Diastereoselective and Enantioselective Silylation of 2-Aryl Cyclohexanols

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Supporting Information

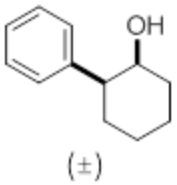
General Information

All the reactions were carried out under a nitrogen atmosphere using oven-dried glassware. Molecular sieves were activated in an oven at 170 °C before use. Tetrahydrofuran (THF), diethyl ether and dichloromethane (CH_2Cl_2) were dried by passing through a column of activated alumina before use and stored over molecular sieves. Carbon tetrachloride (CCl_4) was distilled and degassed prior to use. Sulfuryl chloride (SO_2Cl_2) and tetramethylethylenediamine (TMDEA) were distilled before use. *n*-Butyl lithium was titrated prior to use. Unless otherwise stated, all the other chemicals were obtained from major commercial sources and used without further purification. High resolution mass spectrometry (HRMS) was submitted to and conducted by the Department of Chemistry and Biochemistry's mass spectrometry facility at the University of South Carolina. Infrared spectroscopy (IR) was conducted using a Perkin Elmer Spectrum 100 FT-IR ATR spectrophotometer, ν_{max} in cm^{-1}. ^1H NMR was taken on a Bruker Avance (300 or 400 MHz). Chemical shifts were reported in ppm with TMS or Chloroform as an internal standard (TMS 0.00 ppm for ^1H and ^{13}C or $CHCl_3$ 7.26 ppm and 77.16 for ^1H and ^{13}C respectively). ^{13}C NMR spectra were taken on a Bruker Avance (101 or 75 MHz) with complete proton decoupling. Enantiometic ratios were determined via HPLC using an Agilent 1200 series. The chiral stationary phases were Daicel Chiralcel OD-H, OJ-H, AD, AD-H or Daicel Chiralpak IC columns, and the enantiomers were measured by a diode array detector in comparison with the racemic materials. Optical Rotations were obtained utilizing a JASCO P-1010 polarimeter. Uncorrected melting points (mp) were taken with a Laboratory Devices Mel-Temp.

Preparation of racemic substituted 2-aryl cyclohexanols and general procedures

General Information

The following compounds *trans*-2-phenylcyclohexan-1-ol, 2-(3-methoxyphenyl)cyclohexan-1-one, *trans*-2-(4-methoxyphenyl)cyclohexan-1-ol, *trans*-2-(3-fluorophenyl)cyclohexan-1-ol, *trans*-2-(3-fluorophenyl)cyclohexan-1-ol, *trans*-2-(3-methylphenyl)cyclohexan-1-ol, [1,1'-bi(cyclohexan)]-2-ol, *trans*-2-(naphthalen-1-yl)cyclohexan-1-ol, *trans*-2-phenylcyclopentan-1-ol and *cis*-2-methylcyclohexan-1-ol were purchased. 2-(3-methoxyphenyl)cyclohexan-1-one and *trans*-[1,1'-bi(cyclohexan)]-2-ol were purified via silica gel chromatography prior to use. *Trans*-2-(2-methoxyphenyl)cyclohexan-1-ol,[1] *trans*-2-(3-methoxyphenyl)cyclohexan-1-ol,[2] and *cis*-2-(3-methoxyphenyl)cyclohexan-1-ol[2] were prepared from known literature procedures.



***cis*-2-phenylcyclohexan-1-ol**

To a 50 mL round bottom flask fitted with Teflon coated stir-bar was added the commercially available 2-phenylcyclohexan-1-one (1.05 g, 6 mmol) and ethanol (30 mL) to a concentration of 0.2 M. The solution was treated with $NaBH_4$ (0.62 g, 16.38 mmol) and stirred at room temperature for 2 hours. The reaction was then quenched with saturated NH_4Cl, and the aqueous layer was extracted with diethyl ether (3 x 10 mL). The organic layers were then combined, dried over anhydrous Na_2SO_4, filtered and concentrated. The crude mixture (mixture of diastereomers) was purified on silica gel chromatography (gradient of 5% to 10% to 25% EtOAc in hexanes) giving a while solid (438 mg, 2.49 mmol, yield 42%). **^{1}H NMR**: (300 MHz, $CDCl_3$) δ ppm 7.38-7.20 (m, 5H), 4.03 (d, *J* = 2.0 Hz, 1H), 2.16 – 1.29 (m, 9H) **^{13}C NMR: (**75 MHz, $CDCl_3$) δ ppm 144.4, 128.9, 128.2, 126.9, 71.0, 48.4, 33.3, 26.6, 24.7, 20.0.

General procedure for the tandem ammonia-borane ketone reduction and silylation-based kinetic resolution (GP1)

The synthesis of a mixture of *cis* and *trans* alcohols employed a procedure similar to the published literature.[3] To a 4-dram vial fitted with a Teflon coated stir-bar was charged with the ketone (1 mmol), ammonia borane (NH_3BH_3, 0.51 mmol) and methanol to a concentration of 0.3 M. The reaction was allowed to stir at room temperature for 4 hours, which was monitored by TLC for full conversion. The solvent and all the volatile compounds (trimethyl borate and ammonia) were removed under vacuum after the reaction. The ratio of *cis* alcohol versus *trans* alcohol could be determined by ^{1}H NMR. Catalyst (25 mol% in relationship to *trans* alcohol) and activated 4Å molecular sieves were added to the mixture of *cis* and *trans* alcohols. The vial was then purged with argon and sealed with a septa. *N,N*-Diisopropylethylamine (0.45 equiv in relationship to *trans* alcohol) was added via syringe and the mixture was dissolved in 1.25 mL of THF. The vial was then cooled to -78 °C for 30 min. The cooled mixture was then treated with a 0.71 M solution of silyl chloride in THF (0.45 equiv of SiCl in relationship to *trans* alcohol) and was left to react for 48 hours at -78 °C, then quenched with 0.5 mL of methanol. The solution was left to warm to room temperature and then the crude contents were extracted with diethyl ether and the organic layer was transferred to a 4-dram vial. The solvent was removed under vacuum and the residue was purified via silica gel chromatography (gradient of 5% to 10% to 25% EtOAc in hexanes). The silylated alcohols and unreacted alcohols were collected and concentrated under vacuum for further HPLC analysis.

General procedures for sodium borohydride ketone reduction (GP2)

To a 4-dram vial with a stir bar was added the ketone and absolute methanol to a concentration of 0.5 M. The solution was treated with $NaBH_4$ and stirred at room temperature. Full conversion was monitored by TLC after 2 hours. The reaction mixture was then quenched with 3 mL brine and then extracted with diethyl ether (3 * 4 mL). The organic layers were combined and then dried over anhydrous Na_2SO_4 and

evaporated to dryness. The residue was then purified through silica gel chromatography (10% EtOAc in hexanes to 25% EtOAc in hexanes).

General procedure for the kinetic resolution of the alcohols (GP3)

To a 1-dram vial with an oven dried Teflon coated stir bar and activated 4Å molecular sieves, the racemic substrate (0.4 mmol) and catalyst (0.1 mmol) were added. The vial was then purged with argon and sealed with a septa. The *N,N*-diisopropylethylamine (0.26 mmol) was added via syringe and the starting materials were dissolved in 0.55 mL of THF to make a 0.42 M concentration solution. The vial was then cooled to -78 °C for 30 min. The cooled mixture was then treated with a 0.65 M solution of silyl chloride in THF (0.4 mL, 0.26 mmol) and was left to react for a set amount of time at -78 °C, then quenched with 0.3 mL of methanol. The solution was left to warm to room temperature and then the crude contents were extracted with diethyl ether and the organic layer was transferred to a 4-dram vial. The solvent was removed under vacuum and the residue was purified via silica gel chromatography (gradient of 5% to 10% to 25% EtOAc in hexanes). The silylated alcohol was concentrated under vacuum and saved for analysis and the unreacted alcohol could either be analyzed by HPLC or be converted to a benzoate ester for HPLC analysis.

General procedure for deprotection of silylated alcohols (GP4)

To a 4-dram vial with stir bar and a septa was added the silyl protected alcohol. The solid was then dissolved in 2 ml of THF with stirring. To this solution of tetra-*n*-butylammonium fluoride (TBAF) (1 ml) was added and stir for 2 h for full deprotection. The reaction was then quenched with brine, and extracted with diethyl ether three times. The crude organic layers were combined, then concentrated under vacuum, and purified by silica gel chromatography (gradient of 10 to 25% EtOAc in hexanes). The isolated, deprotected alcohol was then analyzed by HPLC or converted to a benzoate ester.

General procedure for benzoylation of alcohols for HPLC analysis (GP5)

A 4-dram vial containing the alcohols was fitted with a stir bar and a septa. DMAP (4-dimethylaminopyridine, 0.1 equiv) and triethyl amine (2.0 equiv) was added, and the mixture was then dissolved in 2 mL of dichloromethane with stirring. The vial was cooled to 0 °C in an ice bath and 3,5-dinitrobenzoyl chloride (1.4 equiv) was added to the mixture. The reaction was allowed to stir for 2 h and quenched with sat. sodium bicarbonate and extracted three time with dichloromethane. The crude organic layers were combined, then concentrated under vacuum, and purified by silica gel chromatography (5% EtOAc in hexanes) to obtain the desired benzoylated alcohols. The benzoate esters could then be analyzed by HPLC.

General Procedure Making a *p*-Substituted Triphenylsilane. (GP6)

In an oven-dried 250 mL three-neck round-bottom flask, *p*-substituted bromo/iodobenzene (1 equiv) was dissolved using diethyl ether (28 mL) under nitrogen at room temperature. To the stirred solution was slowly added *n*-BuLi (1.025 equiv) at room temperature. After addition of *n*-BuLi, the resulting mixture formed a precipitate which was then allowed to stir for 1−1.5 h. After 1−1.5 h, a solution of $HSiCl_3$ (0.4 M in diethyl ether, 0.3 equiv) was added drop wise to the three-neck flask at -40 °C (dry ice/acetonitrile bath). The reaction mixture was then allowed to stir for another 2 h. After 2 h, the resulting suspension was then quenched with water and extracted with diethyl ether. The organic layer was dried with anhydrous Na_2SO_4 and concentrated under vacuum to yield the crude product. In most cases, purification of the silane was done by recrystallization or silica gel chromatography using hexanes.

General Procedure Making a *p*-Substituted Triphenylsilylchloride. (GP7)

An oven-dried 50 mL three-neck round-bottom flask was charged with *p*-substituted triphenylsilane and the mixture was dissolved with dry, degassed carbon tetrachloride (CCl_4) under a nitrogen atmosphere. The mixture was allowed to stir for 10−15 min. Sulfuryl chloride (SO_2Cl_2) (2−6 equiv) was then added to the flask. The resulting mixture

was then allowed to reflux for 2−10 h (conversion was monitored by the disappearance of the silane peak using ^{1}H NMR). After full conversion, the mixture was concentrated under vacuum. The final product was then recrystallized with pentane at -78 °C.

Analytical data and HPLC traces for kinetic resolutions

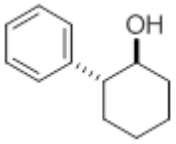
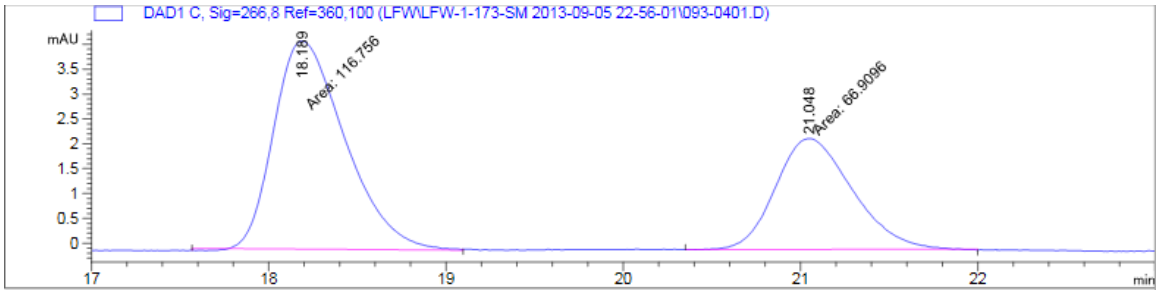


Table 1, Entry 1: Recovered starting material: 34 mg, 39%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.38 – 7.29 (m, 2H), 7.29 – 7.21 (m, 3H), 3.67 (ddd, *J* = 10.1, 6.3, 2.5 Hz, 1H), 2.43 (ddd, *J* = 13.2, 10.0, 3.5 Hz, 1H), 2.16 – 2.06 (m, 1H), 1.85 (dt, *J* = 12.5, 6.6 Hz, 2H), 1.80 – 1.71 (m, 1H), 1.62 – 1.28 (m, 4H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 143.2, 128.8, 127.9, 126.8, 74.4, 53.2, 34.4, 33.3, 26.1, 25.1. **Optical Rotation $[\alpha]^{25}_{D}$**: +3.5 (c = 0.031) $CHCl_3$

HPLC separation conditions and stereochemical assignment[4]: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 18.2 min for (*S*)-enantiomer (major) and 21.0 min for (*R*)-enantiomer (minor). (er = 64:36)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.189	MM	0.4652	116.75569	4.18267	63.5698
2	21.048	MM	0.5005	66.90955	2.22821	36.4302

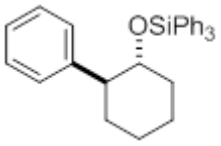


Table 1, Entry 1: Recovered product: 108 mg, 48%, white solid, **mp range =** 118-120 °C. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.49 – 7.19 (m, 18H), 7.11 – 7.03 (m, 2H), 3.82 (td, *J* = 10.3, 4.0 Hz, 1H), 2.73 – 2.64 (m, 1H), 2.03 – 1.94 (m, 1H), 1.88 – 1.51 (m, 4H), 1.45 – 1.11 (m, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 135.5, 135.4, 134.7, 129.6, 128.3, 128.1, 127.5, 126.0, 76.4, 53.1, 36.5, 34.1,

25.9, 25.1. **HRMS (ESI)** Calculated for ($C_{30}H_{30}OSi$ +) (M +): 434.2066 Observed: 434.2069. **IR** (neat, cm^{-1}) 3060, 2929, 1600, 1447, 1250, 1114, 1029, 982, 840, 794, 709. Conversion was calculated based on ^1H NMR.

Kinetic Resolution Data for Table 1, Entry 1

	er^{SM}	% conv	*s*	$s_{AVERAGE}$
1	64:36	51.6	2.2	2
2	59:41	49.0	1.7	

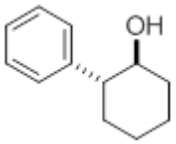
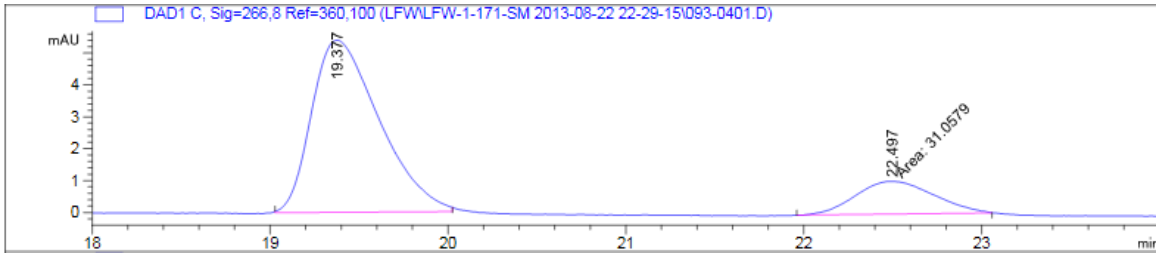


Table 1, Entry 2: Recovered starting material: 36 mg, 41%. **^1H NMR** (400 MHz, $CDCl_3$): δ ppm 7.38 – 7.29 (m, 2H), 7.29 – 7.21 (m, 3H), 3.67 (ddd, *J* = 10.1, 6.3, 2.5 Hz, 1H), 2.43 (ddd, *J* = 13.2, 10.0, 3.5 Hz, 1H), 2.16 – 2.06 (m, 1H), 1.85 (dt, *J* = 12.5, 6.6 Hz, 2H), 1.80 – 1.71 (m, 1H), 1.62 – 1.28 (m, 4H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 143.2, 128.8, 127.9, 126.8, 74.4, 53.2, 34.4, 33.3, 26.1, 25.1 **Optical Rotation $[\alpha]^{25}_D$**: +11.0 (c = 0.04) $CHCl_3$

HPLC separation conditions and stereochemical assignment[4]: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 19.4 min for (*S*)-enantiomer (major) and 22.5 min for (*R*)-enantiomer (minor). (er = 82:18)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.375	BB	0.3902	195.52405	7.37843	81.7723
2	22.497	MM	0.5145	43.58389	1.41175	18.2277

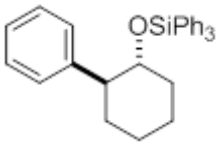
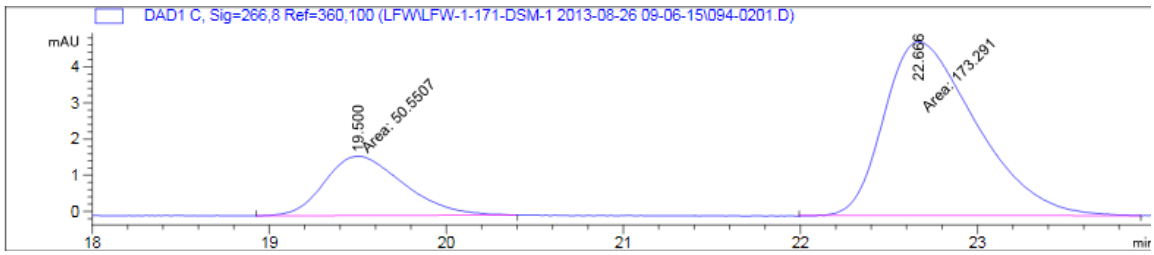


Table 1, Entry 2: Recovered product: 86 mg, 40%, white solid, **mp range =** 118-120°C. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.49 – 7.19 (m, 18H), 7.11 – 7.03 (m, 2H), 3.82 (td, *J* = 10.3, 4.0 Hz, 1H), 2.73 – 2.64 (m, 1H), 2.03 – 1.94 (m, 1H), 1.88 – 1.51 (m, 4H), 1.45 – 1.11 (m, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 135.5, 135.4, 134.7, 129.6, 128.3, 128.1, 127.5, 126.0, 76.4, 53.1, 36.5, 34.1, 25.9, 25.1. **HRMS (ESI)** Calculated for ($C_{30}H_{30}OSi$ +) (M +): 434.2066 Observed: 434.2069. **IR** (neat, cm^{-1}) 2929, 2856, 1447, 1428, 1114, 1106, 1091, 1029, 998, 982, 878, 840, 794, 709. **Optical Rotation [α]$^{25}_{D}$**: -17.8 (c = 0.023) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 77:23)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.500	MM	0.5137	50.55070	1.64016	22.5832
2	22.666	MM	0.6018	173.29129	4.79962	77.4168

Kinetic Resolution Data for Table 1, Entry 2

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	82:18	77:23	56.5	6	6
2	81:19	75:25	58.5	5	

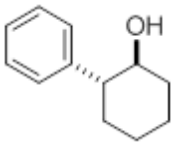
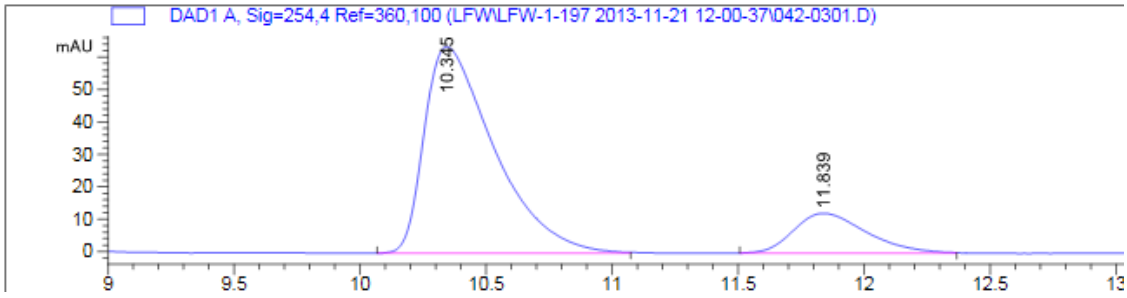


Table 1, Entry 3/Table 2, Entry 1: Recovered starting material: 32 mg, 45%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.38 – 7.29 (m, 2H), 7.29 – 7.21 (m, 3H), 3.67 (ddd, *J* = 10.1, 6.3, 2.5 Hz, 1H), 2.43 (ddd, *J* = 13.2, 10.0, 3.5 Hz, 1H), 2.16 – 2.06 (m, 1H), 1.85 (dt, *J* = 12.5, 6.6 Hz, 2H), 1.80 – 1.71 (m, 1H), 1.62 – 1.28 (m, 4H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 143.2, 128.8, 127.9, 126.8, 74.4, 53.2, 34.4, 33.3, 26.1, 25.1 **Optical Rotation $[\alpha]^{25}_{D}$**: +11.3 (c = 0.039) $CHCl_3$

HPLC separation conditions and stereochemical assignment[4]: Chiralpak OD-H Column 2% isopropyl alcohol in hexanes, flow rate: 1 mL/min, 25 °C; t_R 10.3 min for (*S*)-enantiomer (major) and 11.8 min for (*R*)-enantiomer (minor). (er = 83:17)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
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2	11.839	BB	0.3072	247.74573	12.28680	16.8413

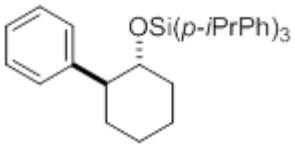
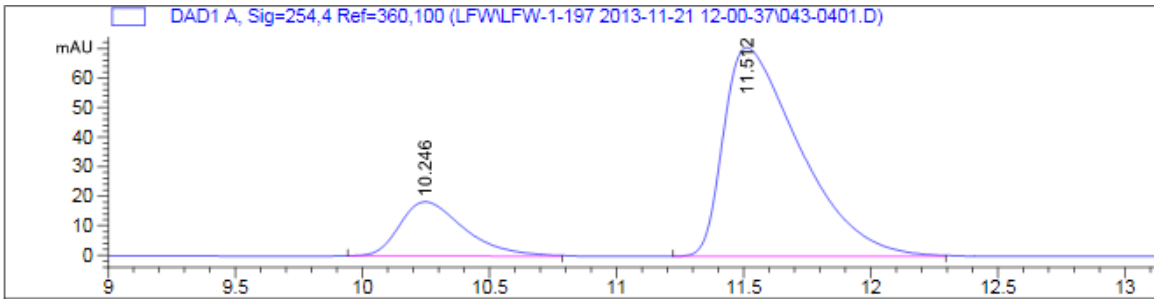


Table 1, Entry 3/Table 2, Entry 1: Recovered product: 110 mg, 49%, white solid, **mp range =** 120-122°C. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.23 – 7.17 (m, 9H), 7.10 (d, *J* = 7.9 Hz, 6H), 7.06 – 7.02 (m, 2H), 3.82 (td, *J* = 10.3, 4.3 Hz, 1H), 2.87 (hept, *J* = 6.9 Hz, 3H), 2.70 – 2.62 (m, 1H), 2.02 – 1.93 (m, 1H), 1.87 – 1.77 (m, 1H), 1.74 – 1.29 (m, 6H), 1.24 (d, *J* = 6.9 Hz, 18H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.0, 145.0, 135.7, 132.1, 128.2, 128.2, 125.9, 125.6, 76.0, 53.2, 36.5, 34.2, 34.1, 26.0, 25.1, 23.9.**HRMS (ESI)** Calculated for ($C_{39}H_{48}OSi$ +) (M +): 560.3474 Observed:

560.3466. **IR** (neat, cm^{-1}) 3065, 2959, 1600, 1460, 1298, 1118, 981, 878, 840, 796, 698 **Optical Rotation** $[\alpha]^{25}_{D}$: -5.6 (c = 0.015) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 82:18)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.246	BB	0.2693	324.80237	18.36493	18.0449
2	11.512	BB	0.3175	1475.16382	70.66980	81.9551

Kinetic Resolution Data for Table 1, Entry 3/Table 2, Entry 1

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	83:17	82:18	50.8	9	10
2	78:22	87:13	43.0	11	

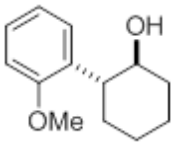
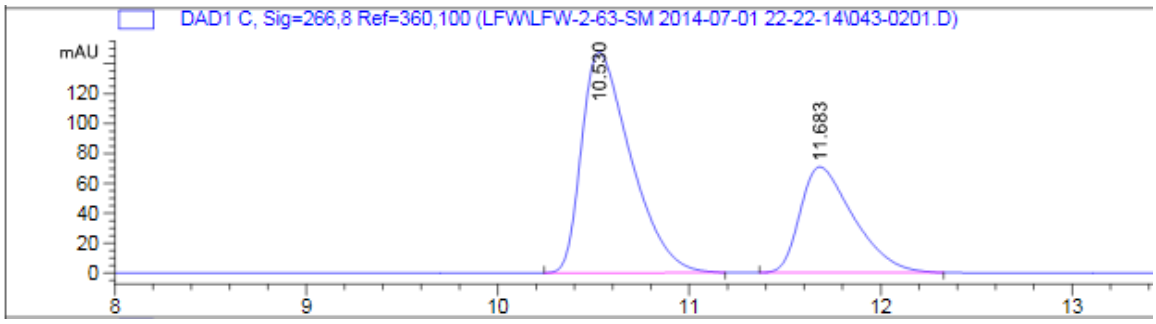


Table 2, Entry 2: Recovered starting material: 54 mg, 65 %. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.30 – 7.21 (m, 2H), 6.99 (td, *J* = 7.5, 0.9 Hz, 1H), 6.92 (d, *J* = 8.2 Hz, 1H), 3.86 (s, 3H), 3.81 – 3.72 (m, 1H), 3.10 – 2.98 (m, 1H), 2.21 – 2.11 (m, 1H), 1.93 – 1.70 (m, 4H), 1.59 – 1.29 (m, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 157.7, 131.5, 127.4, 127.3 121.05, 110.8, 74.1, 55.5, 45.1, 35.2, 32.6, 26.2, 25.2. **Optical Rotation** $[\alpha]^{25}_{D}$: +12.3 (c = 0.04) $CHCl_3$

HPLC separation conditions and stereochemical assignment[5]: Chiralpak OJ-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 10.5 min for (*S*)-enantiomer (major) and 11.7 min for (*R*)-enantiomer (minor). (er = 66:34)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.530	BB	0.2688	2638.36279	147.45033	65.7533
2	11.683	BB	0.2938	1374.15417	70.67300	34.2467

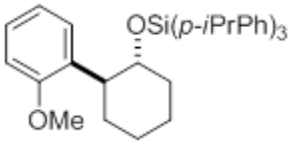
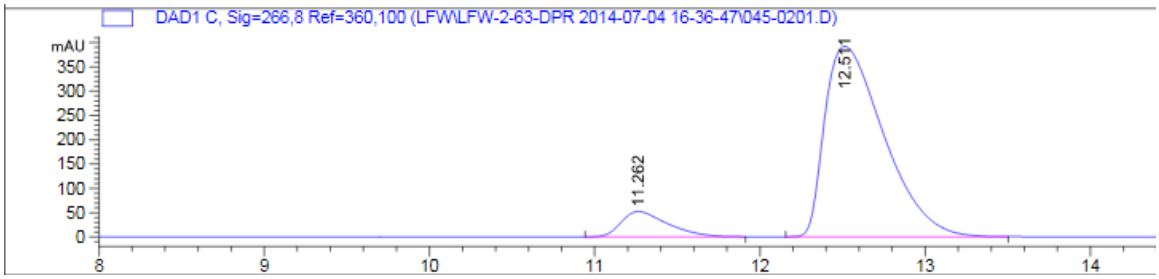


Table 2, Entry 2: Recovered product: 56 mg, 24%, white solid. **mp range =** 145-149 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.21 (d, *J* = 7.9 Hz, 6H), 7.18 – 7.13 (m, 1H), 7.10 (d, *J* = 7.9 Hz, 6H), 6.88 – 6.72 (m, 3H), 4.00 (s, 1H), 3.68 (s, 3H), 3.19 (s, 1H), 2.87 (hept, *J* = 6.9 Hz, 3H), 2.06 – 1.94 (m, 1H), 1.80 – 1.48 (m, 5H), 1.44 – 1.28 (m, 2H), 1.24 (d, *J* = 6.9 Hz, 18H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 157.7, 149.9, 138.7, 135.7, 133.3, 132.4, 126.5, 125.5, 120.6, 110.6, 75.0, 55.4, 36.7, 34.1, 32.8, 26.1, 25.2, 23.9. **IR** (neat, cm^{-1}) 3406, 3069, 2959, 1600, 1586, 1463, 1263, 1156, 926, 823, **HRMS (ESI)** Calculated for ($C_{40}H_{50}O_2Si$ +) (M +): 590.3580 Observed: 590.3553. **Optical Rotation** $[\alpha]^{25}_{D}$: -7.9 (c = 0.017) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 90:10)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.262	BB	0.2936	1024.49329	52.27458	9.5022
2	12.511	BB	0.3875	9757.10254	391.85245	90.4978

Kinetic Resolution Data for Table 2, Entry 2

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	66:34	90:10	28.6	13	13
2	65:35	90:10	27.3	13	

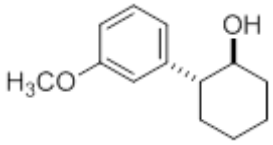
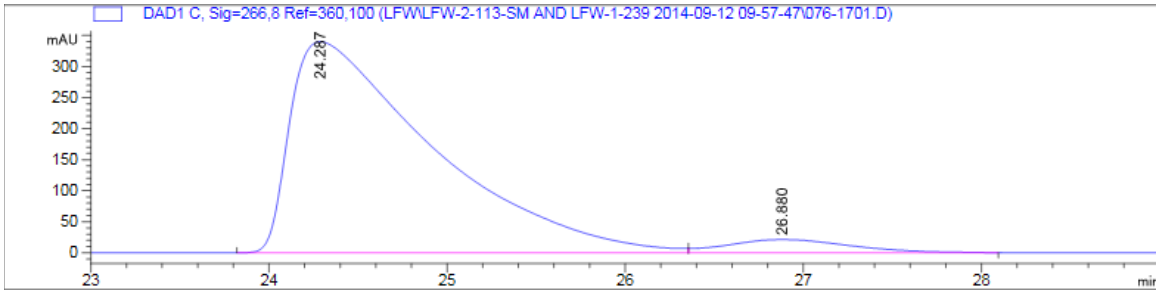


Table 2, Entry 3: Recovered starting material: 35 mg, 43%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.30 – 7.22 (m, 1H), 6.88 – 6.76 (m, 3H), 3.81 (s, 3H), 3.70 – 3.60 (m, 1H), 2.48 – 2.35 (m, 1H), 2.18 – 2.07 (m, 1H), 1.94 – 1.19 (m, 7H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 159.6, 144.8, 129.5, 120.0, 113.5, 111.8, 74.2, 55.1, 53.2, 34.3, 33.2, 26.0, 25.0. **Optical Rotation $[\alpha]^{25}_D$**: +23.2 (c = 0.044) $CHCl_3$. Stereochemical assignment was matched with reported literature.[2]

HPLC separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 24.3 min for (*S*)-enantiomer (major) and 26.9 min for (*R*)-enantiomer (minor). (er = 95:5)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	24.287	BB	0.8061	1.88863e4	339.98151	94.8859
2	26.880	BB	0.7178	1017.91699	21.32901	5.1141

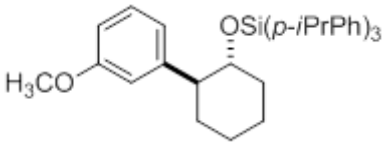
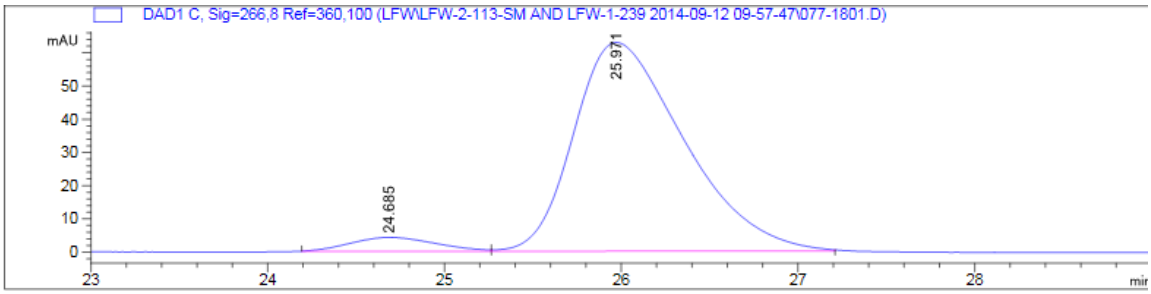


Table 2, Entry 3: Recovered product: 115 mg, 49%, white solid. **mp range =** 137-140 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.21 (d, *J* = 8.0 Hz, 6H), 7.14 (d, *J* = 7.9 Hz, 1H), 7.10 (d, *J* = 7.9 Hz, 6H), 6.76 (dd, *J* = 8.1, 1.9 Hz, 1H), 6.69 – 6.62 (m, 2H), 3.80 (td, *J* = 10.2, 4.2 Hz, 1H), 3.68 (s, 3H), 2.93 – 2.81 (m, 3H), 2.69 – 2.60 (m, 1H), 2.03 – 1.92 (m, 1H), 1.82 (d, *J* = 12.4 Hz, 1H), 1.74 – 1.31 (m, 6H), 1.24 (d, *J* = 6.9 Hz, 18H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 159.5, 150.0, 146.7, 135.6, 132.1, 129.1, 125.6, 120.6, 113.3, 112.0. 76.1, 55.0, 53.2, 36.5, 34.1, 30.3, 25.9, 25.0, 23.8. **HRMS (ESI)** Calculated for ($C_{40}H_{50}O_2Si$ +) (M +): 590.3582 Observed: 590.3580. **IR** (neat, cm^{-1}) 3066, 2959, 2868, 1600, 1461, 1261, 1156, 1089, 990, 875, 785, 698.**Optical Rotation [α]$^{25}_{D}$**: -10.8 (c = 0.017) $CHCl_3$.

