Supporting Information

Water-mediated one-pot multi-step synthesis of chiral 1,3- diarylpropan-1-ols by asymmetric hydrofunctionalisation of simple alkynes

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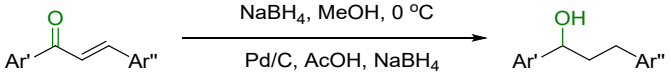
1. General information

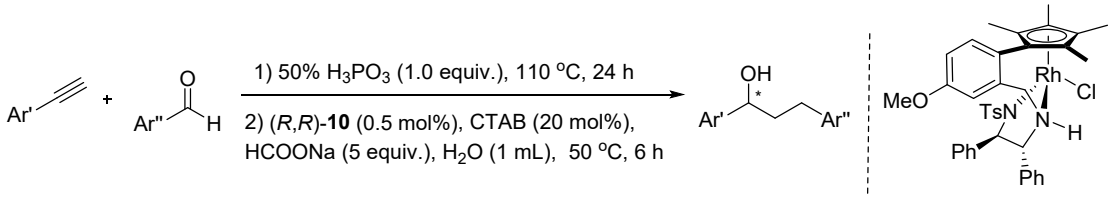
Unless otherwise noted, all reagents and solvents were purchased from commercial suppliers and used without further purification. Column chromatography was performed on silica gel. NMR spectra were recorded on Bruker AVANCE III (400 MHz) spectrometers. $CDCl_3$ was used for the NMR analysis with tetramethyl silane as the internal standard. Chemical shifts were reported upfield to TMS (0.00 ppm) for ^1H NMR and relative to $CDCl_3$ (77.0 ppm) for ^{13}C NMR. HPLC analyses were performed on a Waters 2489 series instrument with chiral column OD-H, IA-H, AD-H, IC-H and OJ-H. Optical rotations were measured using an MCP-500. HRMS spectra were acquired on an Agilent 6210 ESI/TOF mass spectrometer.

2. General procedure for the synthesis of racemic 1,3-diarylpropan-1-ols



To a solution of chalcone derivative (0.25 mmol) in methanol (2 mL) was added $NaBH_4$ (38 mg, 1 mmol) at 0 °C. The mixture was stirred at 0 °C until the reaction was completed (monitored by TLC). Then Pd/C (26.5 mg, 0.25 mmol, 10%), AcOH (1 mL) and $NaBH_4$ (38 mg, 1 mmol) were added and stirred at 0 °C for 5 min. Pd/C was removed by filtration, the solvent was concentrated under reduced pressure. The residue was purified by thin layer chromatography to yield racemic 1,3-diphenylpropan-1-ol.

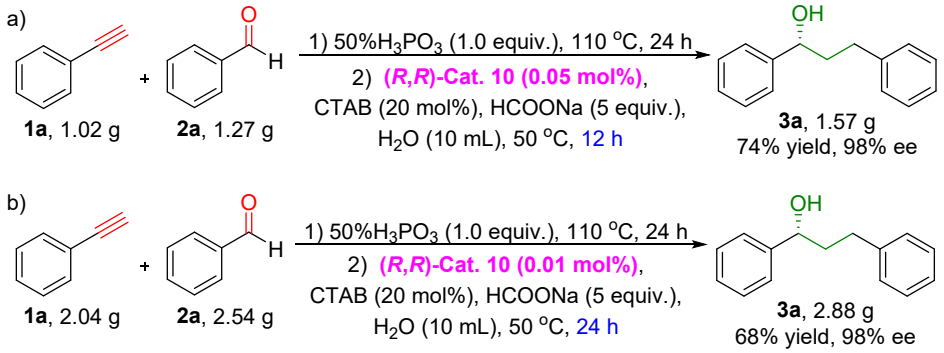
3. General procedure for the asymmetric hydrofunctionalisation of aryl alkynes



(*R*,*R*)-**10**

Under nitrogen atmosphere, alkyne (0.5 mmol), aldehyde (0.6 mmol) and 50% H_3PO_3 (82 mg, 0.5 mmol in H_2O) were added to a 10 mL Schlenk tube. The reaction mixture was stirred at 110 °C for 24 h. Then (*R,R*)-**10** (1.9 mg, 0.5 mol%), CTAB (36.4 mg, 0.1 mol), HCOONa (170 mg, 2.5 mmol) and H_2O (1 mL) were added, the reaction mixture was stirred at 50 °C for 12 h. Then water (2 mL) was added and extracted with EtOAc, the combined organic layer was dried over Na_2SO_4 and concentrated under reduced pressure. The residue was further purified by thin layer chromatography to afford desired product.

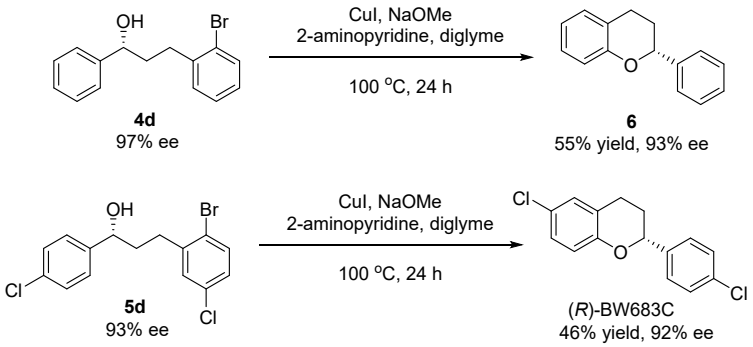
4. Gram-scale synthesis



S/C = 2 000: Under nitrogen atmosphere, phenylacetylene (**1a**, 1.02 g, 10 mmol), benzaldehyde (**2a**, 1.27 g, 12 mmol) and 50% H_3PO_3 (1.64 g, 10 mmol in H_2O) were added to a 50 mL Schlenk tube. The reaction mixture was stirred at 110 °C for 24 h. Then (*R,R*)-**10** (3.8 mg, 0.05 mol%), CTAB (0.73 g, 2 mmol), HCOONa (3.40 g, 50 mmol) and H_2O (10 mL) were added. the reaction mixture was stirred at 50 °C for 12 h. Then water (10 mL) was added and extracted with EtOAc. the combined organic layer was dried over Na_2SO_4 and concentrated under reduced pressure. The residue was further purified by silica gel column chromatography to afford chiral 4-phenyl-2-oxazolidanone **3a** with 74% yield and 98% ee.

S/C = 10 000: Under nitrogen atmosphere, phenylacetylene (**1a**, 2.04 g, 20 mmol), benzaldehyde (**2a**, 2.54 g, 24 mmol) and 50% H_3PO_3 (3.28 g, 20 mmol in H_2O) were added to a 50 mL Schlenk tube. The reaction mixture was stirred at 110 °C for 24 h. Then (*R,R*)-**10** (1.5 mg, 0.01 mol%), CTAB (1.46 g, 4 mmol), HCOONa (6.80 g, 100 mmol) and H_2O (10 mL) were added, the reaction mixture was stirred at 50 °C for 24 h. Then water (20 mL) was added and extracted with EtOAc. the combined organic layer was dried over Na_2SO_4 and concentrated under reduced pressure. The residue was further purified by silica gel column chromatography to afford chiral 4-phenyl-2-oxazolidanone **3a** with 68% yield and 98% ee.

5. Synthetic transformations of chiral secondary alcohol products



Synthesis of chiral chroman 6[10]

To a solution of **4d** (145 mg, 0.5 mmol, 97% ee) in anhydrous diglyme (2 mL) was added CuI (9.5 mg, 0.05 mmol), NaOMe (40.5 mg, 0.75 mmol) and 2-aminopyridine (9.4 mg, 0.1 mmol). The mixture was stirred at 100 °C for 24 h and then quenched with water, extracted with EtOAc.

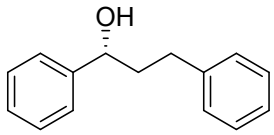
The organic phase was dried over Na_2SO_4, evaporated under reduced pressure and the residue was purified by silica gel column chromatography to afford chiral chroman **6** as a yellow oil (57.8 mg, 55% yield, 93% ee); $[\alpha]_D^{25}$ = +30.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.46 – 7.27 (m, 5H), 7.14 – 7.06 (m, 2H), 6.92 – 6.84 (m, 2H), 5.06 – 5.02 (m, 1H), 3.02 – 2.93 (m, 1H), 2.81 – 2.74 (m, 1H), 2.22 – 2.15 (m, 1H), 2.12 – 2.02 (m, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 155.1, 141.7, 129.5, 128.5, 127.8, 127.3, 126.0, 121.8, 120.3, 116.9, 77.7, 29.9, 25.0; **HPLC** (Chiralcel IA-H column, *n*-hexane, 0.4 mL/min; 220 nm): t_R = 27.0 min (minor), 28.9 min (major).

Synthesis of (*R*)-BW683C[10]

To a solution of **5d** (89.5 mg, 0.25 mmol, 93% ee) in anhydrous diglyme (1 mL) was added CuI (4.8 mg, 0.025 mmol), NaOMe (20.3 mg, 0.375 mmol) and 2-aminopyridine(4.7 mg, 0.05 mmol). The mixture was stirred at 100 °C for 24 h and then quenched with water, extracted with EtOAc. The organic phase was dried over Na_2SO_4, evaporated under reduced pressure and the residue was purified by silica gel column chromatography to afford **(*R*)-BW683C** as a white solid (32.0 mg, 46% yield, 92% ee); $[\alpha]_D^{25}$ = +3.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 – 7.31 (m, 4H), 7.11 – 7.01 (m, 2H), 6.83 – 6.75 (m, 1H), 5.01 (dd, *J* = 10.1, 2.5 Hz, 1H), 2.99 – 2.90 (m, 1H), 2.78 – 2.71 (m, 1H), 2.21 – 2.15 (m, 1H), 2.06 – 1.96 (m, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 153.4, 139.7, 133.7, 129.0, 128.7, 127.4, 127.3, 125.2, 123.2, 118.2, 77.1, 29.4, 24.8; **HPLC** (Chiralcel IA-H column, *n*-hexane : isopropanol = 99 : 1 (v/v); 1.0 mL/min; 220 nm): t_R = 6.3 min (minor), 7.1 min (major).

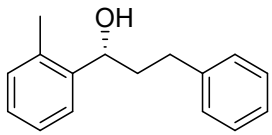
6. Analytical data of chiral alcohols

(*R*)-1,3-diphenylpropan-1-ol[1] **(3a**, known compound**)**



Colorless oil, 85.9 mg, 81% yield, 98% ee; $[\alpha]_D^{25}$ = +37.0 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.35 – 7.16 (m, 10H), 4.67 (dd, *J* = 7.8, 5.4 Hz, 1H), 2.78 – 2.62 (m, 2H), 2.17 – 1.97 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.5, 141.7, 128.5, 128.4, 128.4, 127.6, 125.9, 125.8, 73.8, 40.4, 32.0; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 17.0 min (minor), 20.1 min (major).

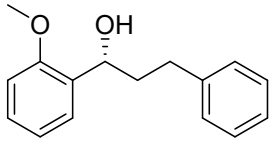
(*R*)-3-phenyl-1-(*o*-tolyl)propan-1-ol[3] **(3b**, known compound**)**



Colorless oil, 81.4 mg, 72% yield, 99% ee; $[\alpha]_D^{25}$ = +108.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz,

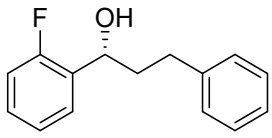
$CDCl_3$) δ 7.48 (d, J = 9.2 Hz, 1H), 7.30 – 7.07 (m, 8H), 4.91 (dd, J = 8.3, 4.4 Hz, 1H), 2.87 – 2.68 (m, 2H), 2.22 (s, 3H), 2.10 – 1.93 (m, 2H), 1.81 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 142.7, 141.8, 134.4, 130.4, 128.4, 128.4, 127.2, 126.3, 125.8, 125.1, 69.9, 39.4, 32.3, 18.9; **HPLC** (Chiralcel AD-H column, *n*-hexane : isopropanol = 99 : 1 (v/v); 1.0 mL/min; 220 nm): t_R = 29.6 min (minor), 32.5 min (major).

(*R*)-1-(2-methoxyphenyl)-3-phenylpropan-1-ol[1] **(3c**, known compound**)**



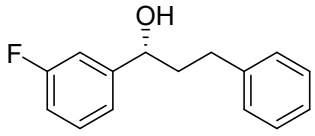
Colorless oil, 66.6 mg, 55% yield, 78% ee; $[\alpha]_D^{25}$ = +29.8 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.31 – 7.15 (m, 7H), 6.95 (t, J = 7.5 Hz, 1H), 6.88 (d, J = 8.2 Hz, 1H), 4.88 (dd, J = 8.0, 5.1 Hz, 1H), 3.83 (s, 3H), 2.87 – 2.79 (m, 1H), 2.72 – 2.64 (m, 2H), 2.20 – 2.05 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 156.6, 142.1, 132.2, 128.4, 128.3, 128.3, 127.0, 125.7, 120.7, 110.5, 70.7, 55.2, 38.6, 32.3; **HPLC** (Chiralcel IB-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 10.3 min (minor), 12.6 min (major).

