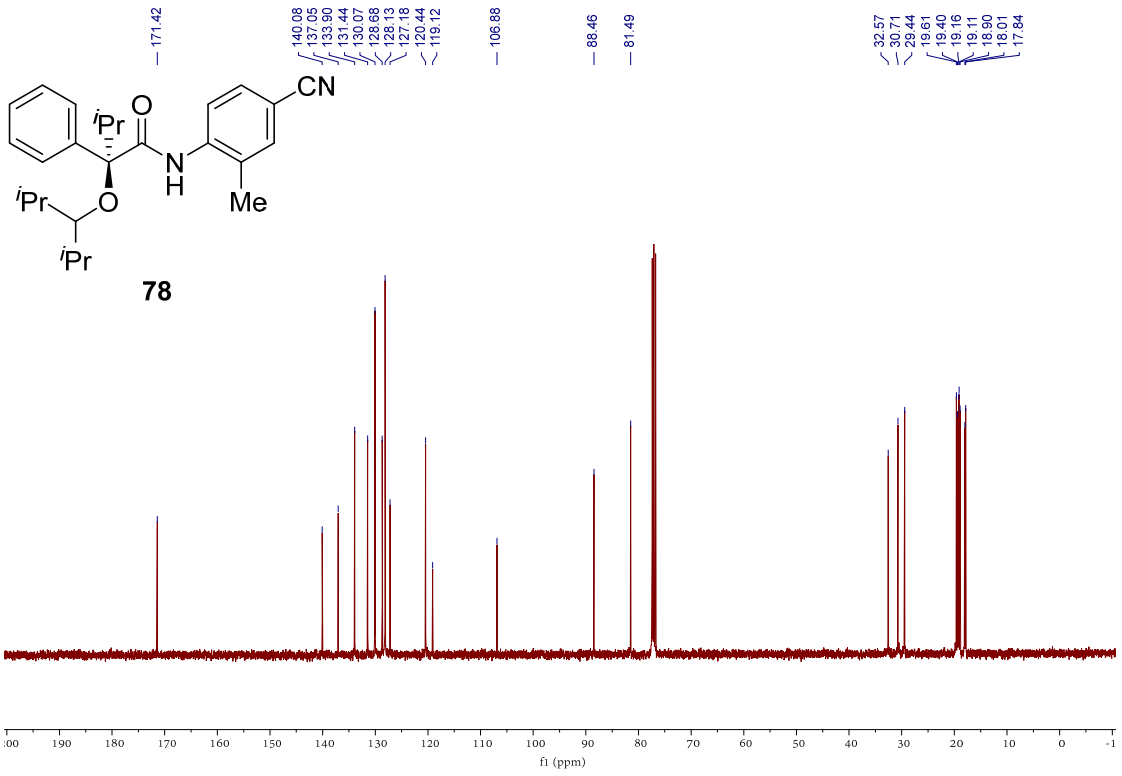

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159.86
140.91
139.90
133.77
131.22
129.72
127.71
120.71
119.02
118.75
113.01
112.85
107.11
85.12
55.28
50.27
24.32
17.35
7.40
CN
Et
O
MeO
N
H
OCD3
Me
f1 (ppm)

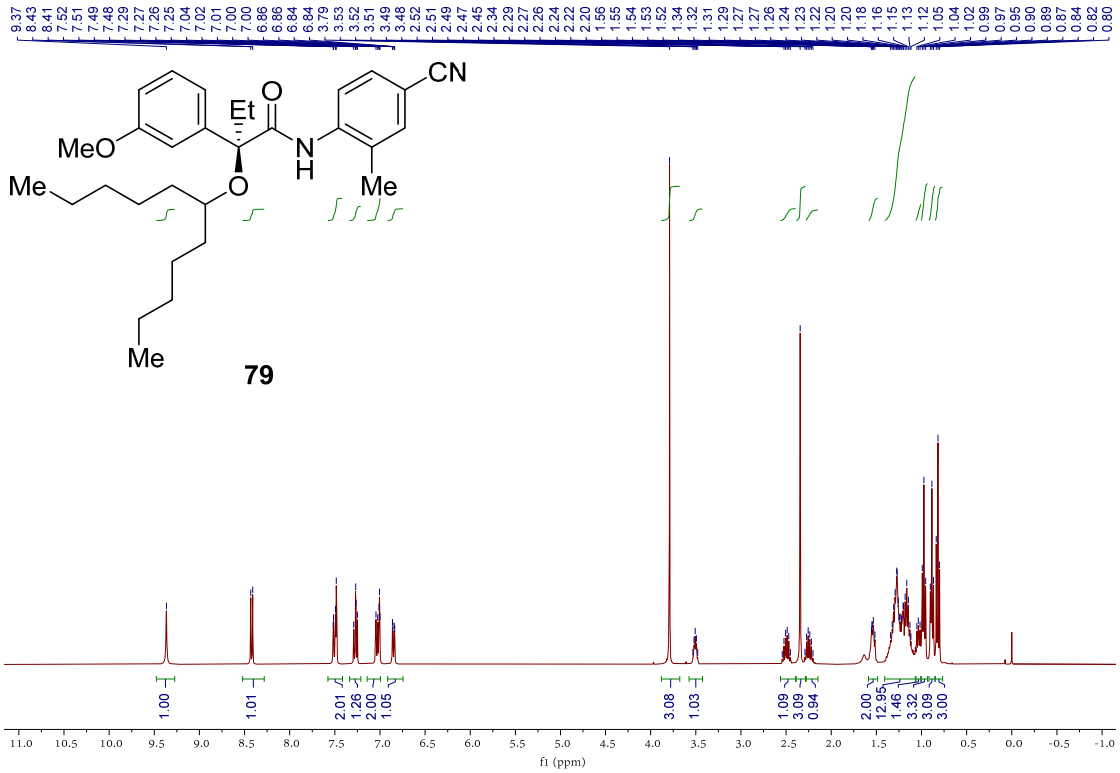
76

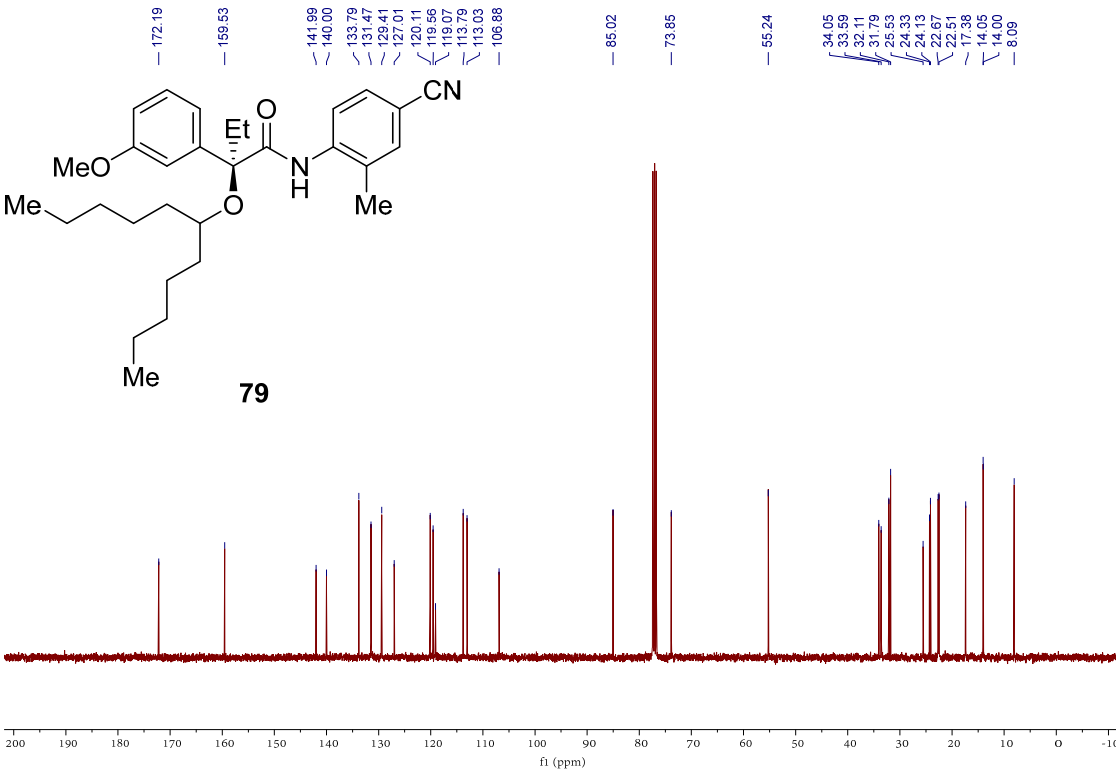

9.36
8.43
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7.48
7.29
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7.27
7.25
7.06
7.04
7.03
7.02
6.86
6.86
6.84
6.84
3.79
3.45
3.43
3.42
2.54
2.52
2.50
2.48
2.35
2.27
2.25
2.23
1.62
1.62
1.61
1.59
1.32
1.30
1.28
1.27
0.99
0.98
0.96
0.92
0.91
0.89
0.77
0.75
CN
O
Et
N
H
MeO
Et
O
Me
Et
77
1.00
0.99
2.02
1.27
2.02
1.03
3.05
1.01
1.07
3.05
1.03
1.97
2.21
3.06
3.02
3.00
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
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-1.0
f1 (ppm)

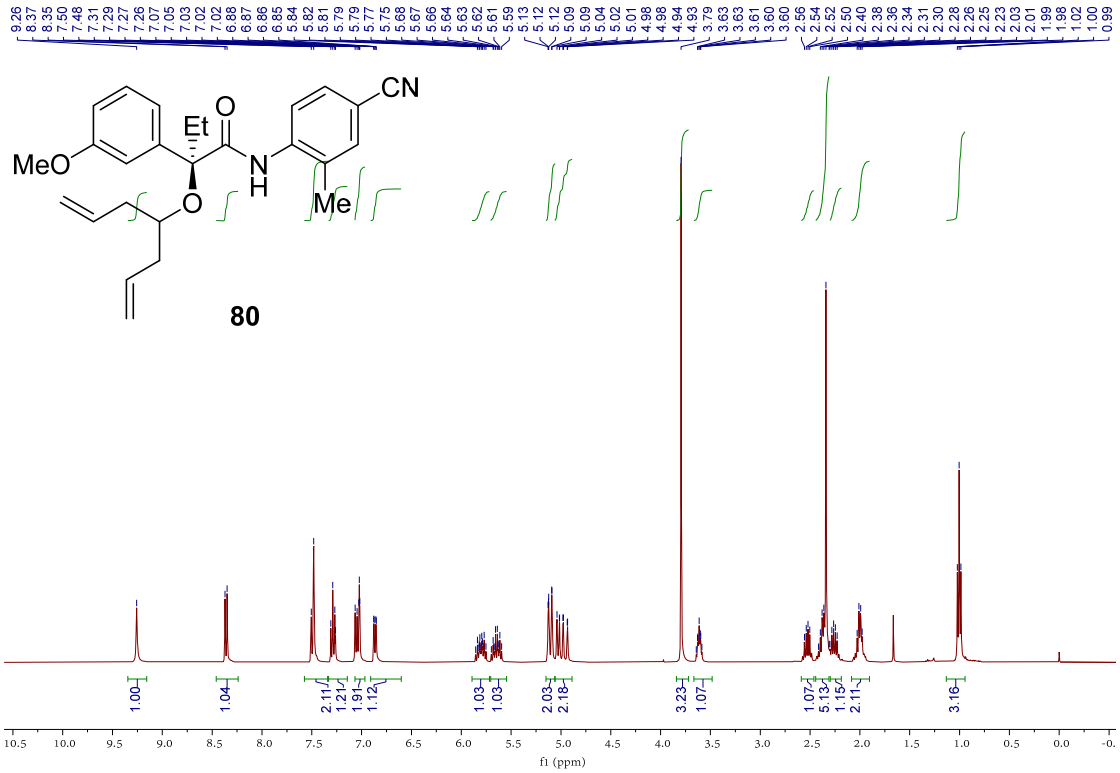

172.17
159.50
142.05
140.00
133.81
131.45
129.43
127.06
120.09
119.49
119.09
113.68
113.01
106.86
84.97
75.60
55.27
25.93
25.60
25.50
17.40
8.82
8.78
8.08
CN
O
Et
N
H
MeO
Et
O
Me
Et
77
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

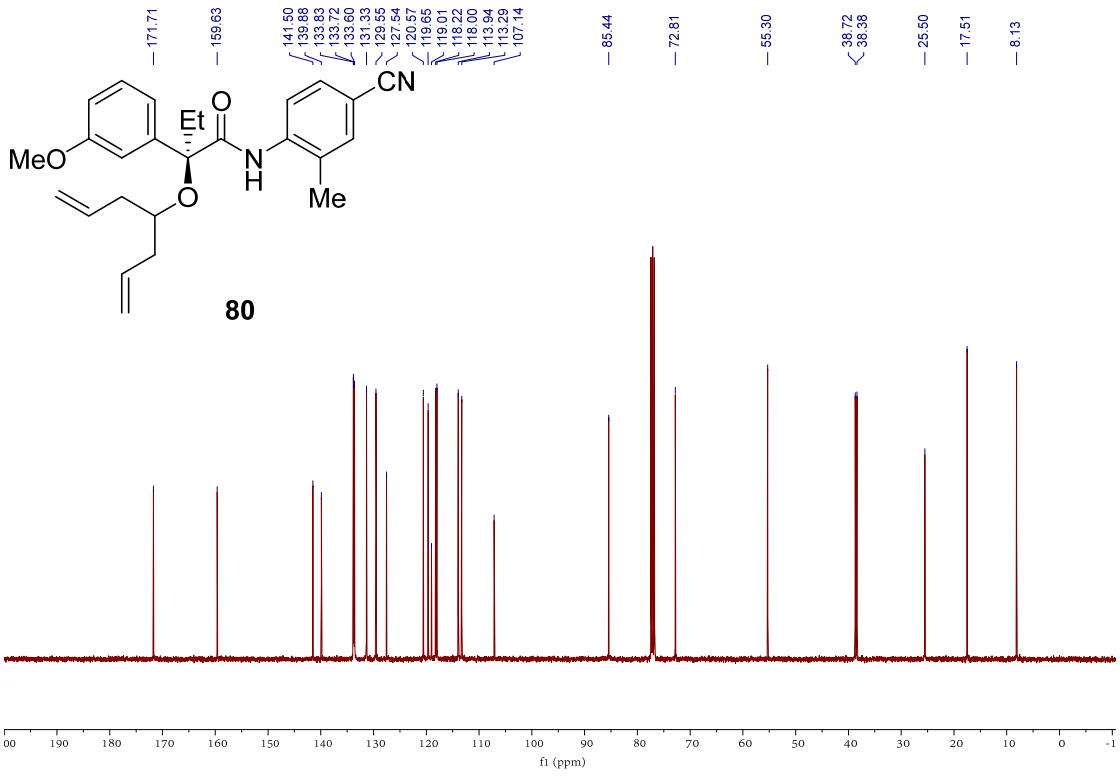

9.58
8.61
8.59
7.57
7.55
7.51
7.39
7.38
7.36
7.35
7.34
7.27
3.23
3.22
3.21
2.74
2.72
2.71
2.69
2.67
2.37
1.97
1.96
1.95
1.94
1.93
1.92
1.92
1.20
1.20
1.17
1.15
1.05
1.03
0.97
0.95
0.59
0.58
0.38
CN
O
iPr
N
H
Me
iPr
O
iPr
78
1.00
1.01
1.07
1.01
5.08
1.00
1.03
3.08
1.04
0.95
3.09
2.85
3.02
2.99
3.01
3.00
f1 (ppm)

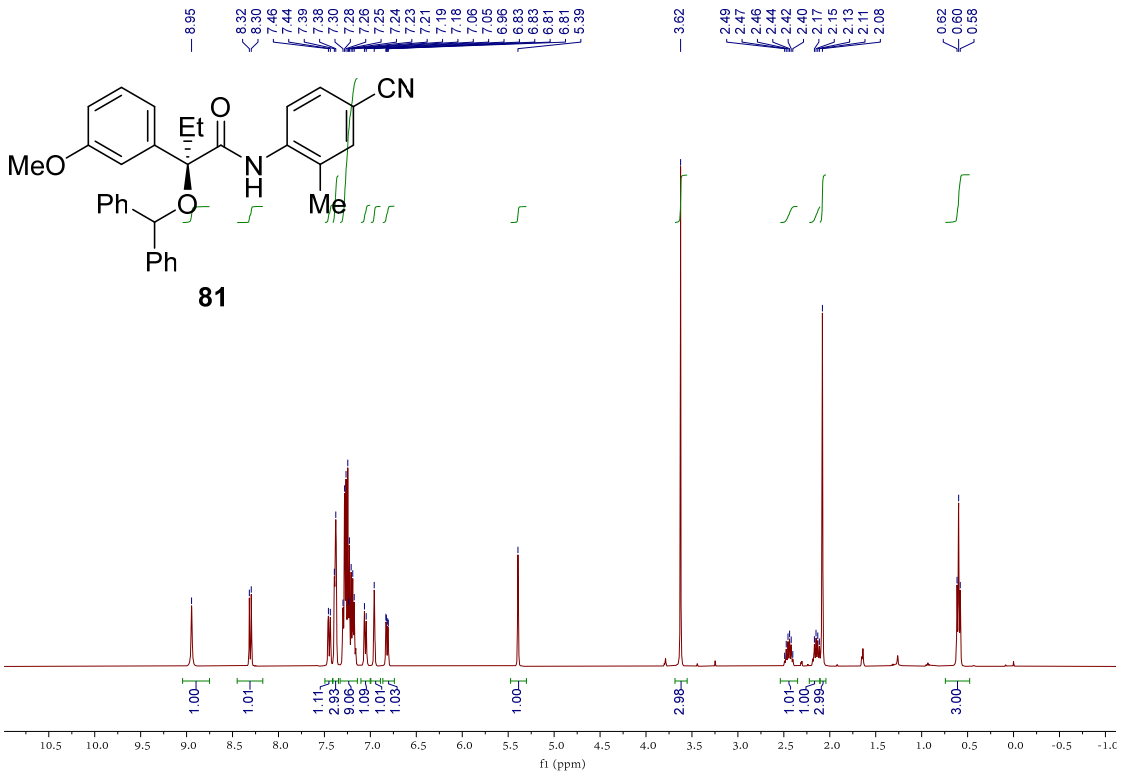

171.42
140.08
137.05
133.90
131.44
130.07
128.68
128.13
127.18
120.44
119.12
106.88
88.46
81.49
32.57
30.71
29.44
19.61
19.40
19.16
19.11
18.90
18.01
17.84
CN
O
iPr
N
H
Me
iPr
O
iPr
78
f1 (ppm)

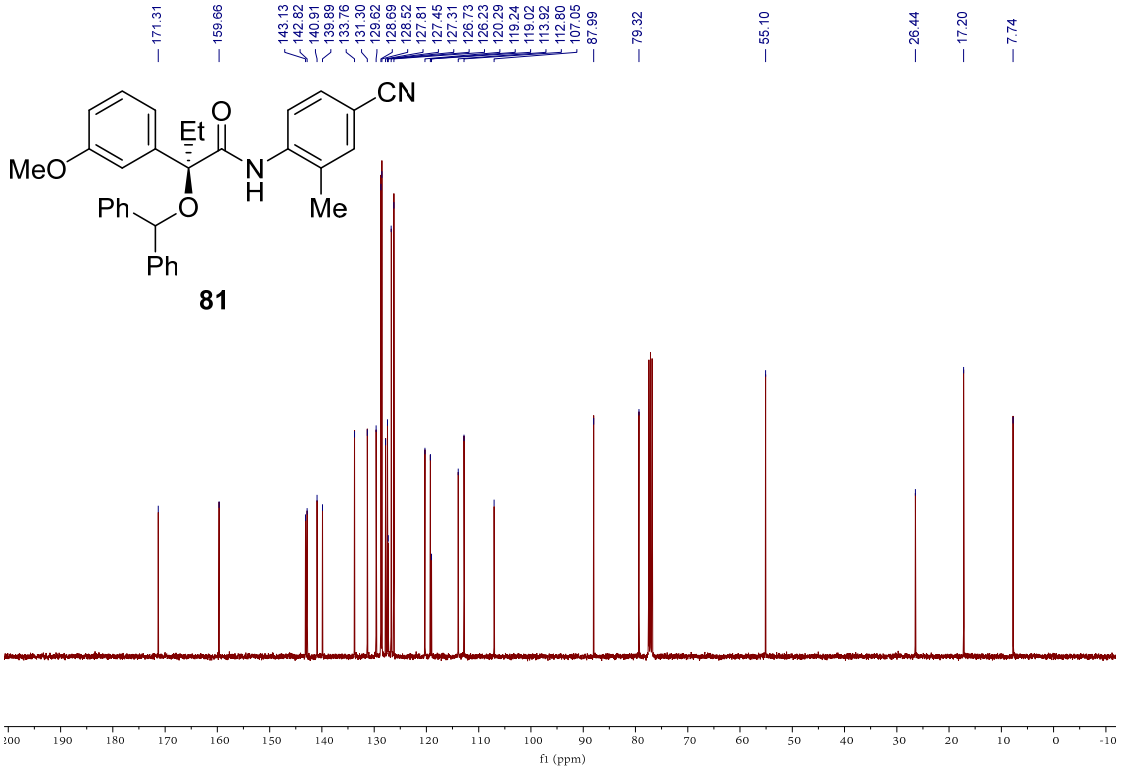

MeO
Et
O
N
H
CN
Me
O
Me
Me
79

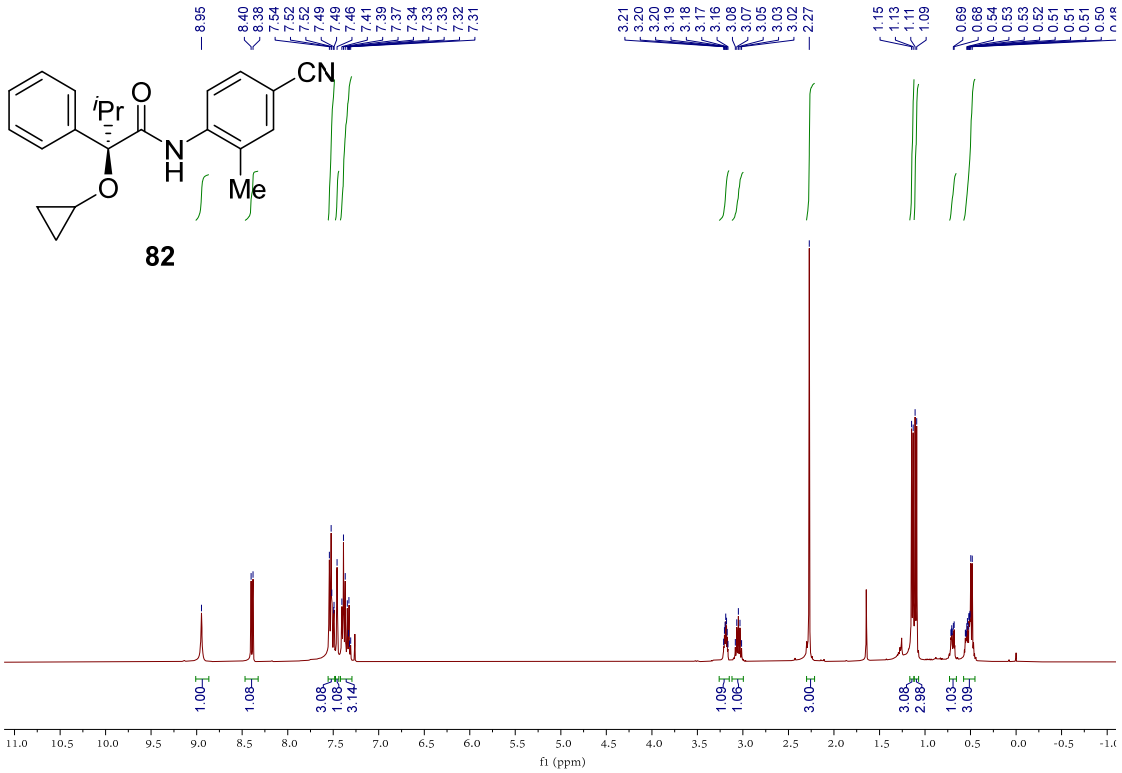

MeO
Et
O
N
H
CN
Me
O
Me
Me
79

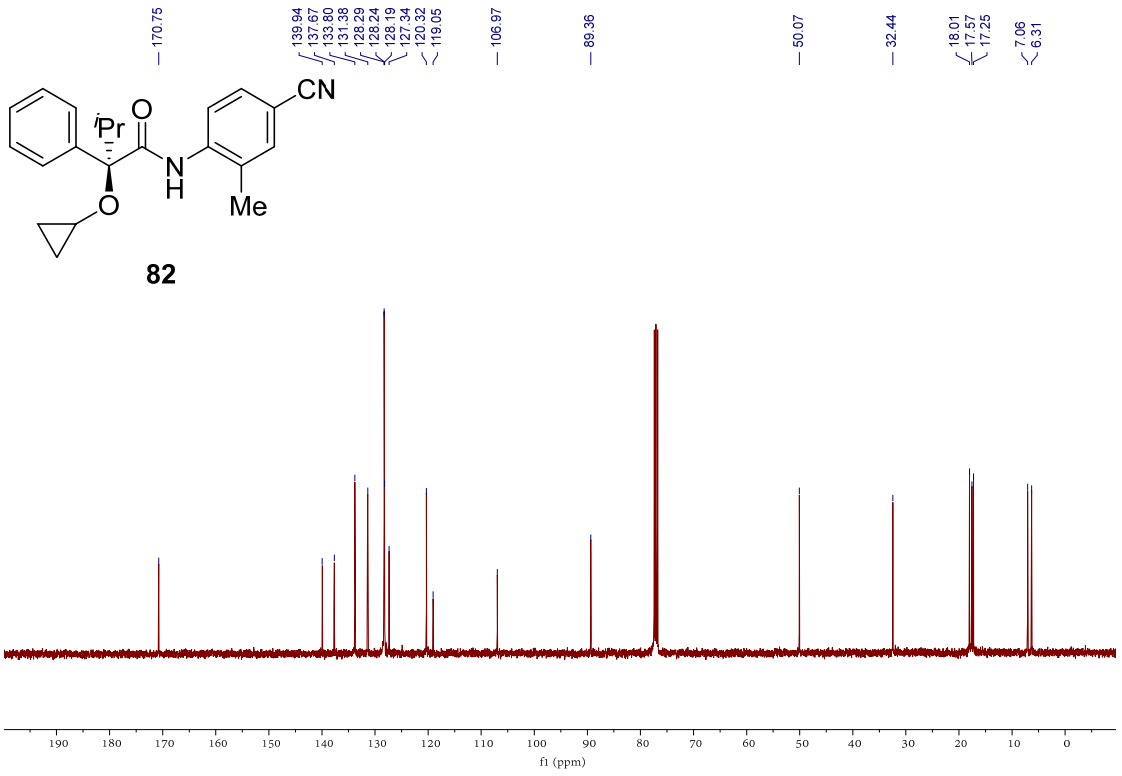

9.26 8.37 8.35 7.50 7.48 7.31 7.29 7.27 7.26 7.07 7.05 7.03 7.02 7.02 6.88 6.87 6.86 6.85 5.84 5.82 5.81 5.79 5.79 5.77 5.75 5.68 5.67 5.66 5.64 5.63 5.62 5.61 5.59 5.13 5.12 5.12 5.09 5.09 5.04 5.02 5.01 4.98 4.98 4.94 4.93 3.79 3.63 3.63 3.61 3.60 3.60 2.56 2.54 2.52 2.50 2.40 2.38 2.36 2.34 2.31 2.30 2.28 2.26 2.25 2.23 2.03 2.01 1.99 1.98 1.02 1.00 0.99
MeO
Et
O
N
H
CN
Me
O
80
1.00 1.04 2.11 1.21 1.91 1.12 1.03 1.03 2.03 2.18 3.23 1.07 1.07 5.13 1.15 2.11 3.16
f1 (ppm)

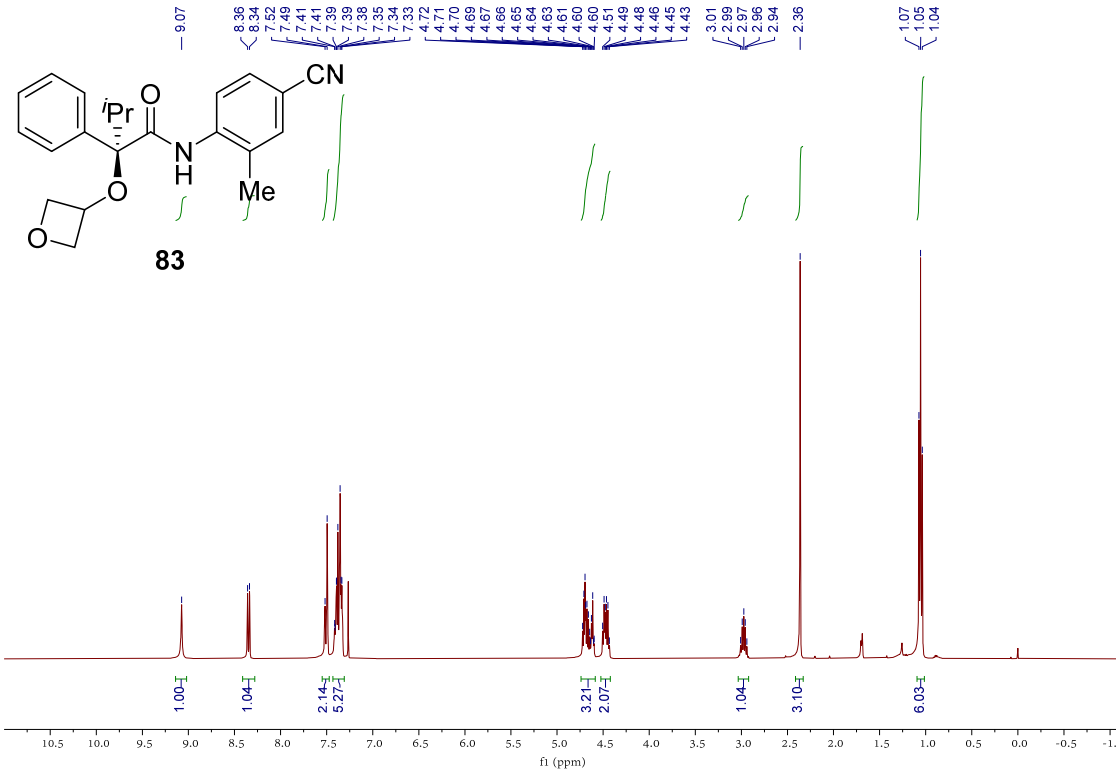

171.71 159.63 141.50 139.88 133.83 133.72 133.60 131.33 129.55 127.54 120.57 119.65 119.01 118.22 118.00 113.94 113.29 107.14 85.44 72.81 55.30 38.72 38.38 25.50 17.51 8.13
MeO
Et
O
N
H
CN
Me
O
80
f1 (ppm)

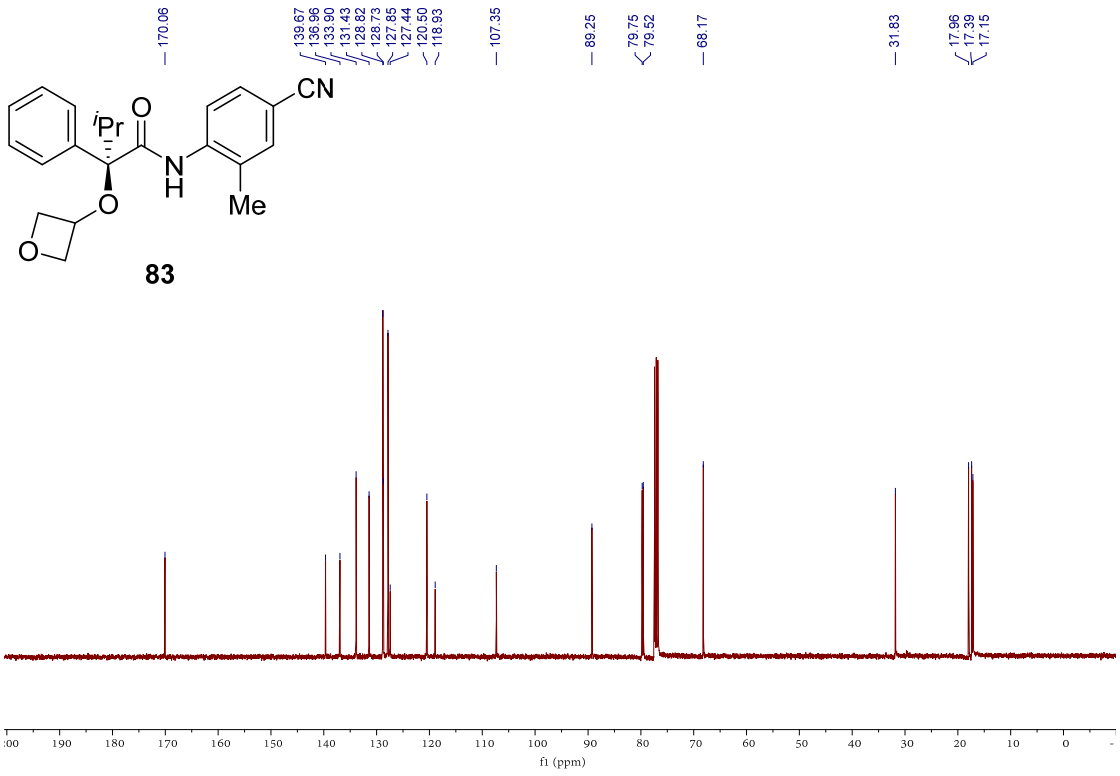

8.95
8.32
8.30
7.46
7.44
7.39
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7.26
7.25
7.24
7.23
7.21
7.19
7.18
7.06
7.05
6.96
6.83
6.83
6.81
6.81
5.39
3.62
2.49
2.47
2.46
2.44
2.42
2.40
2.17
2.15
2.13
2.11
2.08
0.62
0.60
0.58
CN
O
Et
MeO
N
H
Ph
O
Me
Ph
81
1.00
1.01
1.11
2.93
9.06
1.09
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2.99
3.00
f1 (ppm)

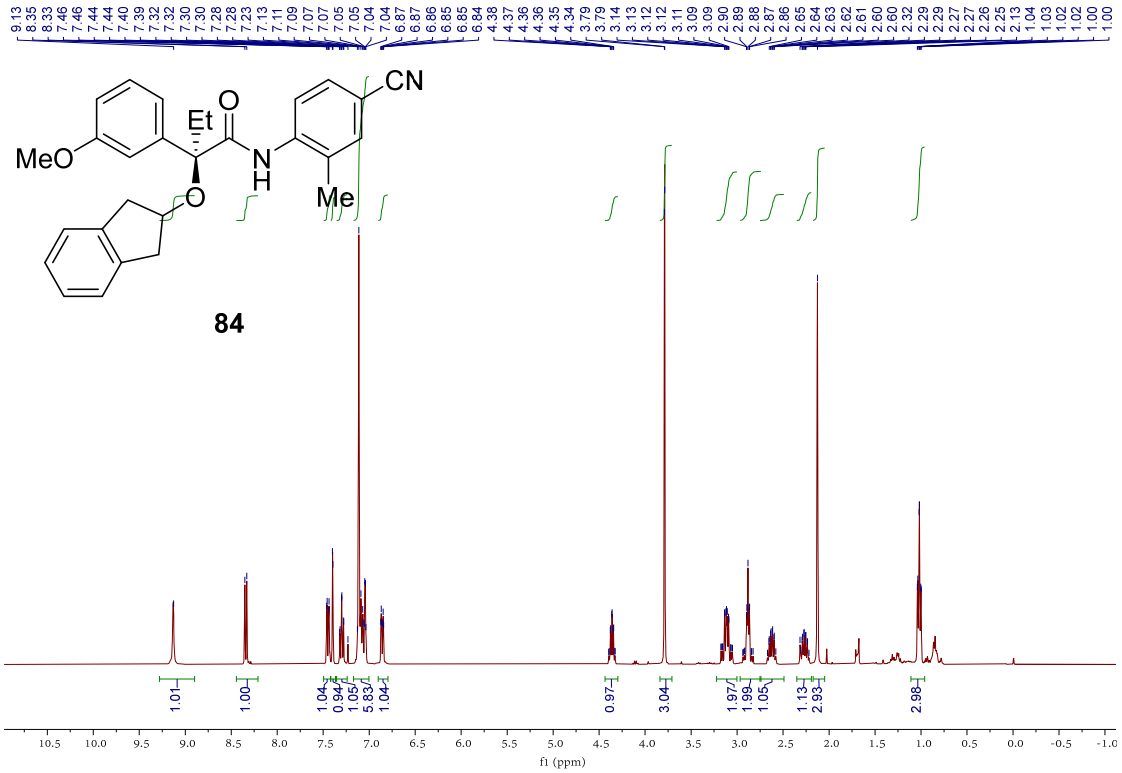

171.31
159.66
143.13
142.82
140.91
139.89
133.76
131.30
129.62
128.69
128.52
127.81
127.45
127.31
126.73
126.23
120.29
119.24
119.02
113.92
112.80
107.05
87.99
79.32
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26.44
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7.74
CN
O
Et
MeO
N
H
Ph
O
Me
Ph
81
f1 (ppm)

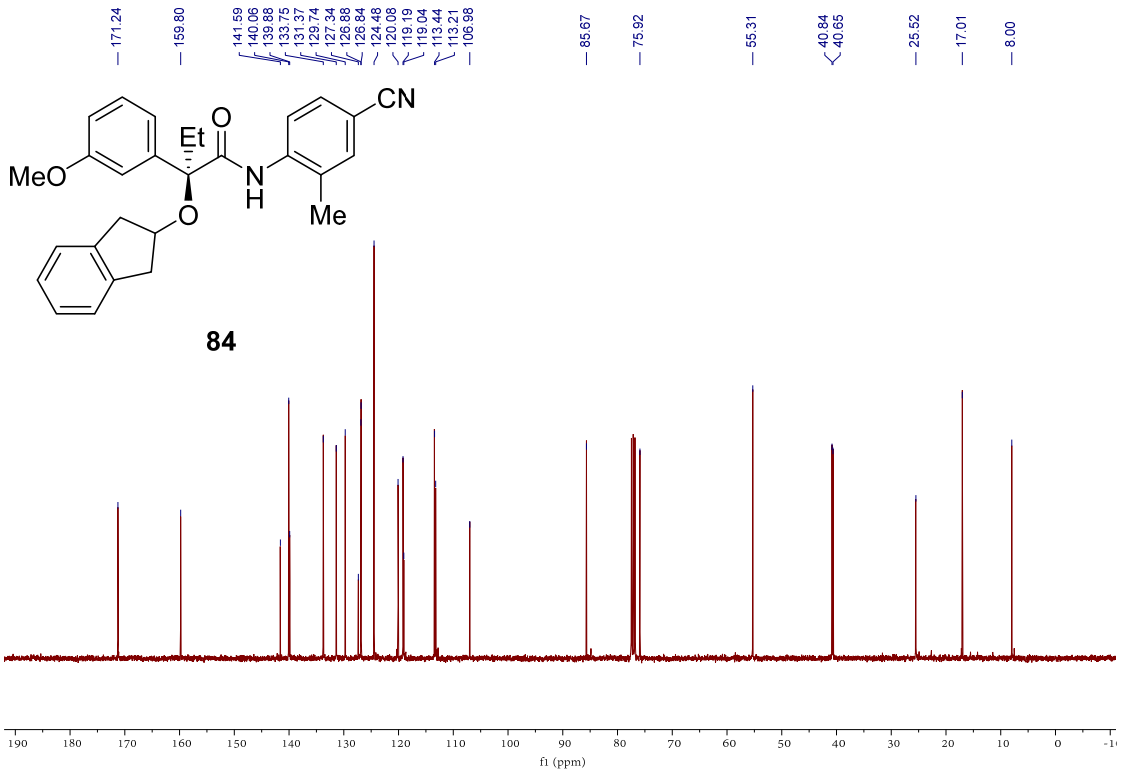

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7.34
7.33
7.32
7.31
3.21
3.20
3.20
3.19
3.18
3.17
3.16
3.08
3.07
3.05
3.03
3.02
2.27
1.15
1.13
1.11
1.09
0.69
0.68
0.54
0.53
0.53
0.52
0.51
0.51
0.51
0.50
CN
iPr
O
N
H
O
Me
82
1.00
1.08
3.08
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3.14
1.09
1.06
3.00
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3.09
f1 (ppm)

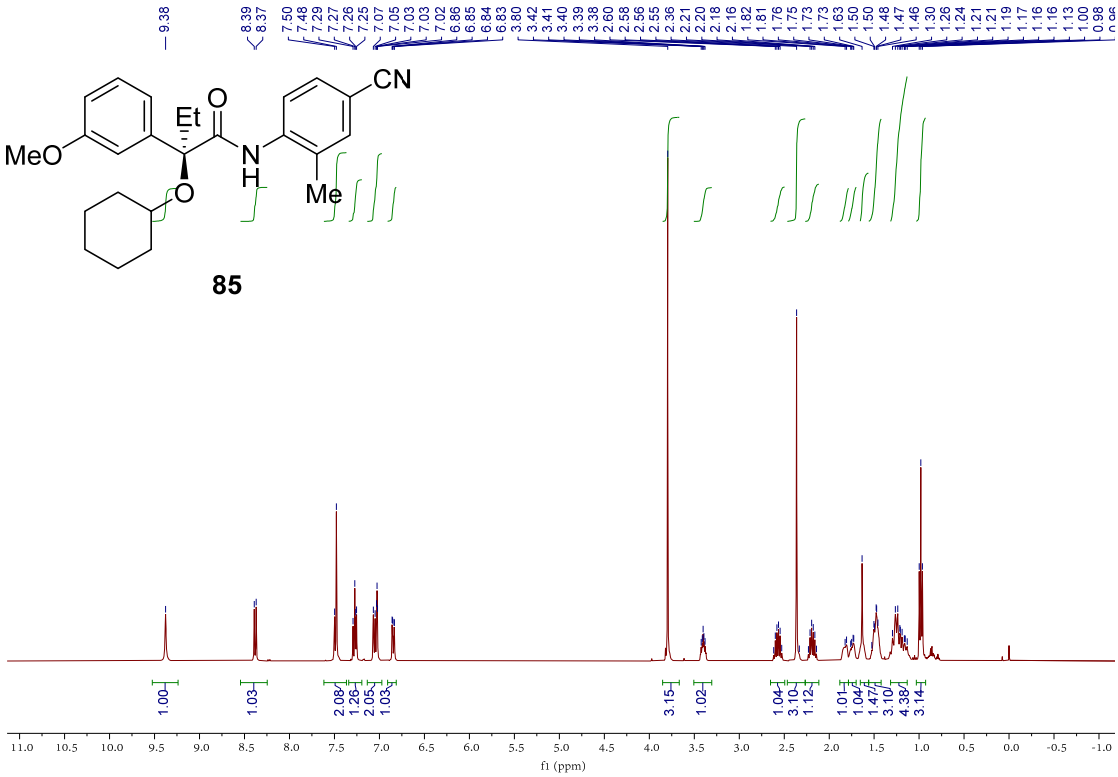

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128.29
128.24
128.19
127.34
120.32
119.05
106.97
89.36
50.07
32.44
18.01
17.57
17.25
7.06
6.31
CN
iPr
O
N
H
O
Me
82
f1 (ppm)

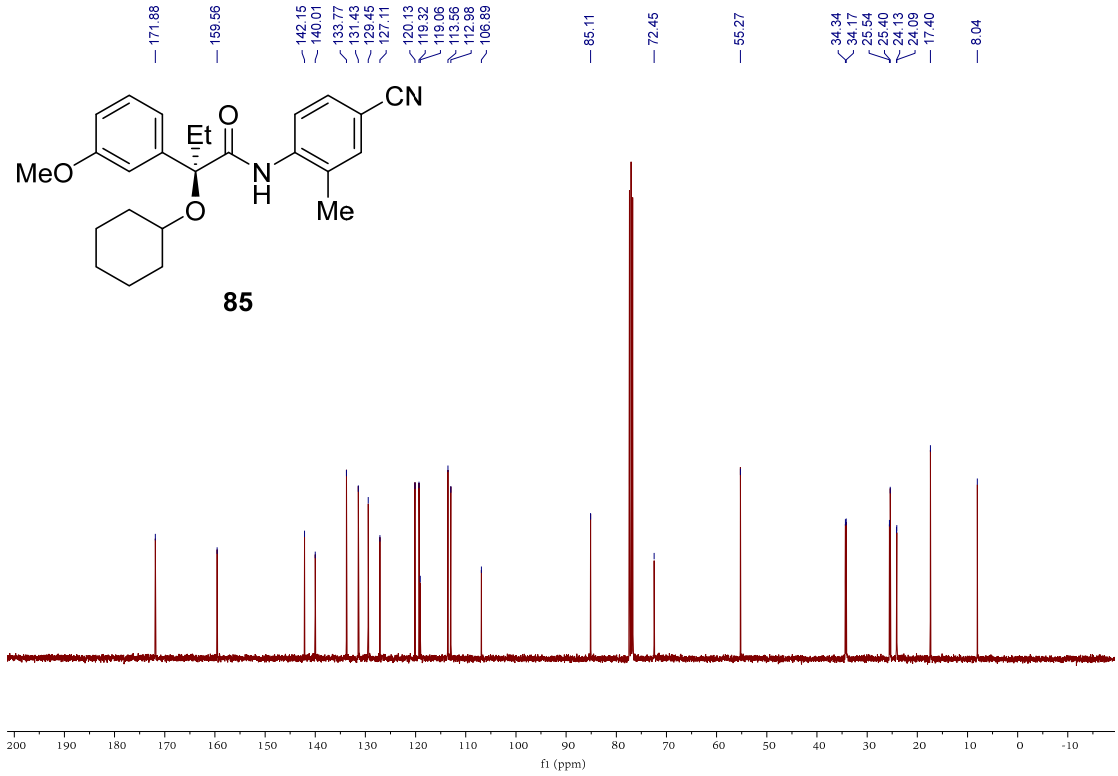

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7.33
4.72
4.71
4.70
4.69
4.67
4.66
4.65
4.64
4.63
4.61
4.60
4.60
4.51
4.49
4.48
4.46
4.45
4.43
3.01
2.99
2.97
2.96
2.94
2.36
1.07
1.05
1.04
CN
iPr
O
N
H
Me
O
O
83
1.00
1.04
2.14
5.27
3.21
2.07
1.04
3.10
6.03
f1 (ppm)

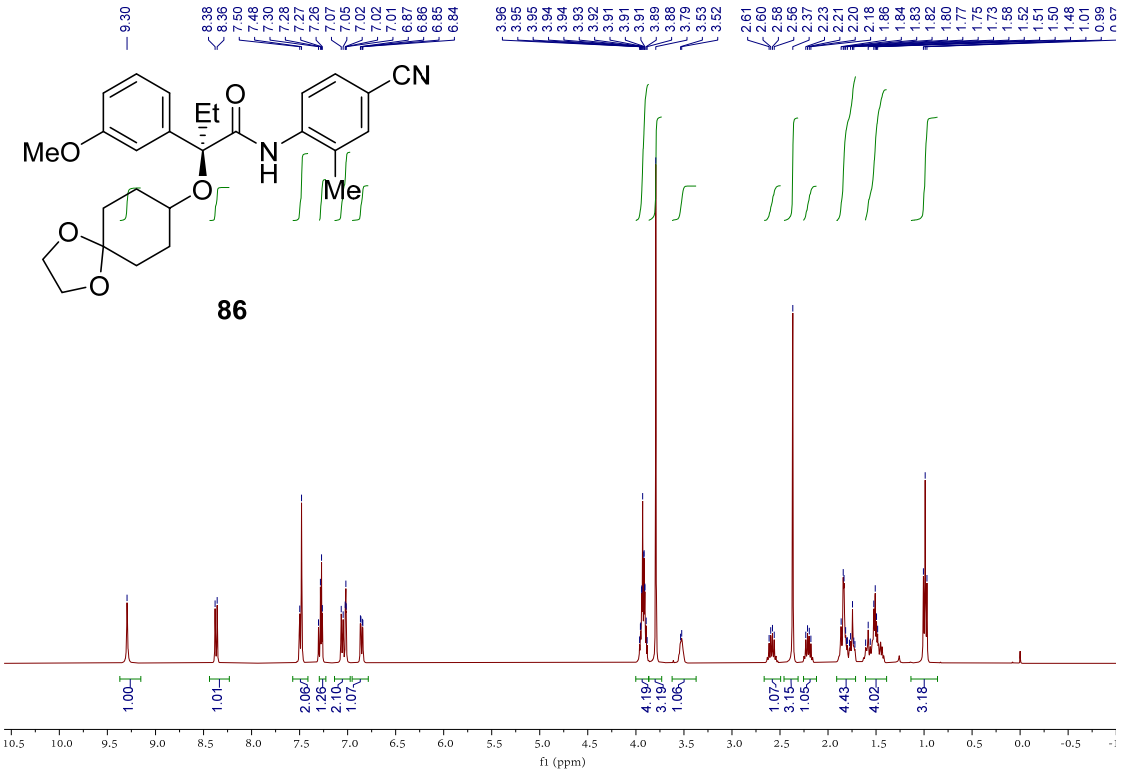

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128.73
127.85
127.44
120.50
118.93
107.35
89.25
79.75
79.52
68.17
31.83
17.96
17.39
17.15
CN
iPr
O
N
H
Me
O
O
83
f1 (ppm)


MeO
Et
O
N
H
O
CN
Me
84
f1 (ppm)

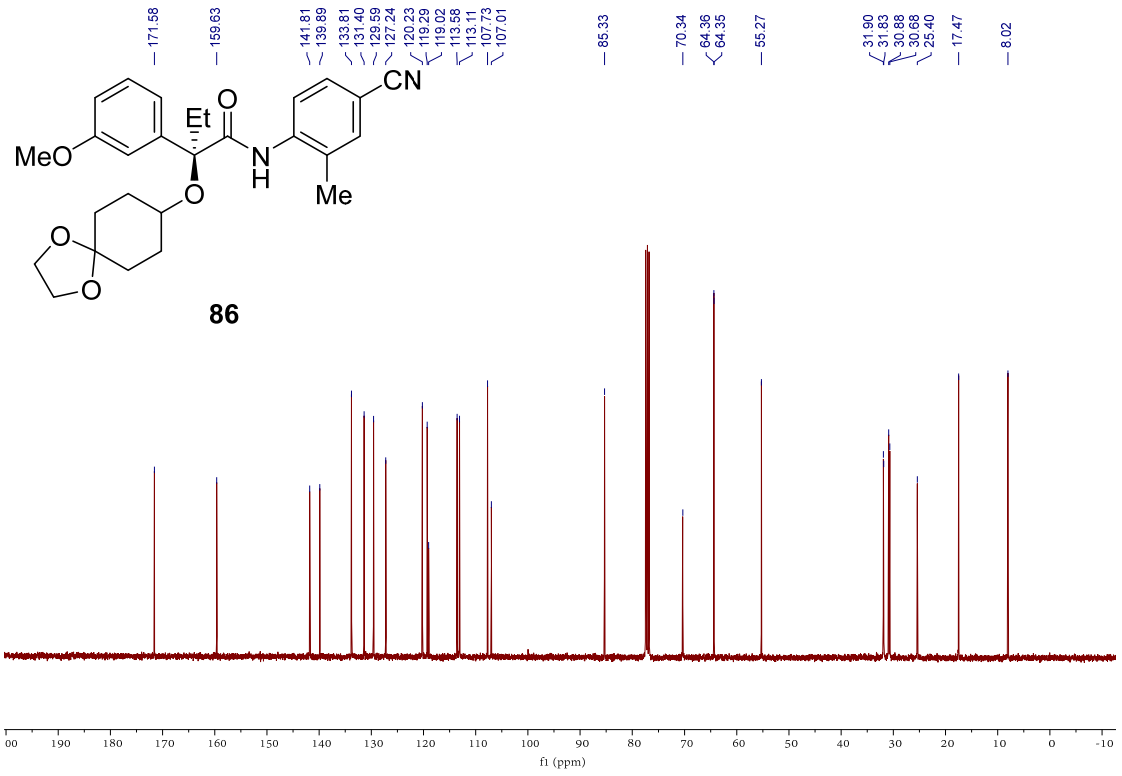

MeO
Et
O
N
H
O
CN
Me
84
f1 (ppm)


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8.39
8.37
7.50
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7.29
7.27
7.26
7.25
7.07
7.05
7.03
7.03
7.02
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2.60
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2.36
2.21
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1.63
1.50
1.50
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1.47
1.46
1.30
1.26
1.24
1.21
1.21
1.19
1.17
1.16
1.16
1.13
1.00
0.98
MeO
Et
O
N
H
O
Me
CN
85
1.00
1.03
2.08
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2.05
1.03
3.15
1.02
1.04
3.10
1.12
1.01
1.04
1.47
3.10
4.38
3.14
f1 (ppm)


171.88
159.56
142.15
140.01
133.77
131.43
129.45
127.11
120.13
119.32
119.06
113.56
112.98
106.89
85.11
72.45
55.27
34.34
34.17
25.54
25.40
24.13
24.09
17.40
8.04
MeO
Et
O
N
H
O
Me
CN
85
f1 (ppm)

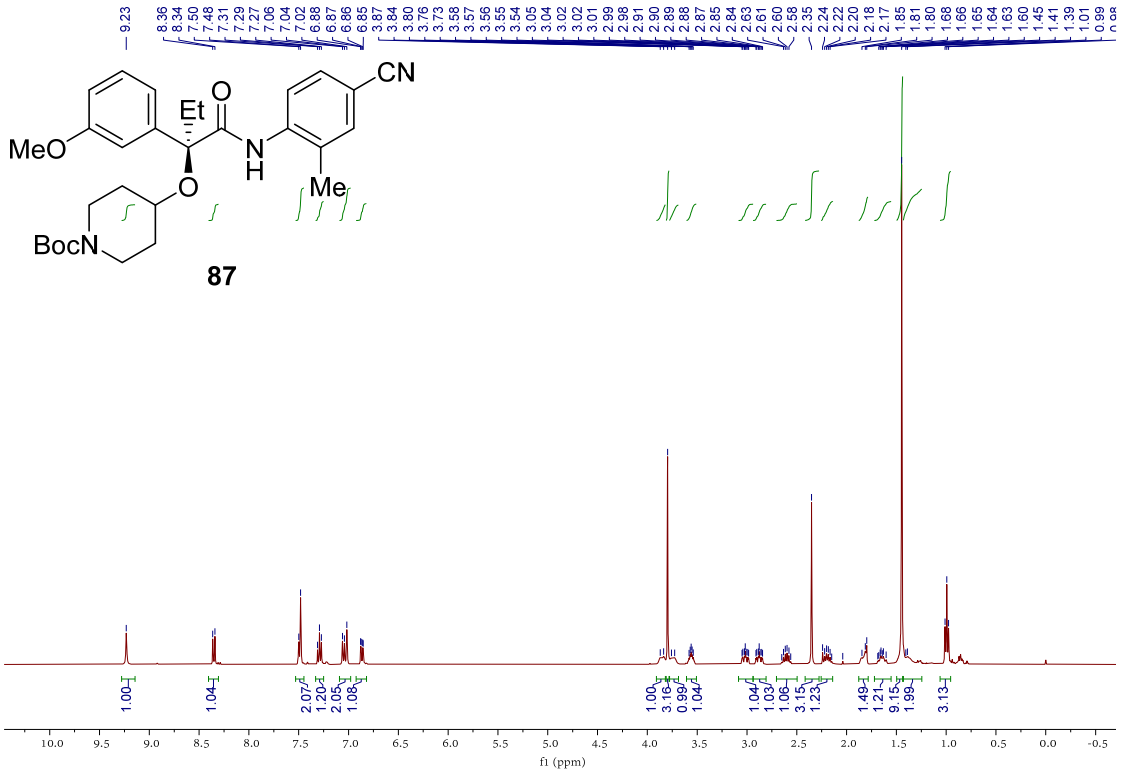

9.30
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7.05
7.02
7.02
7.01
6.87
6.86
6.85
6.84
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3.95
3.94
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3.89
3.88
3.79
3.53
3.52
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2.60
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2.56
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2.23
2.21
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1.51
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1.01
0.99
CN
Et
O
MeO
N
H
Me
O
O
O
1.00
1.01
2.06
1.26
2.10
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1.06
1.07
3.15
1.05
4.43
4.02
3.18
f1 (ppm)

86

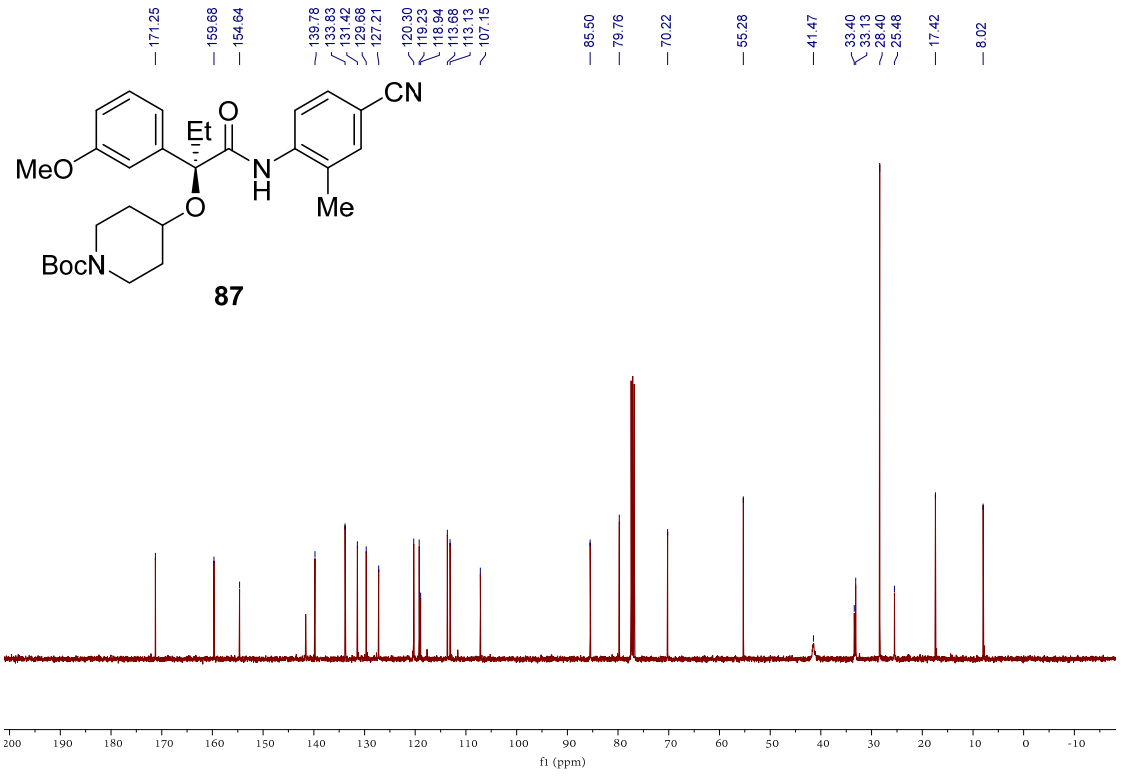

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159.63
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113.58
113.11
107.73
107.01
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70.34
64.36
64.35
55.27
31.90
31.83
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8.02
CN
Et
O
MeO
N
H
Me
O
O
O
f1 (ppm)

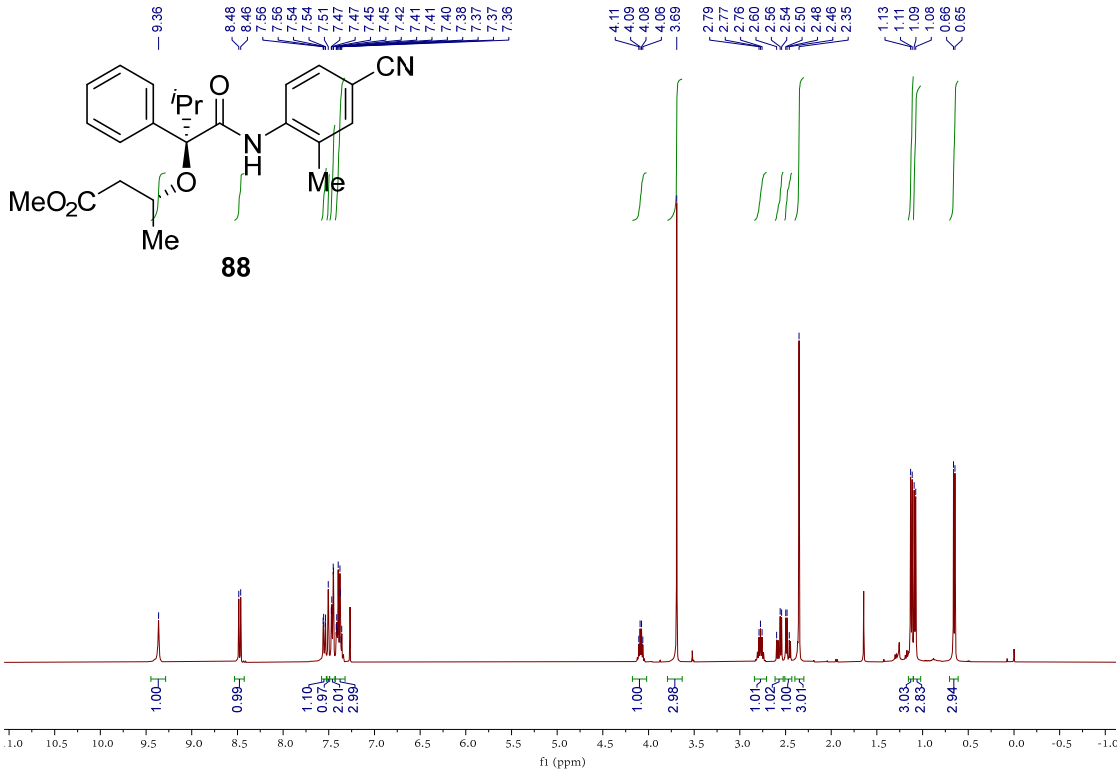
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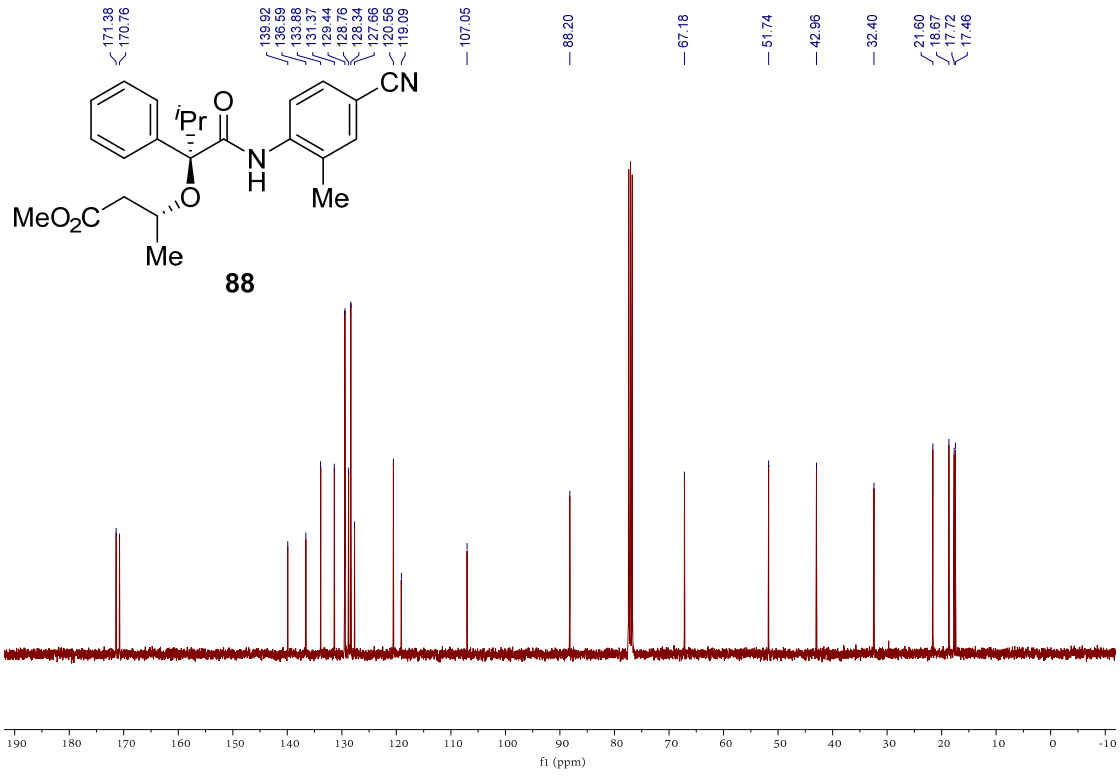
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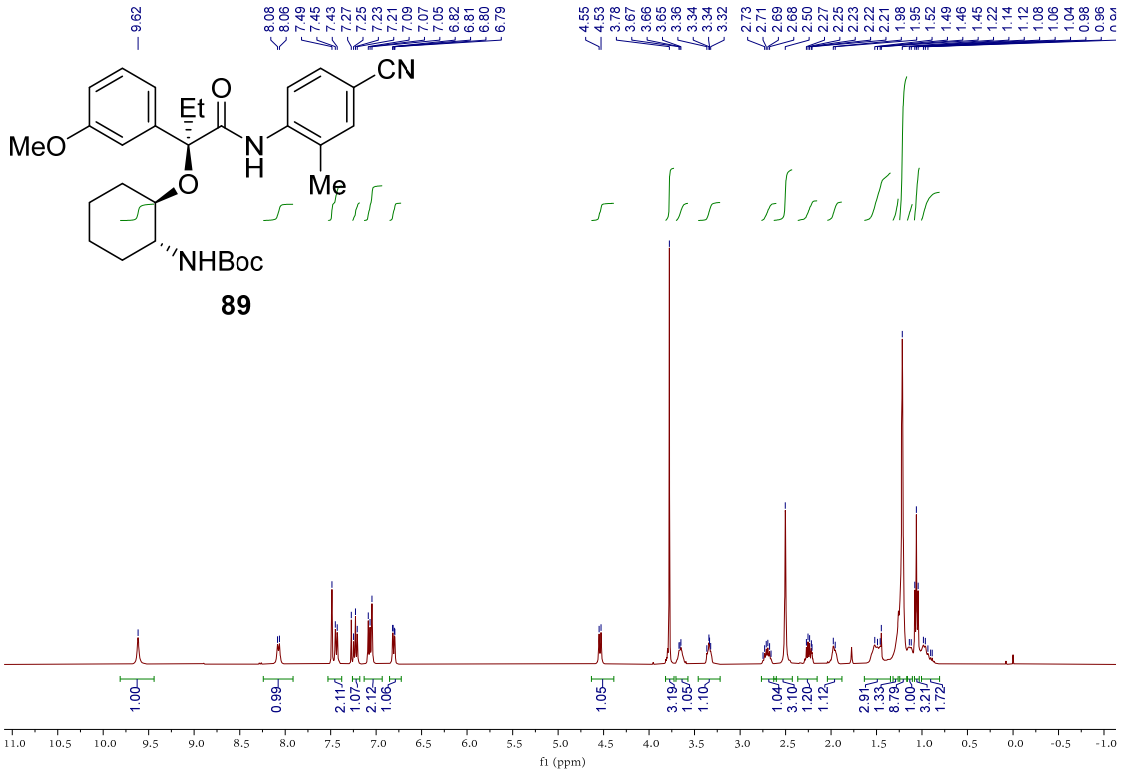