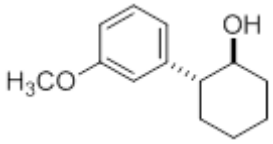
HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er= 95:5)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	24.685	BV	0.4042	142.59865	4.20928	4.9757
2	25.971	VB	0.6385	2723.31787	62.84921	95.0243

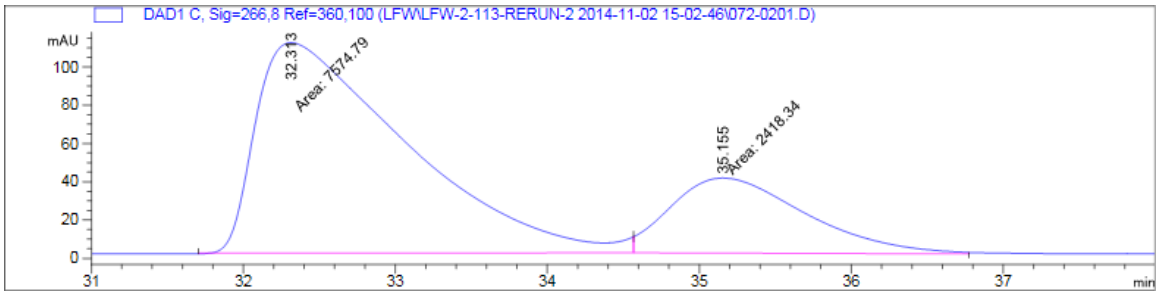
Kinetic Resolution Data for Table 2, Entry 3

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	89:11	96:4	45.8	50	53
2	95:5	95:5	50.0	56	

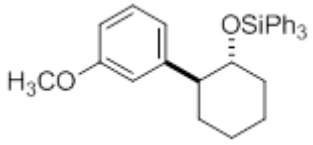


Kinetic resolution of 6 with triphenylsilyl chloride(3a): Recovered starting material: 32 mg, 39%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.30 – 7.22 (m, 1H), 6.88 – 6.76 (m, 3H), 3.81 (s, 3H), 3.70 – 3.60 (m, 1H), 2.48 – 2.35 (m, 1H), 2.18 – 2.07 (m, 1H), 1.94 – 1.19 (m, 7H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 159.6, 144.8, 129.5, 120.0, 113.5, 111.8, 74.2, 55.1, 53.2, 34.3, 33.2, 26.0, 25.0. **Optical Rotation $[\alpha]^{25}_{D}$**: +15.8 (c = 0.037) $CHCl_3$ Stereochemical assignment was matched with reported literature.[2]

HPLC separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 32.3 min for (S)-enantiomer (major) and 35.2 min for (R)-enantiomer (minor). (er= 76:24)



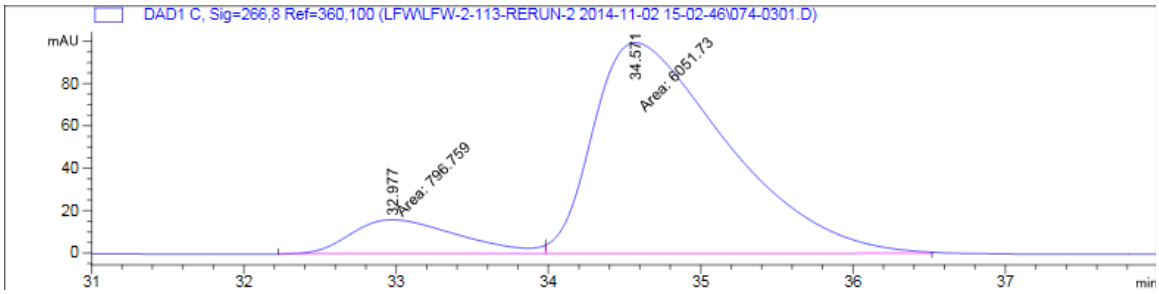
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	32.313	MM	1.1483	7574.79004	109.93856	75.8000
2	35.155	MM	1.0302	2418.33789	39.12281	24.2000



Kinetic resolution of 6 with triphenylsilyl chloride(3a): Recovered product: 76 mg, 41%, white solid. **mp range =** 118-120°C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.33 – 7.26 (m, 3H), 7.24 – 7.16 (m, 12H), 7.07 (t, *J* = 7.8 Hz, 1H), 6.69 (dd, *J* = 8.2, 1.8 Hz, 1H), 6.71 – 6.67 (m, 2H), 3.73 (td, *J* = 10.4, 4.4 Hz, 1H), 3.63 (s, 3H), 2.64 – 2.55 (m, 1H), 1.95 – 1.85 (m, 1H), 1.80 – 1.72 (m, 1H), 1.67 – 1.42 (m, 3H), 1.38 – 1.06 (m, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 159.6, 146.6, 135.6, 134.8, 129.6, 129.2, 127.5, 120.6, 113.6, 111.9, 76.5, 55.1, 53.3, 36.5, 34.0, 25.9, 25.1. **HRMS (ESI)**

Calculated for ($C_{31}H_{32}O_2Si$ +) (M +): 464.2172 Observed: 464.2175. **IR** (neat, cm^{-1}) 2931, 2856, 1601, 1429, 1262, 1115, 998, 980, 816, 787, 699. **Optical Rotation [α]$^{25}_D$**: -9.8 (c = 0.020) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 88:12)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	32.977	MM	0.8284	796.75946	16.03003	11.6341
2	34.571	MM	1.0129	6051.73486	99.58092	88.3659

Kinetic Resolution of 6 with triphenylsilyl chloride(3a) Data

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	76:24	88:12	40.0	12	13
2	82:18	87:13	45.0	13	

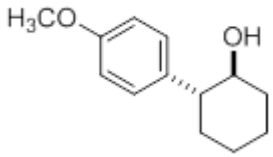
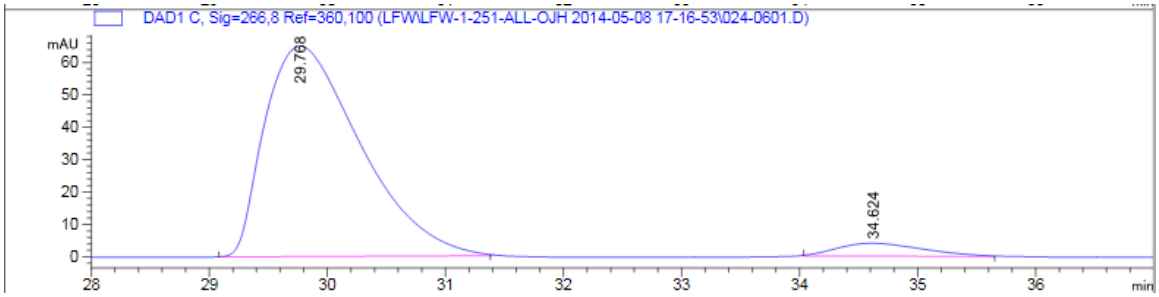


Table 2, Entry 4 : Recovered starting material: 35 mg, 43%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 6.88 (d, *J* = 8.7 Hz, 2H), 6.88 (d, *J* = 8.7 Hz, 2H), 3.80 (s, 3H), 3.60 (td, *J* = 10.1, 4.4 Hz, 1H), 2.42 – 2.33 (m, 1H), 1.90 – 1.71 (m, 3H), 1.64 – 1.24 (m, 5H), **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 158.4, 135.2, 128.8, 114.2, 74.6, 55.3, 52.4, 34.4, 33.5, 26.1, 25.1. **Optical Rotation [α]$^{25}_D$**: +19.8 (c = 0.045) $CHCl_3$. Stereochemical assignment was matched with reported literature.[5]

HPLC separation conditions: Chiralpak OJ-H Column 3% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 29.8 min for (*S*)-enantiomer (major) and 34.6 min for (*R*)-enantiomer (minor). (er = 95:5)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	29.768	BB	0.8671	3660.67969	64.99129	94.8284
2	34.624	BB	0.6186	199.64166	3.97076	5.1716

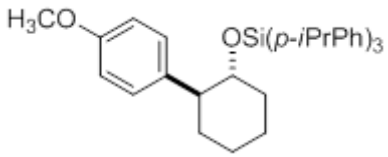
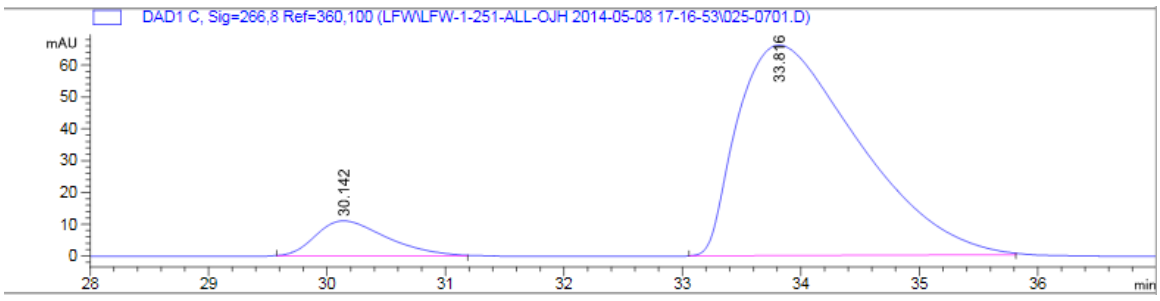


Table 2, Entry 4: Recovered product: 122 mg, 52%, white solid. **mp range =** 130-135 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.14 (d, *J* = 7.9 Hz, 6H), 7.04 (d, *J* = 7.9 Hz, 6H), 6.90 (d, *J* = 8.6 Hz, 2H), 6.69 (d, *J* = 8.6 Hz, 2H), 3.75 (s, 3H), 3.68 (td, *J* = 10.3, 4.3 Hz, 1H), 2.80 (hept, *J* = 6.9 Hz, 3H), 2.59 – 2.49 (m, 1H), 1.92 – 1.83 (m, 1H), 1.77 – 1.22 (m, 7H). 1.17 (d, *J* = 6.9 Hz, 18H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 158.0, 150.0, 137.3, 135.7, 132.2, 129.0, 125.6, 113.6, 76.3, 55.3, 52.2, 36.5, 34.2, 34.1, 26.0, 25.1, 23.9. **IR** (neat, cm^{-1}) 3060, 2955, 2868, 1600, 1490, 1394, 1261, 1150, 1089, 990, 862, 785, 699. **HRMS (ESI)** Calculated for ($C_{40}H_{50}O_2Si$ +) (M +): 590.3580 Observed: 590.3582. **Optical Rotation [α]$^{25}_{D}$**: -9.6 (c = 0.016) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 91:9)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.142	BB	0.6054	458.61127	11.00051	8.8909
2	33.816	BB	1.0765	4699.59326	66.17624	91.1091

Kinetic Resolution Data for Table 2, Entry 4

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	82:18	93:7	42.5	25	28
2	95:5	91:9	52.3	30	

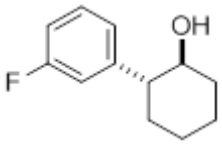
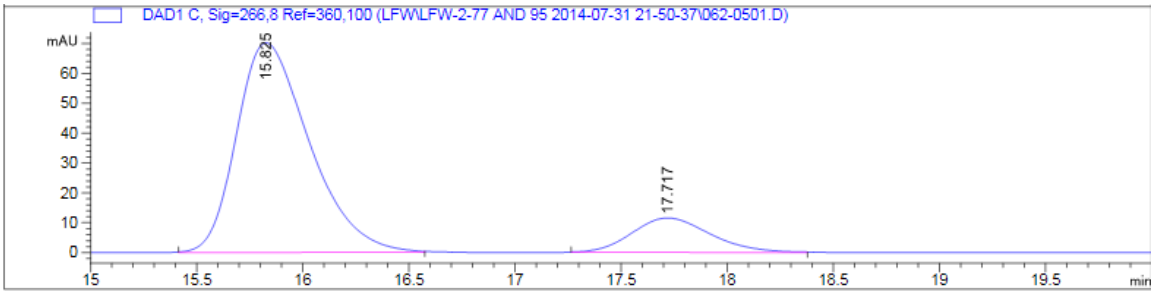


Table 2, Entry 5: Recovered starting material: 38 mg, 49%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.33 – 7.27 (m, 1H), 7.03 (d, *J* = 7.7 Hz, 1H), 6.99 – 6.90 (m, 2H), 3.68 – 3.59 (m, 1H), 2.50 – 2.38 (m, 1H), 2.15 – 2.06 (m, 1H), 1.92 – 1.72 (m, 3H), 1.55 – 1.26 (m, 4H), **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 164.4, 161.9, 146.2, 146.2, 130.2, 130.1, 123.7, 123.6, 114.7, 114.5, 113.8, 113.6. 74.3, 53.0, 34.6, 33.2, 25.9, 25.0. (Peaks splitting due to the fluorine) **Optical Rotation $[\alpha]^{25}_{D}$**: +12.3 (c = 0.046) $CHCl_3$. Stereochemical assignment was made by analogy to similar compounds in Table 2 as well as (1R,2S)-*trans*-2-(4-fluorophenyl)-1-cyclohexanol as reported in the literature.[5]

HPLC separation conditions: Chiralpak OD-H column 2% isopropyl alcohol in hexane, flow rate: mL/min, 25 °C; t_R 15.8 min for (*S*)-enantiomer (major) and 17.7 min for (*R*)-enantiomer (minor). (er = 85:15)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.826	BB	0.3645	1207.61597	50.77181	85.0669
2	17.718	BB	0.3757	211.99130	8.28030	14.9331

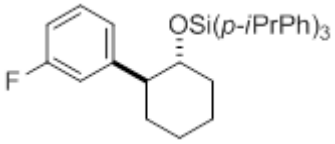
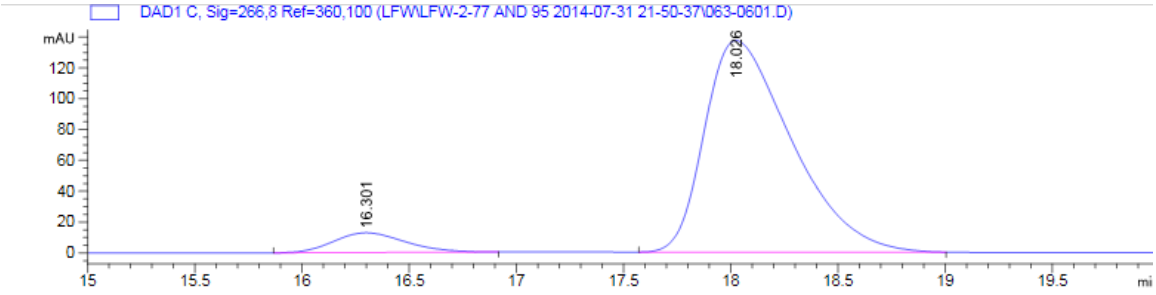


Table 2, Entry 5: Recovered product: 101 mg, 44%, colorless liquid. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.22 (d, *J* = 8.0 Hz, 6H), 7.18 – 7.10 (m, 7H), 6.90 – 6.83 (m, 2H), 6.70 – 6.65 (m, 1H), 3.76 (td, *J* = 10.3, 4.3 Hz, 1H), 2.94 – 2.81 (m, 3H), 2.71 – 2.62 (m, 1H), 2.04 – 1.94 (m, 1H), 1.86 – 1.27 (m, 7H), 1.24 (d, *J* = 6.9 Hz, 18H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 164.1, 161.7, 150.2, 147.8, 135.6, 131.9, 129.4, 126.0, 125.7, 124.1, 114.9, 114.7, 112.9, 112.6, 75.9 53.0, 36.4, 34.1, 33.9, 25.8, 25.0, 23.9. (Peaks splitting due to the fluorine) **IR** (neat, cm^{-1}) 3067, 2960, 1600, 1460, 1446, 1394, 1255, 1119, 1087, 994, 862, 770, 695. **HRMS (ESI)** Calculated for ($C_{39}H_{47}FOSi$ +) (M +): 578.3380 Observed: 578.3378. **Optical Rotation [α]$^{25}_{D}$**: -11.3 (c = 0.017) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 93:7)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.301	BB	0.3554	296.59589	12.74962	7.1039
2	18.026	BB	0.4297	3878.53809	137.24733	92.8961

Kinetic Resolution Data for Table 2, Entry 5

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	85:15	93:7	45.0	27	27
2	82:18	93:7	42.6	26	

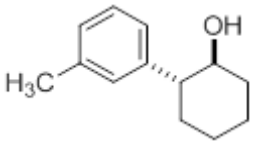
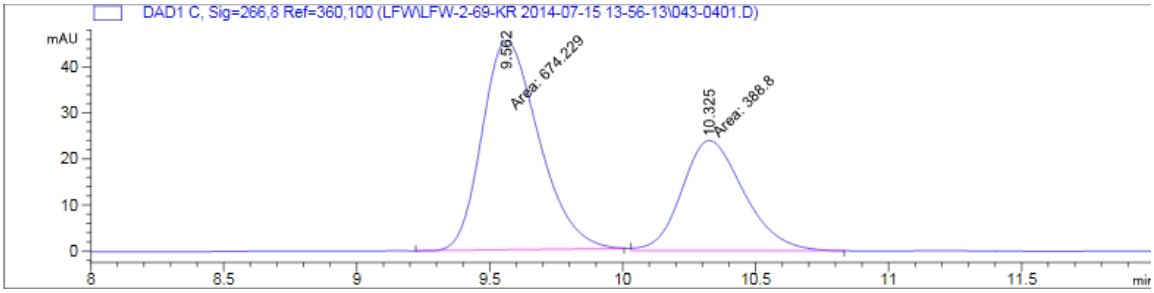


Table 2, Entry 6 : Recovered starting material: 53 mg, 70%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.22 (t, *J* = 7.5 Hz, 1H), 7.06 (d, *J* = 7.9 Hz, 3H), 3.70 – 3.61 (m, 1H), 2.44 – 2.36 (m, 1H), 2.35 (s, 3H), 2.15 – 2.07 (m, 1H), 1.89 – 1.71 (m, 3H), 1.60 – 1.27 (m, 4H), **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 143.2, 138.8, 128.7, 128.6, 127.6, 124.9, 74.4, 53.2, 34.4, 33.3, 26.1, 25.1, 21.5. **Optical Rotation $[\alpha]^{25}_D$**: +8.7 (c = 0.044) $CHCl_3$. Stereochemical assignment was matched with reported literature.[5]

HPLC separation conditions: Chiralpak OJ-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 9.6 min for (*S*)-enantiomer (major) and 10.3 min for (*R*)-enantiomer (minor). (er = 63:37)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.562	MM	0.2469	674.22943	45.51537	63.4253
2	10.325	MM	0.2703	388.79980	23.97302	36.5747

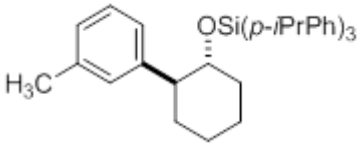
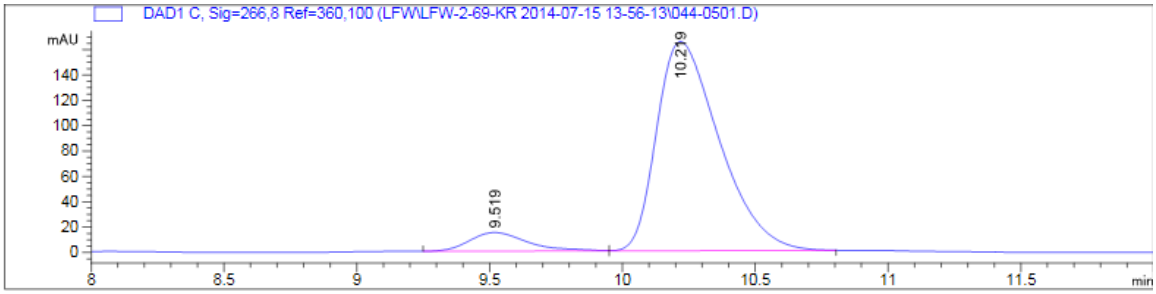


Table 2, Entry 6: Recovered product: 58 mg, 25%, white solid. **mp range =** 128-133 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): 7.19 (d, *J* = 8.0 Hz, 6H), 7.15 – 7.07 (m, 7H), 7.02 (d, *J* = 7.4 Hz, 1H), 6.85 (d, *J* = 10.9 Hz, 2H), 3.80 (td, *J* = 10.3, 4.2 Hz, 1H), 2.94 – 2.82 (m, 3H), 2.68 – 2.57 (m, 1H), 2.25 (s, 3H), 2.04 – 1.93 (m, 1H), 2.02 – 1.29 (m, 7H), 1.24 (d, *J* = 6.9 Hz, 18H). δ **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.0, 145.0, 137.5, 135.7, 132.1, 129.0, 128.2, 126.7, 125.6, 125.3, 76.1, 53.1, 36.5, 34.1, 30.3, 26.0, 25.1, 23.9, 21.5. **IR** (neat, cm^{-1}) 3102, 2933, 1623, 1450, 1282, 1173, 1071, 919, 838, 724, 715. **HRMS (ESI)** Calculated for ($C_{40}H_{50}OSi$ +) (M +): 574.3631 Observed: 574.3630. **Optical Rotation [α]$^{25}_{D}$**: -11.3 (c = 0.017) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 92:8)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.519	BV	0.2328	223.05510	14.72028	7.6130
2	10.219	VB	0.2524	2706.88354	165.03851	92.3870

Kinetic Resolution Data for Table 2, Entry 6

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	64:36	92:8	25.0	15	14
2	63:37	92:8	24.0	13	

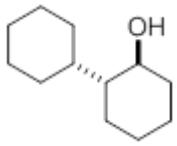


Table 2, Entry 7: Recovered starting material: 42 mg, 58%. **^{1}H NMR** (400 MHz, $CDCl_3$): 3.48 – 3.39 (m, 1H), 2.03 – 1.94 (m, 1H), 1.81 – 1.59 (m, 7H), 1.47 – 0.92 (m, 12H). δ ppm **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 71.2, 50.7, 37.1, 36.4, 31.6, 27.3, 27.2, 26.9, 26.9, 26.0, 25.3, 25.0. **Optical Rotation $[\alpha]^{25}_{D}$**: +5.4 (c = 0.027) $CHCl_3$. Stereochemical assignment was made by analogy to similar compounds in Table 2.

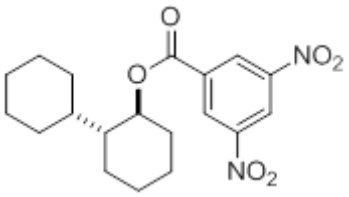
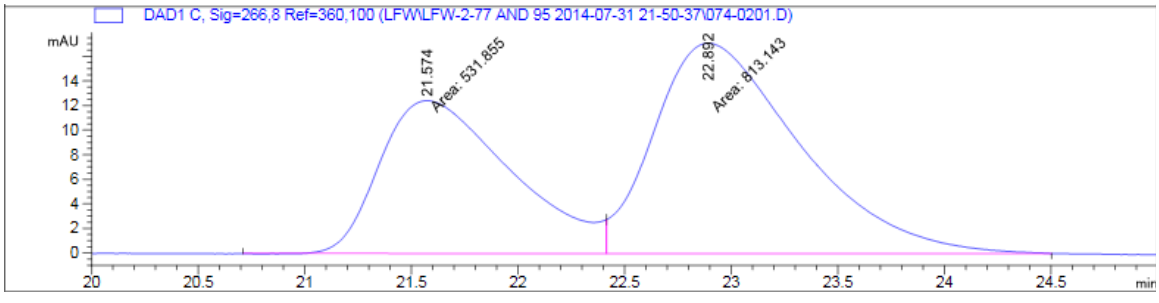


Table 2, Entry 7: Benzyl ester of recovered starting material formed through GP5: **^{1}H NMR** (400 MHz, $CDCl_3$): 9.24 (t, *J* = 2.1 Hz, 1H), 9.16 (d, *J* = 2.1 Hz, 2H), 5.10 (td, *J* = 10.3, 4.3 Hz, 1H), 9.25 – 9.22 (m, 1H), 1.86 – 0.92 (m, 19H), **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 162.0, 148.7, 134.6, 129.4, 122.2, 47.4, 37.9, 32.2, 31.2, 29.7, 27.6, 27.0, 26.9, 26.7, 25.6, 25.3, 24.6. **Optical Rotation $[\alpha]^{25}_{D}$**: +6.7 (c = 0.022) $CHCl_3$. Stereochemical assignment was made by analogy to similar compounds in Table 2.