(*R*)-1-(2-fluorophenyl)-3-phenylpropan-1-ol[1] **(3d**, known compound**)**



Yellow oil, 74.8 mg, 65% yield, 75% ee; $[\alpha]_D^{25}$ = +21.0 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.46 (td, J = 7.5, 1.9 Hz, 1H), 7.28 – 7.12 (m, 7H), 7.04 – 6.99 (m, 1H), 5.02 (dd, J = 7.7, 5.3 Hz, 1H), 2.81 – 2.65 (m, 2H), 2.13 – 2.03 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 159.8 (d, J = 245.4 Hz), 141.6, 131.4 (d, J = 13.2 Hz), 128.9 (d, J = 8.3 Hz), 128.4, 128.4, 127.3 (d, J = 4.5 Hz), 125.9, 124.3 (d, J = 3.5 Hz), 115.3 (d, J = 21.9 Hz), 67.9 (d, J = 2.4 Hz), 39.4, 32.0; **HPLC** (Chiralcel IA-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 9.1 min (minor), 10.1 min (major).

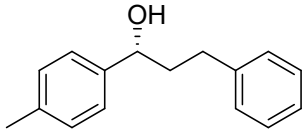
(*R*)-1-(3-fluorophenyl)-3-phenylpropan-1-ol[3] **(3e**, known compound**)**



Yellow oil, 64.4 mg, 56% yield, 96% ee; $[\alpha]_D^{25}$ = +12.0 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.32 – 7.25 (m, 3H), 7.21 – 7.17 (m, 3H), 7.10 – 7.05 (m, 2H), 6.96 (td, J = 8.4, 2.7 Hz, 1H), 4.68 (dd, J = 7.9, 5.2 Hz, 1H), 2.78 – 2.63 (m, 2H), 2.12 – 1.96 (m, 3H); **^{13}C NMR** (100 MHz,

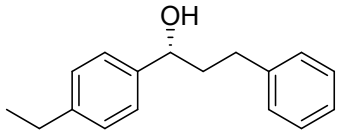
$CDCl_3$) δ 162.9 (d, J = 246.0 Hz), 147.3 (d, J = 6.6 Hz), 141.5, 130.0 (d, J = 8.1 Hz), 128.4, 128.4, 125.9, 121.4 (d, J = 2.8 Hz), 114.4 (d, J = 21.2 Hz), 112.8 (d, J = 21.7 Hz), 73.2, 40.4, 31.9; **HPLC** (Chiralcel IA-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 10.5 min (minor), 12.4 min (major).

(*R*)-3-phenyl-1-(*p*-tolyl)propan-1-ol[1] **(3f**, known compound**)**



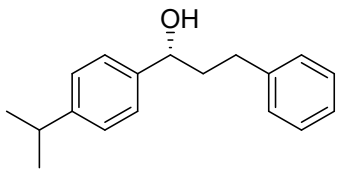
Colorless oil, 90.4 mg, 80% yield, 98% ee; $[\alpha]_D^{25}$ = +36.8 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.28 – 7.13 (m, 9H), 4.61 (dd, J = 7.7, 5.5 Hz, 1H), 2.75 – 2.59 (m, 2H), 2.33 (s, 3H), 2.15 – 1.95 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 141.8, 141.5, 137.3, 129.1, 128.4, 128.3, 125.9, 125.8, 73.7, 40.3, 32.0, 21.1; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 15.0 min (minor), 18.2 min (major).

(*R*)-1-(4-ethylphenyl)-3-phenylpropan-1-ol **(3g**, unknown compound**)**



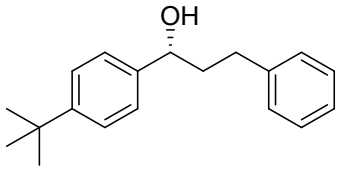
Yellow oil, 90.1 mg, 75% yield, 99% ee; $[\alpha]_D^{25}$ = +28.2 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.29 – 7.15 (m, 9H), 4.64 (dd, J = 7.8, 5.5 Hz, 1H), 2.77 – 2.61 (m, 4H), 2.15 – 1.95 (m, 3H), 1.23 (t, J = 7.6 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.7, 141.8, 141.8, 128.4, 128.3, 128.0, 125.9, 125.8, 73.7, 40.3 , 32.1, 28.5, 15.6; **HRMS** (ESI) Calculated for $C_{15}H_{20}NO_2$ $[M+Na]^+$ 263.1406; found 263.1405; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 12.0 min (major), 16.2 min (minor).

(*R*)-1-(4-isopropylphenyl)-3-phenylpropan-1-ol[3] **(3h**, known compound**)**



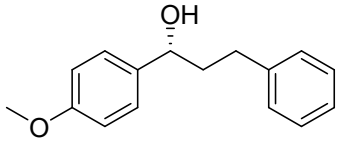
Yellow oil, 101.7 mg, 80% yield, 99% ee; $[\alpha]_D^{25}$ = +40.0 (c = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.29 – 7.15 (m, 9H), 4.64 (dd, J = 7.9, 5.4 Hz, 1H), 2.93 – 2.84 (m, 1H), 2.78 – 2.61 (m, 2H), 2.15 – 1.94 (m, 3H), 1.24 (d, J = 6.9 Hz, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 148.3, 141.9, 141.8, 128.4, 128.3, 126.5, 125.9, 125.7, 73.7, 40.3, 33.8, 32.1, 24.0; **HPLC** (Chiralcel IB-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 8.3 min (minor), 9.7 min (major).

(*R*)-1-(4-(tert-butyl)phenyl)-3-phenylpropan-1-ol[1] **(3i**, known compound**)**



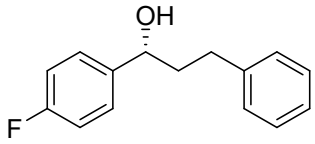
Yellow oil, 111.3 mg, 83% yield, >99% ee; $[\alpha]_D^{25}$ = +27.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.38 – 7.15 (m, 9H), 4.64 (dd, *J* = 7.9, 5.4 Hz, 1H), 2.79 – 2.62 (m, 2H), 2.17 – 1.99 (m, 2H), 1.95 (s, 1H), 1.31 (s, 9H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 150.6, 141.8, 141.5, 128.4, 128.3, 125.8, 125.6, 125.4, 73.6, 40.2, 34.5, 32.1, 31.3; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 10.2 min (major), 15.6 min (minor).

(*R*)-1-(4-methoxyphenyl)-3-phenylpropan-1-ol[1] **(3j**, known compound**)**



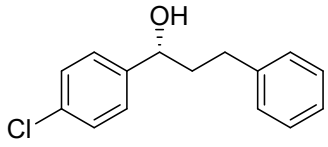
Colorless oil, 89.6 mg, 74% yield, 98% ee; $[\alpha]_D^{25}$ = +29.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.29 – 7.16 (m, 7H), 6.90 – 6.86 (m, 2H), 4.62 (dd, *J* = 7.7, 5.7 Hz, 1H), 3.80 (s, 3H), 2.75 – 2.59 (m, 2H), 2.16 – 1.96 (m, 2H), 1.91 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 159.0, 141.8, 136.6, 128.4, 128.3, 127.2, 125.8, 113.8, 73.4, 55.3, 40.3, 32.1; **HPLC** (Chiralcel AD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 19.6 min (major), 22.0 min (minor).

(*R*)-1-(4-fluorophenyl)-3-phenylpropan-1-ol[1] **(3k**, known compound**)**



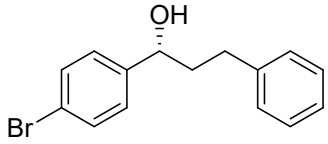
Yellow oil, 78.2 mg, 68% yield, 92% ee; $[\alpha]_D^{25}$ = +16.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.31 – 6.99 (m, 9H), 4.65 (dd, *J* = 7.8, 5.4 Hz, 1H), 2.75 – 2.60 (m, 2H), 2.13 – 1.95 (m, 3H).; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 162.1 (d, *J* = 245.4 Hz), 141.5, 140.2 (d, *J* = 3.2 Hz), 128.4, 128.4, 127.5 (d, *J* = 8.0 Hz), 125.9, 115.3 (d, *J* = 21.3 Hz), 73.1, 40.5, 31.9; **HPLC** (Chiralcel IA-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 10.6 min (minor), 12.0 min (major).

(*R*)-1-(4-chlorophenyl)-3-phenylpropan-1-ol[1] **(3l**, known compound**)**



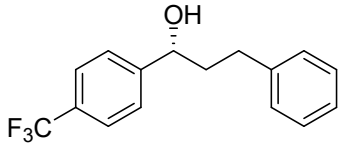
Colorless oil, 96.0 mg, 78% yield, 95% ee; $[\alpha]_D^{25}$ = +17.0 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.33 – 7.16 (m, 9H), 4.64 (dd, *J* = 7.8, 5.3 Hz, 1H), 2.75 – 2.60 (m, 2H), 2.15 – 1.95 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.0, 141.4, 133.2, 128.6, 128.4, 128.4, 127.3, 125.9, 73.1, 40.4, 31.9; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 17.9 min (minor), 22.1 min (major).

(*R*)-1-(4-bromophenyl)-3-phenylpropan-1-ol[1] **(3m**, known compound**)**



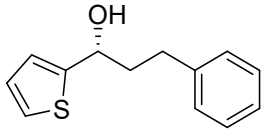
Colorless oil, 114.6 mg, 79% yield, 95% ee; $[\alpha]_D^{25}$ = +15.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.47 – 7.43 (m, 2H), 7.29 – 7.15 (m, 7H), 4.62 (dd, *J* = 7.9, 5.3 Hz, 1H), 2.73 – 2.60 (m, 2H), 2.12 – 1.93 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 143.5, 141.4, 131.5, 128.4, 128.4, 127.6, 125.9, 121.3, 73.1, 40.4, 31.8; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 19.3 min (minor), 23.8 min (major).

(*R*)-3-phenyl-1-(4-(trifluoromethyl)phenyl)propan-1-ol[1] **(3n**, known compound**)**



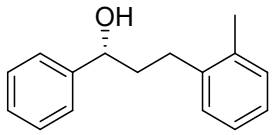
Yellow oil, 50.4 mg, 36% yield, 95% ee; $[\alpha]_D^{25}$ = +10.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.1 Hz, 2H), 7.45 (d, *J* = 8.0 Hz, 2H), 7.30 – 7.18 (m, 5H), 4.75 (dd, *J* = 8.0, 5.1 Hz, 1H), 2.79 – 2.65 (m, 2H), 2.15 – 1.97 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 148.5, 141.3, 129.7 (q, *J* = 32.3 Hz), 128.5, 128.4, 126.1, 126.0, 125.4 (q, *J* = 3.8 Hz), 124.3 (q, *J* = 272.0 Hz), 73.1, 40.5, 31.8; **HPLC** (Chiralcel IB-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 10.6 min (minor), 11.9 min (major).

(*R*)-3-phenyl-1-(thiophen-2-yl)propan-1-ol[1] **(3o**, known compound**)**



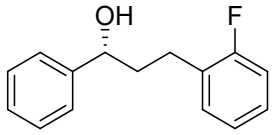
Colorless oil, 89.4 mg, 82% yield, 99% ee; $[\alpha]_D^{25}$ = +18.0 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.30 – 7.17 (m, 6H), 6.97 – 6.95 (m, 2H), 4.91 (dd, *J* = 7.6, 5.7 Hz, 1H), 2.79 – 2.66 (m, 2H), 2.24 – 2.08 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 148.5, 141.4, 128.5, 128.4, 126.6, 125.9, 124.6, 123.9, 69.5, 40.7, 32.0; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 17.7 min (minor), 24.5 min (major).

(*R*)-1-phenyl-3-(*o*-tolyl)propan-1-ol[3] **(4a**, known compound**)**



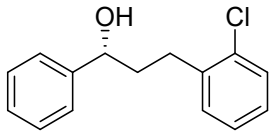
Colorless oil, 82.5 mg, 73% yield, 98% ee; $[\alpha]_D^{25}$ = +42.0 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 – 7.25 (m, 5H), 7.14 – 7.06 (m, 4H), 4.71 (dd, *J* = 7.8, 5.3 Hz, 1H), 2.78 – 2.57 (m, 2H), 2.25 (s, 3H), 2.11 – 1.92 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.5, 140.0, 135.9, 130.2, 128.7, 128.5, 127.6, 126.0, 125.9, 125.9, 74.2, 39.2, 29.4, 19.2; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 17.2 min (minor), 19.3 min (major).

(*R*)-3-(2-fluorophenyl)-1-phenylpropan-1-ol[2] **(4b**, known compound**)**



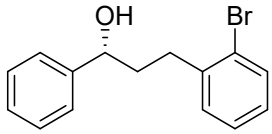
Yellow oil, 79.4 mg, 69% yield, 97% ee; $[\alpha]_D^{25}$ = +36.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 – 7.24 (m, 5H),7.20 – 7.13 (m, 2H), 7.04 – 6.95 (m, 2H) , 4.68 (dd, *J* = 8.0, 5.2 Hz, 1H), 2.83 – 2.65 (m, 2H), 2.14 – 1.97 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 161.1 (d, *J* = 244.7 Hz), 144.4, 130.6 (d, *J* = 5.1 Hz), 128.6, 128.5, 127.6, 127.6, 127.5, 125.9, 115.2 (d, *J* = 22.3 Hz), 73.8, 39.1, 25.5 (d, *J* = 2.4 Hz); **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 12.5 min (minor), 13.1 min (major).