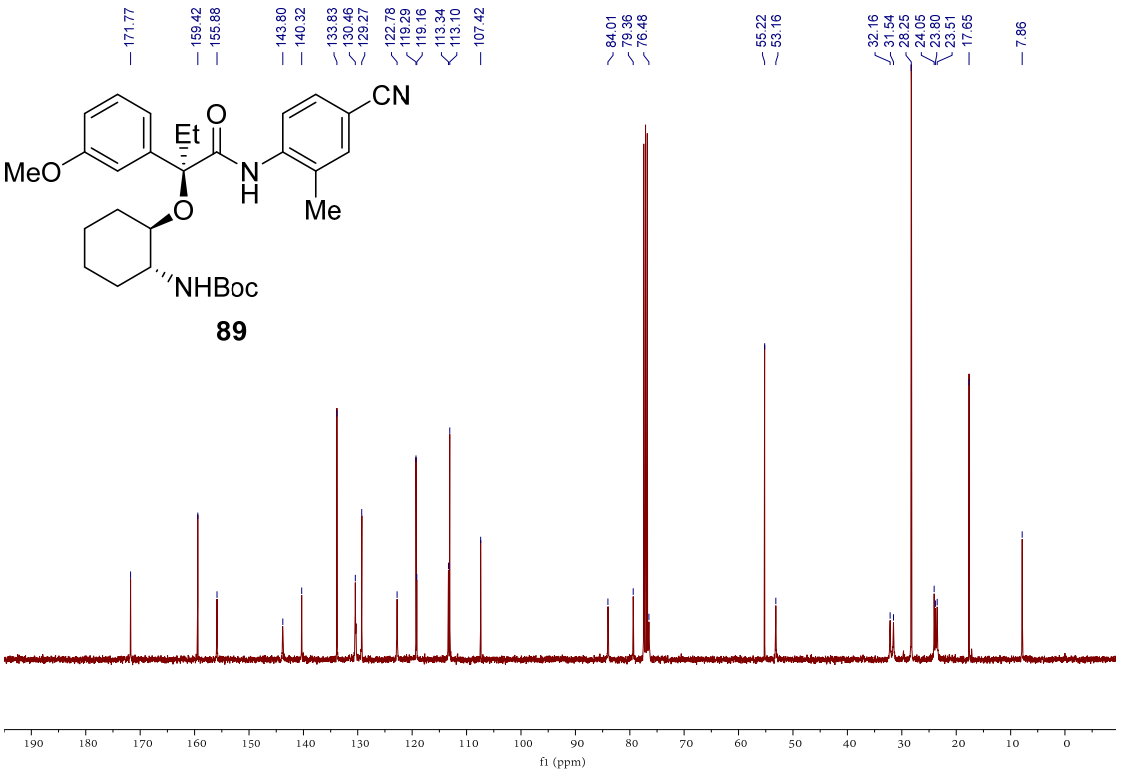
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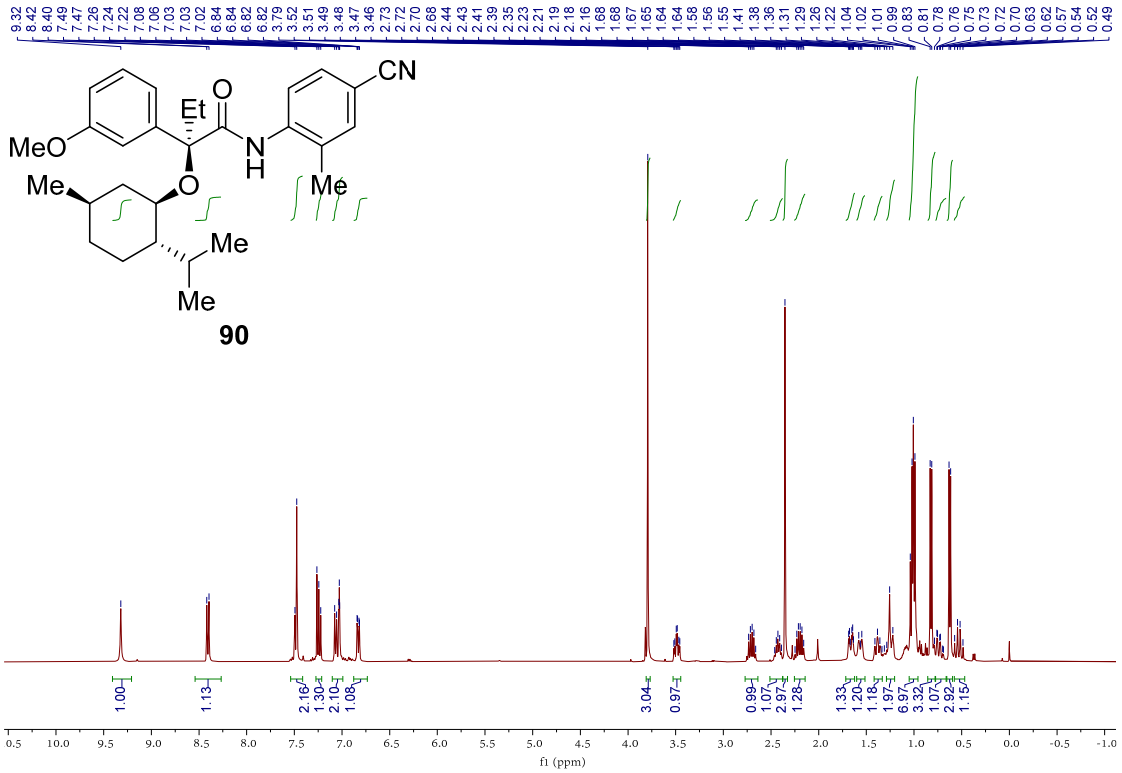


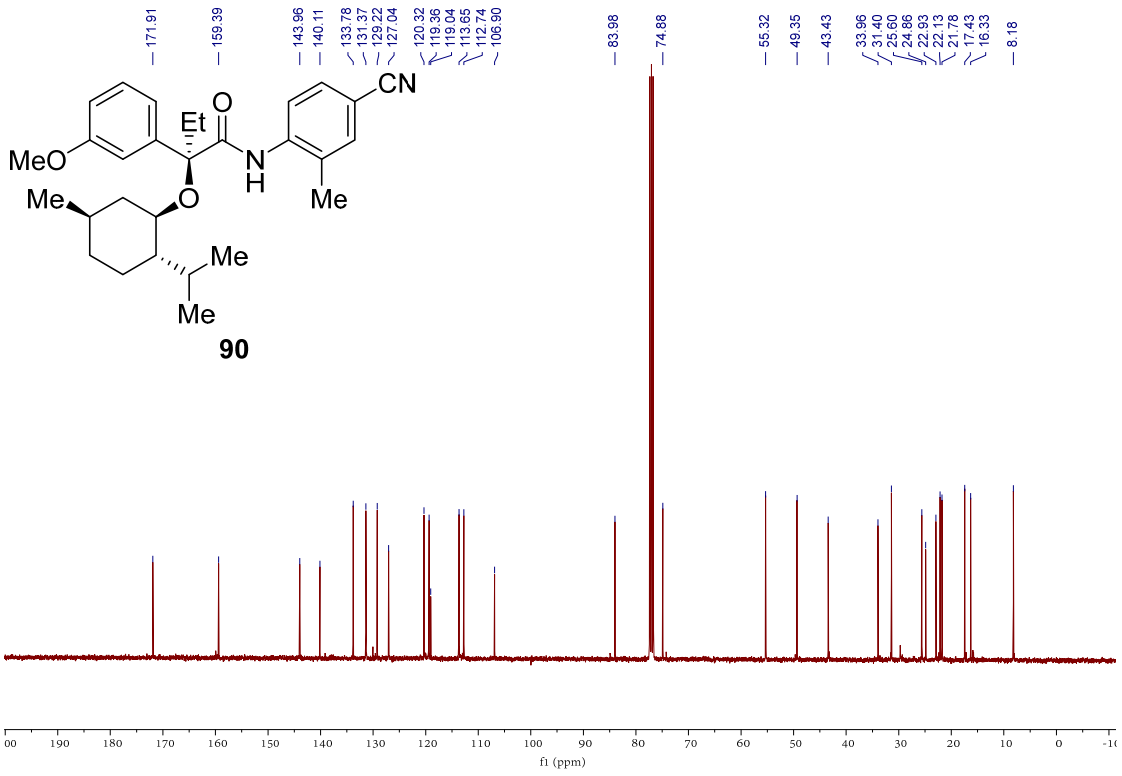

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7.47
7.45
7.42
7.41
7.40
7.38
7.37
7.36
4.11
4.09
4.08
4.06
3.69
2.79
2.77
2.76
2.60
2.56
2.54
2.50
2.48
2.46
2.35
1.13
1.11
1.09
1.08
0.66
0.65
CN
iPr
O
N
H
Me
MeO2C
O
Me
88
1.00
0.99
1.10
0.97
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2.99
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2.98
1.01
1.02
1.00
3.01
3.03
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2.94
f1 (ppm)

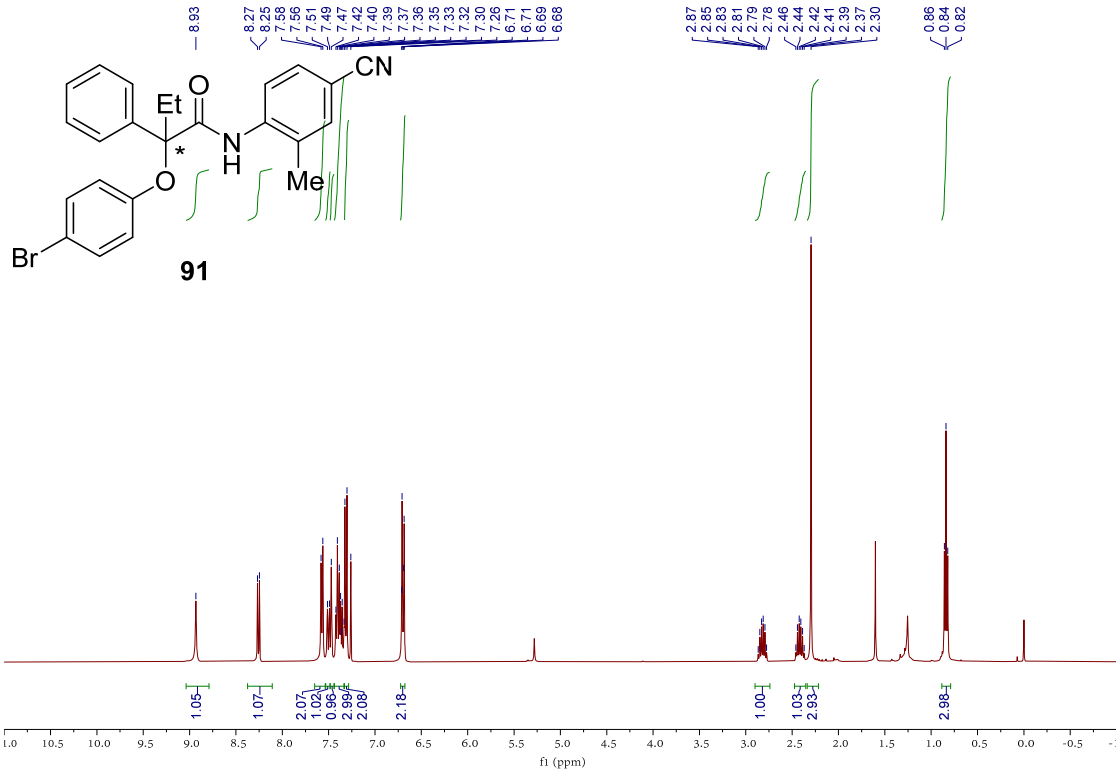

171.38
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131.37
129.44
128.76
128.34
127.66
120.56
119.09
107.05
88.20
67.18
51.74
42.96
32.40
21.60
18.67
17.72
17.46
CN
iPr
O
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MeO2C
O
Me
88
f1 (ppm)

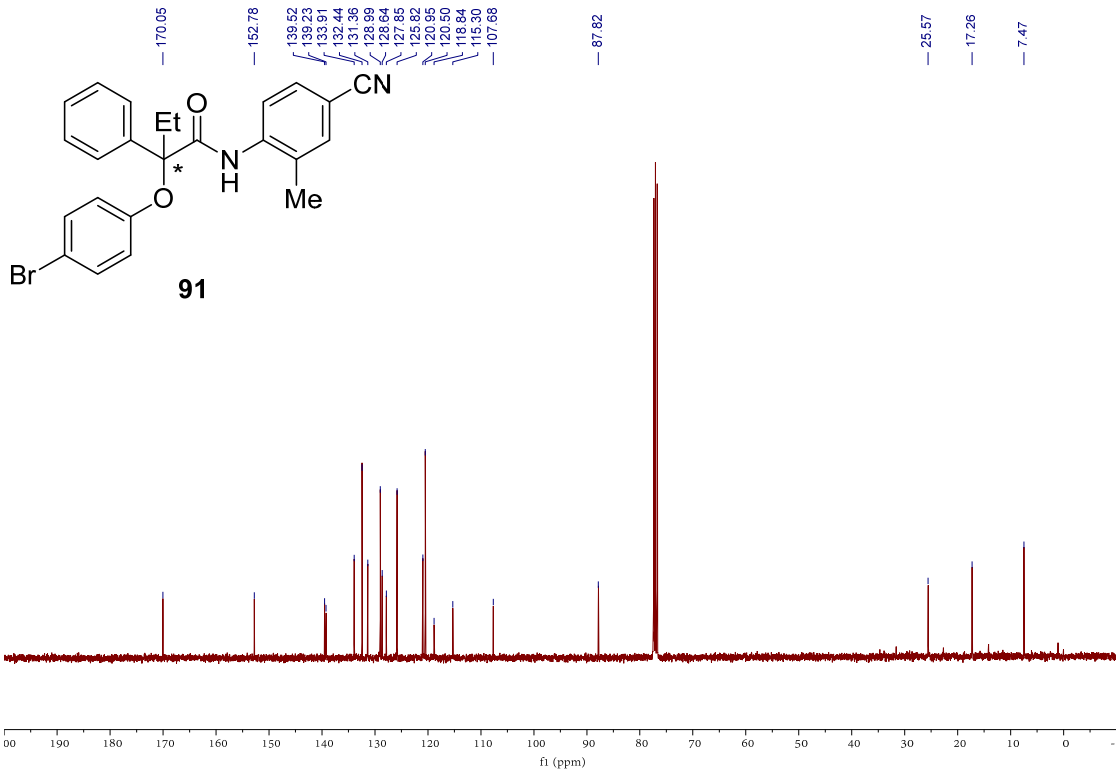

MeO
Et
O
N
H
CN
Me
O
NHBoc
89
f1 (ppm)

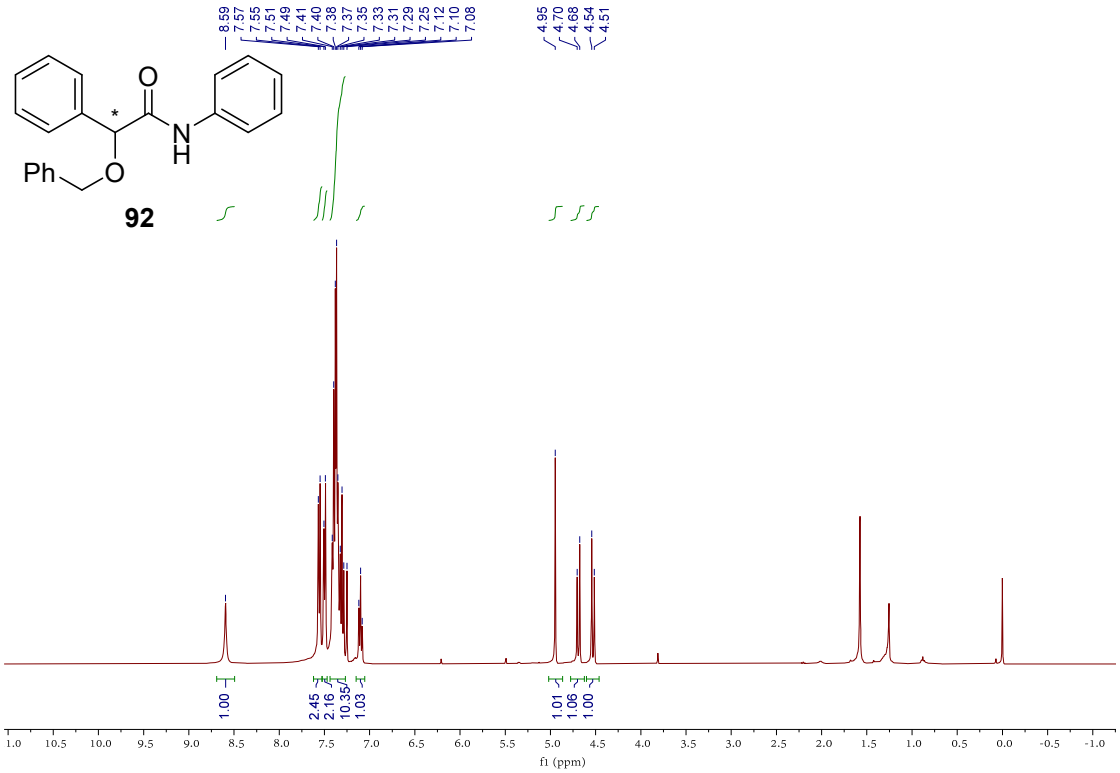

MeO
Et
O
N
H
CN
Me
O
NHBoc
89
f1 (ppm)

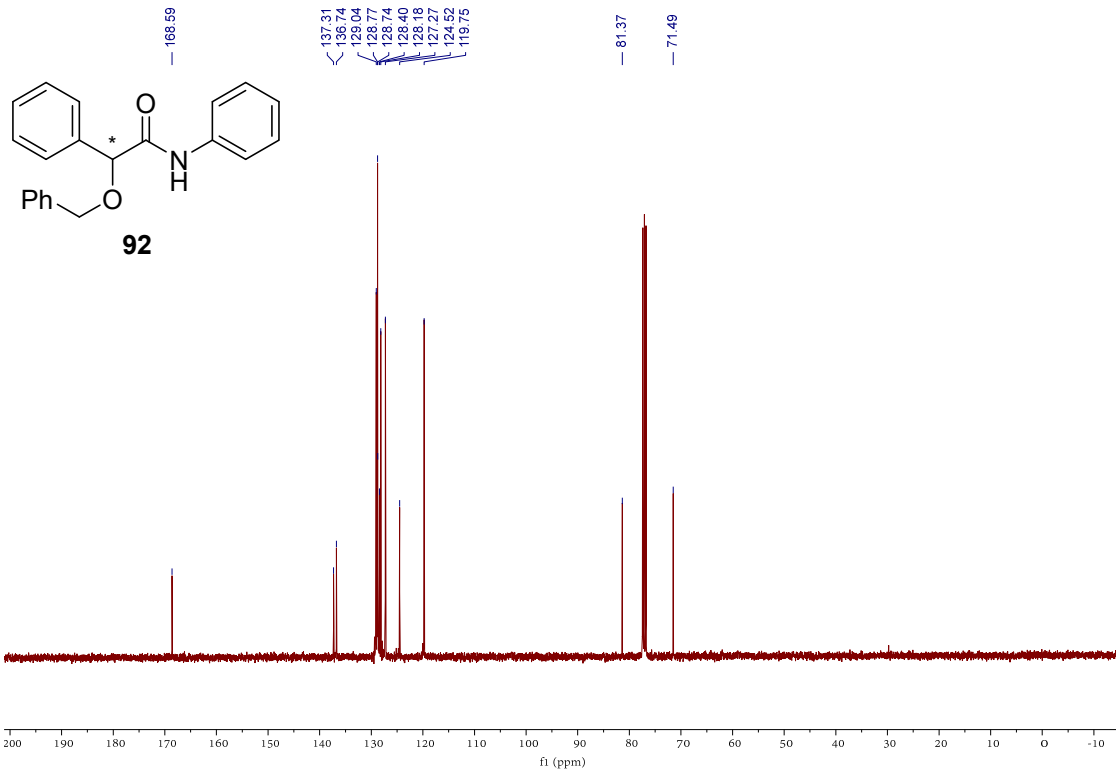

MeO
Et
O
N
H
CN
Me
O
Me
Me
Me
90
fl (ppm)

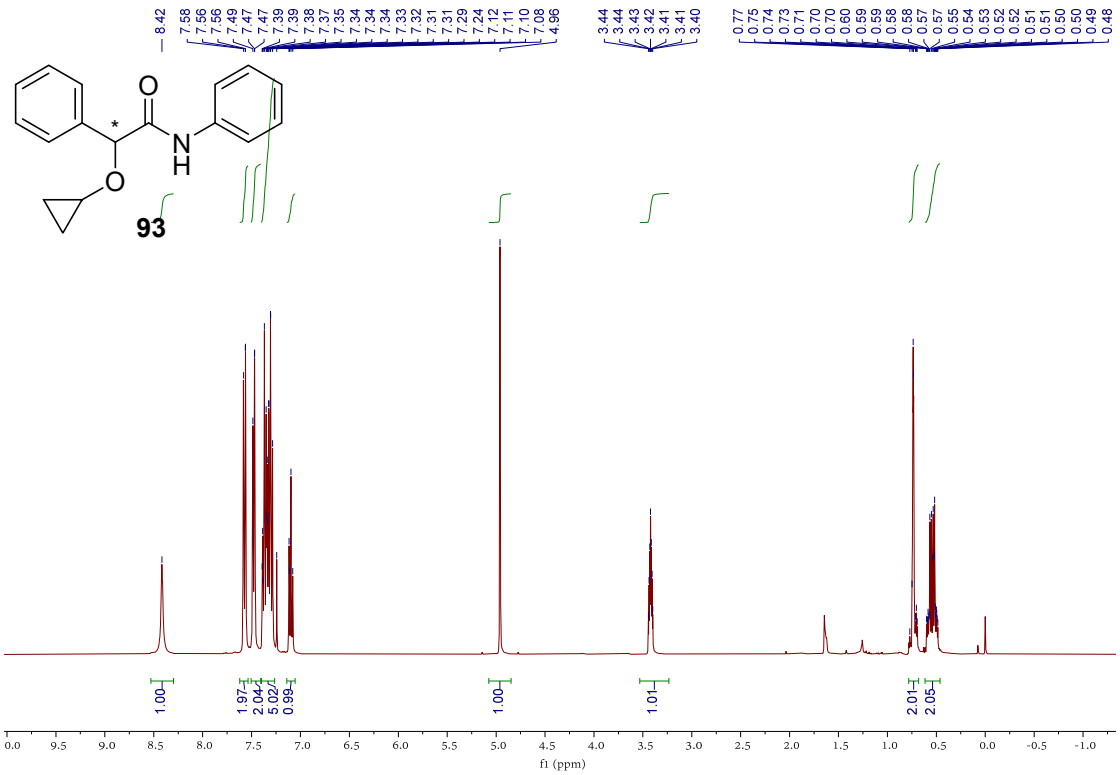

MeO
Et
O
N
H
CN
Me
O
Me
Me
Me
90
fl (ppm)

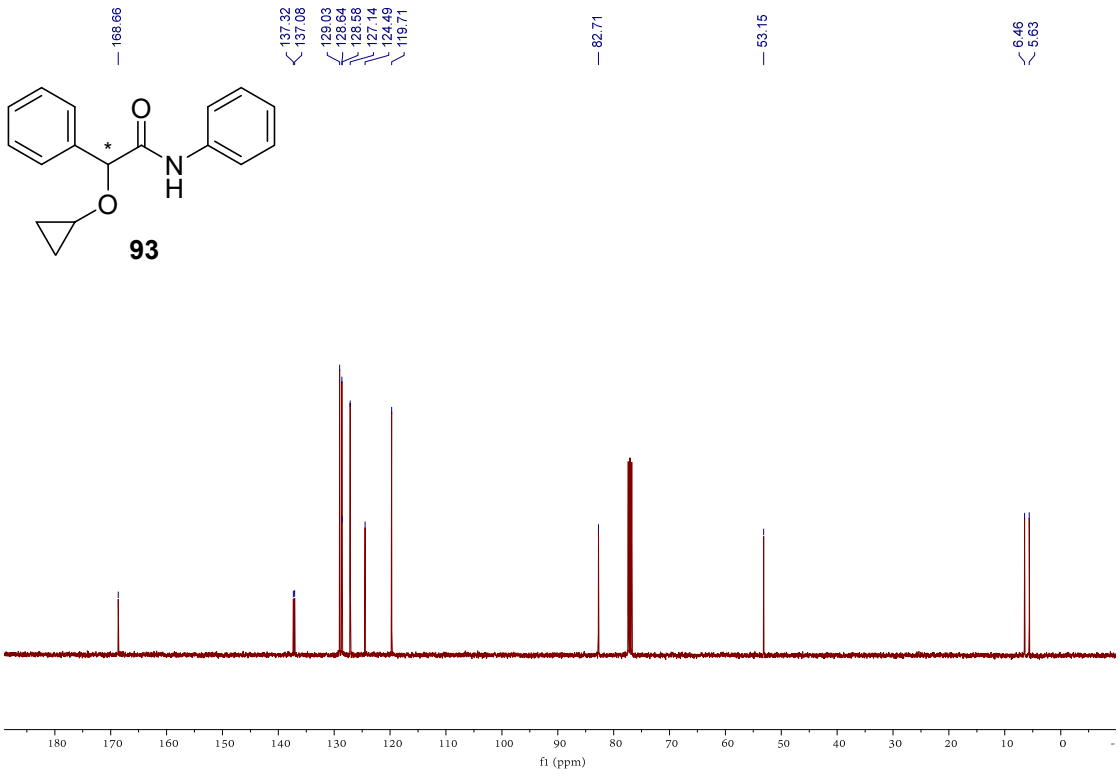

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8.25
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7.56
7.51
7.49
7.47
7.42
7.40
7.39
7.37
7.36
7.35
7.33
7.32
7.30
7.26
6.71
6.69
6.68
2.87
2.85
2.83
2.81
2.79
2.78
2.46
2.44
2.42
2.41
2.39
2.37
2.30
0.86
0.84
0.82
Et
O
N
H
*
O
CN
Me
Br
91
1.05
1.07
2.07
1.02
0.96
2.99
2.08
2.18
1.00
1.03
2.93
2.98
f1 (ppm)

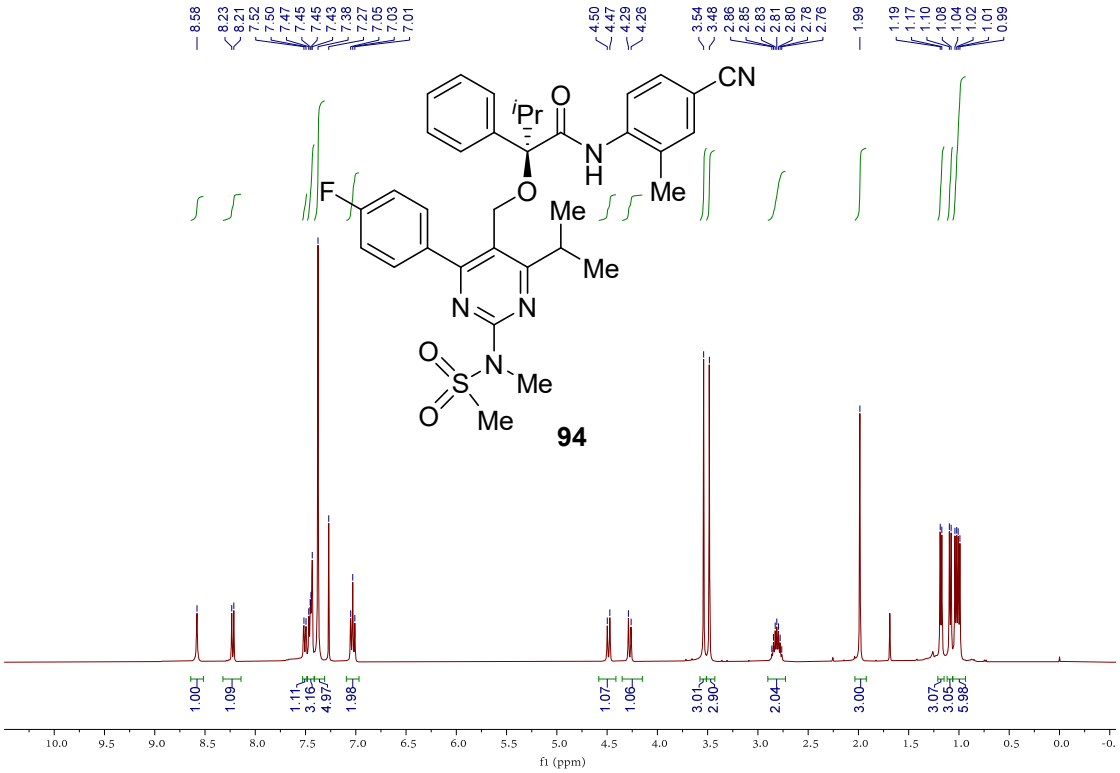

170.05
152.78
139.52
139.23
133.91
132.44
131.36
128.99
128.64
127.85
125.82
120.95
120.50
118.84
115.30
107.68
87.82
25.57
17.26
7.47
Et
O
N
H
*
O
CN
Me
Br
91
f1 (ppm)

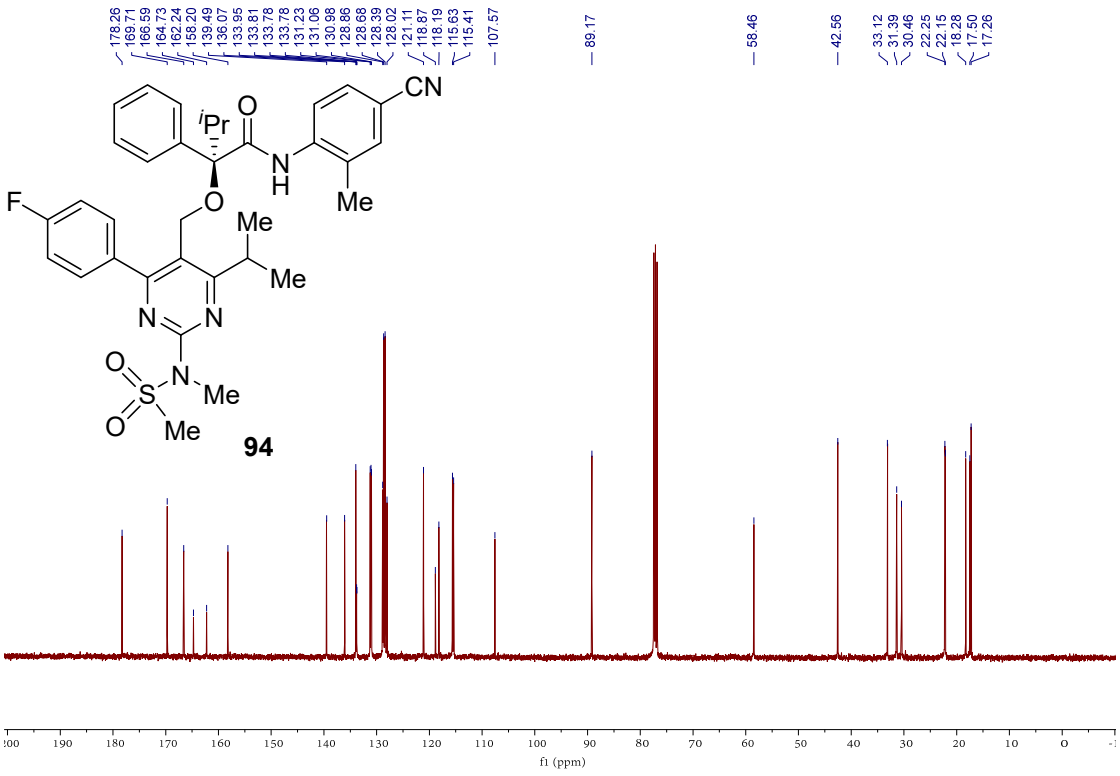

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7.49
7.41
7.40
7.38
7.37
7.35
7.33
7.31
7.29
7.25
7.12
7.10
7.08
4.95
4.70
4.68
4.54
4.51
O
N
H
Ph
O
*
92
1.00
2.45
2.16
10.35
1.03
1.01
1.06
1.00
f1 (ppm)

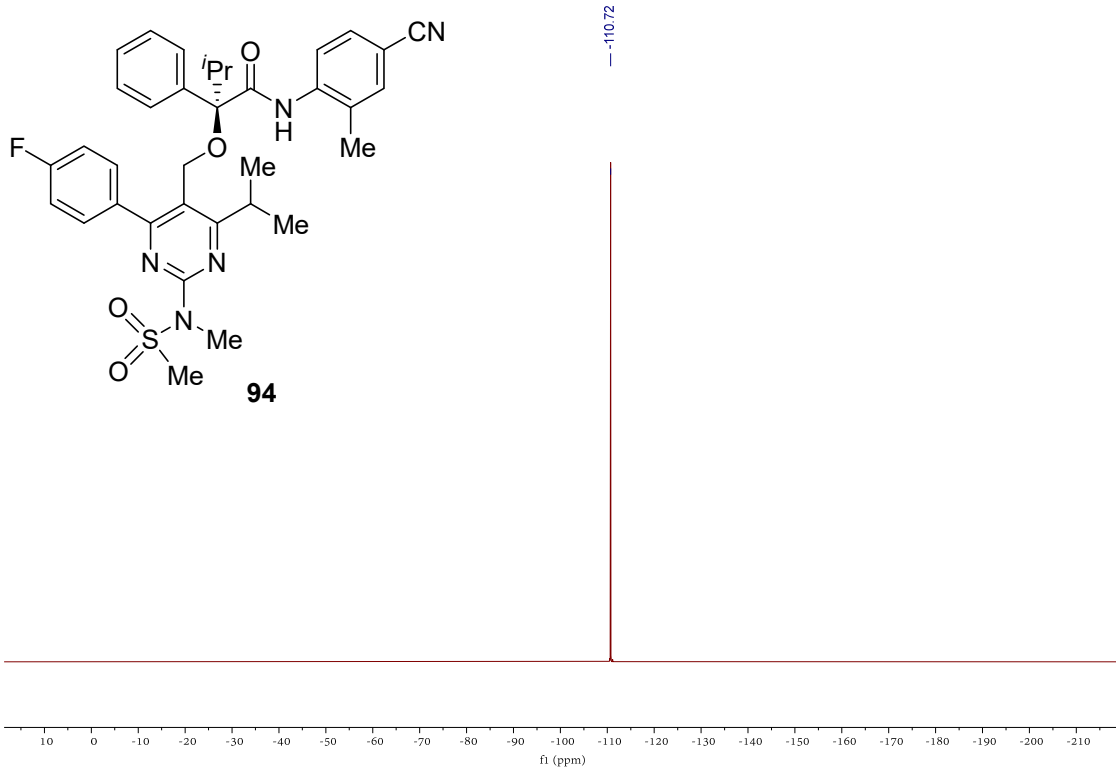

168.59
137.31
136.74
129.04
128.77
128.74
128.40
128.18
127.27
124.52
119.75
81.37
71.49
O
N
H
Ph
O
*
92
f1 (ppm)


8.42
7.58
7.56
7.56
7.56
7.49
7.47
7.47
7.39
7.39
7.38
7.37
7.35
7.34
7.34
7.34
7.33
7.32
7.31
7.31
7.29
7.24
7.12
7.11
7.10
7.08
4.96
3.44
3.44
3.43
3.42
3.41
3.41
3.40
0.77
0.75
0.74
0.73
0.71
0.70
0.70
0.60
0.59
0.59
0.58
0.58
0.57
0.57
0.55
0.54
0.53
0.52
0.52
0.51
0.51
0.50
0.50
0.49
0.48
O
*
N
H
O
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1.97
2.04
5.02
0.99
1.00
1.01
2.01
2.05
f1 (ppm)

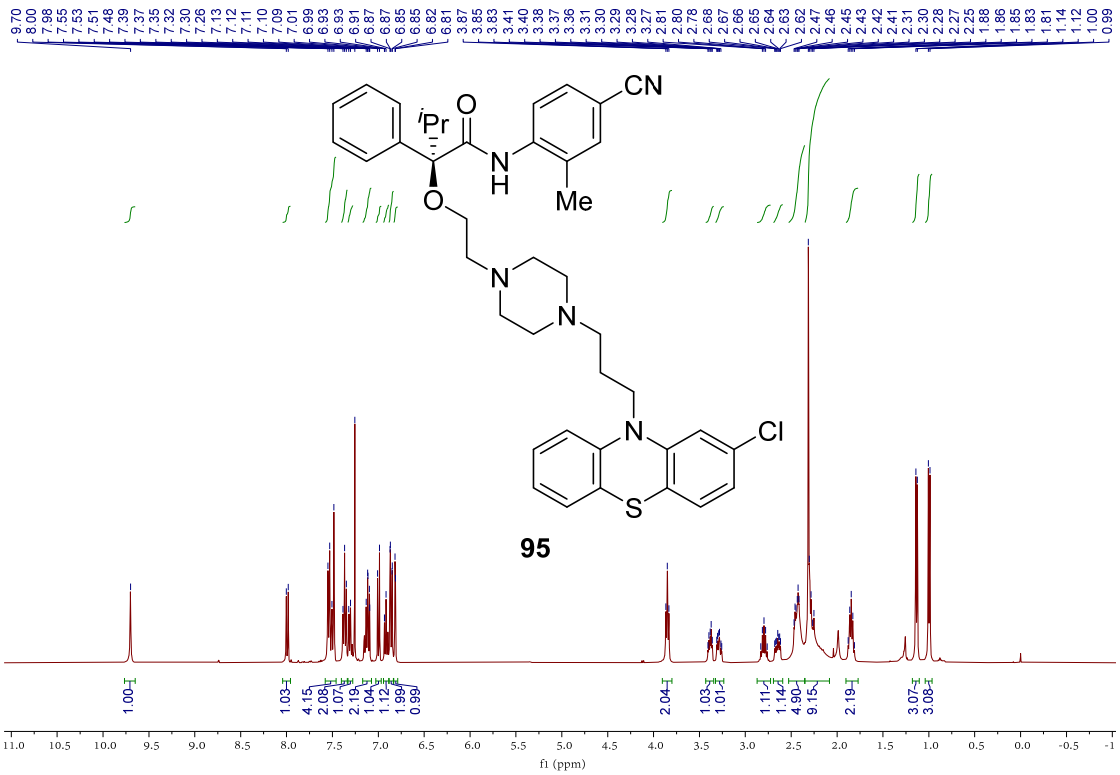

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137.32
137.08
129.03
128.64
128.58
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119.71
82.71
53.15
6.46
5.63
O
*
N
H
O
93
f1 (ppm)

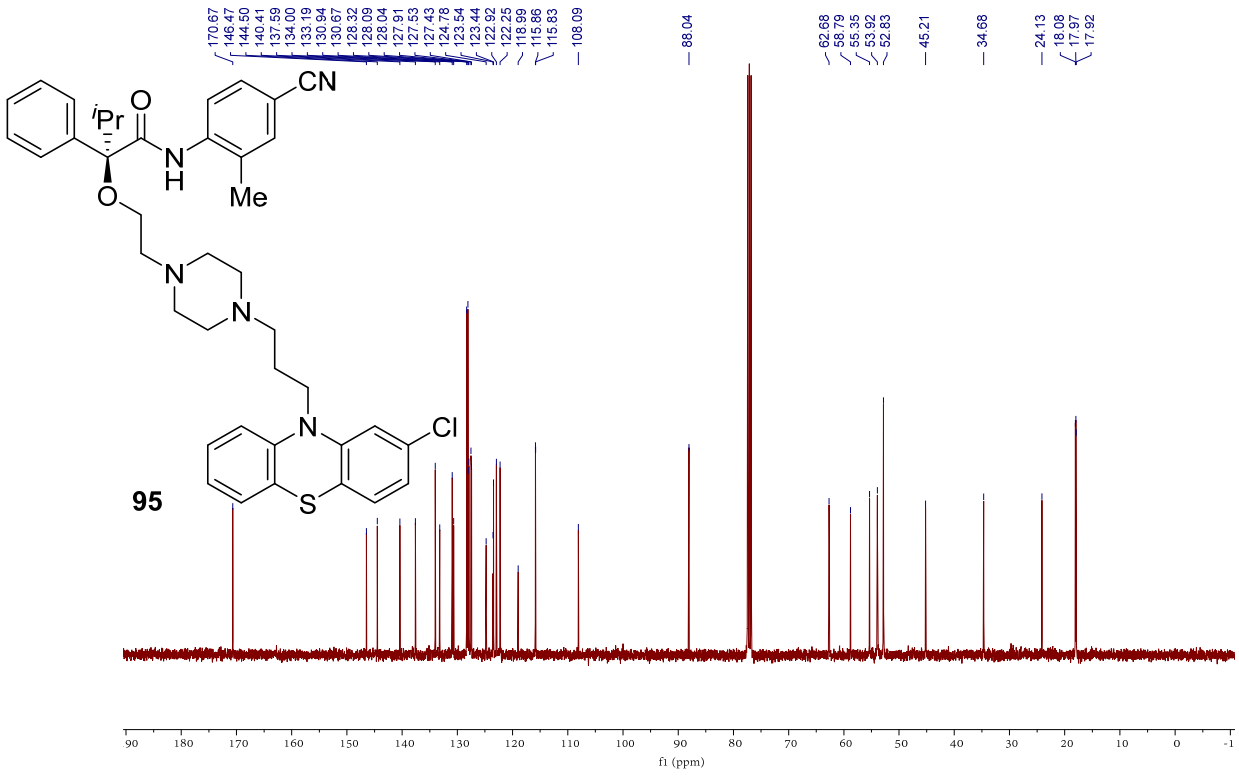

8.58
8.23
8.21
7.52
7.50
7.47
7.45
7.45
7.43
7.38
7.27
7.05
7.03
7.01
4.50
4.47
4.29
4.26
3.54
3.48
2.86
2.85
2.83
2.81
2.80
2.78
2.76
1.99
1.19
1.17
1.10
1.08
1.04
1.02
1.01
0.99
CN
iPr
O
N
H
Me
F
O
Me
Me
N
N
O
S
N
Me
O
Me
94
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1.11
3.16
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1.07
1.06
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2.04
3.00
3.07
3.05
5.98
f1 (ppm)

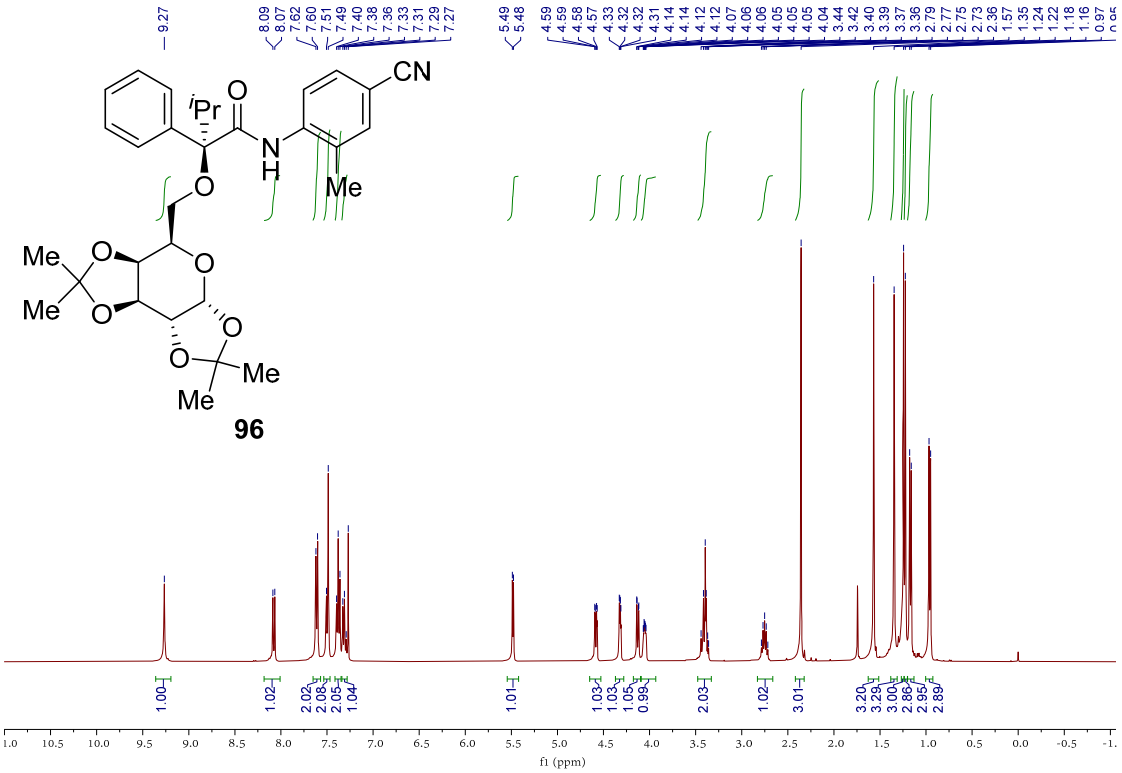

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162.24
158.20
139.49
136.07
133.95
133.81
133.78
133.78
131.23
131.06
130.98
128.86
128.68
128.39
128.02
121.11
118.87
118.19
115.63
115.41
107.57
89.17
58.46
42.56
33.12
31.39
30.46
22.25
22.15
18.28
17.50
17.26
CN
iPr
O
N
H
Me
F
O
Me
Me
N
N
O
S
N
Me
O
Me
94
f1 (ppm)

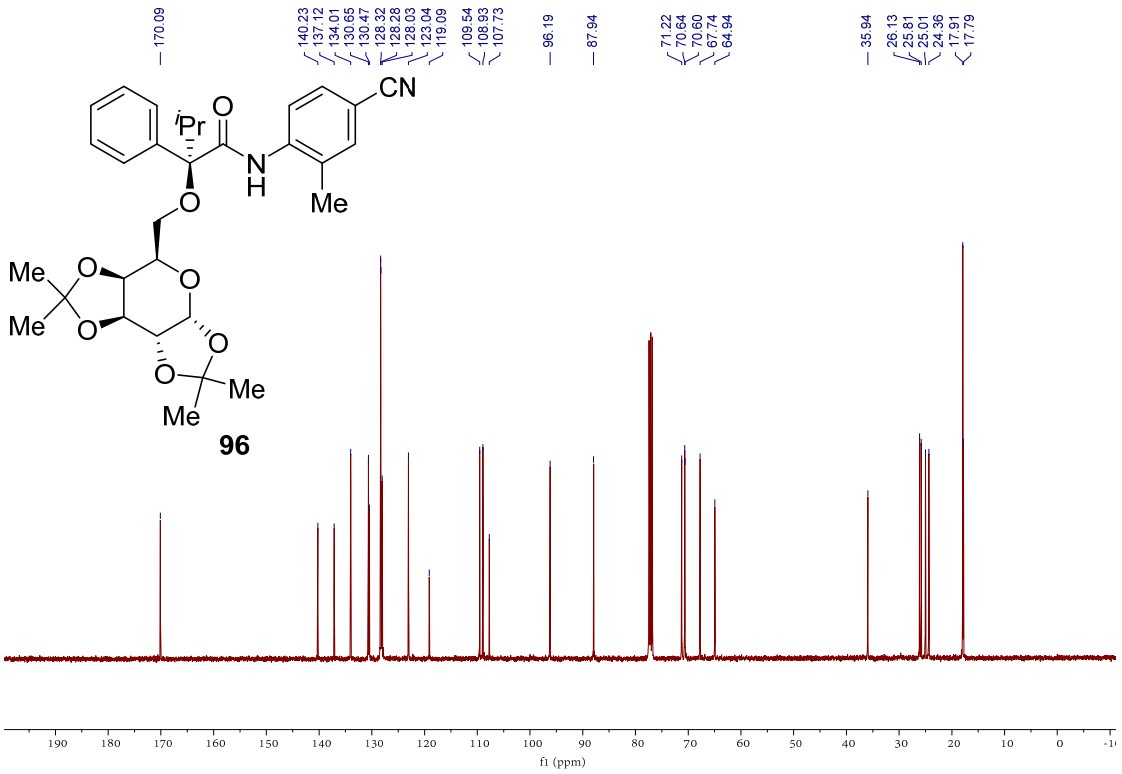

CN
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iPr
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Me
F
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Me
Me
N
N
O
S
N
Me
O
Me
-110.72
10
0
-10
-20
-30
-40
-50
-60
-70
-80
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-100
-110
-120
-130
-140
-150
-160
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-200
-210
f1 (ppm)

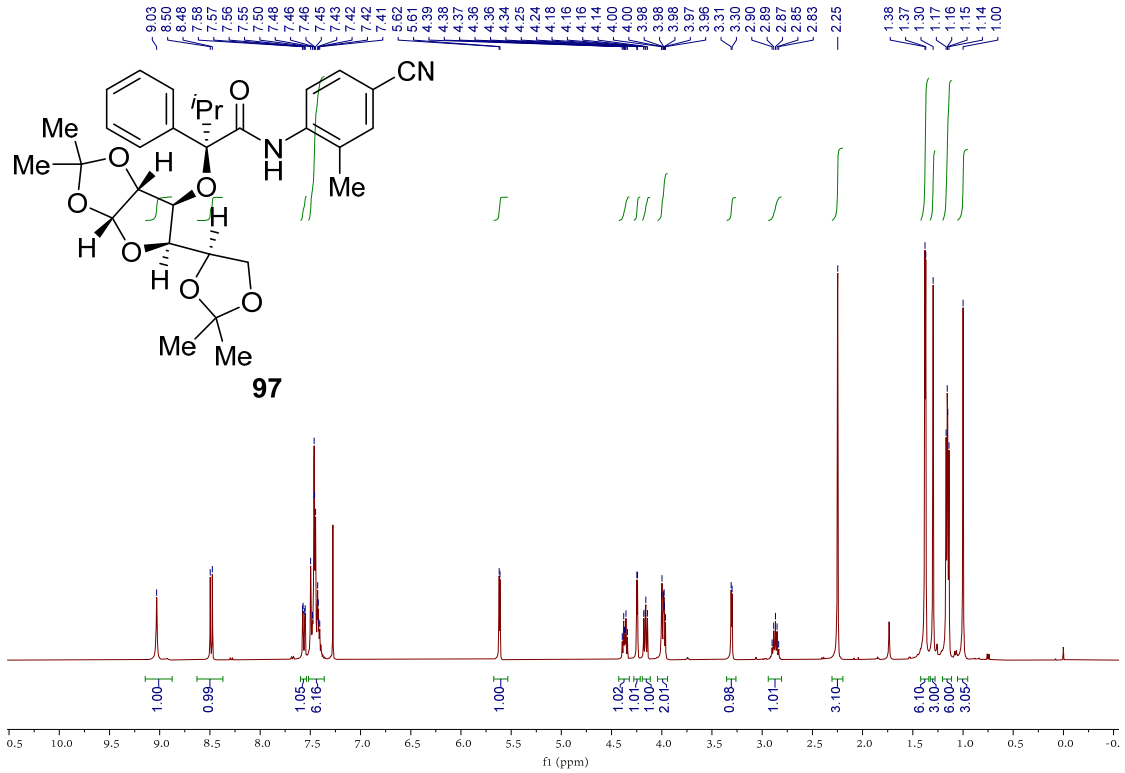
94

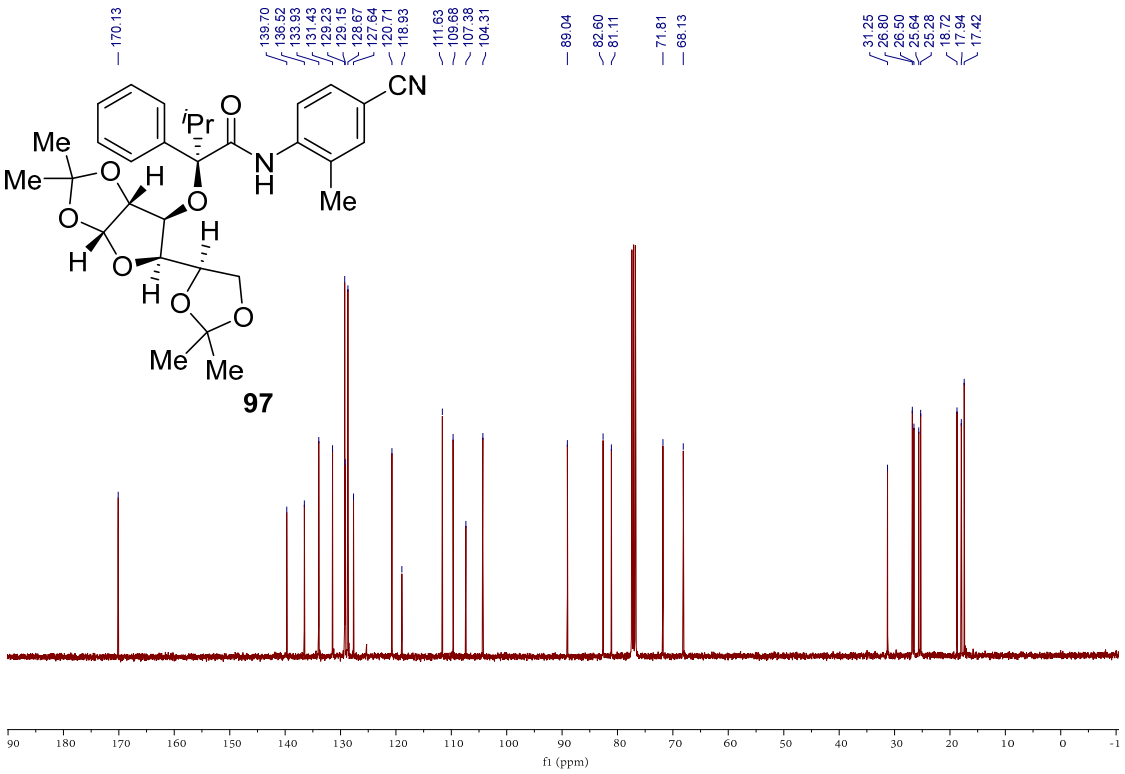

95
f1 (ppm)

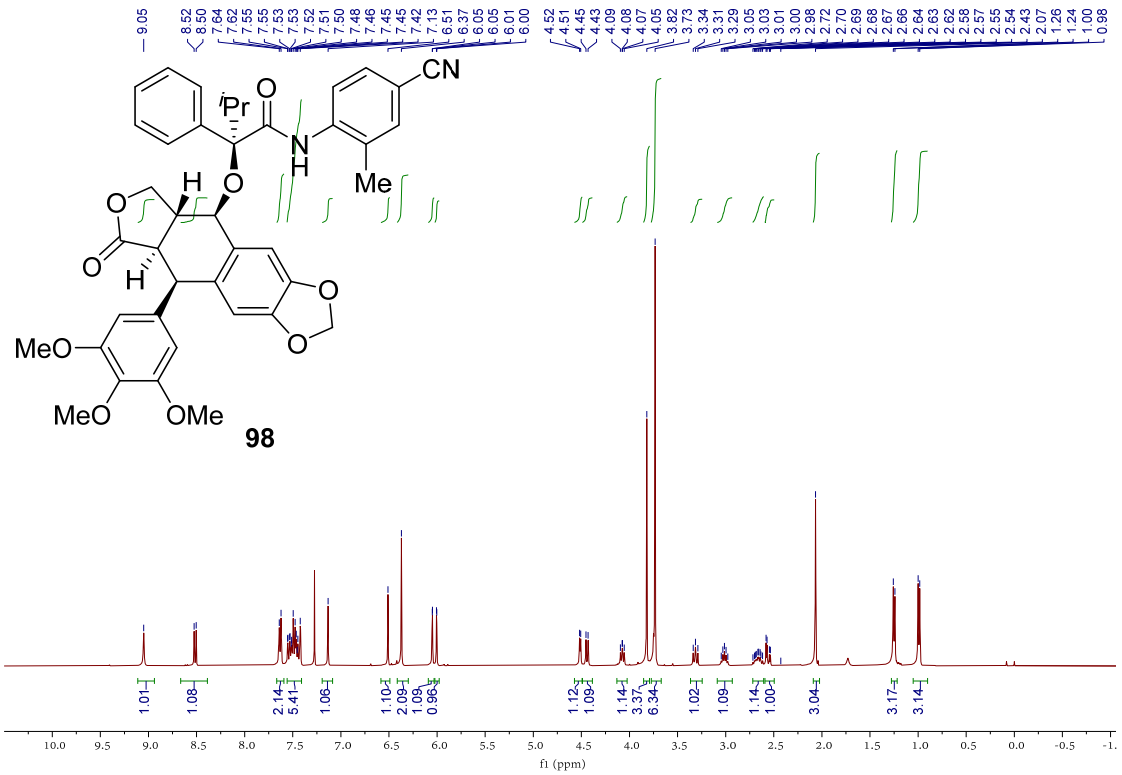

95
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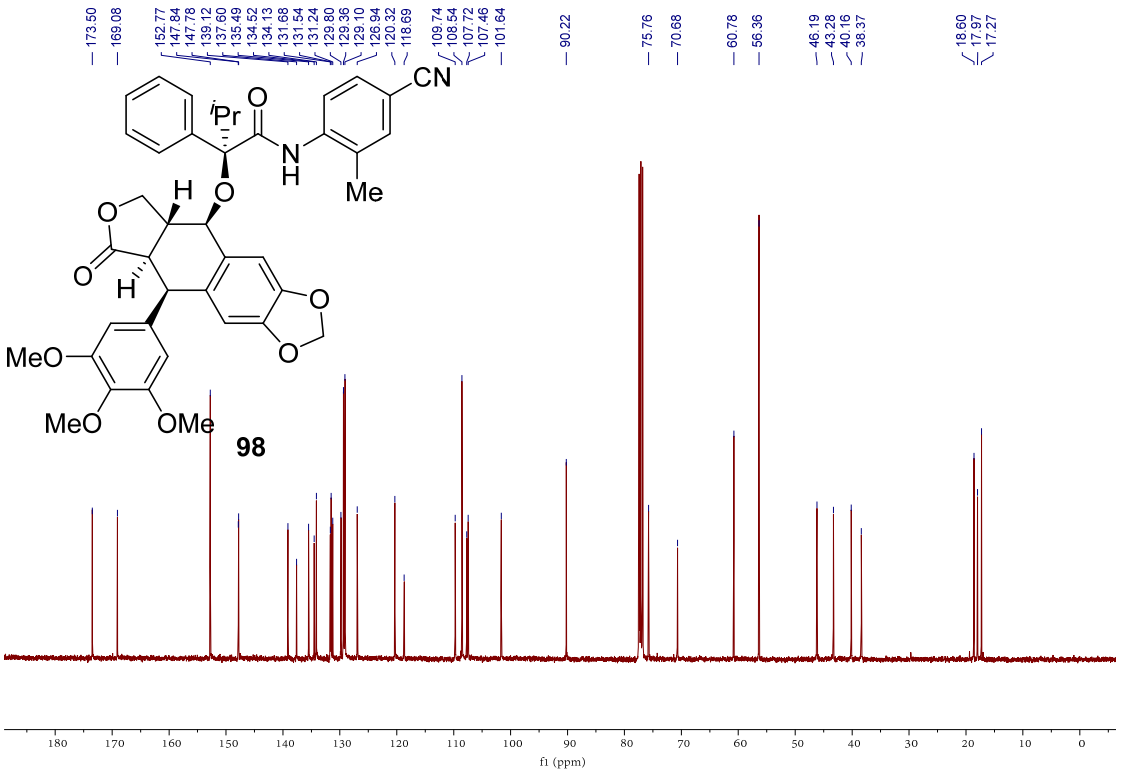

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7.29
7.27
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5.48
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4.58
4.57
4.33
4.32
4.32
4.31
4.14
4.12
4.12
4.07
4.06
4.06
4.05
4.05
4.04
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3.39
3.37
3.36
2.79
2.77
2.75
2.73
2.36
1.57
1.35
1.24
1.22
1.18
1.16
0.97
iPr
O
N
H
CN
Me
O
Me
Me
O
O
O
O
O
Me
Me
96
1.00
1.02
2.02
2.08
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1.04
1.01
1.03
1.03
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2.89
f1 (ppm)

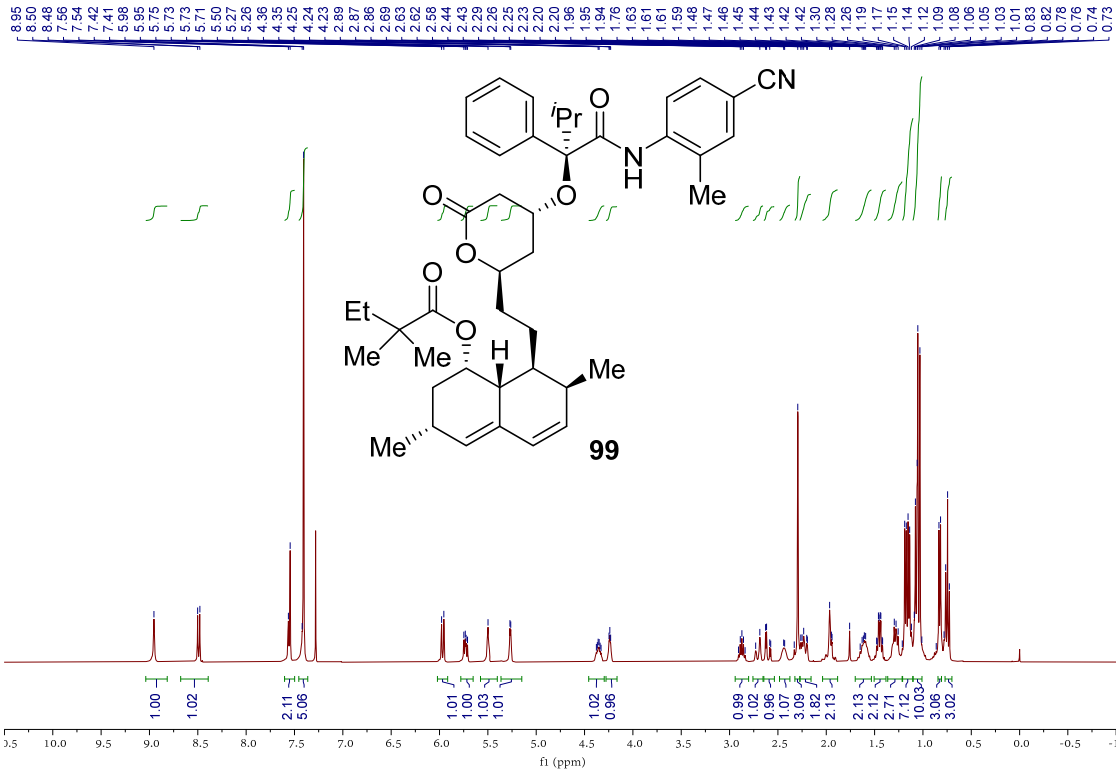

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134.01
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130.47
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128.28
128.03
123.04
119.09
109.54
108.93
107.73
96.19
87.94
71.22
70.64
70.60
67.74
64.94
35.94
26.13
25.81
25.01
24.36
17.91
17.79
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H
CN
Me
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Me
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O
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O
O
O
Me
Me
96
f1 (ppm)

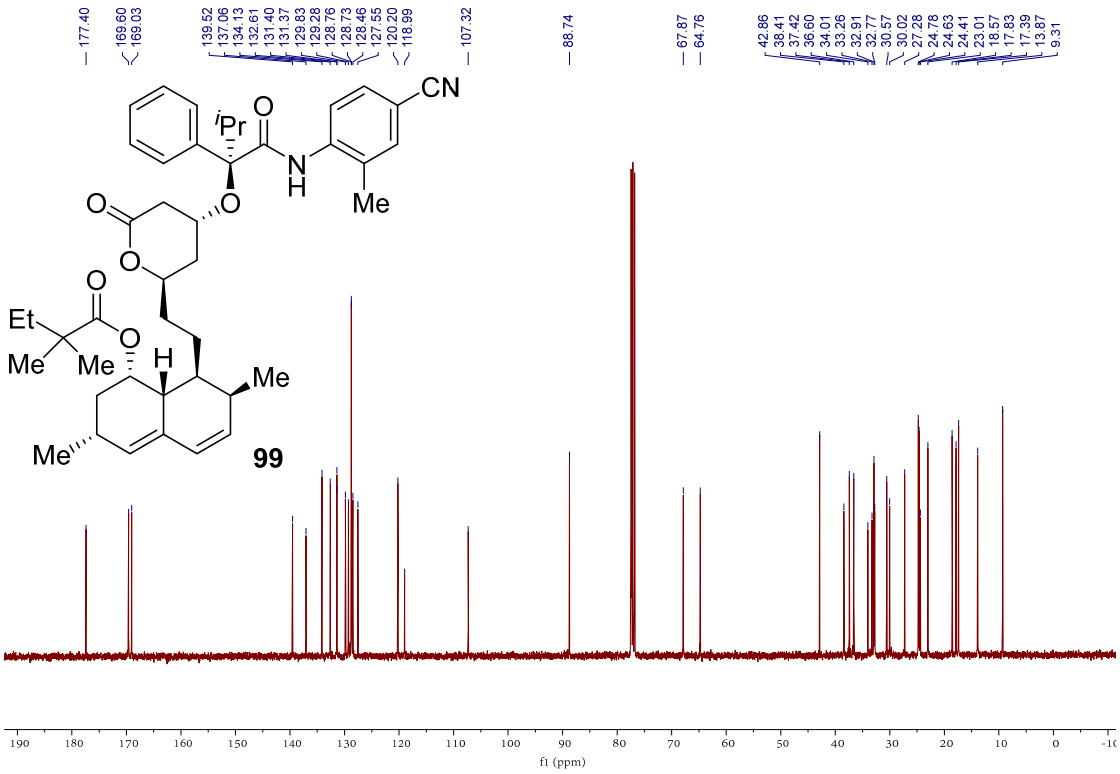

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7.42
7.42
7.41
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4.38
4.37
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4.36
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4.24
4.18
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3.30
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2.87
2.85
2.83
2.25
1.38
1.37
1.30
1.17
1.16
1.15
1.14
1.00
CN
iPr
O
N
H
Me
Me
O
H
O
O
H
H
O
H
O
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Me
Me
97
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6.10
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6.00
3.05
f1 (ppm)

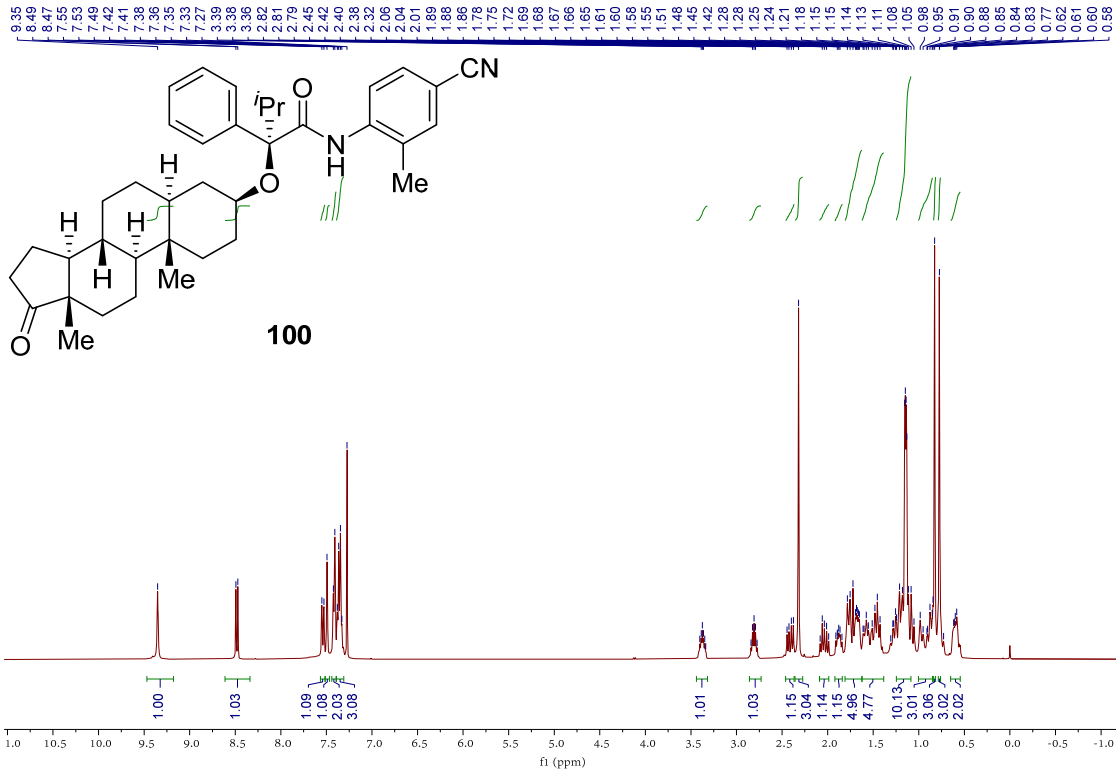

170.13
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136.52
133.93
131.43
129.23
129.15
128.67
127.64
120.71
118.93
111.63
109.68
107.38
104.31
89.04
82.60
81.11
71.81
68.13
31.25
26.80
26.50
25.64
25.28
18.72
17.94
17.42
CN
iPr
O
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H
Me
Me
O
H
O
O
H
H
O
H
O
O
Me
Me
97
f1 (ppm)