HPLC separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 0.75 mL/min, 25 °C; t_R 21.6 min for (*R*)-enantiomer (minor) and 22.9 min for (*S*)-enantiomer (major). (er = 61:39)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.574	MM	0.7083	528.87708	12.44531	38.9903
2	22.892	MM	0.8039	827.55371	17.15611	61.0097

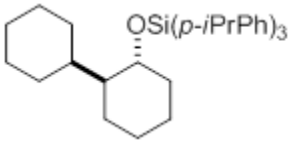
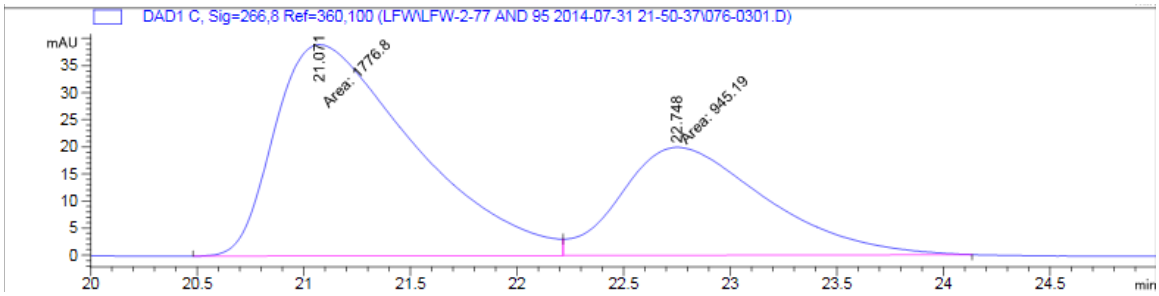


Table 2, Entry 7: Recovered product: 86 mg, 38%, white solid. **mp range =** 128-133 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): 7.55 (d, *J* = 8.0 Hz, 6H), 7.21 (d, *J* = 7.9 Hz, 6H), 3.58 (td, *J* = 9.8, 4.2 Hz, 1H), 2.90 (hept, *J* = 6.9 Hz, 3H), 2.01 – 1.30 (m, 12H), 1.21 – 0.81 (m, 8H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.3, 135.8, 132.5, 125.8, 72.9, 50.5, 36.2, 36.1, 34.2, 31.9, 27.3, 27.0, 26.8, 25.7, 24.9, 24.8, 23.9, 23.9. **IR** (neat, cm^{-1}) 3011, 2959, 2853, 1600, 1460, 1363, 1298, 1118, 1080, 938, 868, 813, 770. **HRMS (ESI)** Calculated for ($C_{39}H_{54}OSi$ +) (M +): 566.3944 Observed: 566.3946. **Optical Rotation [α]$^{25}_{D}$**: -2.9 (c = 0.019) $CHCl_3$

HPLC data is of the desilylated, benzoylated product following GP4 and GP5. The same HPLC separation conditions as the benzoylated, recovered starting materials were utilized. (er = 65:35)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.071	MM	0.7593	1776.80334	39.00140	65.2758
2	22.748	MM	0.7903	945.19012	19.93430	34.7242

Kinetic Resolution Data for Table 2, Entry 7

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	61:39	65:35	42.3	2	2
2	60:40	65:35	40.0	2	

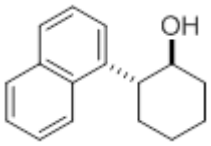
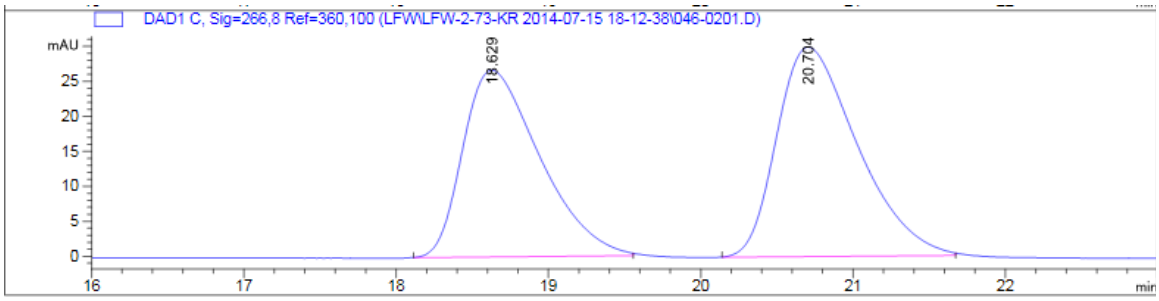


Table 2, Entry 8: Recovered starting material: 77 mg, 85%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 8.20 (d, *J* = 8.4 Hz, 1H), 7.90 – 7.84 (m, 1H), 7.78 – 7.72 (m, 1H), 7.57 – 7.45 (m, 4H), 4.05 – 3.95 (m, 1H), 3.44 – 3.35 (m, 1H), 2.28 – 2.18 (m, 1H)**,** 2.04 – 1.75 (m, 3H)**,** 1.65 – 1.41 (m, 4H)**. ^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 139.5, 134.2, 132.7, 129.0, 127.1, 126.1, 125.7, 125.7, 123.2, 122.7, 74.3, 46.7, 34.8, 33.9, 26.4, 25.2. **Optical Rotation $[\alpha]^{25}_{D}$**: +1.8 (c = 0.017) $CHCl_3$. Stereochemical assignment was matched with reported literature.[5]

HPLC separation conditions: Chiralpak OJ-H Column 3% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 18.6 min for (*R*)-enantiomer (minor) and 20.7 min for (*S*)-enantiomer (major). (er = 54:46)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.629	BB	0.5221	938.14044	26.68749	46.0087
2	20.704	BB	0.5549	1100.91089	29.94416	53.9913

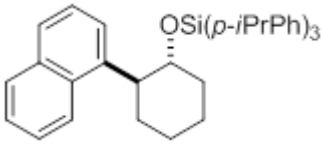
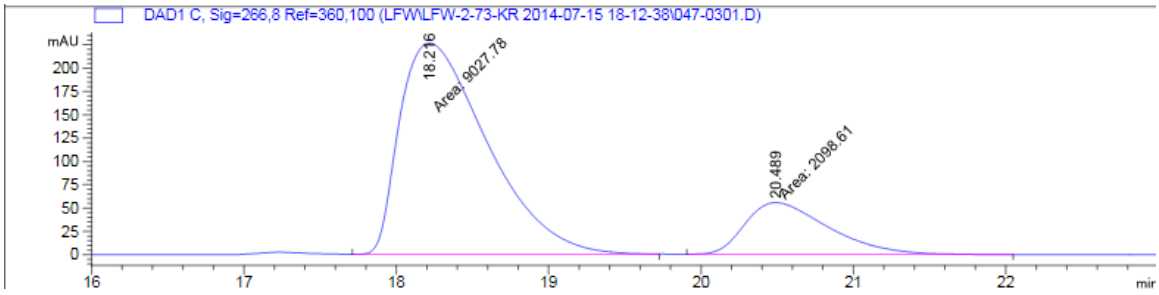


Table 2, Entry 8: Recovered product: 23 mg, 10%, white solid. **mp range =** 140-142 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 8.29 (d, *J* = 8.1 Hz, 1H), 7.91 – 7.84 (m, 1H), 7.65 (d, *J* = 8.1 Hz, 1H), 7.54 – 7.44 (m, 2H), 7.19 (t, *J* = 7.7 Hz, 1H), 7.07 (d, *J* = 7.9 Hz, 6H), 7.03 – 6.96 (m, 7H). 4.11 – 4.00 (m, 1H), 3.68 – 3.55 (m, 1H), 2.84 (hept, *J* = 6.9 Hz, 3H), 2.15 – 2.06 (m, 1H), 1.99 – 1.88 (m, 1H), 1.82 – 1.64 (m, 3H), 1.49 – 1.34 (m, 3H), 1.22 (dd, *J* = 6.9, 1.1 Hz, 18H). δ **^{13}C NMR** (101 MHz, $CDCl_3$) δ

ppm 149.9, 141.2, 135.6, 134.0, 132.7, 132.0, 128.7, 126.0, 125.6, 125.5, 125.1, 123.8, 104.0, 103.0, 76.2, 36.9, 34.1, 26.3, 25.2, 23.8, 23.8, 18.0. **IR** (neat, cm^{-1}) 3011, 2960, 2930, 2868, 1600, 1460, 1362, 1119, 1094, 972, 823, 811, 776. **HRMS (ESI)** Calculated for ($C_{43}H_{50}OSi$ +) (M +): 610.3631 Observed: 610.3630. **Optical Rotation $[\alpha]^{25}_D$**: -12.5 (c = 0.017) $CHCl_3$

HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er = 81:19)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.216	MM	0.6646	9027.78027	226.39357	81.1385
2	20.489	MM	0.6319	2098.60742	55.35519	18.8615

Kinetic Resolution Data for Table 2, Entry 8

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	54:46	81:19	11.0	5	5
2	53:47	80:20	9.0	4	

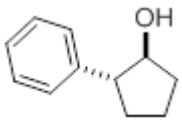
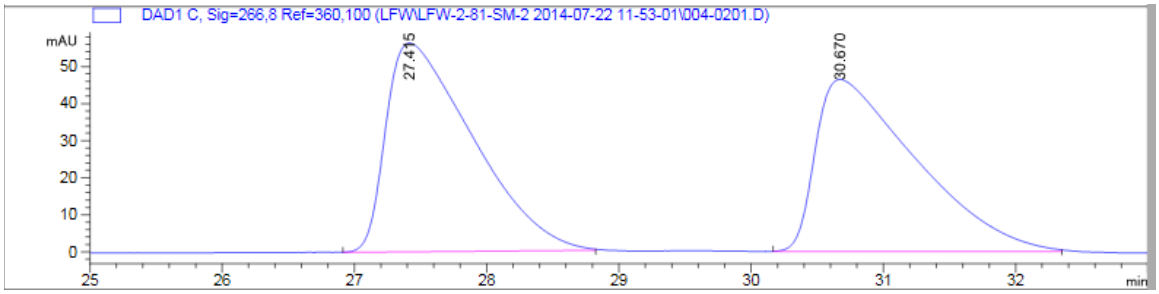


Table 2, Entry 9: Recovered starting material: 27 mg, 42%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.34 – 7.18 (m, 5H), 4.14 (q, *J* = 7.2 Hz, 1H), 2.92 – 2.80 (m, 1H), 2.21 – 2.03 (m, 2H), 1.93 – 1.60 (m, 5H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 143.3, 128.6, 127.4, 126.4, 80.5, 54.5, 34.0, 31.9, 21.8. **Optical Rotation $[\alpha]^{25}_D$**: +1.8 (c = 0.017) $CHCl_3$, Stereochemical assignment was matched with reported literature.[5]

HPLC separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 27.4 min for (*S*)-enantiomer (major) and 30.7 min for (*R*)-enantiomer (minor). (er = 51:49)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.415	BB	0.6439	2569.69312	56.36797	51.2580
2	30.670	BB	0.7226	2443.55957	46.38841	48.7420

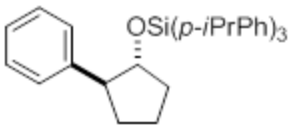
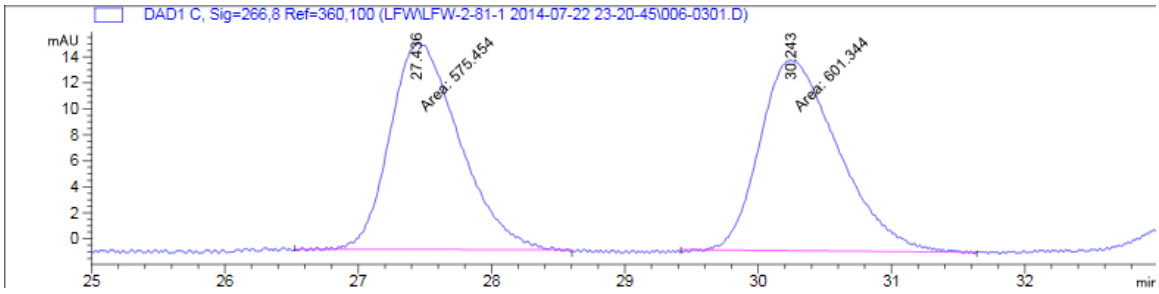


Table 2, Entry 9: Recovered product: 114 mg, 52%, white solid. **mp range =** 115-118 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.40 (d, *J* = 8.0 Hz, 6H), 7.20 – 7.11 (m, 9H), 7.02 – 6.98 (m, 2H), 4.28 (q, *J* = 6.0 Hz, 1H), 3.09 (dd, *J* = 14.5, 8.2 Hz, 1H), 2.87 (hept, *J* = 6.9 Hz, 3H), 2.22 – 2.10 (m, 1H), 1.94 – 1.34 (m, 5H), 1.24 (d, *J* = 6.9 Hz, 18H)**^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.3, 144.0, 135.6, 132.0, 128.2, 127.8, 125.9, 125.8, 81.9, 54.6, 34.6, 34.2, 31.3, 23.9, 22.4. **IR** (neat, cm^{-1}) 3012, 2959, 1600, 1459, 1298, 1118, 1093, 952, 888, 769, 699. **HRMS (ESI)** Calculated for ($C_{38}H_{46}OSi$ +) (M +): 546.3318 Observed: 546.3320. **Optical Rotation [α]$^{25}_D$**: -1.1 (c = 0.017) $CHCl_3$

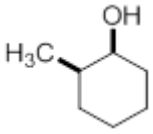
HPLC data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized. (er= 51:49)



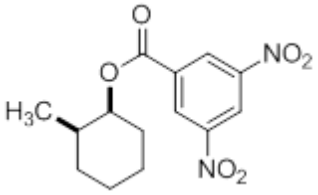
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.436	MM	0.6026	575.45380	15.91496	48.9000
2	30.243	MM	0.6812	601.34424	14.71205	51.1000

Kinetic Resolution Data for Table 2, Entry 9

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	51:49	51:49	54.0	1.1	1.1
2	51:49	51:49	54.0	1.1	

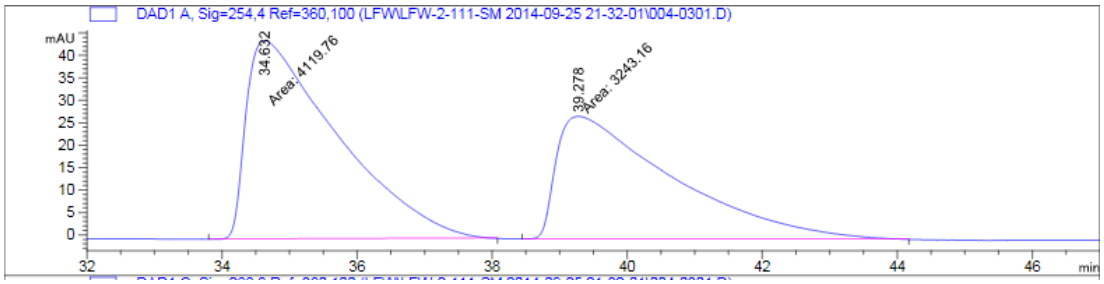


Scheme 2, 9: Recovered starting material: 11 mg, 24%. **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 3.80 – 3.74 (m, 1H), 1.78 – 1.19 (m, 9H), 0.93 (d, *J* = 7.0 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 71.1, 35.8, 32.5, 28.8, 24.5, 20.7, 17.0. **Optical Rotation $[\alpha]^{25}_{D}$**: +2.1 (c = 0.077) $CHCl_3$. Stereochemical assignment was matched with reported literature.[6]

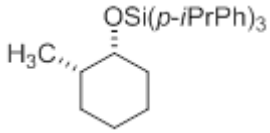


Scheme 2, 9: Benzyl ester of recovered starting material formed through GP5: **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 9.24 (t, *J* = 2.1 Hz, 1H), 9.16 (d, *J* = 2.2 Hz, 2H), 5.33 – 5.29 (m, 1H), 2.09 – 1.10 (m, 9H), 0.98 (d, *J* = 6.9 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 162.1, 148.7, 134.7, 129.3, 122.2, 34.7, 29.7, 29.7, 24.3, 21.2, 27.4, 25.3. **Optical Rotation $[\alpha]^{25}_{D}$**: +3.2 (c = 0.027) $CHCl_3$.

HPLC separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 34.6 min for (*S*)-enantiomer (major) and 39.3 min for (*R*)-enantiomer (minor). (er = 56:44)



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	34.632	MM	1.5549	4119.76367	44.15929	55.9528
2	39.278	MM	1.9803	3243.16284	27.29562	44.0472

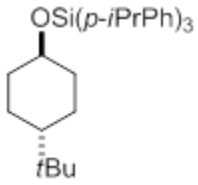


Scheme 2, 9: Recovered product: 97 mg, 49%, white solid. **mp range =** 120-125 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.57 (d, *J* = 8.0 Hz, 6H), 7.21 (d, *J* = 7.9 Hz, 6H), 3.92 (dt, *J* = 5.2, 2.6 Hz, 1H), 2.96 – 2.85 (m, 3H), 1.81 – 1.30 (m, 9H), 1.25 (d, *J* = 6.9 Hz, 18H), 0.85 (d, *J* = 6.6 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.2, 135.7, 131.7, 125.8, 72.9, 36.7, 34.1, 32.6, 29.4, 24.4, 23.9, 21.3, 17.3 **IR** (neat, cm^{-1}) 3012, 2960, 2930, 1667, 1600, 1553, 1460, 1394, 1363, 1298, 1263, 1119, 1091, 1050, 1018, 961, 878, 822, 770, 746, 733. **HRMS (ESI)** Calculated for ($C_{38}H_{46}OSi$ +) (M +): 498.3318 Observed: 546.3320. **Optical Rotation [α]$^{25}_{D}$**: -2.3 (c = 0.018) $CHCl_3$

Due to the volatility of the desilylated product, only trace amounts of the desilylated product were collected after removal of the solvent under vacuum. Thus NMR conversion was used for the calculation of the selectivity factor.

Kinetic Resolution Data for Scheme 2, 9

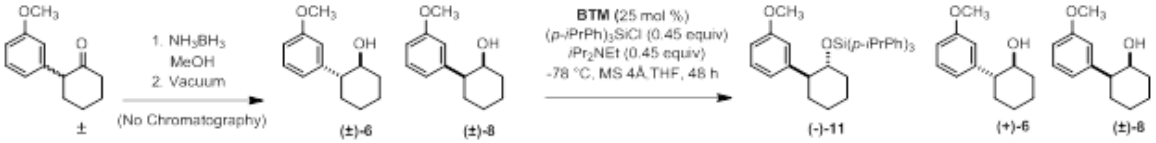
	er^{SM}	% conv	*s*	$s_{AVERAGE}$
1	51:49	54.0	1.4	1.4
2	51:49	54.0	1.4	



Scheme 2, *trans*-10: Recovered product: 104 mg, 48%, white solid. **mp range =** 140-143 °C . **^{1}H NMR** (400 MHz, $CDCl_3$): δ ppm 7.55 (d, *J* = 8.0 Hz, 6H), 7.22 (d, *J* = 7.9 Hz, 6H), 3.73 – 3.64 (m, 1H), 2.90 (hept, *J* = 6.9 Hz, 3H), 1.96 – 1.85 (m, 2H), 1.70 – 1.61 (m, 2H), 1.45 – 1.31 (m, 2H), 1.25 (d, *J* = 6.9 Hz, 18H), 0.99 – 0.82 (m, 3H), 0.78 (s, 9H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ ppm 150.3, 135.6, 132.5, 125.9, 72.7, 47.2, 36.3, 34.2, 32.3, 27.7, 25.7, 23.9. **IR** (neat, cm^{-1}) 3012, 1600, 1496, 1460, 1364, 1298, 1117, 1050, 999, 843, 769 **HRMS (ESI)** Calculated for ($C_{37}H_{52}OSi$ +) (M +): 540.3787 Observed: 540.3790.

Scheme 3:

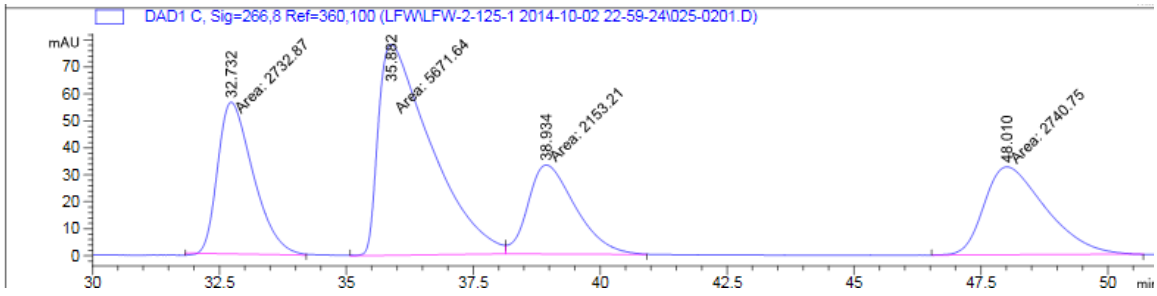
SI Scheme 1. one-pot reduction/kinetic resolution to isolate (1R,2S)-2-(3-methoxyphenyl)cyclohexan-1-ol enantiomerically enriched,



Procedure: See GP1.

HPLC of (+)-6:

Separation conditions: Chiralpak OD-H Column 2% isopropyl alcohol in hexane, flow rate: 1 mL/min, 25 °C; t_R 32.7 min and 48.0 min for two enantiomers of *cis*-2-(3-methoxyphenyl)cyclohexan-1-ol. t_R 35.9 min for (1*S*,2*R*)-2-(3-methoxyphenyl)cyclohexan-1-ol (major) and 38.9 min for (1*R*,2*S*)-2-(3-methoxyphenyl)cyclohexan-1-ol.

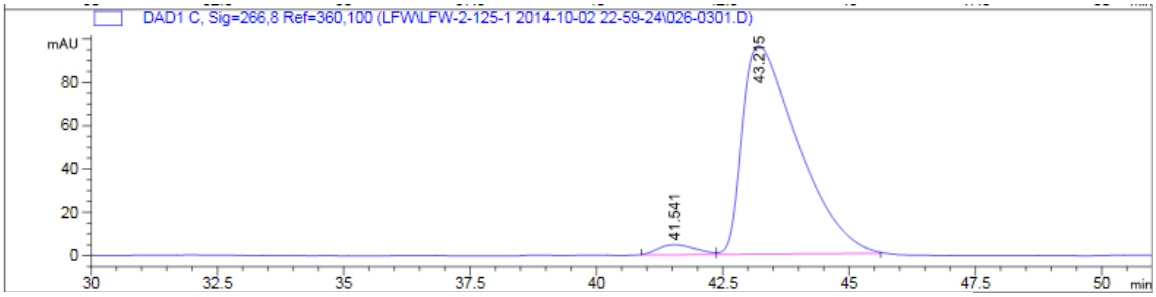


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	32.732	MM	0.8103	2732.86597	56.21363	49.9280
2	48.010	MM	1.4018	2740.74951	32.58558	50.0720

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	35.882	MM	1.2089	5671.64160	78.19499	72.4824
2	38.934	MM	1.0863	2153.20874	33.03622	27.5176

HPLC of desilylated (-)-11:

Separation conditions: Data is of the desilylated product formed by following GP4. The same HPLC separation conditions as the recovered starting materials were utilized.



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	41.541	BV	0.6017	235.11639	4.60508	3.0838
2	43.215	VB	1.0782	7389.15771	96.08588	96.9162

Kinetic Resolution Data for SI Scheme 3

	er^{SM}	er^{PR}	% conv	*s*	$s_{AVERAGE}$
1	78:22	96:4	37.3	49	50
2	72:28	97:3	32.7	50	

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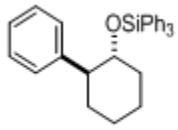
Spectroscopic Data of Selected Compounds



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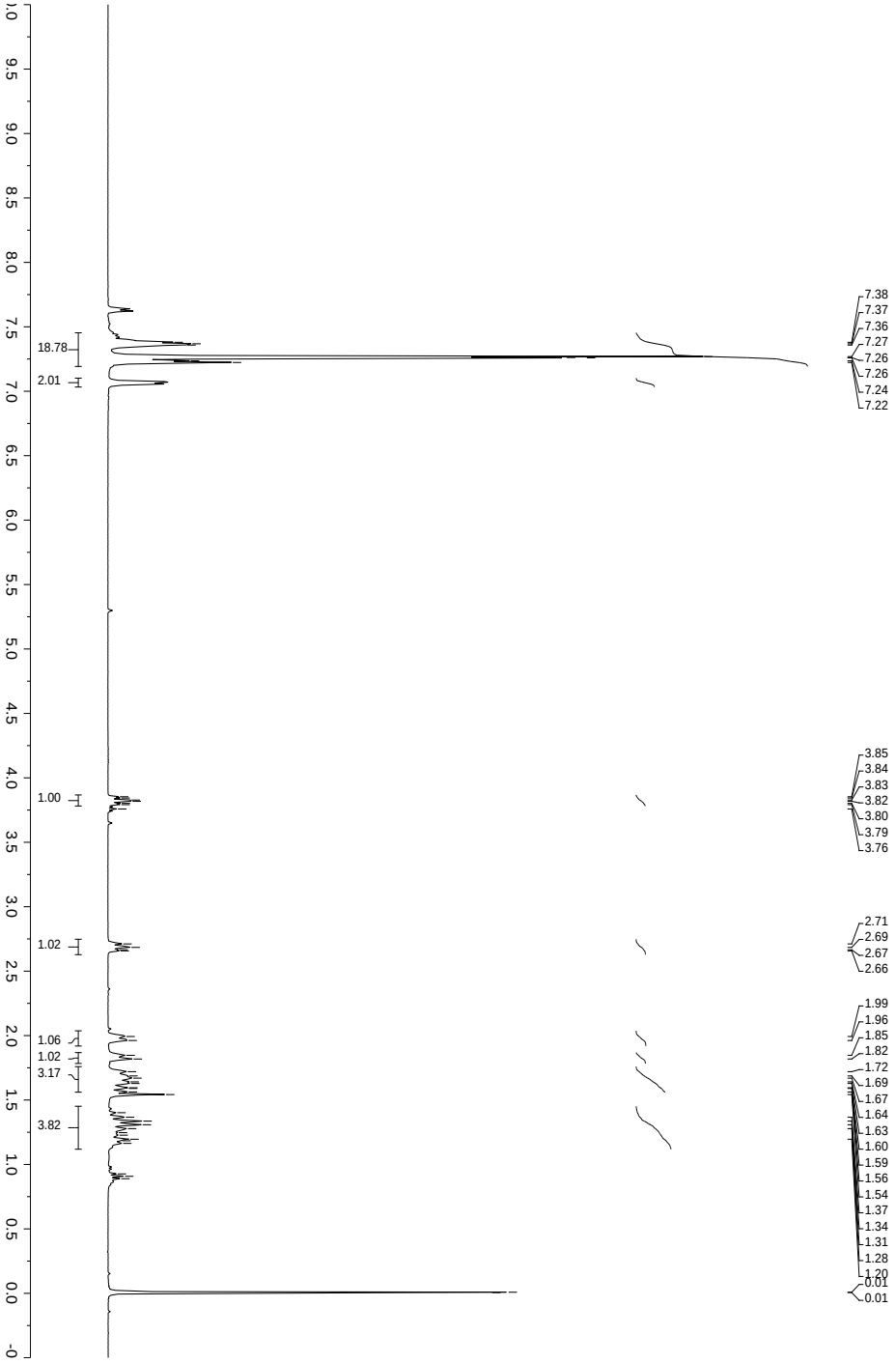

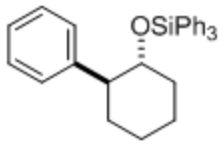

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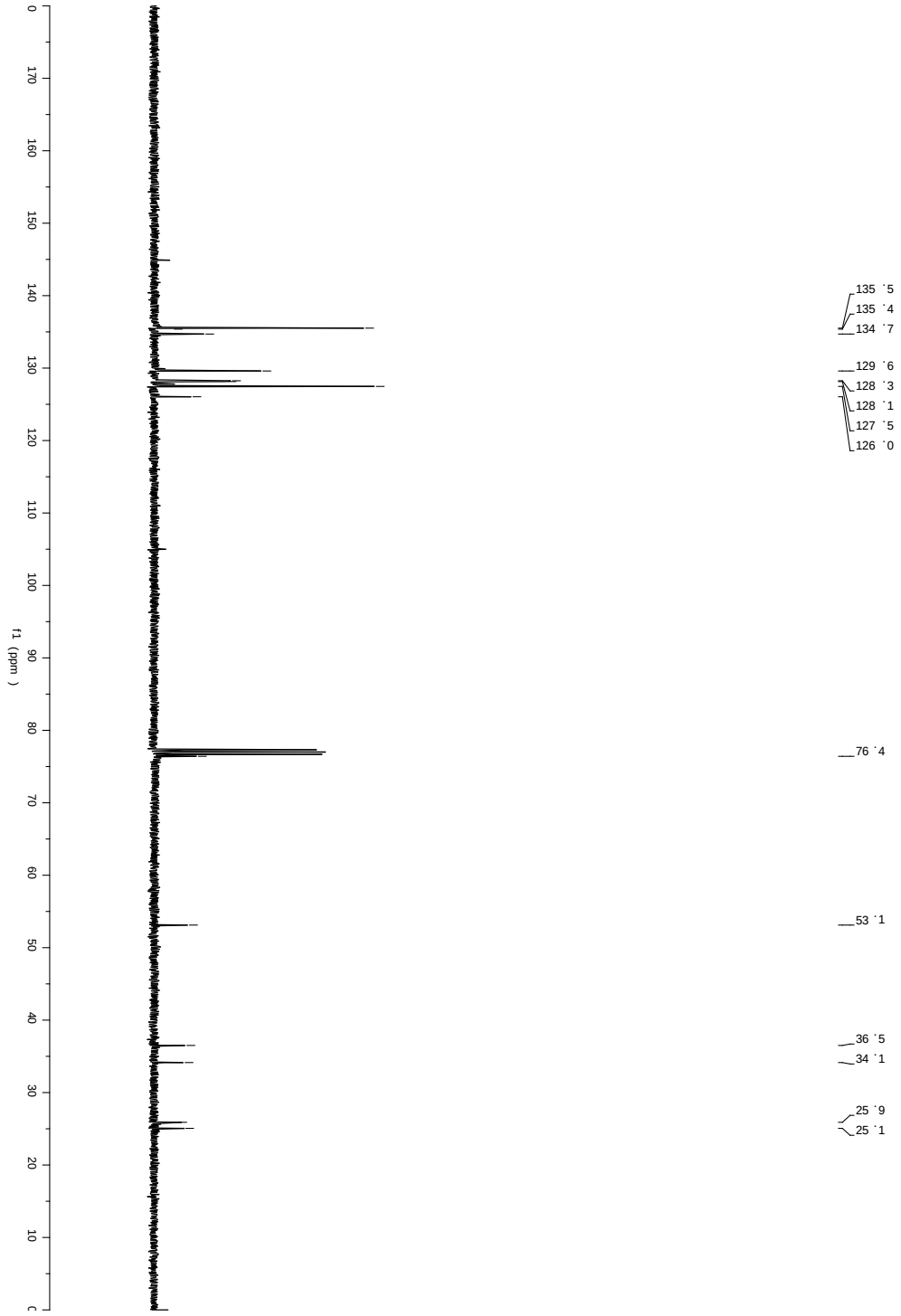

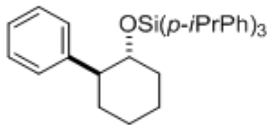

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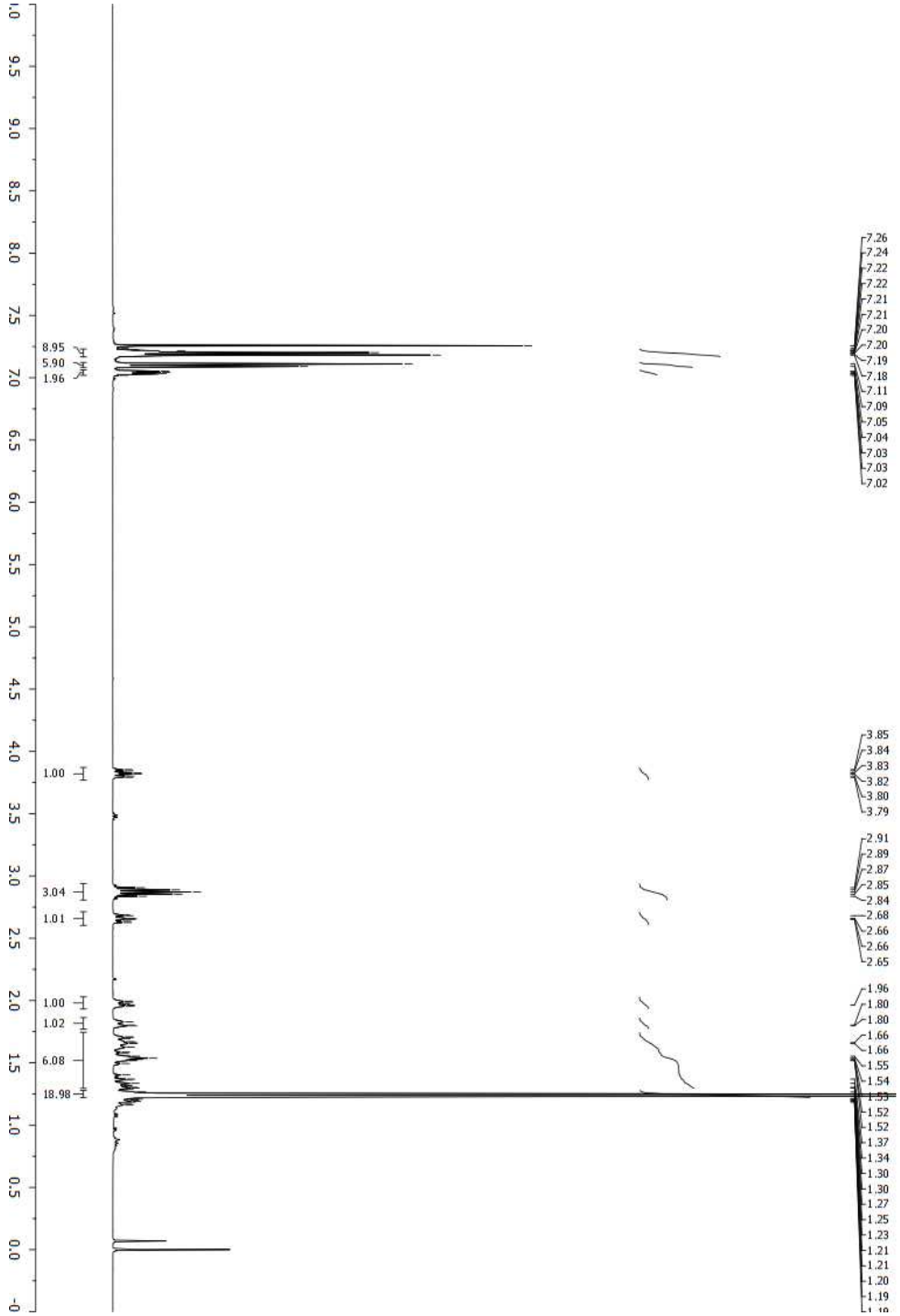