(*R*)-3-(2-chlorophenyl)-1-phenylpropan-1-ol[6] **(4c**, known compound**)**



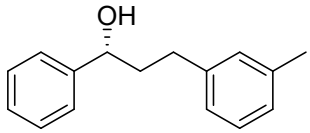
Colorless oil, 91.0 mg, 74% yield, 95% ee; $[\alpha]_D^{25}$ = +40.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 – 7.12 (m, 9H), 4.71 (dd, *J* = 7.8, 5.3 Hz, 1H), 2.93 – 2.85 (m, 1H), 2.80 – 2.73 (m, 1H), 2.14 – 1.99 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.3, 139.4, 133.9, 130.4, 129.5, 128.5, 127.6, 127.4, 126.8, 125.9, 73.9, 38.7, 30.0; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 14.8 min (minor), 17.8 min (major).

(*R*)-3-(2-bromophenyl)-1-phenylpropan-1-ol[5] **(4d**, known compound**)**



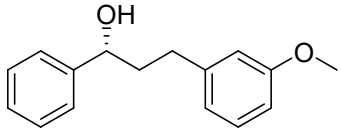
Colorless oil, 120.4 mg, 83% yield, 97% ee; $[\alpha]_D^{25}$ = +38.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.54 – 7.49 (m, 1H), 7.37 – 7.18 (m, 7H), 7.07 – 7.01 (m, 1H), 4.71 (dd, *J* = 7.7, 5.4 Hz, 1H), 2.92 – 2.72 (m, 2H), 2.12 – 1.98 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.3, 141.1, 132.8, 130.4, 128.5, 127.6, 127.6, 127.4, 125.9, 124.4, 73.9, 38.8, 32.5; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 15.3 min (major), 16.9 min (minor).

(*R*)-1-phenyl-3-(*m*-tolyl)propan-1-ol[3] **(4e**, known compound**)**



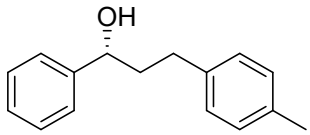
Colorless oil, 90.5 mg, 80% yield, 98% ee; $[\alpha]_D^{25}$ = +37.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.35 – 7.23 (m, 5H), 7.18 – 7.13 (m, 1H), 7.00 – 6.97 (m, 3H), 4.67 (dd, *J* = 7.8, 5.3 Hz, 1H), 2.74 – 2.58 (m, 2H), 2.31 (s, 3H), 2.17 – 1.96 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.6, 141.7, 137.9, 129.2, 128.5, 128.3, 127.6, 126.6, 125.9, 125.4, 73.9, 40.5, 31.9, 21.4; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 13.5 min (minor), 16.7 min (major).

(*R*)-3-(3-methoxyphenyl)-1-phenylpropan-1-ol[2] **(4f**, known compound**)**



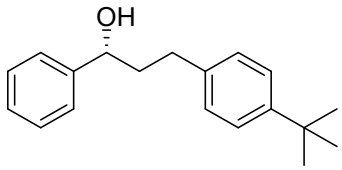
Yellow oil, 61.7 mg, 51% yield, 98% ee; $[\alpha]_D^{25}$ = +31.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.34 – 7.17 (m, 6H), 6.79 – 6.71 (m, 3H), 4.67 (dd, *J* = 7.9, 5.3 Hz, 1H), 3.77 (s, 3H), 2.75 – 2.59 (m, 2H), 2.16 – 1.96 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 159.6, 144.5, 143.4, 129.3, 128.5, 127.6, 125.9, 120.8, 114.1, 111.1, 73.8, 55.1, 40.3, 32.1; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 26.6 min (minor), 34.2 min (major).

(*R*)-1-phenyl-3-(*p*-tolyl)propan-1-ol[3] **(4g**, known compound**)**



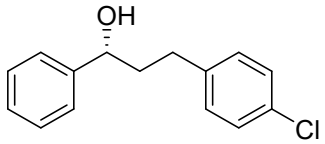
Colorless oil, 75.8 mg, 67% yield, 98% ee; $[\alpha]_D^{25}$ = +18.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37 – 7.25 (m, 1H), 7.08 (s, 4H), 4.67 (dd, *J* = 7.8, 5.4 Hz, 1H), 2.73 – 2.58 (m, 2H), 2.31 (s, 3H), 2.19 – 1.93 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.6, 138.6, 135.3, 129.0, 128.5, 128.3, 127.6, 125.9, 73.9, 40.5, 31.6, 21.0; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 12.7 min (major), 15.4 min (minor).

(*R*)-3-(4-(tert-butyl)phenyl)-1-phenylpropan-1-ol[8] **(4h**, known compound**)**



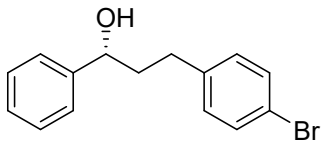
Colorless oil, 93.9 mg, 70% yield, 96% ee; $[\alpha]_D^{25}$ = +25.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.36 – 7.24 (m, 7H), 7.14 – 7.09 (m, 2H), 4.68 (dd, *J* = 7.8, 5.4 Hz, 1H), 2.75 – 2.58 (m, 2H), 2.16 – 1.96 (m, 3H), 1.30 (s, 9H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 148.6, 144.6, 138.6, 128.5, 128.0, 127.6, 125.9, 125.2, 73.9, 40.4, 34.3, 31.5, 31.4; **HPLC** (Chiralcel IB-H column, *n*-hexane : isopropanol = 98 : 2 (v/v); 1.0 mL/min; 220 nm): t_R = 12.1 min (major), 12.9 min (minor).

(*R*)-3-(4-chlorophenyl)-1-phenylpropan-1-ol[3] **(4i**, known compound**)**



Colorless oil, 99.7 mg, 81% yield, 98% ee; $[\alpha]_D^{25}$ = +19.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.36 – 7.25 (m, 7H), 7.13 – 7.08 (m, 2H), 4.65 (dd, *J* = 7.9, 5.3 Hz, 1H), 2.75 – 2.59 (m, 2H), 2.14 – 1.93 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.4, 140.2, 131.5, 129.8, 128.6, 128.4, 127.7, 125.9, 73.7, 40.3, 31.3; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 12.9 min (major), 14.5 min (minor).

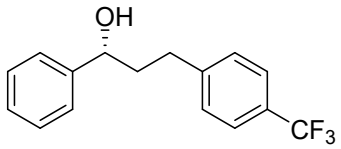
(*R*)-3-(4-bromophenyl)-1-phenylpropan-1-ol[3] **(4j**, known compound**)**



Colorless oil, 116.0 mg, 80% yield, 99% ee; $[\alpha]_D^{25}$ = +17.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.40 – 7.26 (m, 7H), 7.07 – 7.03 (m, 2H), 4.65 (dd, *J* = 7.9, 5.3 Hz, 1H), 2.73 – 2.57 (m, 2H), 2.13 – 1.93 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.3, 140.7, 131.4, 130.2, 128.5, 127.7, 125.8, 119.5, 73.6, 40.2, 31.4; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); flow

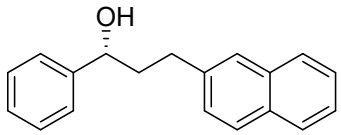
rate = 1.0 mL/min; 220 nm): t_R = 19.2 min (major), 21.6 min (minor).

(*R*)-1-phenyl-3-(4-(trifluoromethyl)phenyl)propan-1-ol[2] **(4k**, known compound**)**



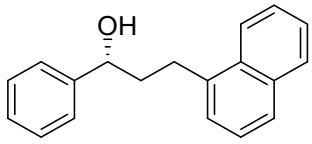
Colorless oil, 82.6 mg, 59% yield, 96% ee; $[\alpha]_D^{25}$ = +23.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 8.0 Hz, 2H), 7.36 – 7.25 (m, 7H), 4.67 (dd, *J* = 7.9, 5.3 Hz, 1H), 2.84 – 2.68 (m, 2H), 2.17 – 1.97 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 145.9, 144.3, 128.7, 128.6, 128.1, 127.8, 125.8, 125.3 (q, *J* = 4.0 Hz), 124.3 (q, *J* = 270 Hz), 73.7, 40.0, 31.8; **HPLC** (Chiralcel FLM-H column, *n*-hexane : isopropanol = 98 : 2 (v/v); 1.0 mL/min; 220 nm): t_R = 19.1 min (major), 22.8 min (minor).

(*R*)-3-(naphthalen-2-yl)-1-phenylpropan-1-ol[3] **(4l**, known compound**)**



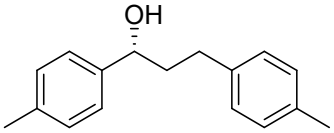
Yellow oil, 85.2 mg, 65% yield, 96% ee; $[\alpha]_D^{25}$ = +3.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 14.6, 7.9 Hz, 3H), 7.61 (s, 1H), 7.45 – 7.38 (m, 2H), 7.34 – 7.23 (m, 6H), 4.68 (dd, *J* = 7.9, 5.3 Hz, 1H), 2.92 – 2.77 (m, 2H), 2.24 – 2.02 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.5, 139.2, 133.6, 132.0, 128.5, 127.9, 127.6, 127.6, 127.4, 127.3, 126.4, 125.9, 125.9, 125.1, 73.8, 40.3, 32.1; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 85 : 15 (v/v); 1.0 mL/min; 220 nm): t_R = 18.5 min (major), 22.5 min (minor).

(*R*)-3-(naphthalen-1-yl)-1-phenylpropan-1-ol[9] **(4m**, known compound**)**



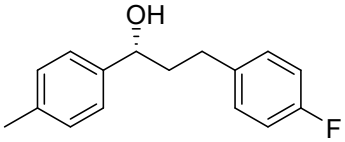
Yellow oil, 89.1 mg, 68% yield, 96% ee; $[\alpha]_D^{25}$ = +48.0 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.97 – 7.91 (m, 1H), 7.84 – 7.80 (m, 1H), 7.69 (d, *J* = 6.8 Hz, 1H), 7.48 – 7.41 (m, 2H), 7.36 – 7.24 (m, 7H), 4.74 (dd, *J* = 7.8, 5.2 Hz, 1H), 3.25 – 3.18 (m, 1H), 3.11 – 3.03 (m, 1H), 2.26 – 2.08 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 144.5, 138.0, 133.9, 131.8, 128.7, 128.5, 127.6, 126.6, 125.9, 125.9, 125.8, 125.5, 125.4, 123.7, 74.1, 39.8, 29.1; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 32.2 min (minor), 36.9 min (major).

(*R*)-1,3-di-*p*-tolylpropan-1-ol[4] **(5a**, known compound**)**



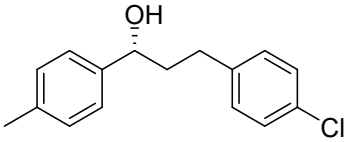
Colorless oil, 90.1 mg, 75% yield, 97% ee; $[\alpha]_D^{25}$ = +15.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.24 – 7.21 (m, 2H), 7.14 (d, *J* = 8.4 Hz, 2H), 7.07 (s, 4H), 4.62 (dd, *J* = 7.7, 5.5 Hz, 1H), 2.70 – 2.56 (m, 2H), 2.33 (s, 3H), 2.30 (s, 3H), 2.12 – 1.93 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 141.6, 138.7, 137.2, 135.2, 129.1, 129.0, 128.3, 125.9, 73.7, 40.4, 31.6, 21.1, 21.0; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 12.1 min (major), 13.7 min (minor).

(*R*)-3-(4-fluorophenyl)-1-(*p*-tolyl)propan-1-ol[1] **(5b**, known compound**)**



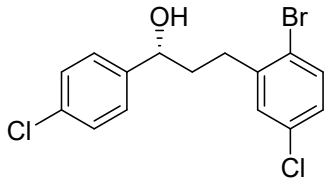
Yellow oil, 90.3 mg, 74% yield, 98% ee; $[\alpha]_D^{25}$ = +27.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.22 – 7.08 (m, 6H), 6.97 – 6.91 (m, 2H), 4.59 (dd, *J* = 7.8, 5.5 Hz, 1H), 2.72 – 2.56 (m, 2H), 2.33 (s, 3H), 2.12 – 1.90 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 161.2 (d, *J* = 243.2 Hz), 141.5, 137.4 (d, *J* = 3.2 Hz), 137.3, 129.7 (d, *J* = 7.8 Hz), 129.2, 125.8, 115.0 (d, *J* = 21.1 Hz), 73.5, 40.4, 31.2, 21.1; **HPLC** (Chiralcel OJ-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 15.1 min (major), 18.2 min (minor).

(*R*)-3-(4-chlorophenyl)-1-(*p*-tolyl)propan-1-ol[7] **(5c**, known compound**)**



Colorless oil, 100.1 mg, 77% yield, 98% ee; $[\alpha]_D^{25}$ = +18.8 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.24 – 7.08 (m, 8H), 4.60 (dd, *J* = 7.8, 5.5 Hz, 1H), 2.72 – 2.56 (m, 2H), 2.34 (s, 3H), 2.12 – 2.03 (m, 1H), 1.99 – 1.90 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 141.4, 140.2, 137.4, 131.4, 129.8, 129.2, 128.4, 125.8, 73.5, 40.2, 31.4, 21.1; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 97 : 3 (v/v); 1.0 mL/min; 220 nm): t_R = 17.1 min (major), 18.5 min (minor).