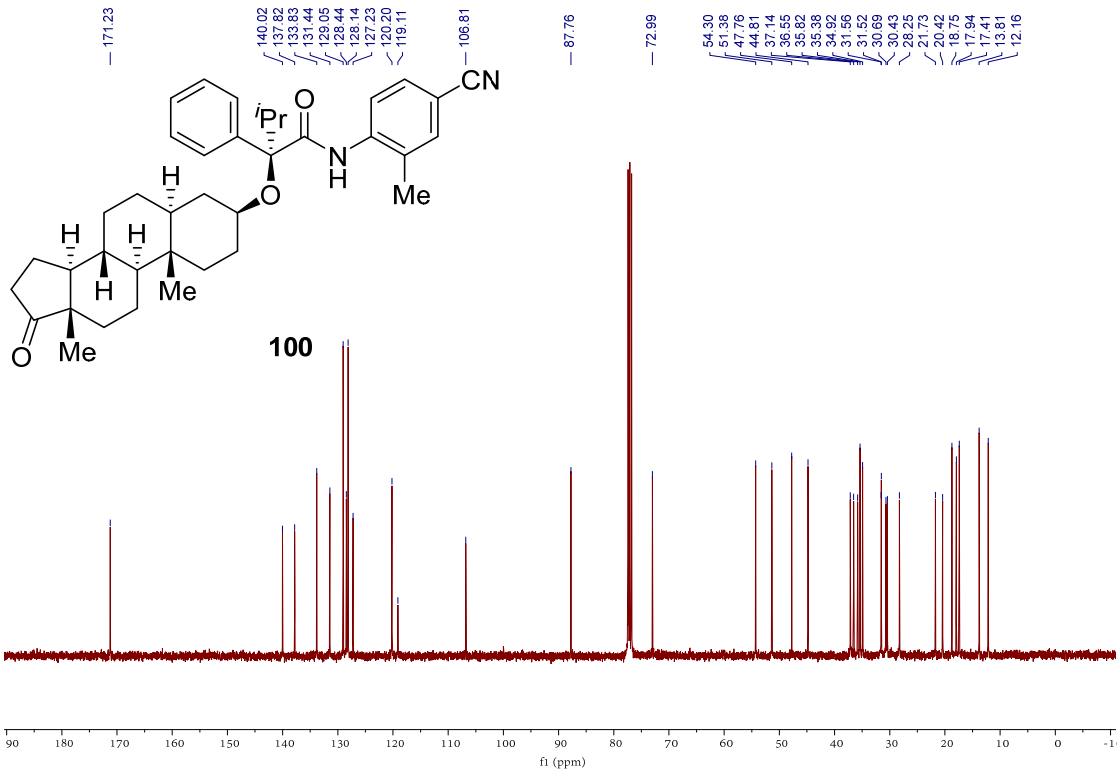

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7.53
7.53
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7.46
7.45
7.45
7.42
7.13
6.51
6.37
6.05
6.01
6.00
4.52
4.51
4.45
4.43
4.09
4.08
4.07
4.05
3.82
3.73
3.34
3.31
3.29
3.05
3.03
3.01
3.00
2.98
2.72
2.70
2.69
2.68
2.67
2.66
2.64
2.63
2.62
2.58
2.57
2.55
2.54
2.43
2.07
1.26
1.24
1.00
0.98
iPr
O
N
H
CN
Me
H
O
O
O
H
O
O
MeO
MeO
OMe
98
1.01
1.08
2.14
5.41
1.06
1.10
2.09
1.09
0.96
1.12
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1.09
1.14
1.00
3.04
3.17
3.14
f1 (ppm)

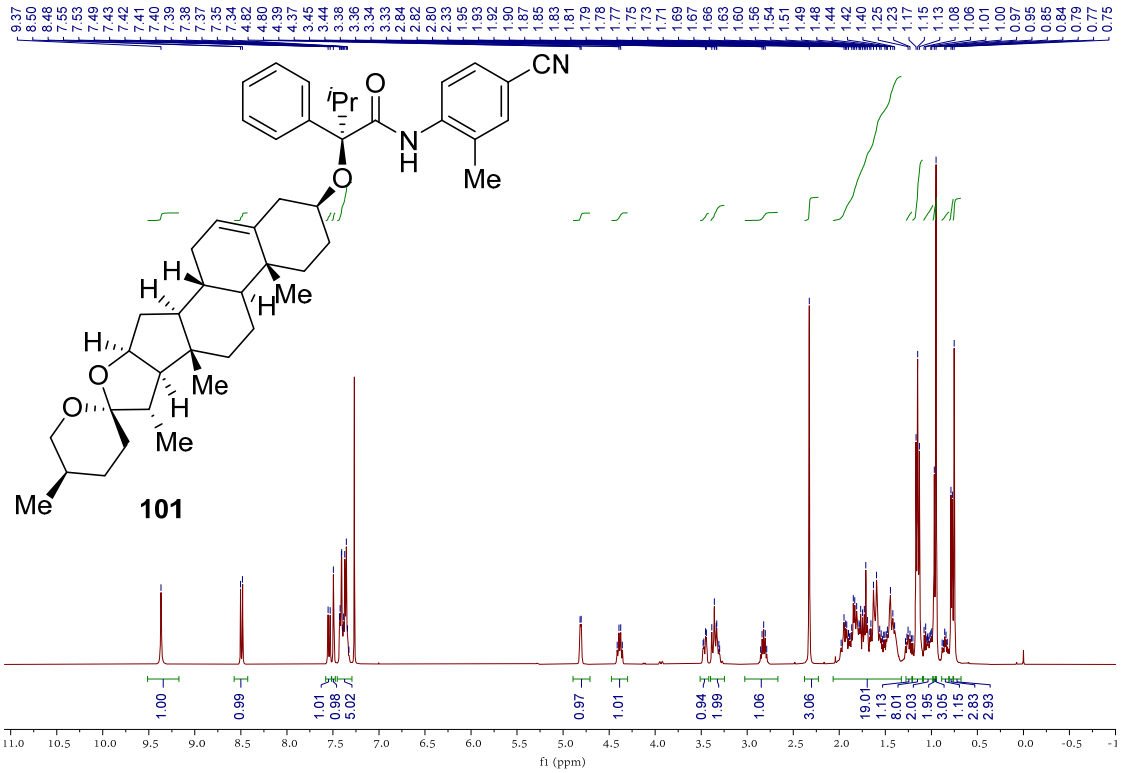

173.50
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135.49
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134.13
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131.54
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129.80
129.36
129.10
126.94
120.32
118.69
109.74
108.54
107.72
107.46
101.64
90.22
75.76
70.68
60.78
56.36
46.19
43.28
40.16
38.37
18.60
17.97
17.27
iPr
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H
CN
Me
H
O
O
O
H
O
O
MeO
MeO
OMe
98
f1 (ppm)

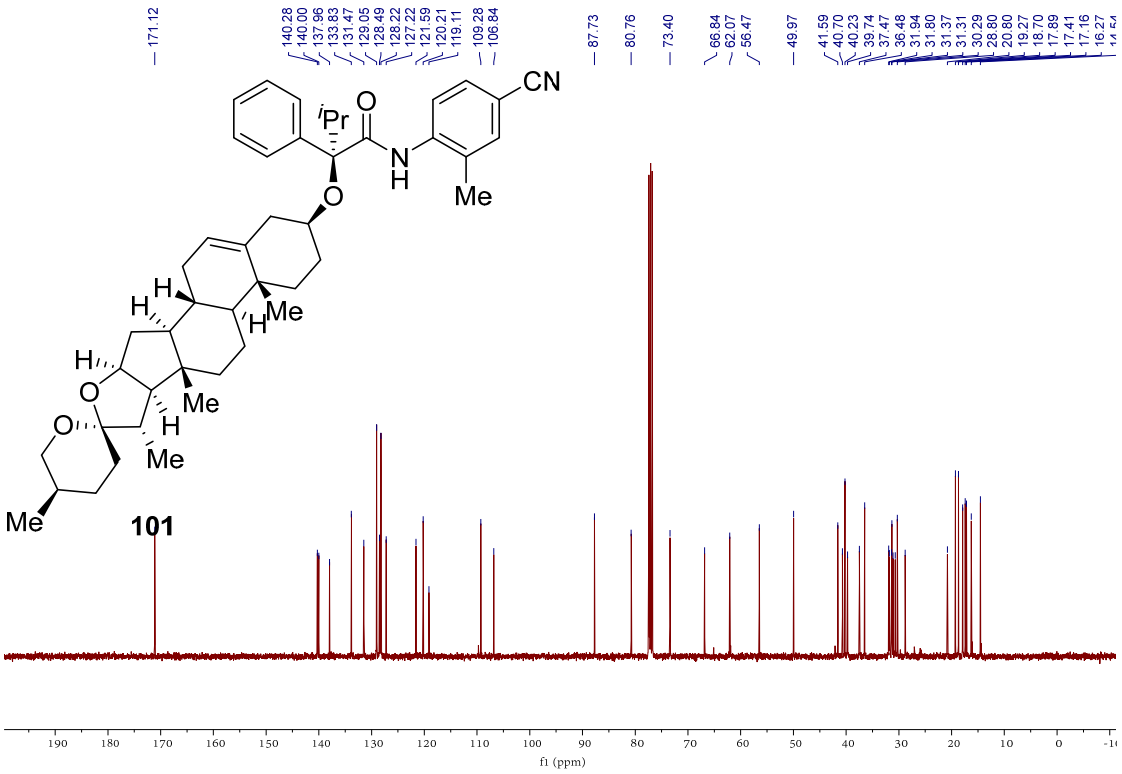

99
f1 (ppm)

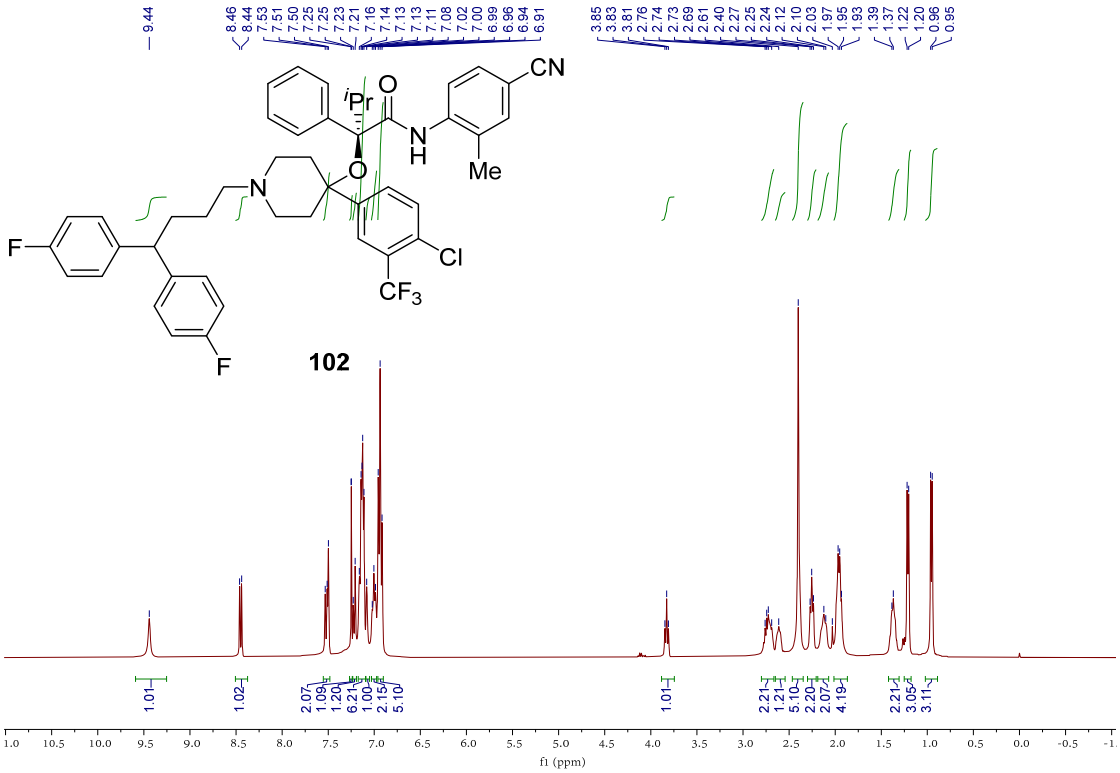

99
f1 (ppm)

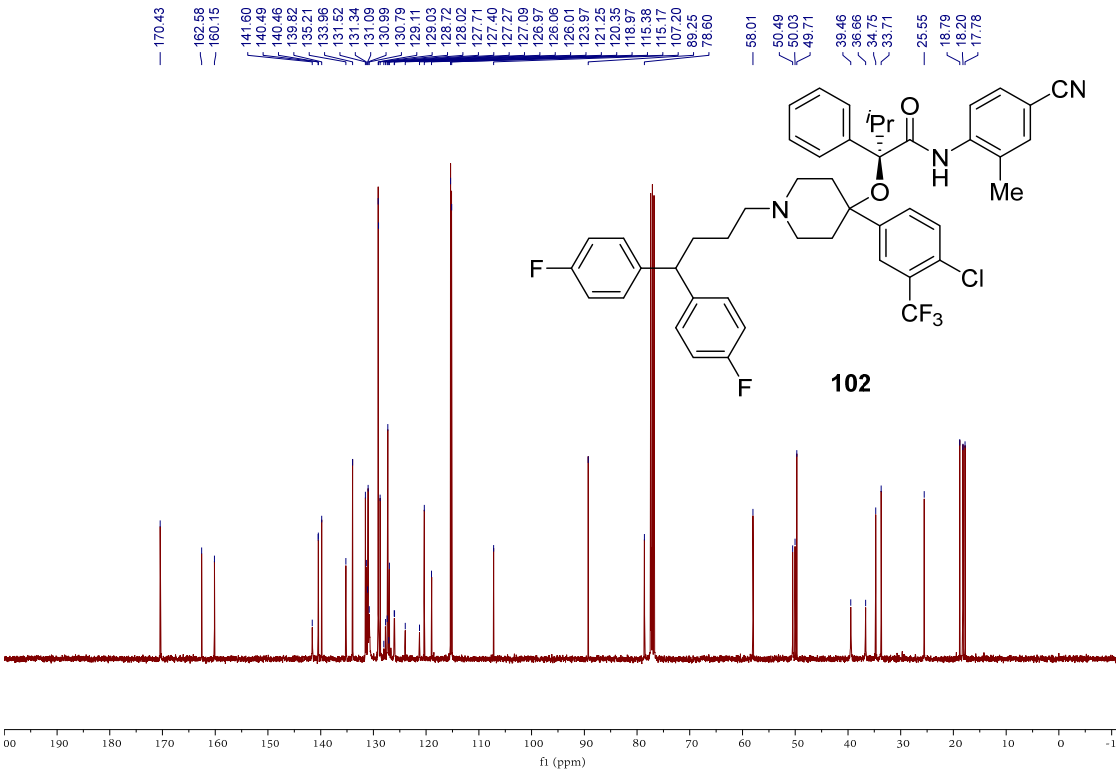

100
fl (ppm)

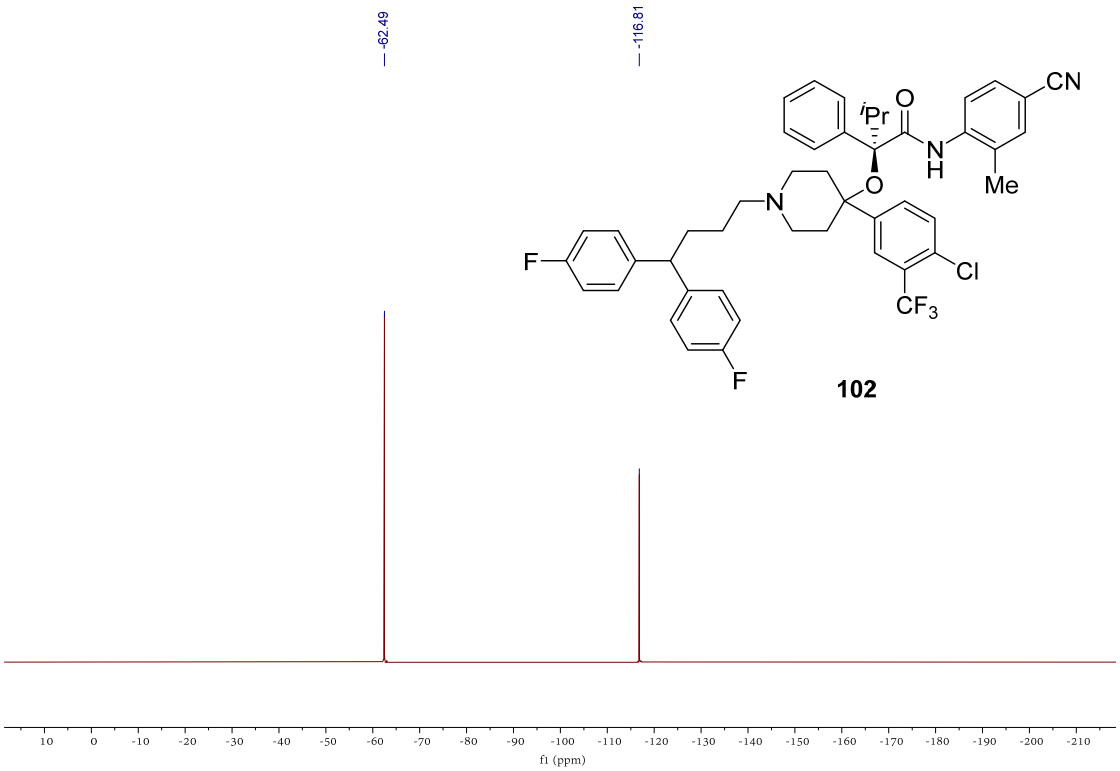

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fl (ppm)

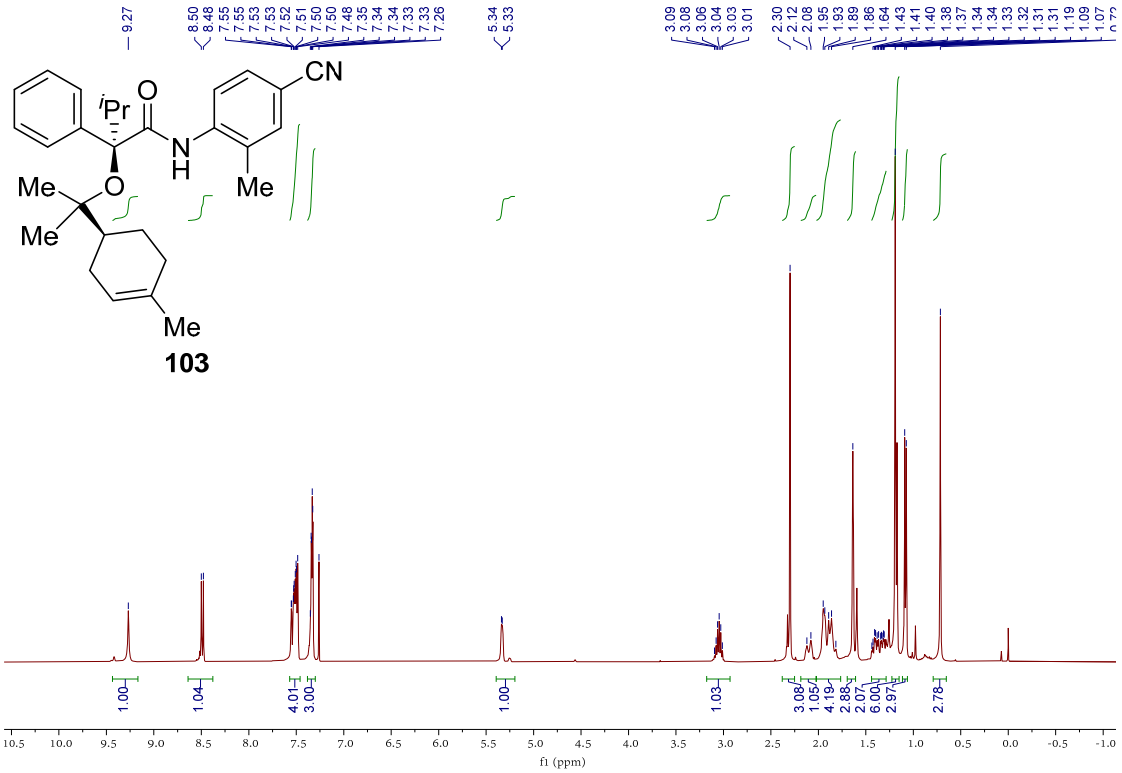

101
f1 (ppm)

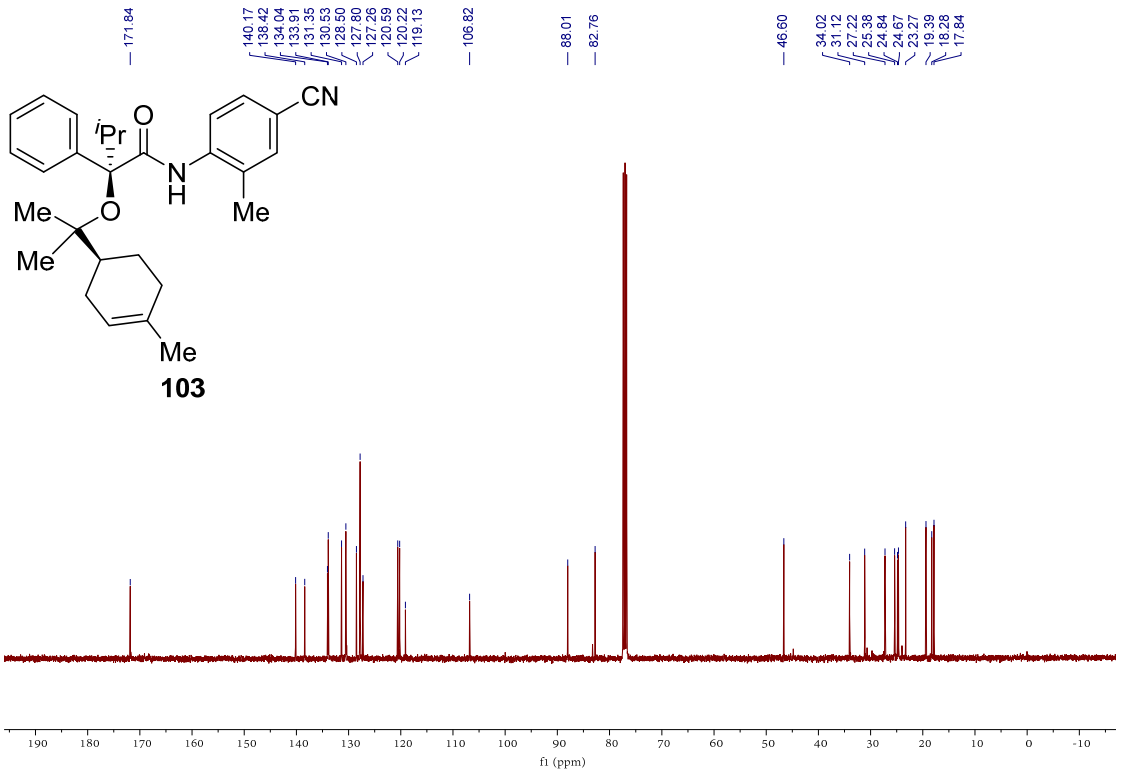

101
f1 (ppm)

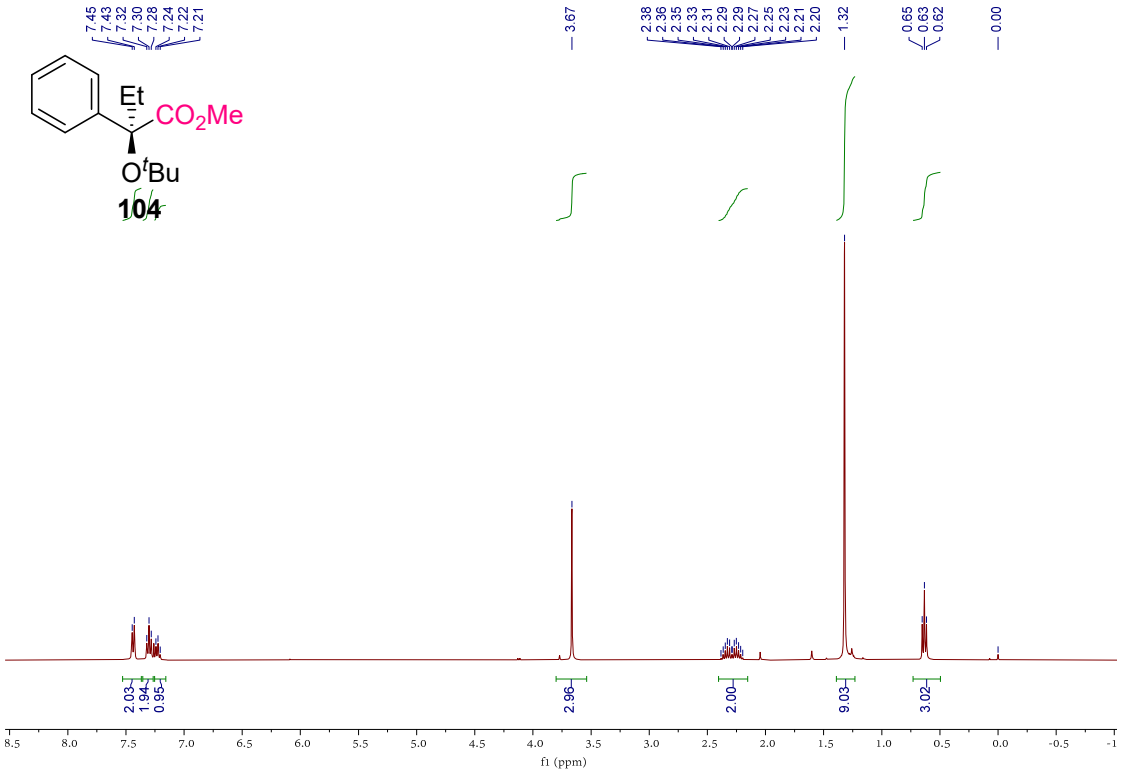

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8.46
8.44
7.53
7.51
7.50
7.25
7.25
7.23
7.21
7.16
7.14
7.13
7.13
7.11
7.08
7.02
7.00
6.99
6.96
6.94
6.91
3.85
3.83
3.81
2.76
2.74
2.73
2.69
2.61
2.40
2.27
2.25
2.24
2.12
2.10
2.03
1.97
1.95
1.93
1.39
1.37
1.22
1.20
0.96
0.95
iPr
O
N
H
CN
Me
N
O
F
Cl
CF3
F
102
1.01
1.02
2.07
1.09
1.20
6.21
1.00
2.15
5.10
1.01
2.21
1.21
5.10
2.20
2.07
4.19
2.21
3.05
3.11
f1 (ppm)

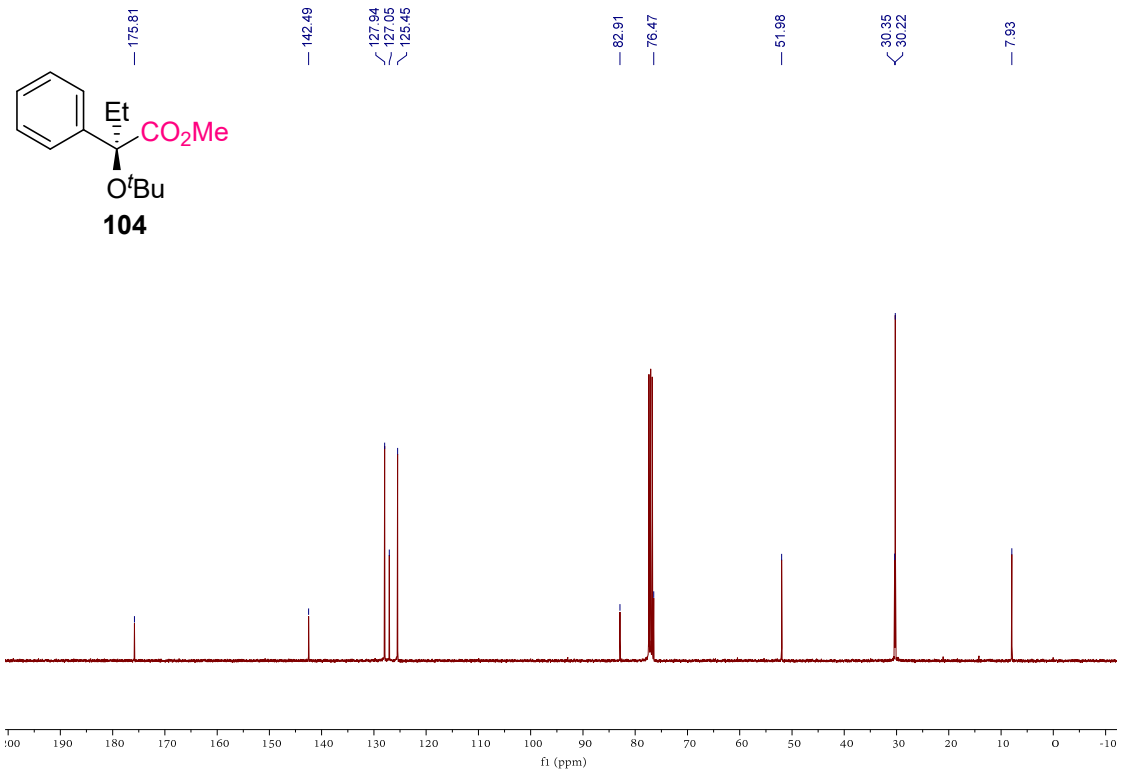

170.43
162.58
160.15
141.60
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140.46
139.82
135.21
133.96
131.52
131.34
131.09
130.99
130.79
129.11
129.03
128.72
128.02
127.71
127.40
127.27
127.09
126.97
126.06
126.01
123.97
121.25
120.35
118.97
115.38
115.17
107.20
89.25
78.60
58.01
50.49
50.03
49.71
39.46
36.66
34.75
33.71
25.55
18.79
18.20
17.78
iPr
O
N
H
CN
Me
N
O
F
Cl
CF3
F
102
f1 (ppm)

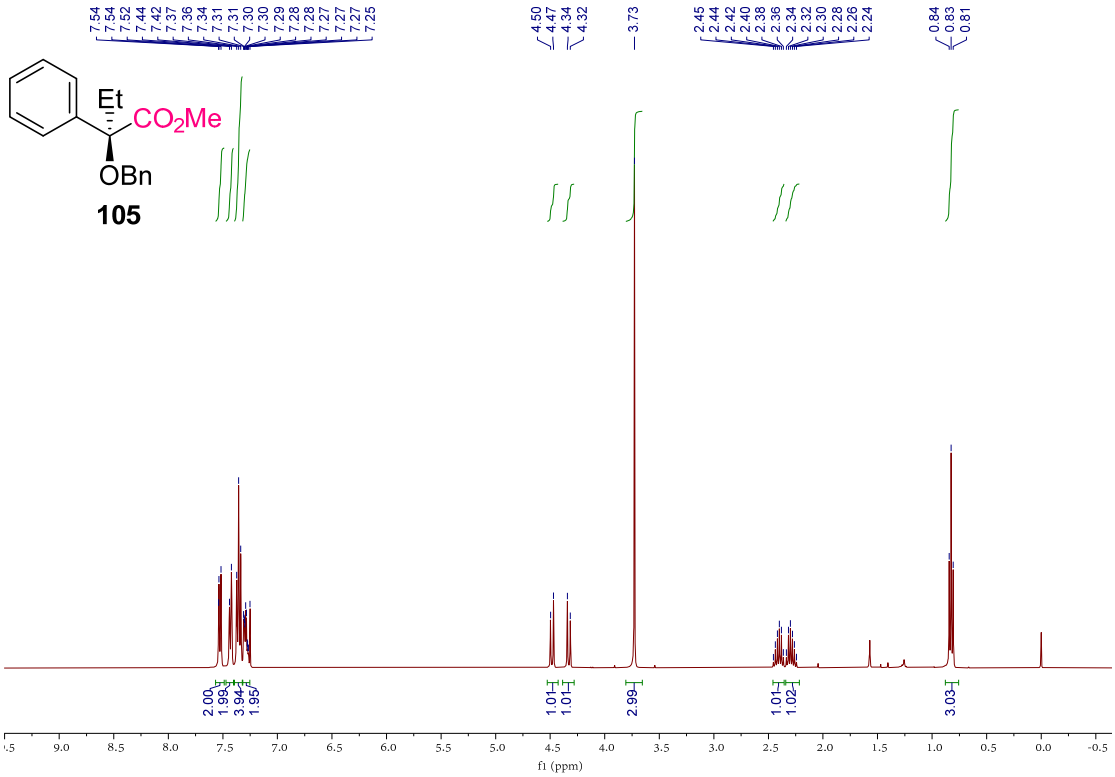

-62.49
-116.81
CN
O
iPr
N
H
Me
O
N
F
Cl
CF3
F
102
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

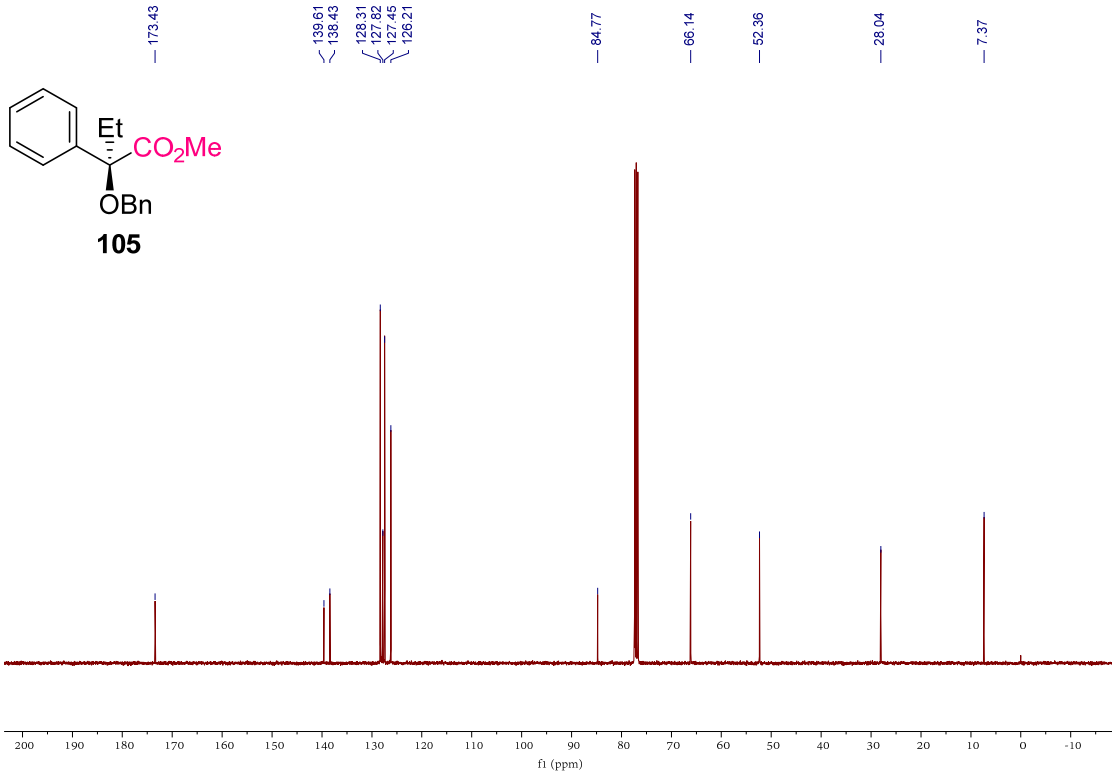

9.27
8.50
8.48
7.55
7.53
7.52
7.51
7.50
7.48
7.35
7.34
7.33
7.26
5.34
5.33
3.09
3.08
3.06
3.04
3.03
3.01
2.30
2.12
2.08
1.95
1.93
1.89
1.86
1.64
1.43
1.41
1.40
1.38
1.37
1.34
1.34
1.33
1.32
1.31
1.31
1.19
1.09
1.07
CN
iPr
O
N
H
Me
Me
O
Me
Me
103
1.00
1.04
4.01
3.00
1.00
1.03
3.08
1.05
4.19
2.88
2.07
6.00
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2.78
f1 (ppm)

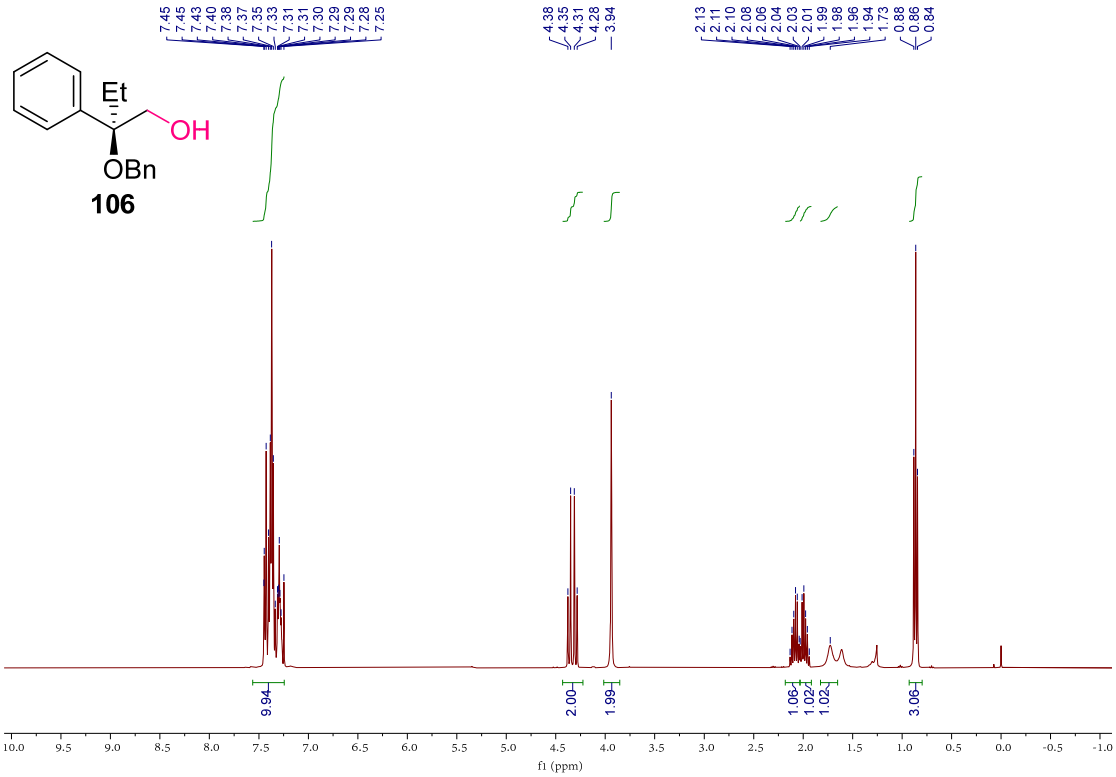

171.84
140.17
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134.04
133.91
131.35
130.53
128.50
127.80
127.26
120.59
120.22
119.13
106.82
88.01
82.76
46.60
34.02
31.12
27.22
25.38
24.84
24.67
23.27
19.39
18.28
17.84
CN
iPr
O
N
H
Me
Me
O
Me
Me
103
f1 (ppm)

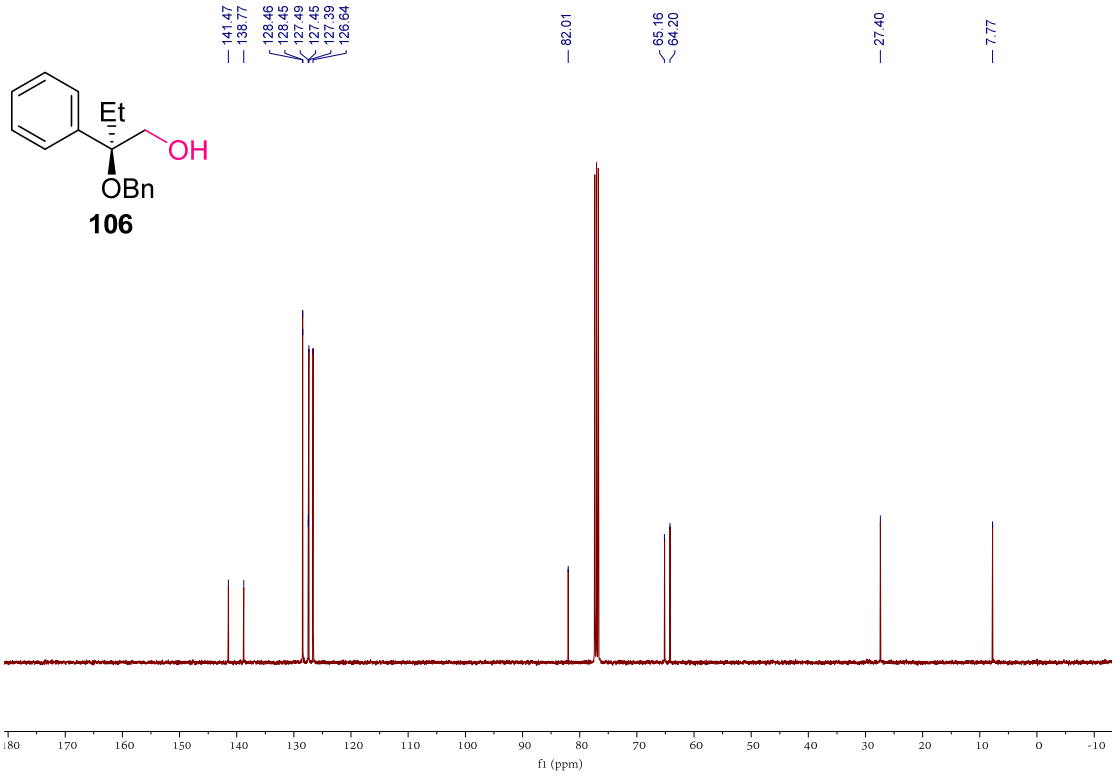

7.45
7.43
7.32
7.30
7.28
7.24
7.22
7.21
3.67
2.38
2.36
2.35
2.33
2.31
2.29
2.29
2.27
2.25
2.23
2.21
2.20
1.32
0.65
0.63
0.62
0.00
Et
CO2Me
OtBu
104
2.03
1.94
0.95
2.96
2.00
9.03
3.02
f1 (ppm)

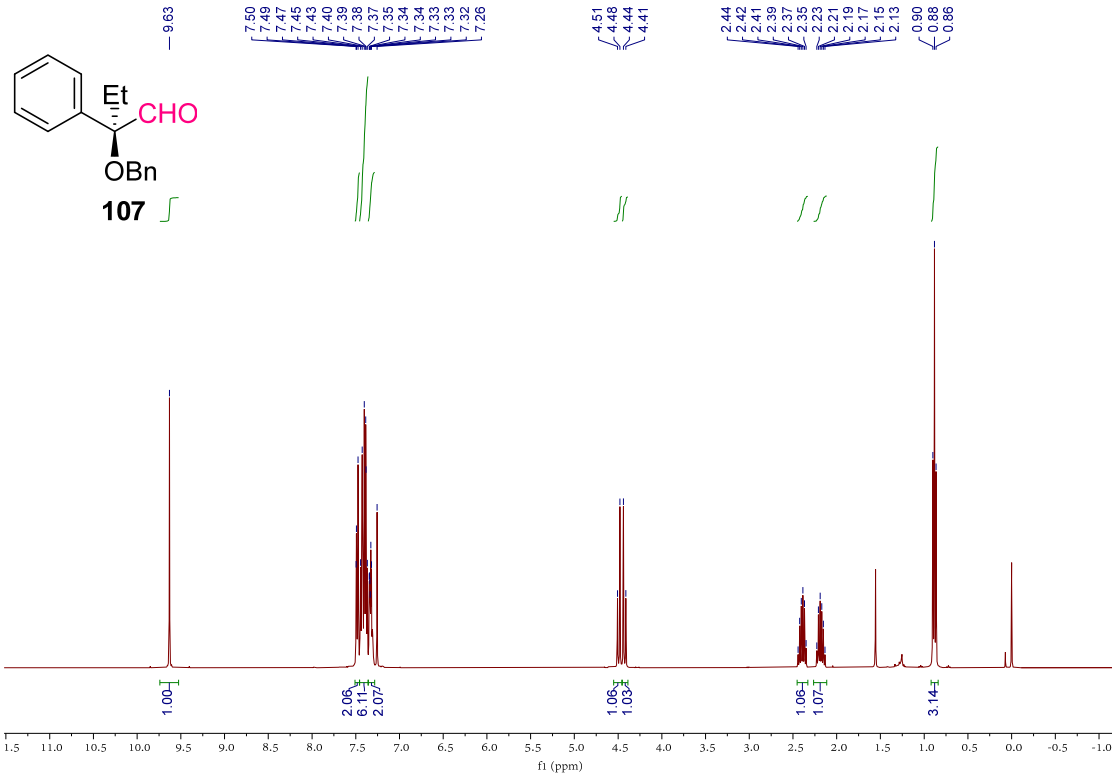

175.81
142.49
127.94
127.05
125.45
82.91
76.47
51.98
30.35
30.22
7.93
Et
CO2Me
OtBu
104
f1 (ppm)

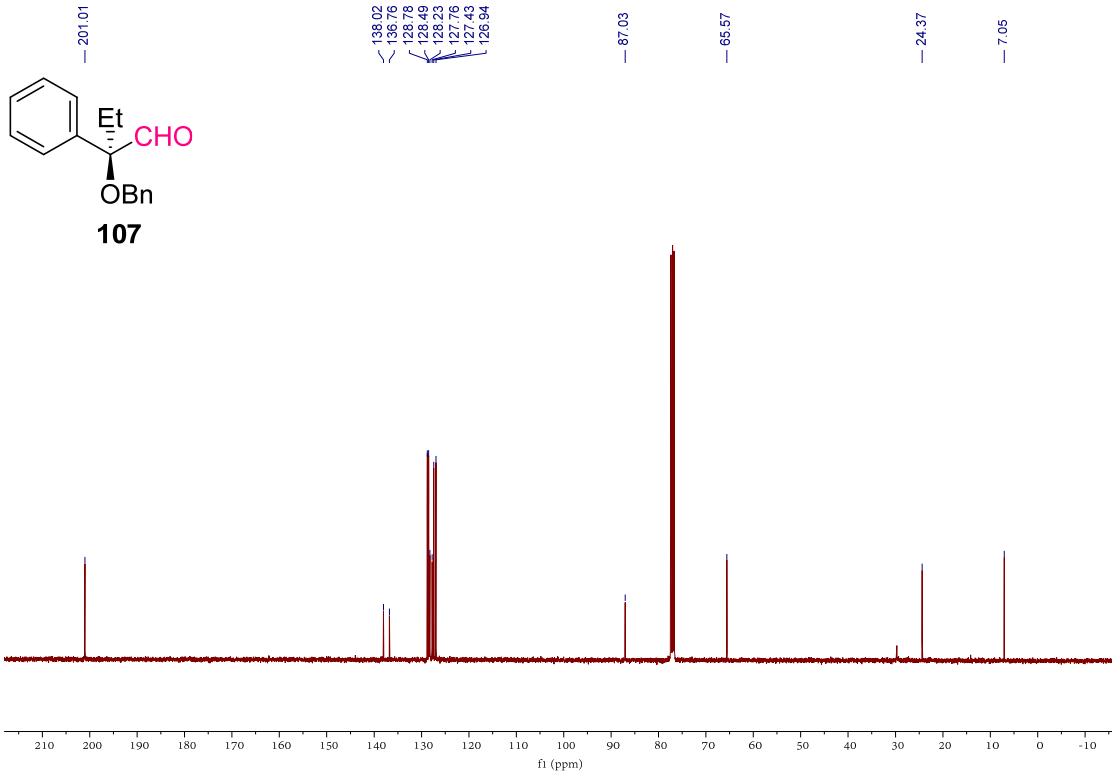

Et
CO2Me
OBn
105
f1 (ppm)

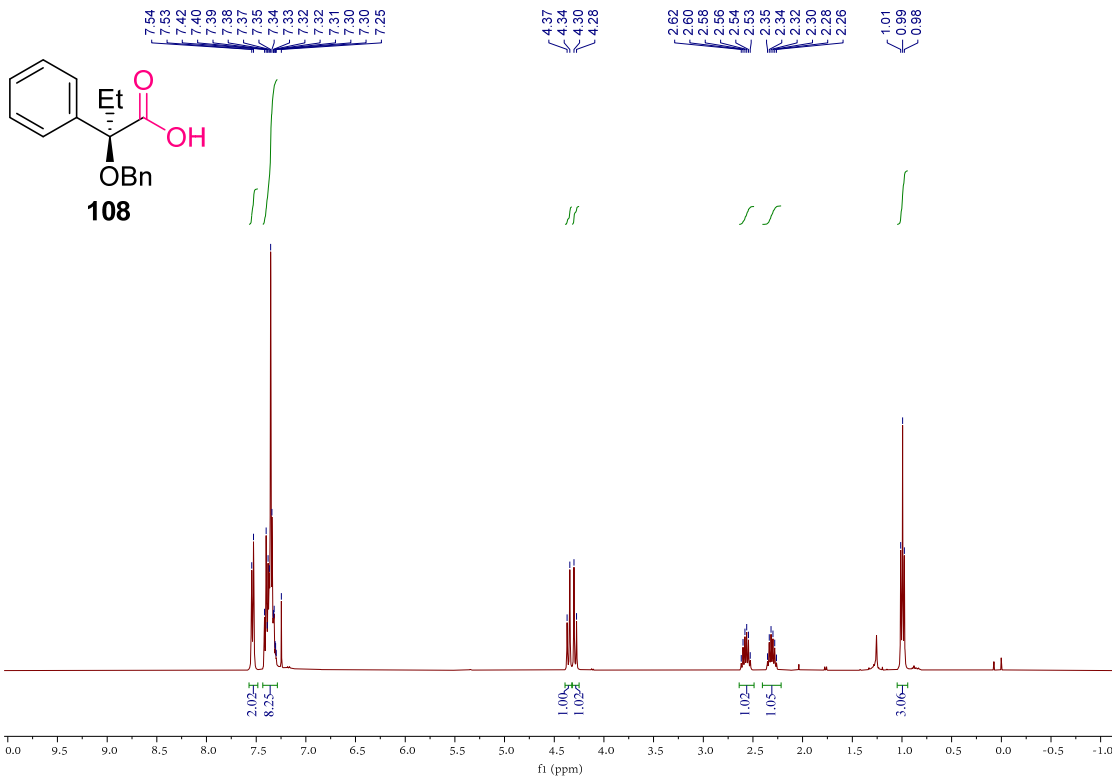

Et
CO2Me
OBn
105
f1 (ppm)

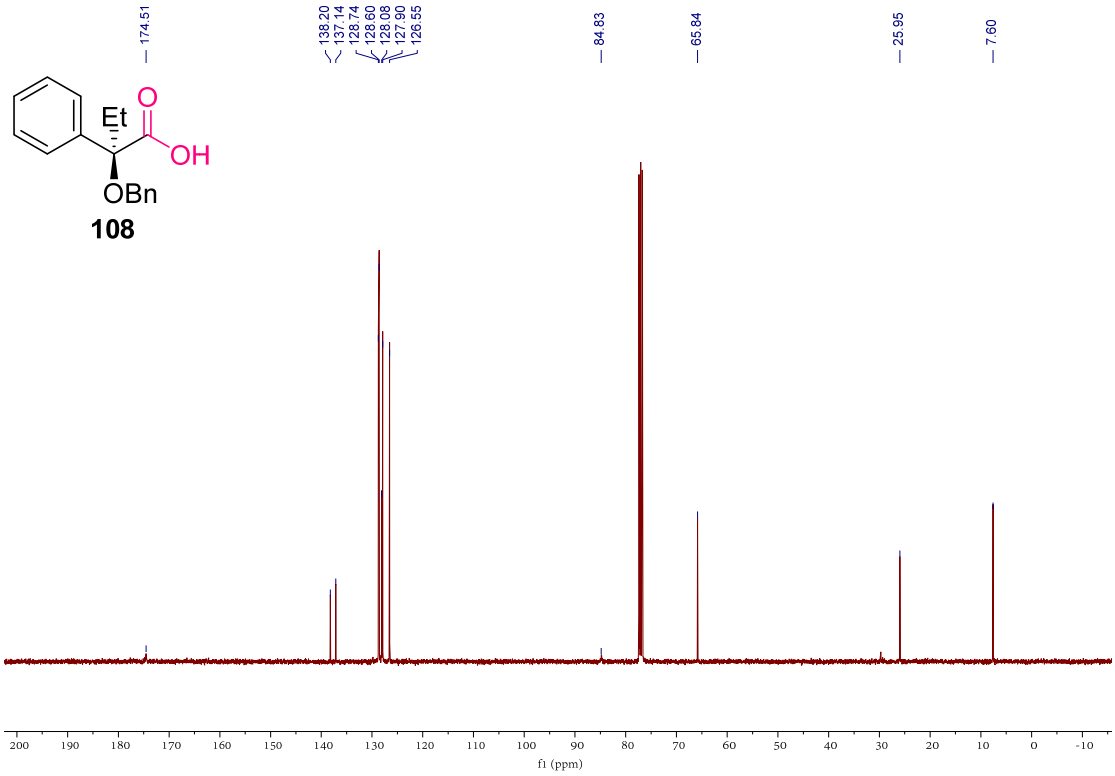

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7.45
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7.37
7.35
7.33
7.31
7.31
7.30
7.29
7.29
7.28
7.25
4.38
4.35
4.31
4.28
3.94
2.13
2.11
2.10
2.08
2.06
2.04
2.03
2.01
1.99
1.98
1.96
1.94
1.73
0.88
0.86
0.84
Et
OH
OBn
106
9.94
2.00
1.99
1.06
1.02
1.02
3.06
f1 (ppm)

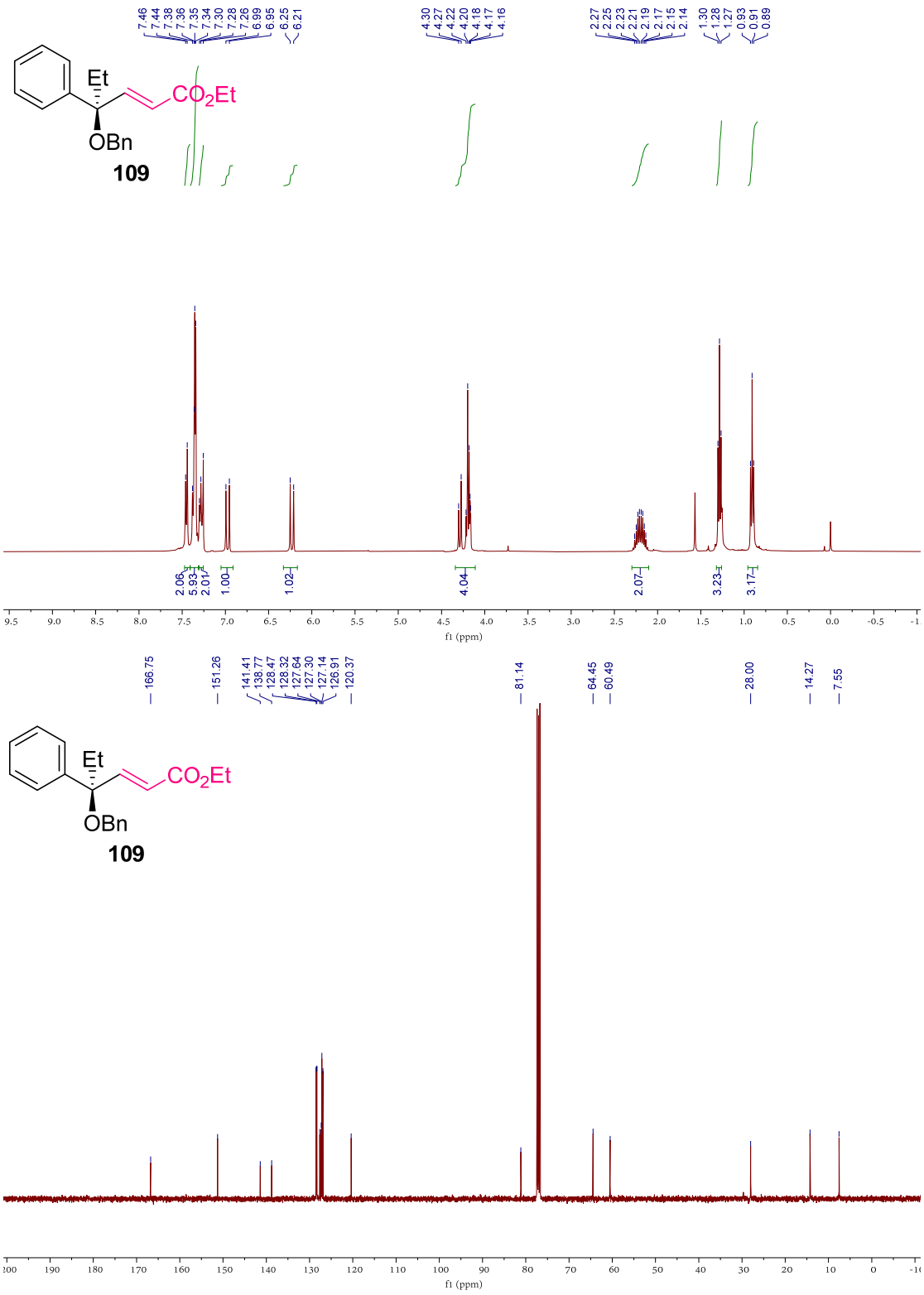

141.47
138.77
128.46
128.45
127.49
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126.64
82.01
65.16
64.20
27.40
7.77
Et
OH
OBn
106
f1 (ppm)

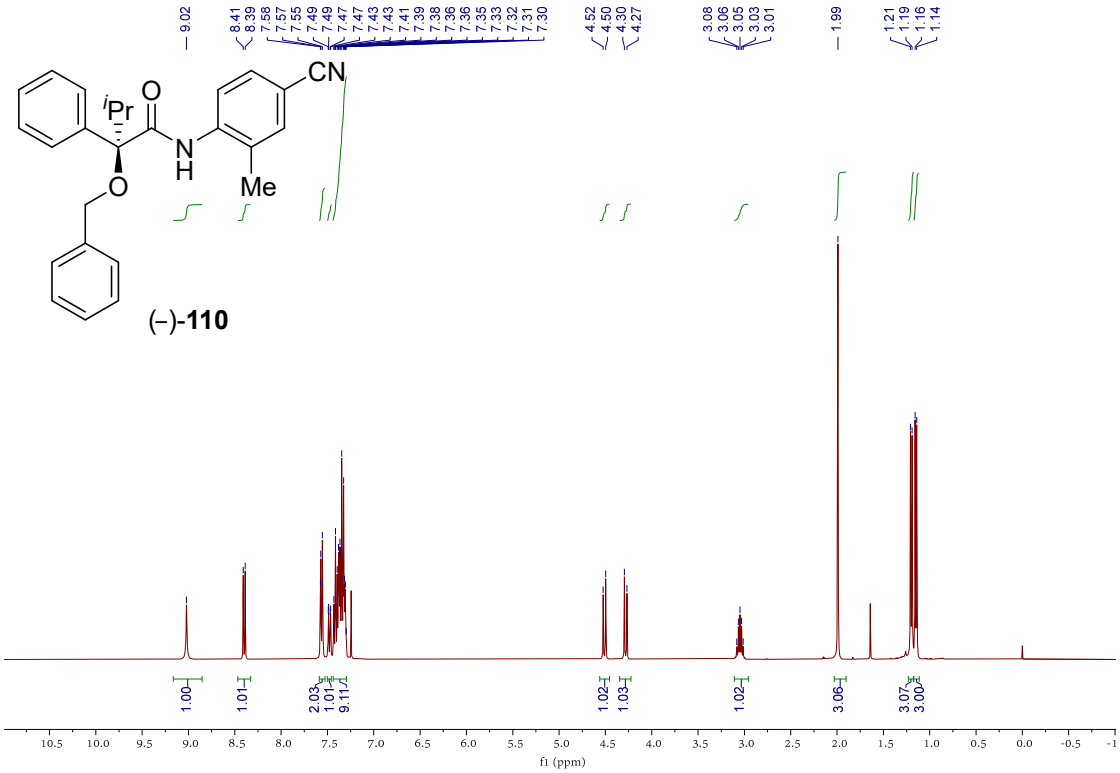

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7.39
7.38
7.37
7.35
7.34
7.34
7.33
7.33
7.32
7.26
4.51
4.48
4.44
4.41
2.44
2.42
2.41
2.39
2.37
2.35
2.23
2.21
2.19
2.17
2.15
2.13
0.90
0.88
0.86
Et
CHO
OBn
107
1.00
2.06
6.11
2.07
1.06
1.03
1.08
1.07
3.14
f1 (ppm)

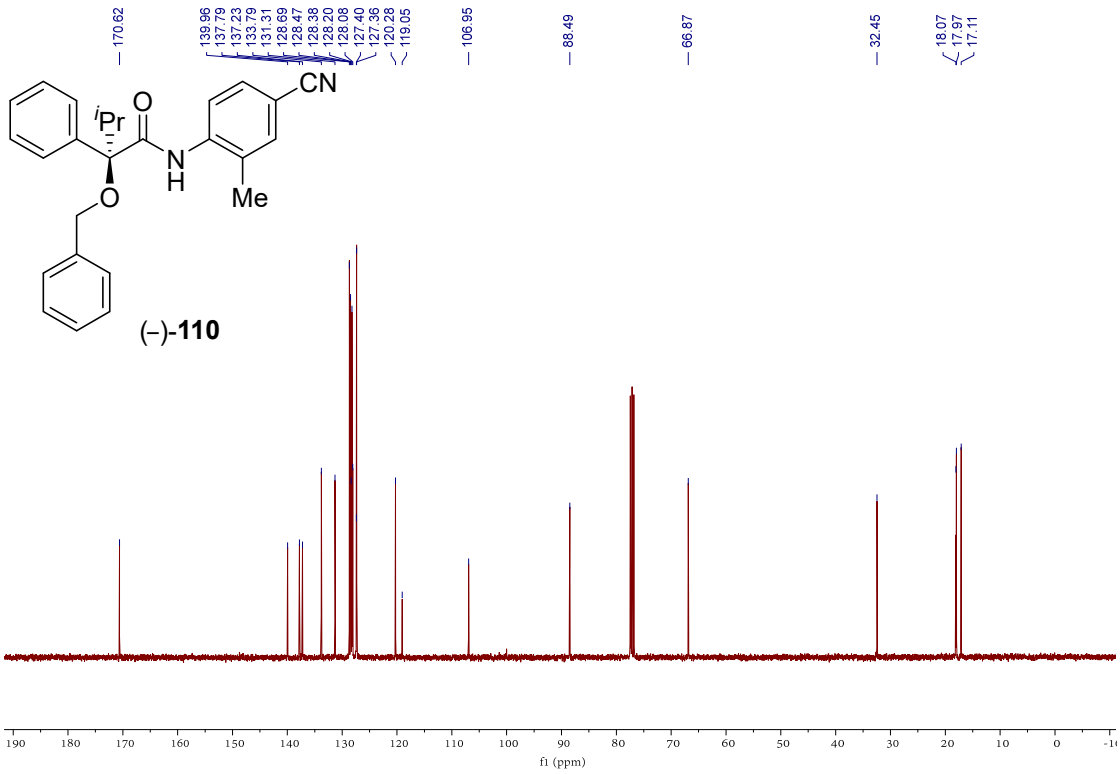

201.01
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136.76
128.78
128.49
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127.43
126.94
87.03
65.57
24.37
7.05
Et
CHO
OBn
107
f1 (ppm)

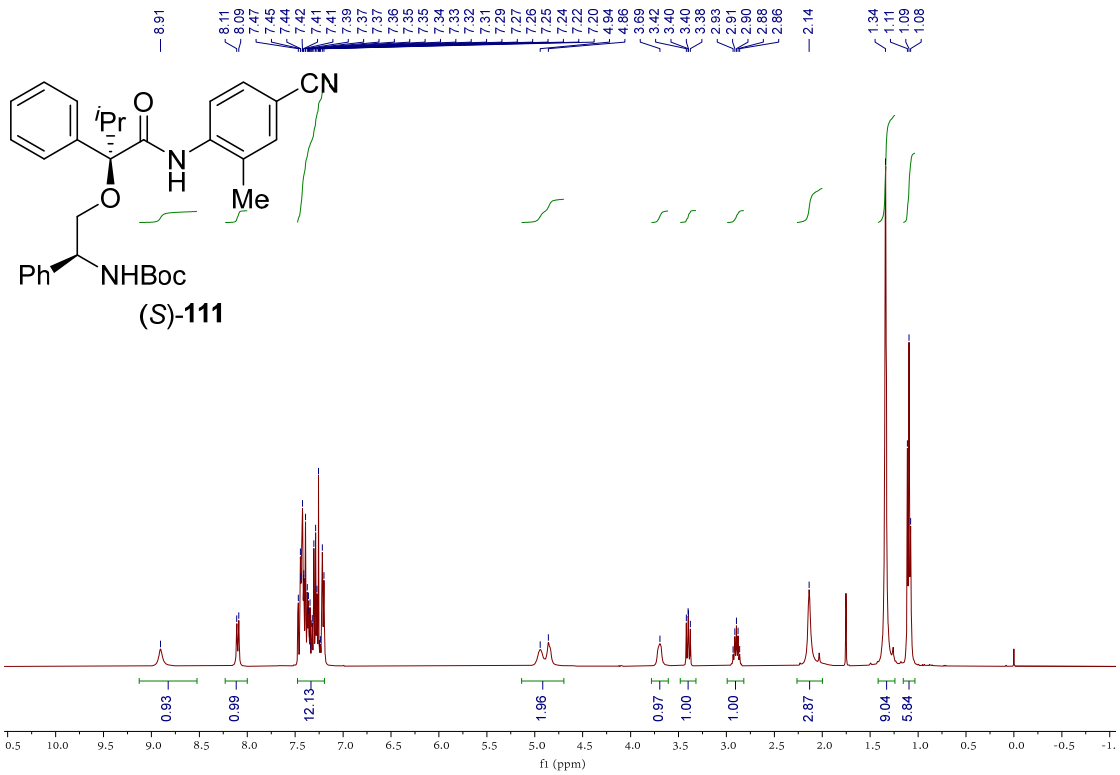

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7.38
7.37
7.35
7.34
7.33
7.32
7.32
7.31
7.30
7.30
7.25
4.37
4.34
4.30
4.28
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2.60
2.58
2.56
2.54
2.53
2.35
2.34
2.32
2.30
2.28
2.26
1.01
0.99
0.98
Et
O
OH
OBn
108
2.02
8.25
1.00
1.02
1.02
1.05
3.06
f1 (ppm)