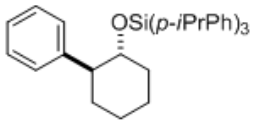

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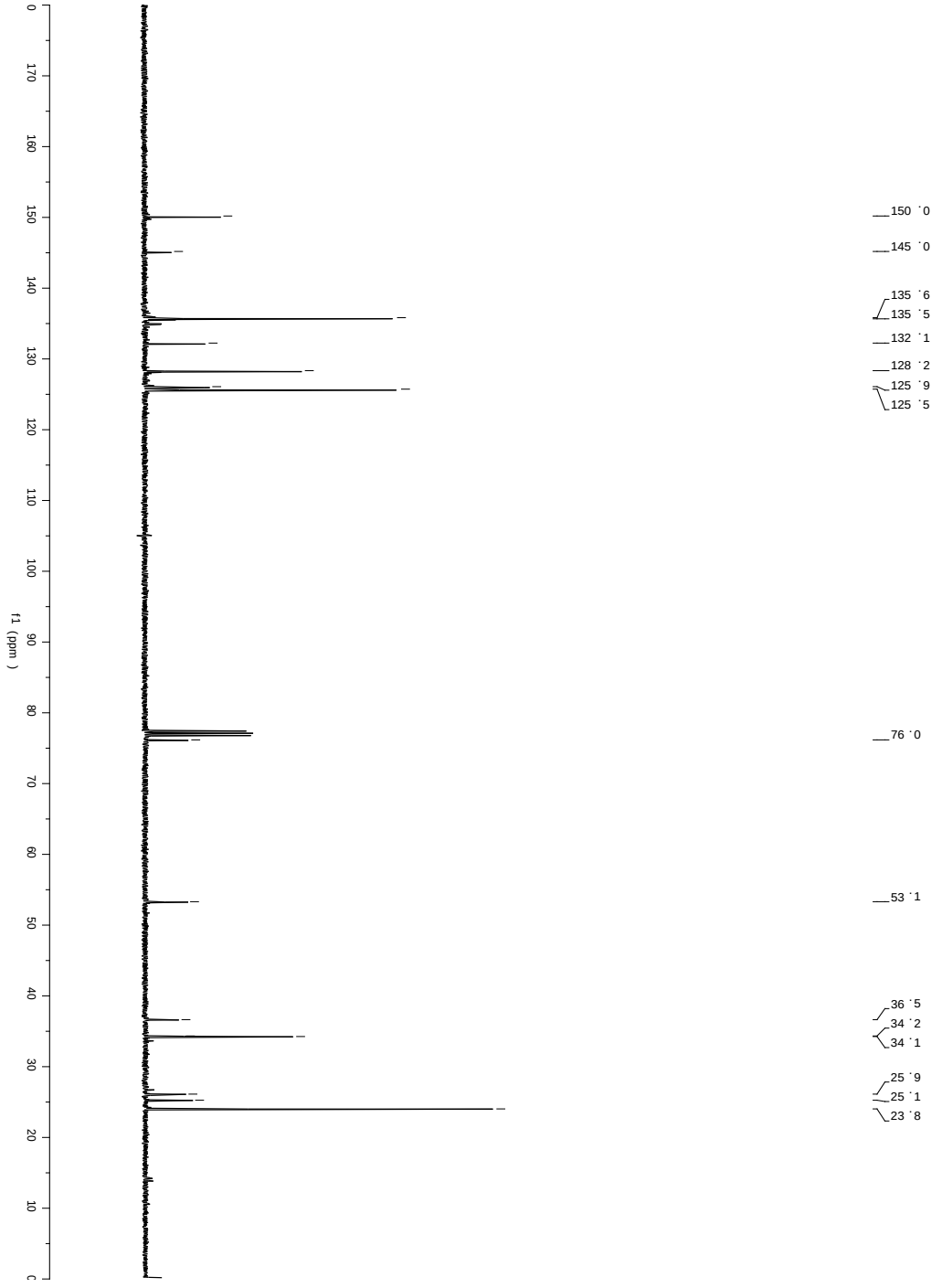

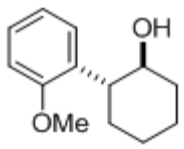

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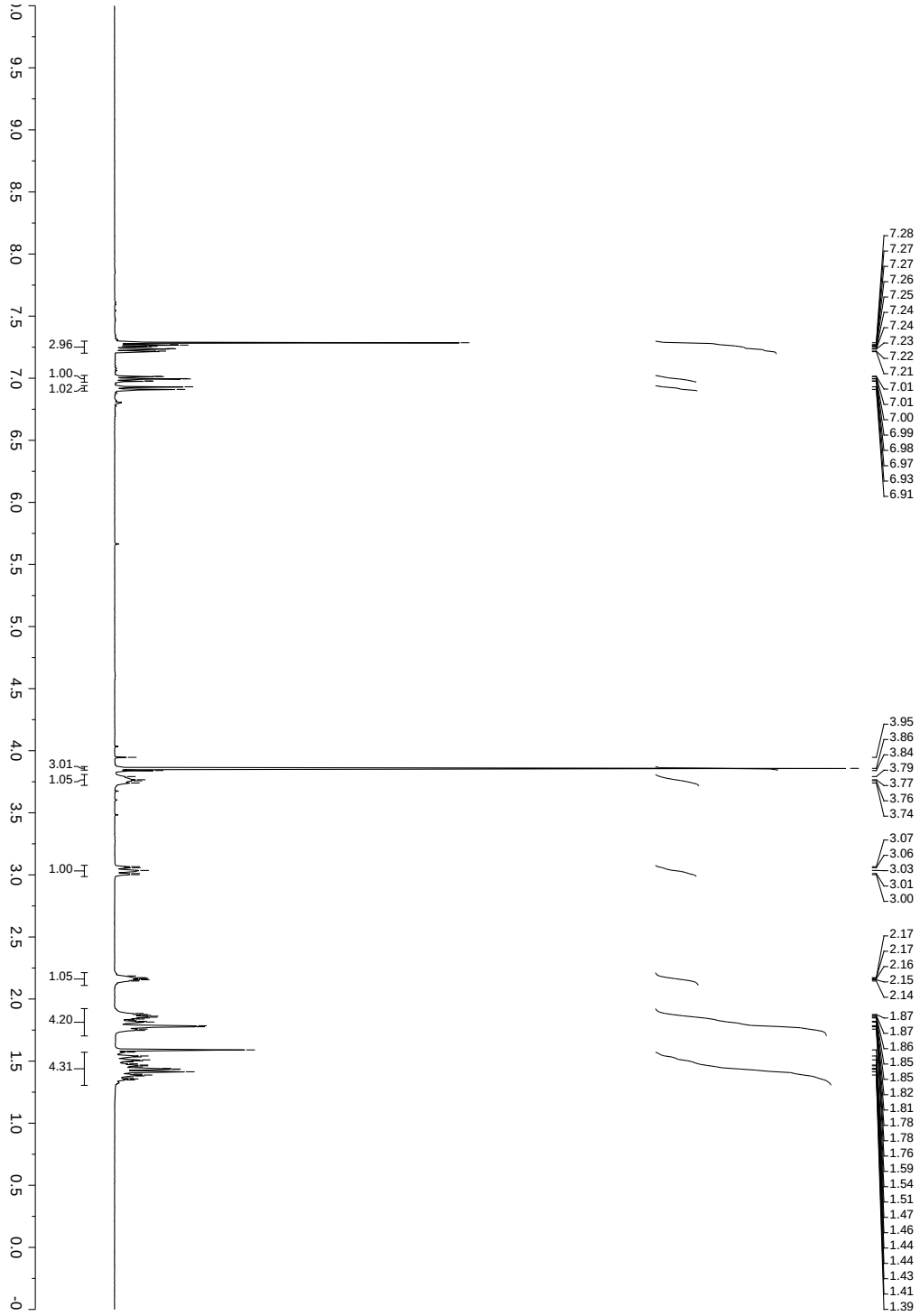

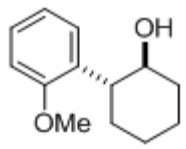

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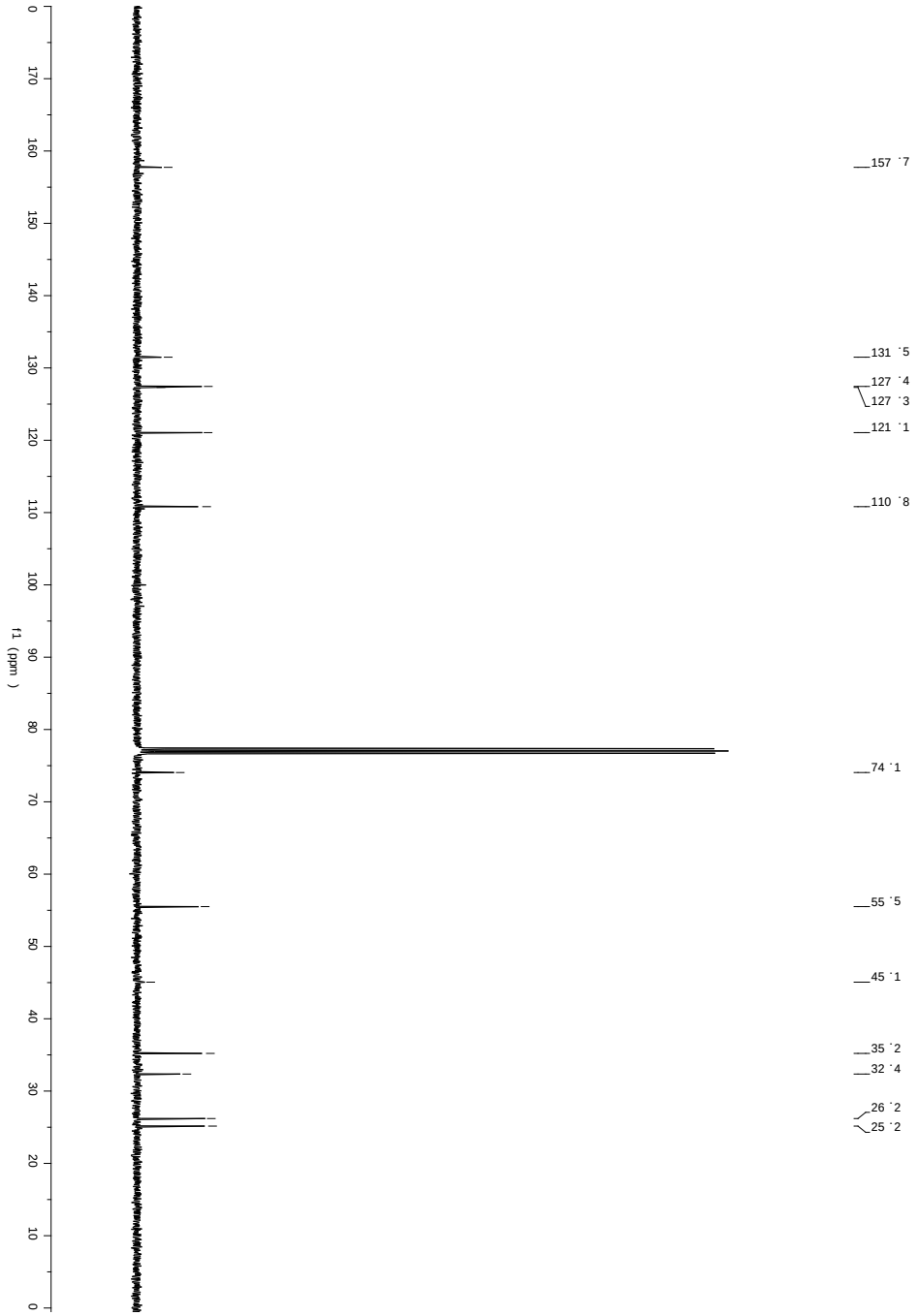

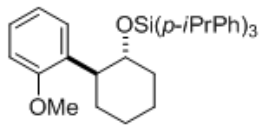

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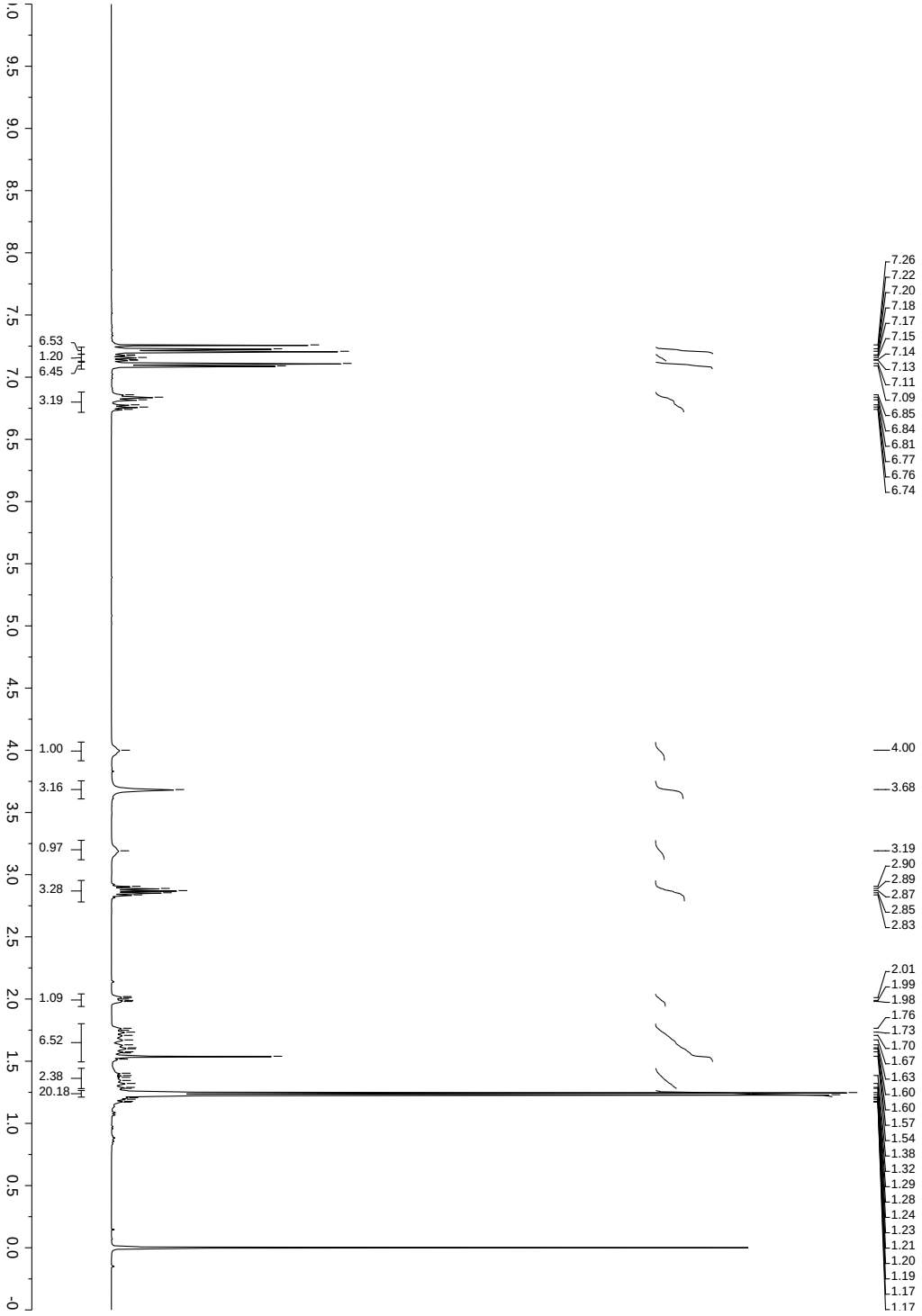

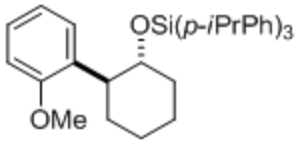

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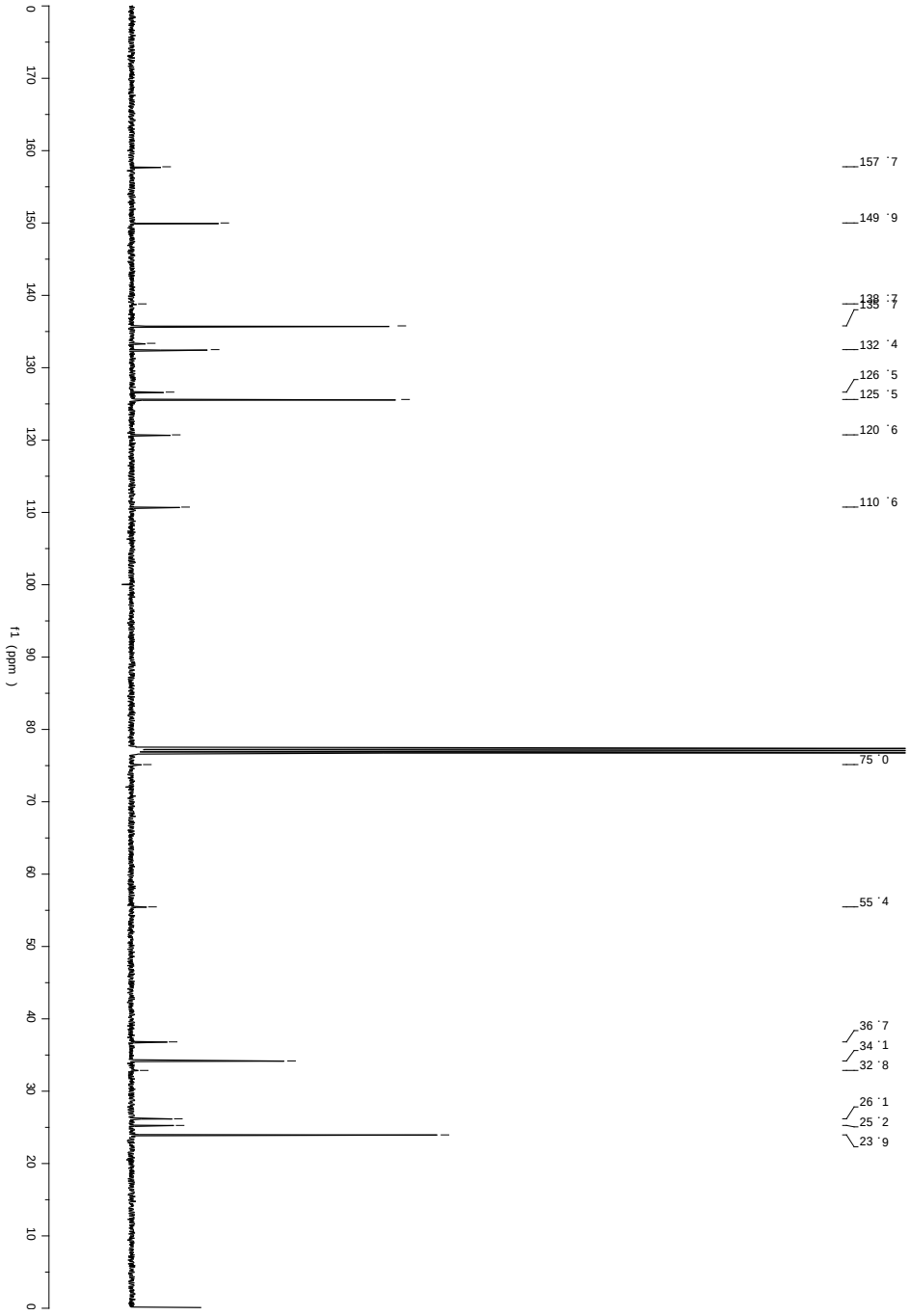

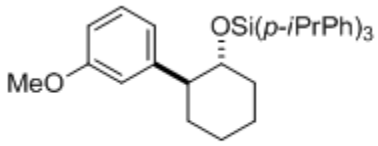

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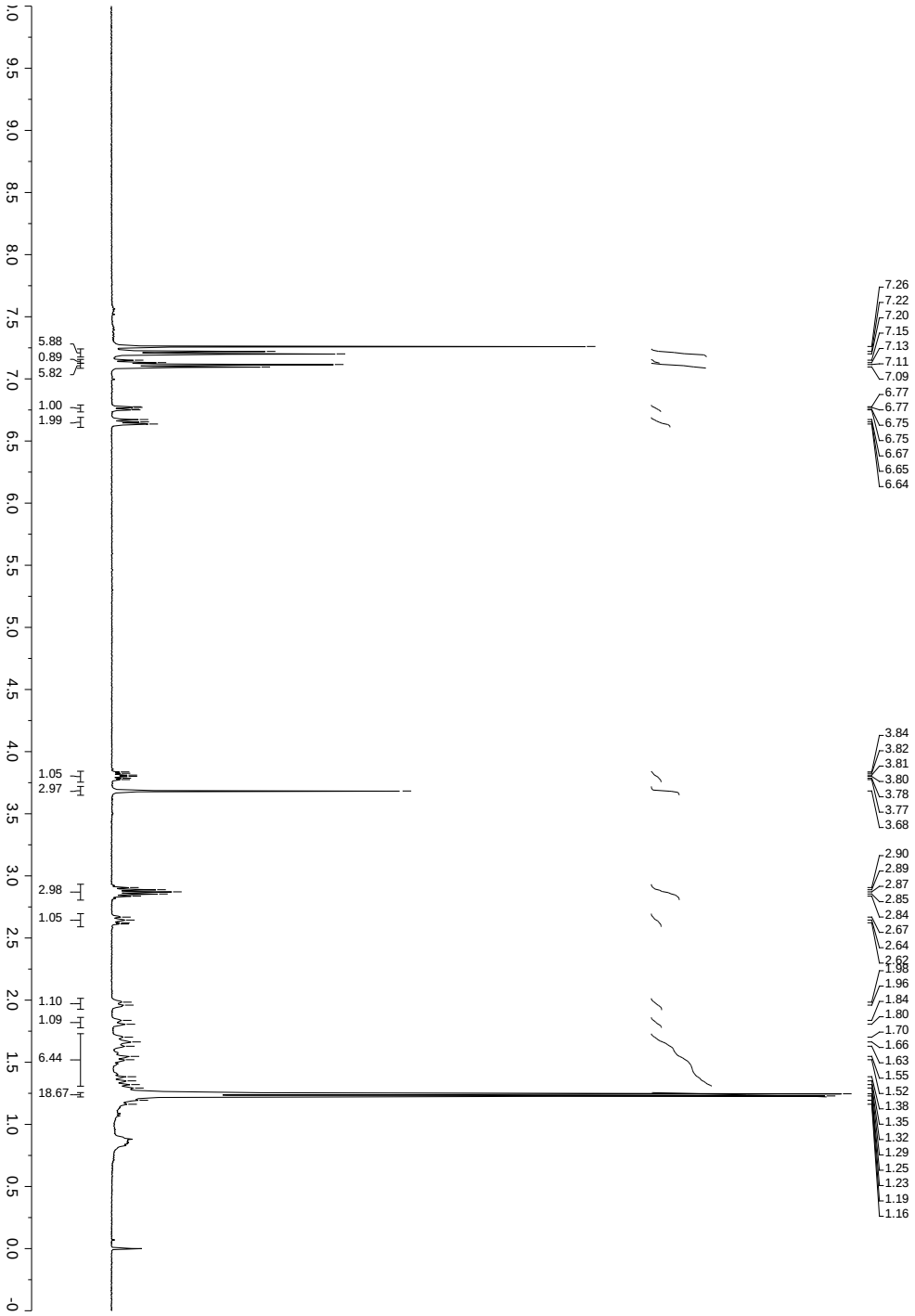

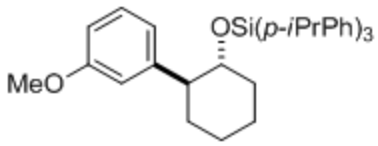

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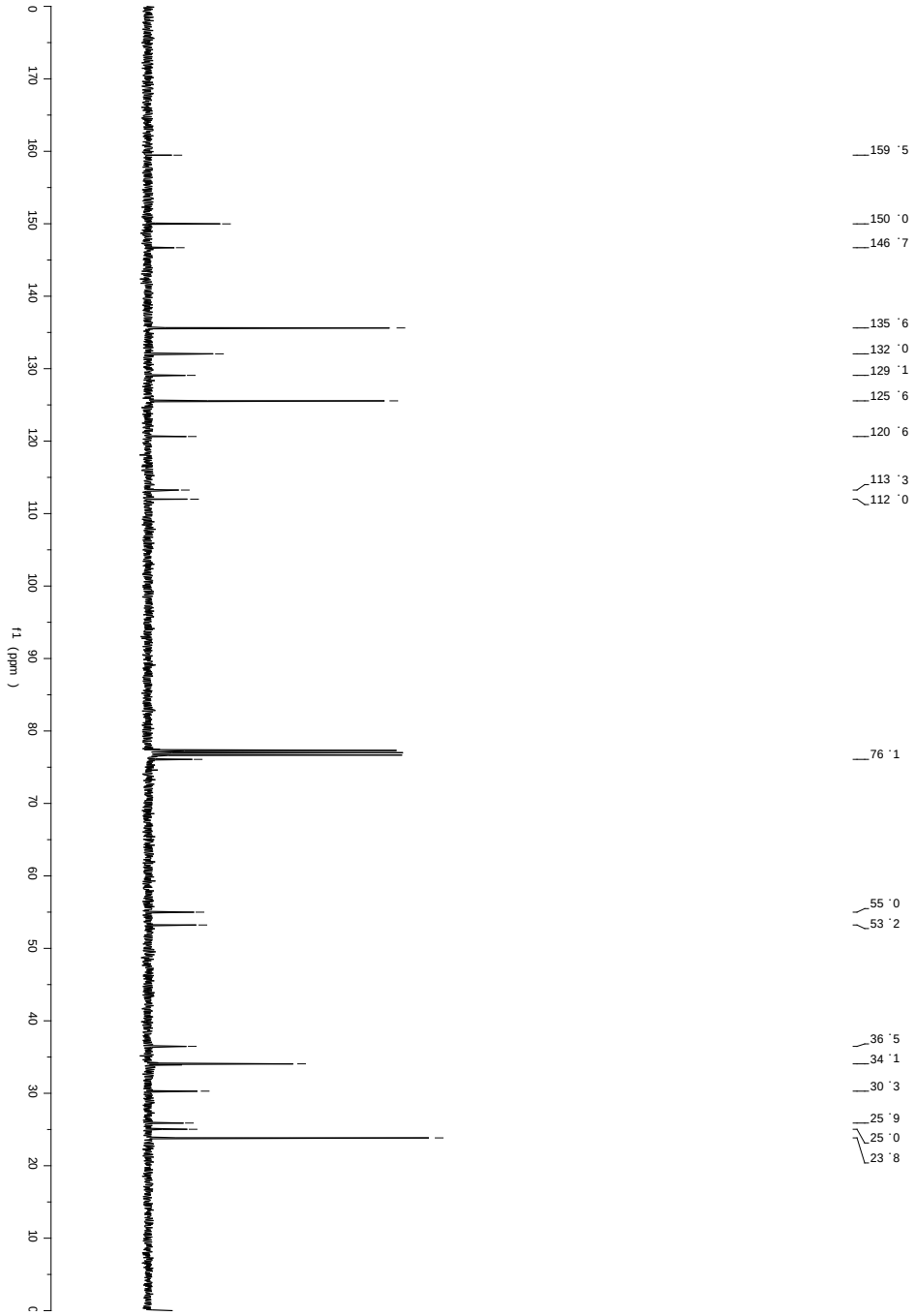
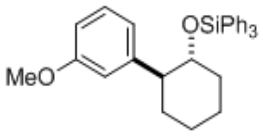
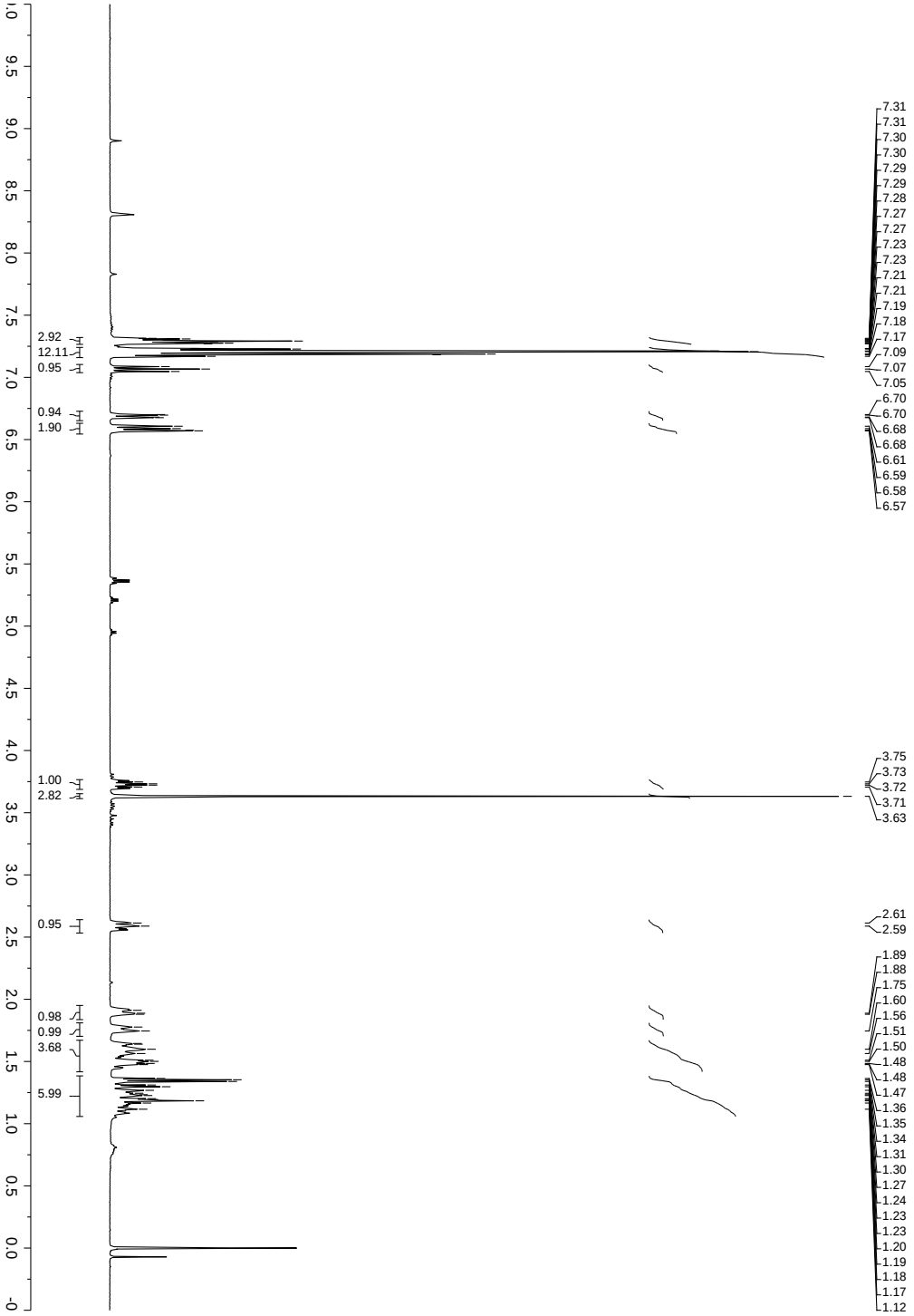
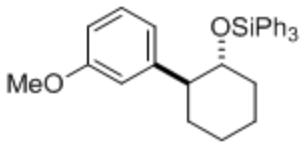




Kinetic resolution with triphenylsilyl chloride (3a)