(*R*)-3-(2-bromo-5-chlorophenyl)-1-(4-chlorophenyl)propan-1-ol **(5d**, unknown compound**)**



Colorless oil, 136.0 mg, 76% yield, 93% ee; $[\alpha]_D^{25}$ = +21.4 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.47 – 7.40 (m, 1H), 7.35 – 7.26 (m, 4H), 7.19 (d, *J* = 2.6 Hz, 1H), 7.03 (dd, *J* = 8.4, 2.6 Hz, 1H), 4.69 (dd, *J* = 7.8, 5.1 Hz, 1H), 2.87 – 2.67 (m, 2H), 2.12 – 1.92 (m, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ 142.7, 142.6, 133.8, 133.4, 133.3, 130.2, 128.7, 127.8, 127.2, 122.2, 73.0, 38.5, 32.3; **HPLC** (Chiralcel OD-H column, *n*-hexane : isopropanol = 95 : 5 (v/v); 1.0 mL/min; 220 nm): t_R = 11.1 min (minor), 11.7 min (major).

References

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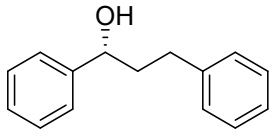
7. NMR spectra of chiral alcohols



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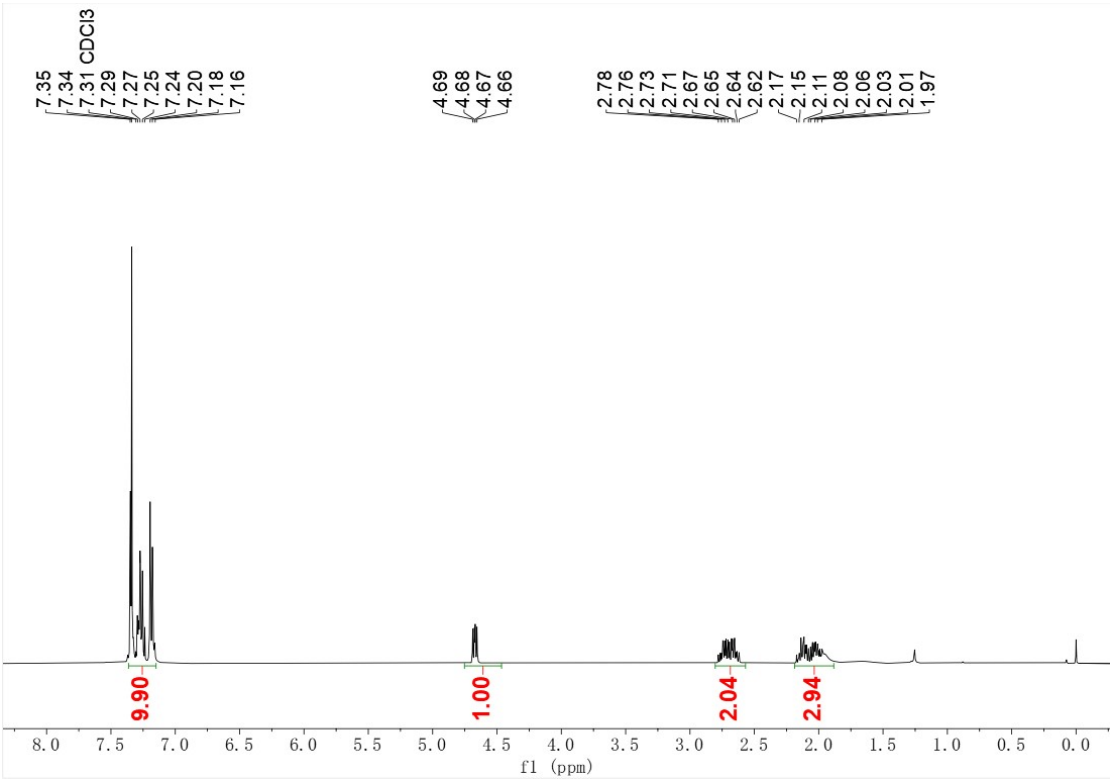

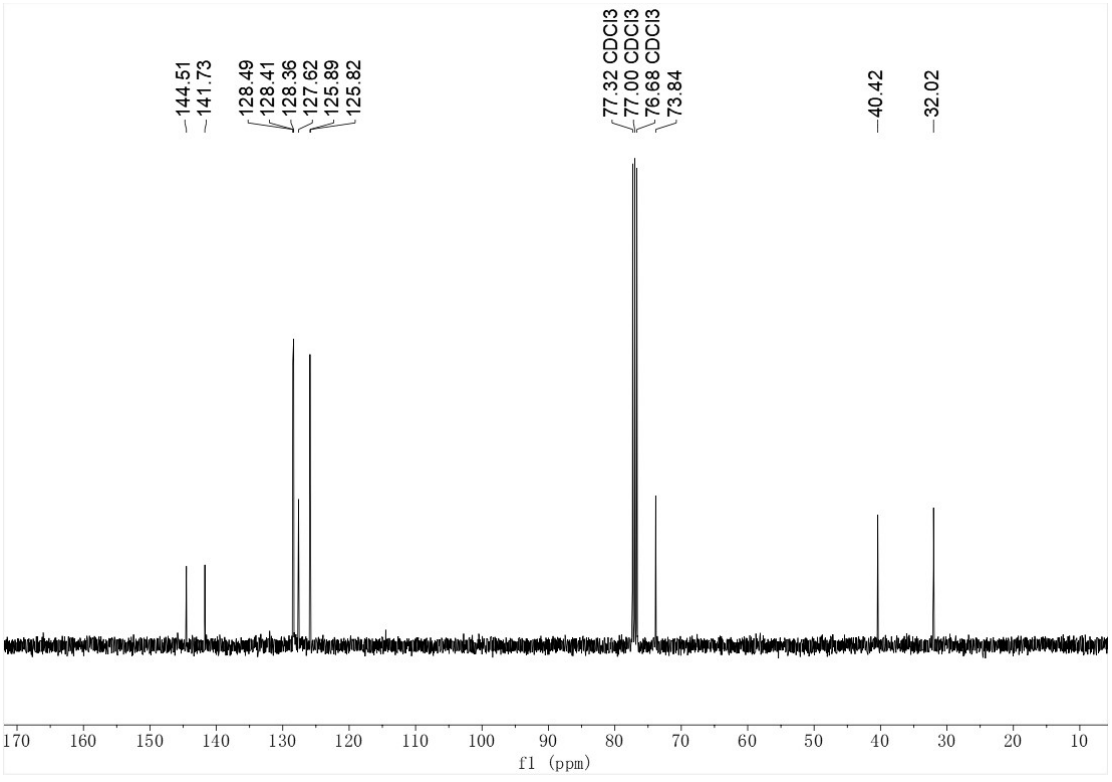

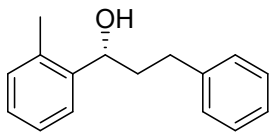
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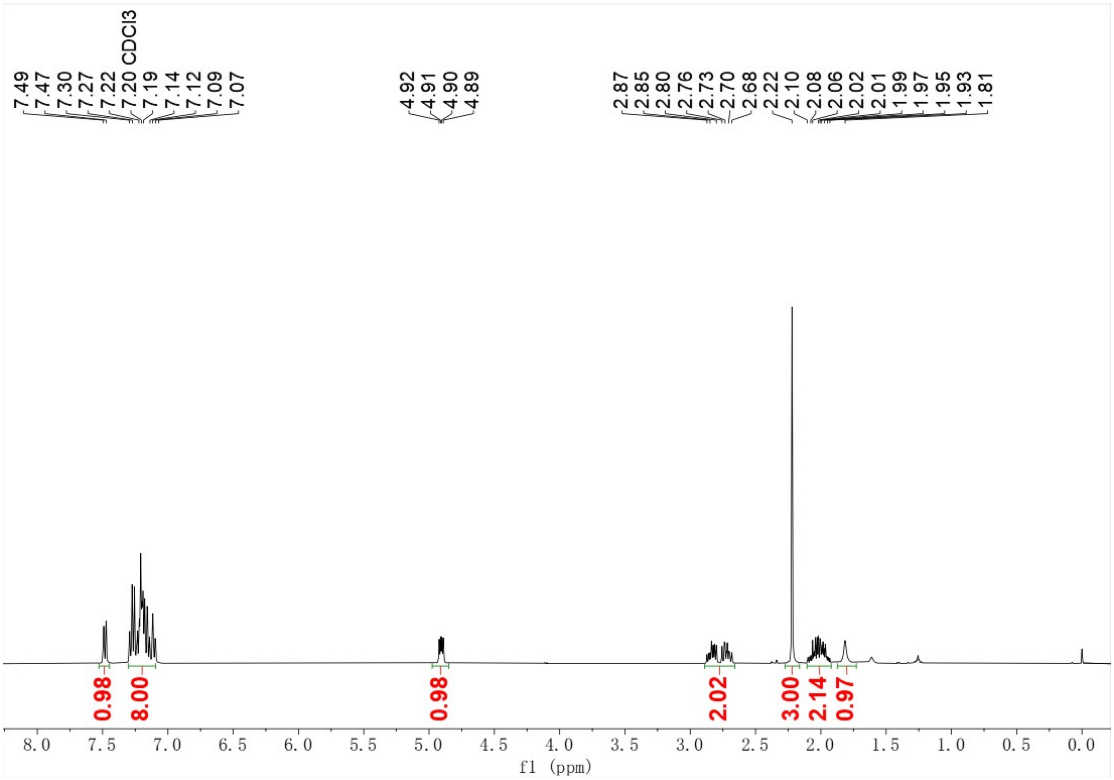
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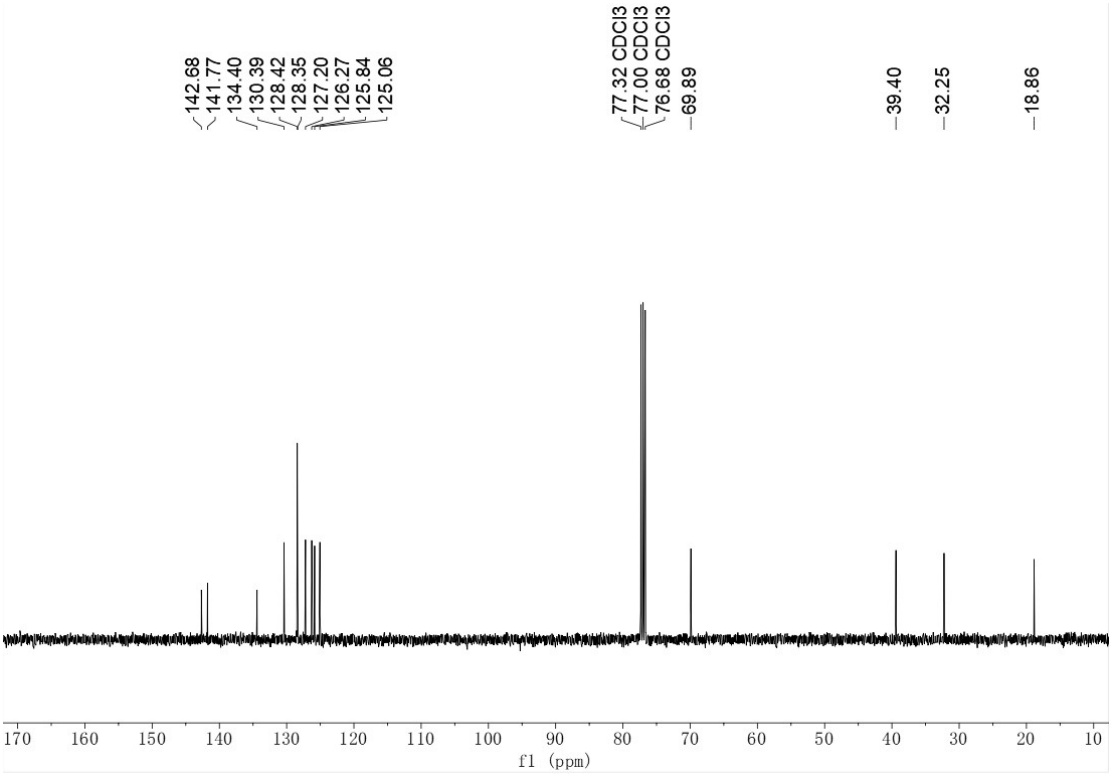
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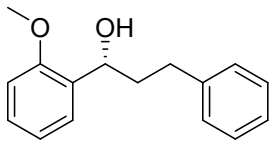
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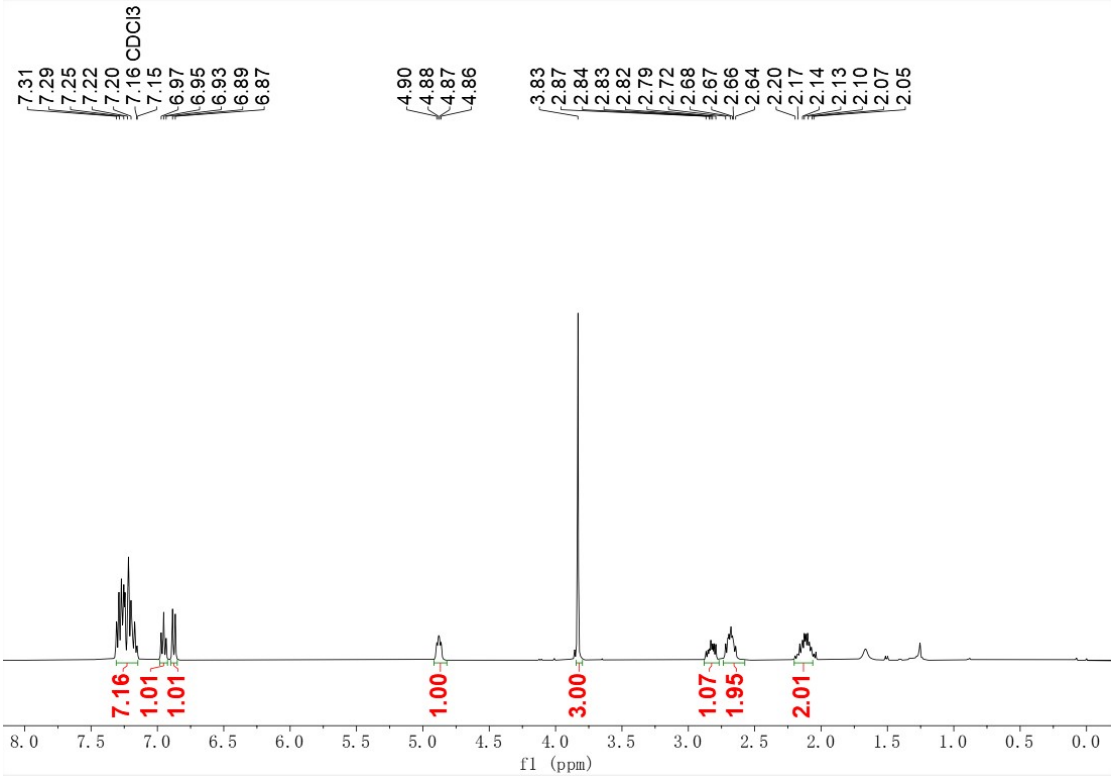
OH