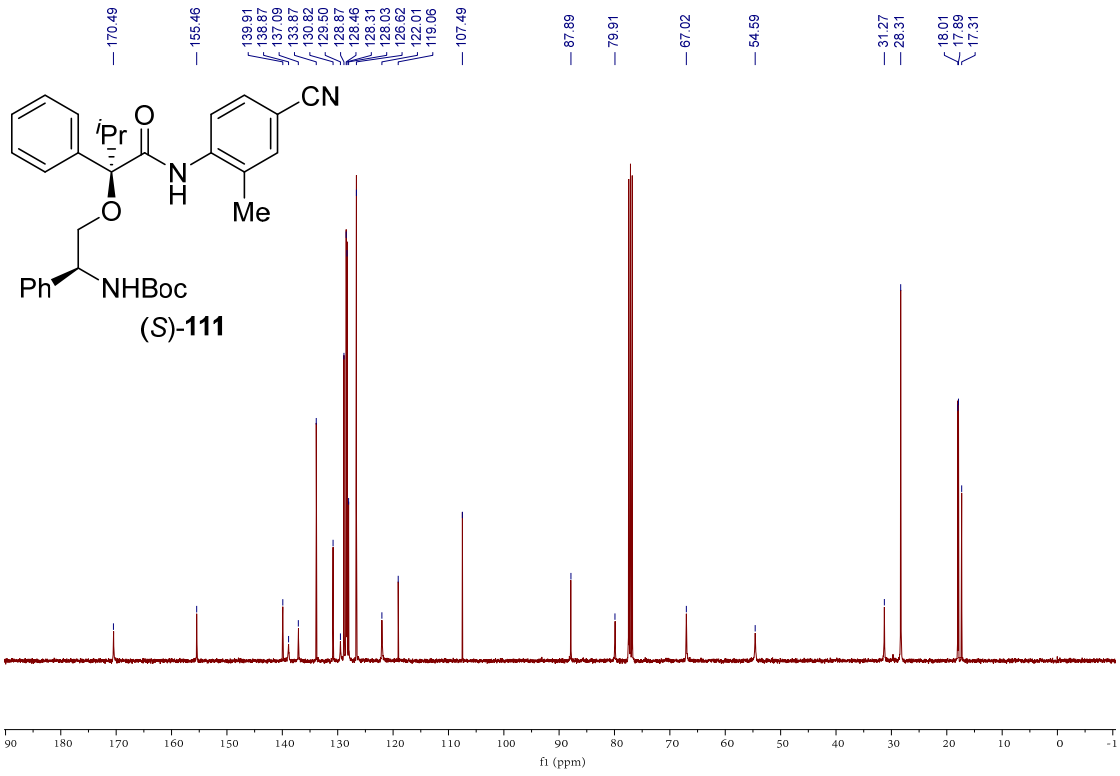

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137.14
128.74
128.60
128.08
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126.55
84.83
65.84
25.95
7.60
Et
O
OH
OBn
108
f1 (ppm)

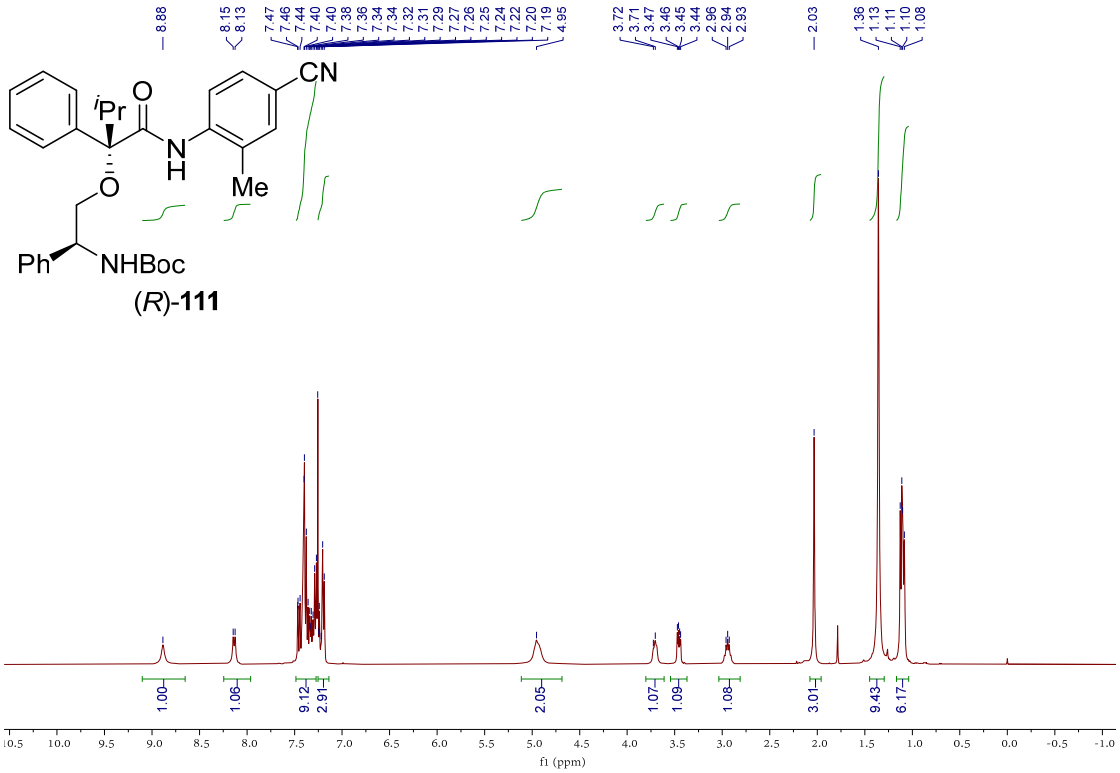

7.46
7.44
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7.34
7.30
7.28
7.26
6.99
6.95
6.25
6.21
4.30
4.27
4.22
4.20
4.18
4.17
4.16
2.27
2.25
2.23
2.21
2.19
2.17
2.15
2.14
1.30
1.28
1.27
0.93
0.91
0.89
Et
CO2Et
OBn
109
2.06
5.93
2.01
1.00
1.02
4.04
2.07
3.23
3.17
f1 (ppm)
166.75
151.26
141.41
138.77
128.47
128.32
127.64
127.30
127.14
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120.37
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64.45
60.49
28.00
14.27
7.55
Et
CO2Et
OBn
109
f1 (ppm)

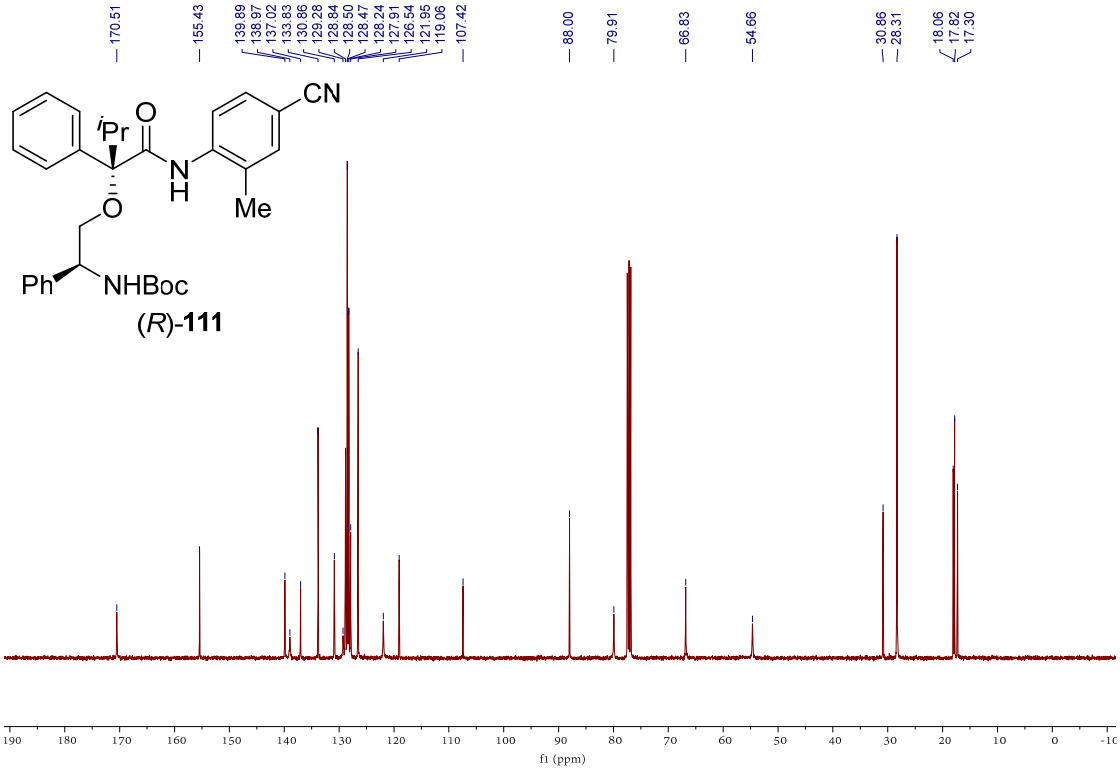

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7.57
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7.49
7.47
7.47
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7.43
7.41
7.39
7.38
7.36
7.36
7.35
7.33
7.32
7.31
7.30
4.52
4.50
4.30
4.27
3.08
3.06
3.05
3.03
3.01
1.99
1.21
1.19
1.16
1.14
CN
iPr
O
N
H
Me
O
(–)-110
1.00
1.01
2.03
1.01
9.11
1.02
1.03
1.02
3.06
3.07
3.00
f1 (ppm)

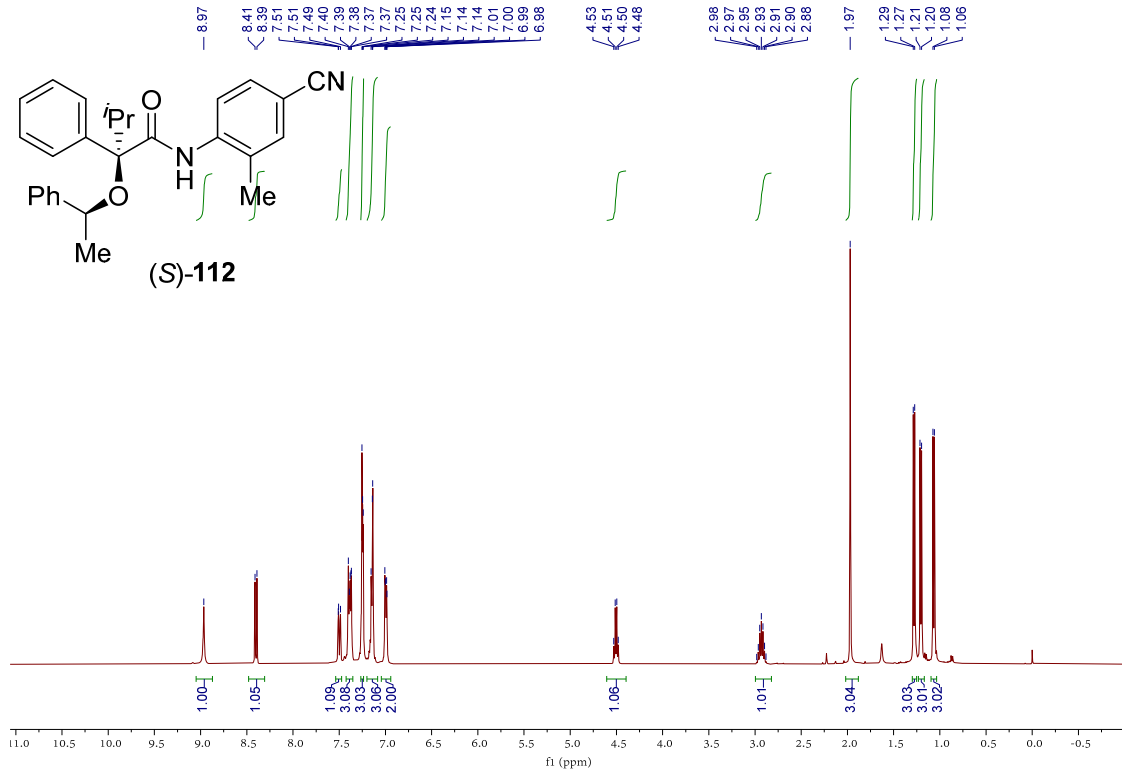

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137.23
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128.47
128.38
128.20
128.08
127.40
127.36
120.28
119.05
106.95
88.49
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18.07
17.97
17.11
CN
iPr
O
N
H
Me
O
(–)-110
f1 (ppm)

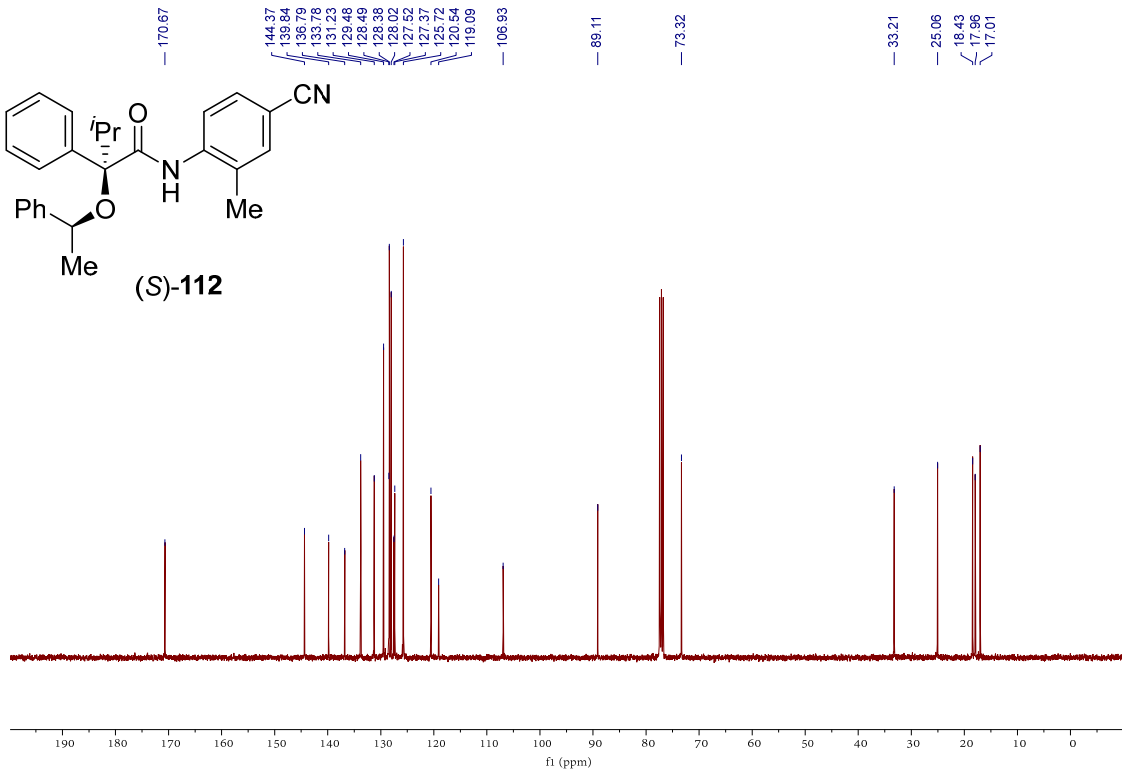

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7.41
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7.35
7.35
7.34
7.33
7.32
7.31
7.29
7.27
7.26
7.25
7.24
7.22
7.20
4.94
4.86
3.69
3.42
3.40
3.40
3.38
2.93
2.91
2.90
2.88
2.86
2.14
1.34
1.11
1.09
1.08
CN
O
iPr
N
H
Me
O
Ph
NHBoc
(S)-111
0.93
0.99
12.13
1.96
0.97
1.00
1.00
2.87
9.04
5.84
f1 (ppm)

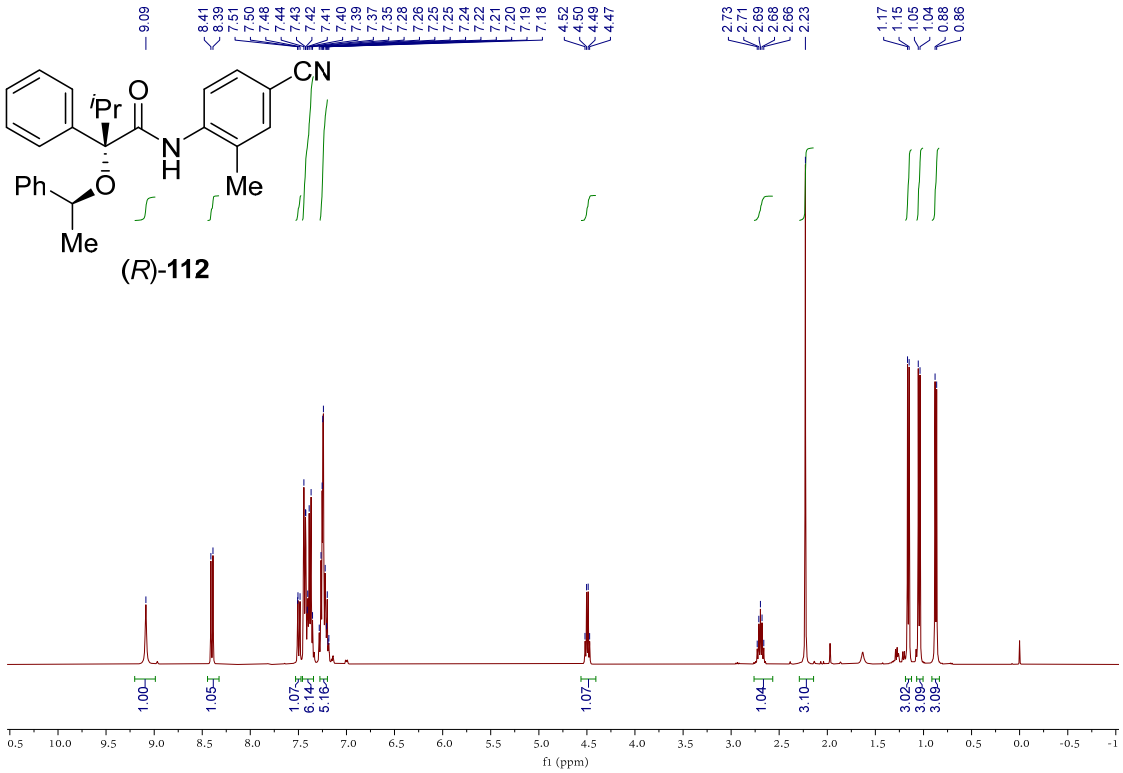

170.49
155.46
139.91
138.87
137.09
133.87
130.82
129.50
128.87
128.46
128.31
128.03
126.62
122.01
119.06
107.49
87.89
79.91
67.02
54.59
31.27
28.31
18.01
17.89
17.31
CN
O
iPr
N
H
Me
O
Ph
NHBoc
(S)-111
f1 (ppm)

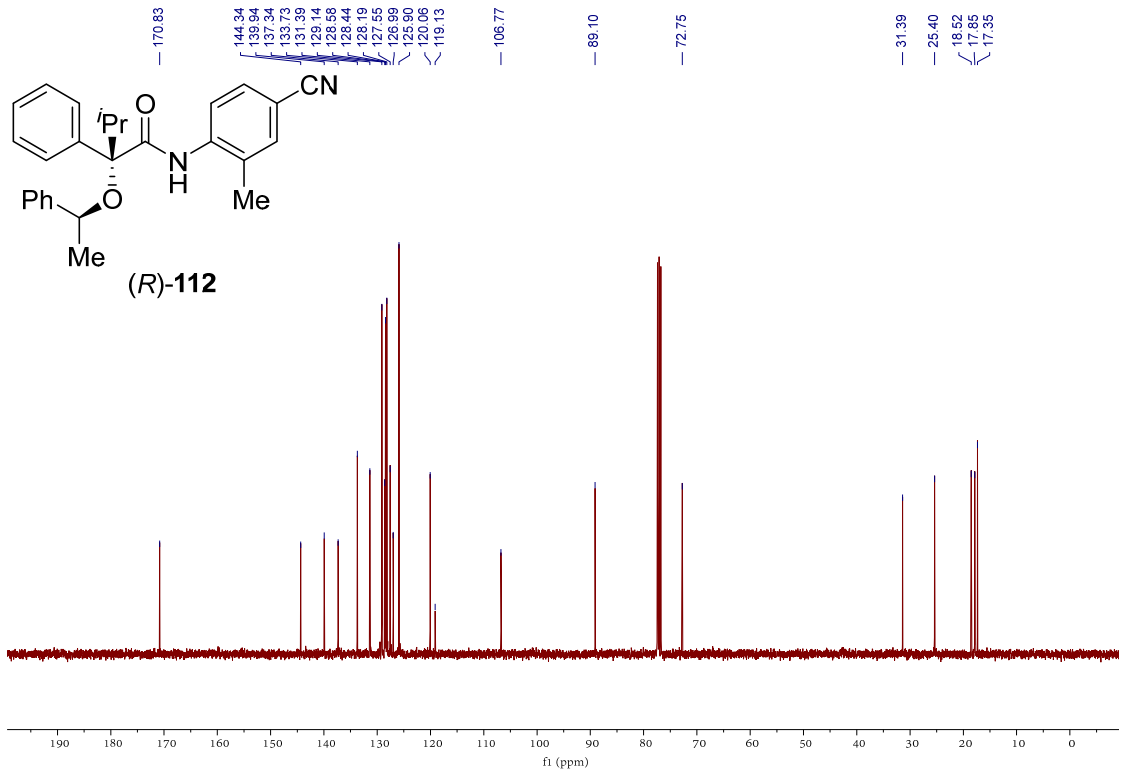

8.88
8.15
8.13
7.47
7.46
7.44
7.40
7.40
7.38
7.36
7.34
7.34
7.32
7.31
7.29
7.27
7.26
7.25
7.24
7.22
7.20
7.19
4.95
3.72
3.71
3.47
3.46
3.45
3.44
2.96
2.94
2.93
2.03
1.36
1.13
1.11
1.10
1.08
CN
O
iPr
N
H
O
Me
Ph
NHBoc
(R)-111
1.00
1.06
9.12
2.91
2.05
1.07
1.09
1.08
3.01
9.43
6.17
f1 (ppm)

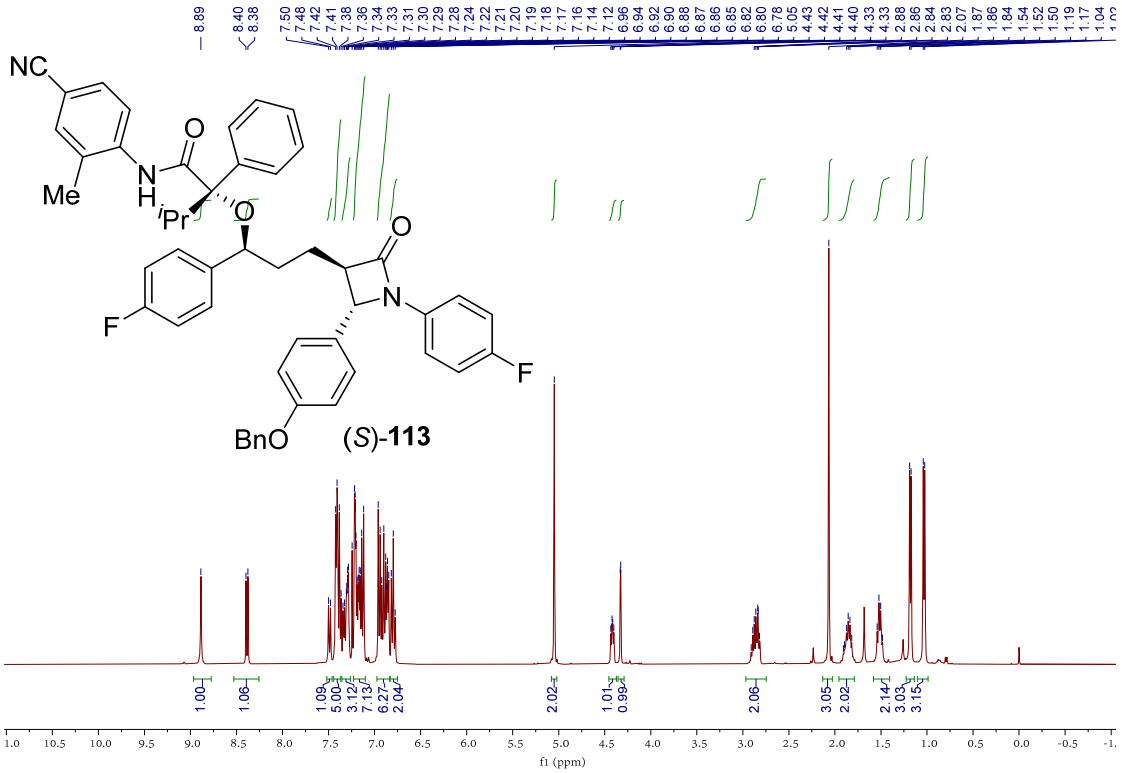

170.51
155.43
139.89
138.97
137.02
133.83
130.86
129.28
128.84
128.50
128.47
128.24
127.91
126.54
121.95
119.06
107.42
88.00
79.91
66.83
54.66
30.86
28.31
18.06
17.82
17.30
CN
O
iPr
N
H
O
Me
Ph
NHBoc
(R)-111
f1 (ppm)

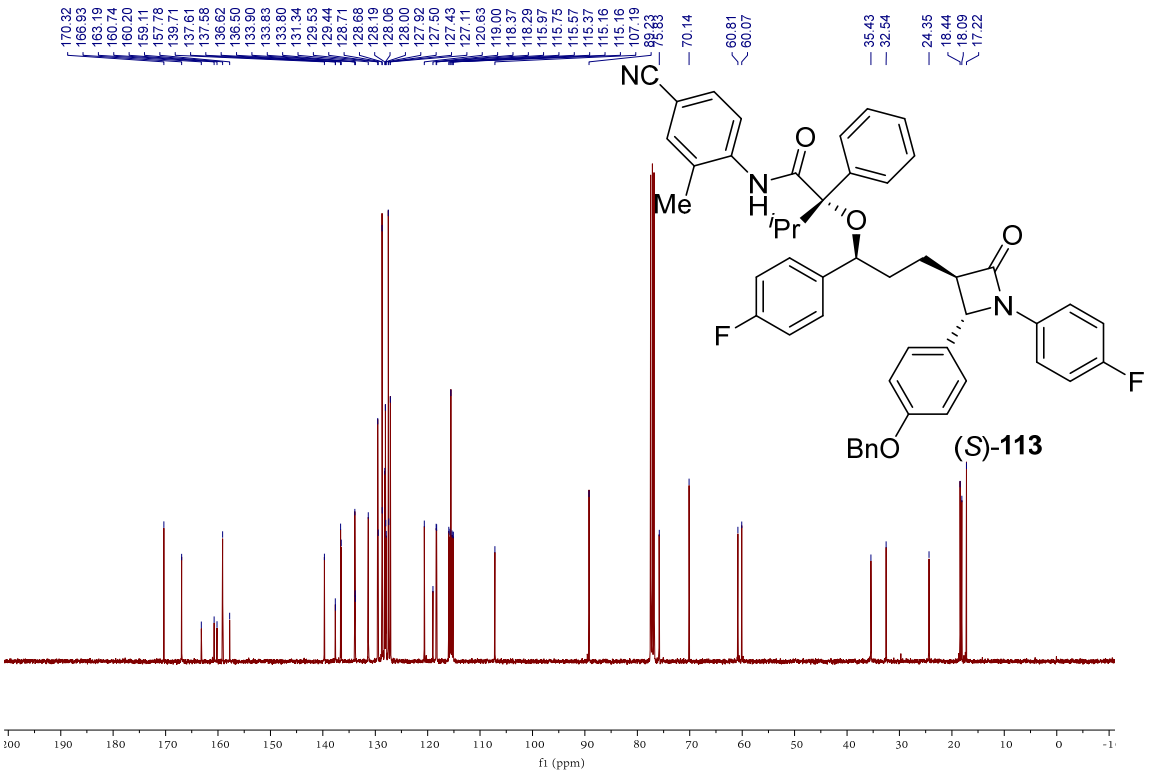

8.97
8.41
8.39
7.51
7.51
7.49
7.40
7.39
7.38
7.37
7.37
7.25
7.25
7.24
7.15
7.14
7.14
7.01
7.00
6.99
6.98
4.53
4.51
4.50
4.48
2.98
2.97
2.95
2.93
2.91
2.90
2.88
1.97
1.29
1.27
1.21
1.20
1.08
1.06
CN
iPr
O
N
H
Ph
O
Me
Me
(S)-112
1.00
1.05
1.09
3.08
3.03
3.06
2.00
1.06
1.01
3.04
3.03
3.01
3.02
f1 (ppm)

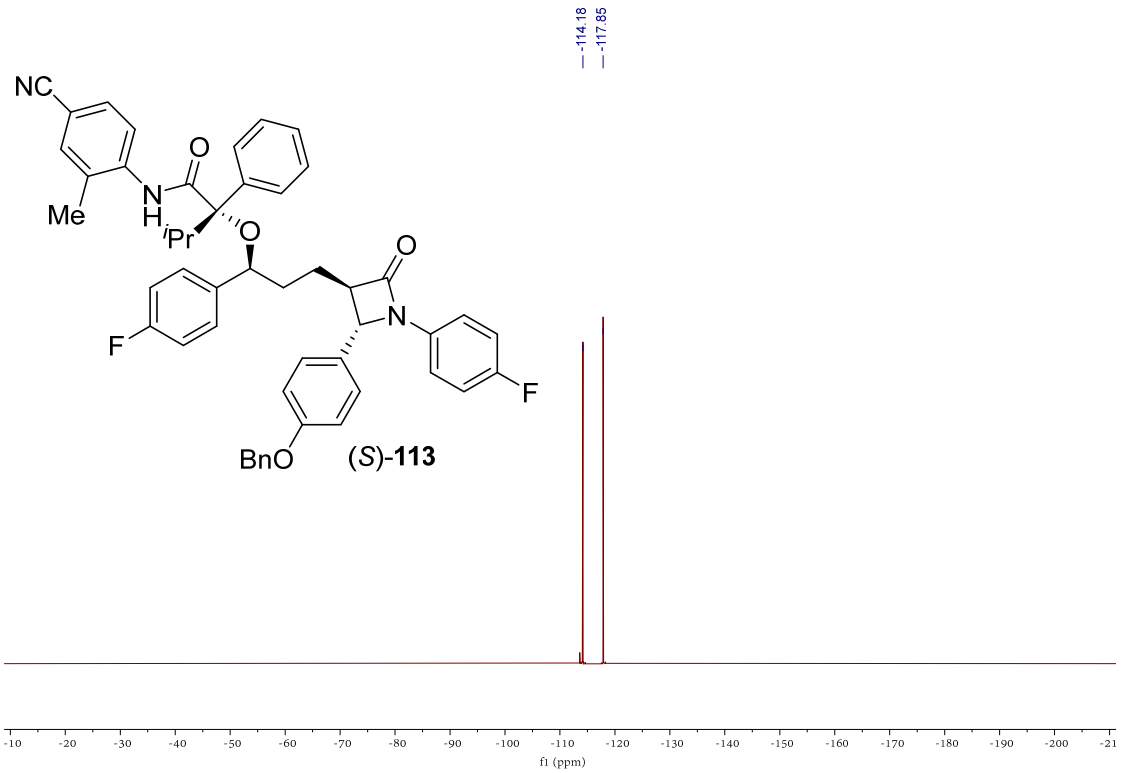

170.67
144.37
139.84
136.79
133.78
131.23
129.48
128.49
128.38
128.02
127.52
127.37
125.72
120.54
119.09
106.93
89.11
73.32
33.21
25.06
18.43
17.96
17.01
CN
iPr
O
N
H
Ph
O
Me
Me
(S)-112
f1 (ppm)

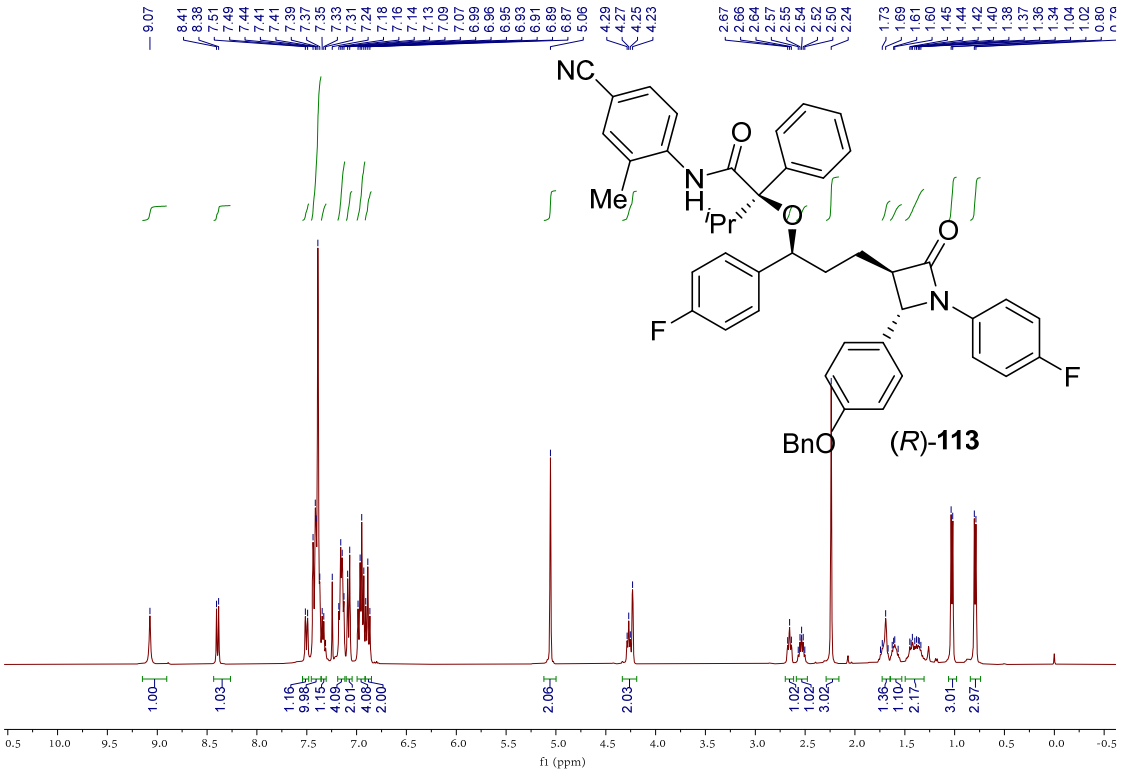

9.09
8.41
8.39
7.51
7.50
7.48
7.44
7.43
7.42
7.41
7.40
7.39
7.37
7.35
7.28
7.26
7.25
7.25
7.24
7.22
7.21
7.20
7.19
7.18
4.52
4.50
4.49
4.47
2.73
2.71
2.69
2.68
2.66
2.23
1.17
1.15
1.05
1.04
0.88
0.86
iPr
O
N
H
CN
Me
Ph
O
Me
(R)-112
1.00
1.05
1.07
6.14
5.16
1.07
1.04
3.10
3.02
3.09
3.09
f1 (ppm)

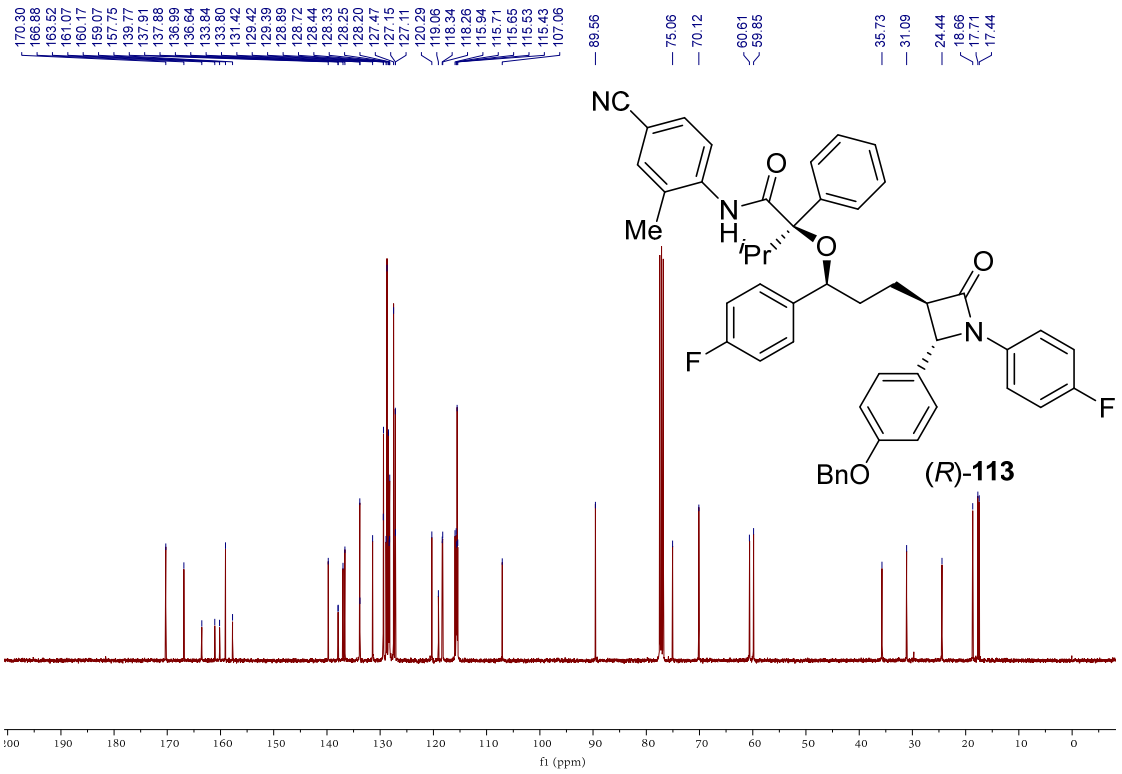

170.83
144.34
139.94
137.34
133.73
131.39
129.14
128.58
128.44
128.19
127.55
126.99
125.90
120.06
119.13
106.77
89.10
72.75
31.39
25.40
18.52
17.85
17.35
iPr
O
N
H
CN
Me
Ph
O
Me
(R)-112
f1 (ppm)

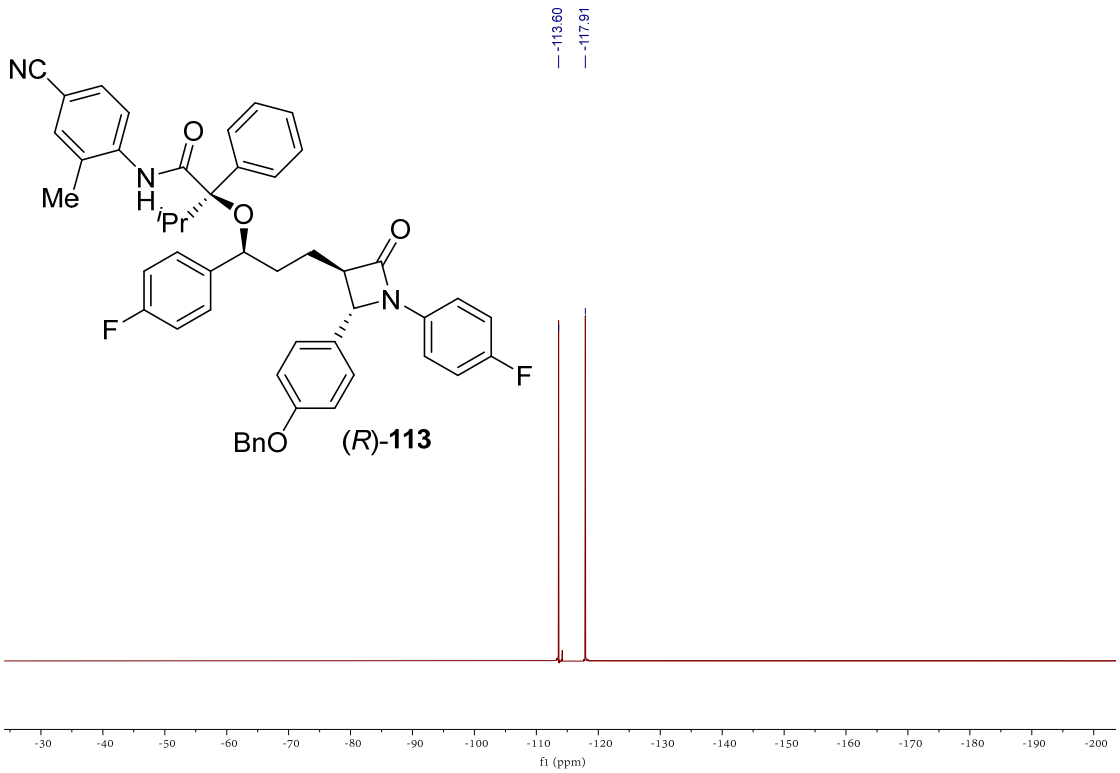

NC
Me
N
H
O
iPr
O
O
F
N
F
BnO
(S)-113
f1 (ppm)

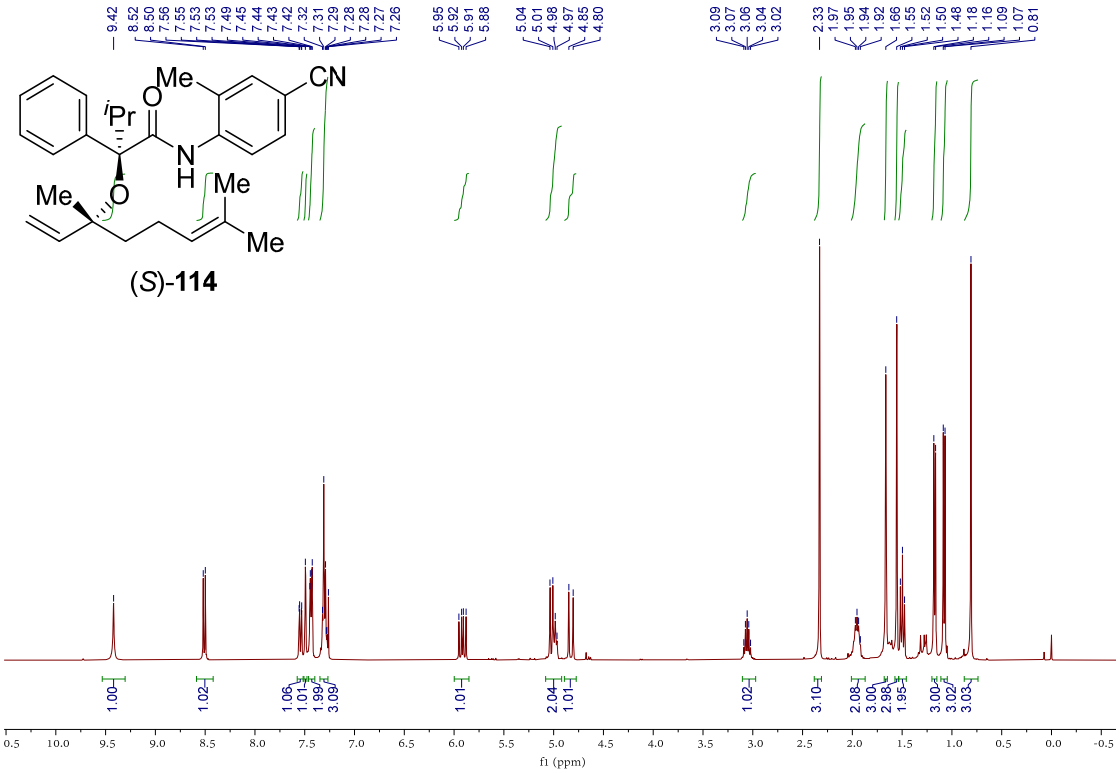

NC
Me
N
H
O
iPr
O
O
F
N
F
BnO
(S)-113
f1 (ppm)

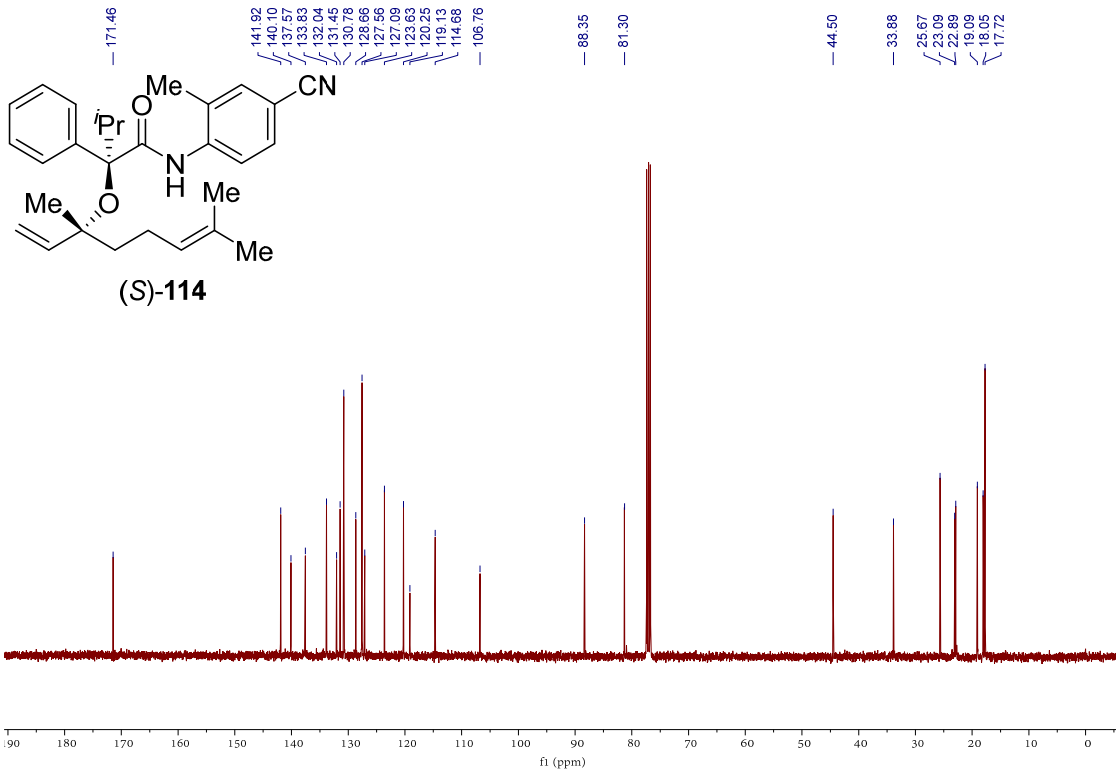

-114.18
-117.85
NC
Me
N
H
O
iPr
O
O
N
F
F
BnO
(S)-113
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-21
f1 (ppm)

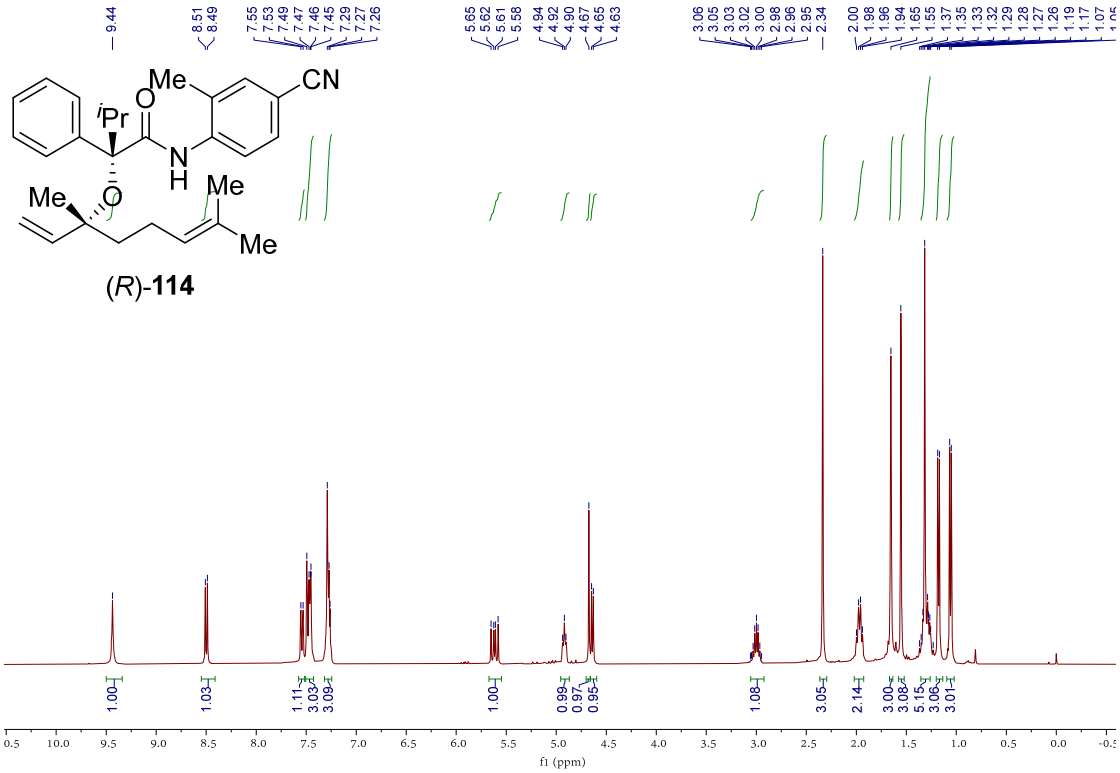

NC
Me
N
H
O
iPr
O
O
F
N
F
BnO
(R)-113
f1 (ppm)

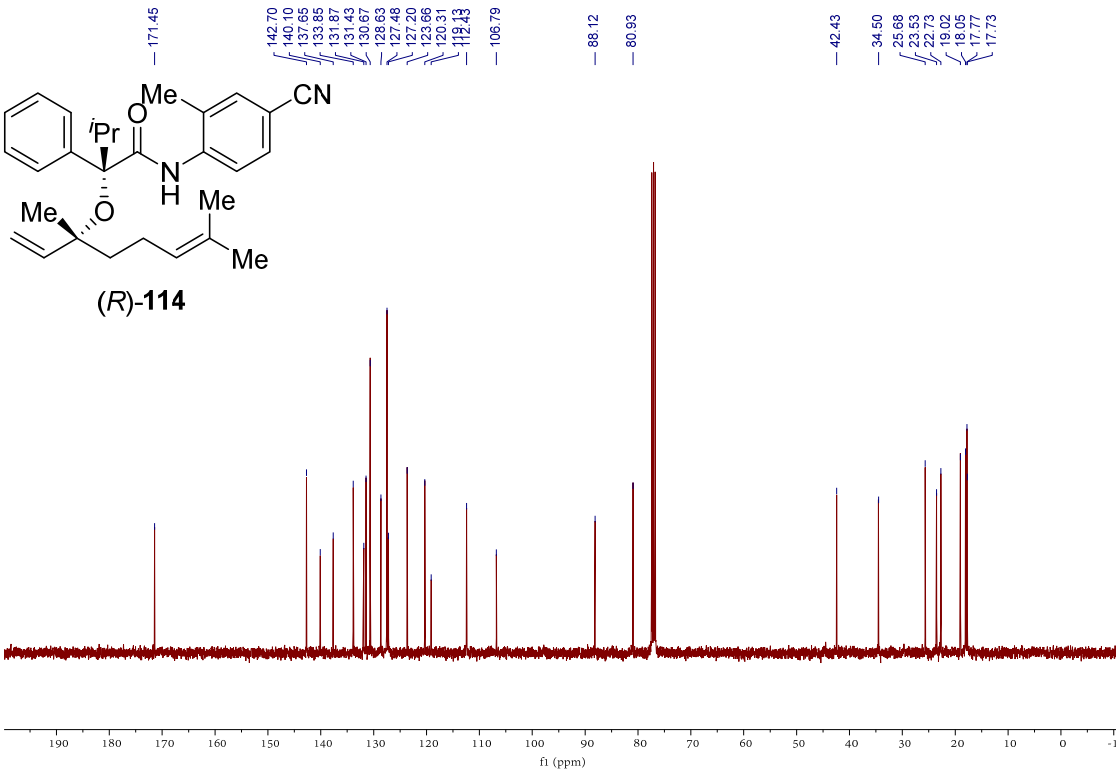

NC
Me
N
H
O
iPr
O
O
F
N
F
BnO
(R)-113
f1 (ppm)

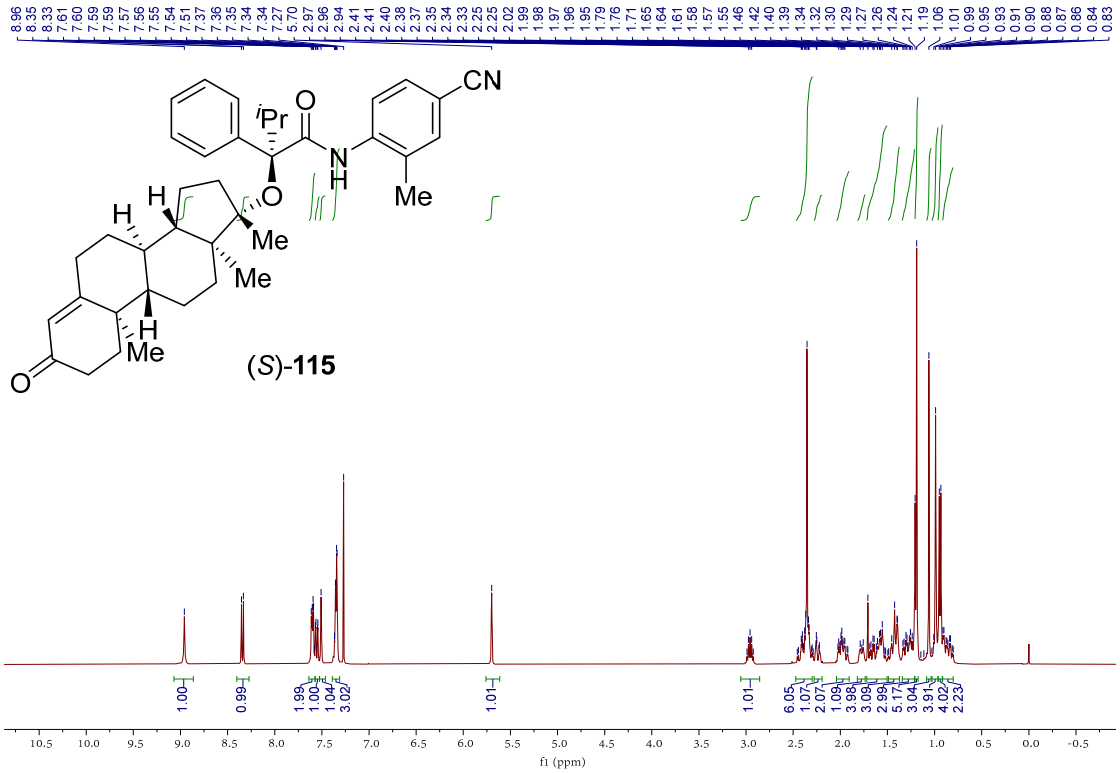

-113.60
-117.91
NC
Me
N
H
O
iPr
O
O
N
F
F
BnO
(R)-113
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
f1 (ppm)

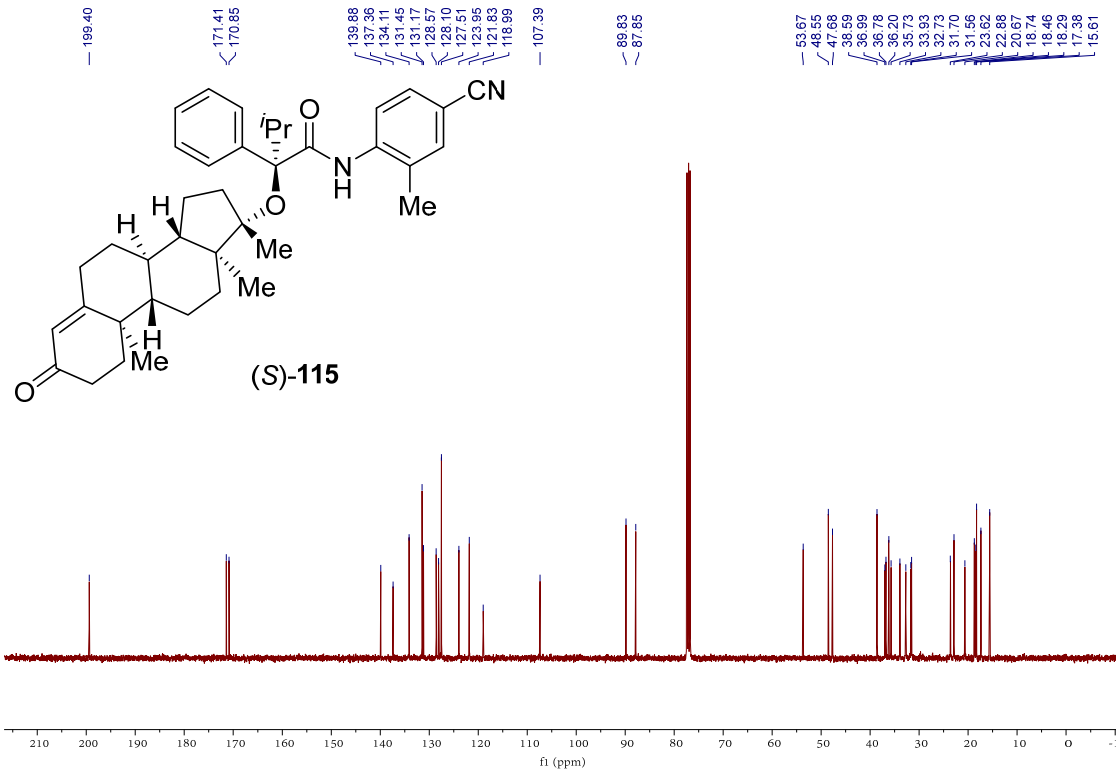

9.42
8.52
8.50
7.56
7.55
7.53
7.53
7.49
7.45
7.44
7.43
7.42
7.32
7.31
7.29
7.28
7.28
7.27
7.26
5.95
5.92
5.91
5.88
5.04
5.01
4.98
4.97
4.85
4.80
3.09
3.07
3.06
3.04
3.02
2.33
1.97
1.95
1.94
1.92
1.66
1.55
1.52
1.50
1.48
1.18
1.16
1.09
1.07
0.81
Me
CN
O
iPr
N
H
Me
Me
O
Me
(S)-114
1.00
1.02
1.06
1.01
1.99
3.09
1.01
2.04
1.01
1.02
3.10
2.08
3.00
2.98
1.95
3.00
3.02
3.03
f1 (ppm)

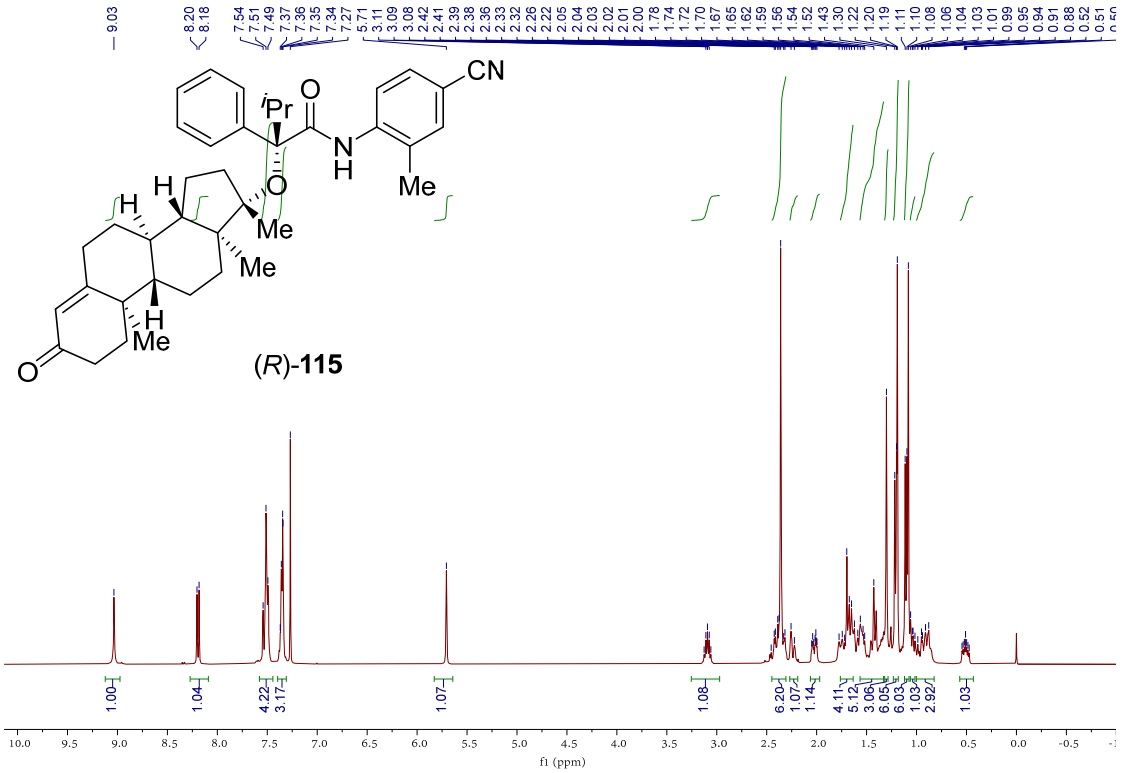

171.46
141.92
140.10
137.57
133.83
132.04
131.45
130.78
128.66
127.56
127.09
123.63
120.25
119.13
114.68
106.76
88.35
81.30
44.50
33.88
25.67
23.09
22.89
19.09
18.05
17.72
Me
CN
O
iPr
N
H
Me
Me
O
Me
(S)-114
f1 (ppm)

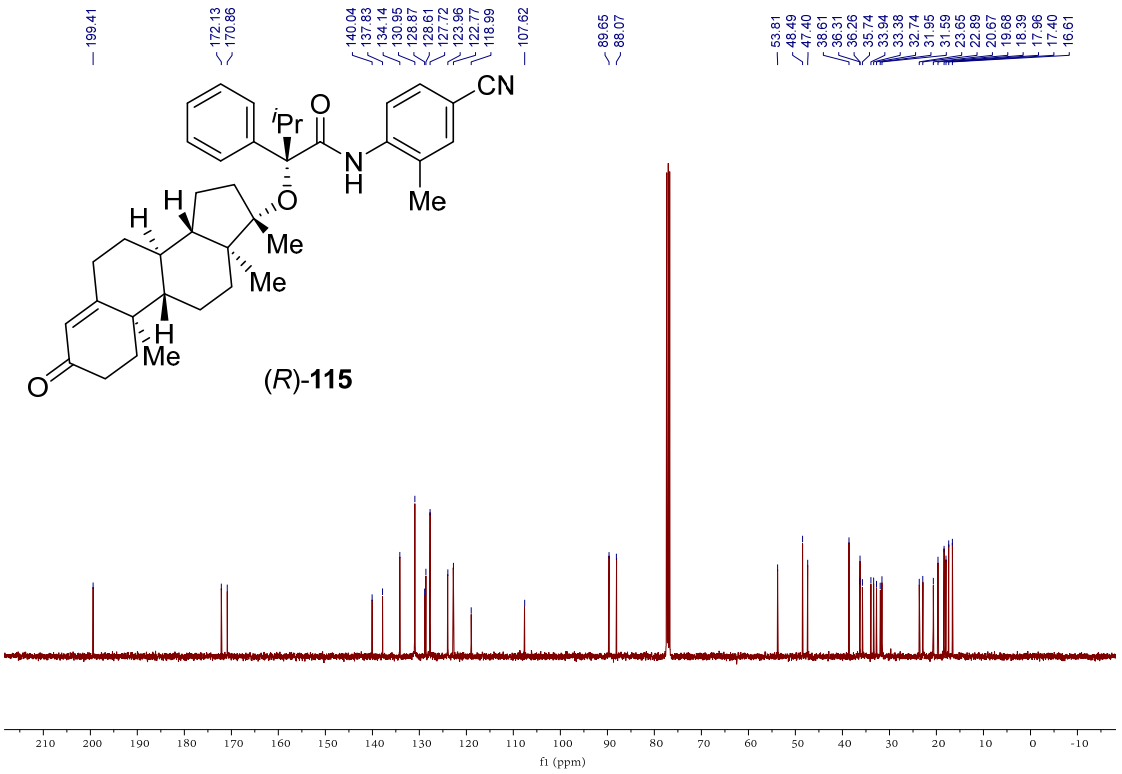

Me
CN
O
iPr
N
H
Me
O
Me
Me
(R)-114
f1 (ppm)

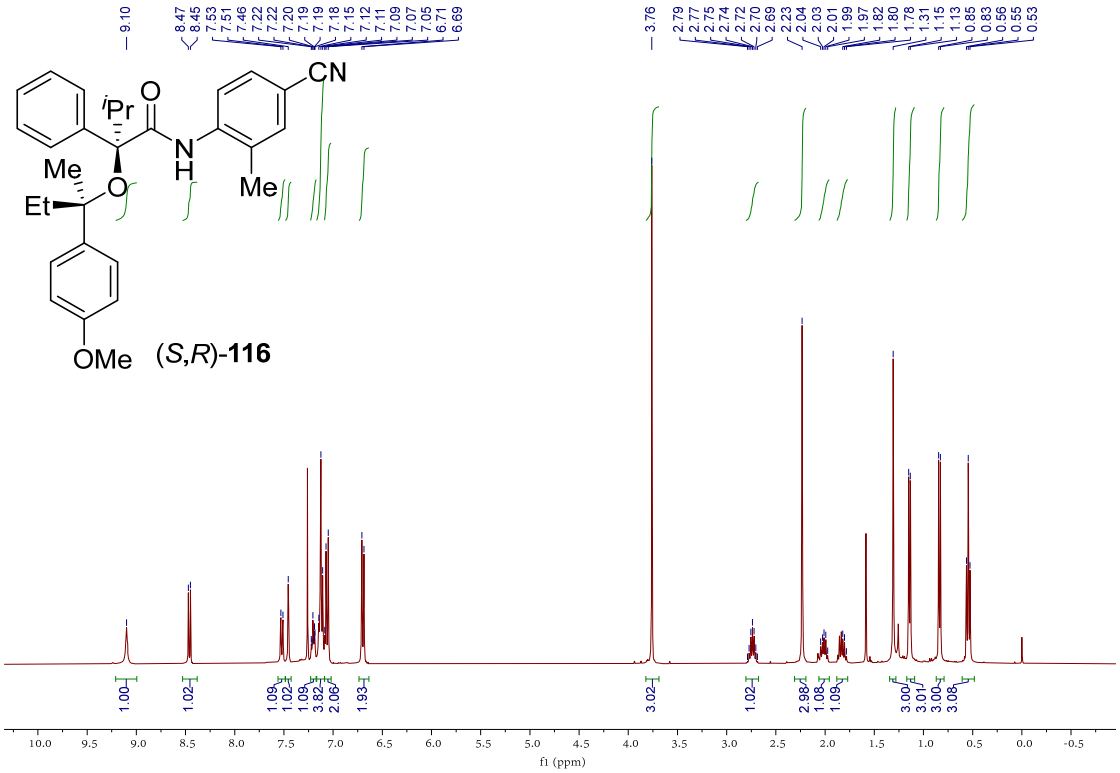

Me
CN
O
iPr
N
H
Me
O
Me
Me
(R)-114
f1 (ppm)