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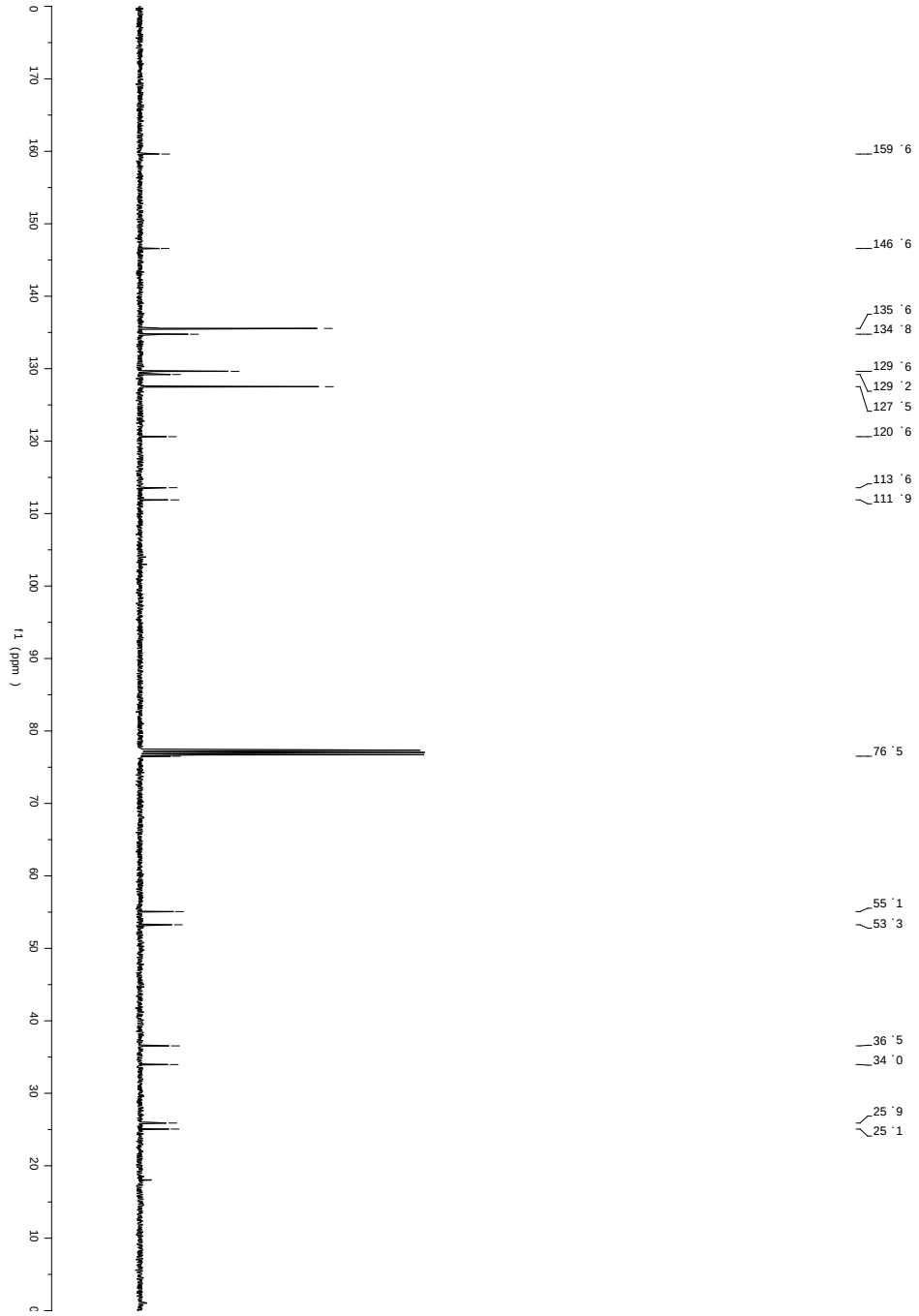

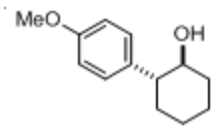

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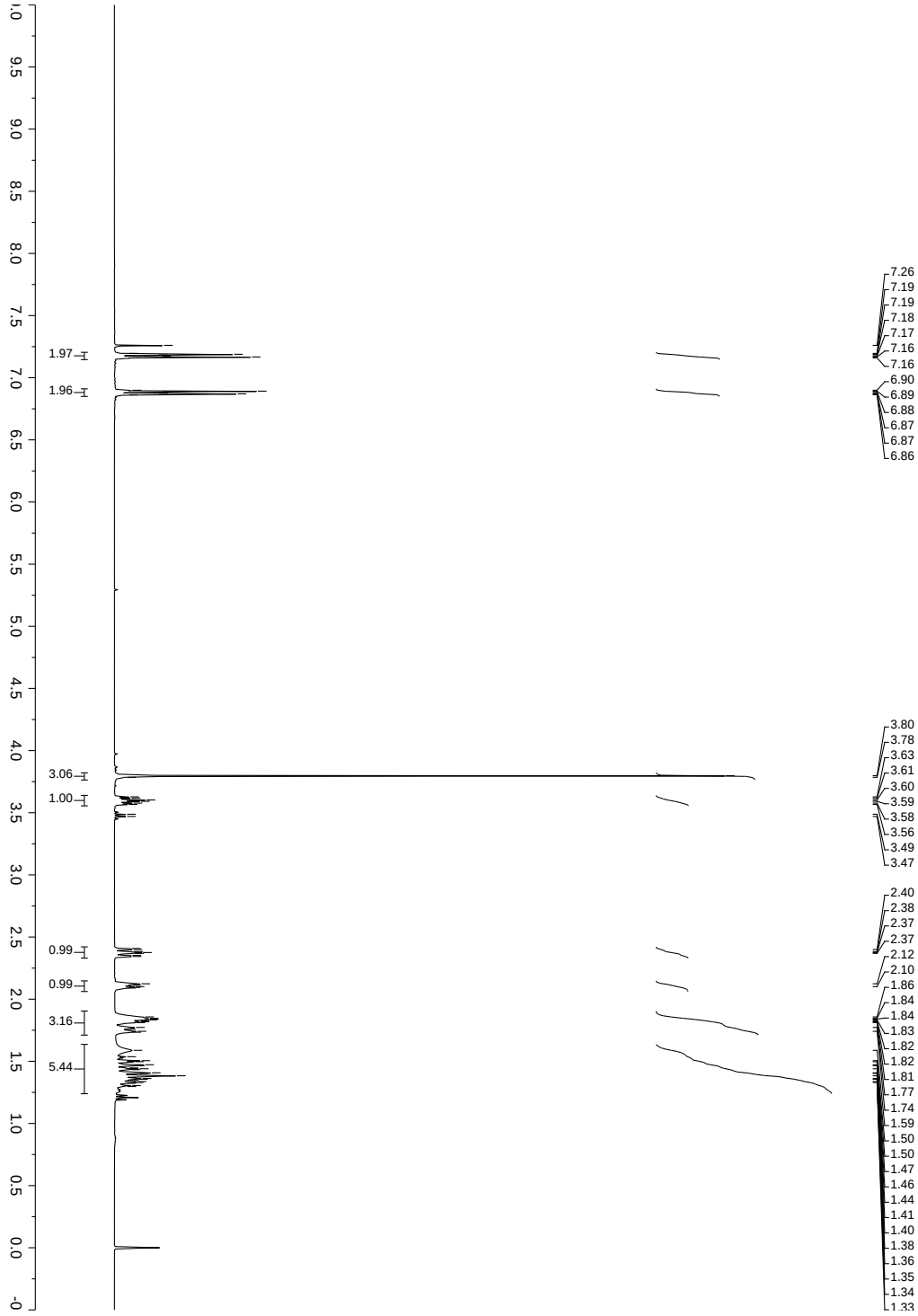

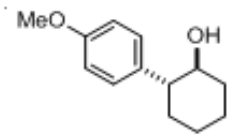

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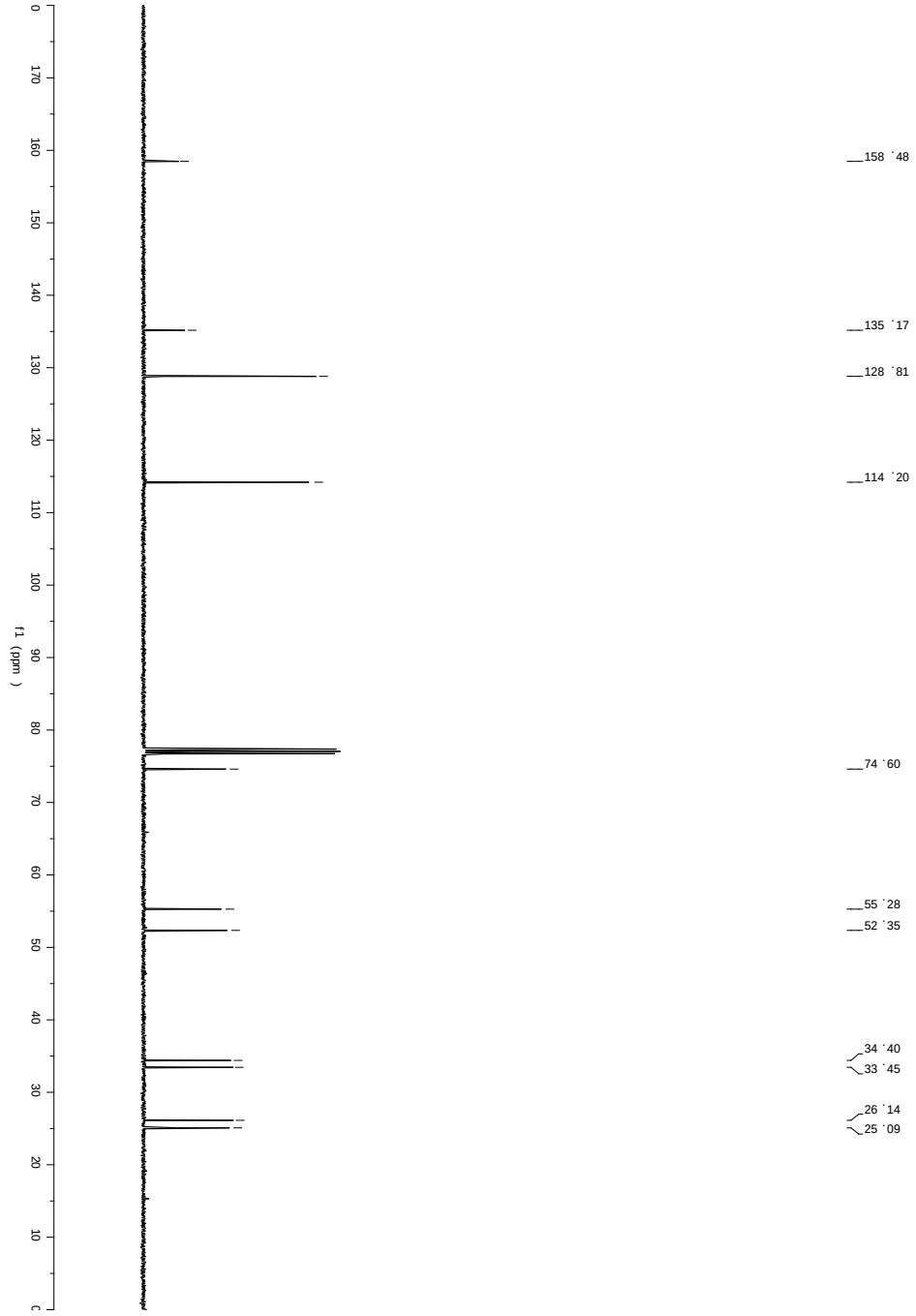

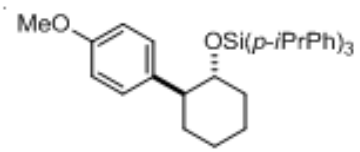

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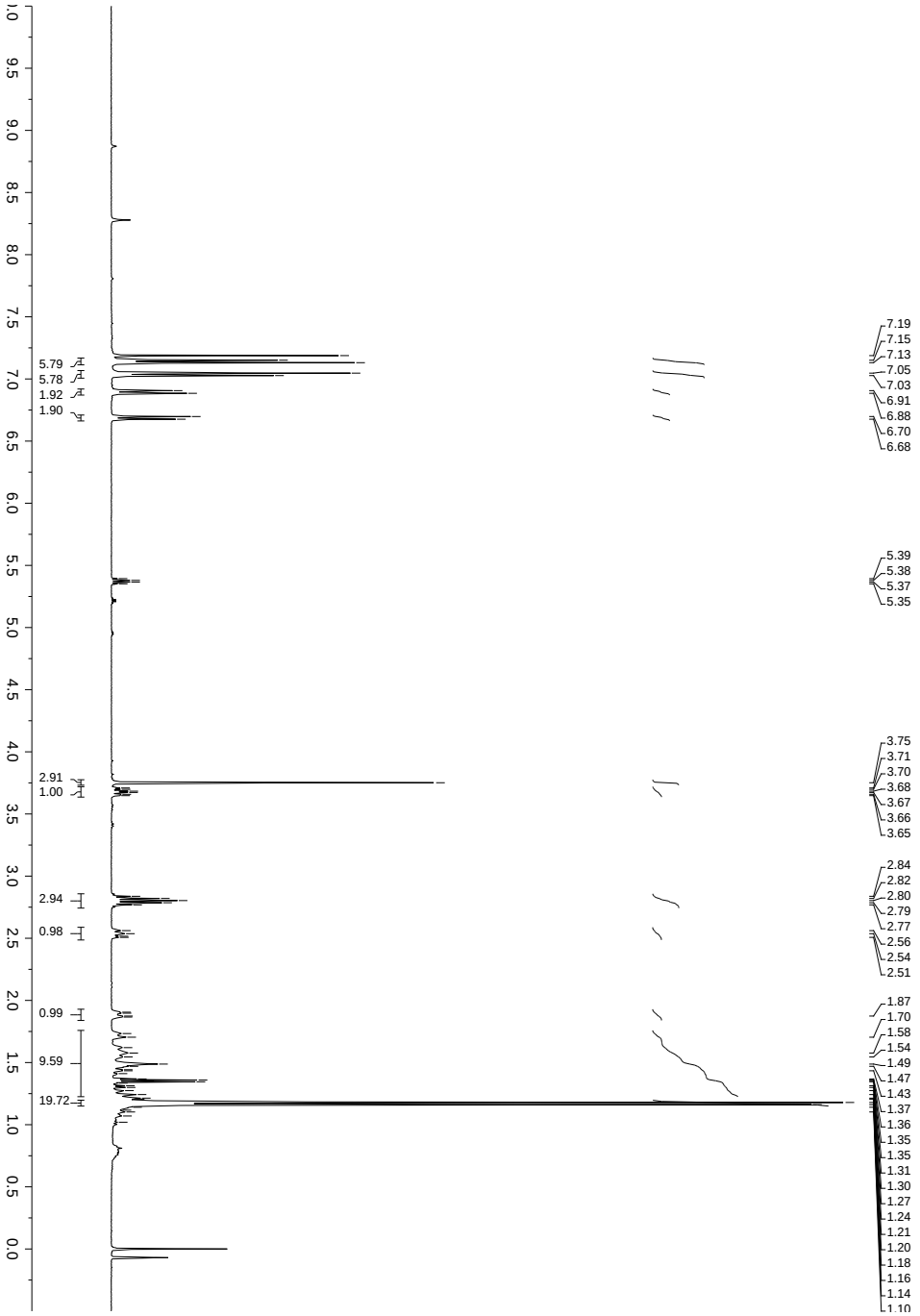

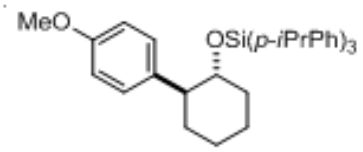

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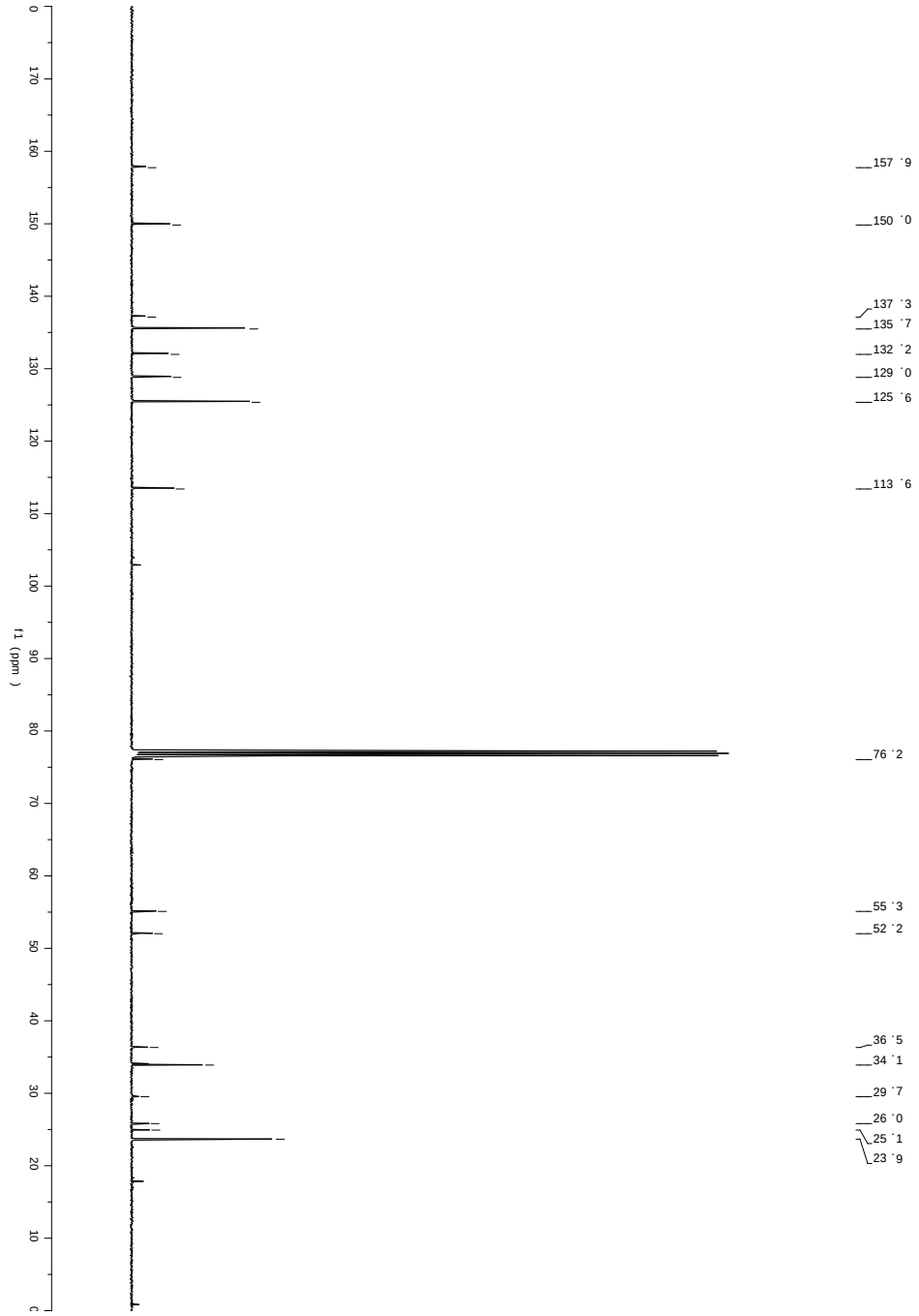

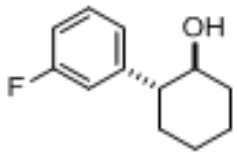

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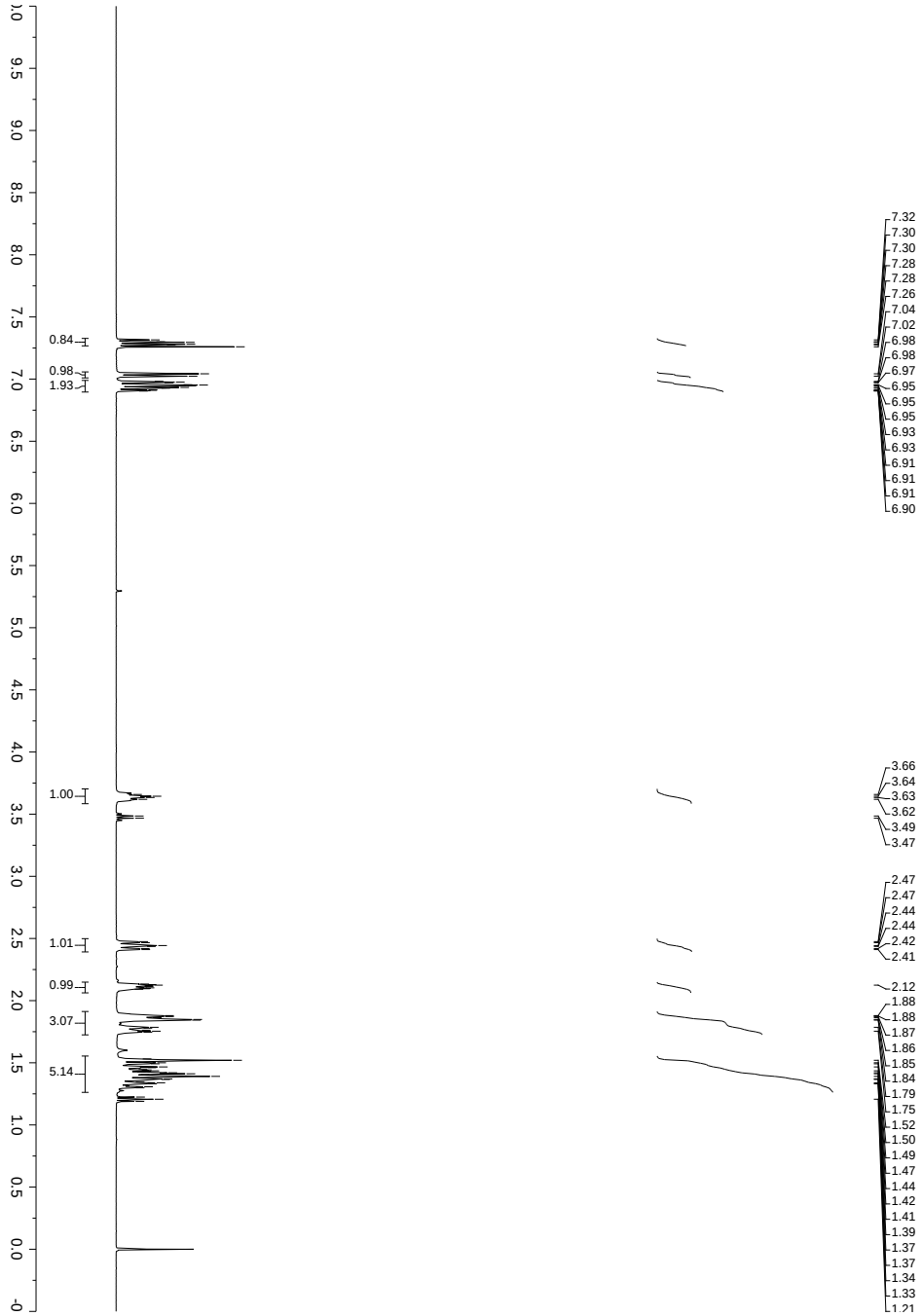

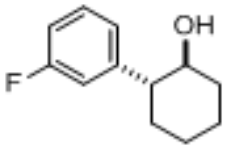

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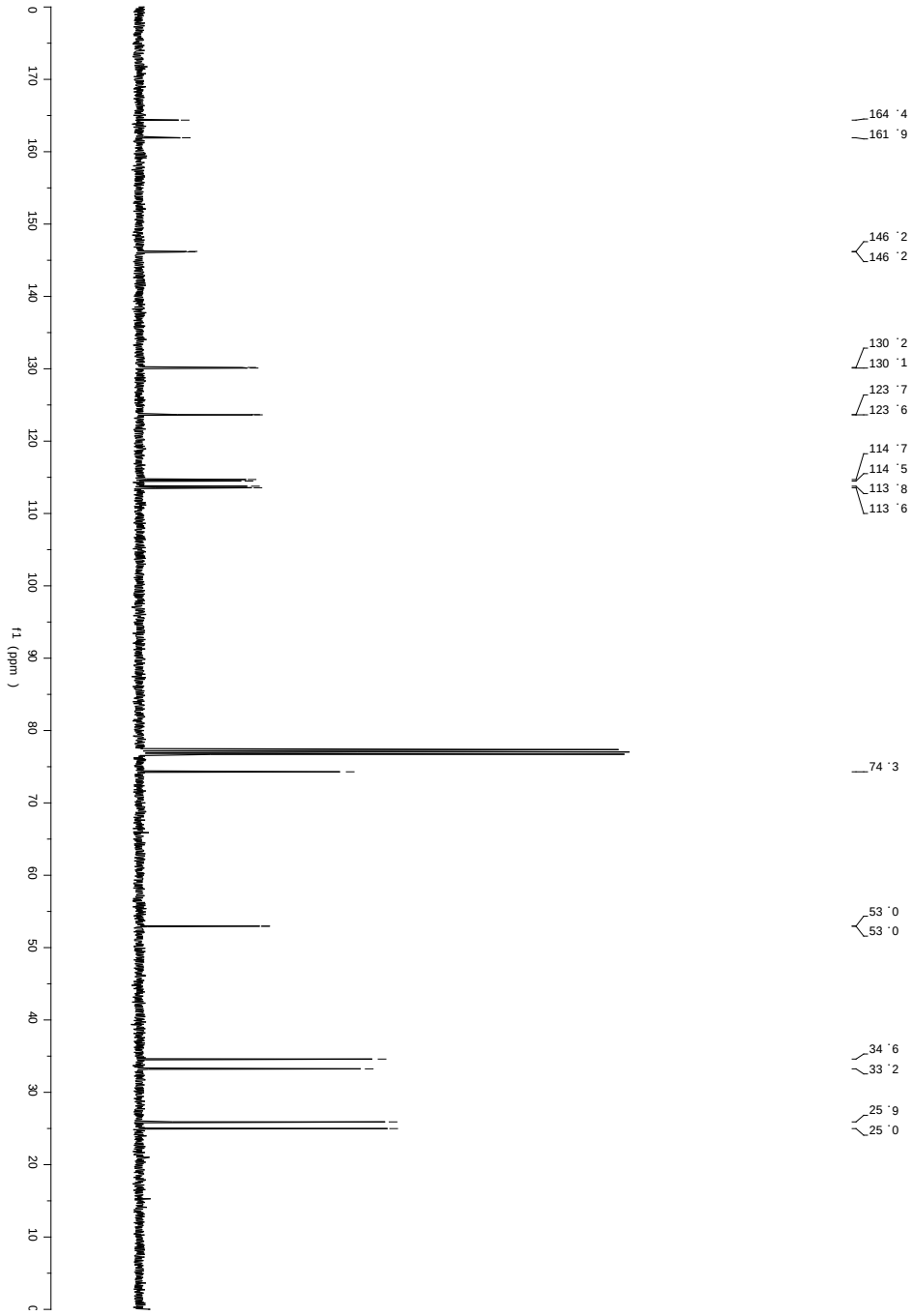

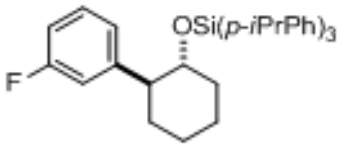

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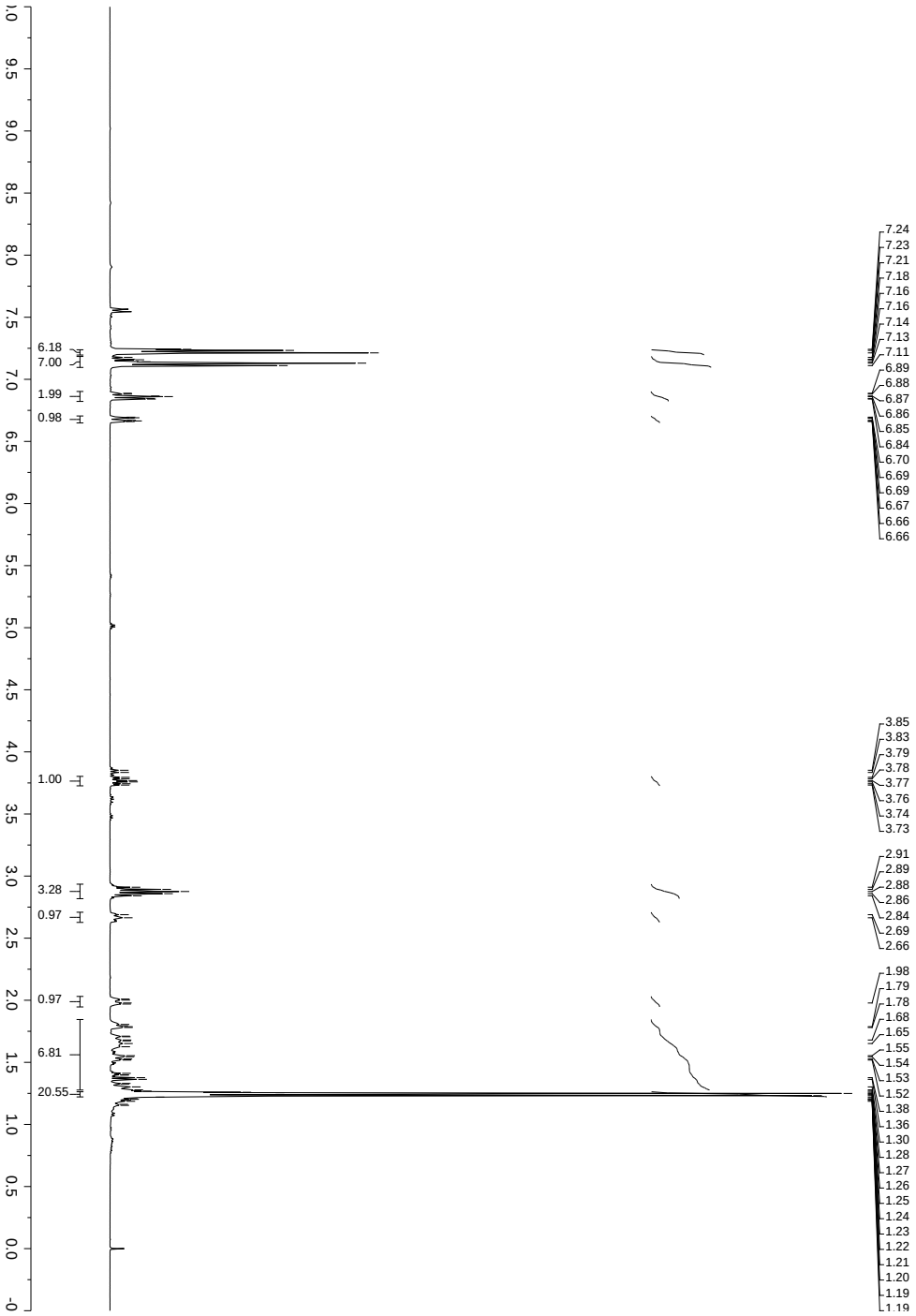