3c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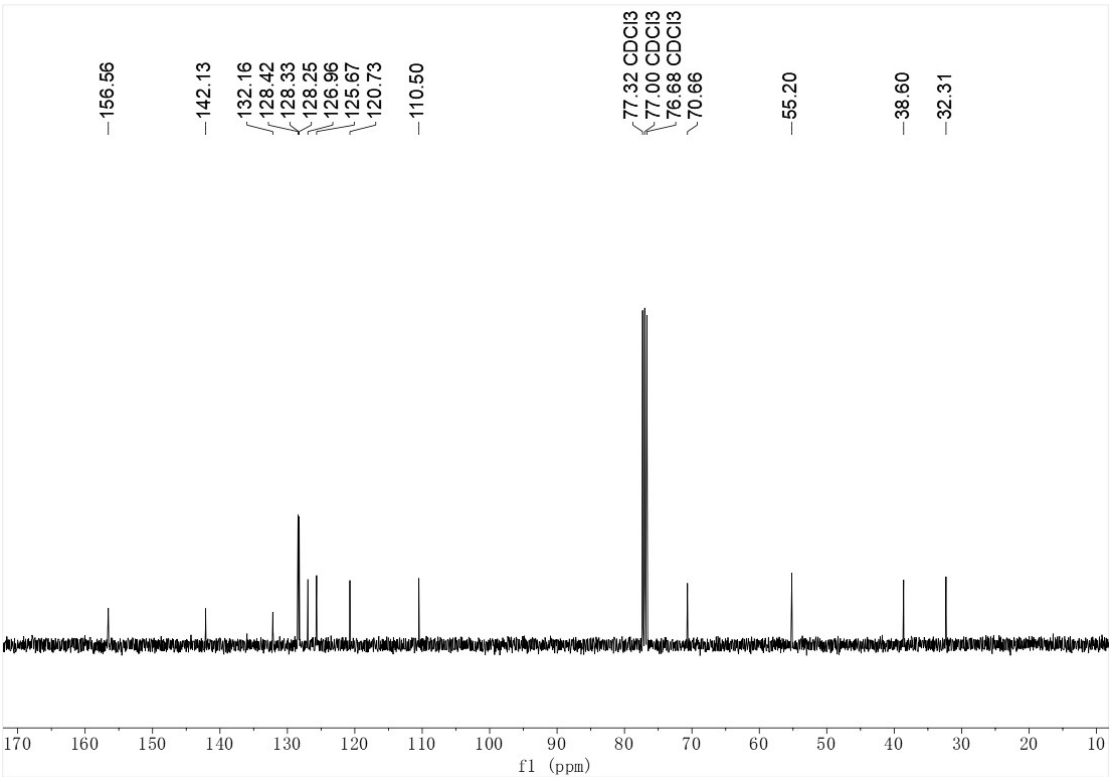
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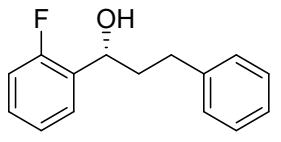
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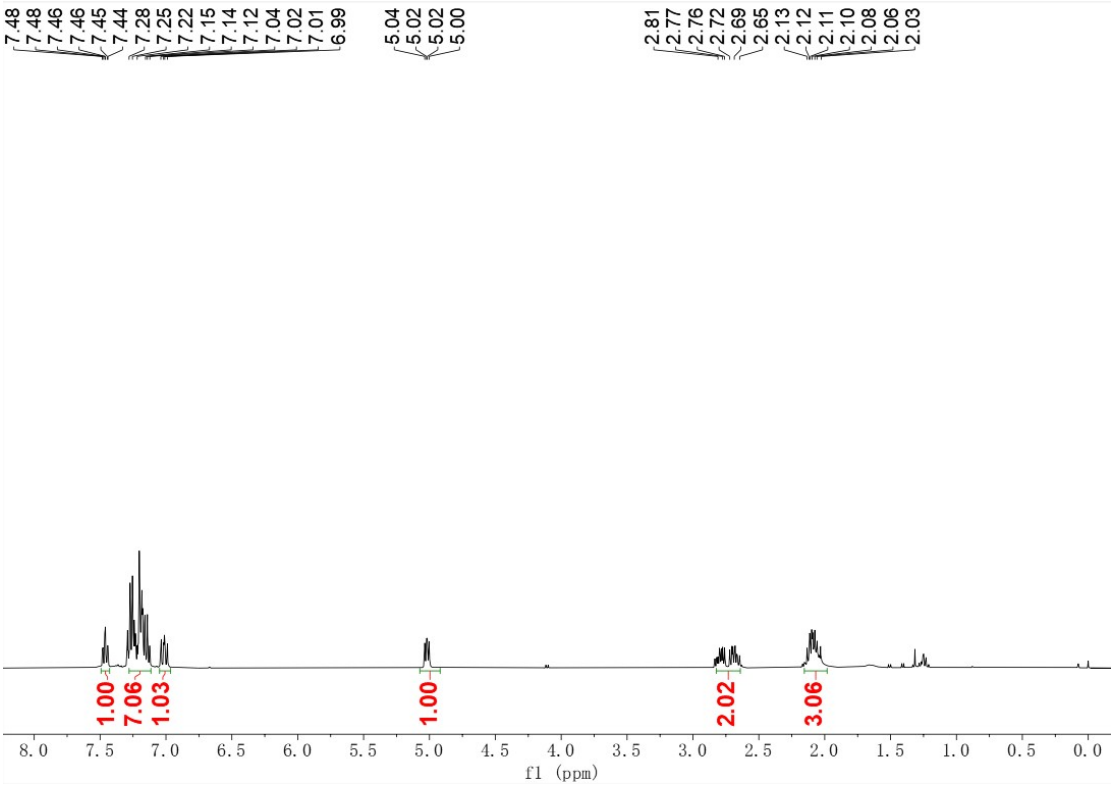
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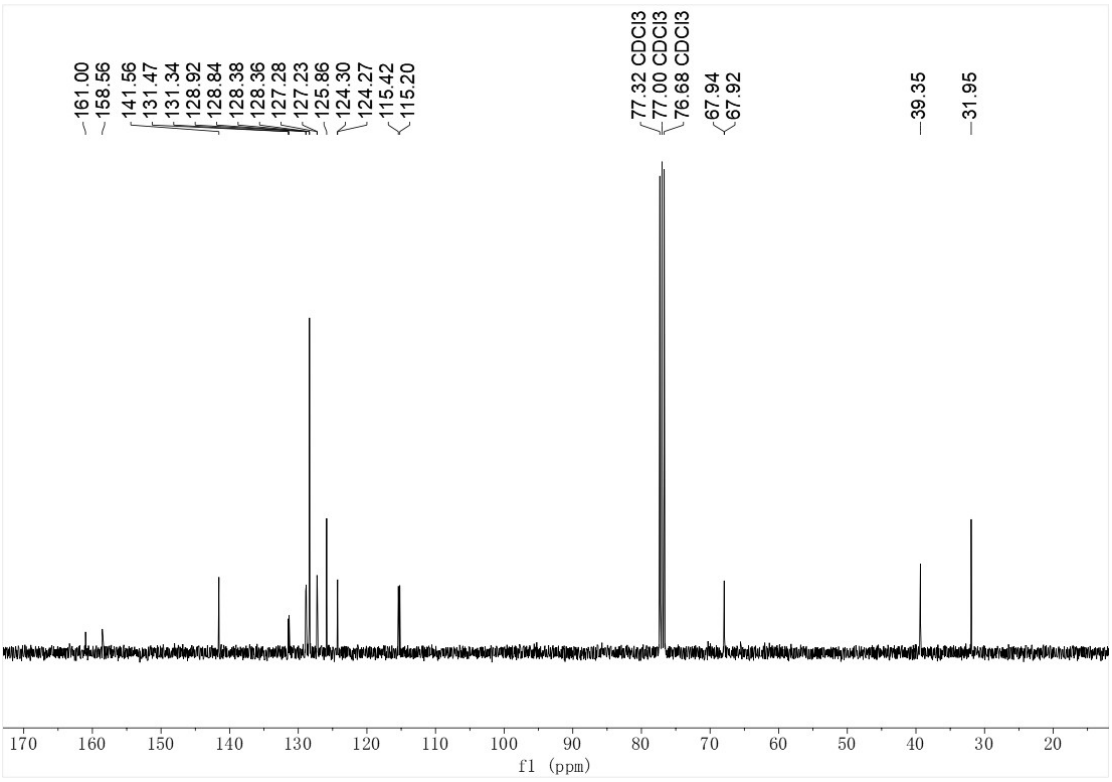
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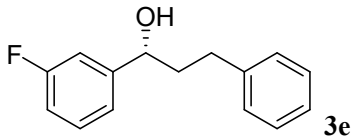
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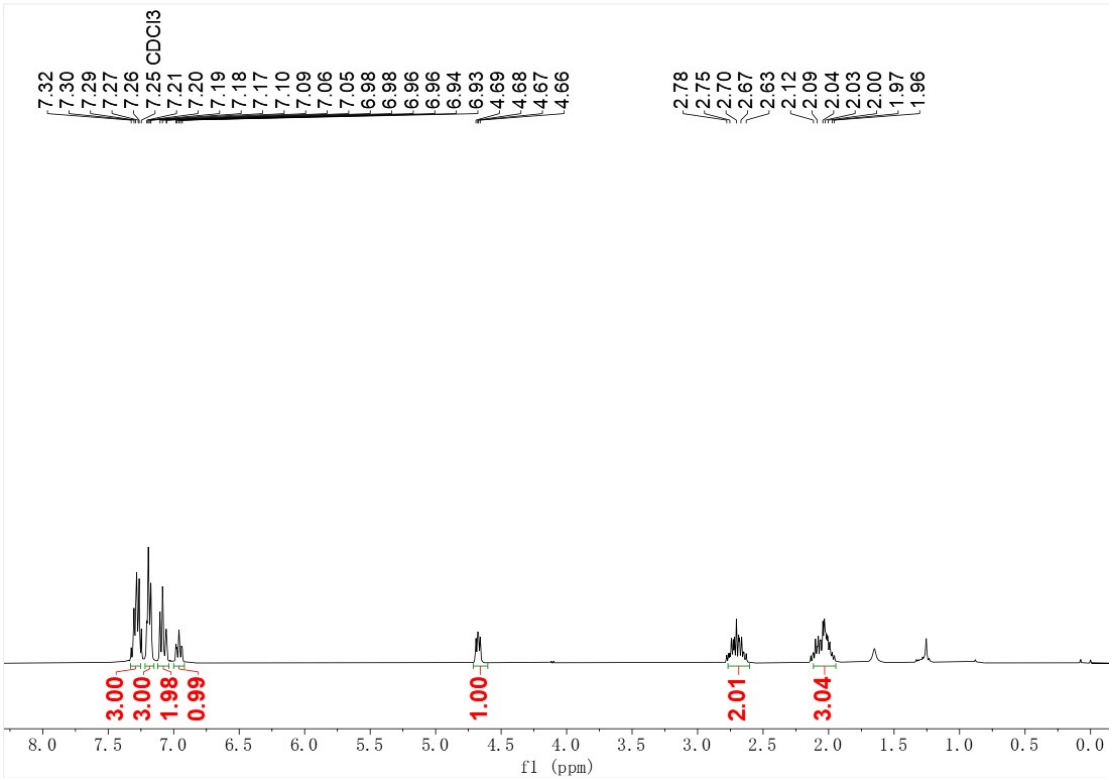
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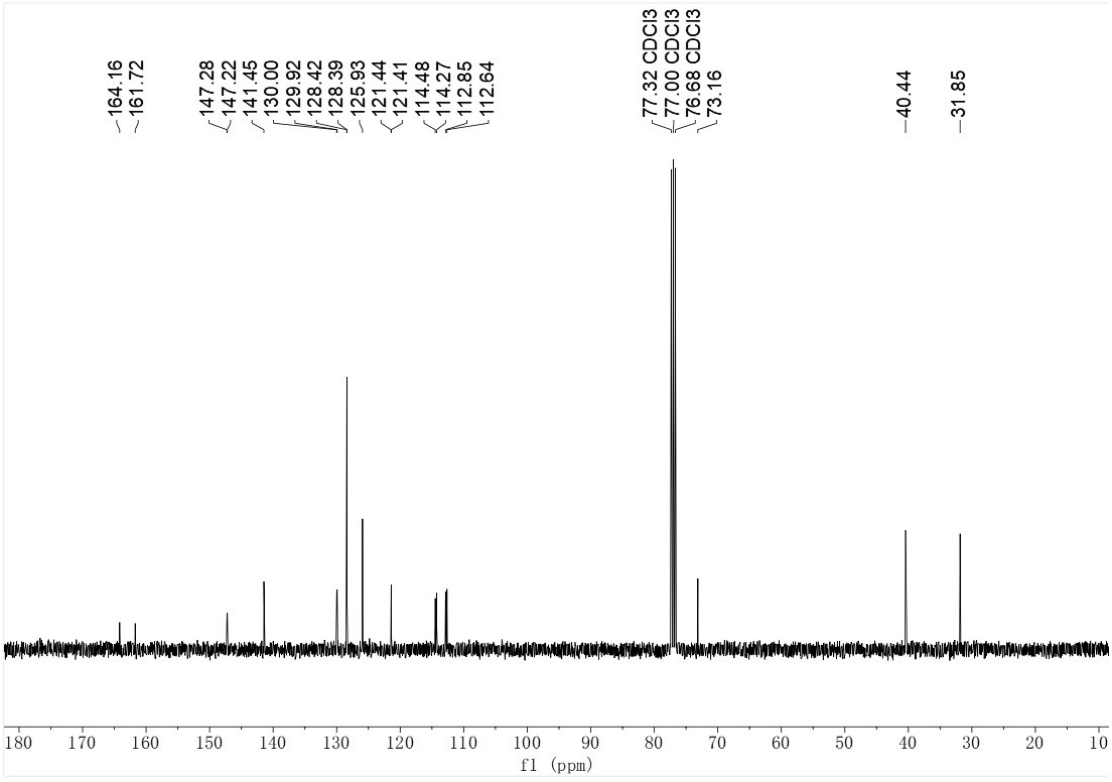