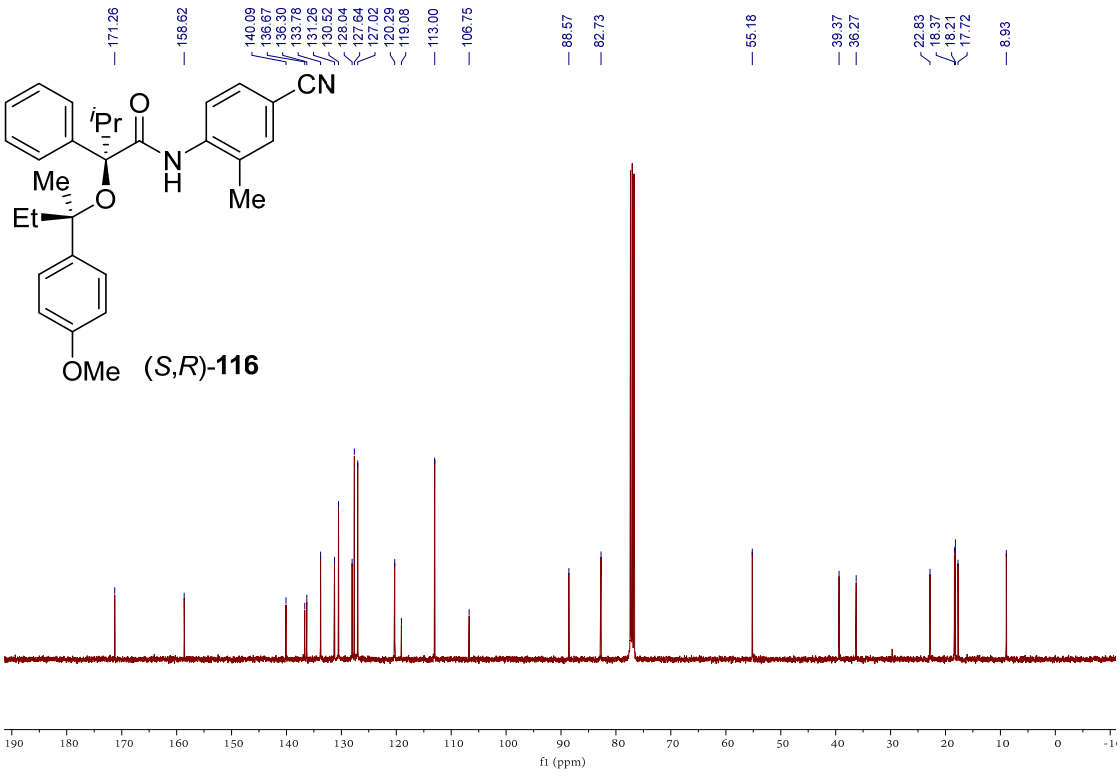

8.96 8.35 8.33 7.61 7.60 7.59 7.59 7.57 7.56 7.55 7.54 7.51 7.37 7.36 7.35 7.34 7.34 7.27 5.70 2.97 2.96 2.94 2.41 2.40 2.38 2.37 2.35 2.34 2.33 2.25 2.02 1.99 1.98 1.97 1.96 1.95 1.79 1.76 1.71 1.65 1.64 1.61 1.58 1.57 1.55 1.46 1.42 1.40 1.39 1.34 1.32 1.30 1.29 1.27 1.26 1.24 1.21 1.19 1.06 1.01 0.99 0.95 0.93 0.91 0.90 0.88 0.87 0.86 0.84 0.83
CN
iPr
O
N
H
Me
H
O
H
Me
Me
H
Me
O
(S)-115
1.00 0.99 1.99 1.00 1.04 3.02 1.01 1.01 6.05 1.07 2.07 1.09 3.98 3.09 2.99 5.17 3.04 3.91 4.02 2.23
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

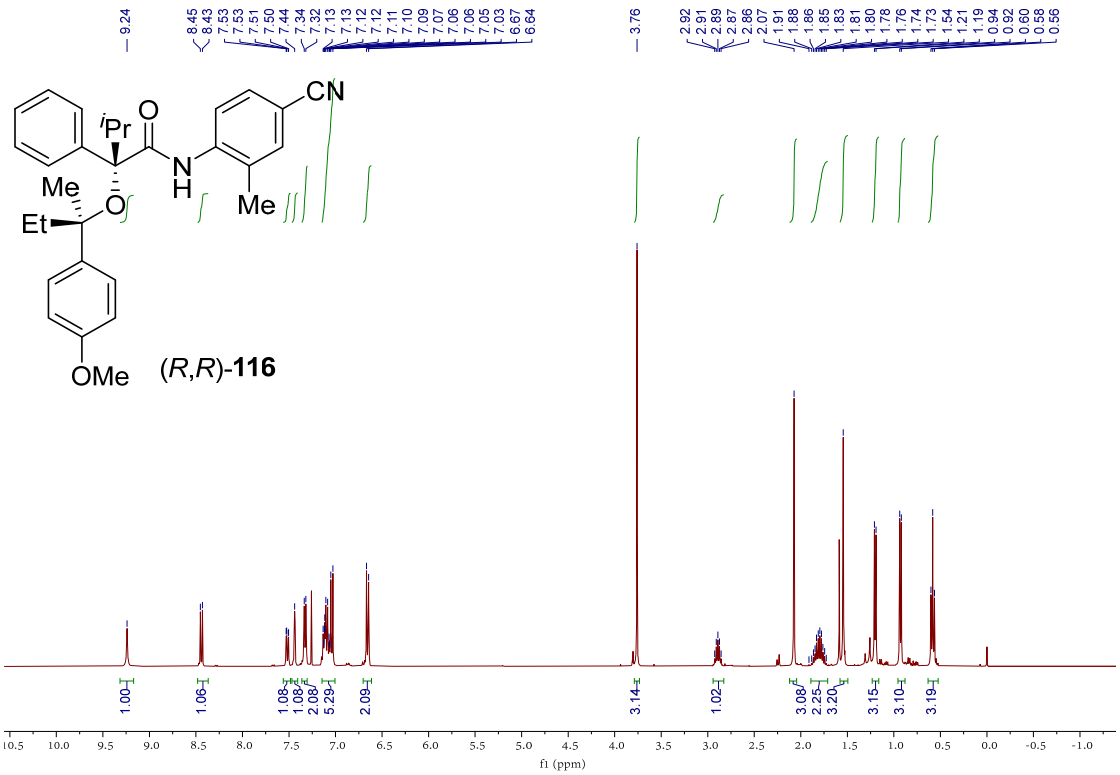

199.40
171.41 170.85
139.88 137.36 134.11 131.45 131.17 128.57 128.10 127.51 123.95 121.83 118.99
107.39
89.83 87.85
53.67 48.55 47.68 38.59 36.99 36.78 36.20 35.73 33.93 32.73 31.70 31.56 23.62 22.88 20.67 18.74 18.46 18.29 17.38 15.61
CN
iPr
O
N
H
Me
H
O
H
Me
Me
H
Me
O
(S)-115
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

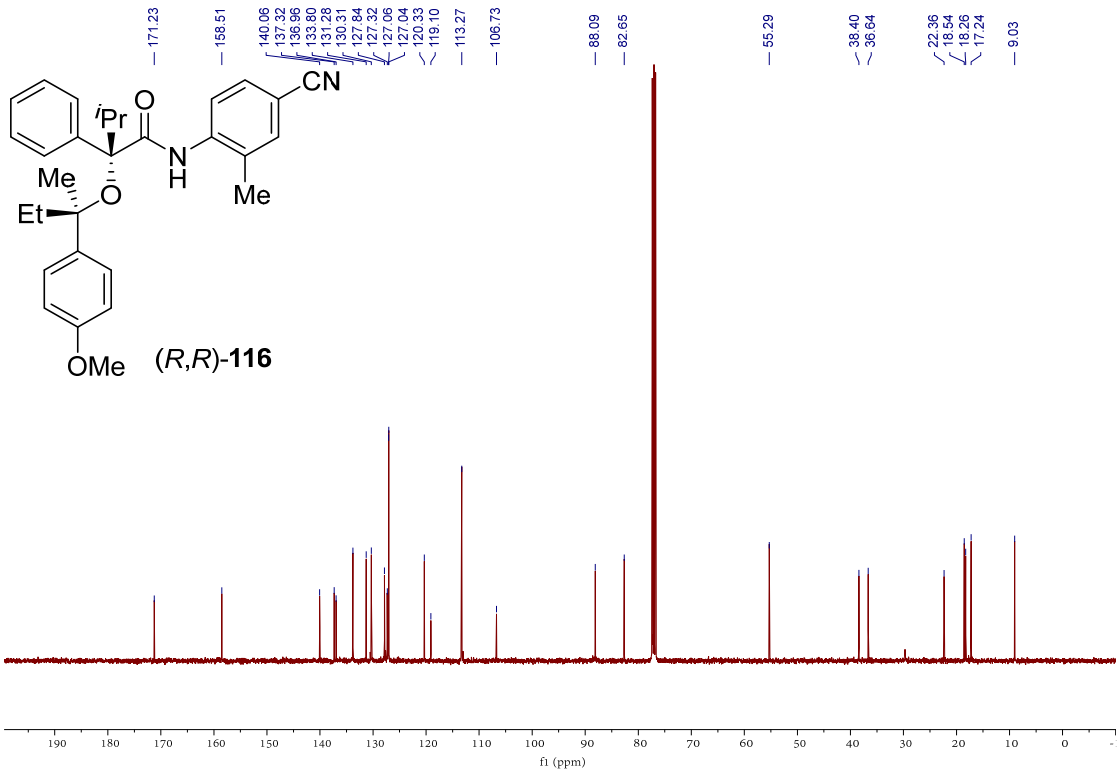

(R)-115
f1 (ppm)

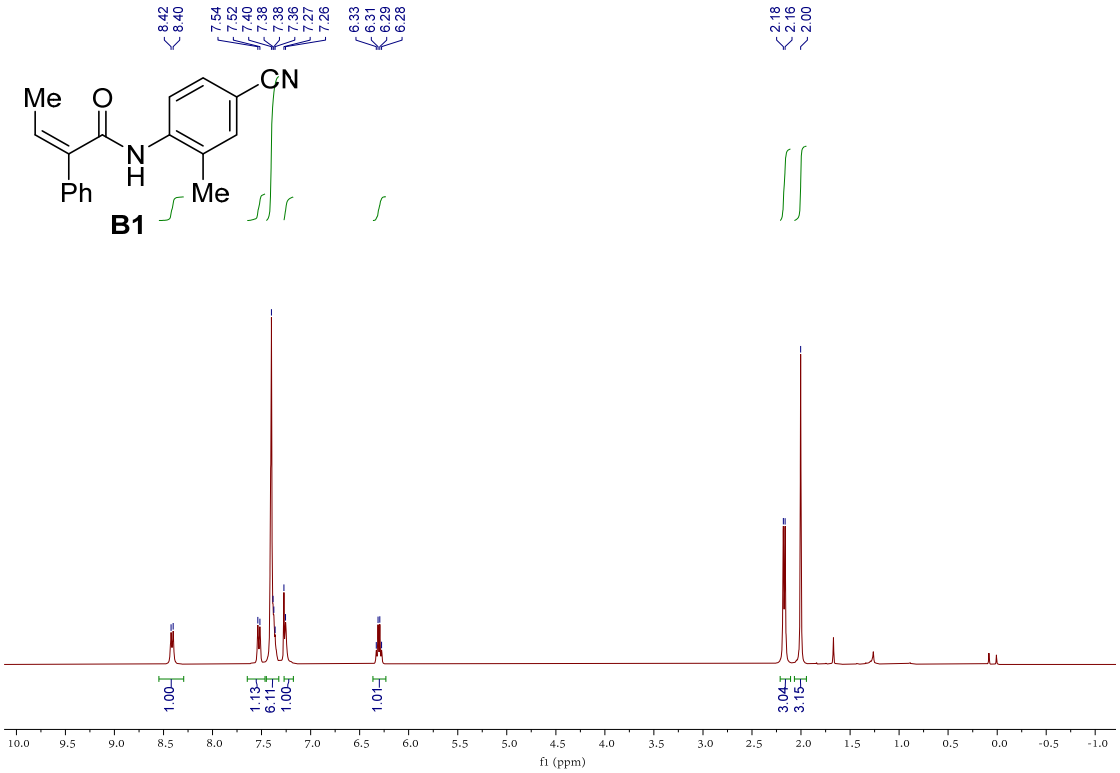

(R)-115
f1 (ppm)

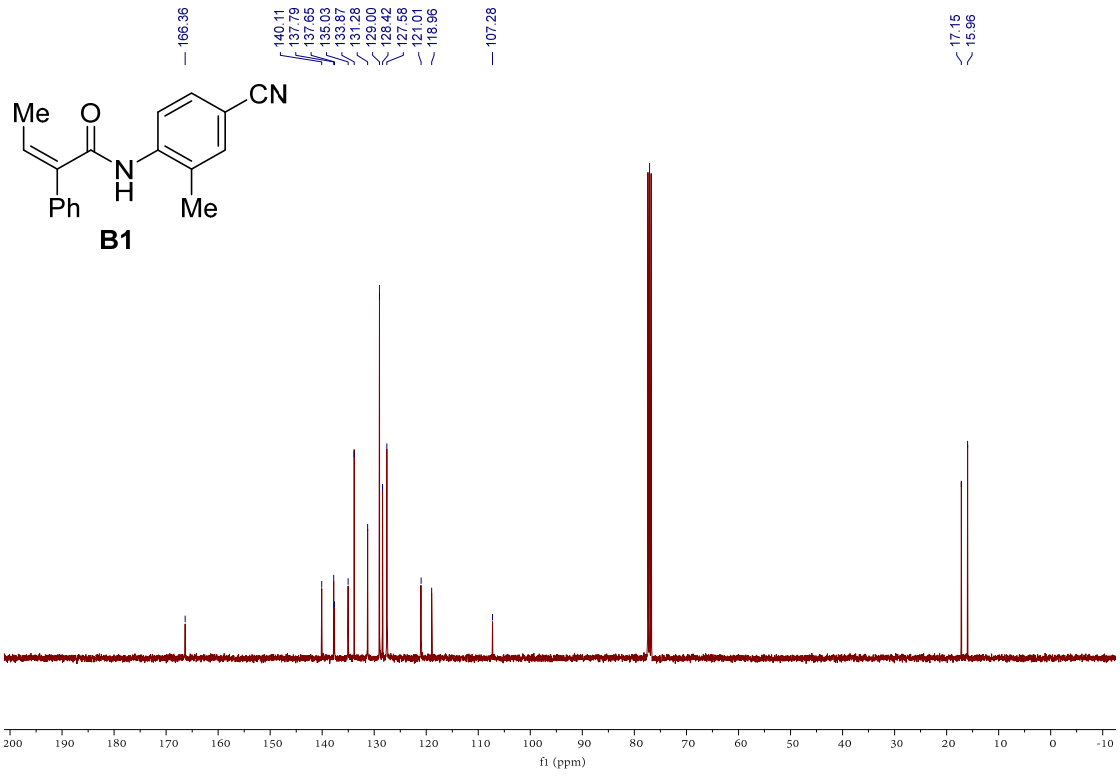

9.10
8.47
8.45
7.53
7.51
7.46
7.22
7.22
7.20
7.19
7.19
7.18
7.15
7.12
7.11
7.09
7.07
7.05
6.71
6.69
3.76
2.79
2.77
2.75
2.74
2.72
2.70
2.69
2.23
2.04
2.03
2.01
1.99
1.97
1.82
1.80
1.78
1.31
1.15
1.13
0.85
0.83
0.56
0.55
0.53
CN
iPr
O
N
H
Me
Me
Et
O
OMe
(S,R)-116
1.00
1.02
1.09
1.02
1.09
3.82
2.06
1.93
3.02
1.02
2.98
1.08
1.09
3.00
3.01
3.00
3.08
f1 (ppm)


171.26
158.62
140.09
136.67
136.30
133.78
131.26
130.52
128.04
127.64
127.02
120.29
119.08
113.00
106.75
88.57
82.73
55.18
39.37
36.27
22.83
18.37
18.21
17.72
8.93
CN
iPr
O
N
H
Me
Me
Et
O
OMe
(S,R)-116
f1 (ppm)

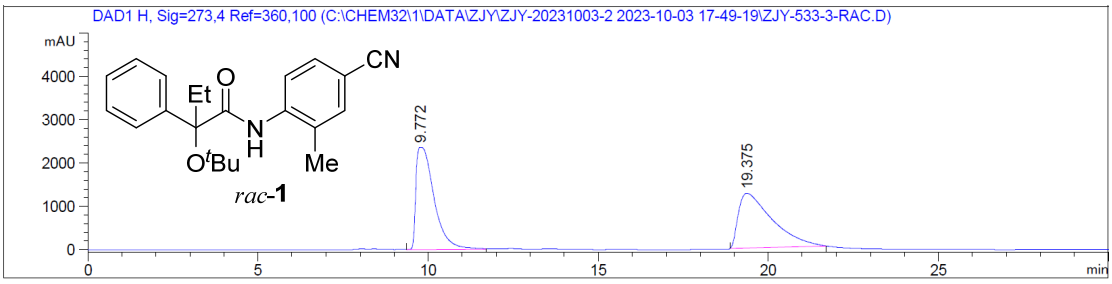

9.24
8.45
8.43
7.53
7.53
7.51
7.50
7.44
7.34
7.32
7.13
7.13
7.12
7.12
7.11
7.10
7.09
7.07
7.06
7.06
7.05
7.03
6.67
6.64
3.76
2.92
2.91
2.89
2.87
2.86
2.07
1.91
1.88
1.86
1.85
1.83
1.81
1.80
1.78
1.76
1.74
1.73
1.54
1.21
1.19
0.94
0.92
0.60
0.58
0.56
iPr
O
N
H
CN
Me
Me
O
Et
OMe
(R,R)-116
1.00
1.06
1.08
1.08
2.08
5.29
2.09
3.14
1.02
3.08
2.25
3.20
3.15
3.10
3.19
f1 (ppm)


171.23
158.51
140.06
137.32
136.96
133.80
131.28
130.31
127.84
127.32
127.06
127.04
120.33
119.10
113.27
106.73
88.09
82.65
55.29
38.40
36.64
22.36
18.54
18.26
17.24
9.03
iPr
O
N
H
CN
Me
Me
O
Et
OMe
(R,R)-116
f1 (ppm)


8.42
8.40
7.54
7.52
7.40
7.38
7.38
7.36
7.27
7.26
6.33
6.31
6.29
6.28
2.18
2.16
2.00
Me
O
CN
N
H
Ph
Me
B1
1.00
1.13
6.11
1.00
1.01
3.04
3.15
f1 (ppm)

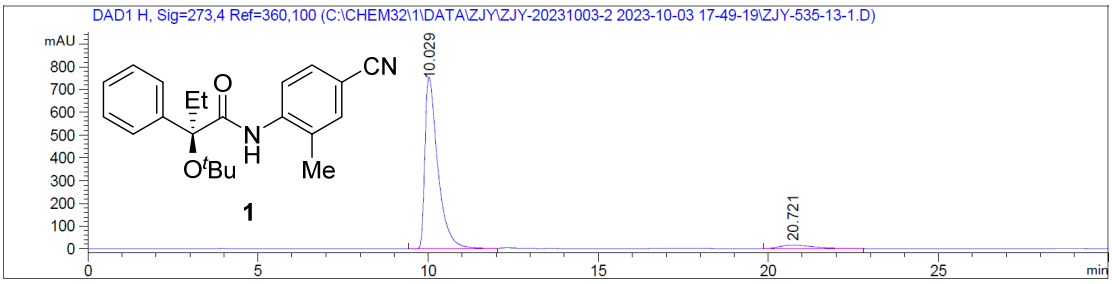

166.36
140.11
137.79
137.65
135.03
133.87
131.28
129.00
128.42
127.58
121.01
118.96
107.28
17.15
15.96
Me
O
CN
N
H
Ph
Me
B1
f1 (ppm)

HPLC Spectra



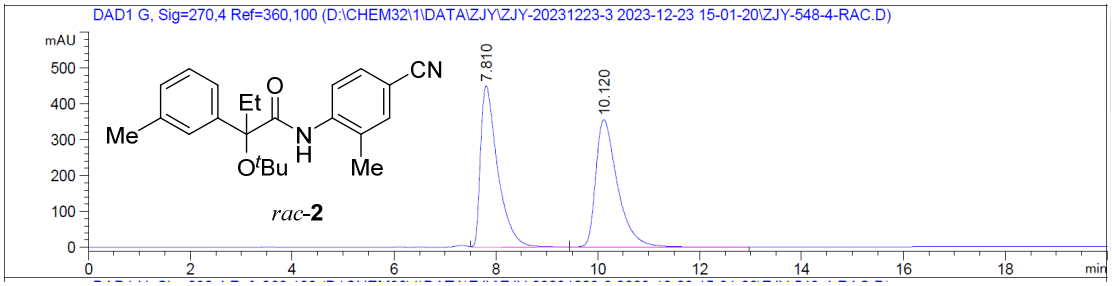
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.772	MM R	0.6151	8.72353e4	2363.86694	50.1232
2	19.375	MM R	1.1500	8.68063e4	1258.00928	49.8768
Totals :				1.74042e5	3621.87622	



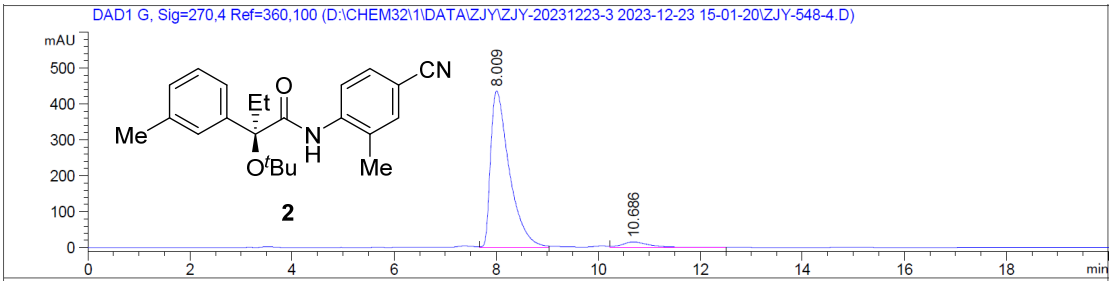
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.029	MM R	0.4437	2.00473e4	753.08563	94.8241
2	20.721	MM R	1.1166	1094.26770	16.33386	5.1759
Totals :				2.11416e4	769.41949	



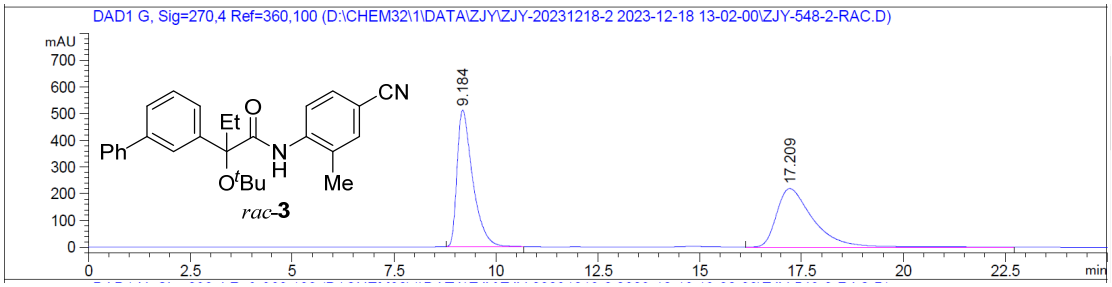
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.810	VB	0.3490	1.05130e4	449.26563	49.9969
2	10.120	BB	0.4455	1.05143e4	355.03433	50.0031
Totals :				2.10273e4	804.29996	



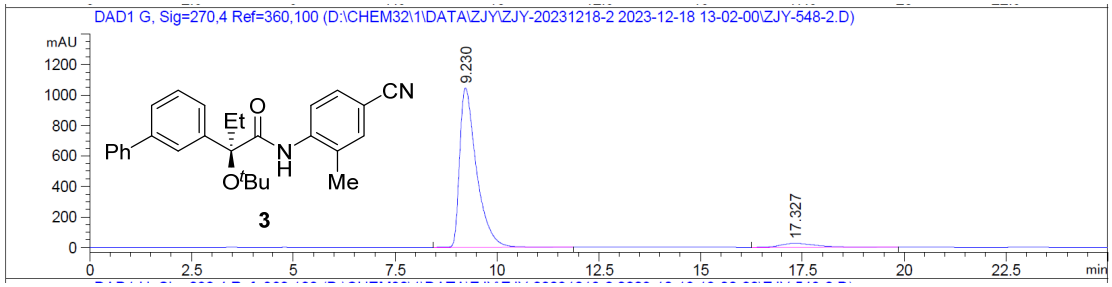
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.009	MF R	0.4238	1.10705e4	435.39261	95.4585
2	10.686	FM R	0.6054	526.68134	14.50052	4.5415
Totals :				1.15972e4	449.89312	



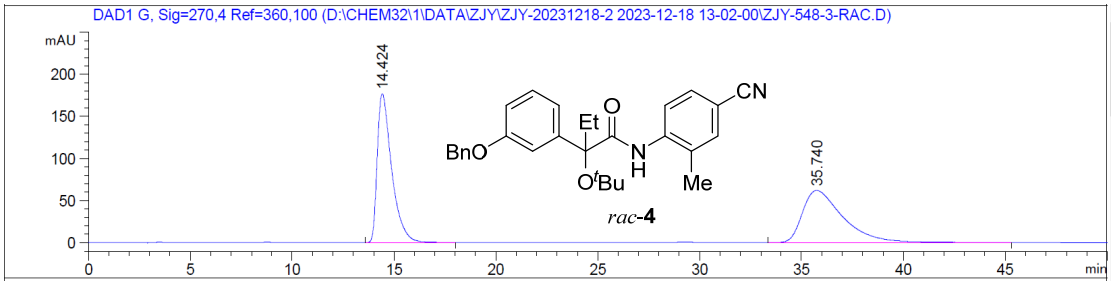
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.184	MM R	0.4463	1.37016e4	511.64484	50.1569
2	17.209	BB	0.9160	1.36159e4	218.80220	49.8431
Totals :				2.73175e4	730.44704	



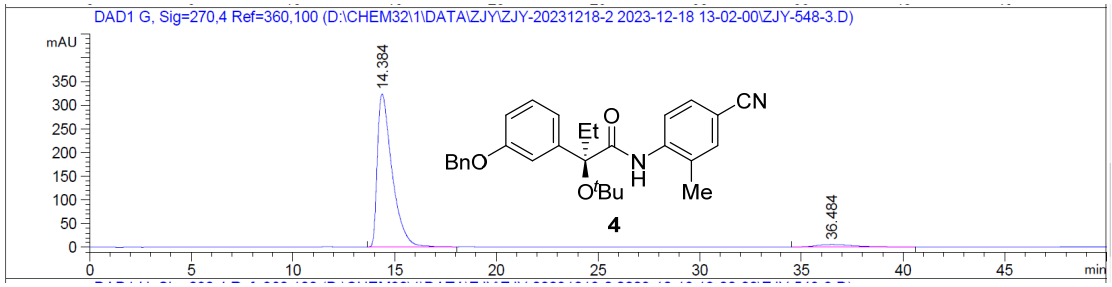
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.230	BB	0.4295	3.00710e4	1045.58862	94.8594
2	17.327	BB	0.9121	1629.58899	25.96856	5.1406
Totals :				3.17006e4	1071.55718	



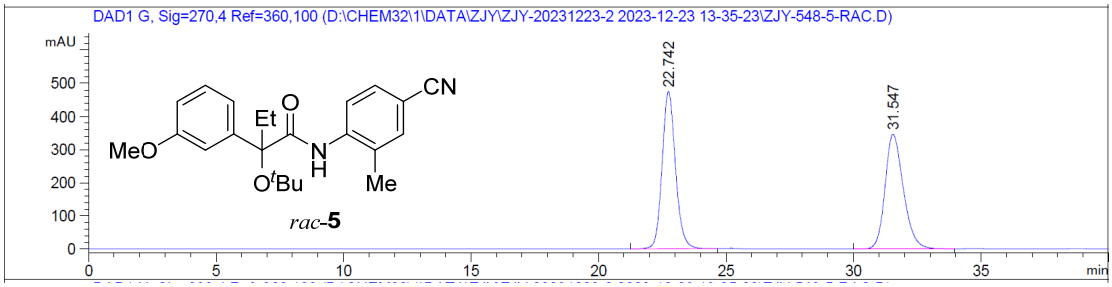
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.424	MM R	0.8225	8720.29883	176.70126	49.9840
2	35.740	MM R	2.3419	8725.88379	62.09908	50.0160
Totals :				1.74462e4	238.80035	



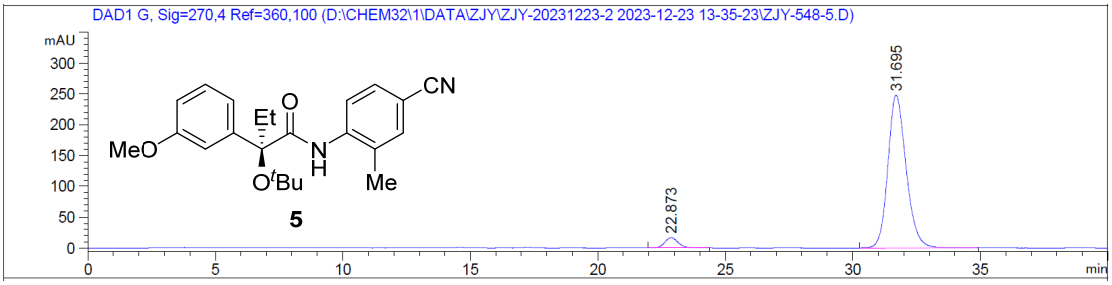
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.384	BB	0.7507	1.62466e4	323.06650	95.4799
2	36.484	MM R	2.3203	769.12396	5.52451	4.5201
Totals :				1.70157e4	328.59101	



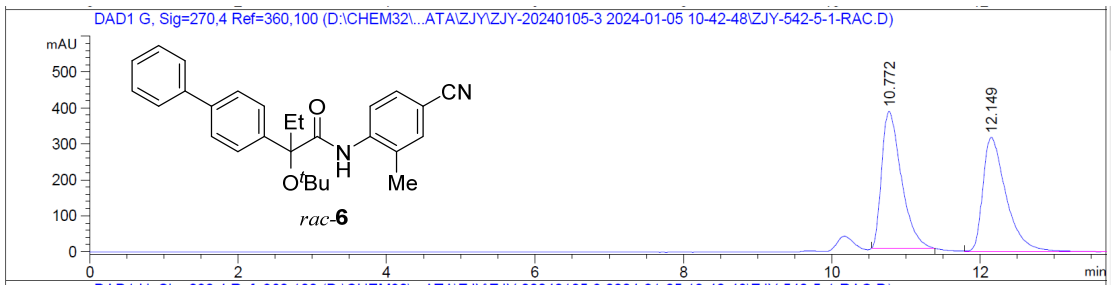
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.742	BB	0.5620	1.73906e4	474.08255	50.0699
2	31.547	BB	0.7644	1.73421e4	346.22803	49.9301
Totals :				3.47327e4	820.31058	



Signal 7: DAD1 G, Sig=270,4 Ref=360,100

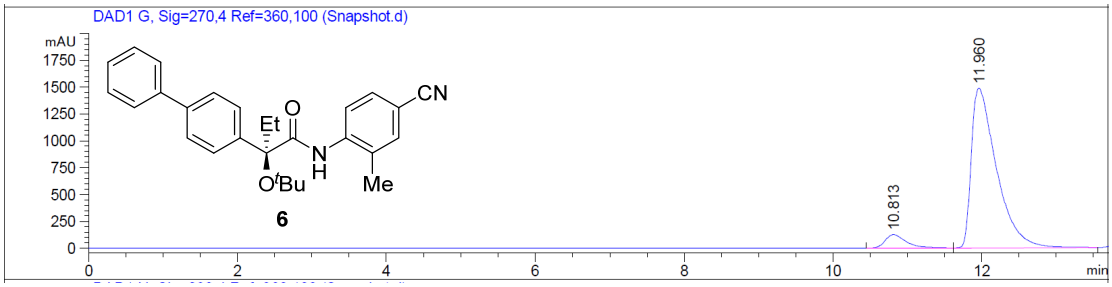
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.873	BB	0.5483	609.75610	16.76413	4.7166
2	31.695	BB	0.7544	1.23182e4	247.60161	95.2834
Totals :				1.29280e4	264.36574	



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Signal 7: DAD1 G, Sig=270,4 Ref=360,100

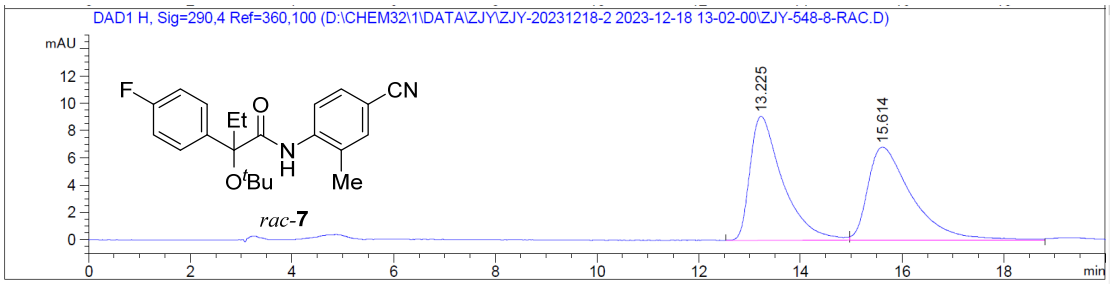
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.772	MM R	0.3079	7032.52783	380.65100	49.9566
2	12.149	VB	0.3319	7044.74805	318.68625	50.0434
Totals :				1.40773e4	699.33725	



6

Signal 7: DAD1 G, Sig=270,4 Ref=360,100

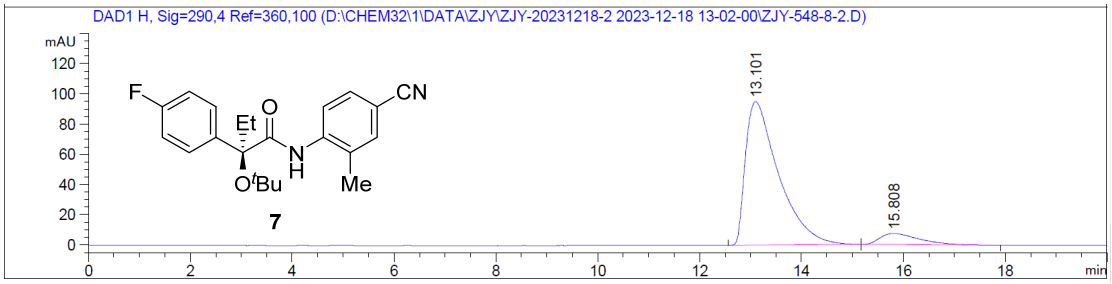
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.813	BB	0.2934	2421.53735	124.24792	6.4676
2	11.960	BV	0.3505	3.50197e4	1488.35803	93.5324
Totals :				3.74412e4	1612.60596	



Signal 8: DAD1 H, Sig=290,4 Ref=360,100

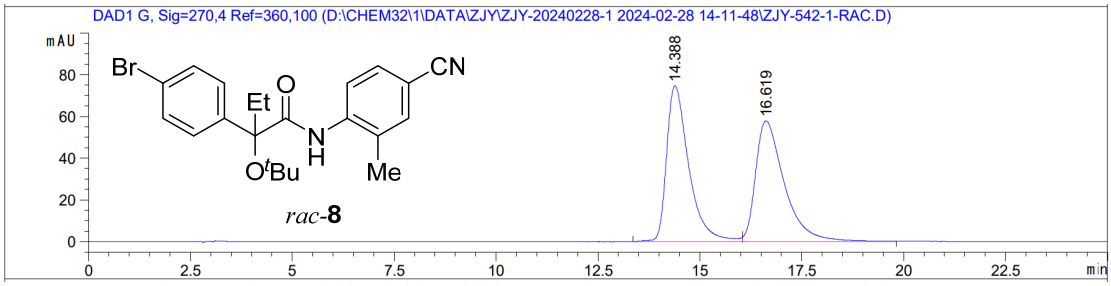
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.225	MF R	0.7457	406.41776	9.08339	49.9190
2	15.614	FM R	0.9978	407.73700	6.81043	50.0810
Totals :				814.15475	15.89381	

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Signal 8: DAD1 H, Sig=290,4 Ref=360,100

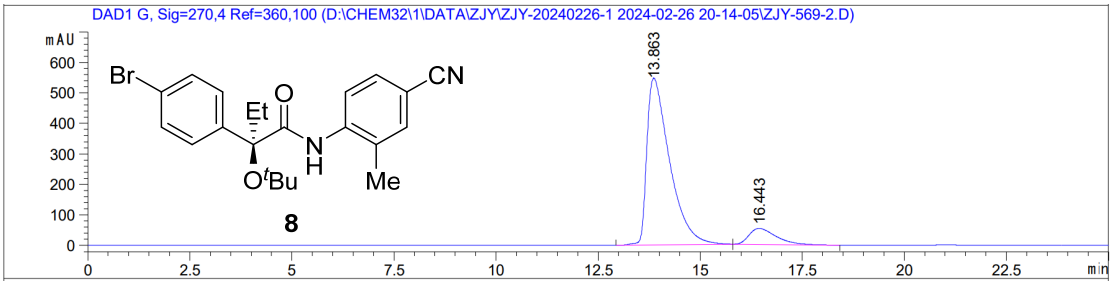
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.101	BB	0.6685	4308.38330	95.10184	91.4116
2	15.808	BB	0.7438	404.78421	7.42714	8.5884
Totals :				4713.16751	102.52899	



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Signal 7: DAD1 G, Sig=270,4 Ref=360,100

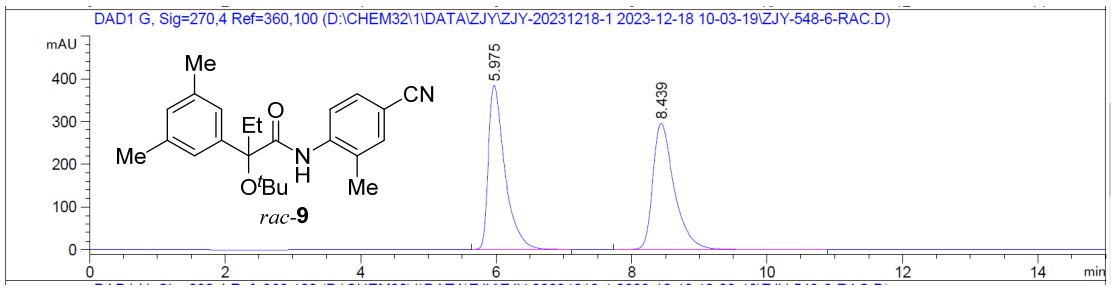
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.388	MF R	0.6334	2842.35059	74.79630	49.9284
2	16.619	FM R	0.8207	2850.49927	57.88484	50.0716
Totals :				5692.84985	132.68113	



8

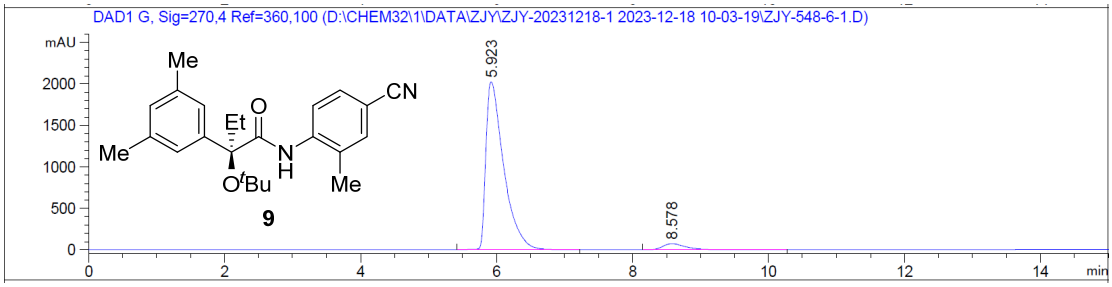
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.863	BB	0.5775	2.11653e4	546.91302	89.7756
2	16.443	BB	0.6837	2410.49512	52.30594	10.2244
Totals :				2.35758e4	599.21897	



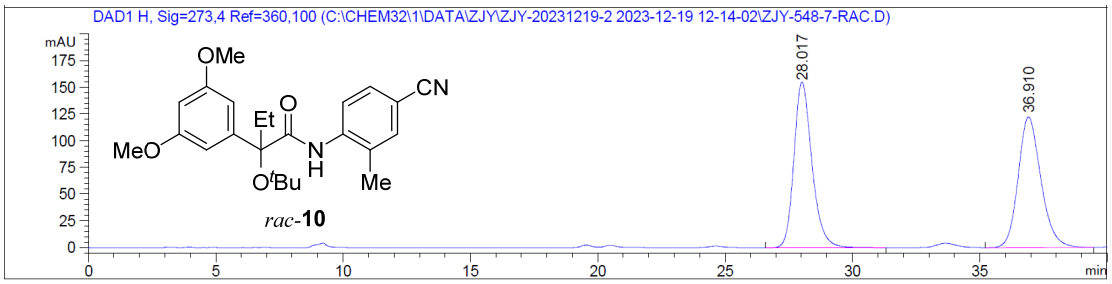
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.975	BB	0.2519	6506.99512	383.59637	49.9728
2	8.439	BB	0.3291	6514.07959	295.60864	50.0272
Totals :				1.30211e4	679.20502	



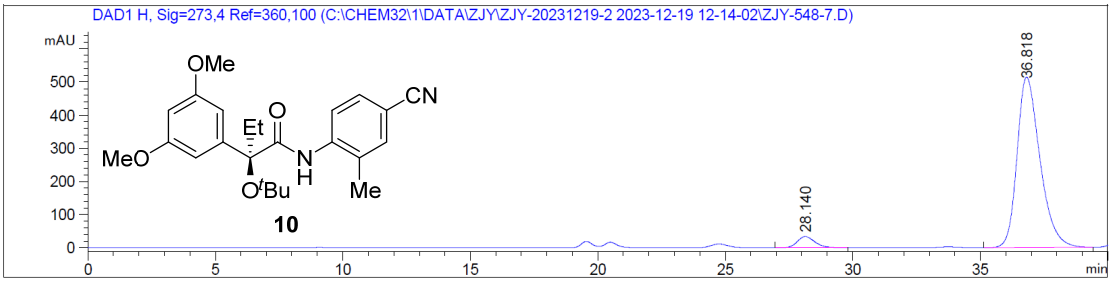
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.923	BB	0.2735	3.70610e4	2024.77197	95.4219
2	8.578	BB	0.3545	1778.08923	75.03723	4.5781
Totals :				3.88391e4	2099.80920	



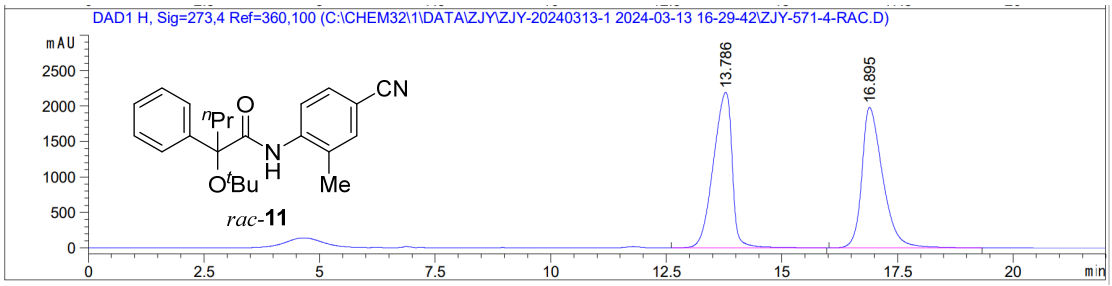
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.017	BB	0.7524	7664.63574	155.12761	50.1552
2	36.910	BB	0.9486	7617.20361	122.30558	49.8448
Totals :				1.52818e4	277.43319	



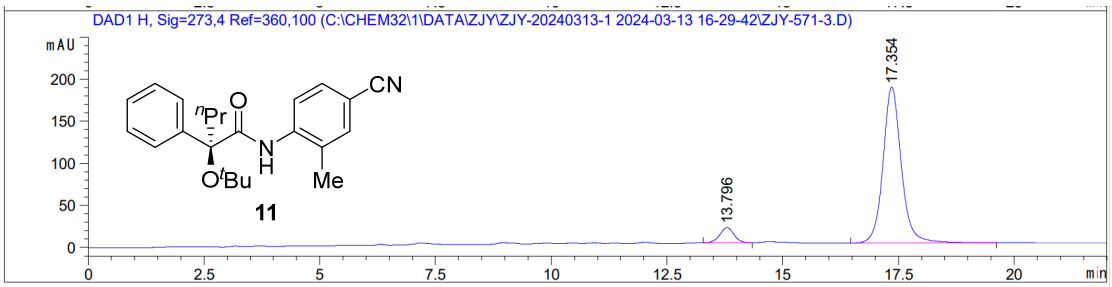
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.140	BB	0.7477	1638.09607	33.78263	4.8490
2	36.818	MF R	1.0427	3.21440e4	513.80426	95.1510
Totals :				3.37821e4	547.58689	



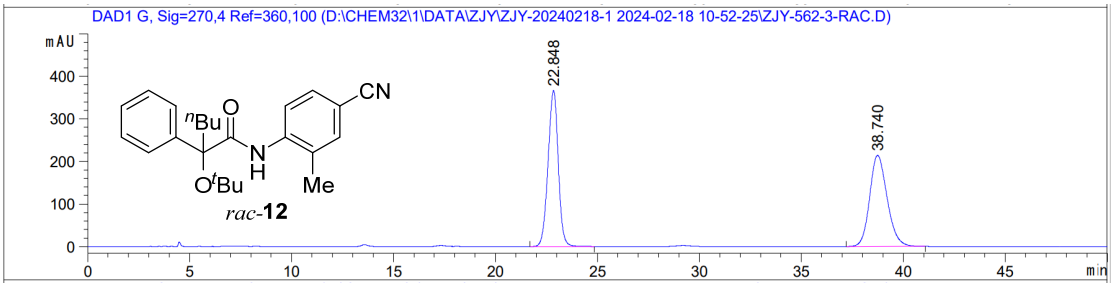
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.786	BB	0.4479	6.19114e4	2189.62939	49.8776
2	16.895	BB	0.4728	6.22152e4	1978.78772	50.1224
Totals :				1.24127e5	4168.41711	



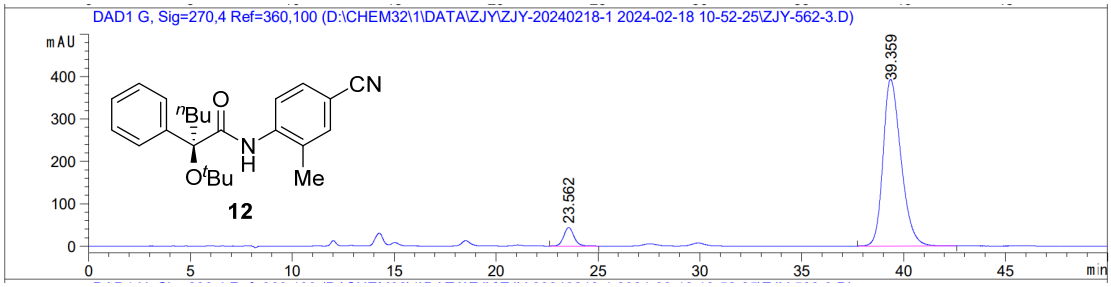
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.796	BB	0.3256	383.38489	18.06425	7.0096
2	17.354	BB	0.4142	5086.01514	185.31151	92.9904
Totals :				5469.40002	203.37576	



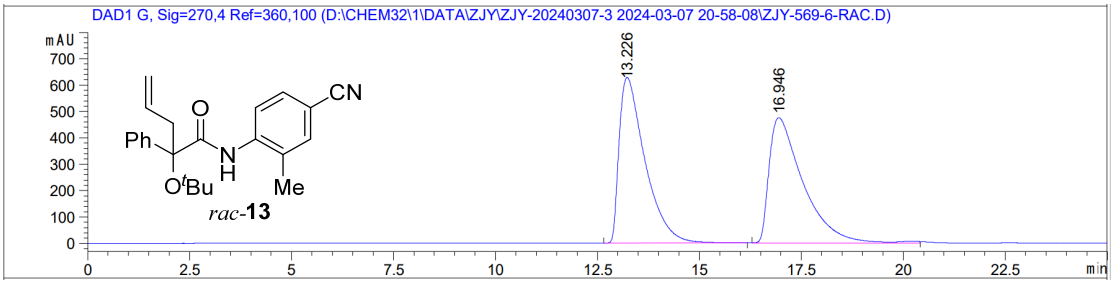
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.848	BB	0.5404	1.27617e4	366.39383	50.0098
2	38.740	BB	0.9115	1.27567e4	213.97916	49.9902
Totals :				2.55184e4	580.37299	



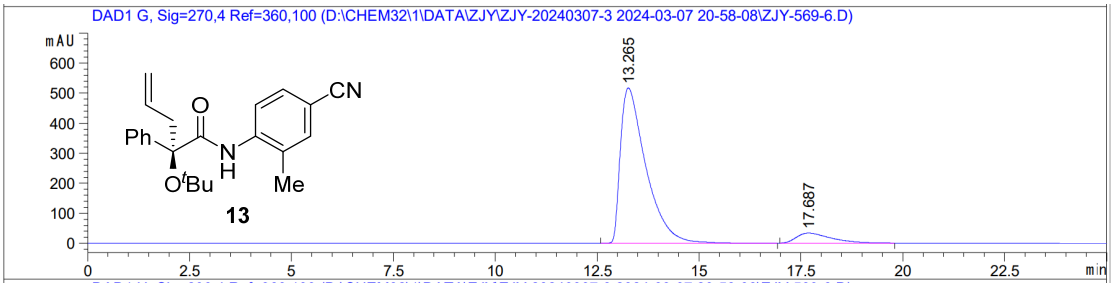
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.562	BB	0.5235	1518.51965	43.68852	5.9323
2	39.359	BB	0.9284	2.40790e4	393.22531	94.0677
Totals :				2.55975e4	436.91383	



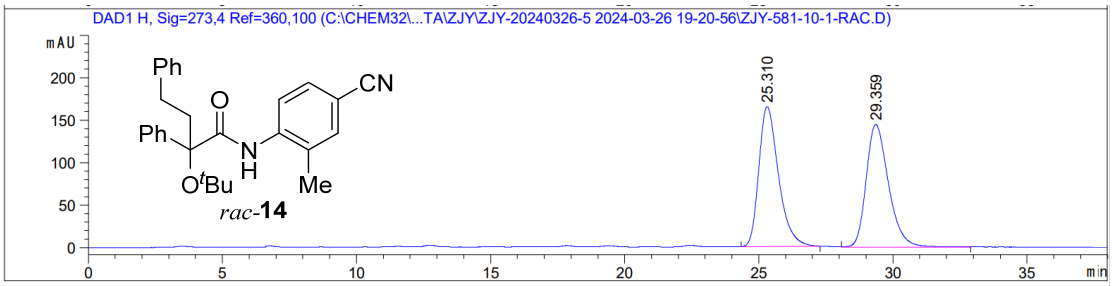
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.226	BB	0.6557	2.76453e4	627.79785	50.0333
2	16.946	MM R	0.9679	2.76085e4	475.42212	49.9667
Totals :				5.52538e4	1103.21997	



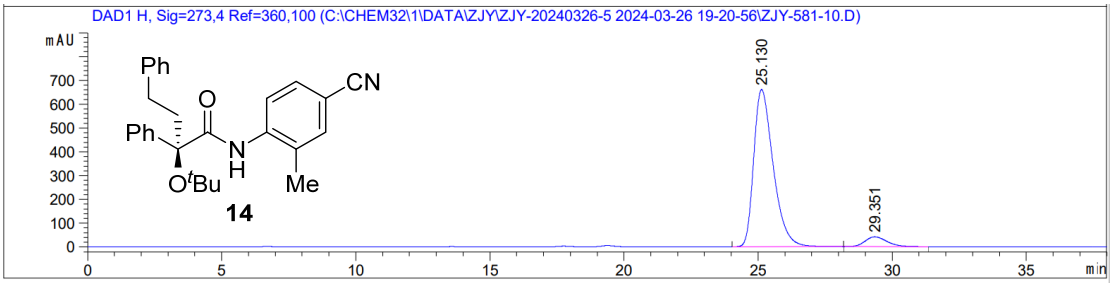
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.265	MM R	0.7270	2.25564e4	517.08997	92.0050
2	17.687	MM R	0.9836	1960.10559	33.21204	7.9950
Totals :				2.45165e4	550.30201	



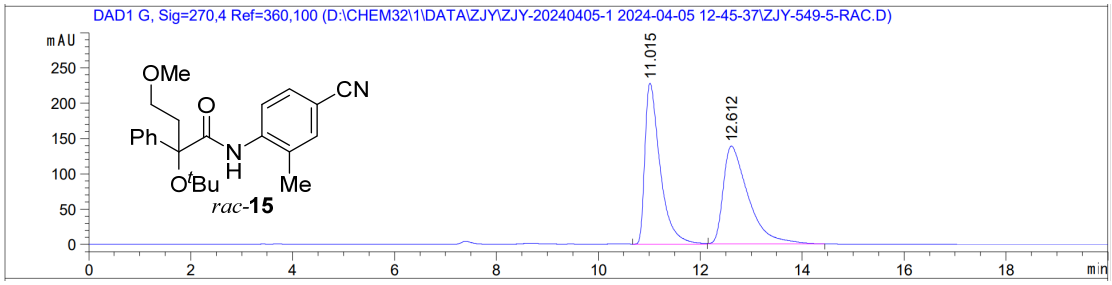
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.310	MM R	0.8501	8390.80176	164.50340	50.0811
2	29.359	MM R	0.9660	8363.62500	144.30400	49.9189
Totals :				1.67544e4	308.80740	



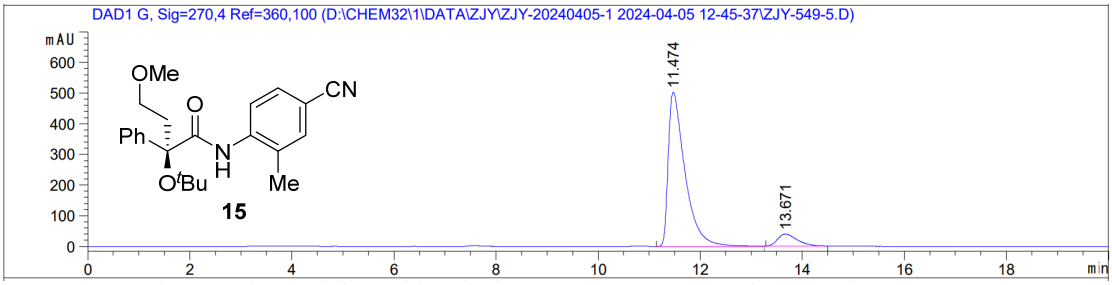
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.130	BB	0.7747	3.33125e4	660.14417	93.4182
2	29.351	BB	0.8724	2347.03638	41.33498	6.5818
Totals :				3.56596e4	701.47915	



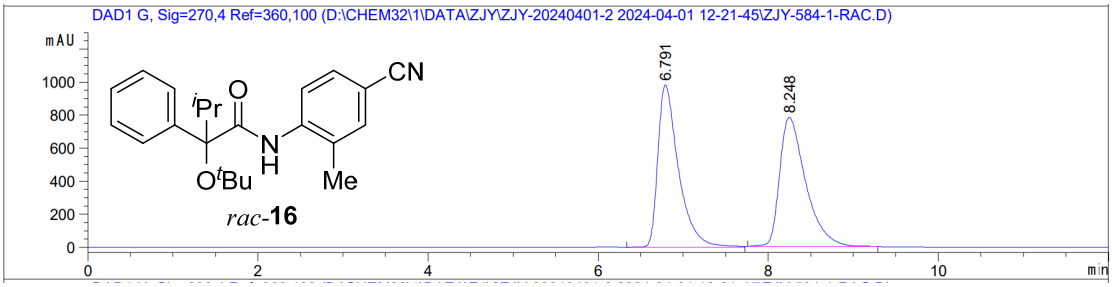
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.015	BV	0.3076	4721.44287	227.96152	50.0158
2	12.612	MM R	0.5684	4718.45703	138.34357	49.9842
Totals :				9439.89990	366.30508	



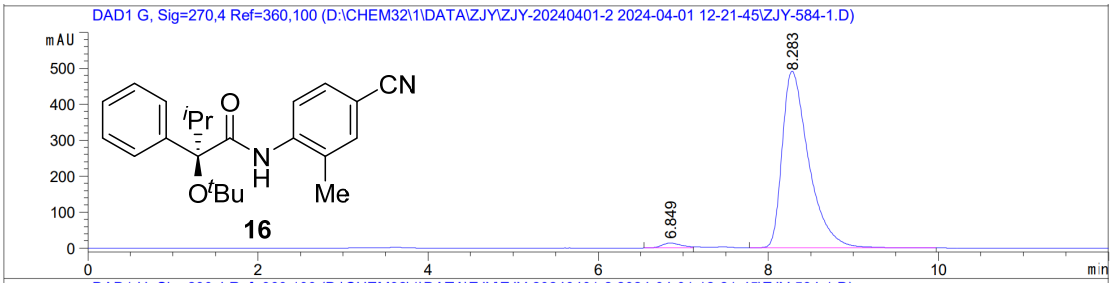
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.474	MM R	0.3806	1.14828e4	502.87070	91.6812
2	13.671	MM R	0.4480	1041.90759	38.76234	8.3188
Totals :				1.25247e4	541.63304	



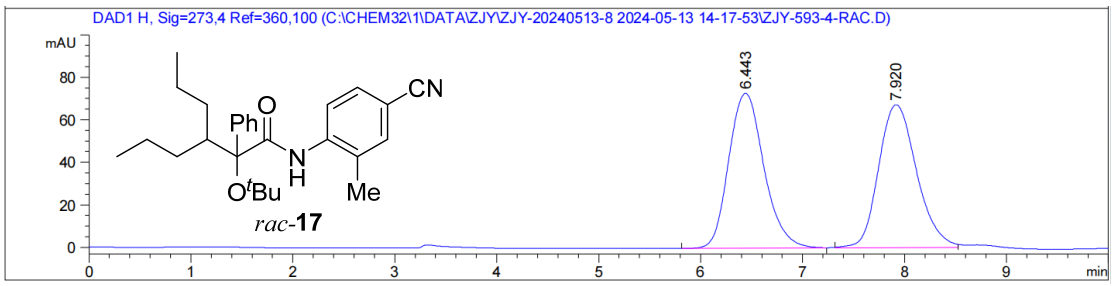
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.791	VV	0.2513	1.65996e4	981.43457	49.9838
2	8.248	MM R	0.3543	1.66103e4	781.45917	50.0162
Totals :				3.32098e4	1762.89374	



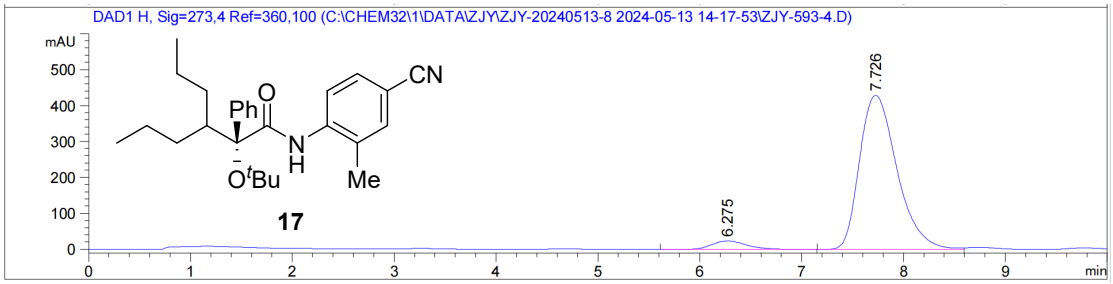
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.849	MM R	0.2712	221.03981	13.58345	2.0321
2	8.283	BB	0.3272	1.06561e4	490.90799	97.9679
Totals :				1.08772e4	504.49144	



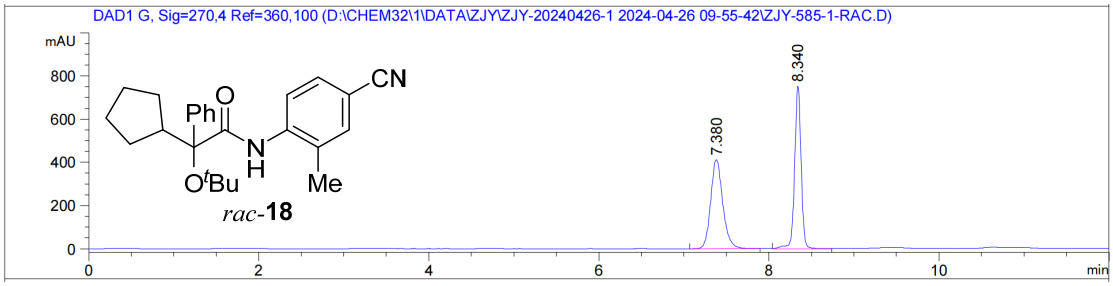
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.443	BB	0.3754	1744.47034	72.83012	49.9465
2	7.920	MM R	0.4329	1748.21021	67.30302	50.0535
Totals :				3492.68054	140.13314	



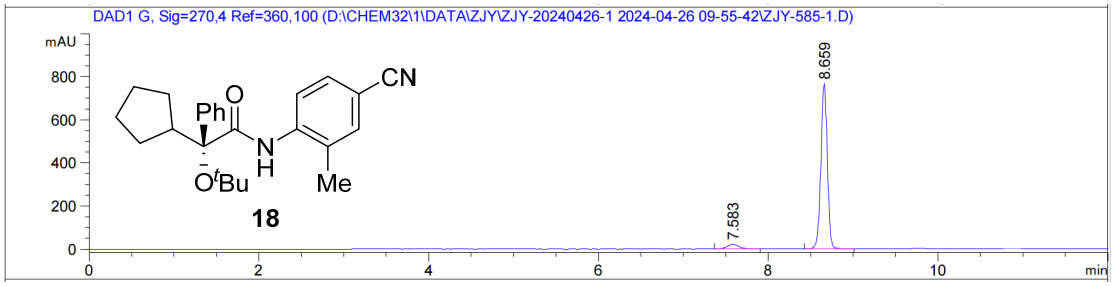
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.275	BB	0.3746	560.33862	23.29475	4.8612
2	7.726	MF R	0.4263	1.09663e4	428.73502	95.1388
Totals :				1.15267e4	452.02976	



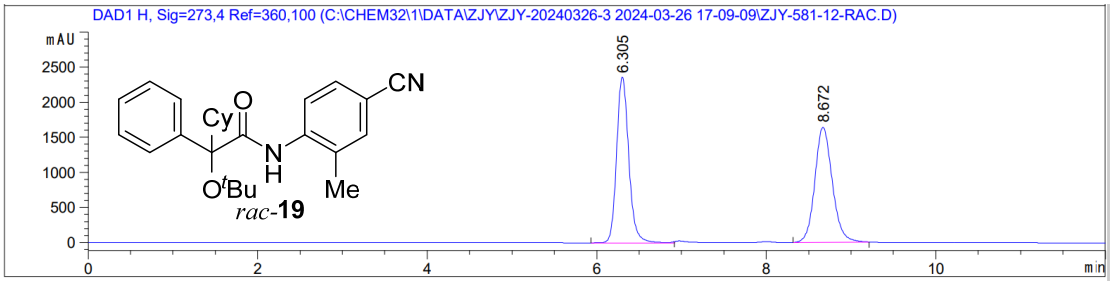
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.380	BB	0.1513	4070.98364	412.01663	50.0414
2	8.340	MM R	0.0900	4064.25171	752.61859	49.9586
Totals :				8135.23535	1164.63522	



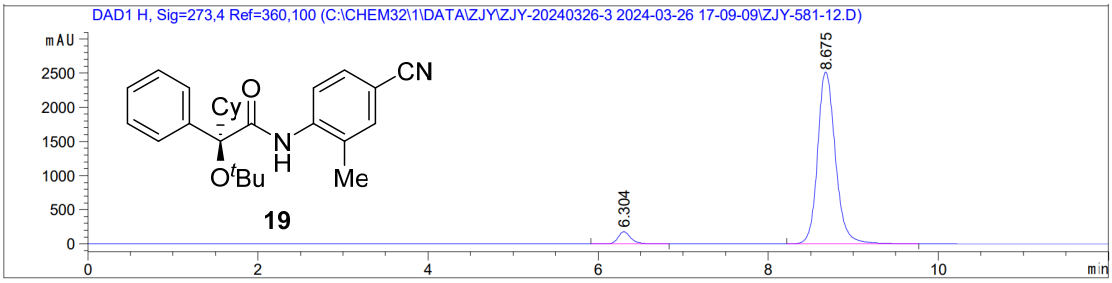
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.583	MM R	0.1667	217.44008	21.74247	5.0617
2	8.659	MM R	0.0887	4078.34229	766.41779	94.9383
Totals :				4295.78236	788.16025	



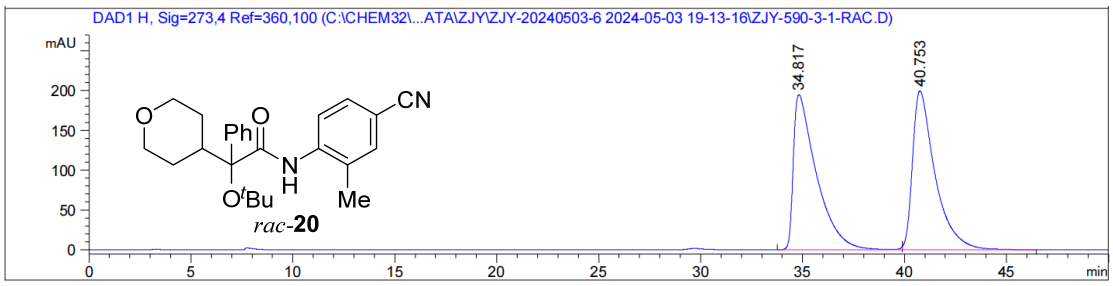
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.305	MM R	0.1666	2.35799e4	2359.20850	50.0276
2	8.672	MM R	0.2389	2.35539e4	1643.16052	49.9724
Totals :				4.71339e4	4002.36902	



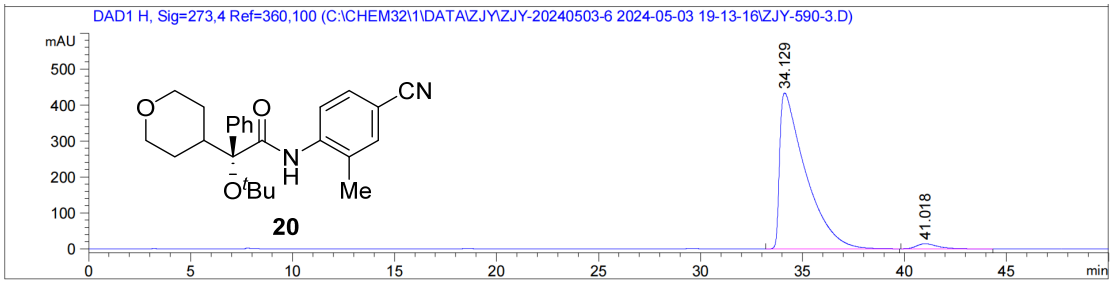
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.304	BB	0.1565	1845.40259	178.71577	4.8137
2	8.675	VB	0.2231	3.64913e4	2516.93970	95.1863
Totals :				3.83367e4	2695.65547	