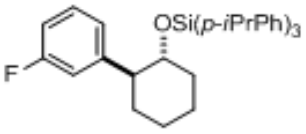

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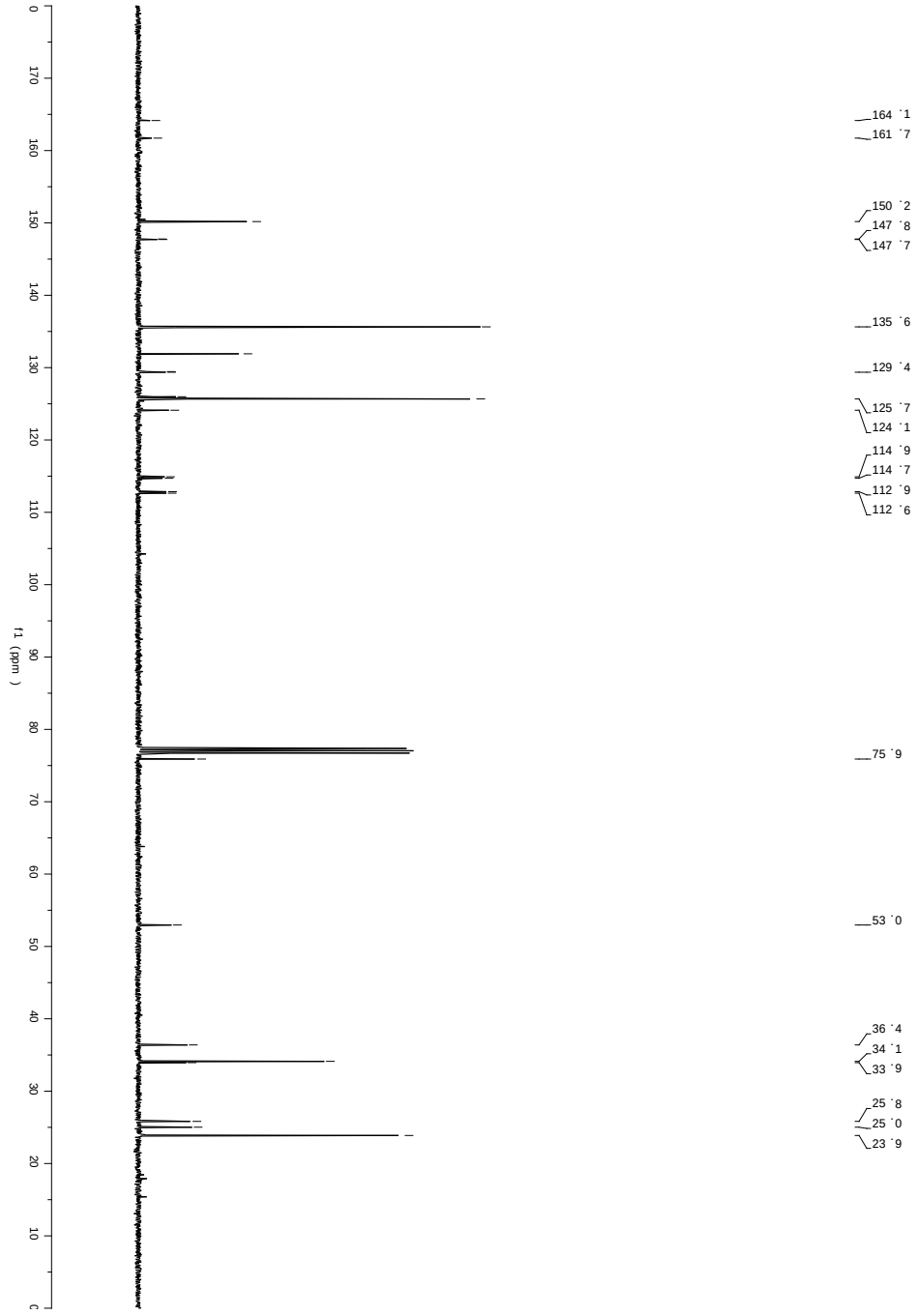

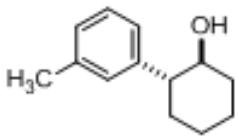

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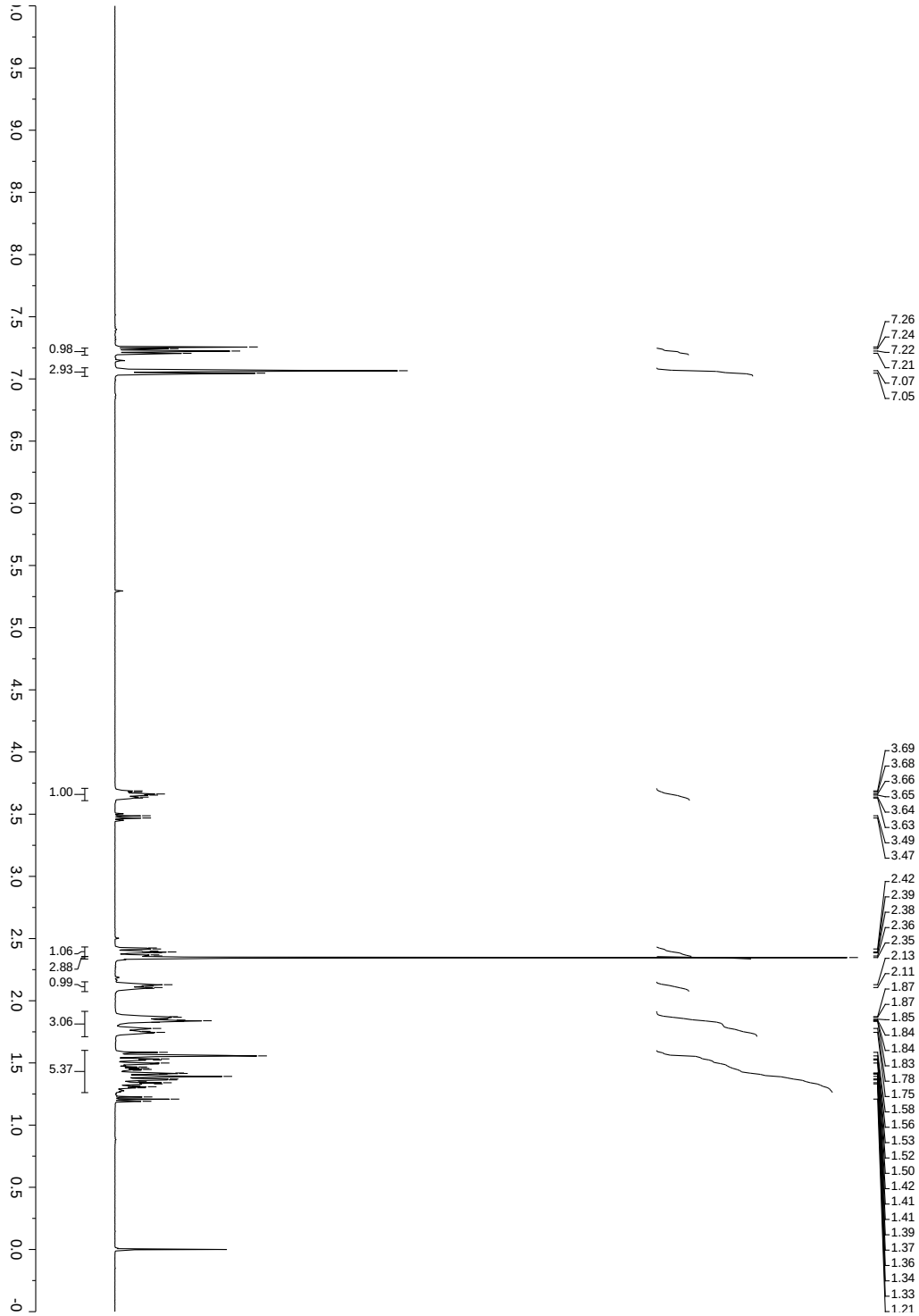

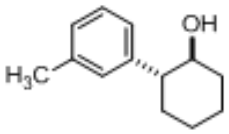

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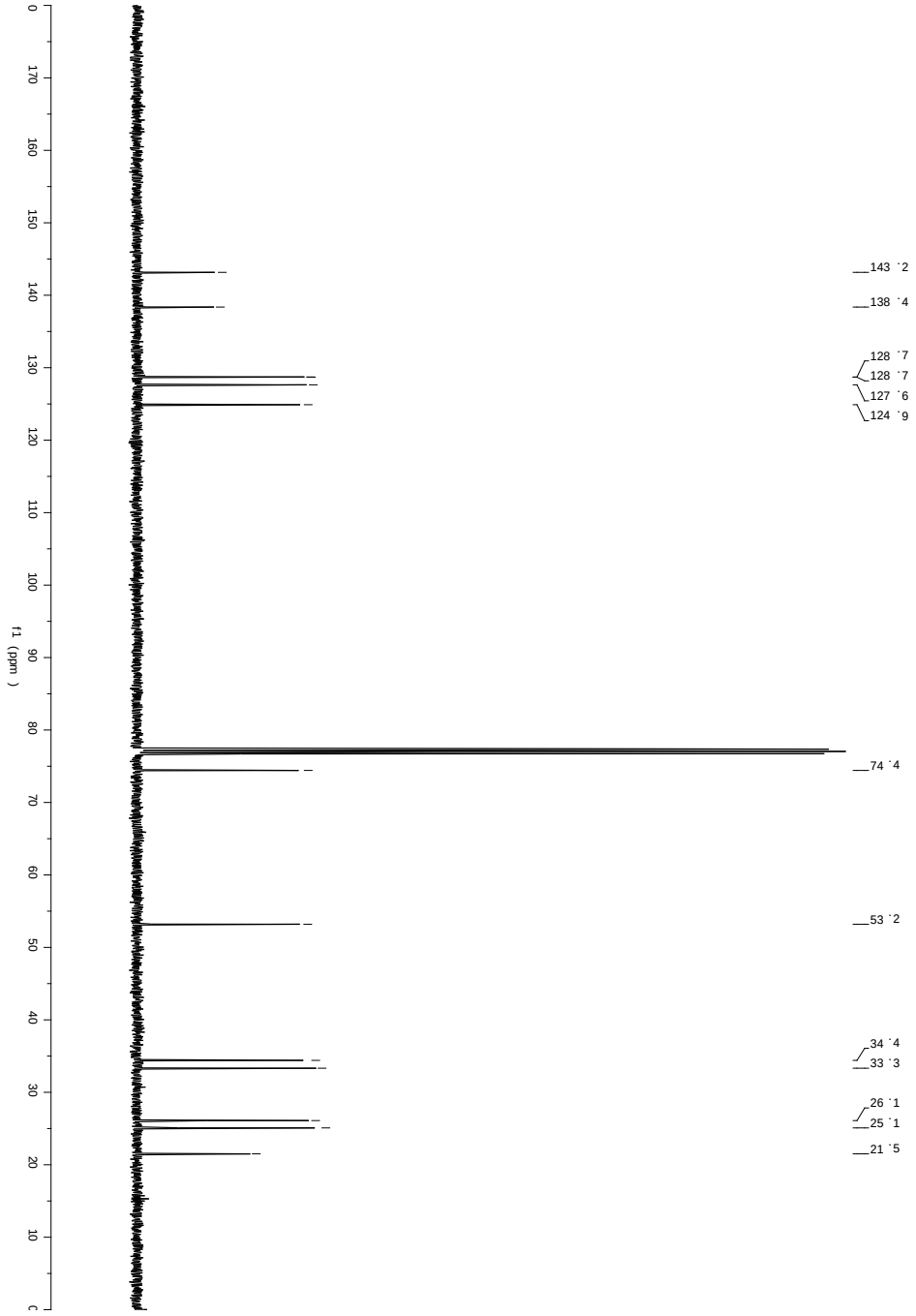

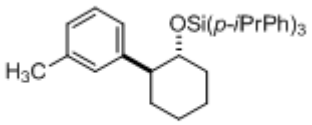

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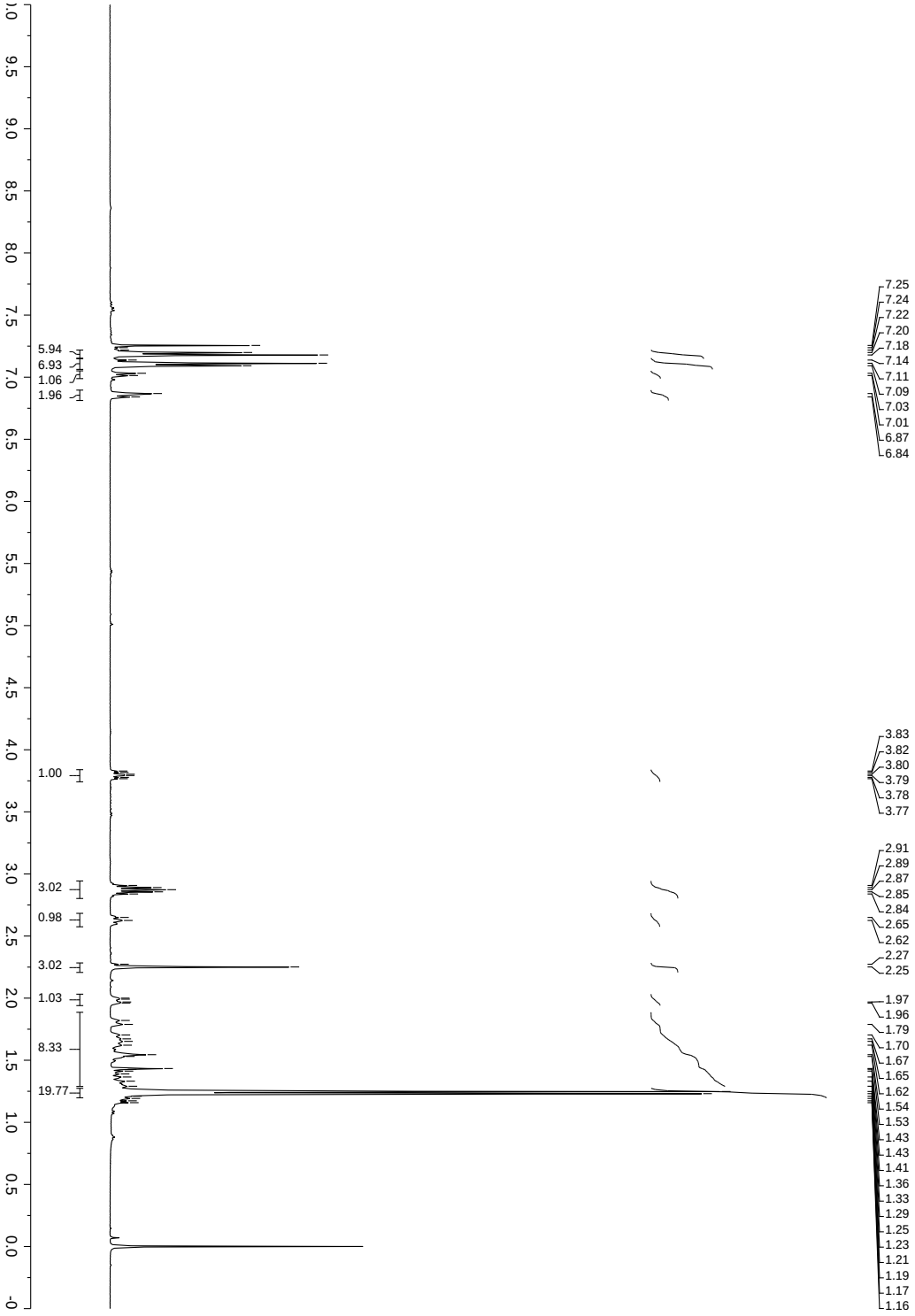

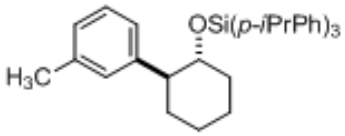

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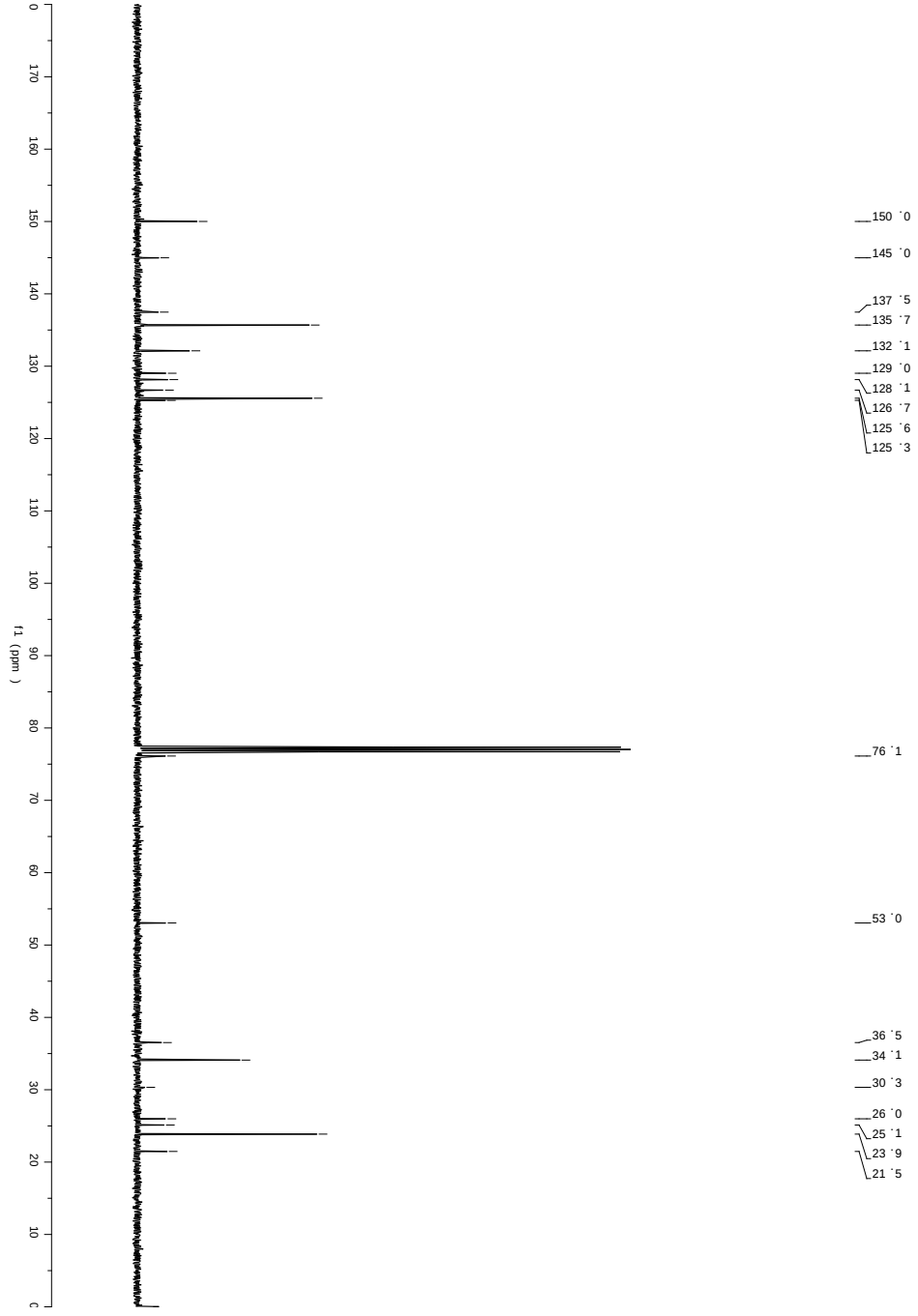

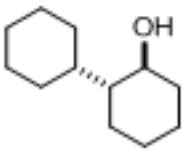

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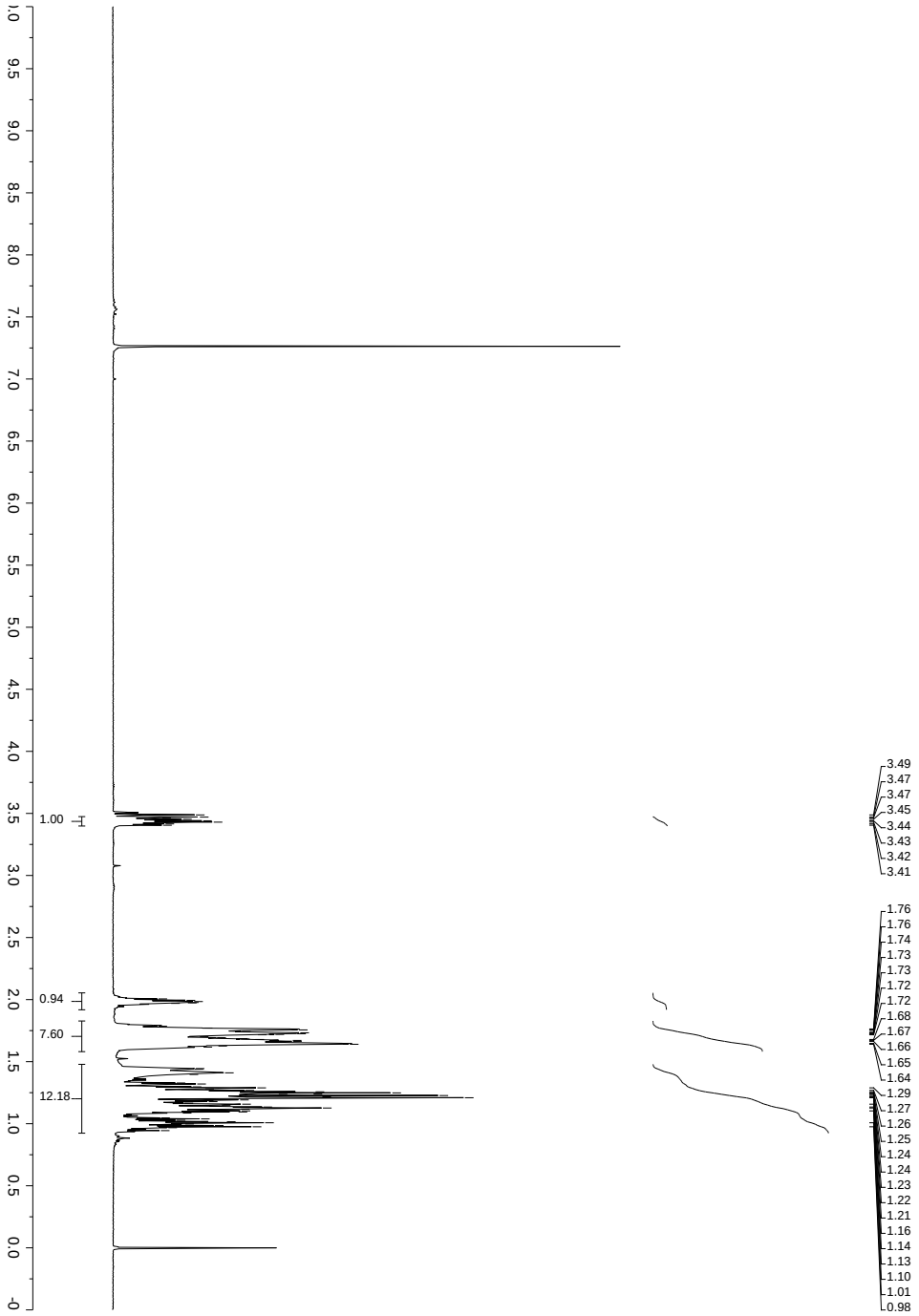


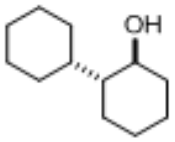
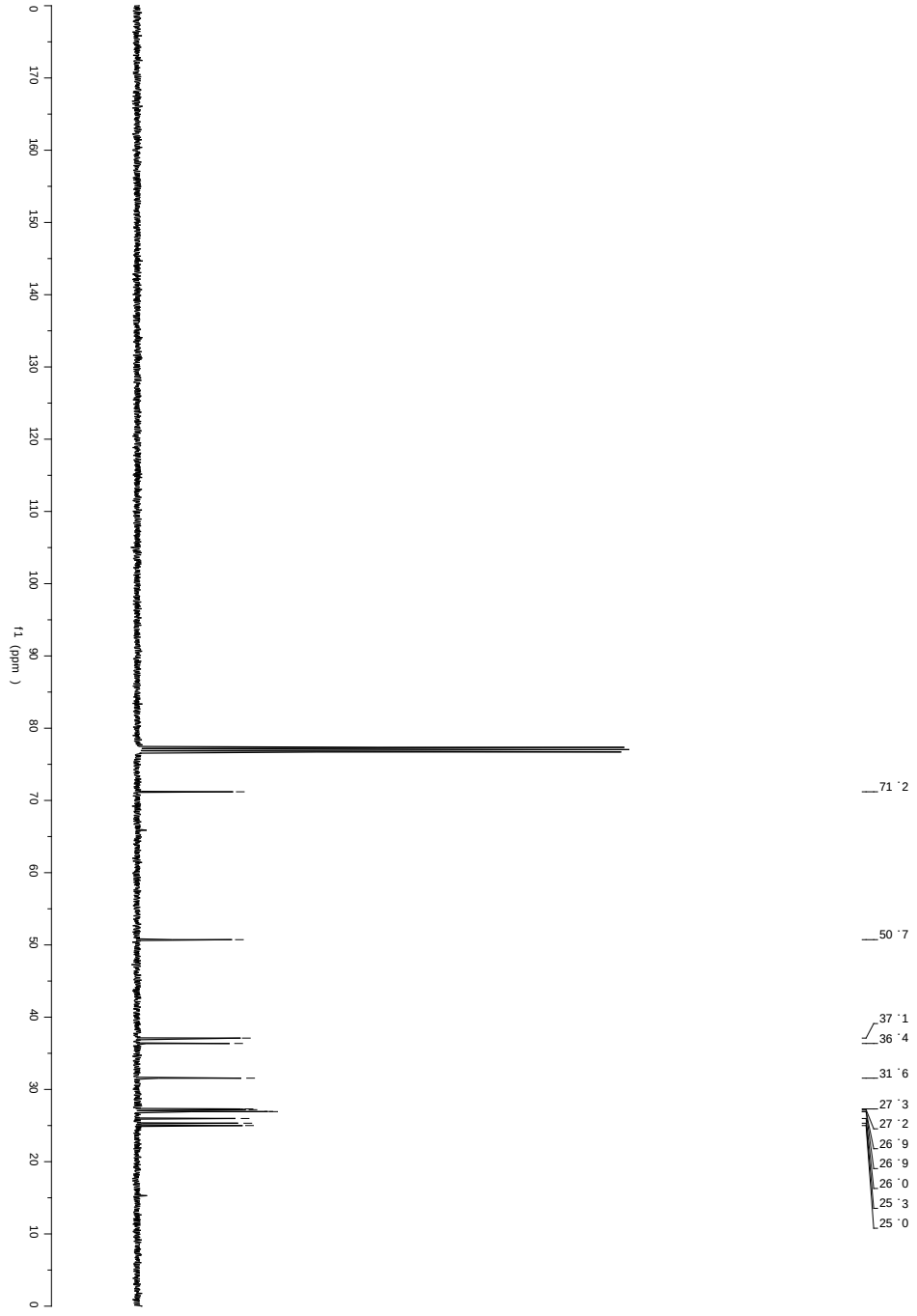
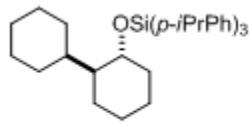


Table 2, Entry 7





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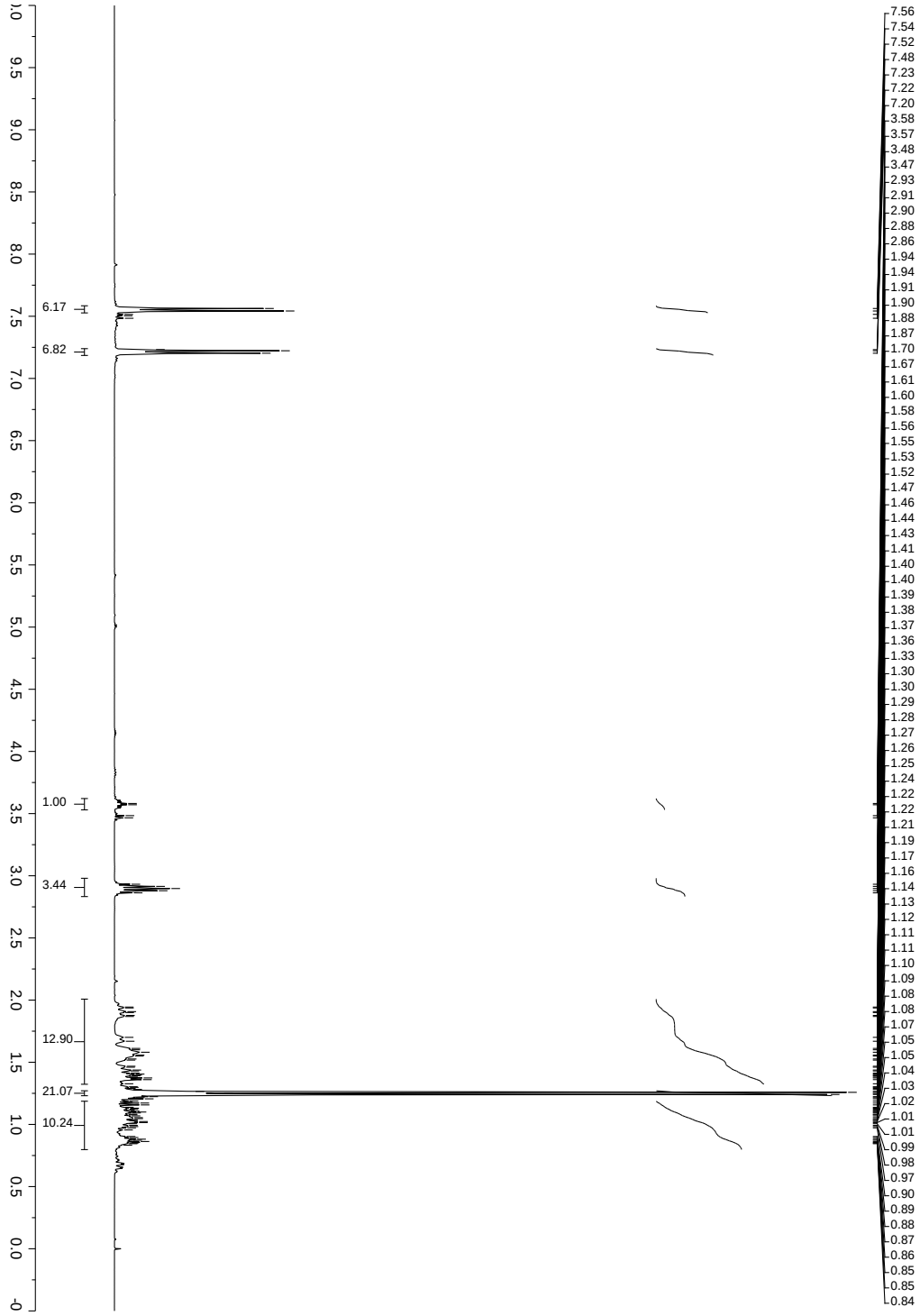