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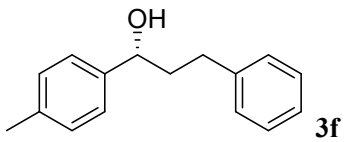
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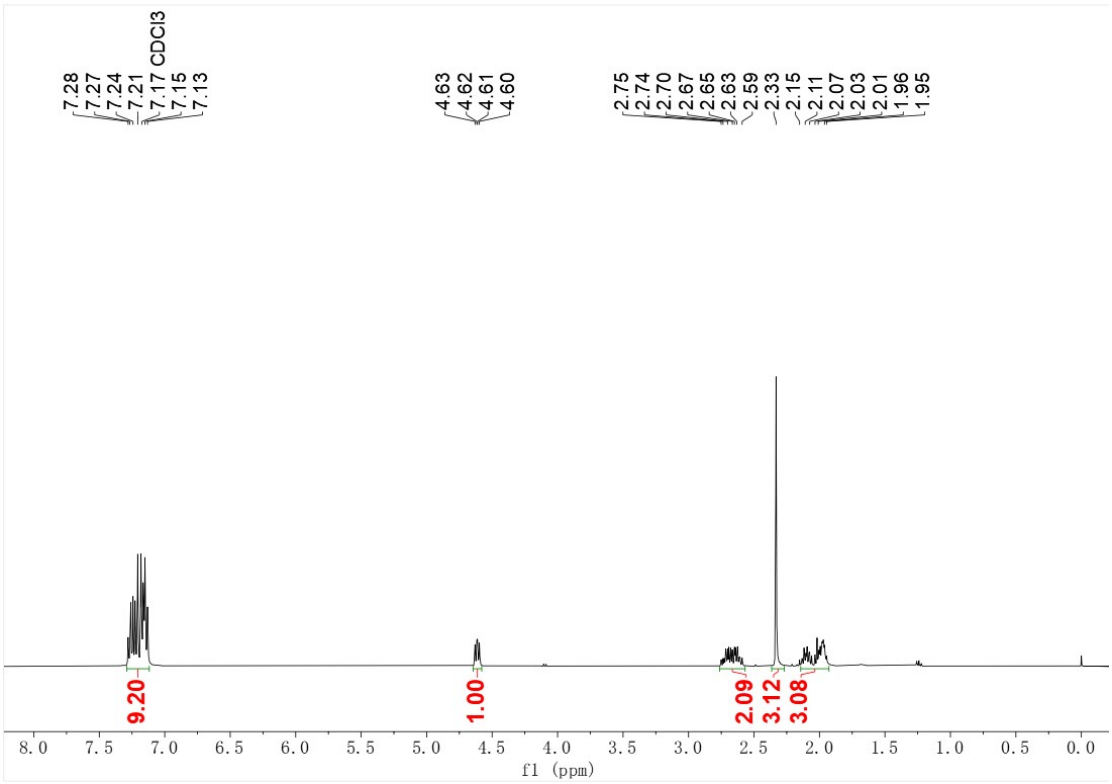
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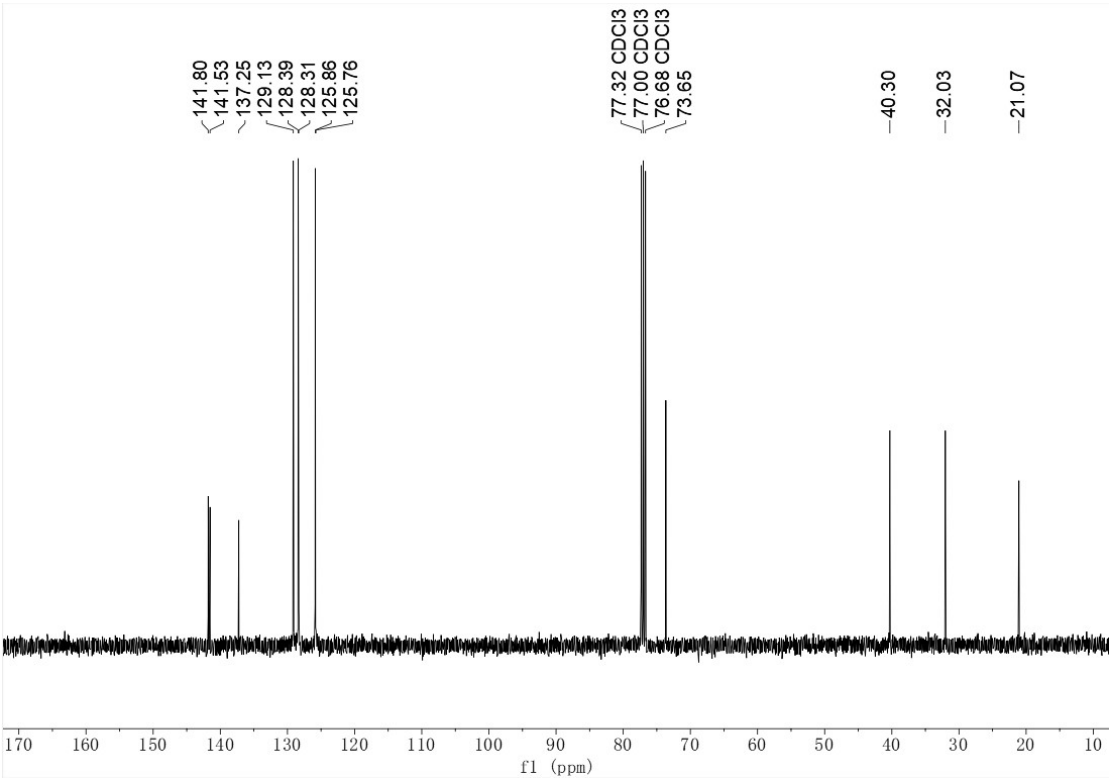
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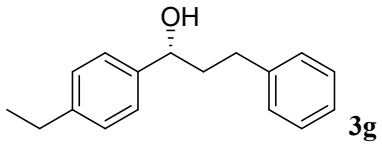
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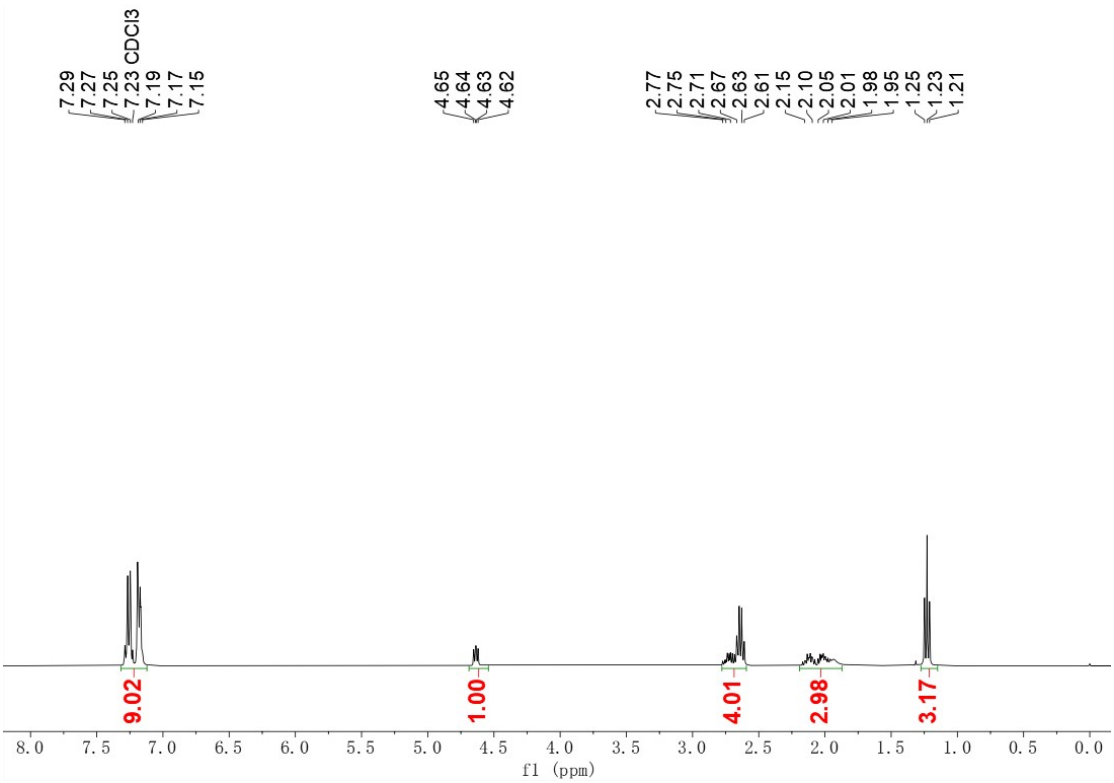
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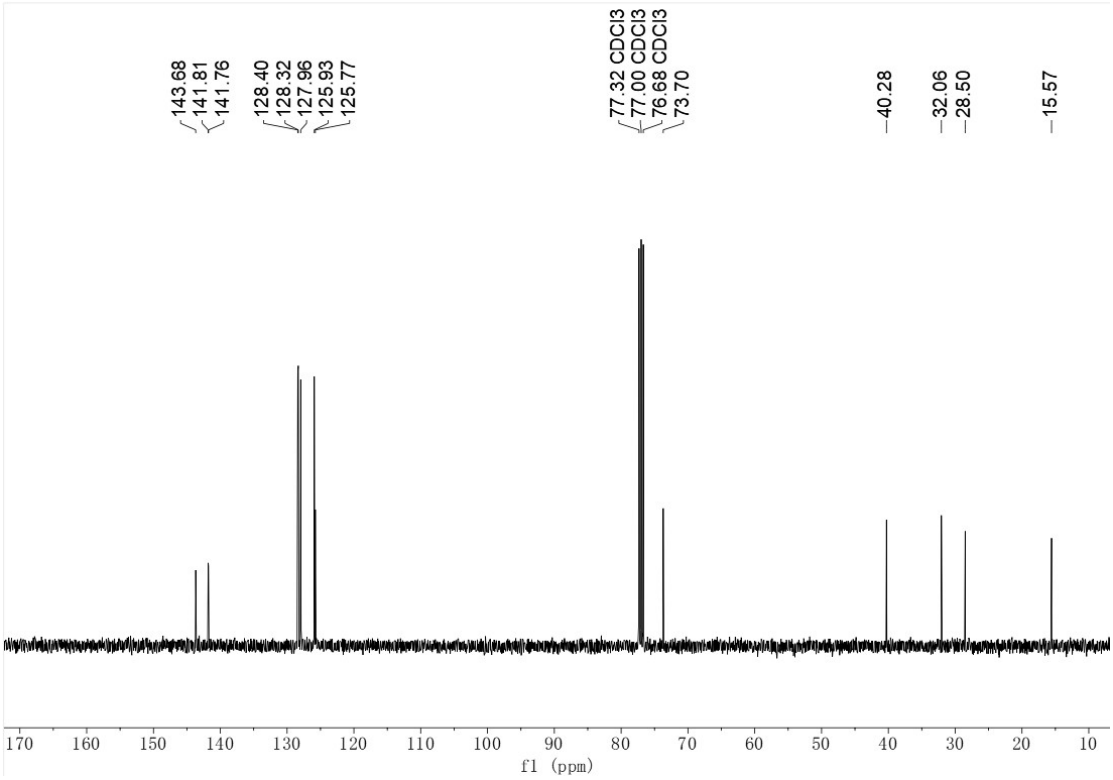
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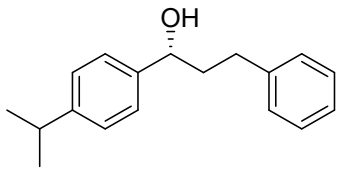
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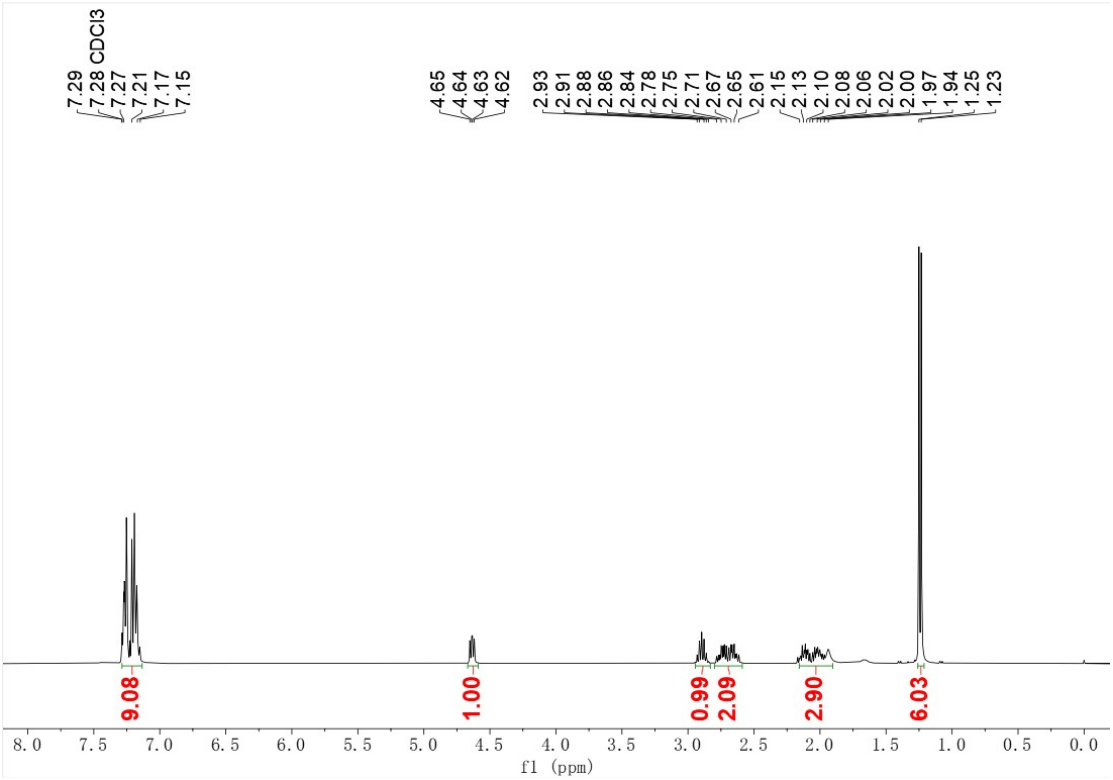