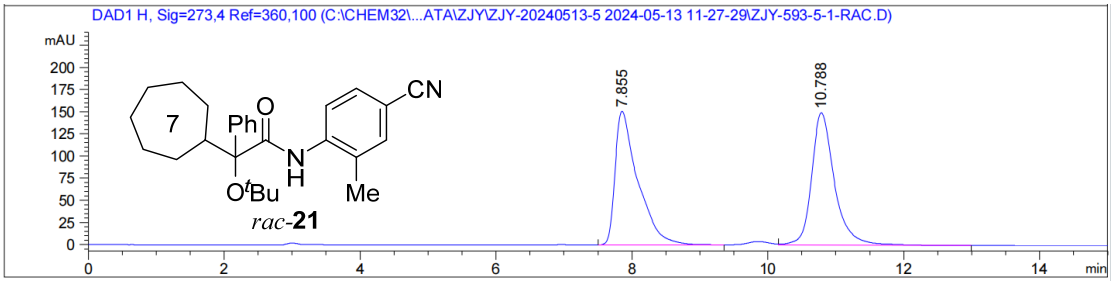
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	34.817	MF R	1.3124	1.53497e4	194.93938	49.9829
2	40.753	FM R	1.2833	1.53602e4	199.48462	50.0171
Totals :				3.07100e4	394.42400	



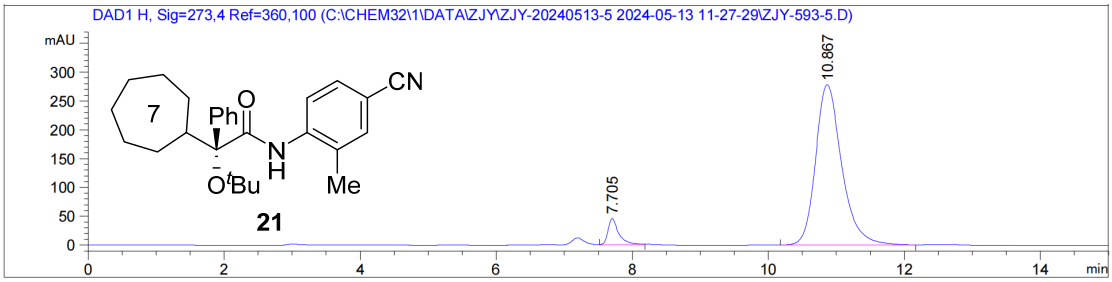
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	34.129	BB	1.2100	3.81589e4	433.91226	97.3437
2	41.018	BB	0.9620	1041.27380	14.32637	2.6563
Totals :				3.92002e4	448.23863	



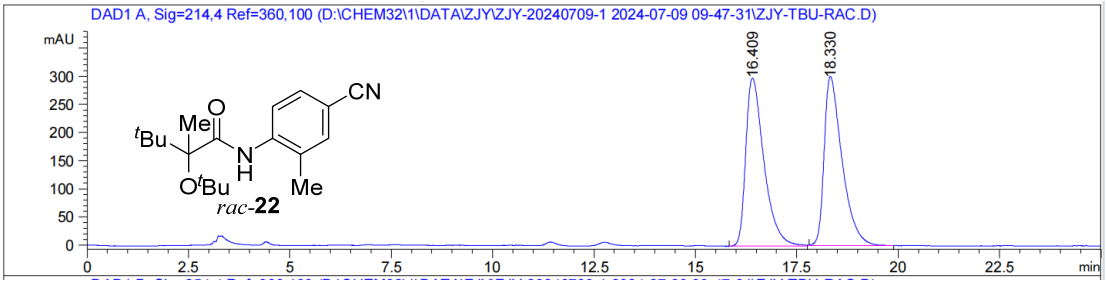
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.855	BB	0.3318	3514.42358	150.86819	50.0194
2	10.788	FM R	0.3917	3511.69238	149.42952	49.9806



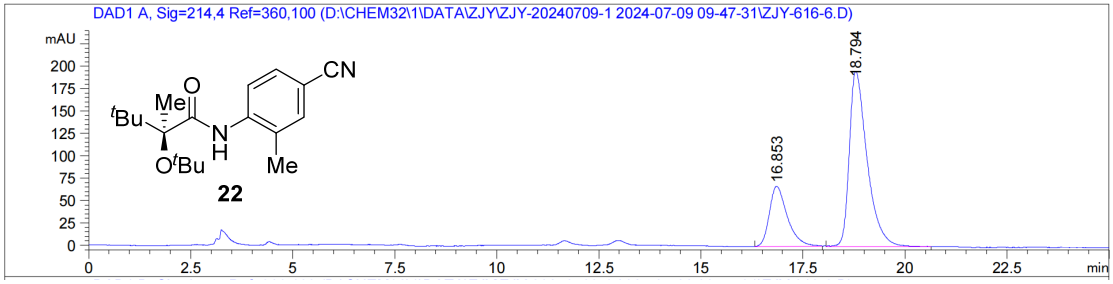
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.705	MM R	0.1859	509.13461	45.64339	6.4316
2	10.867	BB	0.4050	7406.99756	277.90631	93.5684
Totals :				7916.13217	323.54970	



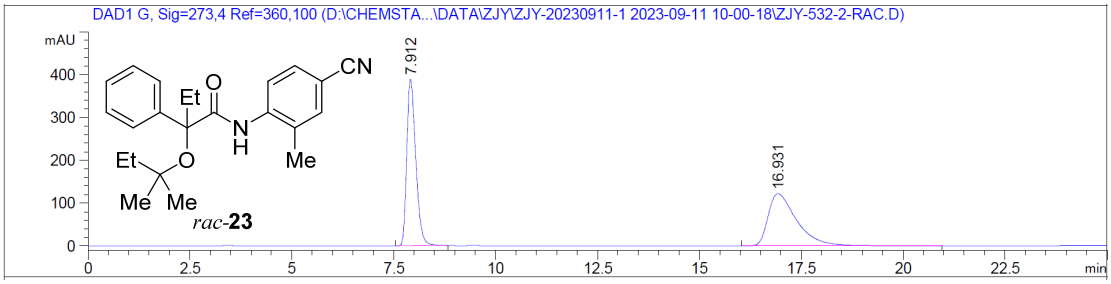
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.409	BV	0.4639	9307.60254	298.38260	50.0925
2	18.330	MM R	0.5136	9273.24316	300.89658	49.9075
Totals :				1.85808e4	599.27917	



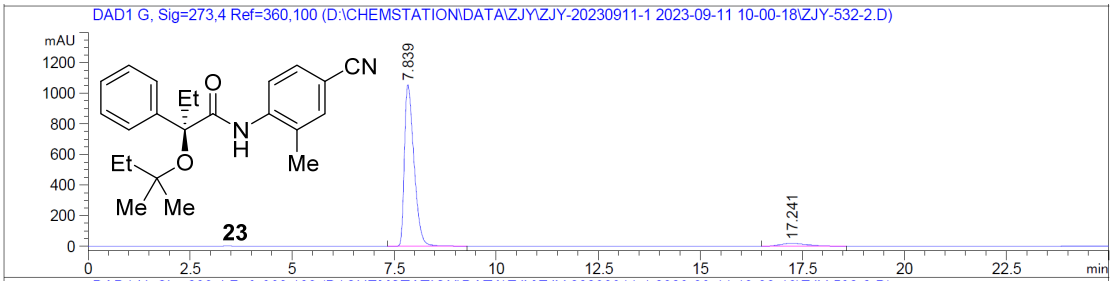
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.853	MM R	0.5085	2047.37671	67.10780	25.5258
2	18.794	MM R	0.5072	5973.43555	196.27896	74.4742
Totals :				8020.81226	263.38676	



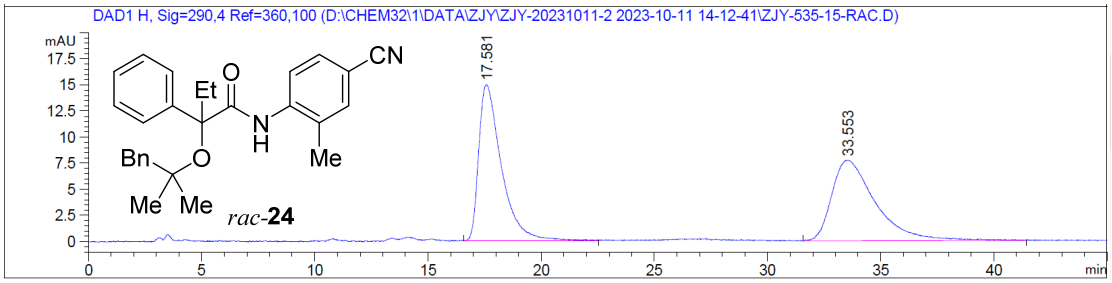
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.912	BB	0.2353	5958.44727	387.76236	49.9193
2	16.931	BB	0.7312	5977.71484	122.09773	50.0807
Totals :				1.19362e4	509.86009	



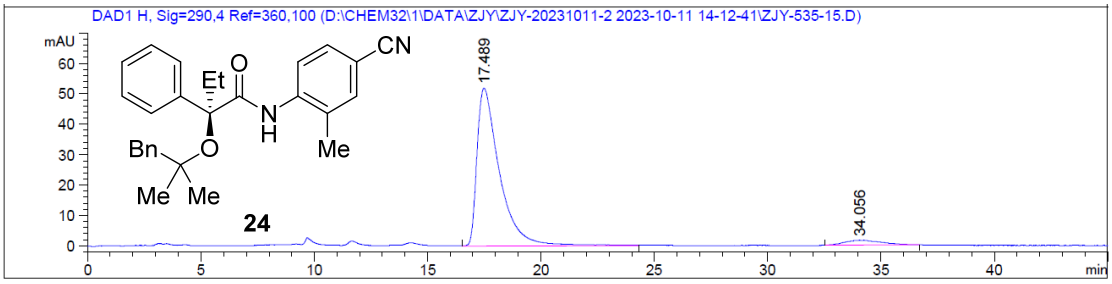
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.839	MM R	0.2738	1.73519e4	1056.23938	94.9377
2	17.241	MM R	0.8209	925.24023	18.78562	5.0623
Totals :				1.82772e4	1075.02500	



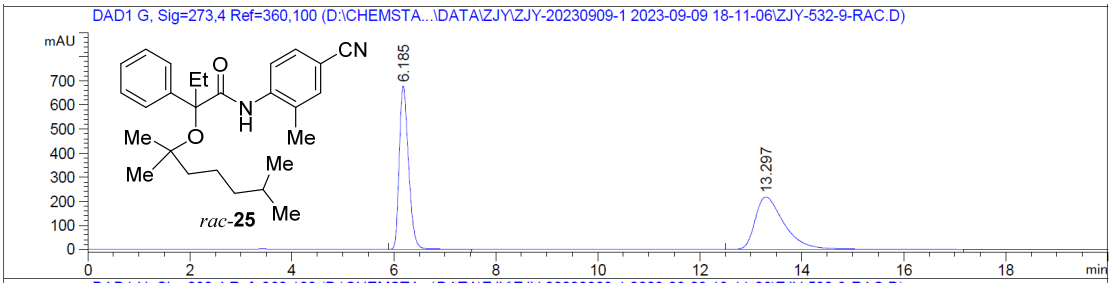
Signal 8: DAD1 H, Sig=290,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.581	MM R	1.1590	1041.48267	14.97689	50.0409
2	33.553	MM R	2.2394	1039.78186	7.73849	49.9591
Totals :				2081.26453	22.71538	



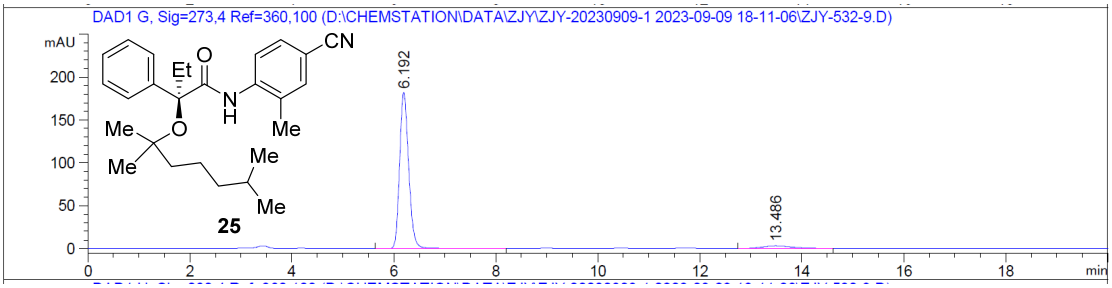
Signal 8: DAD1 H, Sig=290,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.489	MM R	1.1565	3598.00220	51.85067	95.0023
2	34.056	MM R	1.9417	189.27882	1.62469	4.9977
Totals :				3787.28102	53.47536	



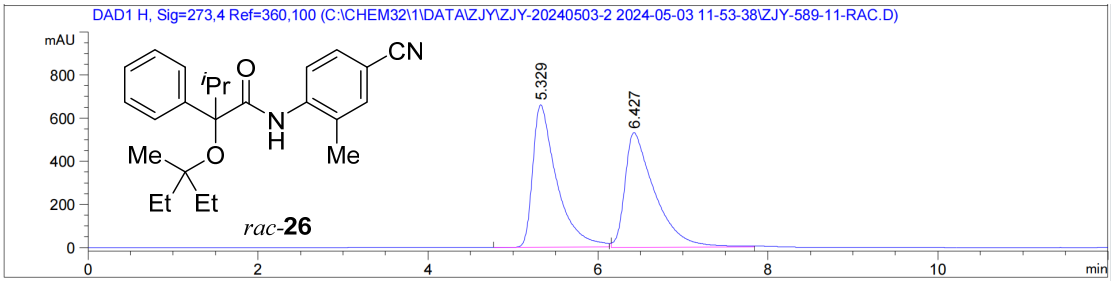
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.185	BB	0.1979	8588.77344	677.47589	50.0479
2	13.297	BB	0.5928	8572.32129	218.00064	49.9521
Totals :				1.71611e4	895.47653	



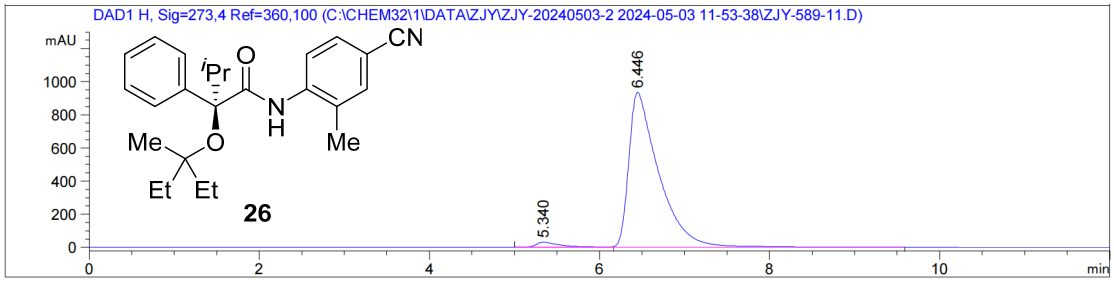
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.192	MM R	0.2058	2244.88574	181.80731	94.9672
2	13.486	MM R	0.6758	118.96767	2.93391	5.0328
Totals :				2363.85342	184.74122	



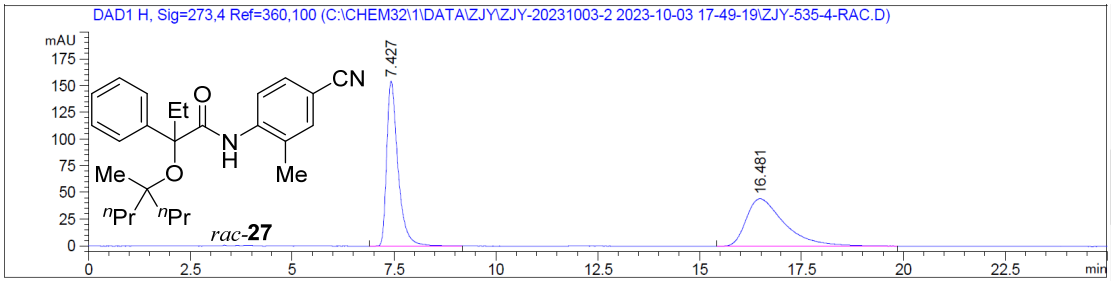
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.329	BV	0.2829	1.29429e4	659.66418	49.9174
2	6.427	MF R	0.4073	1.29858e4	531.32935	50.0826
Totals :				2.59287e4	1190.99353	



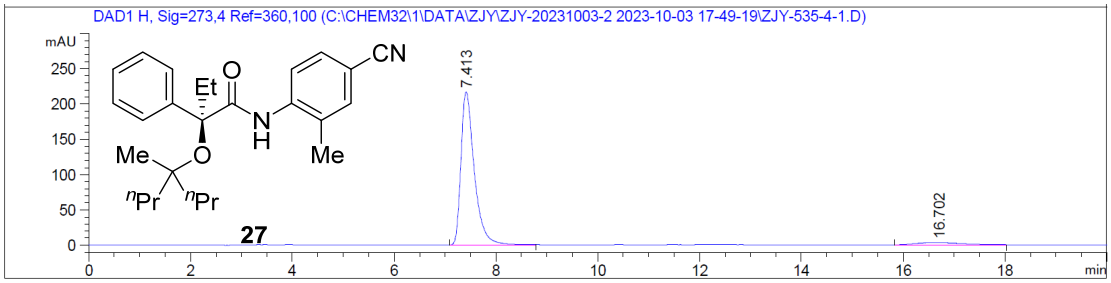
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.340	BV E	0.2833	623.63684	30.91579	2.6435
2	6.446	VB R	0.3444	2.29678e4	935.76270	97.3565
Totals :				2.35914e4	966.67849	



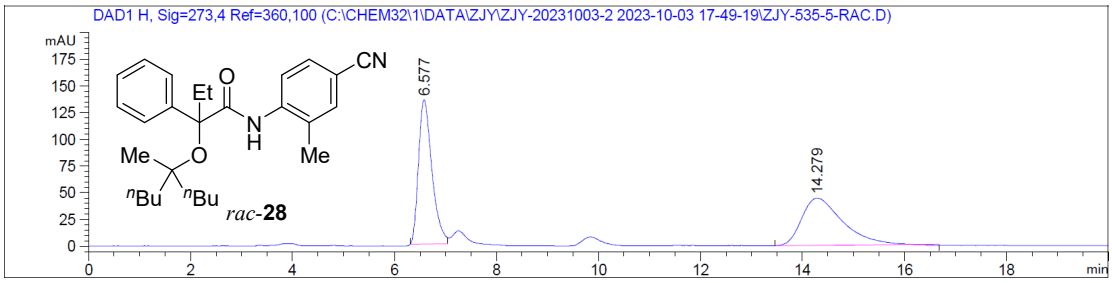
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.427	MM R	0.3225	2990.81372	154.55420	50.0948
2	16.481	MM R	1.1115	2979.49683	44.67863	49.9052
Totals :				5970.31055	199.23283	



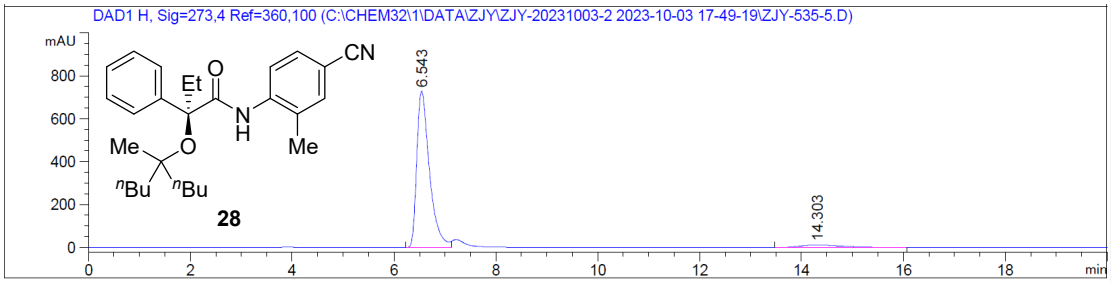
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.413	MM R	0.3086	4034.27637	217.88335	94.9481
2	16.702	MM R	1.0531	214.65161	3.39726	5.0519
Totals :				4248.92798	221.28060	



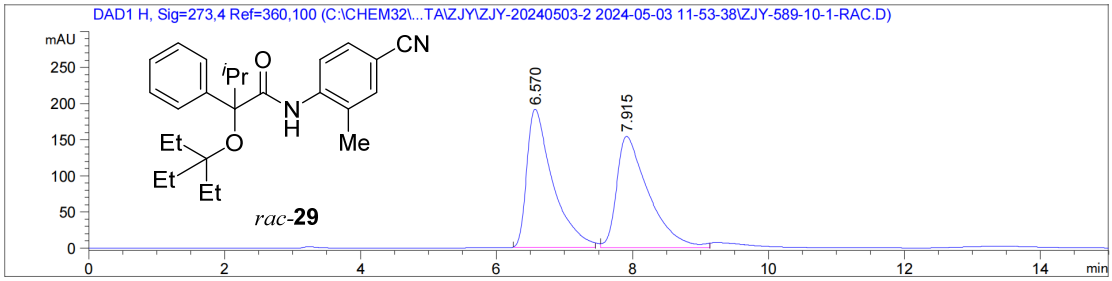
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.577	MM R	0.3053	2478.76758	135.30101	50.1110
2	14.279	MM R	0.9312	2467.78809	44.17011	49.8890
Totals :				4946.55566	179.47112	



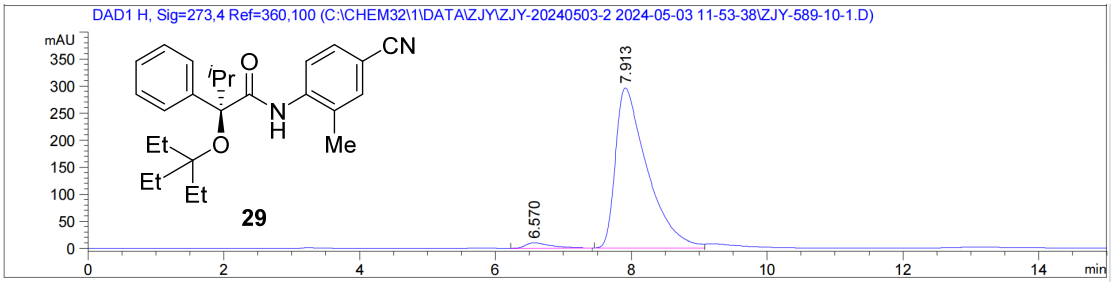
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.543	MF R	0.2888	1.26174e4	728.21161	94.9491
2	14.303	BB	0.6667	671.19684	11.92487	5.0509
Totals :				1.32886e4	740.13648	



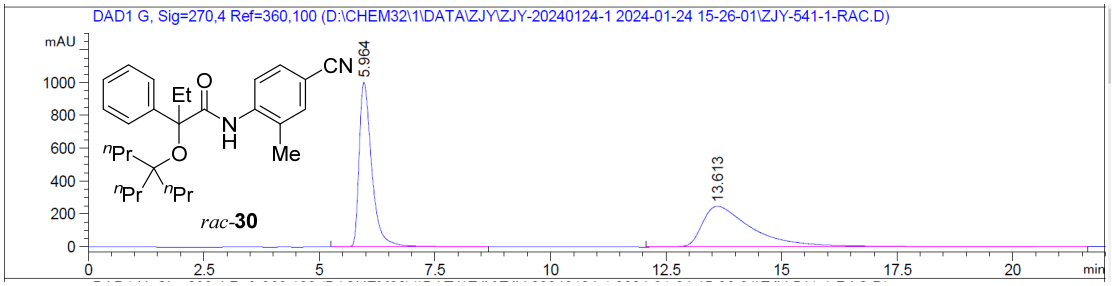
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.570	MM R	0.4402	5047.55615	191.12688	50.0455
2	7.915	MM R	0.5446	5038.38428	154.18895	49.9545
Totals :				1.00859e4	345.31583	



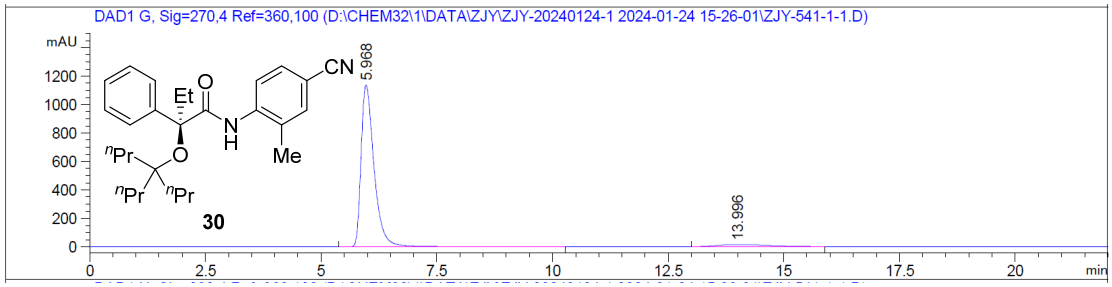
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.570	BB	0.3605	249.83398	10.03346	2.5363
2	7.913	MM R	0.5412	9600.65137	295.68301	97.4637
Totals :				9850.48535	305.71647	



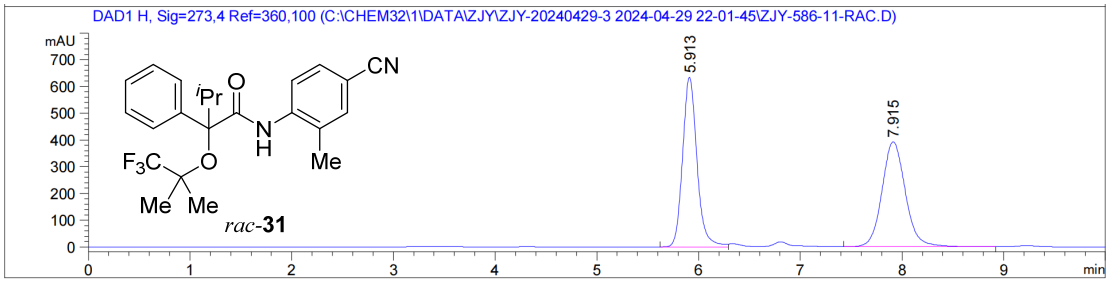
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.964	BB	0.2885	1.91426e4	1003.63989	50.0789
2	13.613	BB	1.1093	1.90823e4	247.54642	49.9211
Totals :				3.82249e4	1251.18631	



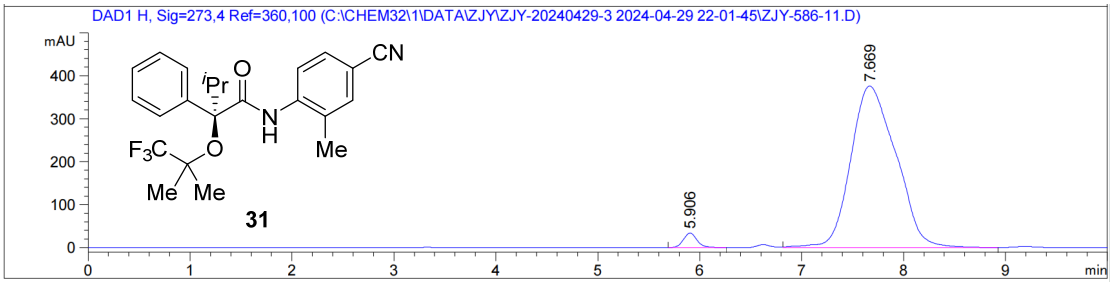
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.968	MM R	0.3288	2.24476e4	1137.69788	94.9253
2	13.996	MM R	1.4118	1200.04846	14.16687	5.0747
Totals :				2.36476e4	1151.86475	



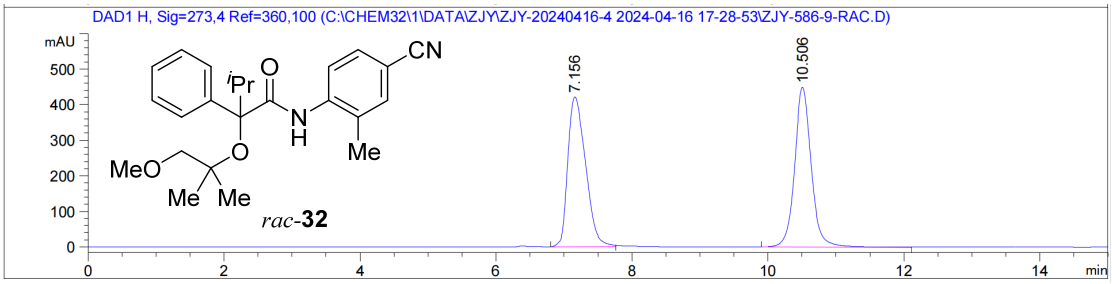
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.913	MM R	0.1638	6237.37842	634.60455	49.9308
2	7.915	BB	0.2462	6254.65576	391.84372	50.0692
Totals :				1.24920e4	1026.44827	



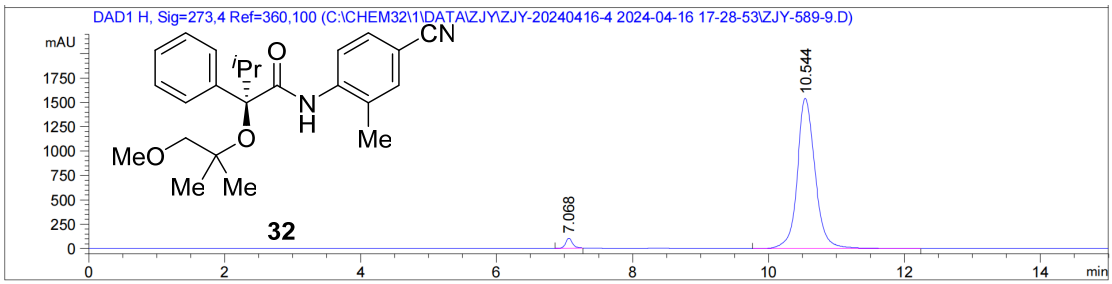
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.906	BB	0.1431	308.86172	33.63893	2.6012
2	7.669	FM R	0.5133	1.15650e4	375.49857	97.3988
Totals :				1.18739e4	409.13749	



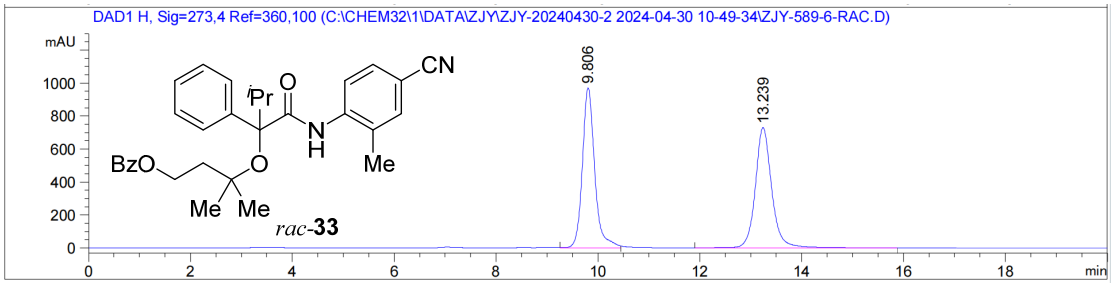
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.156	MF R	0.3017	7631.74365	421.59772	49.9899
2	10.506	MM R	0.2829	7634.83496	449.72079	50.0101
Totals :				1.52666e4	871.31851	



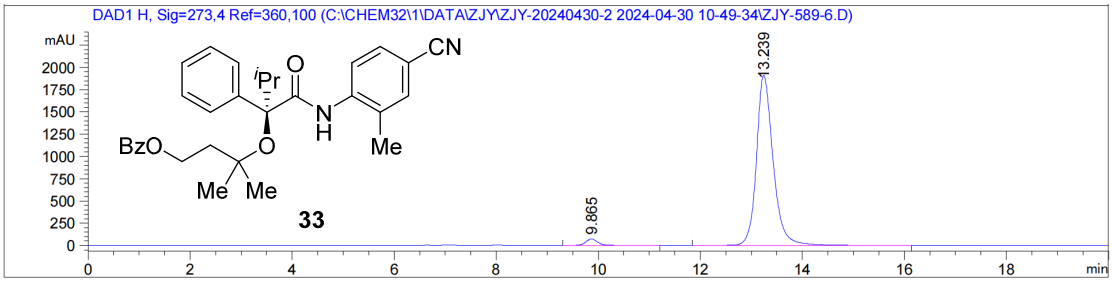
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.068	MM R	0.1151	721.71136	104.50311	2.5171
2	10.544	BB	0.2736	2.79502e4	1540.86987	97.4829
Totals :				2.86719e4	1645.37298	



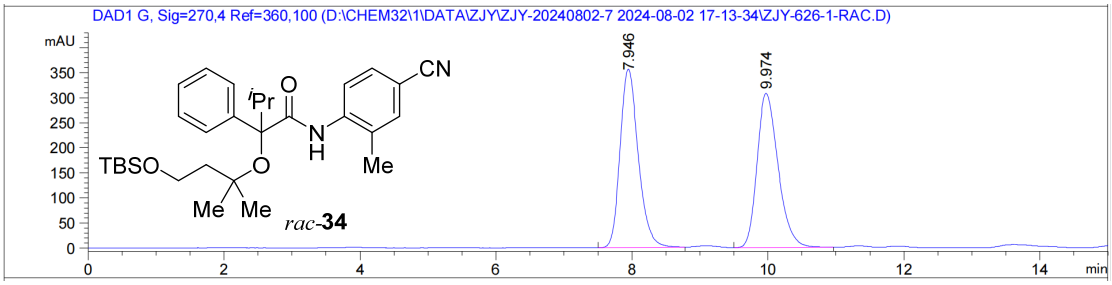
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.806	MF R	0.2800	1.62902e4	969.72693	49.9931
2	13.239	BB	0.3362	1.62947e4	730.59180	50.0069
Totals :				3.25848e4	1700.31873	



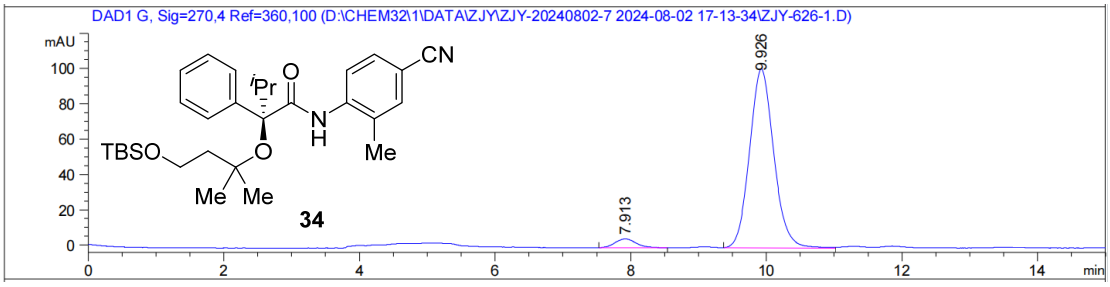
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.865	BB	0.2516	1208.35974	72.83409	2.7118
2	13.239	BB	0.3409	4.33503e4	1909.07080	97.2882
Totals :				4.45586e4	1981.90489	



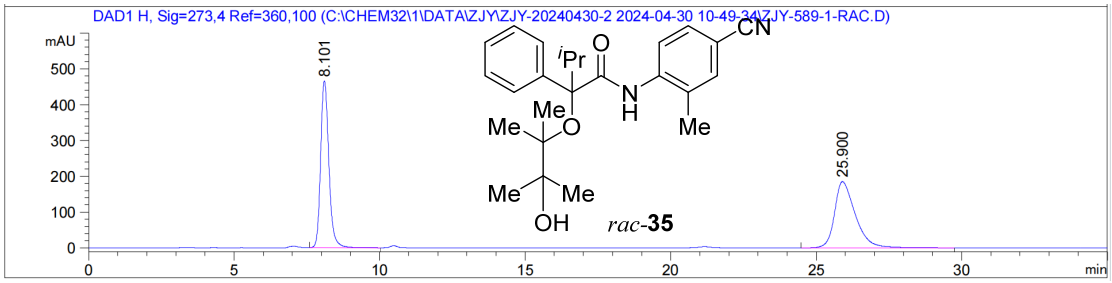
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.946	BB	0.2846	6603.48389	355.70883	50.0188
2	9.974	BB	0.3284	6598.52588	307.48764	49.9812
Totals :				1.32020e4	663.19647	



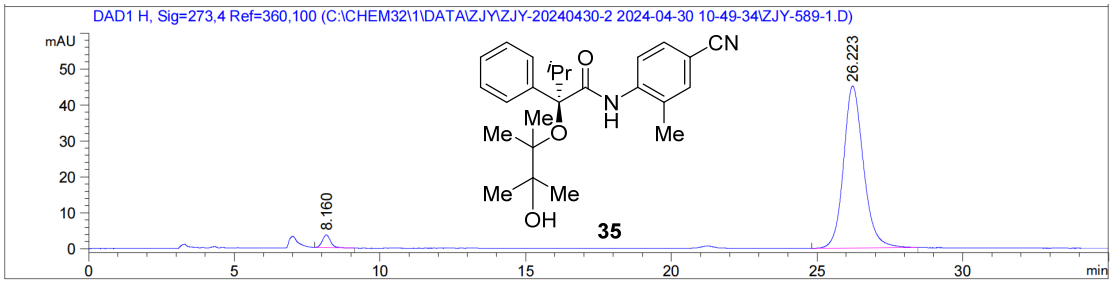
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.913	MM R	0.3685	110.38676	4.99201	4.2037
2	9.926	MM R	0.4130	2515.53979	101.52246	95.7963
Totals :				2625.92655	106.51447	



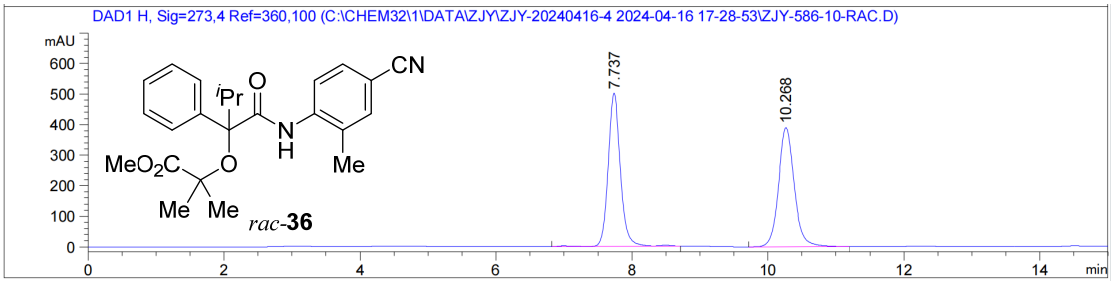
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.101	BB	0.3048	9119.41016	464.98724	49.9221
2	25.900	BB	0.7413	9147.86914	184.86771	50.0779
Totals :				1.82673e4	649.85495	



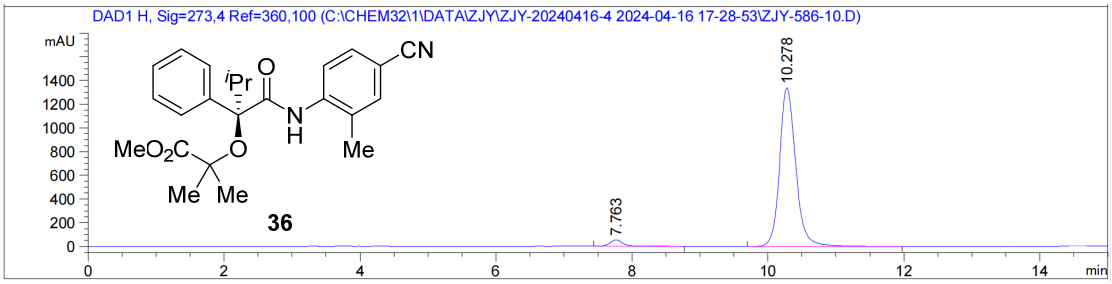
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.160	BB	0.3006	68.93727	3.51821	3.1111
2	26.223	BB	0.7218	2146.92139	45.06852	96.8889



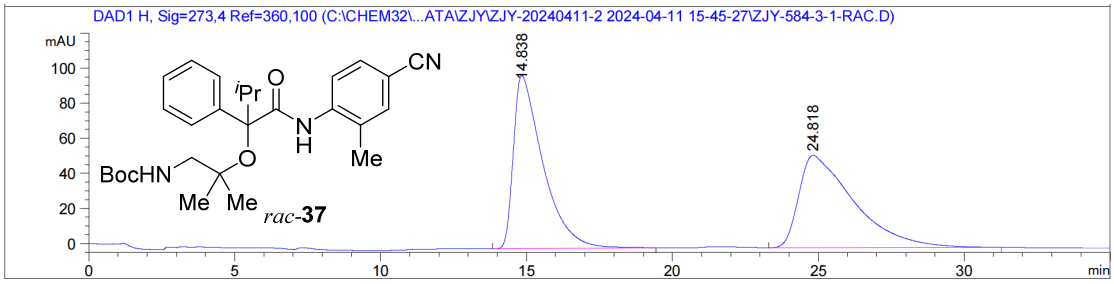
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.737	VV R	0.1906	6278.88721	500.77197	50.0833
2	10.268	BB	0.2453	6258.00342	389.80978	49.9167
Totals :				1.25369e4	890.58176	



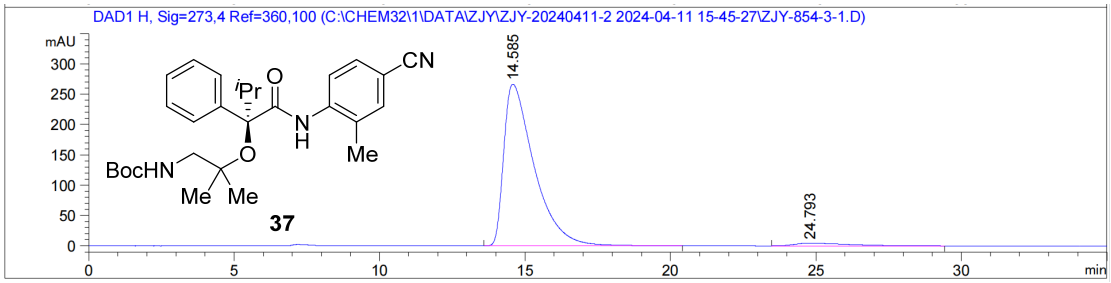
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.763	BB	0.1965	696.71680	54.00510	3.0626
2	10.278	BB	0.2524	2.20527e4	1337.49304	96.9374
Totals :				2.27495e4	1391.49815	



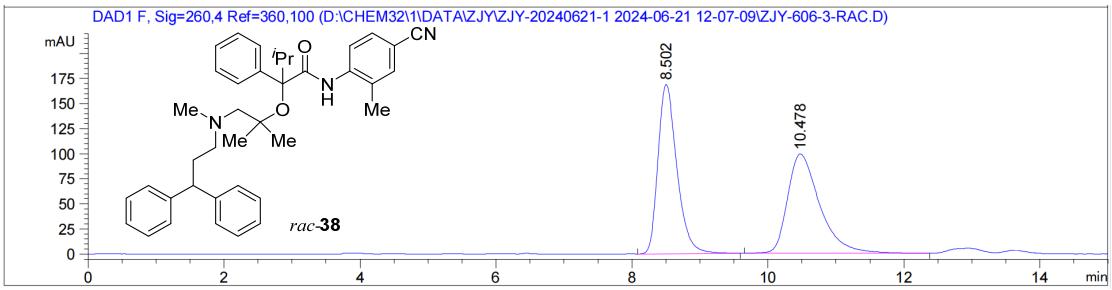
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.838	BB	1.0110	6909.21875	98.66045	50.1046
2	24.818	BB	1.7200	6880.37598	52.67184	49.8954
Totals :				1.37896e4	151.33229	



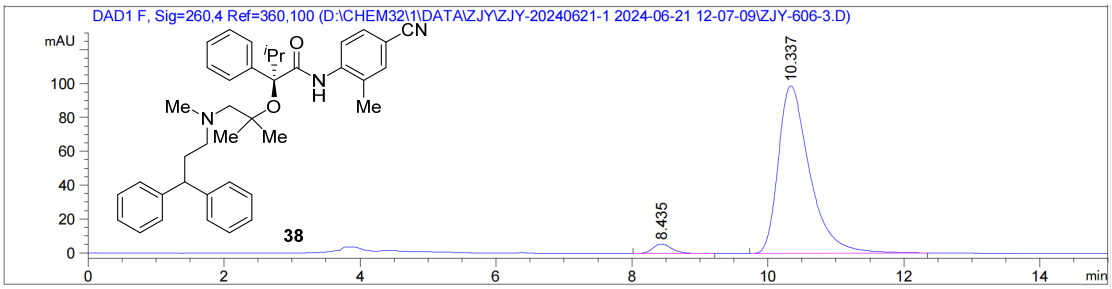
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.585	BB	1.0765	1.93211e4	266.30234	97.0330
2	24.793	MM R	2.1589	590.78937	4.56084	2.9670
Totals :				1.99118e4	270.86318	



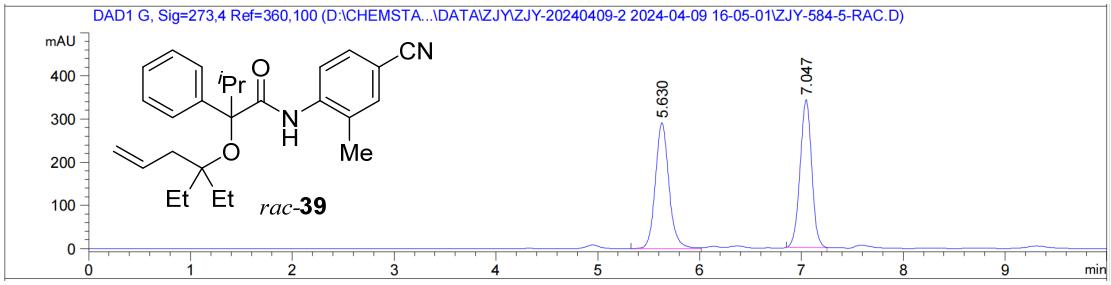
Signal 6: DAD1 F, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.502	BB	0.2973	3260.07446	168.79439	49.9951
2	10.478	BB	0.4940	3260.71826	99.06252	50.0049
Totals :				6520.79272	267.85690	



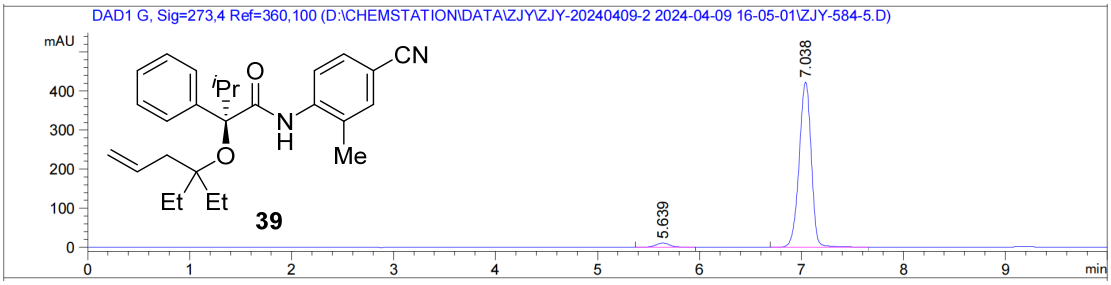
Signal 6: DAD1 F, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.435	BB	0.2932	113.08136	5.65624	3.4325
2	10.337	BB	0.4888	3181.37646	99.03453	96.5675
Totals :				3294.45782	104.69077	



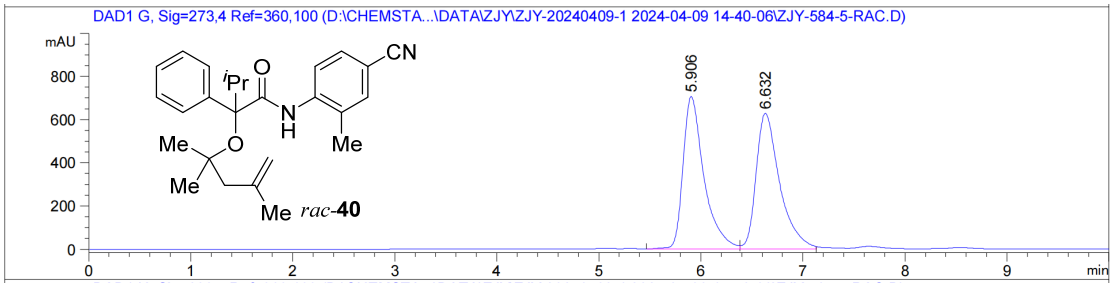
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.630	MM R	0.1547	2712.57520	292.16095	50.0166
2	7.047	MM R	0.1319	2710.77490	342.55118	49.9834
Totals :				5423.35010	634.71213	



Signal 7: DAD1 G, Sig=273,4 Ref=360,100

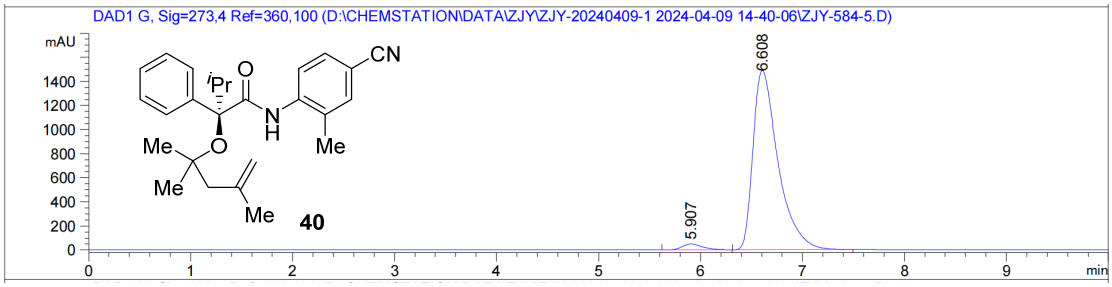
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.639	BB	0.1513	107.58864	10.88677	2.9857
2	7.038	MF R	0.1376	3495.93140	423.48245	97.0143
Totals :				3603.52003	434.36922	



Signal 7: DAD1 G, Sig=273,4 Ref=360,100

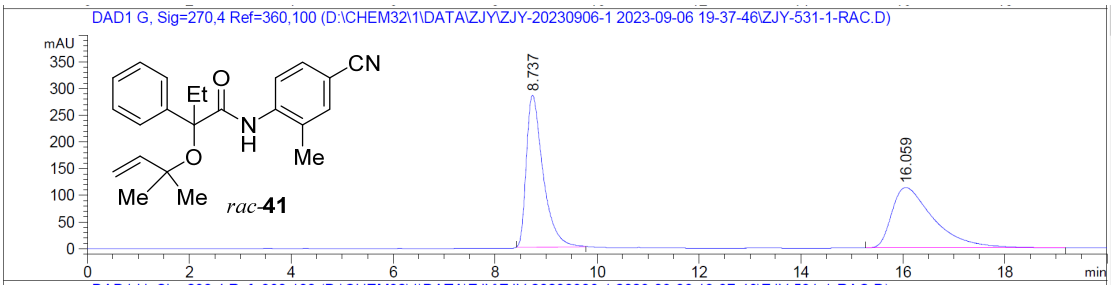
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.906	BV	0.2122	1.00436e4	705.17261	49.9150
2	6.632	MF R	0.2676	1.00778e4	627.73370	50.0850

Signal 8: DAD1 H, Sig=280,4 Ref=360,100



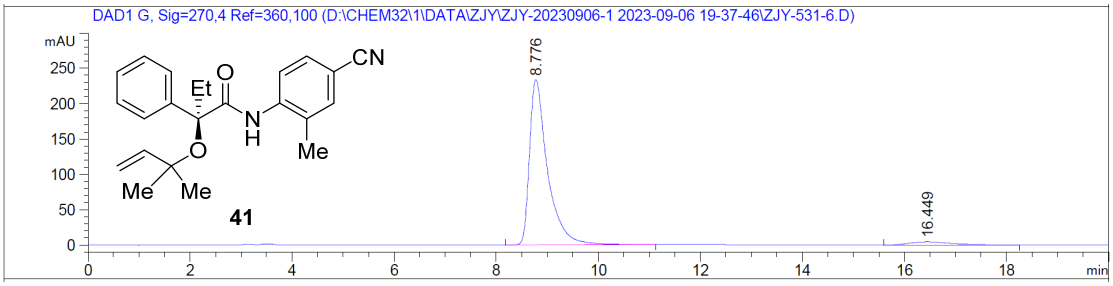
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.907	BB	0.2088	687.00574	49.85614	2.6342
2	6.608	BB	0.2570	2.53935e4	1488.53442	97.3658
Totals :				2.60805e4	1538.39056	



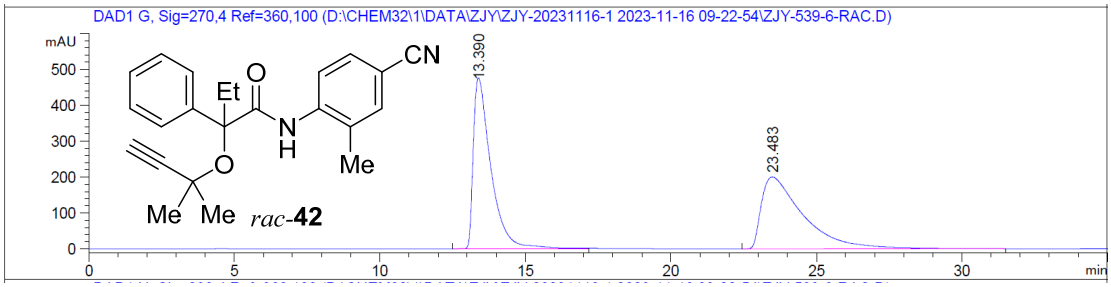
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.737	MM R	0.3794	6464.39209	283.94156	49.9963
2	16.059	BB	0.8391	6465.35449	113.06520	50.0037
Totals :				1.29297e4	397.00676	



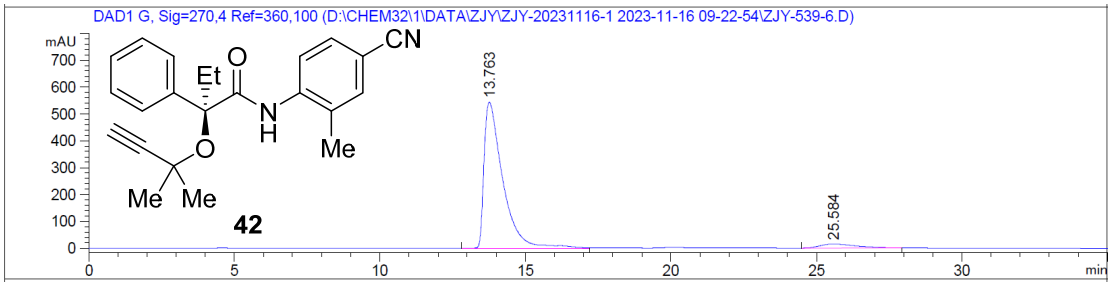
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.776	BB	0.3608	5748.69336	233.86259	95.8303
2	16.449	BB	0.6897	250.13000	4.34439	4.1697
Totals :				5998.82336	238.20698	



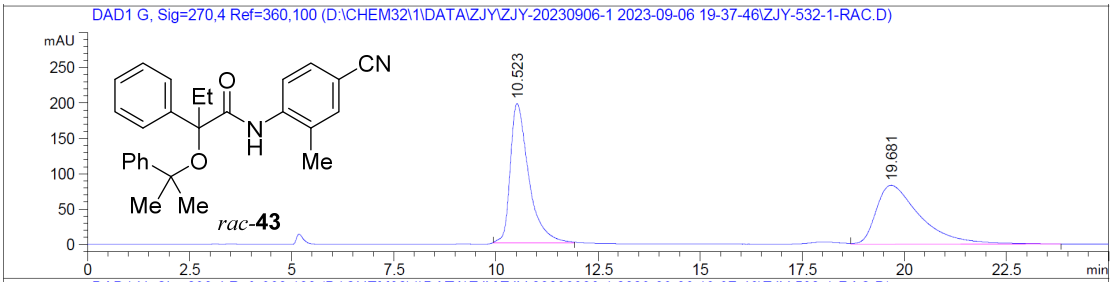
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.390	MM R	0.7043	2.01256e4	476.25134	50.0140
2	23.483	BB	1.4539	2.01143e4	200.25336	49.9860
Totals :				4.02399e4	676.50470	



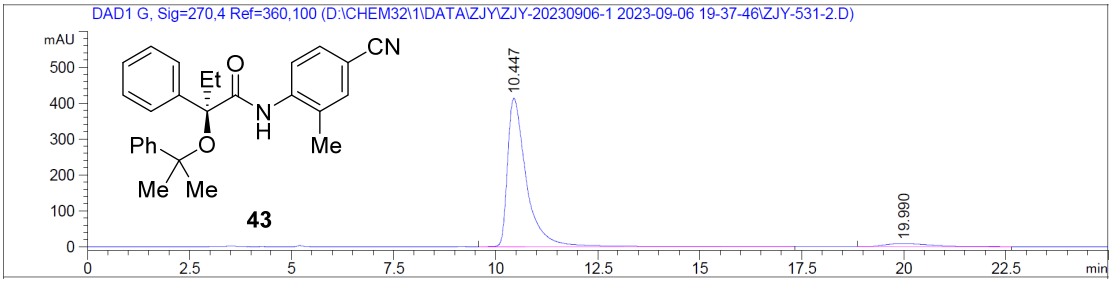
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.763	MM R	0.7457	2.43373e4	543.92004	94.8484
2	25.584	MM R	1.4518	1321.86426	15.17495	5.1516
Totals :				2.56592e4	559.09499	



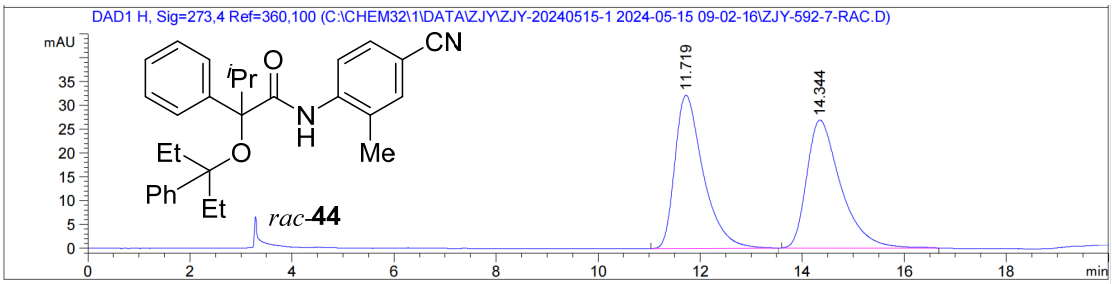
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.523	MM R	0.5288	6265.29248	197.48247	50.0106
2	19.681	MM R	1.2542	6262.64746	83.22398	49.9894
Totals :				1.25279e4	280.70644	



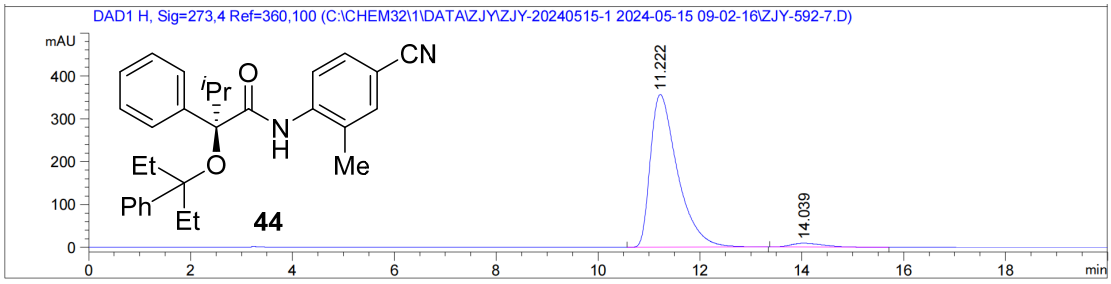
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.447	MM R	0.5407	1.34093e4	413.31726	95.2981
2	19.990	BB	0.8881	661.59875	8.93212	4.7019
Totals :				1.40709e4	422.24938	



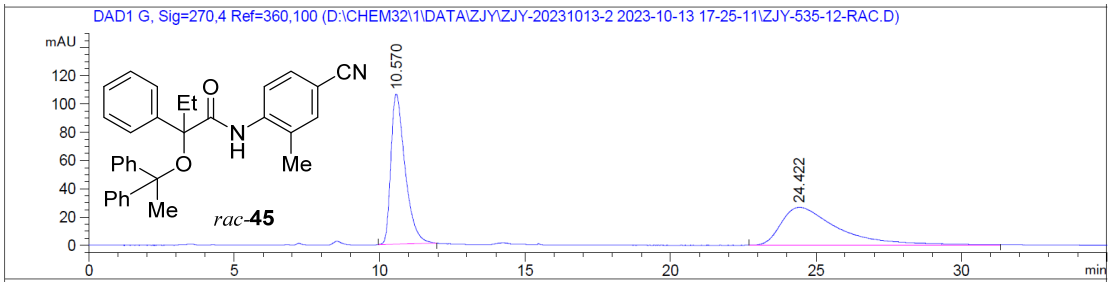
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.719	BB	0.5827	1241.29272	32.13012	49.9400
2	14.344	MM R	0.7726	1244.27307	26.84016	50.0600
Totals :				2485.56580	58.97028	



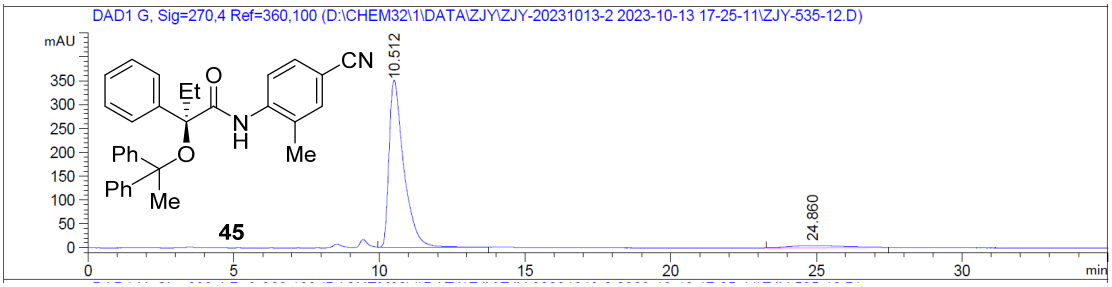
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.222	BB	0.5605	1.32053e4	356.20026	96.9885
2	14.039	BB	0.6470	410.01965	9.00923	3.0115
Totals :				1.36153e4	365.20949	



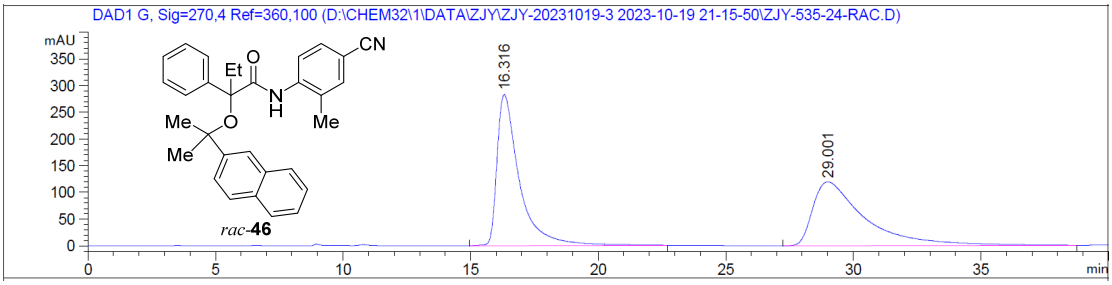
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.570	MM R	0.5655	3609.66260	106.38744	50.0191
2	24.422	MM R	2.2500	3606.89941	26.71815	49.9809
Totals :				7216.56201	133.10560	



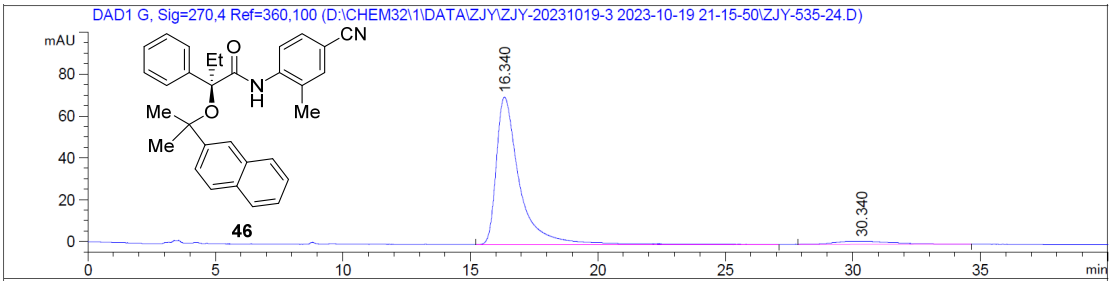
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.512	MM R	0.5916	1.24427e4	350.56198	95.0166
2	24.860	MM R	2.2080	652.59644	4.92604	4.9834
Totals :				1.30953e4	355.48802	



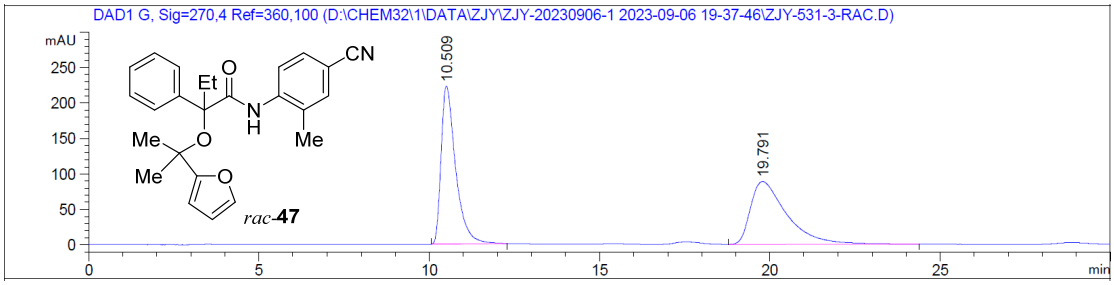
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.316	BB	0.8861	1.72552e4	282.69754	49.8694
2	29.001	MM R	2.4111	1.73456e4	119.89979	50.1306
Totals :				3.46008e4	402.59733	



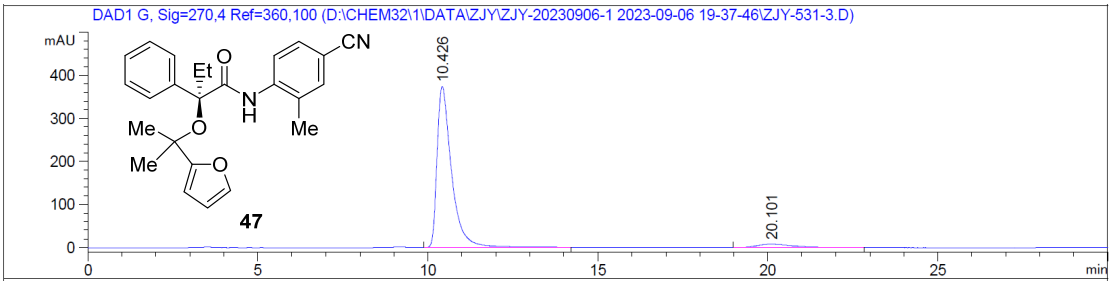
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.340	MM R	1.0626	4494.38867	70.49158	94.8296
2	30.340	MM R	2.6092	245.04825	1.56531	5.1704
Totals :				4739.43692	72.05689	