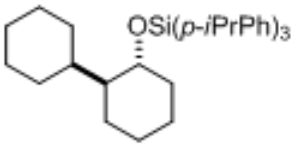

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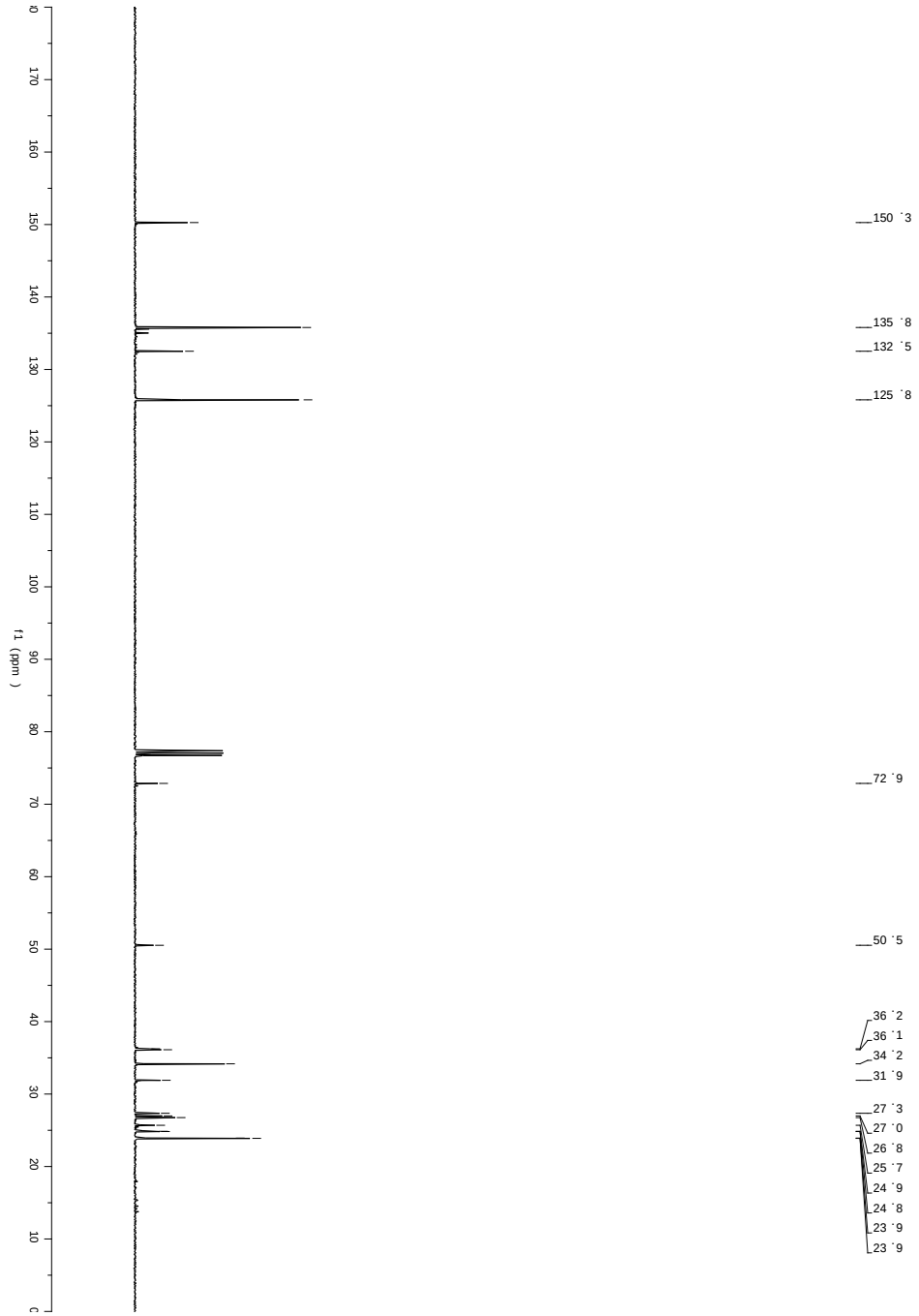

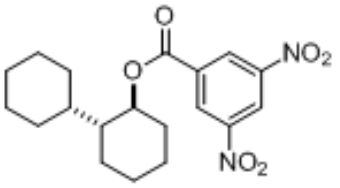

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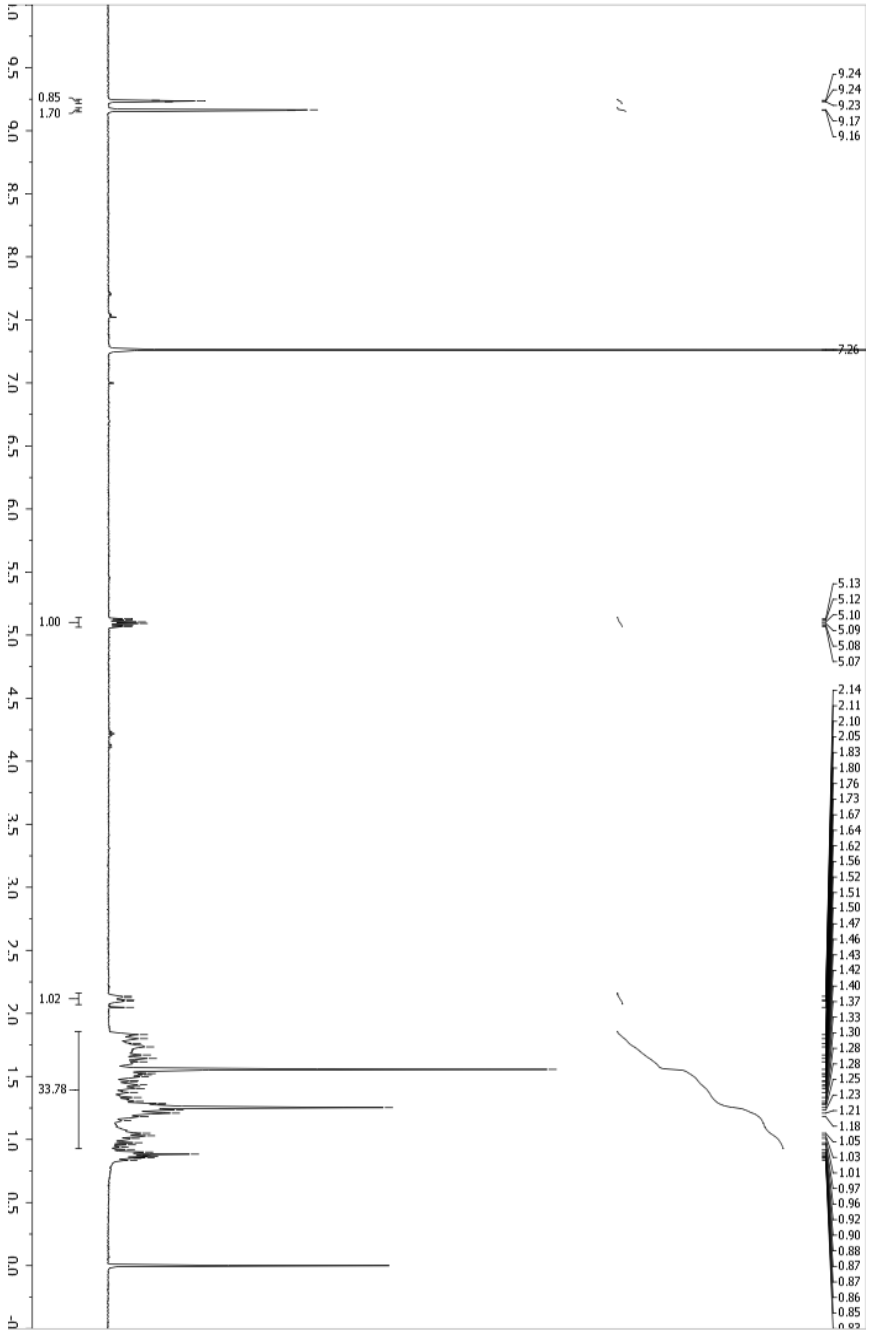

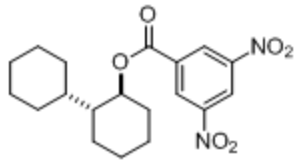

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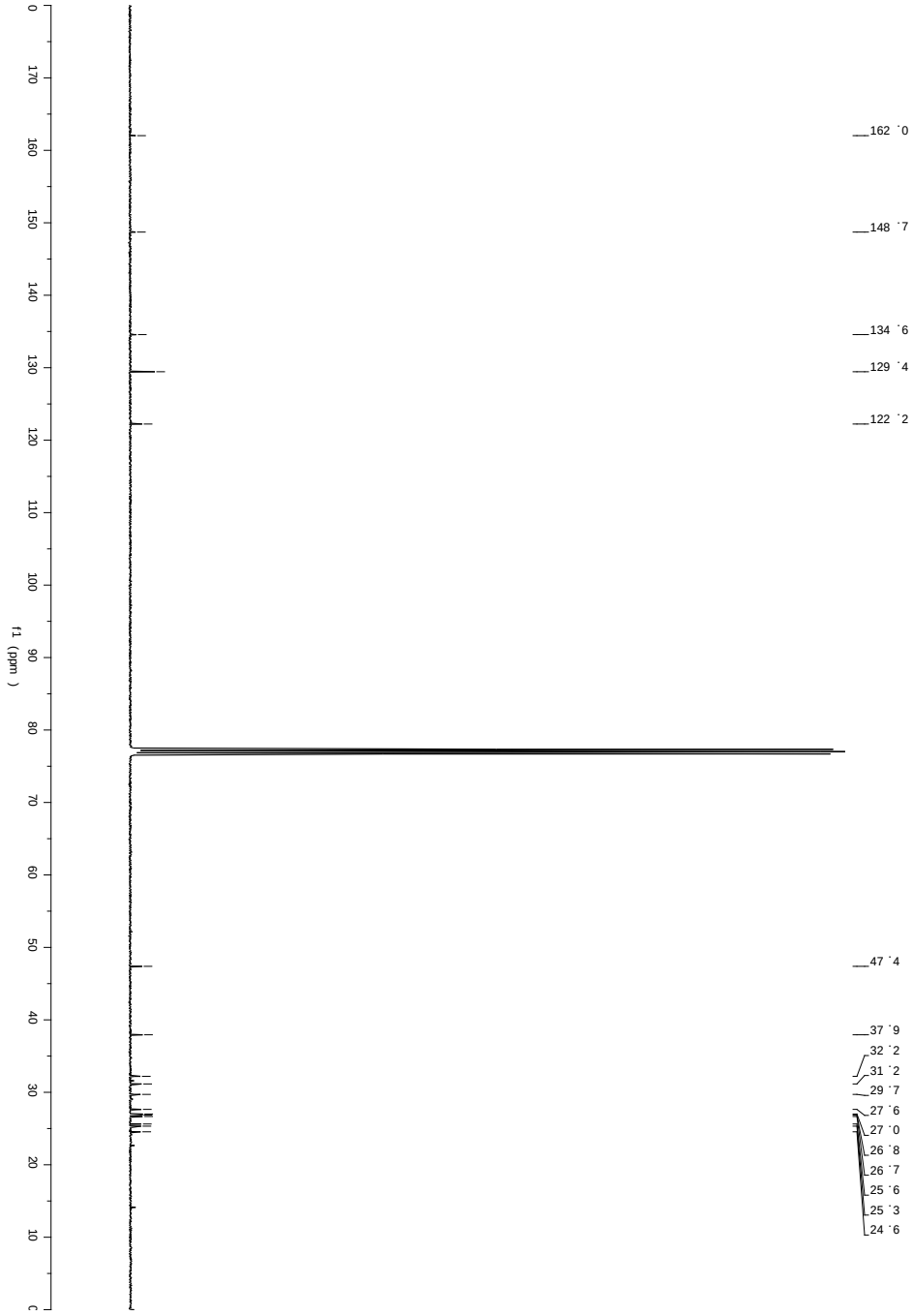

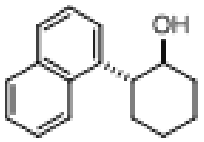

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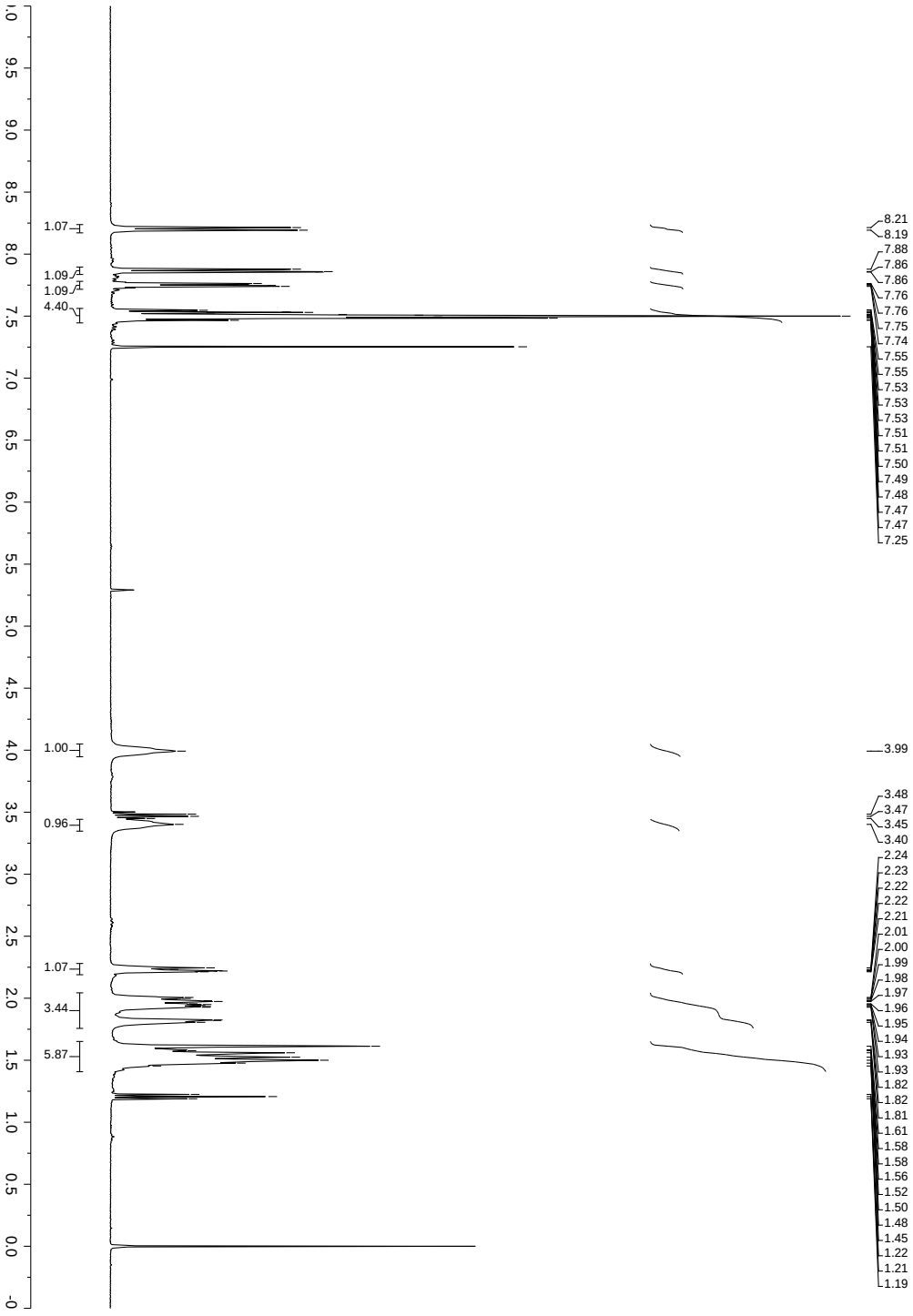

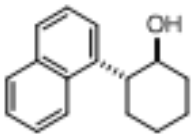

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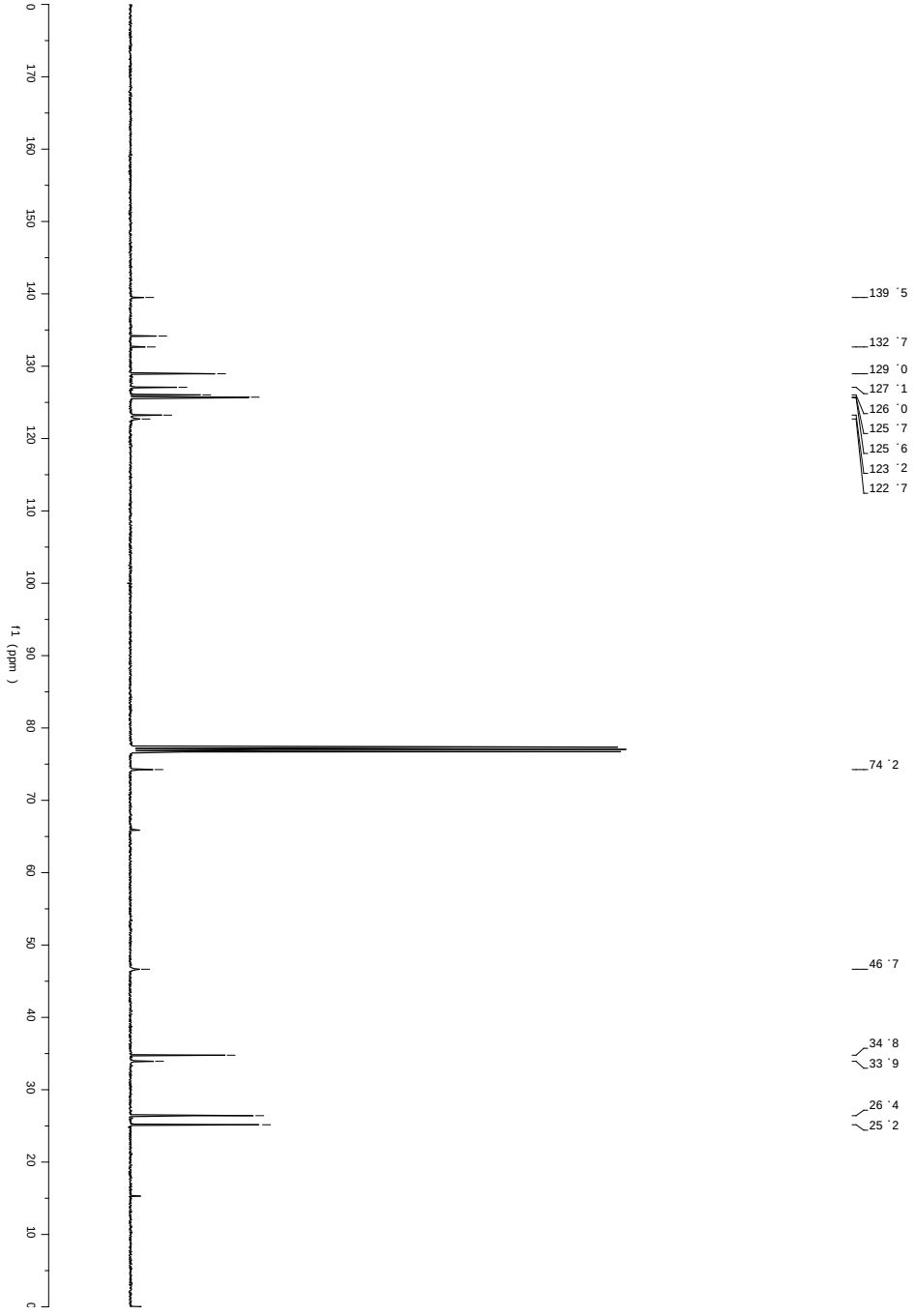

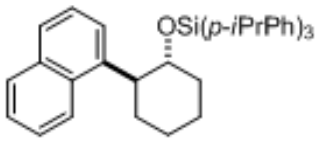

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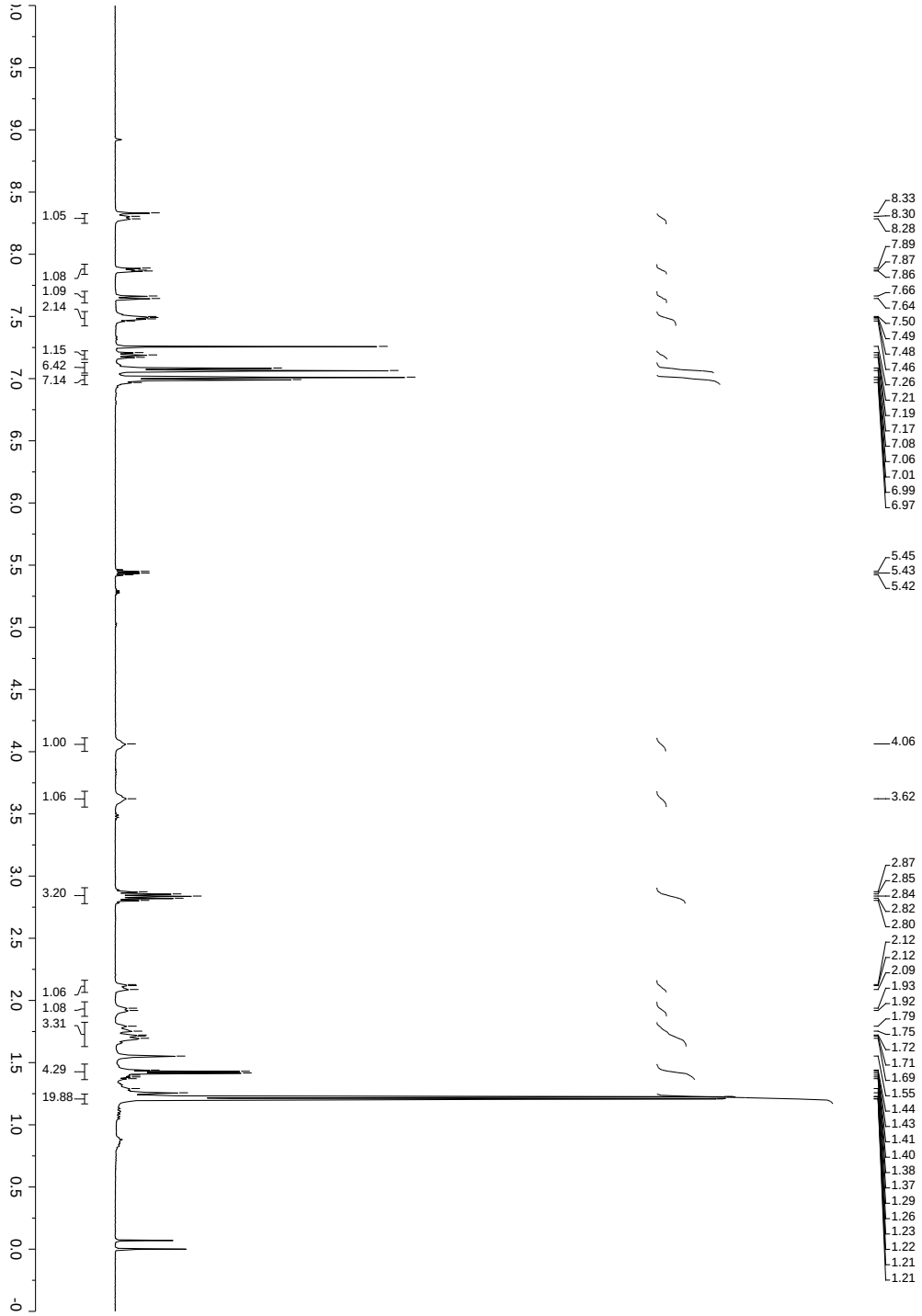


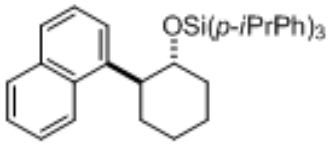
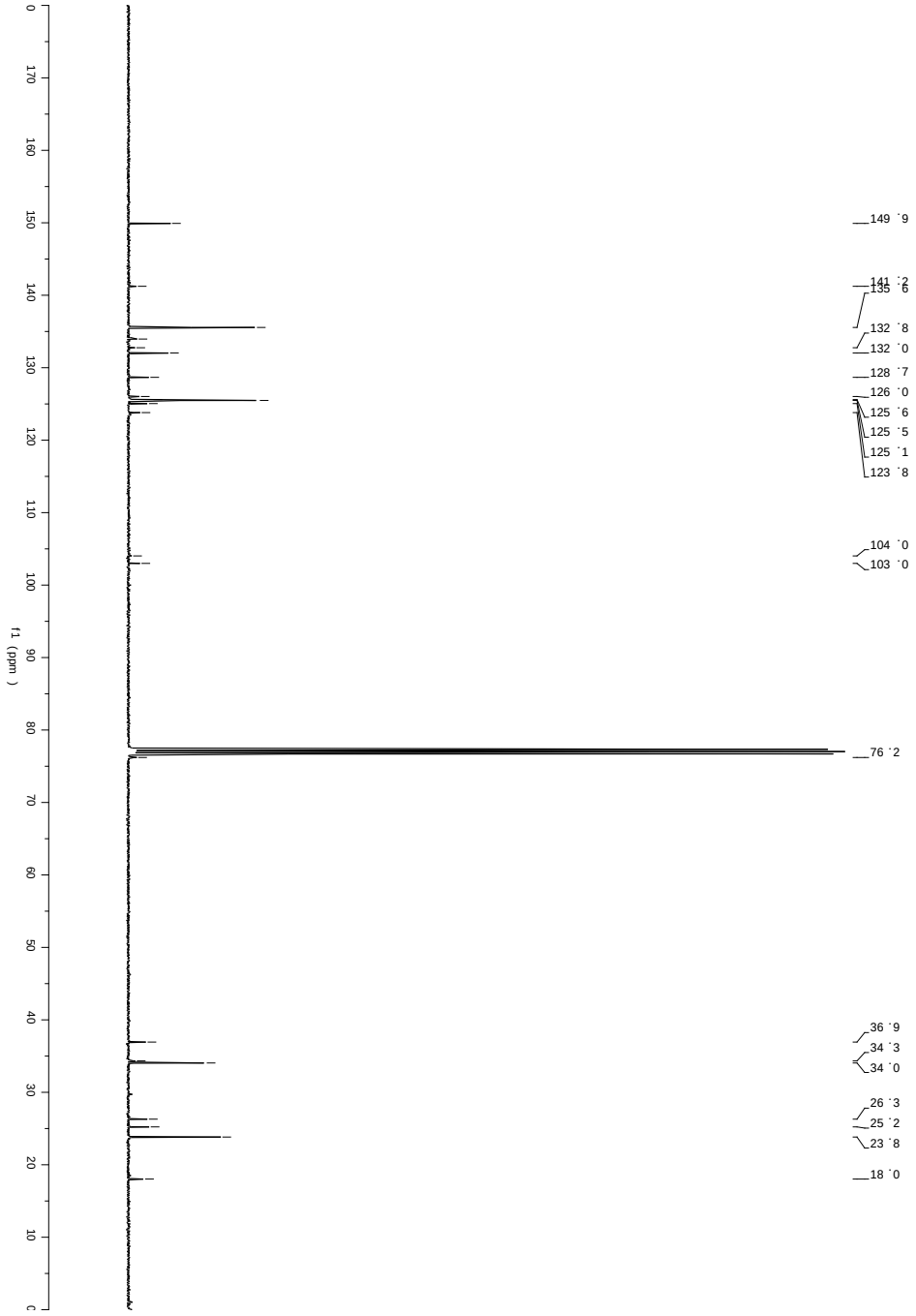
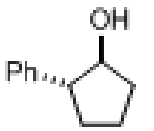


Table 2, Entry 8





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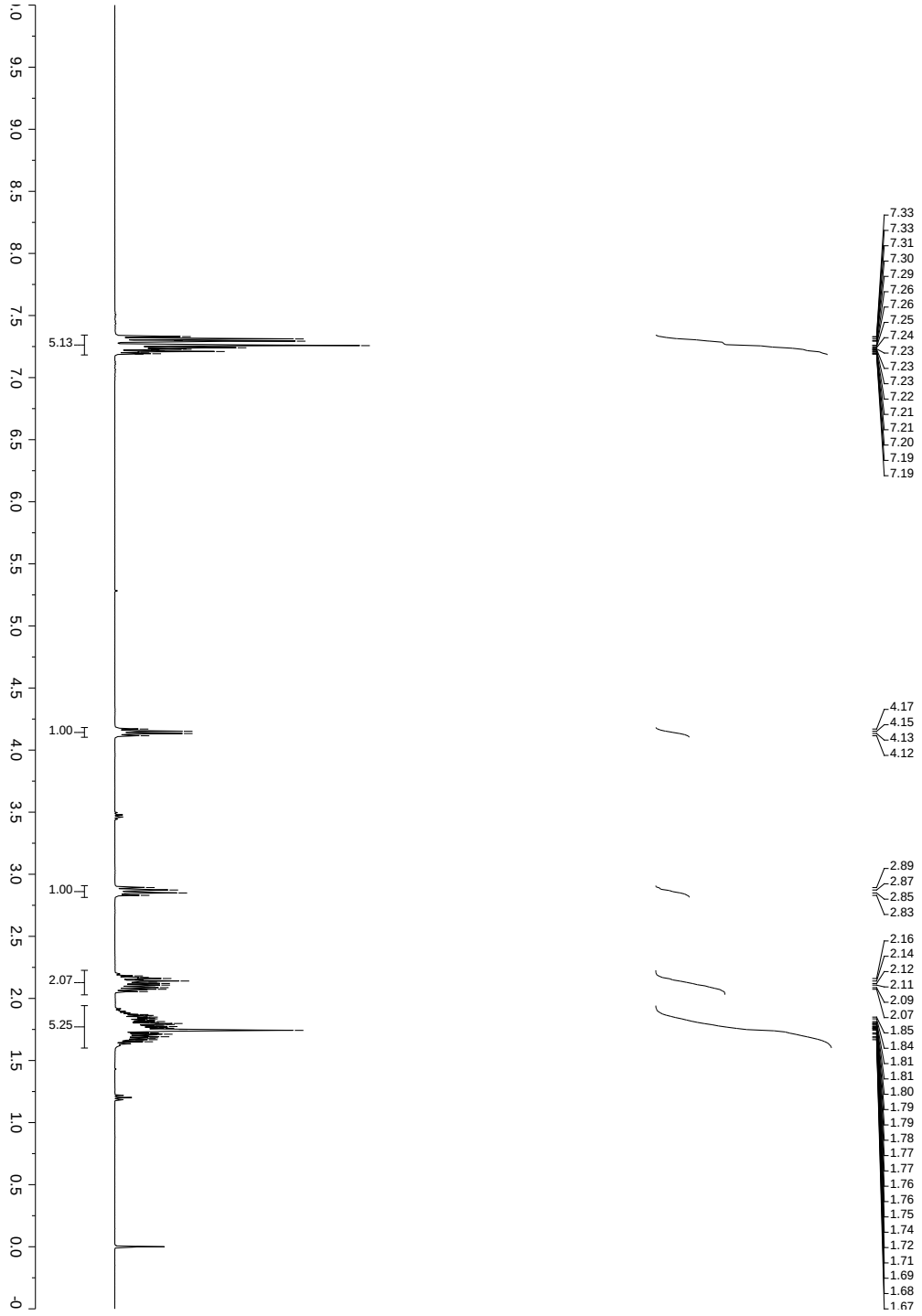