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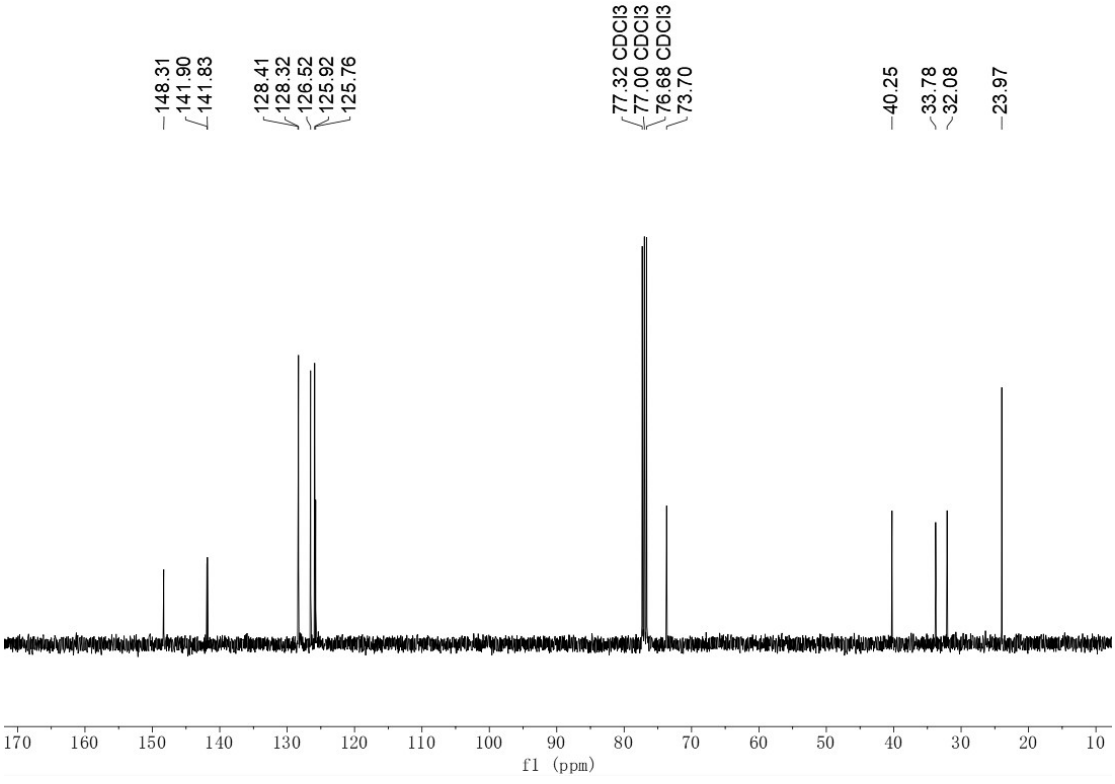
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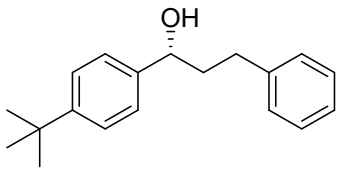
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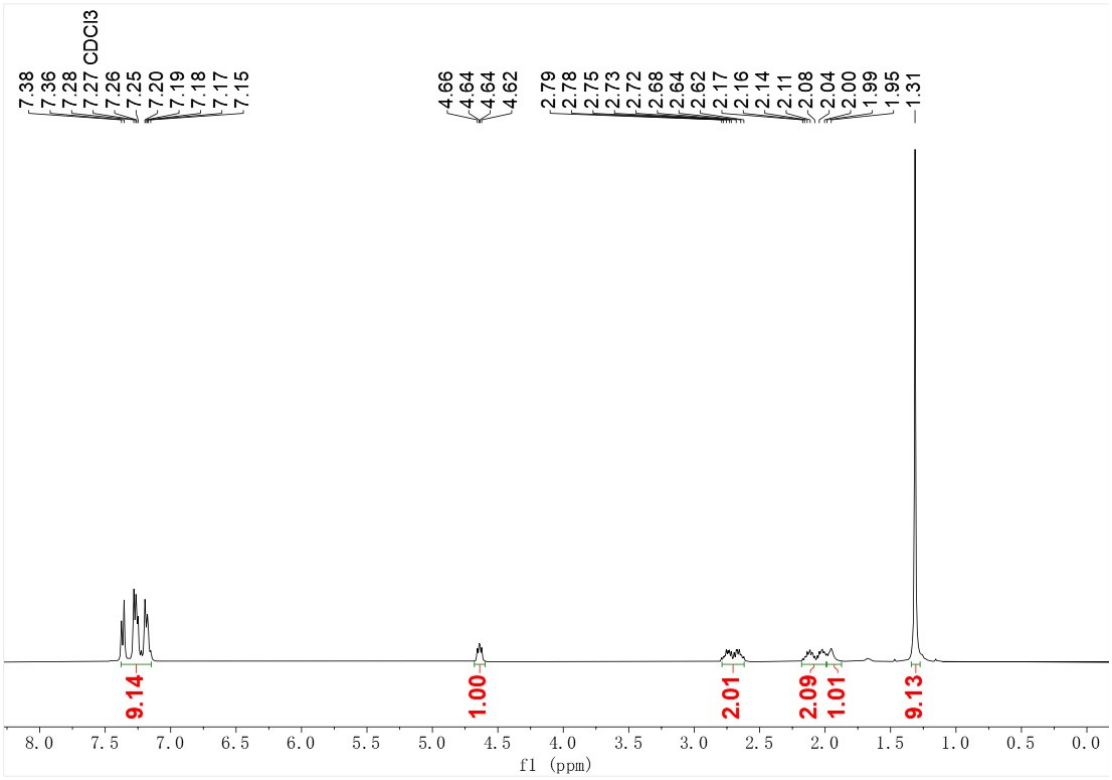
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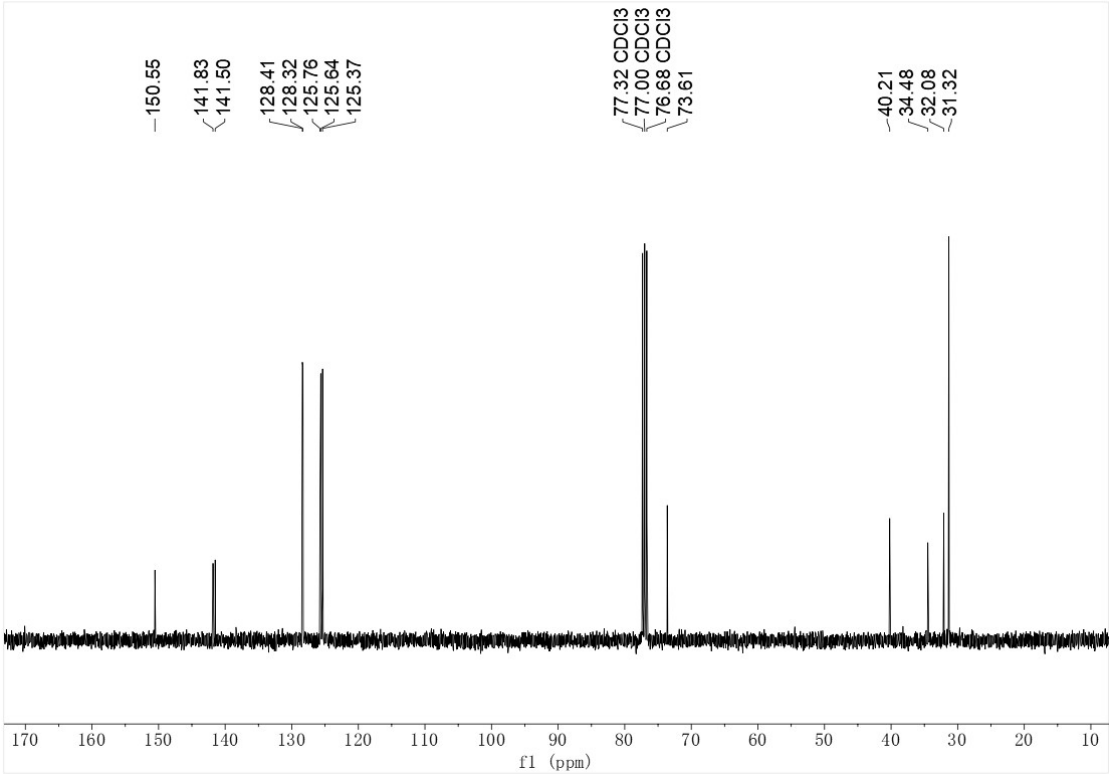
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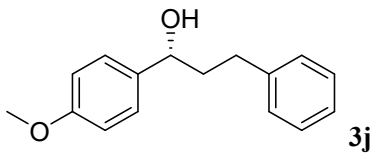
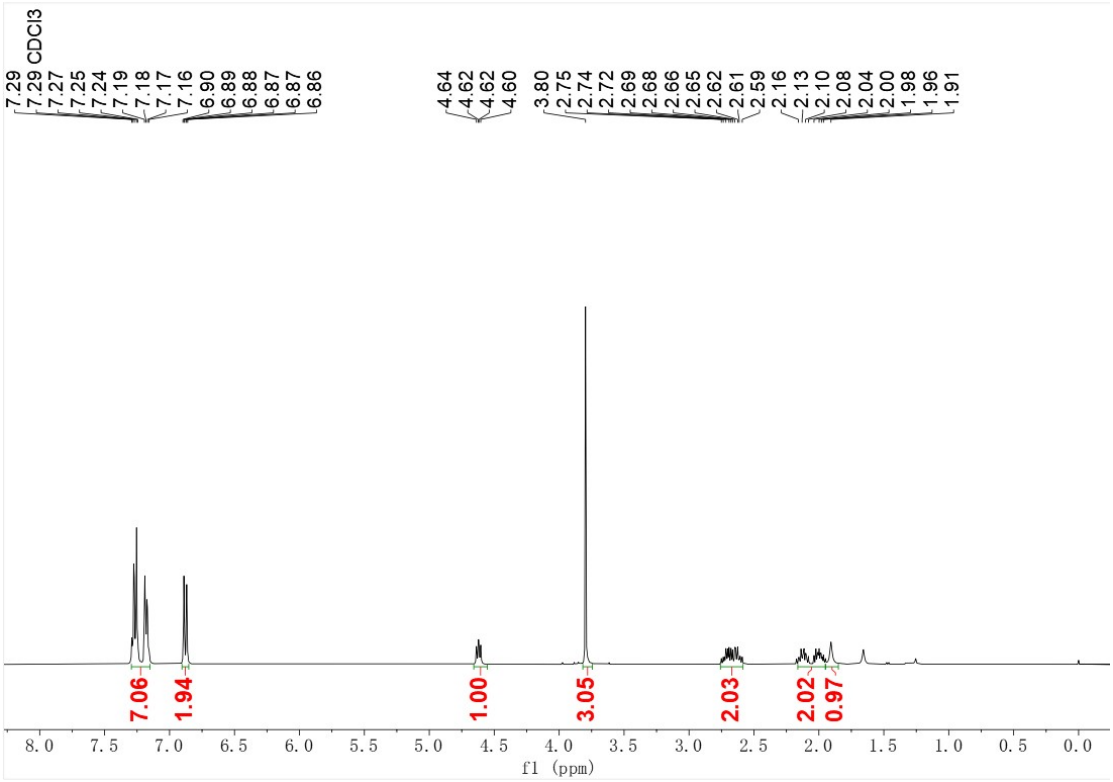
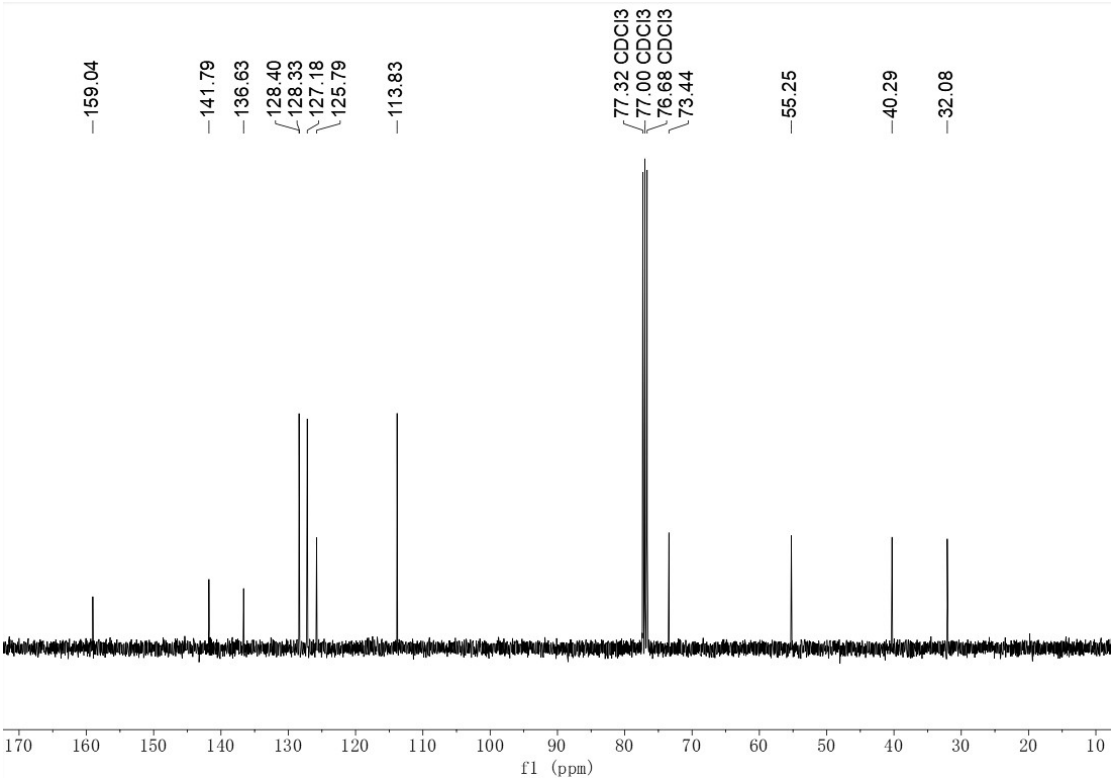
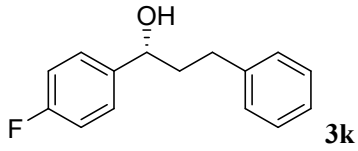
76.68 CDCl3
73.61
40.21
34.48
32.08
31.32
f1 (ppm)