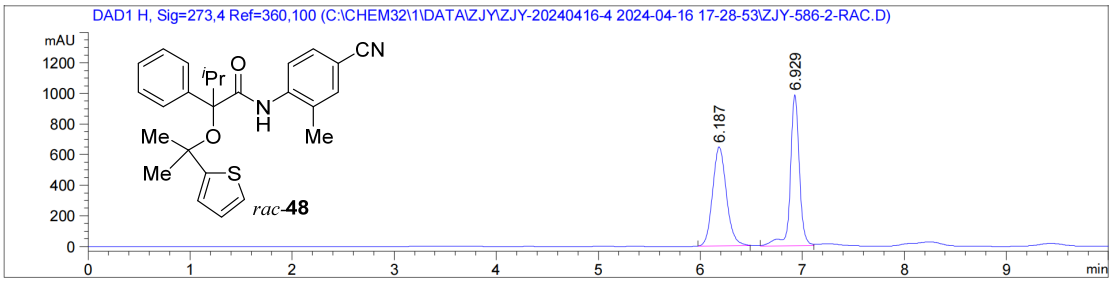
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.509	MM R	0.4956	6629.22949	222.94589	50.1934
2	19.791	BB	1.0760	6578.15137	88.62374	49.8066
Totals :				1.32074e4	311.56963	



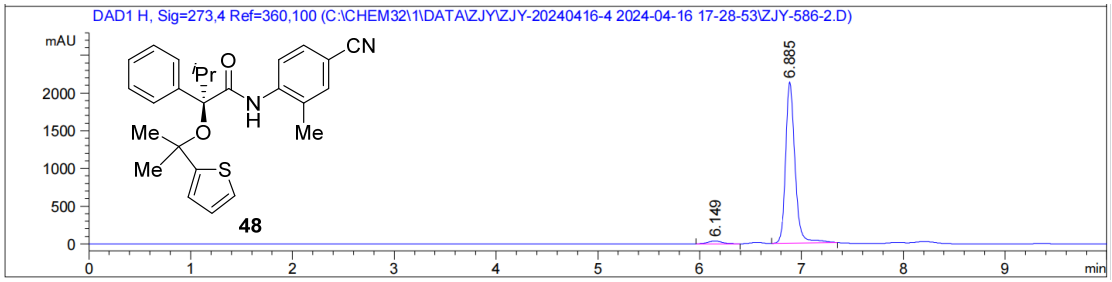
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.426	BB	0.4423	1.10982e4	373.90573	94.9683
2	20.101	BB	0.8829	588.01642	7.82356	5.0317
Totals :				1.16862e4	381.72929	



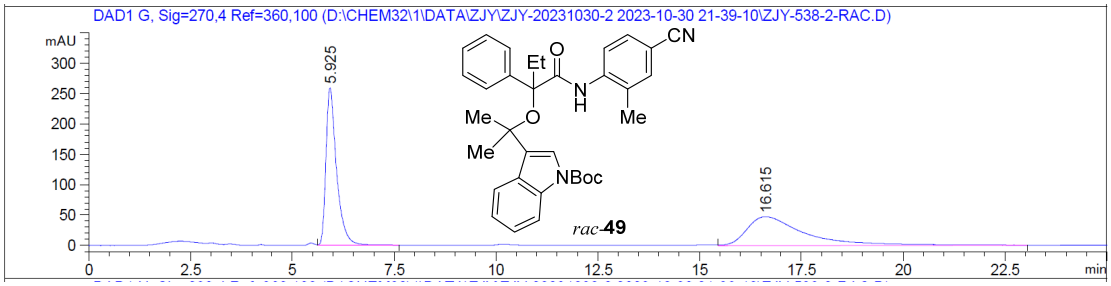
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.187	MM R	0.1569	6101.82129	647.97937	50.0374
2	6.929	MM R	0.1027	6092.69482	988.74121	49.9626
Totals :				1.21945e4	1636.72058	



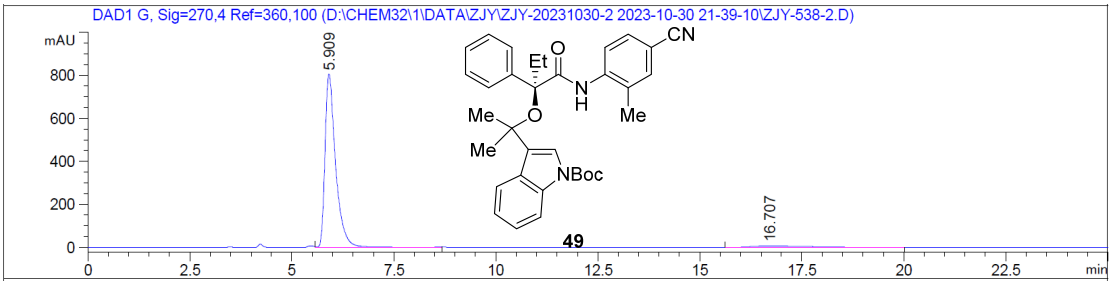
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.149	MM R	0.1554	361.74341	38.79779	2.5603
2	6.885	MM R	0.1072	1.37674e4	2140.65576	97.4397
Totals :				1.41291e4	2179.45356	



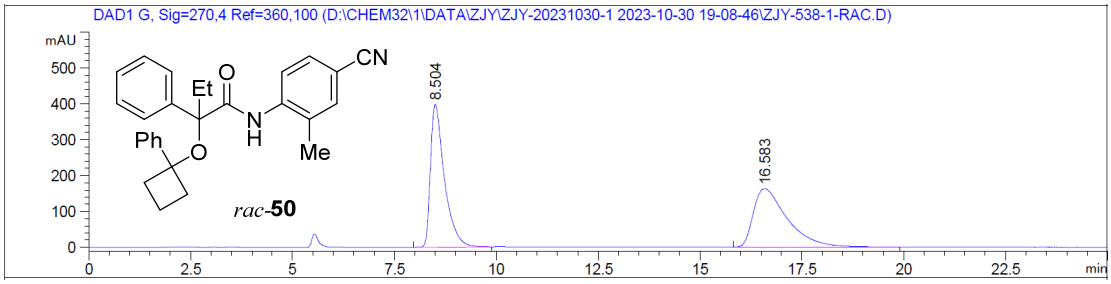
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.925	VB	0.2725	4712.41309	258.77097	50.0062
2	16.615	MM R	1.6543	4711.23682	47.46447	49.9938
Totals :				9423.64990	306.23544	



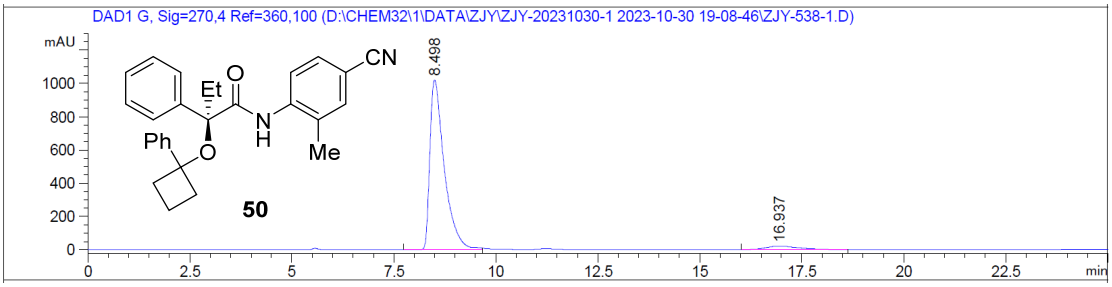
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.909	MM R	0.3045	1.47196e4	805.66998	95.0915
2	16.707	MM R	1.7732	759.79700	7.14141	4.9085
Totals :				1.54794e4	812.81139	



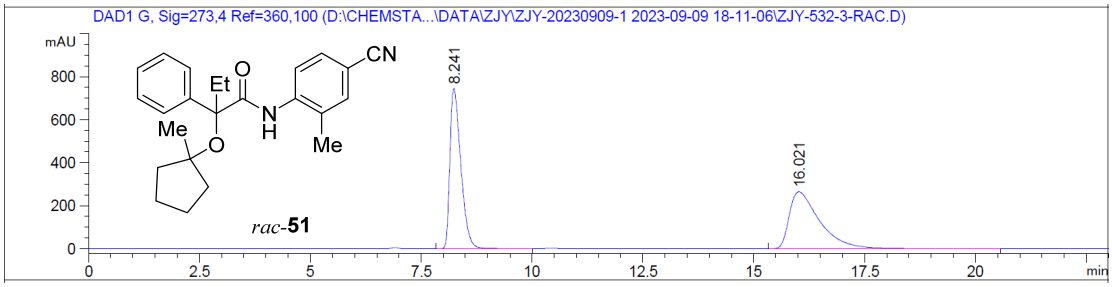
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.504	BB	0.3531	9433.30176	397.15009	50.0777
2	16.583	BB	0.8392	9404.03125	162.96455	49.9223
Totals :				1.88373e4	560.11464	



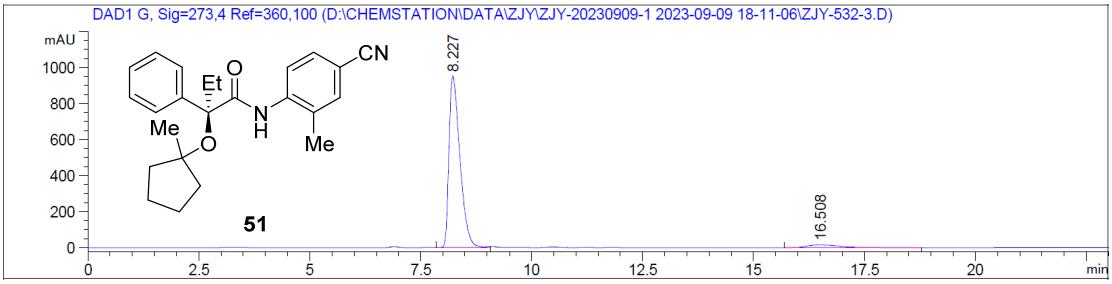
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.498	MM R	0.4107	2.51763e4	1021.58533	95.4561
2	16.937	MM R	0.9565	1198.43372	20.88249	4.5439
Totals :				2.63747e4	1042.46782	



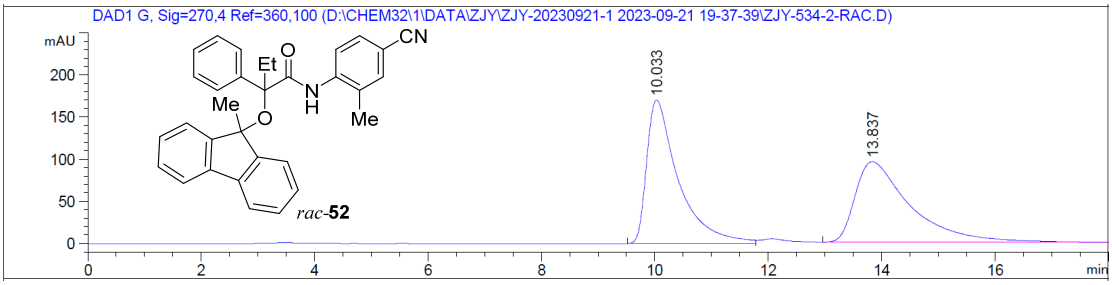
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.241	BB	0.2607	1.26686e4	743.86334	49.9273
2	16.021	BB	0.7142	1.27055e4	264.58450	50.0727
Totals :				2.53740e4	1008.44785	



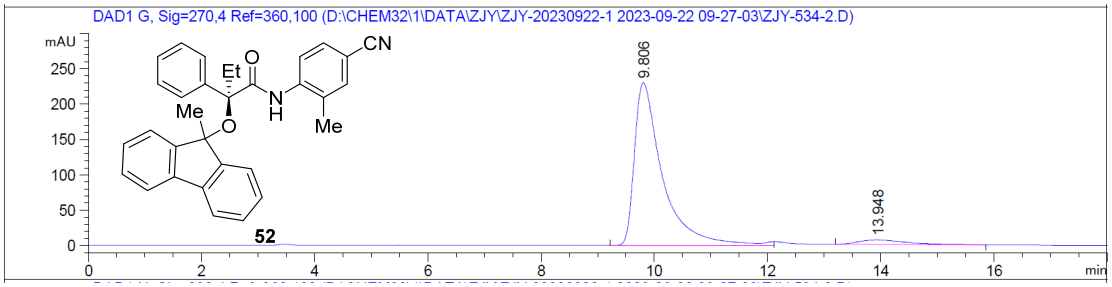
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.227	MM R	0.2872	1.63882e4	950.88721	94.9990
2	16.508	MM R	0.8549	862.72723	16.82008	5.0010



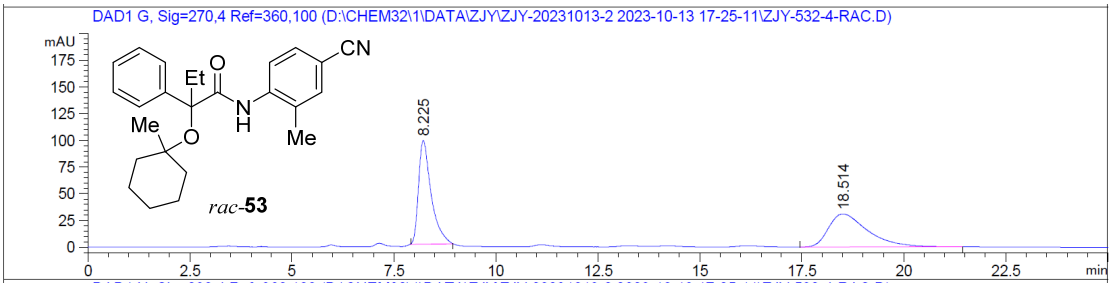
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.033	MM R	0.6450	6585.06494	170.15077	50.0817
2	13.837	BB	0.9803	6563.56982	95.67711	49.9183
Totals :				1.31486e4	265.82788	



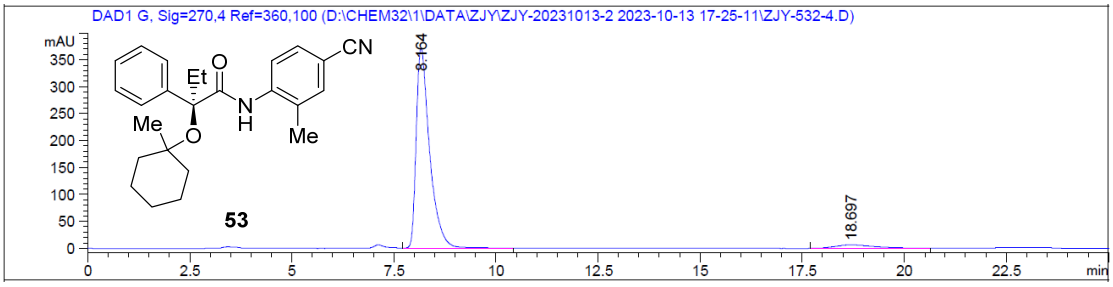
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.806	MM R	0.5749	7935.60400	230.05339	95.2965
2	13.948	MM R	0.9995	391.67014	6.53104	4.7035
Totals :				8327.27414	236.58443	



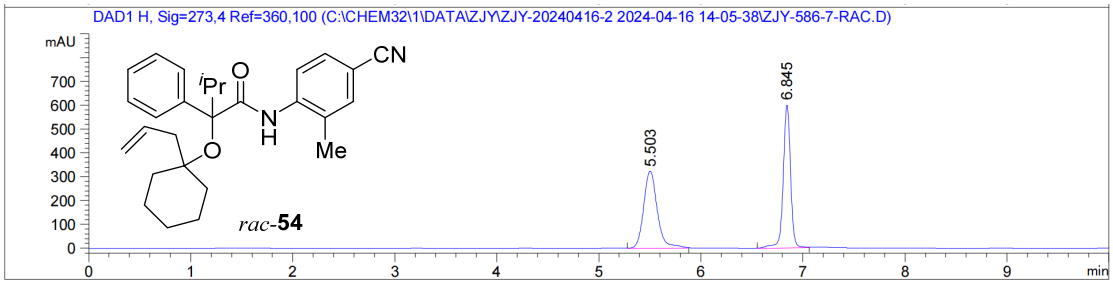
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.225	MM R	0.3589	2085.60425	96.84821	50.0932
2	18.514	BB	0.8752	2077.84399	31.03124	49.9068
Totals :				4163.44824	127.87944	



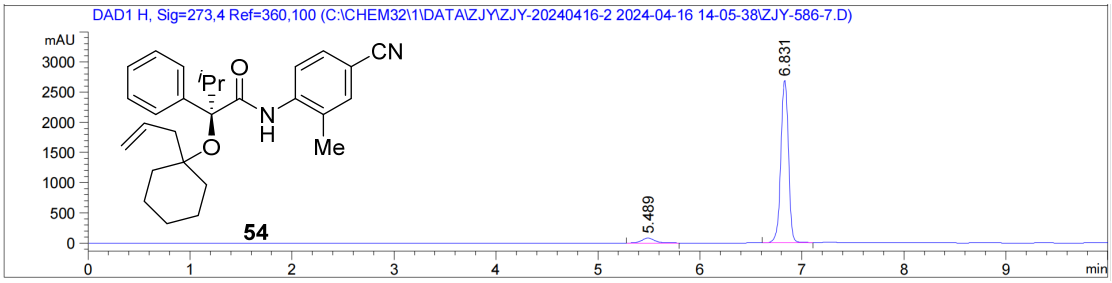
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.164	BB	0.3426	8475.25879	370.85281	95.2942
2	18.697	BB	0.7779	418.52780	6.32565	4.7058
Totals :				8893.78659	377.17846	



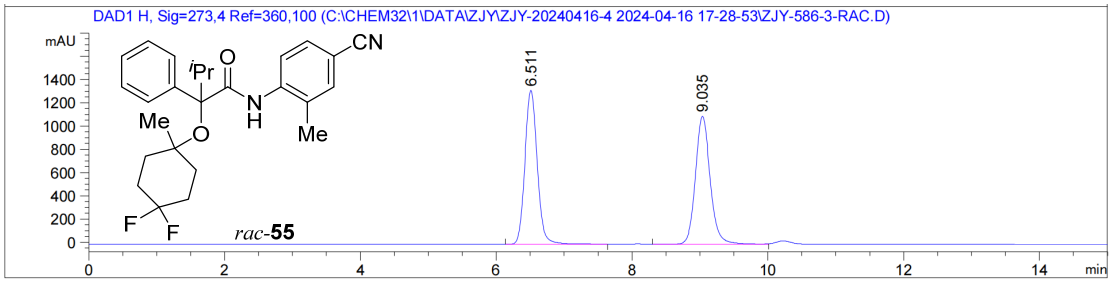
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.503	MM R	0.1538	2987.38428	323.64755	50.0271
2	6.845	MM R	0.0825	2984.14941	602.60645	49.9729
Totals :				5971.53369	926.25400	



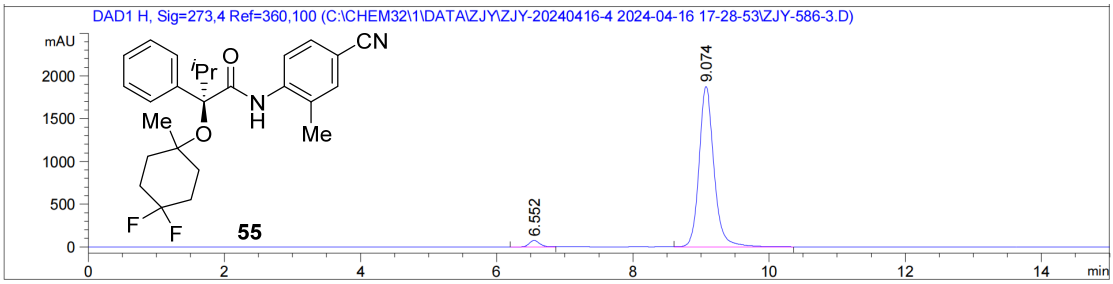
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.489	MM R	0.1438	691.16663	80.11406	4.7156
2	6.831	MM R	0.0862	1.39660e4	2699.62207	95.2844
Totals :				1.46572e4	2779.73613	



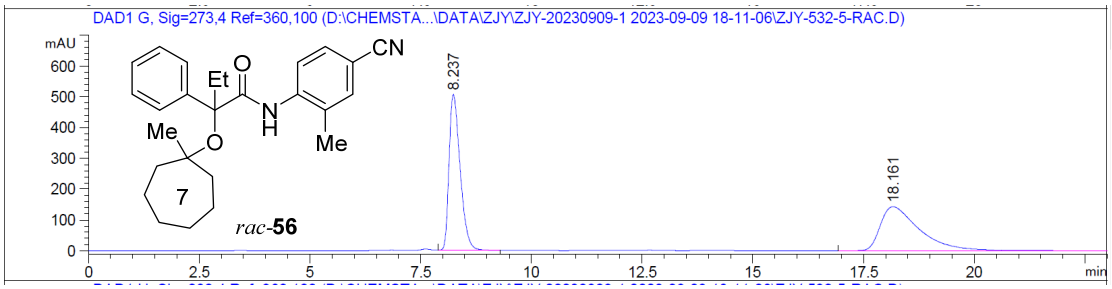
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.511	BB	0.1953	1.66994e4	1322.65796	50.0817
2	9.035	MF R	0.2519	1.66449e4	1101.49646	49.9183
Totals :				3.33444e4	2424.15442	



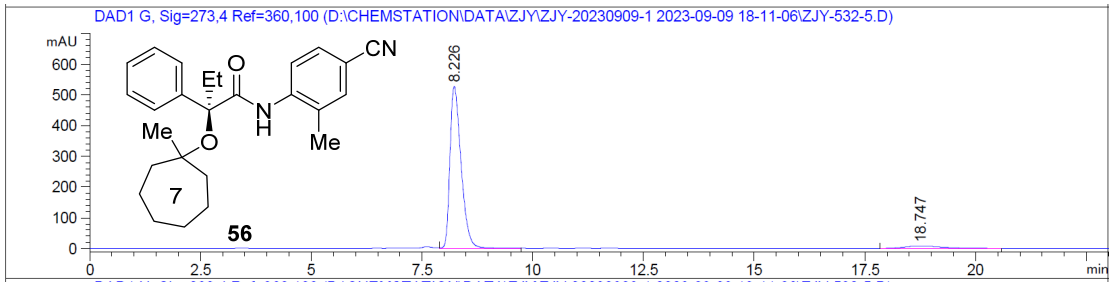
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.552	MF R	0.1756	796.07910	75.54842	2.7143
2	9.074	MF R	0.2535	2.85331e4	1876.25720	97.2857
Totals :				2.93292e4	1951.80562	



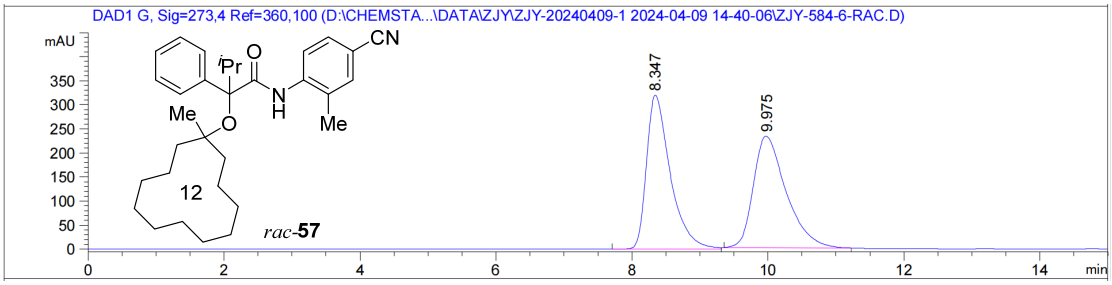
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.237	MM R	0.2906	8830.12402	506.35004	50.0010
2	18.161	BB	0.9210	8829.77246	142.88376	49.9990
Totals :				1.76599e4	649.23380	



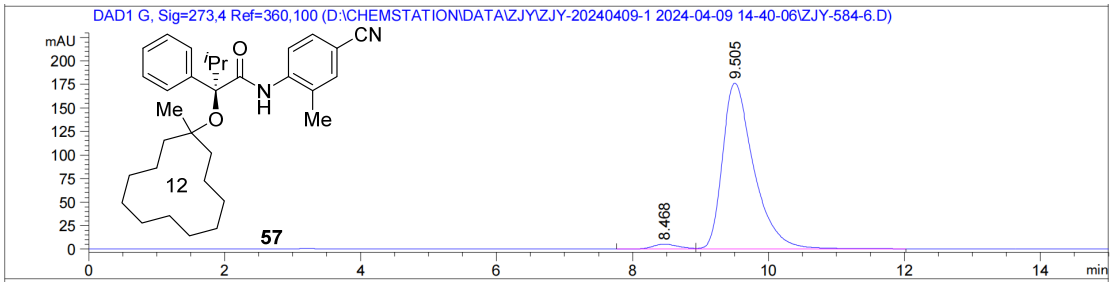
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.226	MM R	0.2925	9255.53516	527.44788	94.8293
2	18.747	MM R	1.0646	504.66757	7.90070	5.1707
Totals :				9760.20273	535.34858	



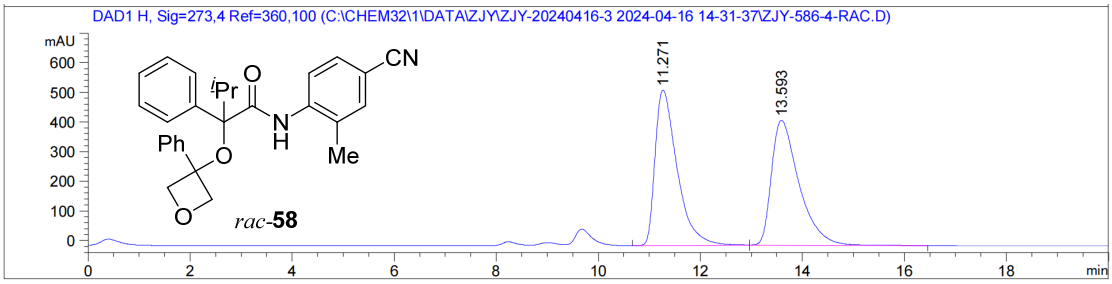
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.347	BV	0.3637	7776.60059	319.77048	50.0399
2	9.975	MM R	0.5582	7764.21436	231.81955	49.9601
Totals :				1.55408e4	551.59003	



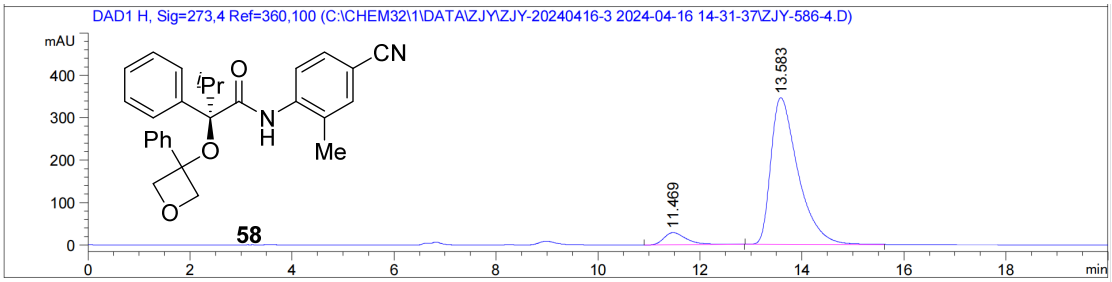
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.468	MF R	0.4431	139.81833	5.25940	2.4260
2	9.505	FM R	0.5318	5623.42969	176.25253	97.5740
Totals :				5763.24802	181.51194	



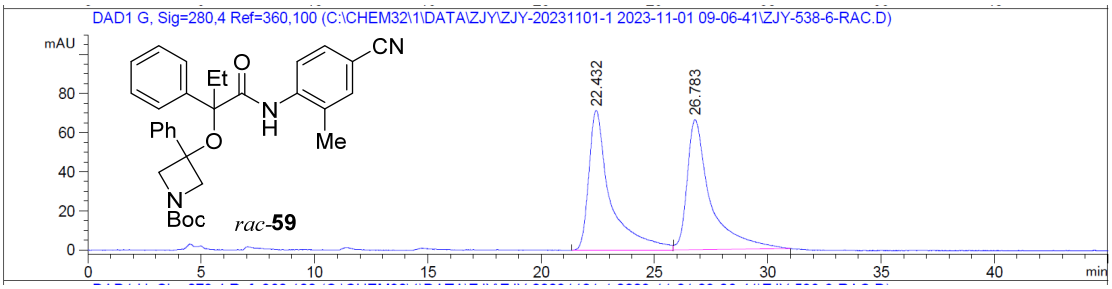
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.271	BB	0.4537	1.57179e4	524.42639	50.0200
2	13.593	BB	0.5614	1.57053e4	420.86237	49.9800
Totals :				3.14233e4	945.28876	



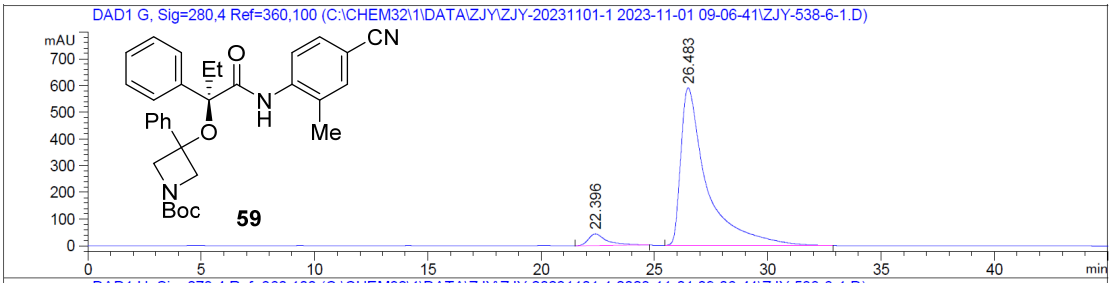
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.469	BB	0.4691	892.11469	28.82409	6.5109
2	13.583	MF R	0.6167	1.28099e4	346.20297	93.4891
Totals :				1.37020e4	375.02706	



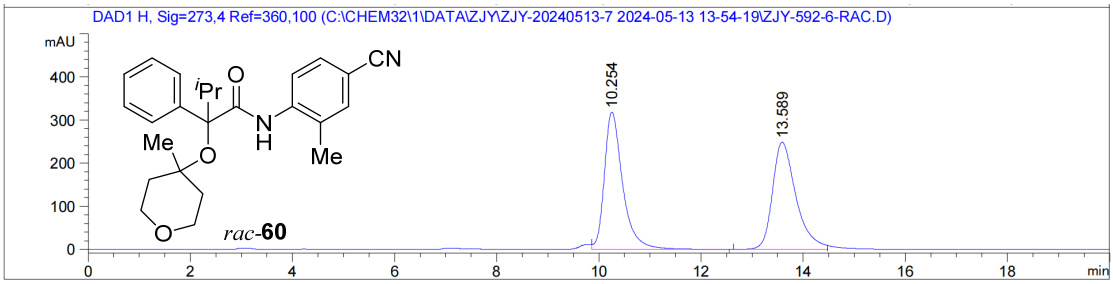
Signal 7: DAD1 G, Sig=280,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.432	MM R	1.1117	4774.54590	71.58198	49.9268
2	26.783	MM R	1.1970	4788.54834	66.67358	50.0732
Totals :				9563.09424	138.25555	



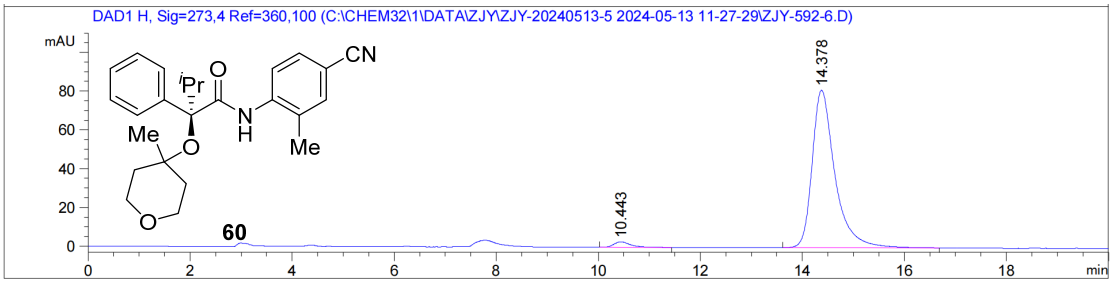
Signal 7: DAD1 G, Sig=280,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.396	BB	0.7459	2523.93384	43.69628	5.0816
2	26.483	BB	1.0947	4.71440e4	589.70227	94.9184
Totals :				4.96679e4	633.39855	



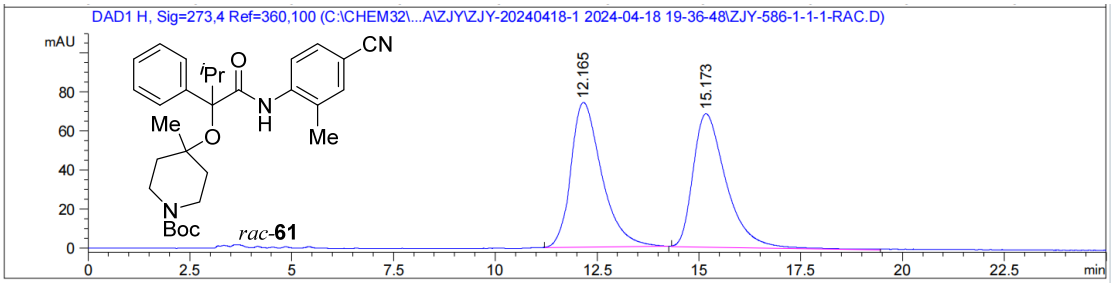
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.254	FM R	0.4141	7907.01953	318.20547	50.0034
2	13.589	MF R	0.5309	7905.93359	248.19205	49.9966
Totals :				1.58130e4	566.39752	



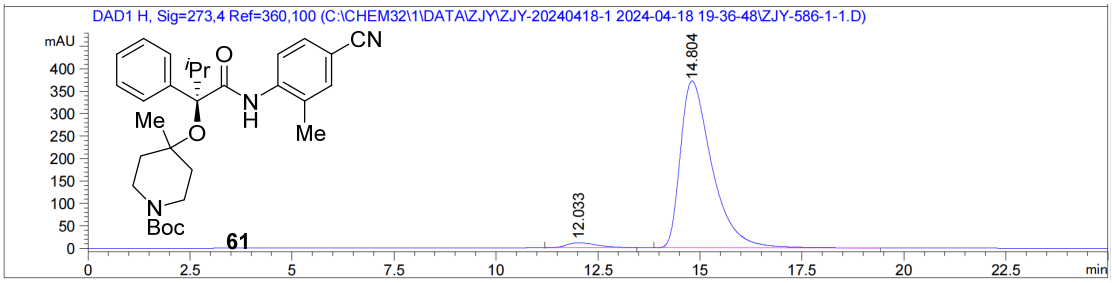
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.443	BB	0.3336	65.89607	2.87248	2.5462
2	14.378	BB	0.4618	2522.16064	81.32195	97.4538
Totals :				2588.05672	84.19443	



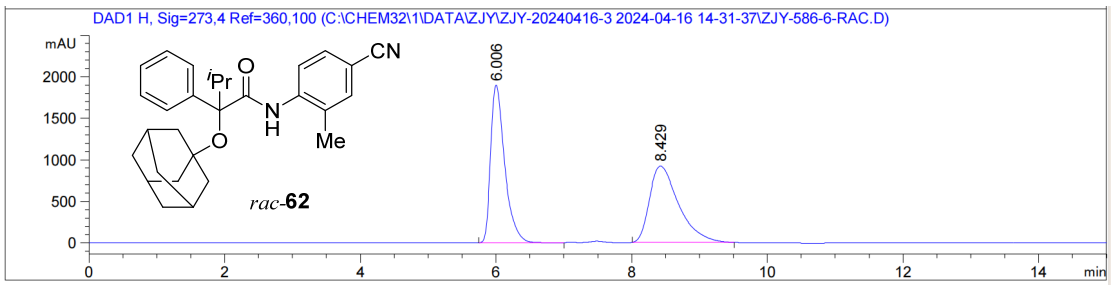
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.165	BB	0.7813	3894.10010	74.07789	50.0149
2	15.173	MM R	0.9476	3891.78687	68.44643	49.9851
Totals :				7785.88696	142.52431	



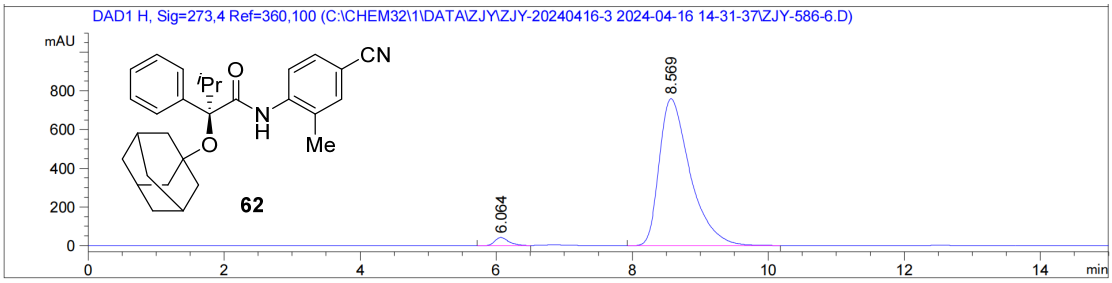
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.033	BB	0.6055	568.97217	11.22159	2.7685
2	14.804	BB	0.8110	1.99826e4	371.84622	97.2315
Totals :				2.05515e4	383.06781	



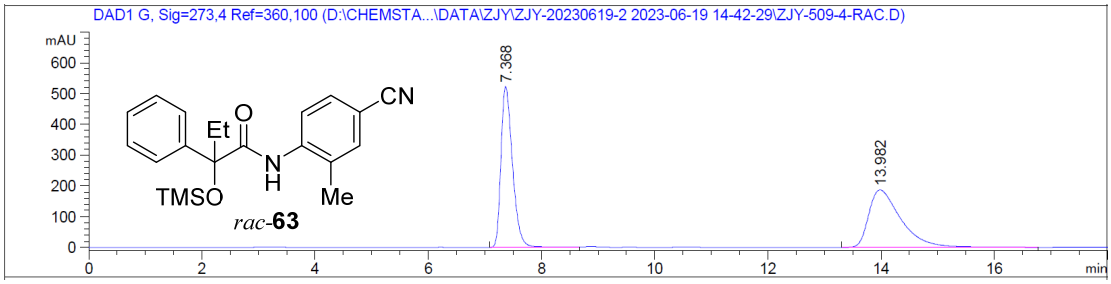
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.006	MM R	0.2407	2.74501e4	1900.54932	50.0133
2	8.429	MM R	0.4976	2.74355e4	919.00238	49.9867
Totals :				5.48857e4	2819.55170	



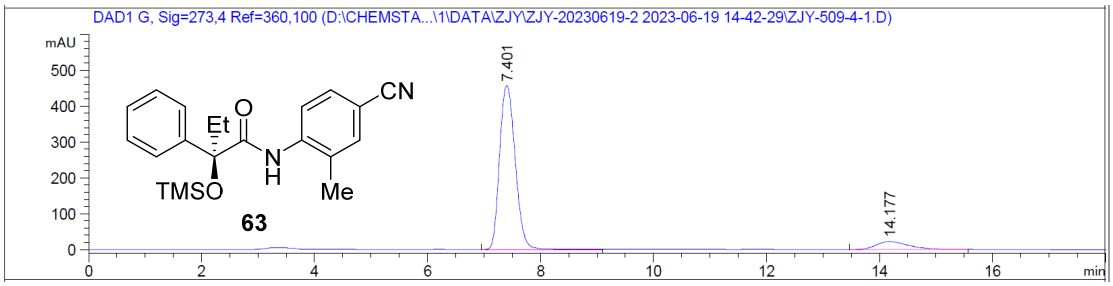
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.064	BB	0.2133	598.89734	42.26440	2.4314
2	8.569	MF R	0.5265	2.40326e4	760.73444	97.5686
Totals :				2.46315e4	802.99884	



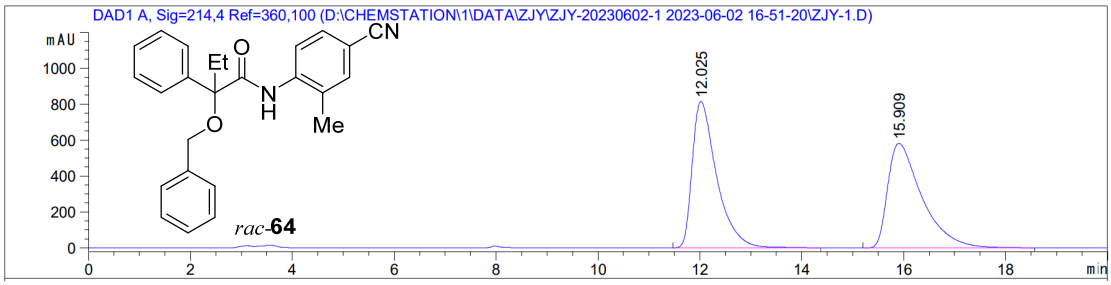
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.368	MM R	0.2359	7395.11523	522.40729	50.0266
2	13.982	BB	0.5913	7387.24219	186.81926	49.9734
Totals :				1.47824e4	709.22655	



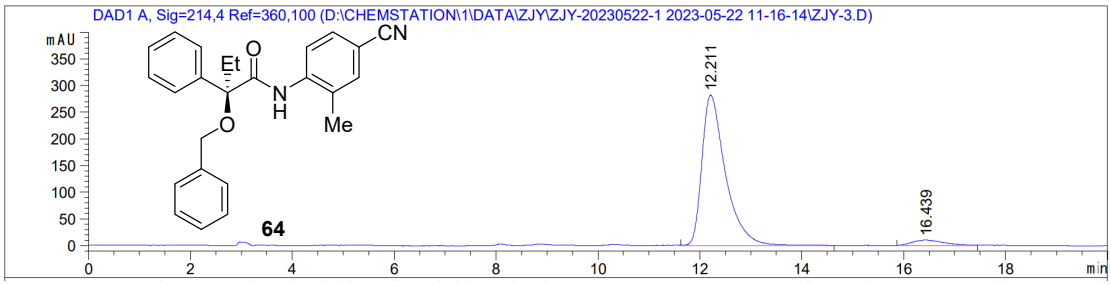
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.401	MM R	0.3216	8820.39648	457.07272	90.8043
2	14.177	BB	0.5940	893.24091	22.26875	9.1957
Totals :				9713.63739	479.34148	



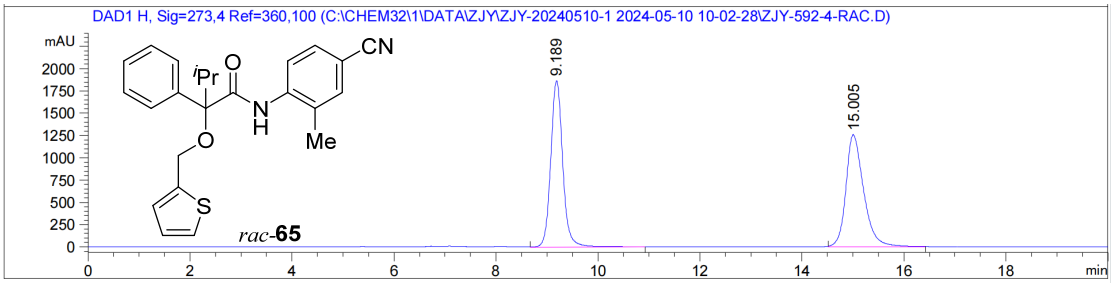
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.025	MM R	0.5576	2.72633e4	814.87073	50.0352
2	15.909	BB	0.6711	2.72250e4	582.69855	49.9648
Totals :				5.44883e4	1397.56927	



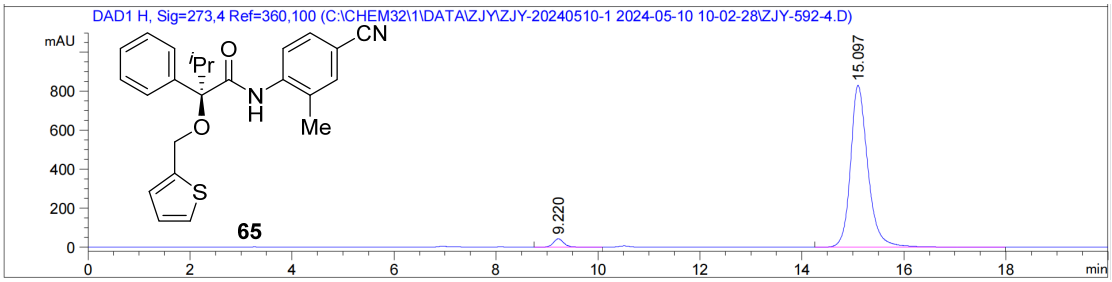
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.211	MM R	0.5324	9009.26953	282.00818	95.5791
2	16.439	MM R	0.7050	416.70990	9.85142	4.4209
Totals :				9425.97943	291.85960	



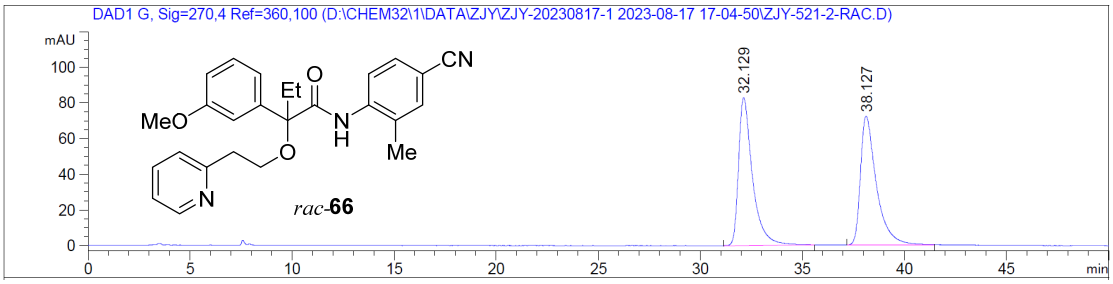
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.189	MM R	0.2734	3.06605e4	1869.25049	50.0952
2	15.005	FM R	0.4043	3.05440e4	1259.06104	49.9048
Totals :				6.12045e4	3128.31152	



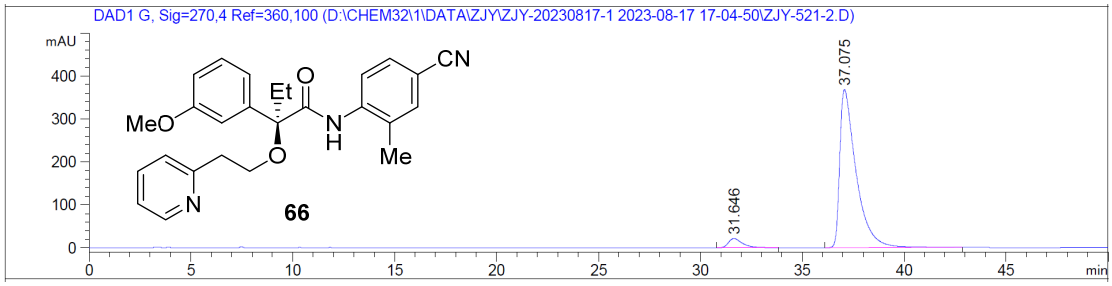
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.220	BB	0.2224	625.44574	42.82741	3.0886
2	15.097	BB	0.3534	1.96245e4	831.21722	96.9114
Totals :				2.02500e4	874.04463	



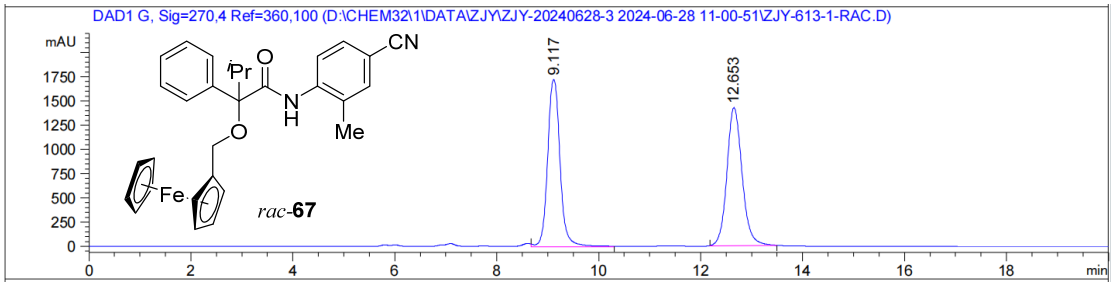
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	32.129	BB	0.7024	3930.74219	83.01740	49.9656
2	38.127	MM R	0.9060	3936.16138	72.41030	50.0344
Totals :				7866.90356	155.42770	



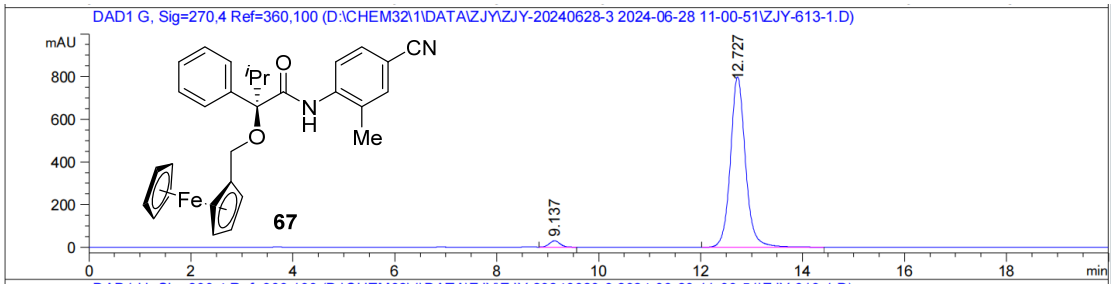
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	31.646	BB	0.7033	1056.24573	21.64679	4.8848
2	37.075	BB	0.8169	2.05670e4	367.53229	95.1152
Totals :				2.16232e4	389.17908	



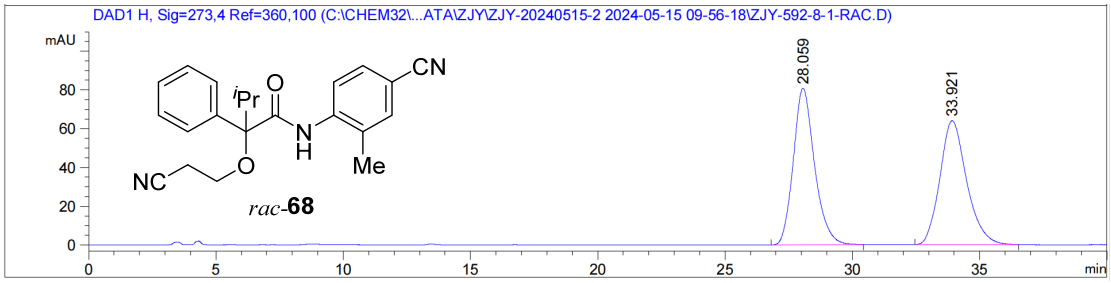
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.117	MM R	0.2838	2.94414e4	1729.25134	49.9856
2	12.653	MM R	0.3449	2.94584e4	1423.57178	50.0144
Totals :				5.88998e4	3152.82312	



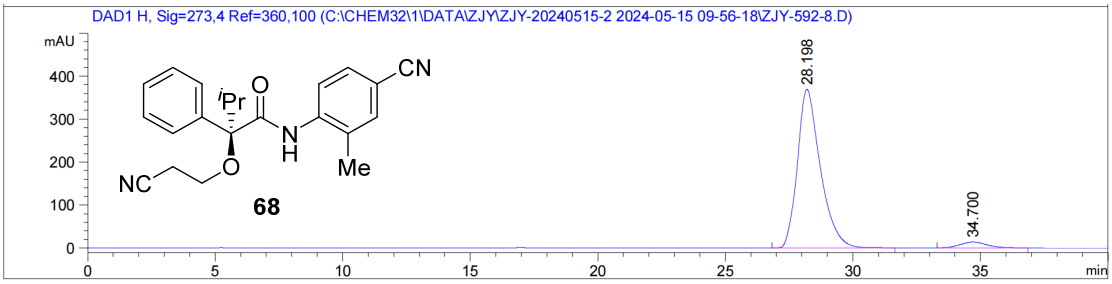
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.137	MM R	0.2448	440.86060	30.01180	2.6146
2	12.727	MM R	0.3425	1.64206e4	799.09656	97.3854
Totals :				1.68615e4	829.10836	



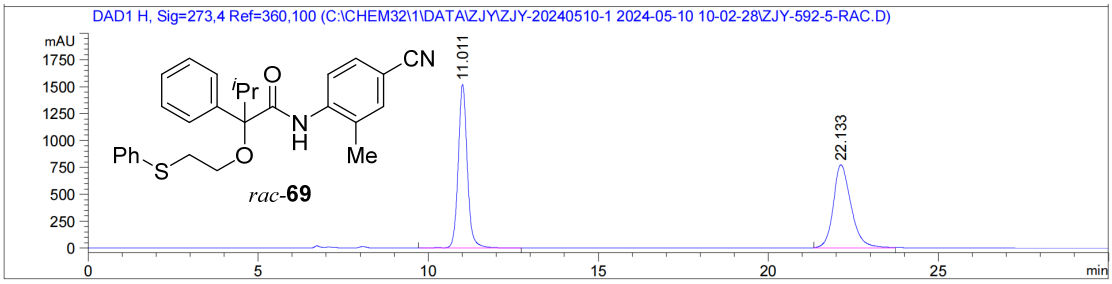
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.059	BB	0.8672	4690.00146	80.79340	50.0668
2	33.921	BB	1.0718	4677.48389	63.91832	49.9332
Totals :				9367.48535	144.71172	



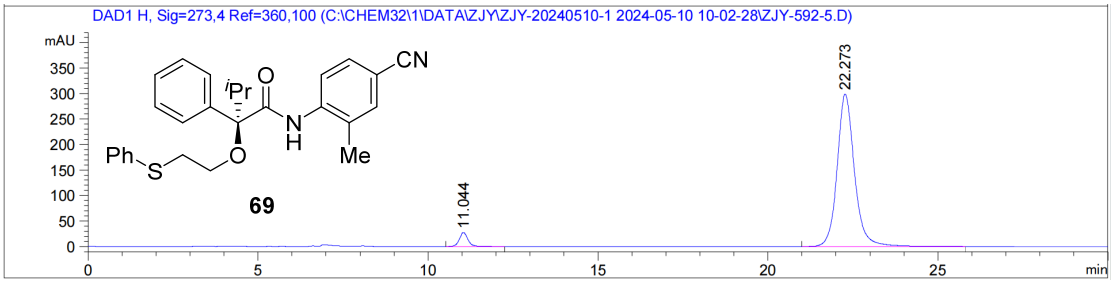
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.198	BB	0.9175	2.30479e4	368.58124	95.9417
2	34.700	BB	0.9586	974.91046	13.52997	4.0583
Totals :				2.40228e4	382.11121	



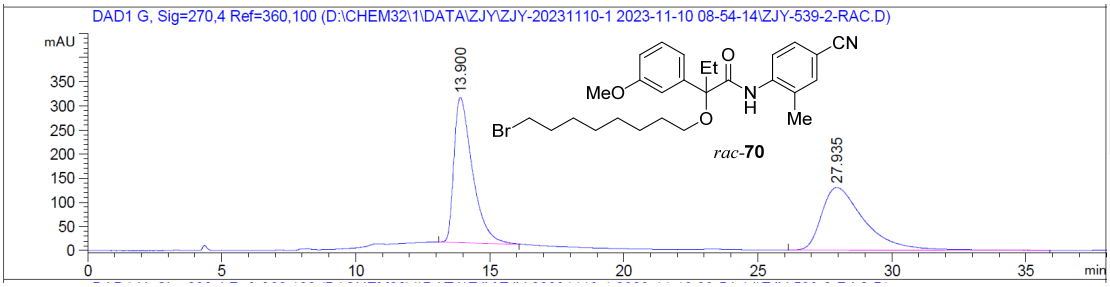
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.011	VB R	0.2844	2.83028e4	1521.73352	49.9788
2	22.133	MF R	0.6096	2.83267e4	774.52307	50.0212
Totals :				5.66295e4	2296.25659	



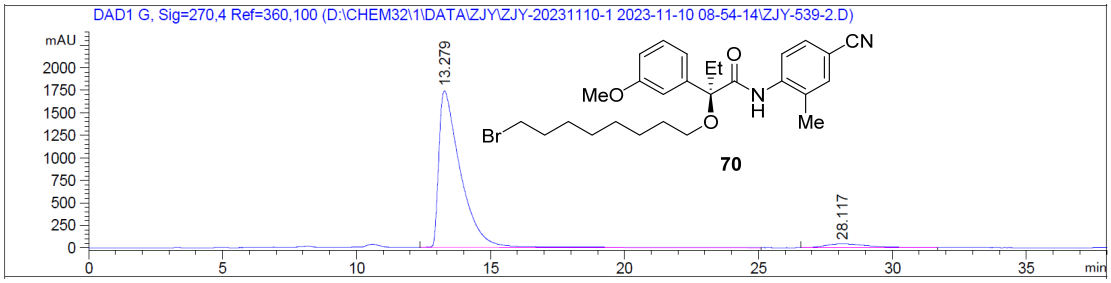
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.044	BB	0.2643	480.71405	27.44855	4.3407
2	22.273	BB	0.5332	1.05938e4	299.13541	95.6593
Totals :				1.10745e4	326.58395	



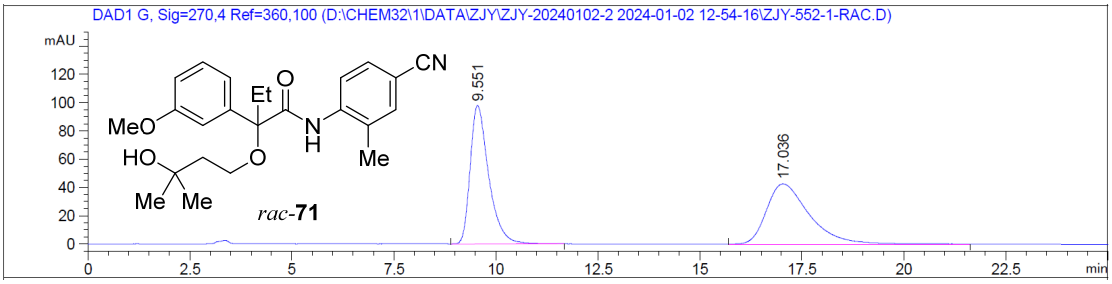
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.900	MM R	0.7991	1.44405e4	301.17480	50.0670
2	27.935	MM R	1.8506	1.44019e4	129.70734	49.9330
Totals :				2.88424e4	430.88214	



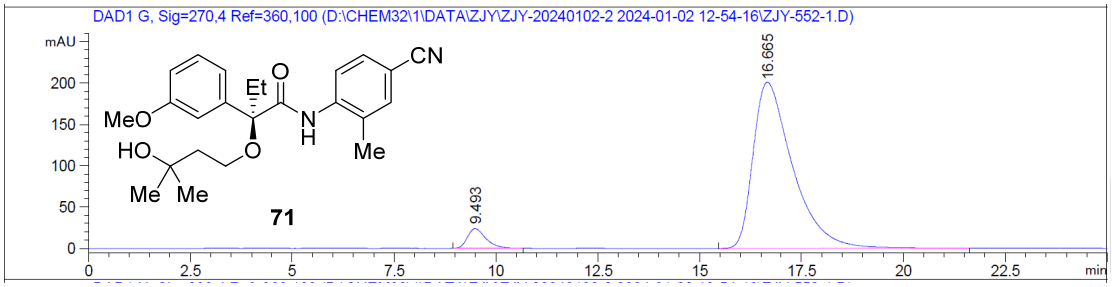
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.279	MM R	0.9482	9.92145e4	1743.89746	95.4608
2	28.117	MM R	1.8087	4717.64063	43.47255	4.5392
Totals :				1.03932e5	1787.37001	



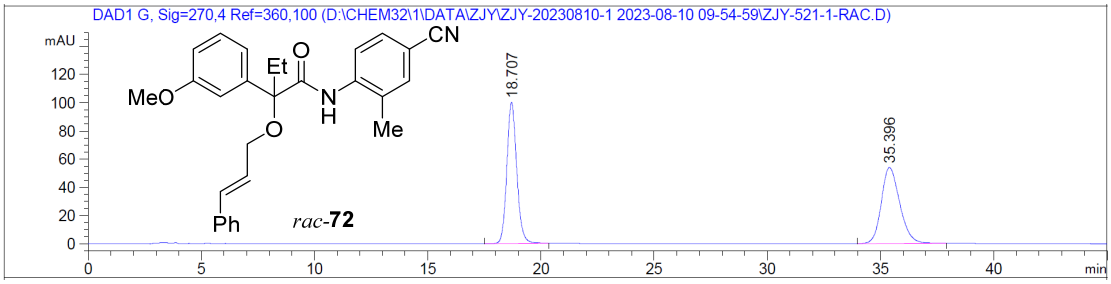
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.551	BB	0.4731	3101.88892	98.03699	49.9571
2	17.036	MM R	1.2131	3107.21558	42.69144	50.0429
Totals :				6209.10449	140.72843	



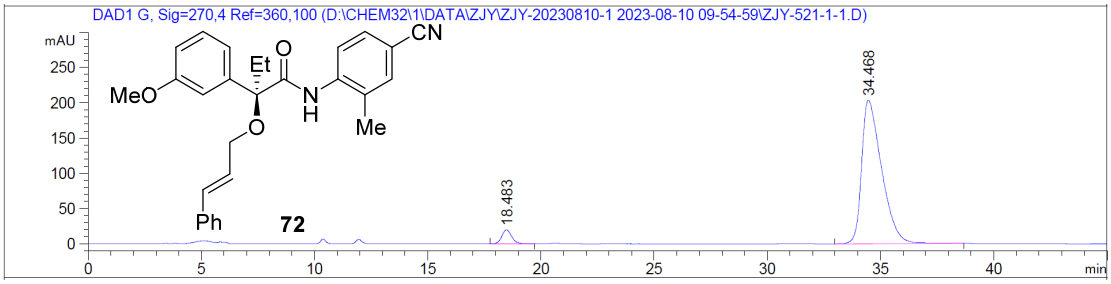
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.493	MM R	0.5214	745.73358	23.83940	5.2010
2	16.665	MM R	1.1267	1.35925e4	201.06366	94.7990
Totals :				1.43382e4	224.90306	



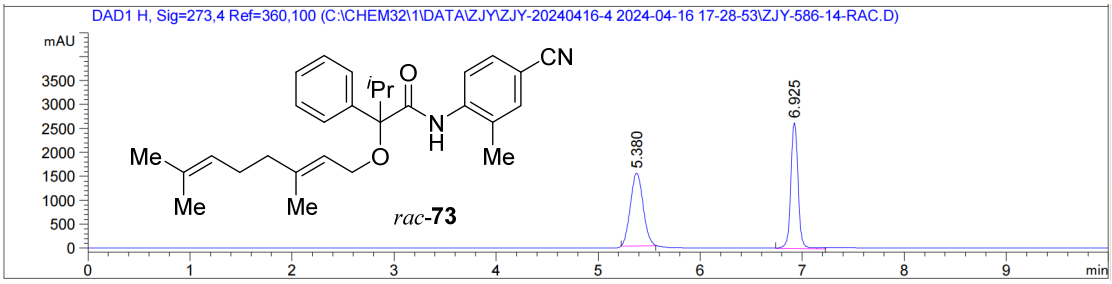
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.707	BB	0.4670	3046.90186	100.14691	49.9548
2	35.396	BB	0.8577	3052.41455	53.98501	50.0452
Totals :				6099.31641	154.13192	



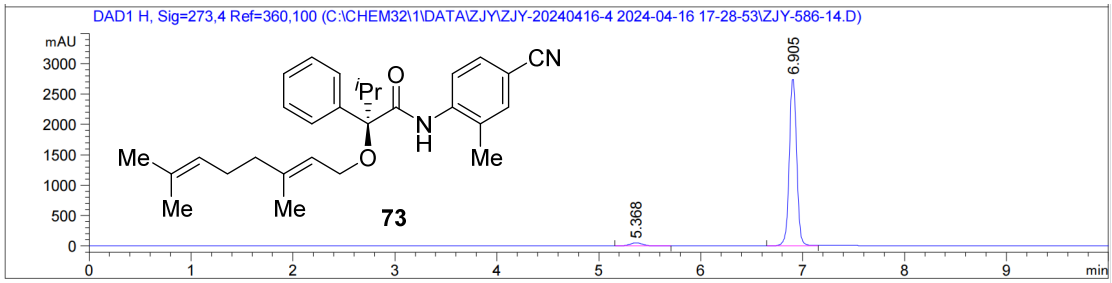
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.483	BB	0.4563	595.76776	19.84211	4.5508
2	34.468	BB	0.9177	1.24956e4	203.70451	95.4492
Totals :				1.30914e4	223.54662	



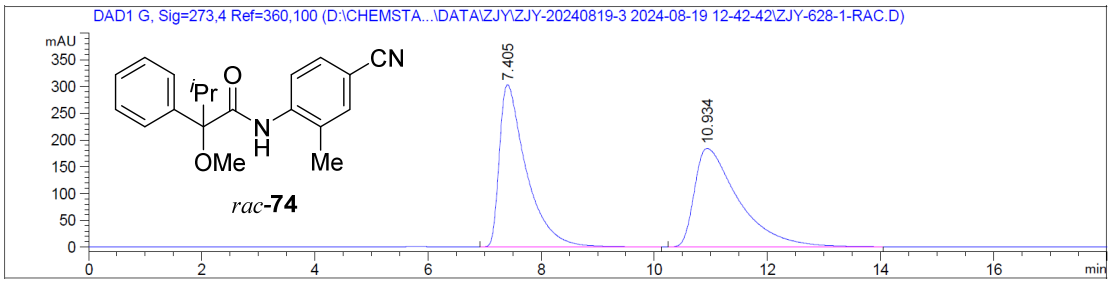
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.380	MM R	0.1436	1.30844e4	1518.82861	49.9491
2	6.925	MM R	0.0828	1.31111e4	2638.20313	50.0509
Totals :				2.61955e4	4157.03174	



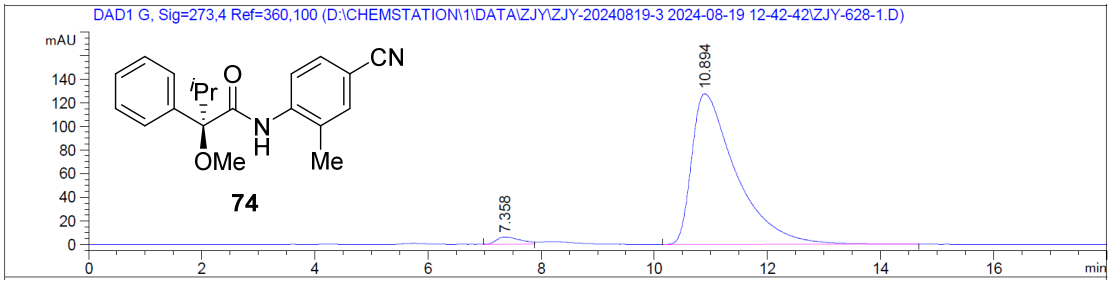
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.368	MM R	0.1495	459.18250	51.20518	3.2034
2	6.905	MM R	0.0839	1.38749e4	2755.97974	96.7966
Totals :				1.43341e4	2807.18492	