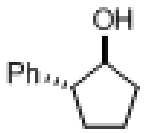

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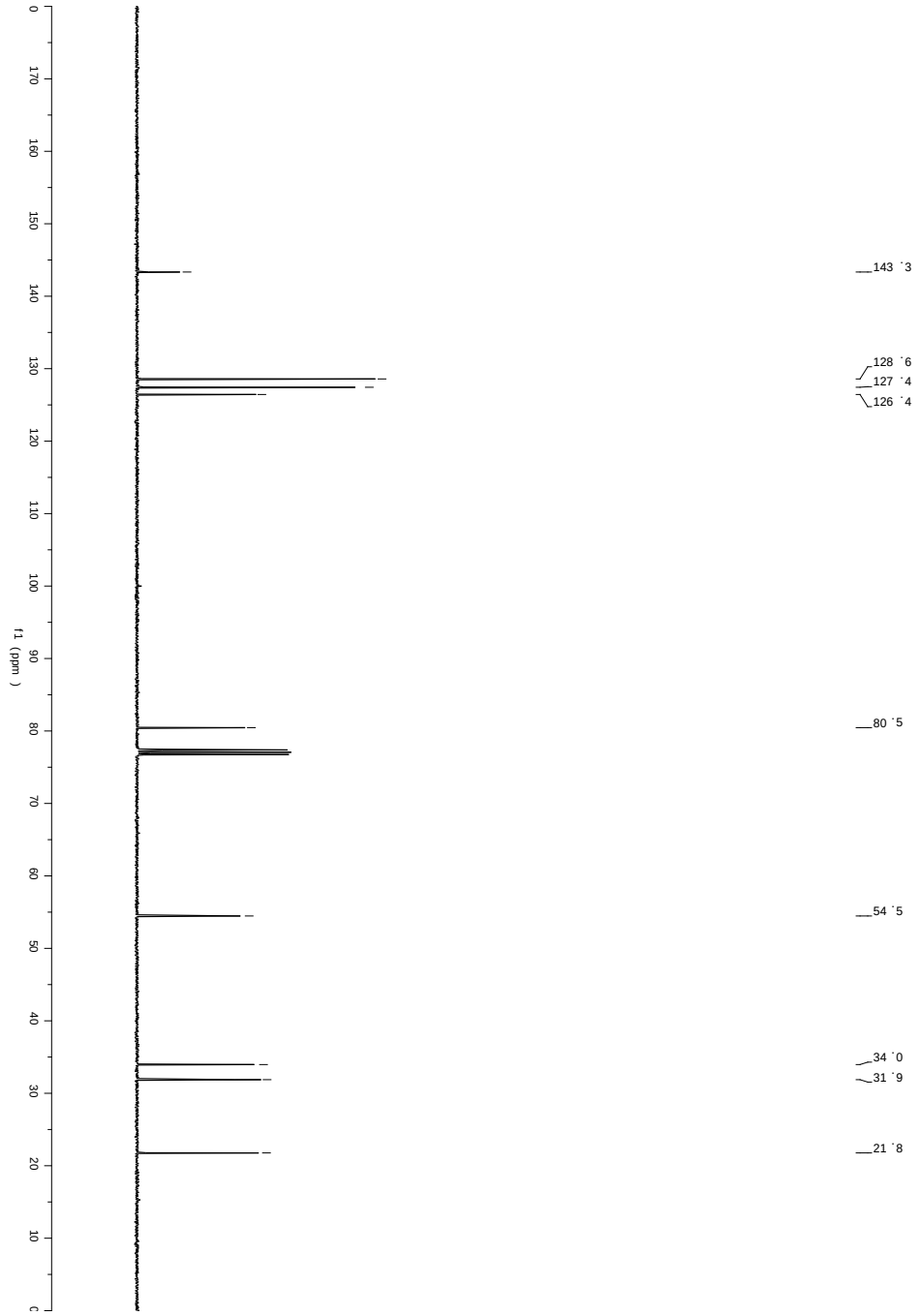


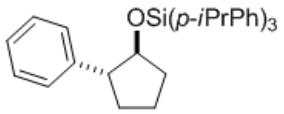
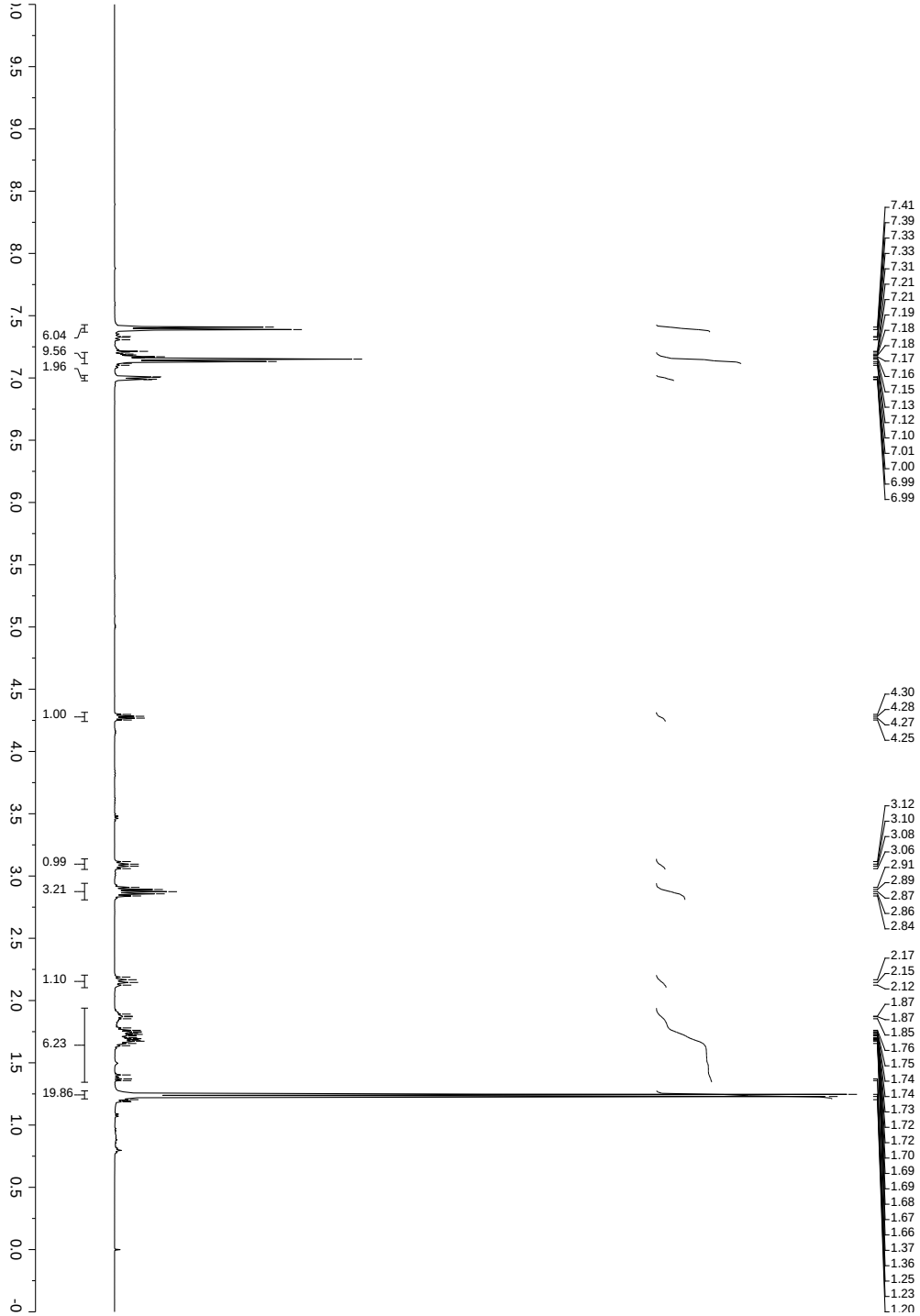


Table 2, Entry 9



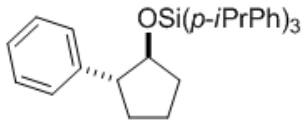
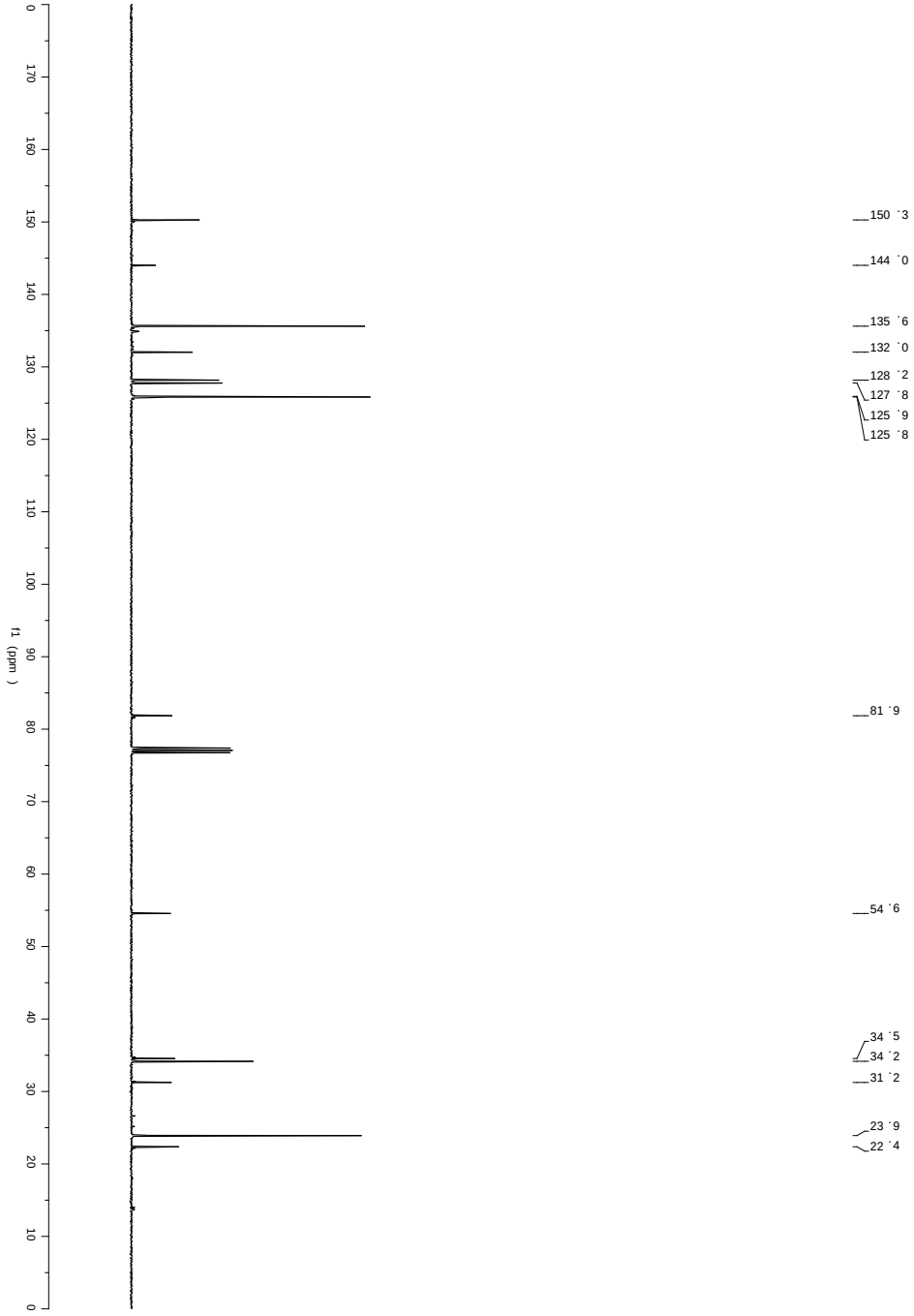
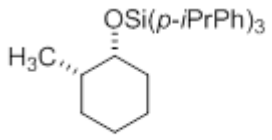
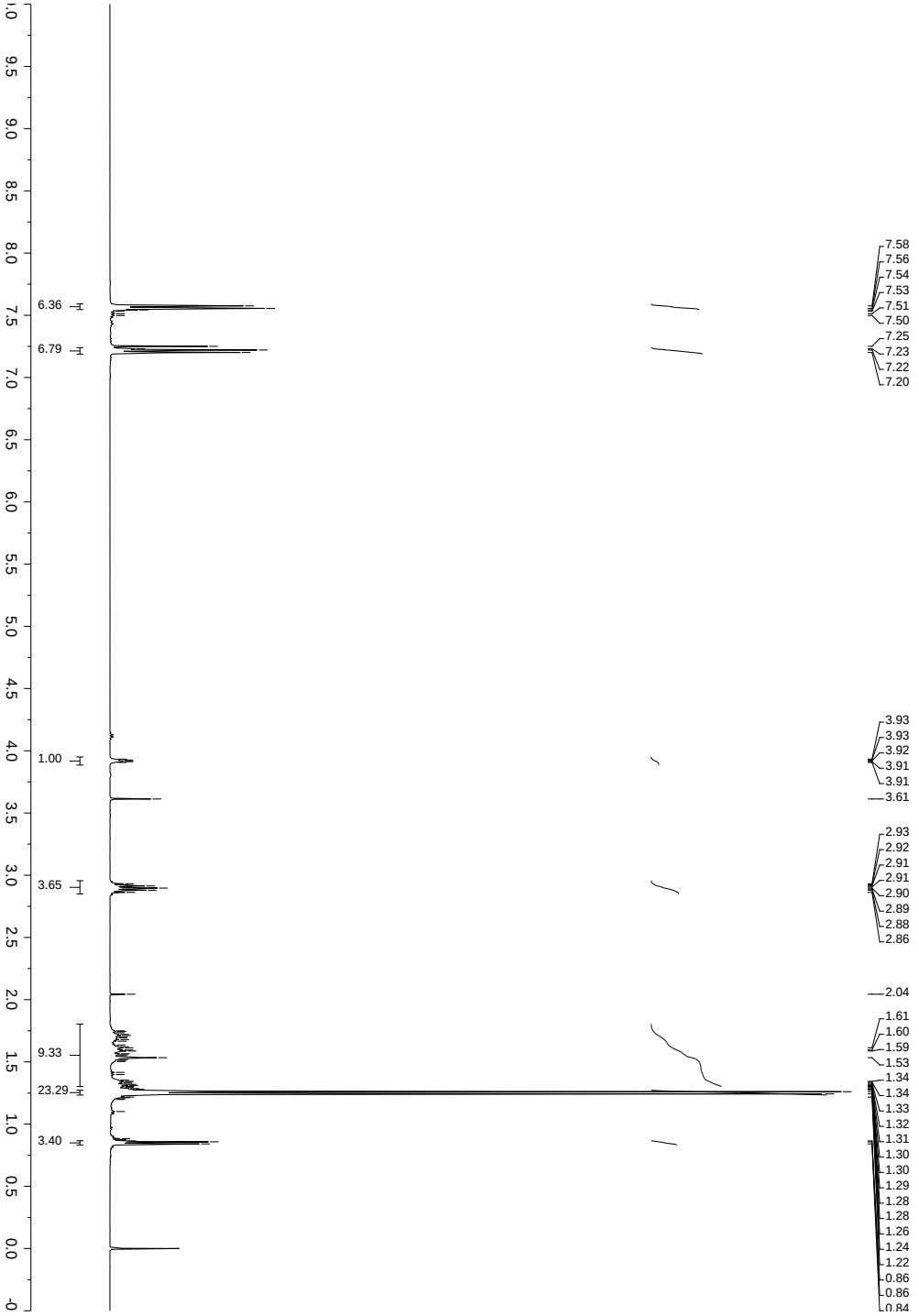


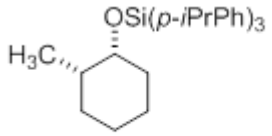
Table 2, Entry 9



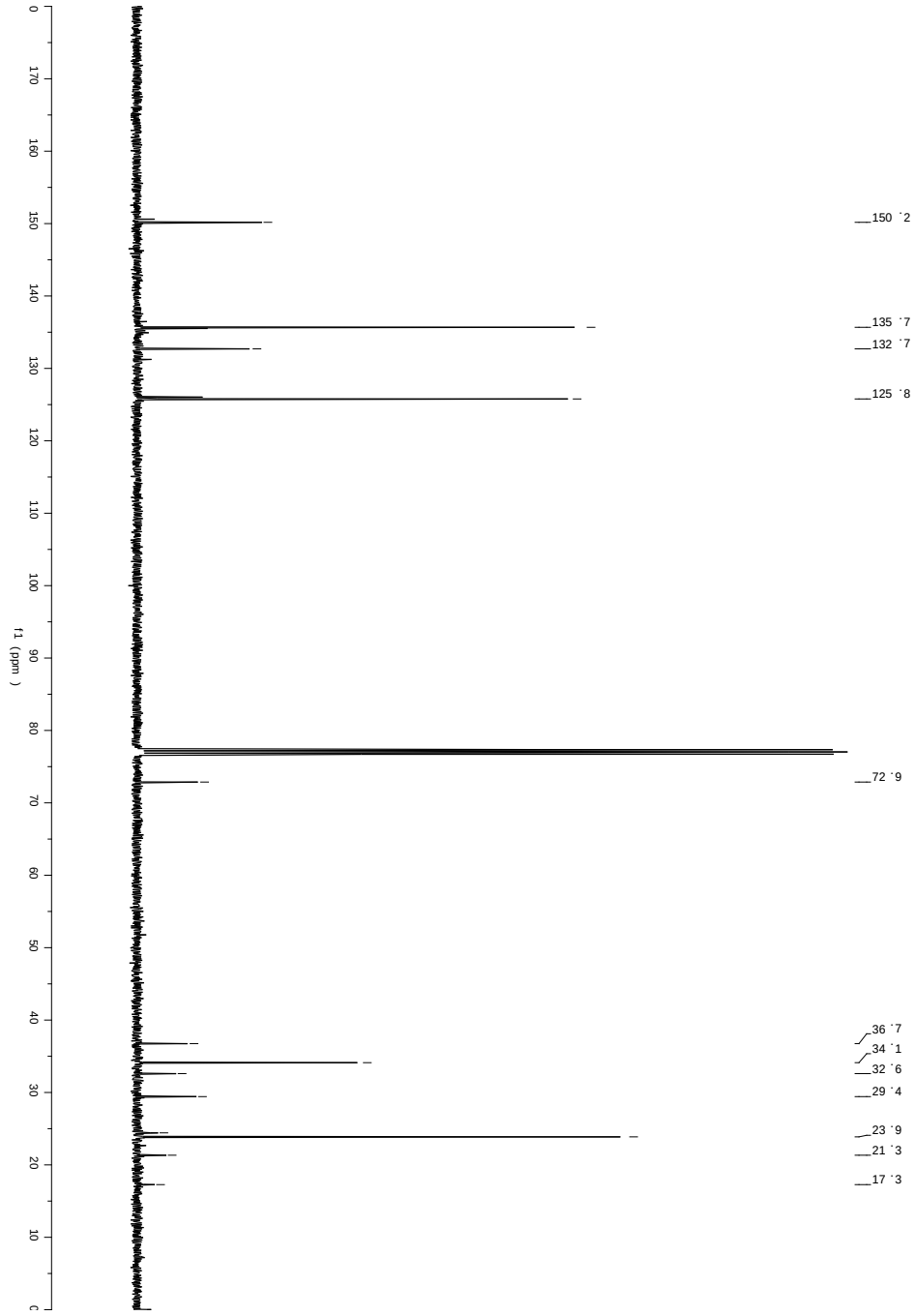

OSi(p-iPrPh)3
H3C

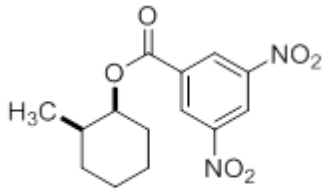
Scheme 2, **9**


6.36
6.79
1.00
3.65
9.33
23.29
3.40
7.58
7.56
7.54
7.53
7.51
7.50
7.25
7.23
7.22
7.20
3.93
3.93
3.92
3.91
3.91
3.61
2.93
2.92
2.91
2.91
2.90
2.89
2.88
2.86
2.04
1.61
1.60
1.59
1.53
1.34
1.34
1.33
1.32
1.31
1.30
1.30
1.29
1.28
1.28
1.26
1.24
1.22
0.86
0.86

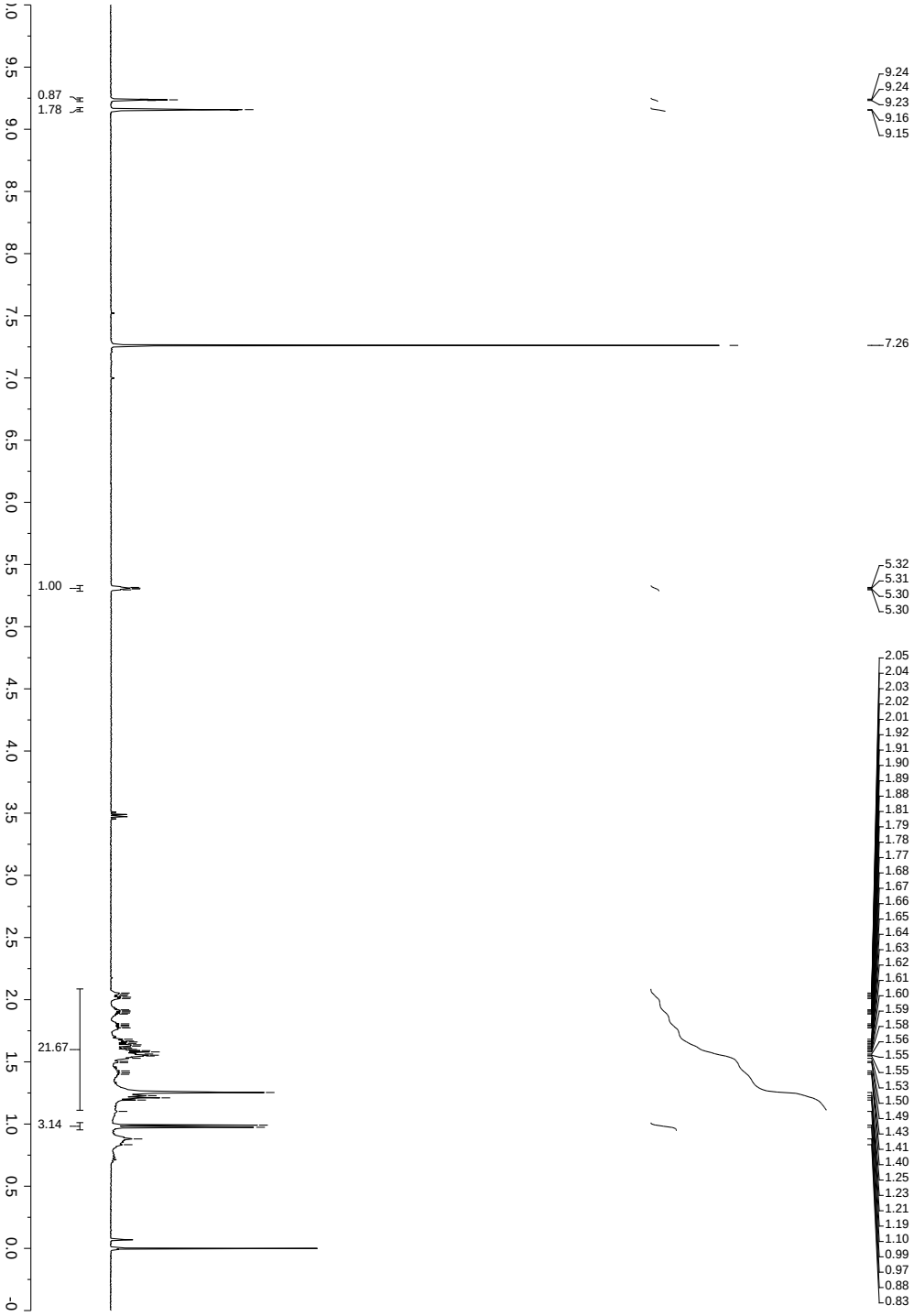

OSi(p-iPrPh)3
H3C

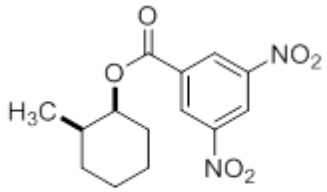
Scheme 2, **9**


150.2
135.7
132.7
125.8
72.9
36.7
34.1
32.6
29.4
23.9
21.3
17.3
f1 (ppm)

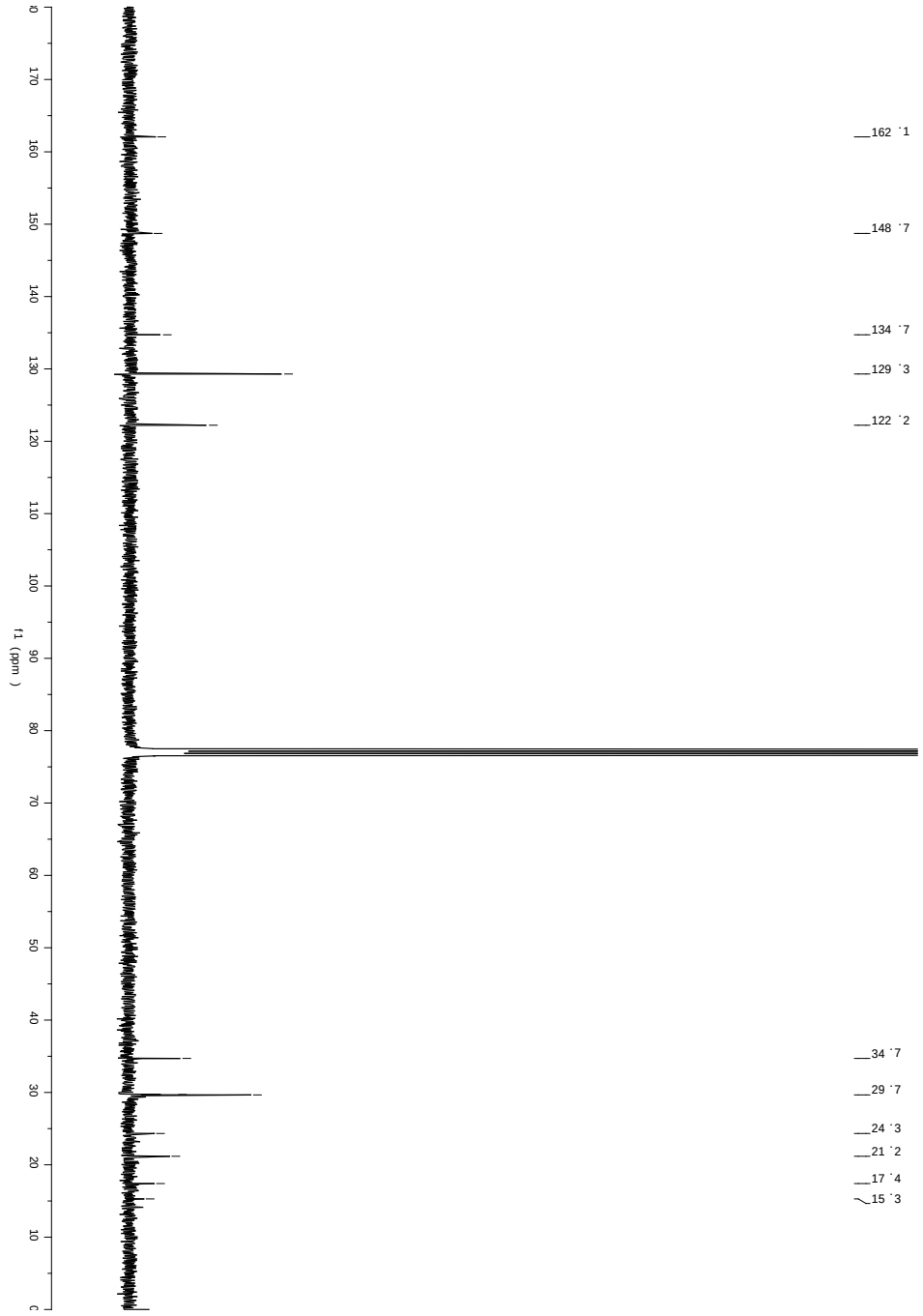

O
O
NO_2
H_3C
NO_2

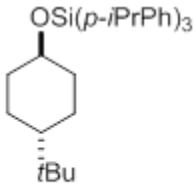
Scheme 2, **9**


0.87
1.78
1.00
21.67
3.14
9.24
9.24
9.23
9.16
9.15
7.26
5.32
5.31
5.30
5.30
2.05
2.04
2.03
2.02
2.01
1.92
1.91
1.90
1.89
1.88
1.81
1.79
1.78
1.77
1.68
1.67
1.66
1.65
1.64
1.63
1.62
1.61
1.60
1.59
1.58
1.56
1.55
1.55
1.53
1.50
1.49
1.43
1.41
1.40
1.25
1.23
1.21
1.19
1.10
0.99
0.97
0.88
0.83

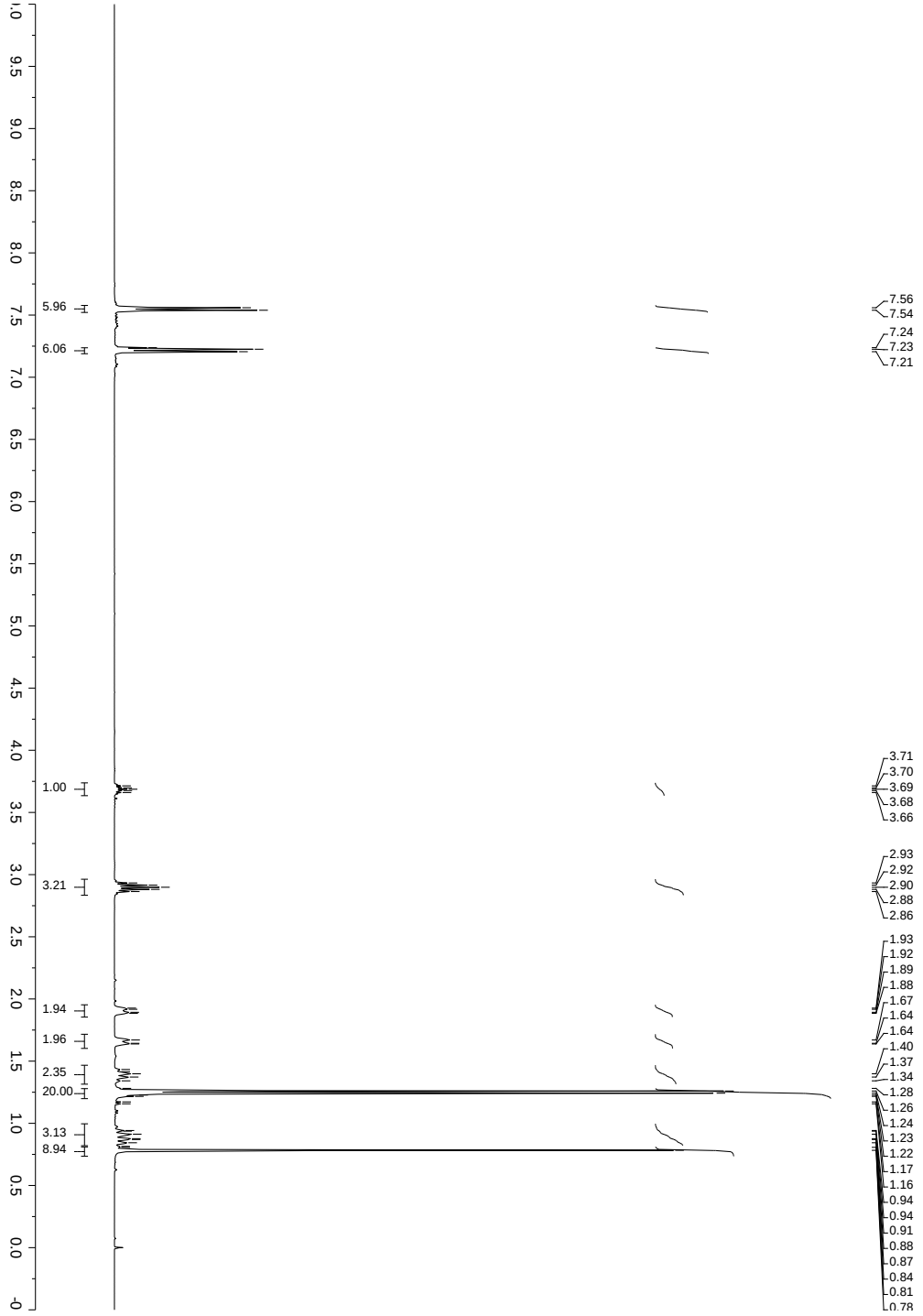

O
O
NO2
H3C
NO2

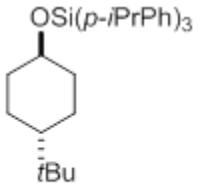
Scheme 2, **9**


162.1
148.7
134.7
129.3
122.2
34.7
29.7
24.3
21.2
17.4
15.3
f1 (ppm)



Scheme 2, ***trans*-10**





Scheme 2, ***trans*-10**