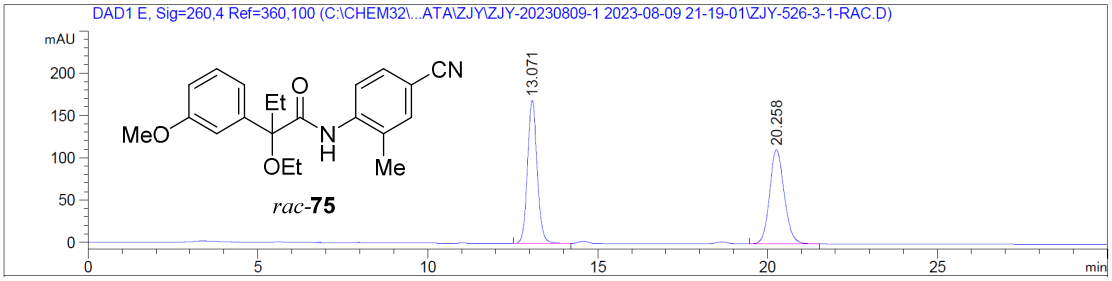
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.405	BB	0.4775	1.00073e4	302.86417	50.0086
2	10.934	BB	0.7962	1.00038e4	184.02191	49.9914
Totals :				2.00111e4	486.88608	



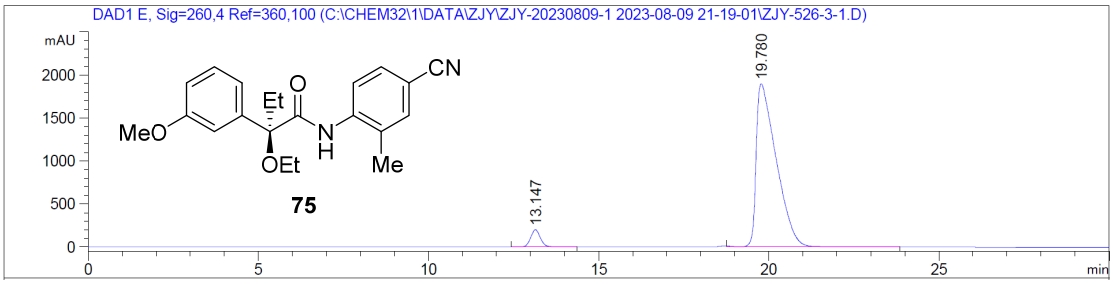
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.358	MM R	0.4913	181.57143	6.16008	2.5439
2	10.894	MM R	0.9082	6956.08545	127.65669	97.4561
Totals :				7137.65688	133.81677	



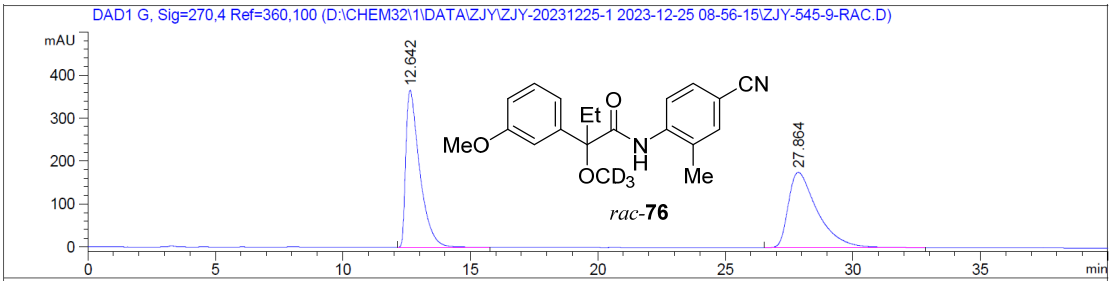
Signal 5: DAD1 E, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.071	BB	0.3037	3321.12622	168.69626	50.0355
2	20.258	BB	0.4602	3316.41260	111.11203	49.9645
Totals :				6637.53882	279.80829	



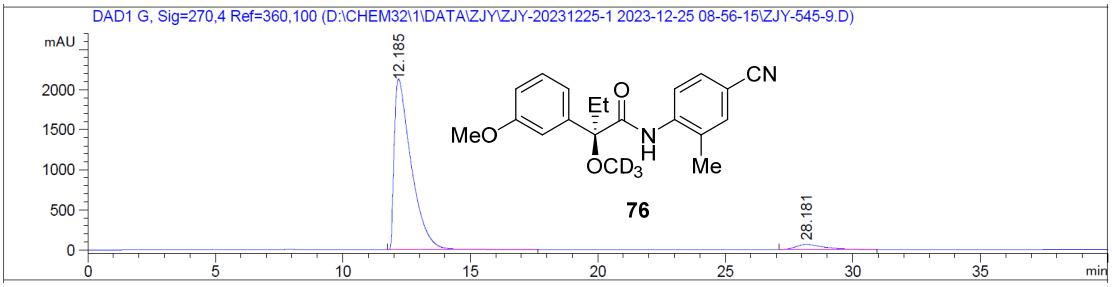
Signal 5: DAD1 E, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.147	BB	0.3080	4032.44775	201.04536	4.9339
2	19.780	FM R	0.6823	7.76971e4	1897.84827	95.0661
Totals :				8.17296e4	2098.89363	



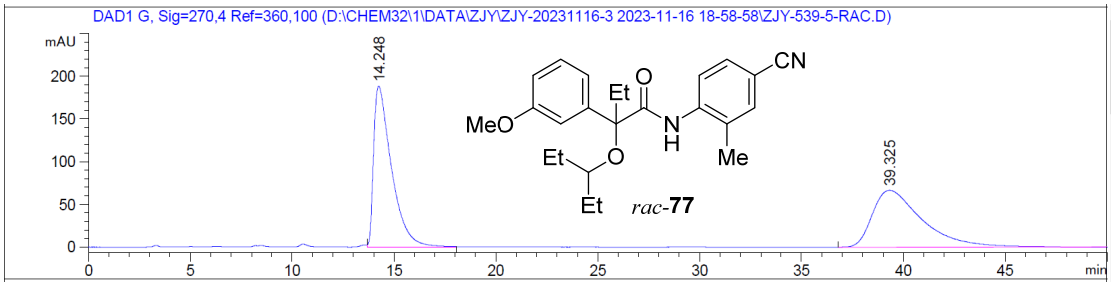
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.642	BB	0.5619	1.38377e4	365.36771	49.9984
2	27.864	BB	1.1648	1.38386e4	175.34535	50.0016
Totals :				2.76763e4	540.71306	



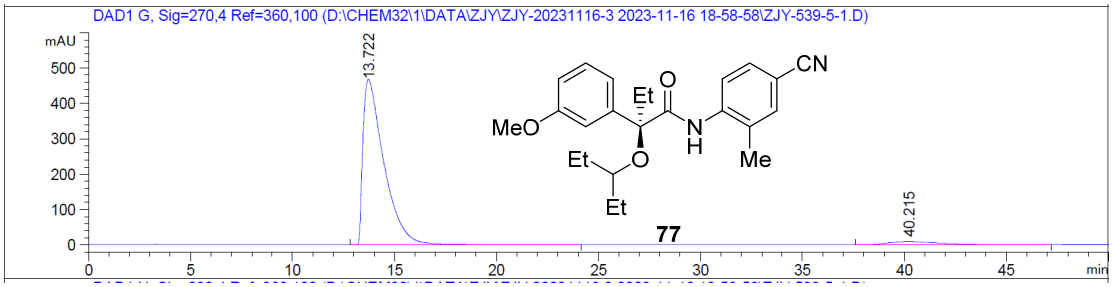
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.185	BB	0.6664	9.81541e4	2127.06079	95.2560
2	28.181	MM R	1.2981	4888.31299	62.76081	4.7440
Totals :				1.03042e5	2189.82161	



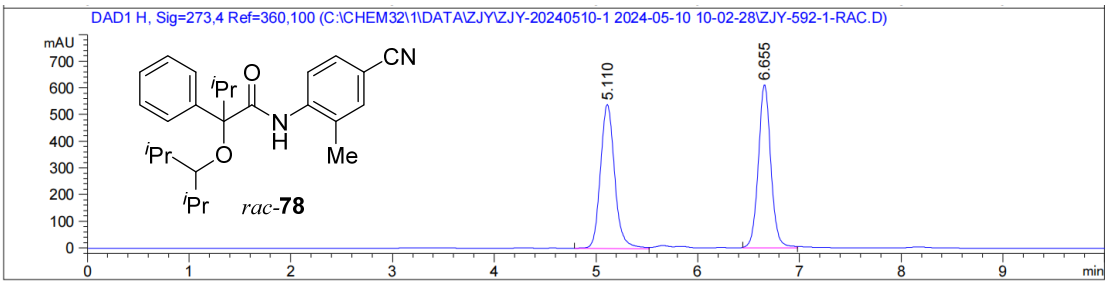
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.248	MM R	1.0111	1.14090e4	188.06505	50.0529
2	39.325	MM R	2.8514	1.13849e4	66.54523	49.9471
Totals :				2.27939e4	254.61028	



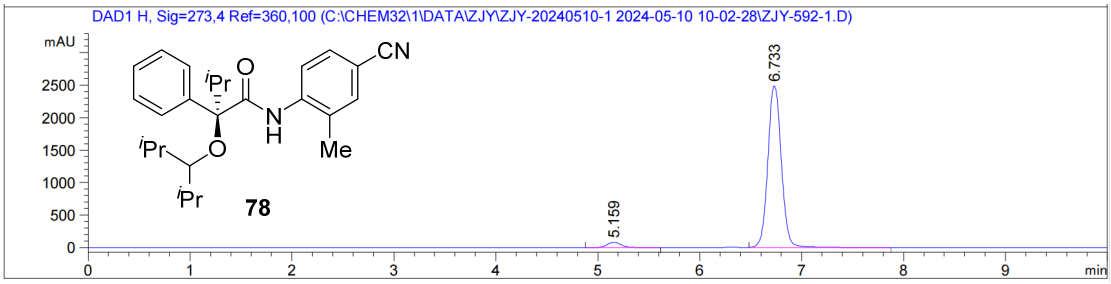
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.722	MM R	1.1906	3.34769e4	468.63867	95.4393
2	40.215	MM R	2.9110	1599.74487	9.15916	4.5607
Totals :				3.50767e4	477.79783	



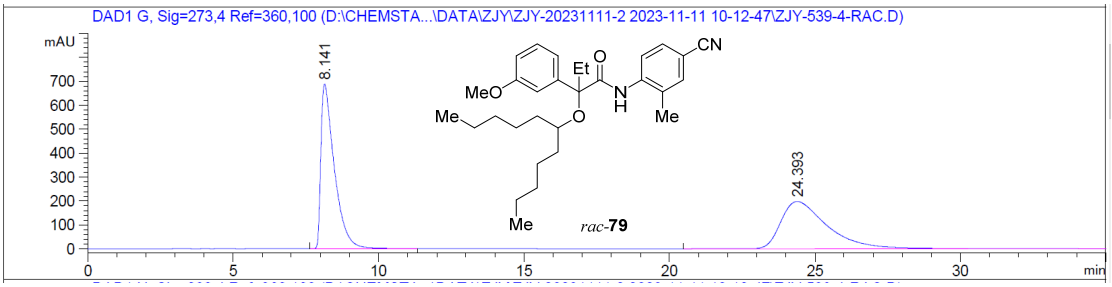
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.110	MF R	0.1623	5264.01709	540.43671	50.0182
2	6.655	FM R	0.1430	5260.18555	613.00024	49.9818
Totals :				1.05242e4	1153.43695	



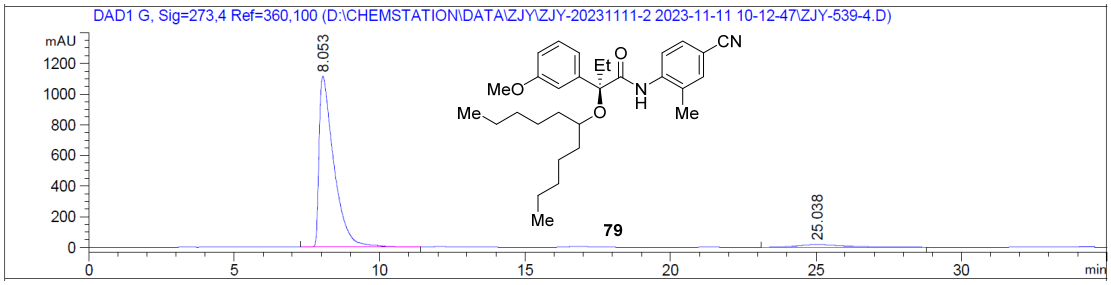
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.159	BB	0.1485	795.40076	82.51814	3.3502
2	6.733	FM R	0.1537	2.29462e4	2488.43872	96.6498
Totals :				2.37416e4	2570.95686	



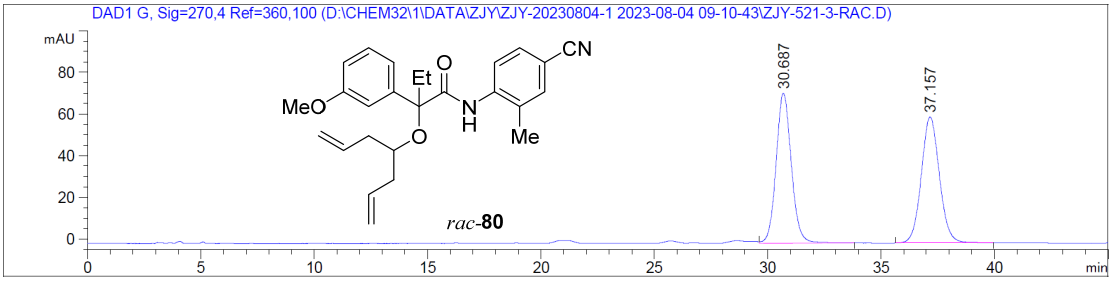
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.141	BB	0.4715	2.21436e4	687.94067	49.9939
2	24.393	MM R	1.8660	2.21490e4	197.82460	50.0061
Totals :				4.42927e4	885.76527	



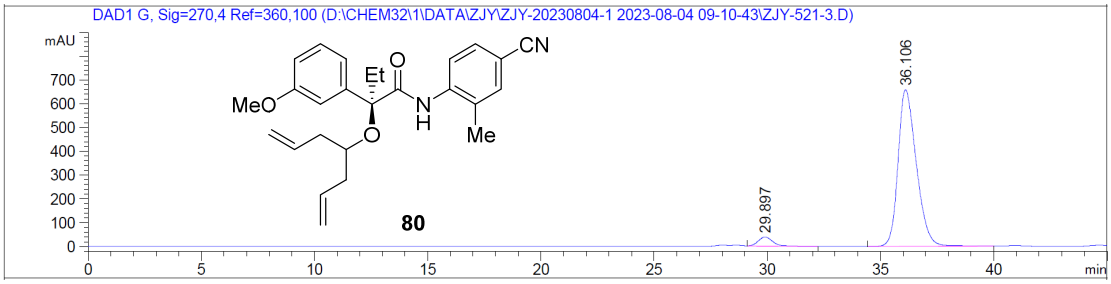
Signal 7: DAD1 G, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.053	MM R	0.5913	3.95882e4	1115.79163	95.3630
2	25.038	BB	1.3705	1924.97229	16.45938	4.6370
Totals :				4.15132e4	1132.25101	



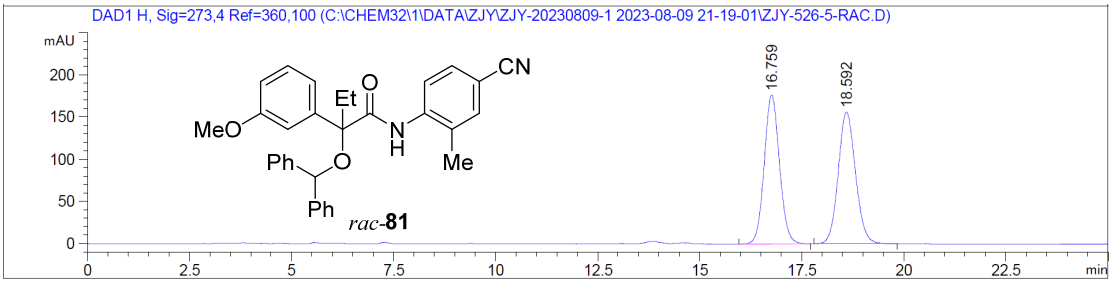
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.687	MM R	0.7791	3363.40723	71.95265	50.0557
2	37.157	BB	0.8504	3355.91797	60.38195	49.9443
Totals :				6719.32520	132.33460	



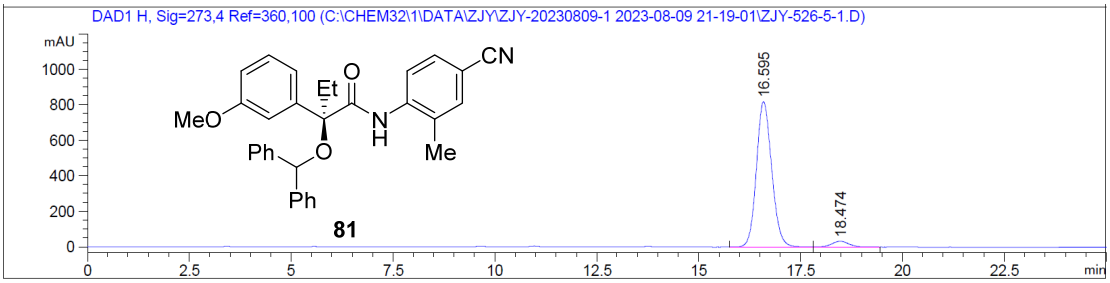
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	29.897	BB	0.6847	1685.62488	37.91377	4.3684
2	36.106	BB	0.8602	3.69010e4	658.05115	95.6316
Totals :				3.85866e4	695.96492	



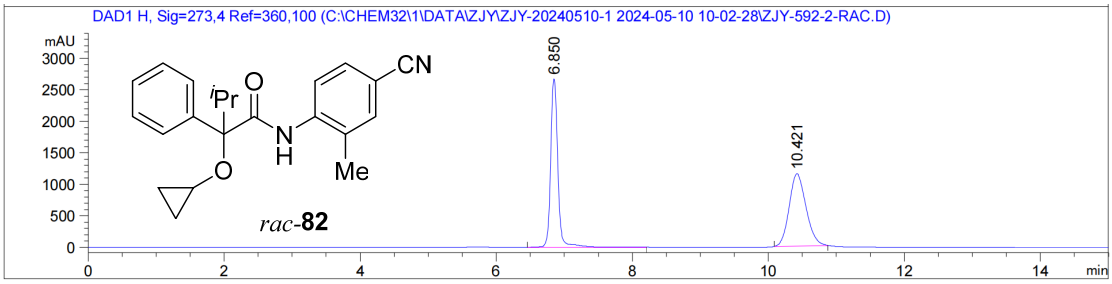
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.759	BB	0.4014	4601.25879	176.92570	49.9058
2	18.592	BB	0.4548	4618.62842	156.29587	50.0942
Totals :				9219.88721	333.22157	



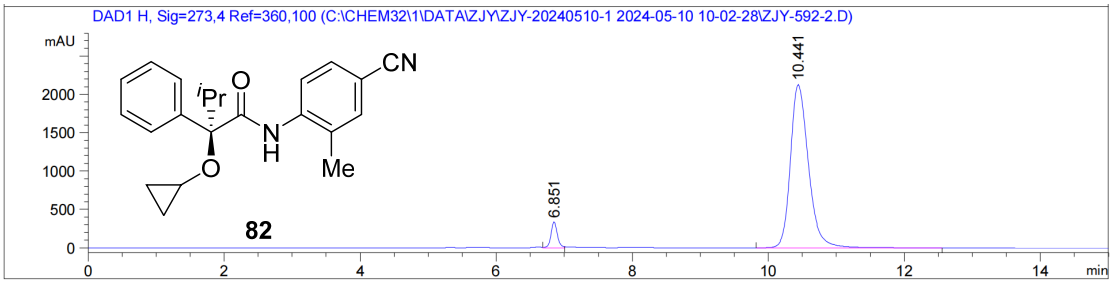
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.595	BB	0.4016	2.13010e4	818.42273	95.8225
2	18.474	BB	0.4479	928.63574	32.25405	4.1775
Totals :				2.22296e4	850.67678	



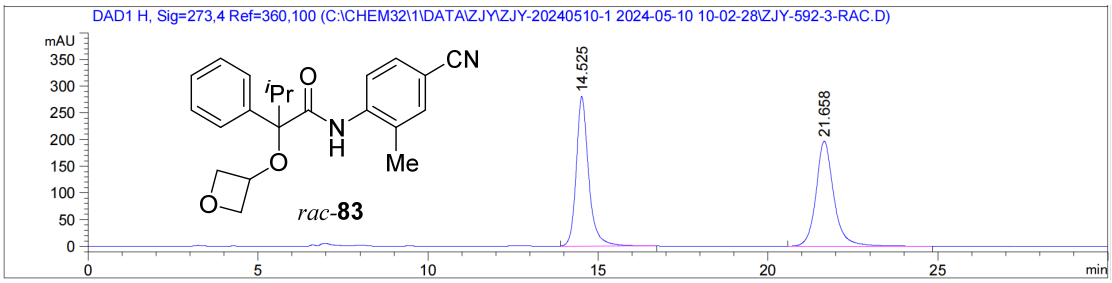
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.850	MM R	0.1224	1.96954e4	2682.91650	50.0754
2	10.421	MM R	0.2851	1.96360e4	1148.10010	49.9246
Totals :				3.93314e4	3831.01660	



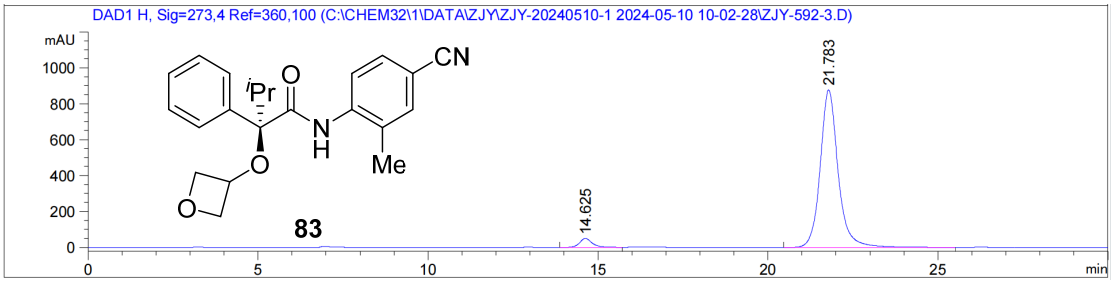
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.851	MM R	0.1061	2147.22095	337.22311	5.1942
2	10.441	BB	0.2830	3.91919e4	2126.87036	94.8058
Totals :				4.13392e4	2464.09348	



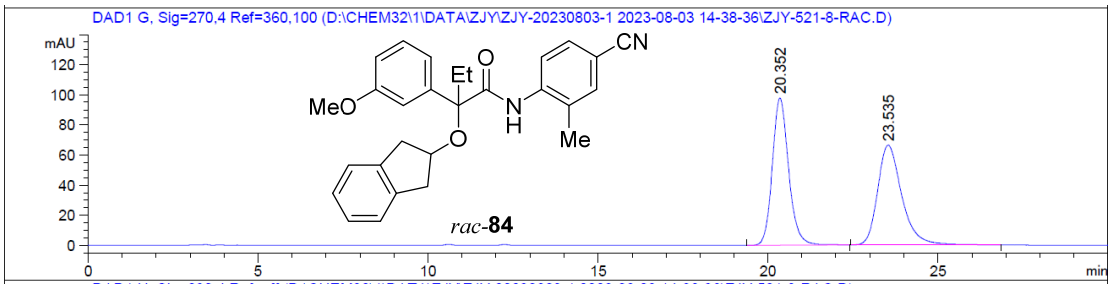
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.525	MM R	0.4239	7128.17480	280.23639	49.9585
2	21.658	BB	0.5438	7140.02539	196.54353	50.0415
Totals :				1.42682e4	476.77992	



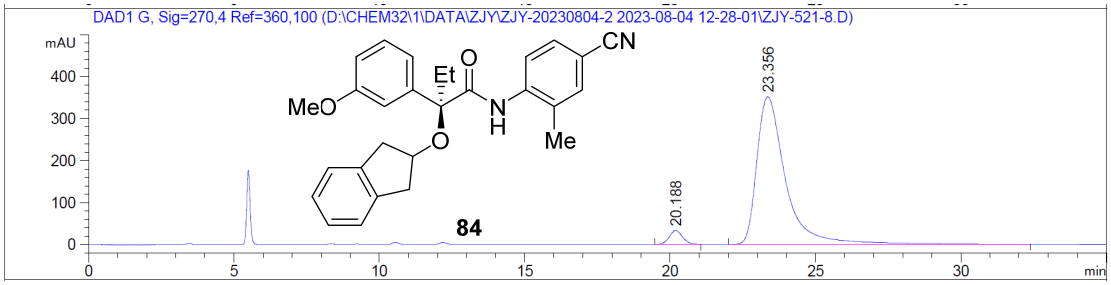
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.625	BB	0.3848	1277.25500	49.54619	3.8240
2	21.783	BB	0.5497	3.21241e4	876.25824	96.1760
Totals :				3.34014e4	925.80443	



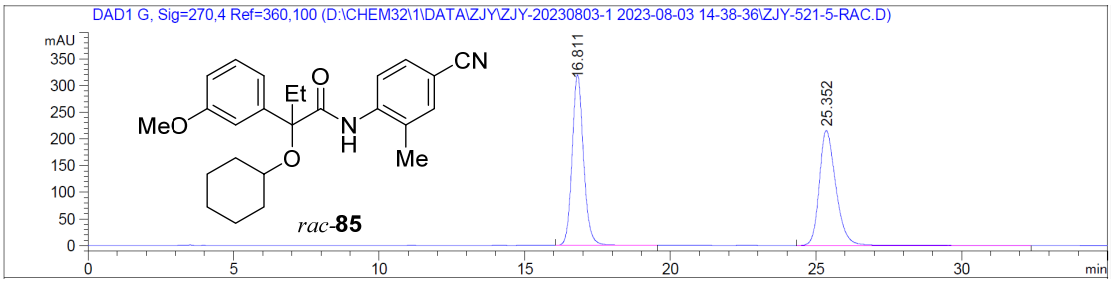
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.352	BB	0.5119	3271.76514	97.89706	50.0184
2	23.535	BB	0.7461	3269.35571	66.21120	49.9816
Totals :				6541.12085	164.10827	



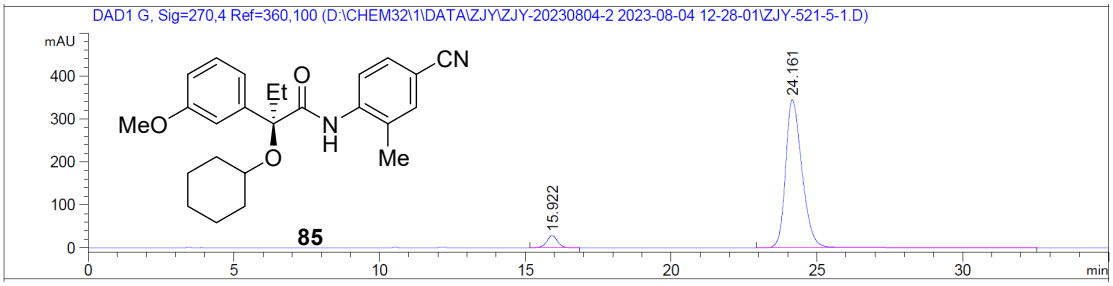
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.188	MM R	0.5360	1078.06519	33.52443	4.2318
2	23.356	BB	1.0458	2.43971e4	351.48901	95.7682
Totals :				2.54752e4	385.01345	



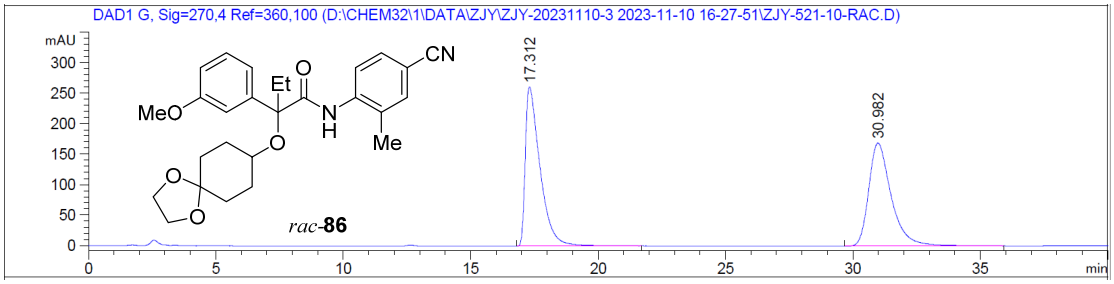
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.811	BB	0.4158	8693.41992	319.17947	50.0724
2	25.352	MM R	0.6703	8668.27051	215.51932	49.9276
Totals :				1.73617e4	534.69879	



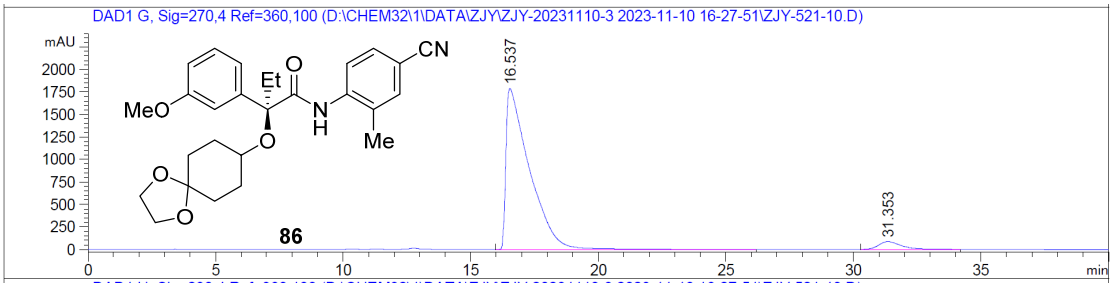
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.922	MM R	0.4371	749.88623	28.59574	5.1710
2	24.161	MM R	0.6647	1.37520e4	344.80835	94.8290
Totals :				1.45019e4	373.40409	



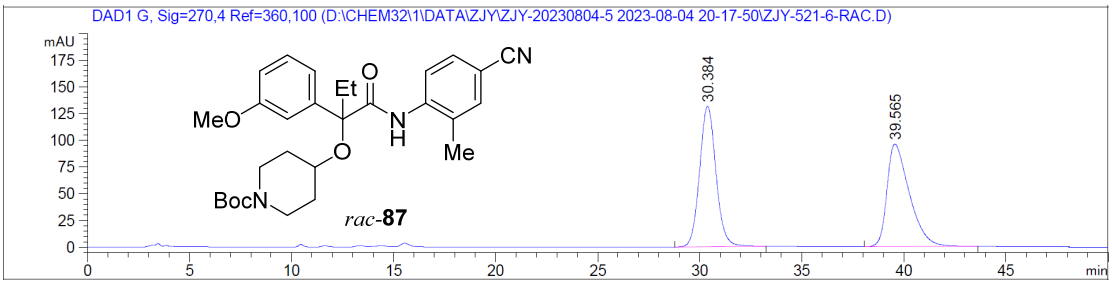
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.312	MM R	0.6696	1.04786e4	260.82599	49.9691
2	30.982	MM R	1.0347	1.04915e4	168.99342	50.0309
Totals :				2.09701e4	429.81941	



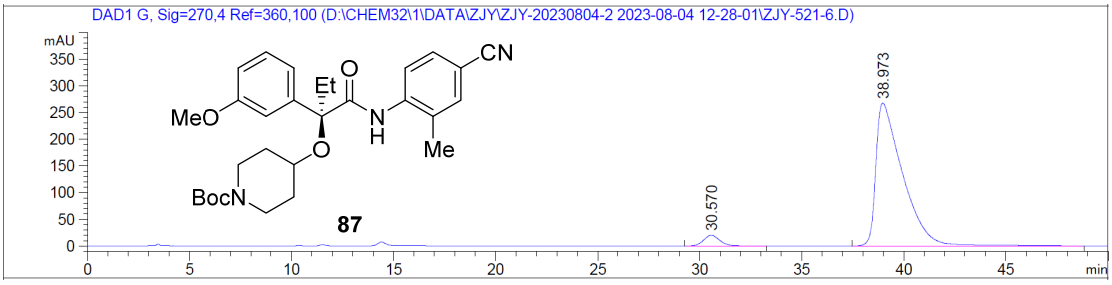
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.537	MM R	1.0634	1.14127e5	1788.77771	95.5569
2	31.353	BB	0.8540	5306.60596	85.75305	4.4431
Totals :				1.19434e5	1874.53076	



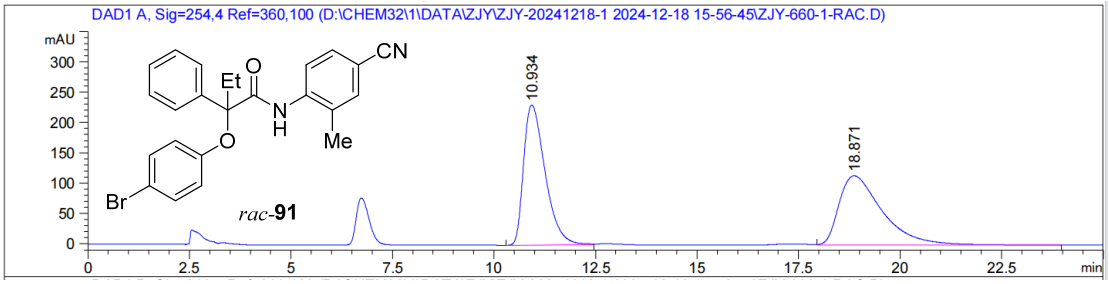
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.384	BB	0.8574	7333.56982	131.34871	49.9489
2	39.565	BB	1.1229	7348.58789	96.01993	50.0511



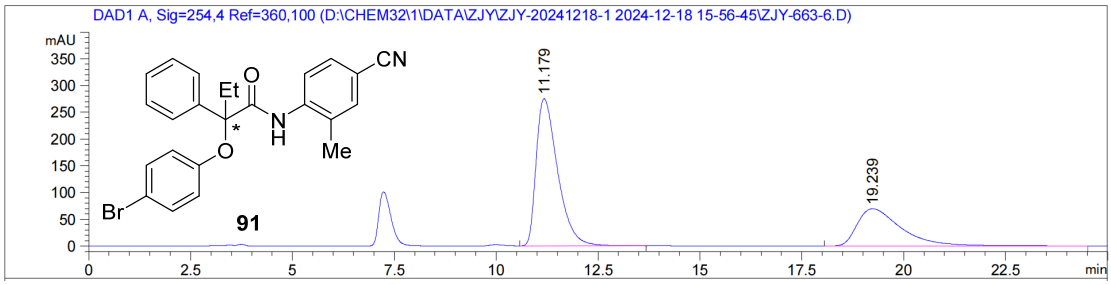
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.570	BB	0.8146	1114.37244	19.92069	4.3485
2	38.973	BB	1.2650	2.45124e4	267.50903	95.6515



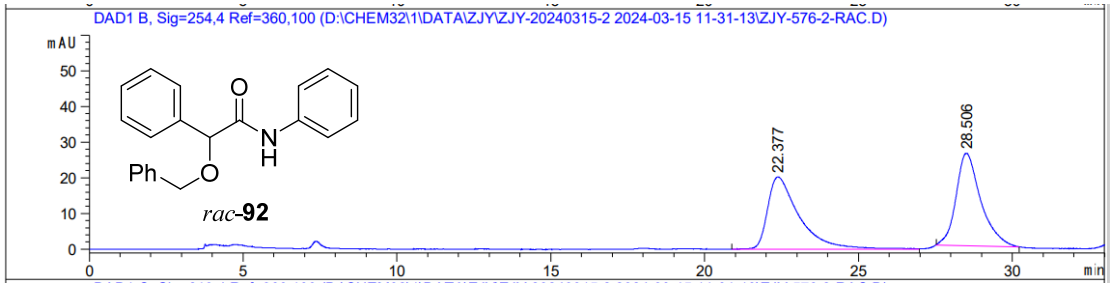
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.934	MM R	0.6134	8494.66406	230.79407	49.9490
2	18.871	MM R	1.2449	8512.00000	113.95564	50.0510
Totals :				1.70067e4	344.74970	



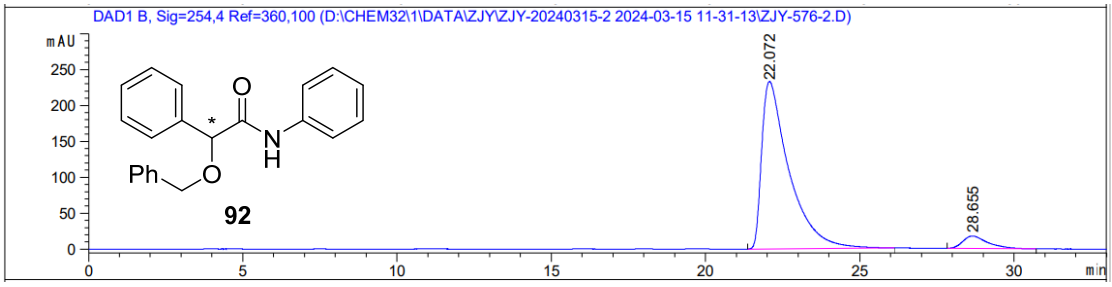
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.179	BB	0.5610	1.00645e4	275.01935	65.8649
2	19.239	BB	1.1254	5216.04297	69.51165	34.1351
Totals :				1.52806e4	344.53100	



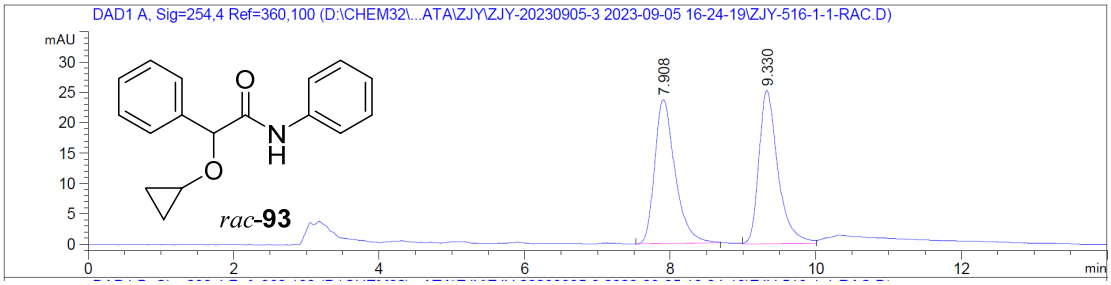
Signal 2: DAD1 B, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.377	MM R	1.2022	1464.00244	20.29604	50.1617
2	28.506	MM R	0.9336	1454.56201	25.96705	49.8383
Totals :				2918.56445	46.26309	



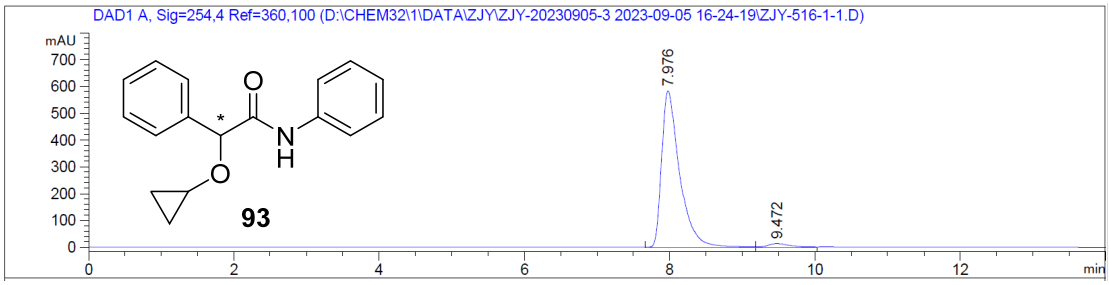
Signal 2: DAD1 B, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.072	BB	0.8692	1.43722e4	233.14795	93.5741
2	28.655	BB	0.6724	986.96832	17.48867	6.4259
Totals :				1.53592e4	250.63662	



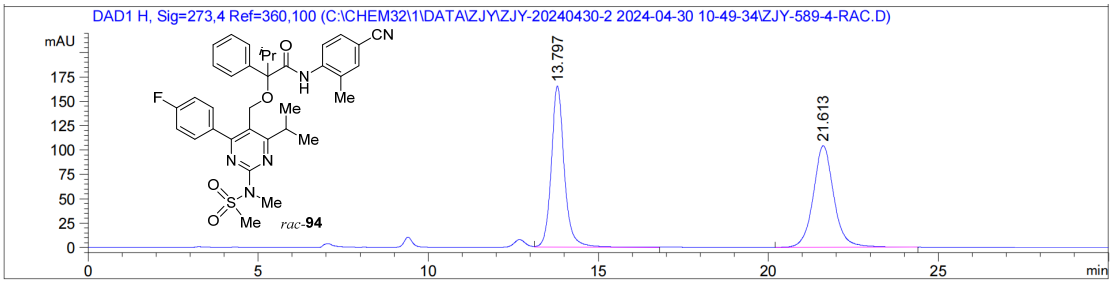
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.908	MM R	0.3248	461.08044	23.65743	50.0766
2	9.330	MM R	0.3035	459.67032	25.24359	49.9234
Totals :				920.75076	48.90102	



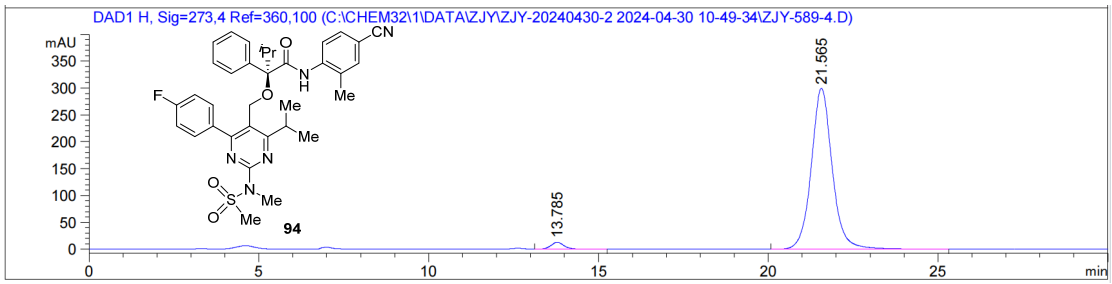
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.976	BV	0.2520	1.00047e4	583.47791	97.5274
2	9.472	VB	0.2893	253.64482	13.01986	2.4726
Totals :				1.02584e4	596.49777	



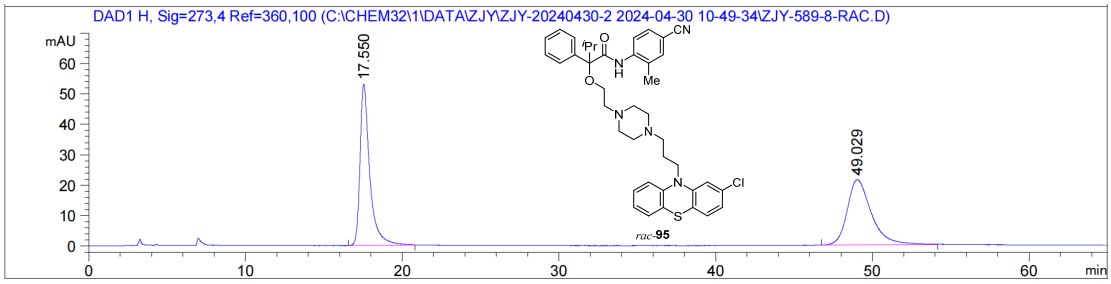
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.797	MM R	0.4439	4398.43945	165.15089	50.0877
2	21.613	BB	0.6346	4383.04248	104.23176	49.9123
Totals :				8781.48193	269.38265	



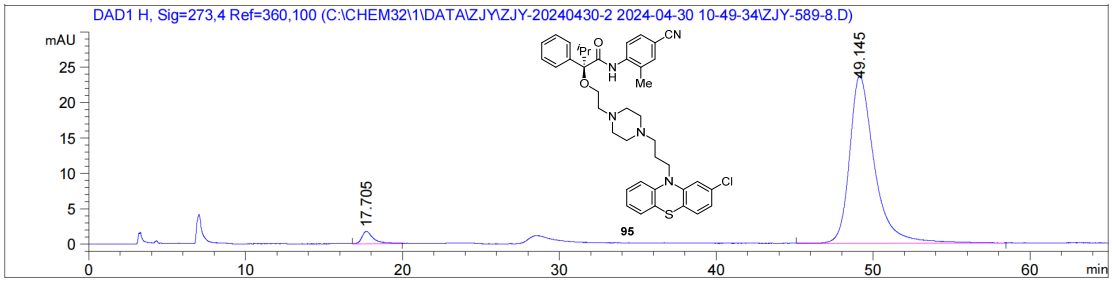
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.785	BB	0.4156	350.92255	12.81127	2.6551
2	21.565	BB	0.6477	1.28662e4	299.22421	97.3449
Totals :				1.32171e4	312.03548	



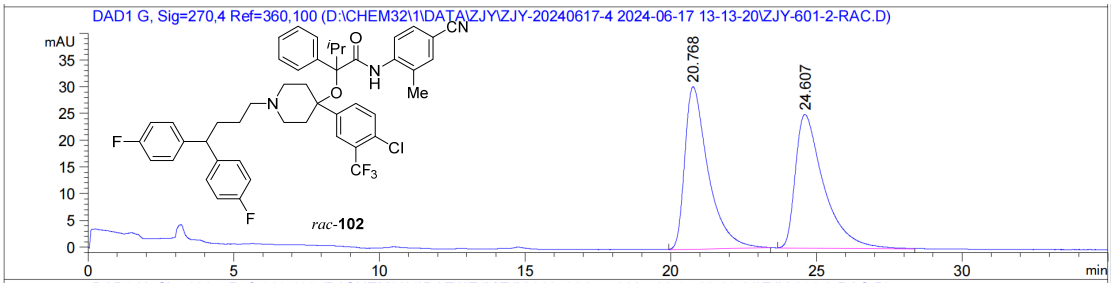
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.550	BB	0.6274	2286.58081	52.99187	49.9831
2	49.029	MM R	1.7767	2288.12744	21.46386	50.0169
Totals :				4574.70825	74.45573	



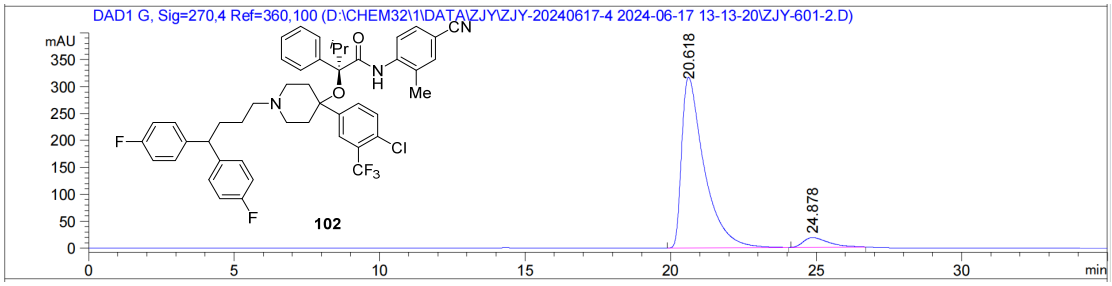
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.705	MM R	0.8245	87.16998	1.76201	3.2292
2	49.145	MM R	1.8414	2612.23438	23.64296	96.7708
Totals :				2699.40436	25.40497	



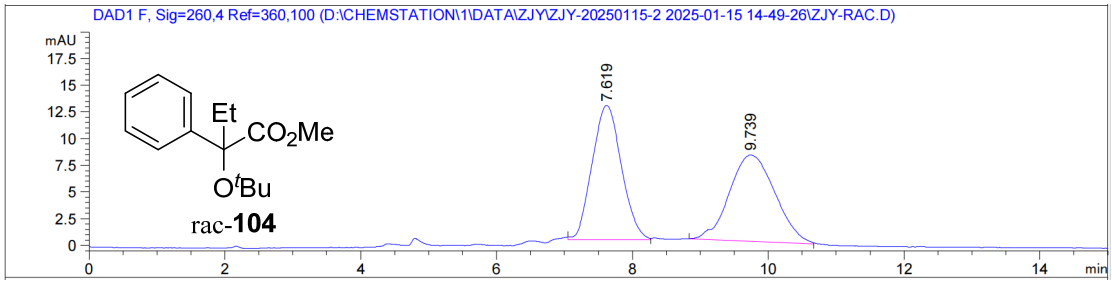
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.768	MM R	0.9312	1696.46826	30.36287	50.0695
2	24.607	MM R	1.1285	1691.75574	24.98621	49.9305
Totals :				3388.22400	55.34907	



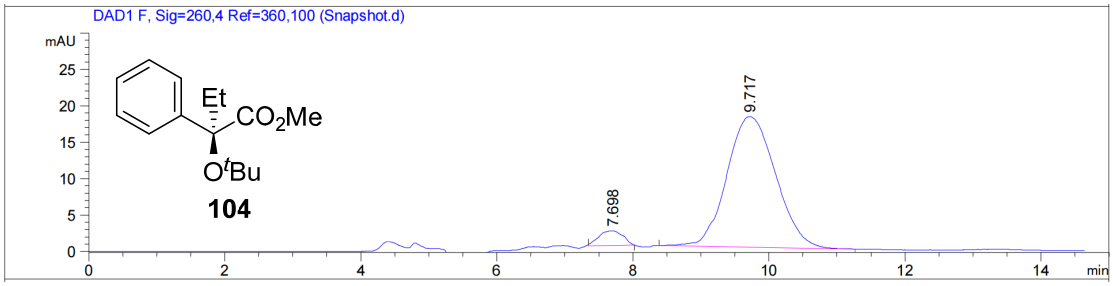
Signal 7: DAD1 G, Sig=270,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.618	MM R	0.8966	1.70411e4	316.78812	94.0223
2	24.878	MM R	1.0066	1083.43481	17.93869	5.9777
Totals :				1.81246e4	334.72680	



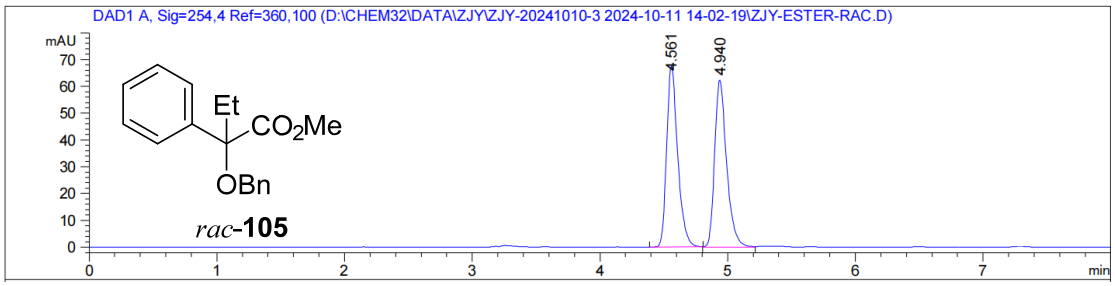
Signal 6: DAD1 F, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.619	MM R	0.5009	378.27176	12.58666	50.0668
2	9.739	MM R	0.7758	377.26193	8.10524	49.9332
Totals :				755.53369	20.69190	



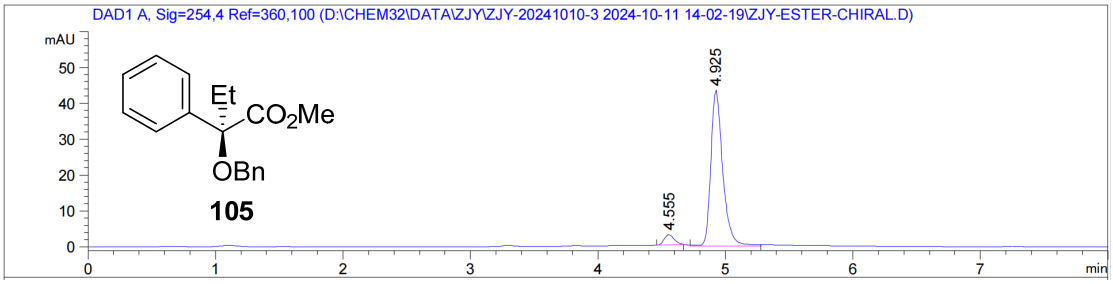
Signal 6: DAD1 F, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.698	MM R	0.4110	48.90607	1.98342	5.1825
2	9.717	BB	0.7201	894.77826	17.93398	94.8175
Totals :				943.68433	19.91740	



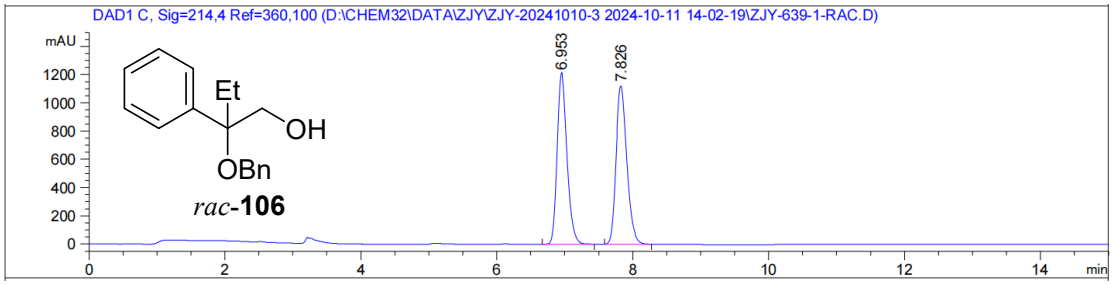
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.561	BB	0.0899	404.38086	67.52033	49.9139
2	4.940	MM R	0.1083	405.77591	62.44109	50.0861
Totals :				810.15677	129.96143	



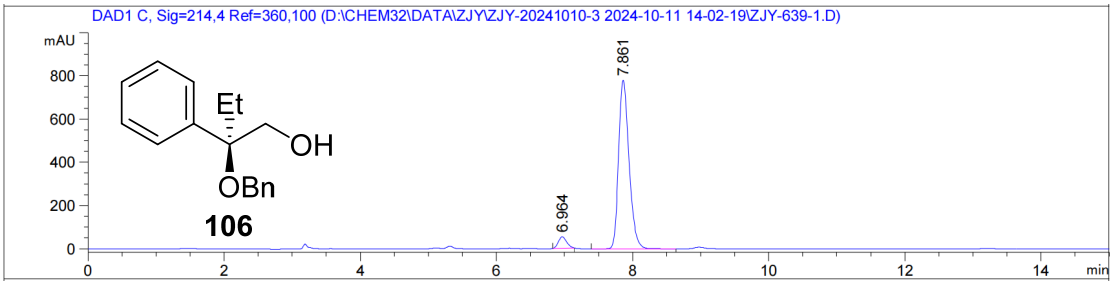
Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.555	MM R	0.0900	15.56377	2.88116	5.2001
2	4.925	MM R	0.1089	283.73410	43.40929	94.7999
Totals :				299.29787	46.29046	



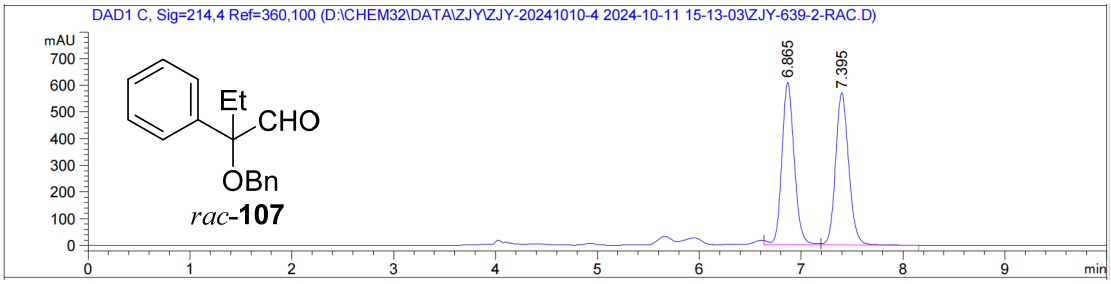
Signal 3: DAD1 C, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.953	MM R	0.1691	1.23520e4	1217.52844	49.9612
2	7.826	MM R	0.1839	1.23711e4	1121.40479	50.0388
Totals :				2.47231e4	2338.93323	



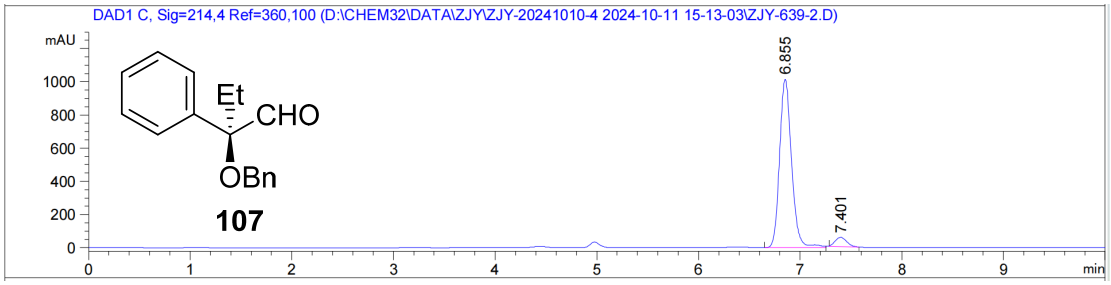
Signal 3: DAD1 C, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.964	MM R	0.1410	457.72675	54.11922	5.2055
2	7.861	MM R	0.1780	8335.42090	780.62756	94.7945
Totals :				8793.14764	834.74679	



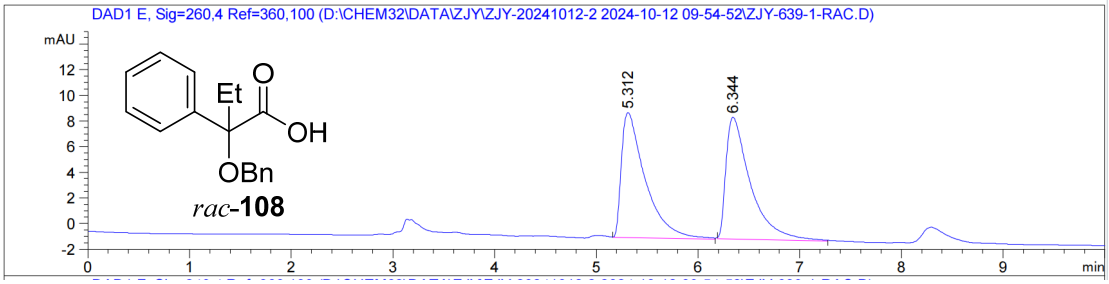
Signal 3: DAD1 C, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.865	FM R	0.1408	5151.79150	609.96991	50.0486
2	7.395	VB	0.1391	5141.79346	570.84332	49.9514
Totals :				1.02936e4	1180.81323	



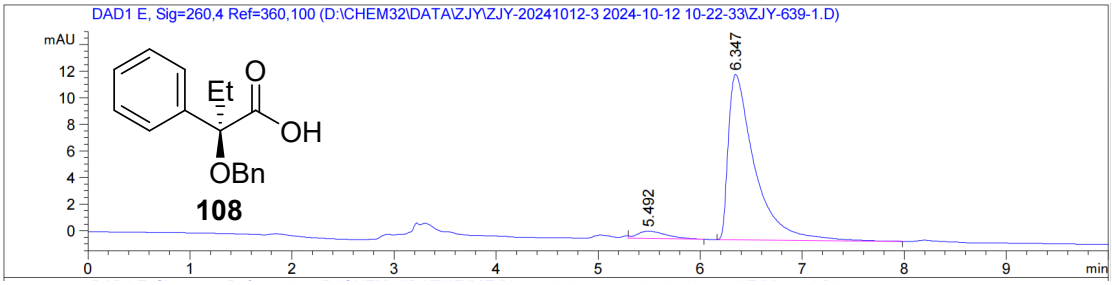
Signal 3: DAD1 C, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.855	MM R	0.1360	8300.43555	1016.88324	94.8146
2	7.401	MM R	0.1332	453.95026	56.78180	5.1854
Totals :				8754.38580	1073.66504	



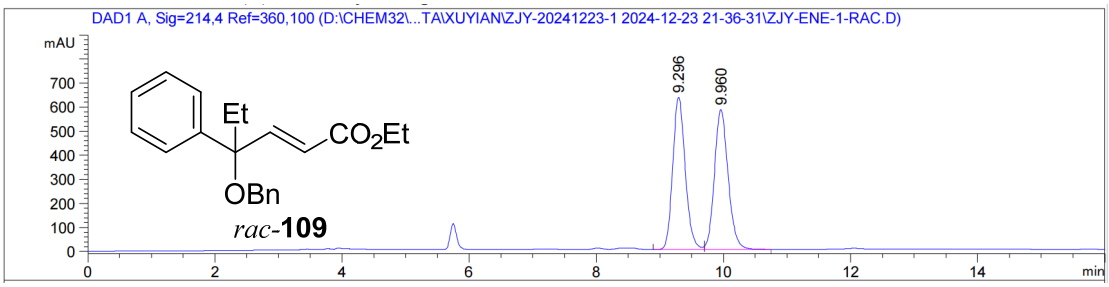
Signal 5: DAD1 E, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.312	BV	0.2359	158.47325	9.73771	49.9686
2	6.344	MM R	0.2779	158.67232	9.51545	50.0314
Totals :				317.14557	19.25316	



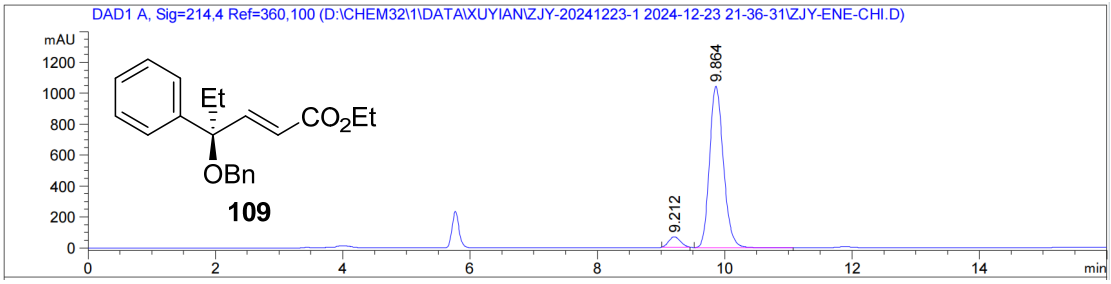
Signal 5: DAD1 E, Sig=260,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.492	MM R	0.3371	11.56682	5.71852e-1	4.9195
2	6.347	MM R	0.2991	223.55545	12.45546	95.0805
Totals :				235.12227	13.02731	



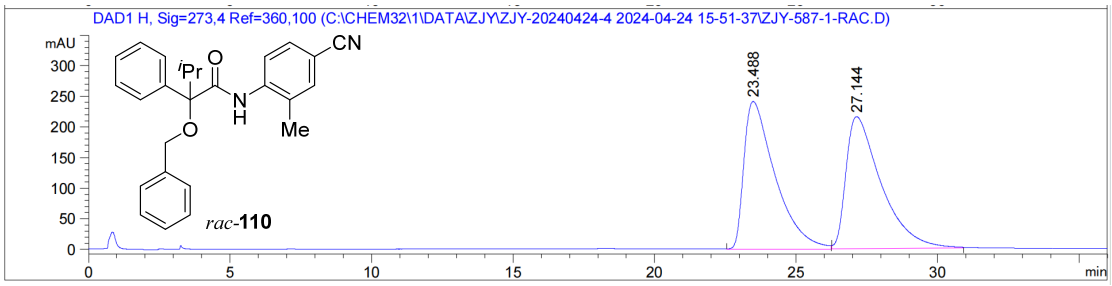
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.296	MF R	0.2290	8698.55762	633.19690	49.9481
2	9.960	FM R	0.2499	8716.64844	581.25226	50.0519
Totals :				1.74152e4	1214.44916	



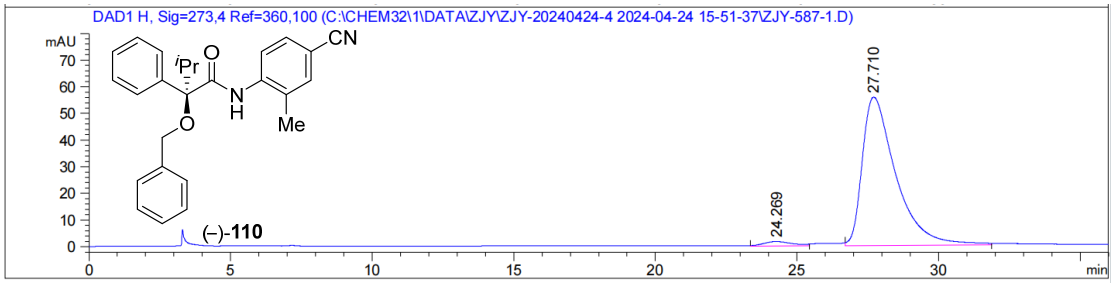
Signal 1: DAD1 A, Sig=214,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.212	MM R	0.2110	848.35486	67.00385	5.0928
2	9.864	MM R	0.2521	1.58095e4	1045.31348	94.9072
Totals :				1.66579e4	1112.31733	



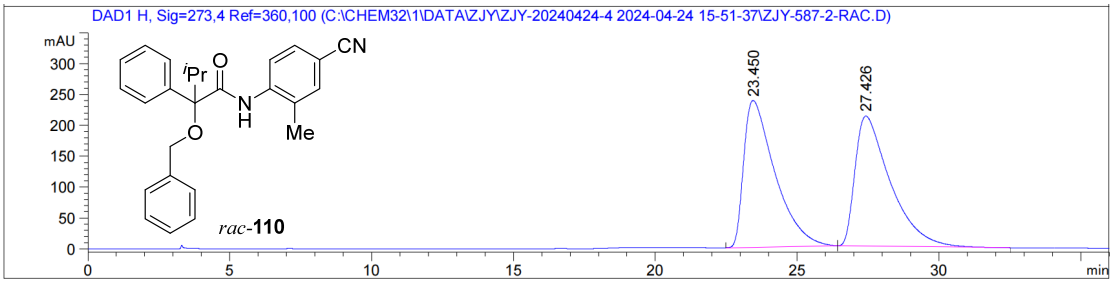
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.488	MF R	1.2824	1.85613e4	241.23868	49.9038
2	27.144	MM R	1.4406	1.86329e4	215.56831	50.0962
Totals :				3.71942e4	456.80699	



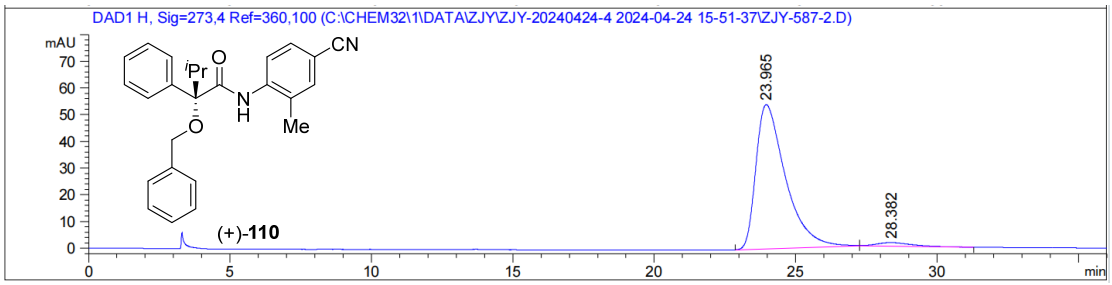
Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	24.269	MF R	1.2069	116.47484	1.60840	2.4686
2	27.710	MF R	1.3773	4601.76514	55.68464	97.5314
Totals :				4718.23997	57.29304	



Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.450	BB	1.1366	1.81849e4	237.67448	49.9578
2	27.426	BB	1.2634	1.82156e4	210.53691	50.0422
Totals :				3.64005e4	448.21140	



Signal 8: DAD1 H, Sig=273,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.965	MM R	1.2153	3939.42749	54.02416	97.0342
2	28.382	MM R	1.4856	120.40456	1.35076	2.9658
Totals :				4059.83205	55.37492	

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