OH
O

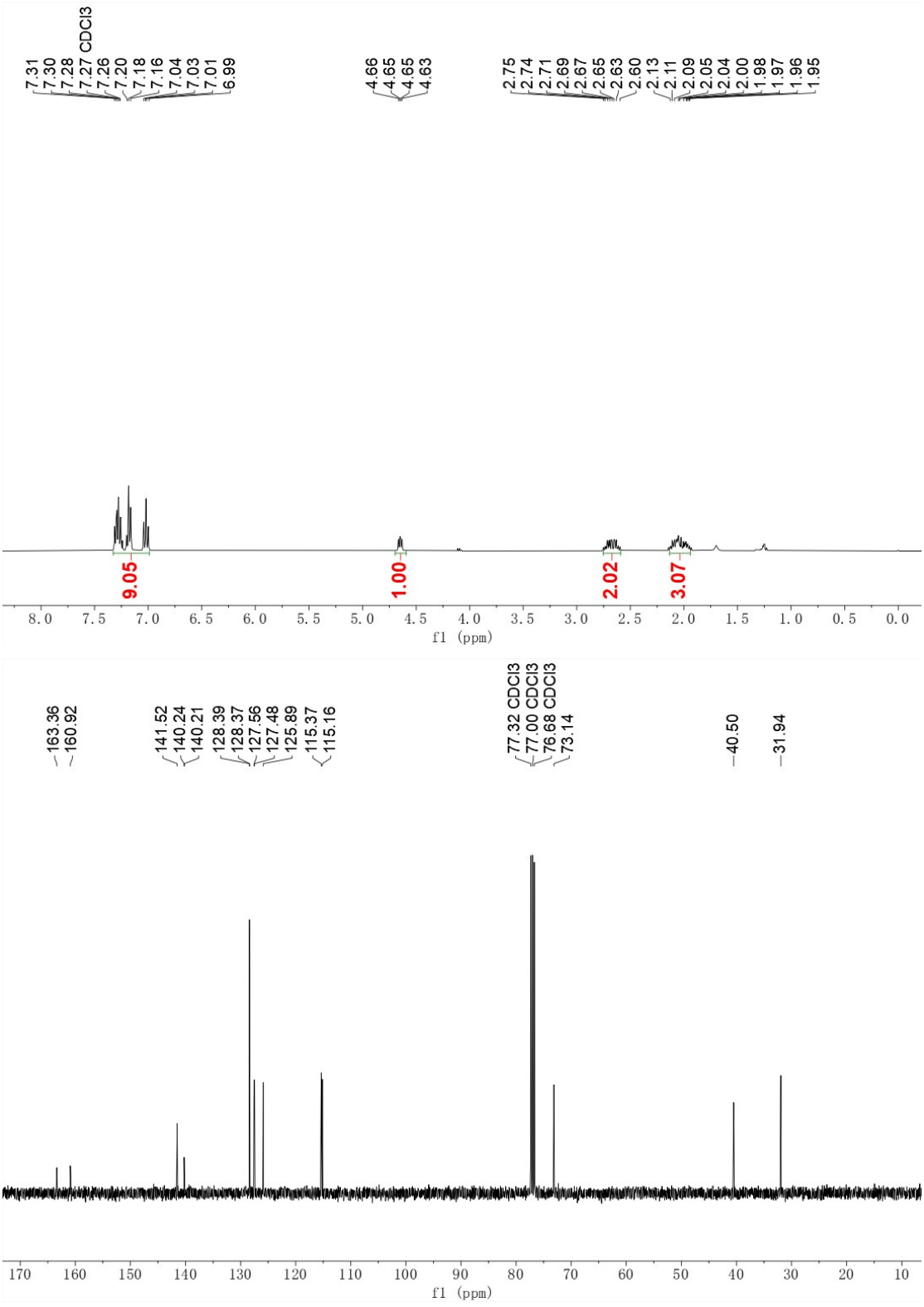
3j


7.29
7.29 CDCl3
7.27
7.25
7.24
7.19
7.18
7.17
7.16
6.90
6.89
6.88
6.87
6.87
6.86
4.64
4.62
4.62
4.60
3.80
2.75
2.74
2.72
2.69
2.68
2.66
2.65
2.62
2.61
2.59
2.16
2.13
2.10
2.08
2.04
2.00
1.98
1.96
1.91
7.06
1.94
1.00
3.05
2.03
2.02
0.97
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
f1 (ppm)


159.04
141.79
136.63
128.40
128.33
127.18
125.79
113.83
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.44
55.25
40.29
32.08
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)


OH
F

3k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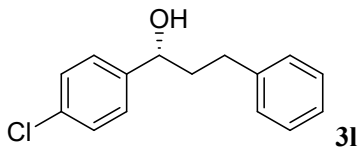
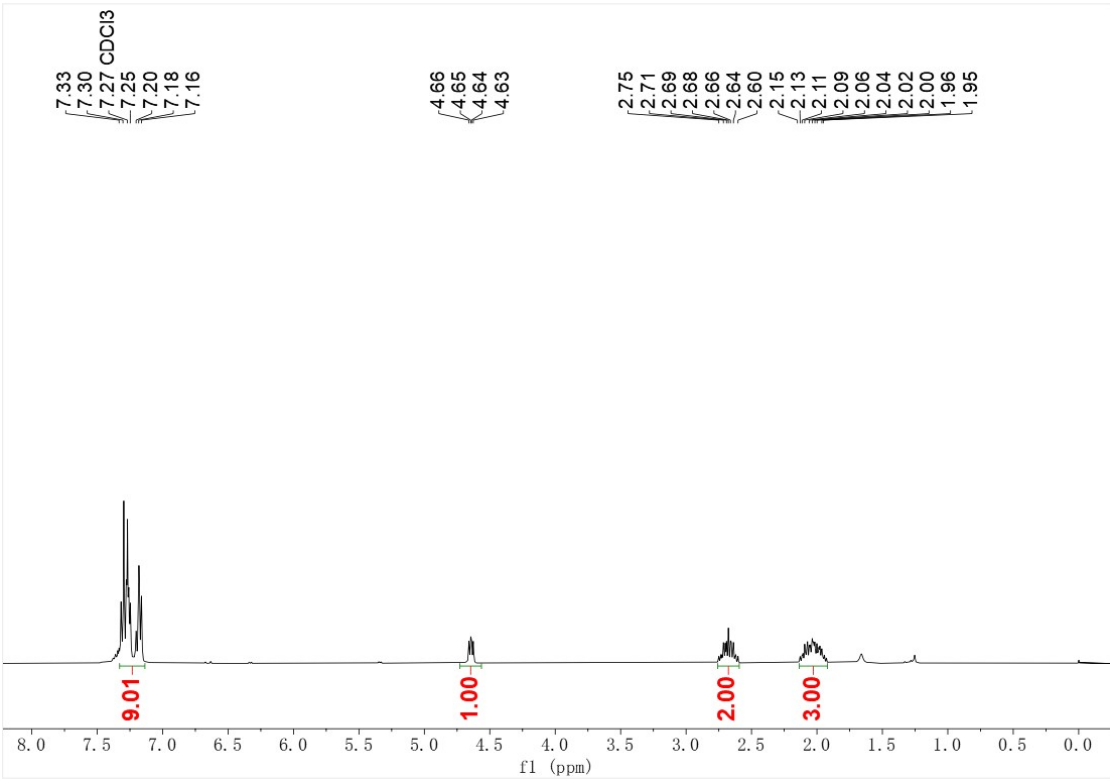
7.30
7.28
CDCl3
7.27
7.26
7.20
7.18
7.16
7.04
7.03
7.01
6.99
4.66
4.65
4.65
4.63
2.75
2.74
2.71
2.69
2.67
2.65
2.63
2.60
2.13
2.11
2.09
2.05
2.04
2.00
1.98
1.97
1.96
1.95
9.05
1.00
2.02
3.07
f1 (ppm)
163.36
160.92
141.52
140.24
140.21
128.39
128.37
127.56
127.48
125.89
115.37
115.16
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.14
40.50
31.94
f1 (ppm)


OH
Cl

3l


7.33
7.30
7.27 CDCl3
7.25
7.20
7.18
7.16
4.66
4.65
4.64
4.63
2.75
2.71
2.69
2.68
2.66
2.64
2.60
2.15
2.13
2.11
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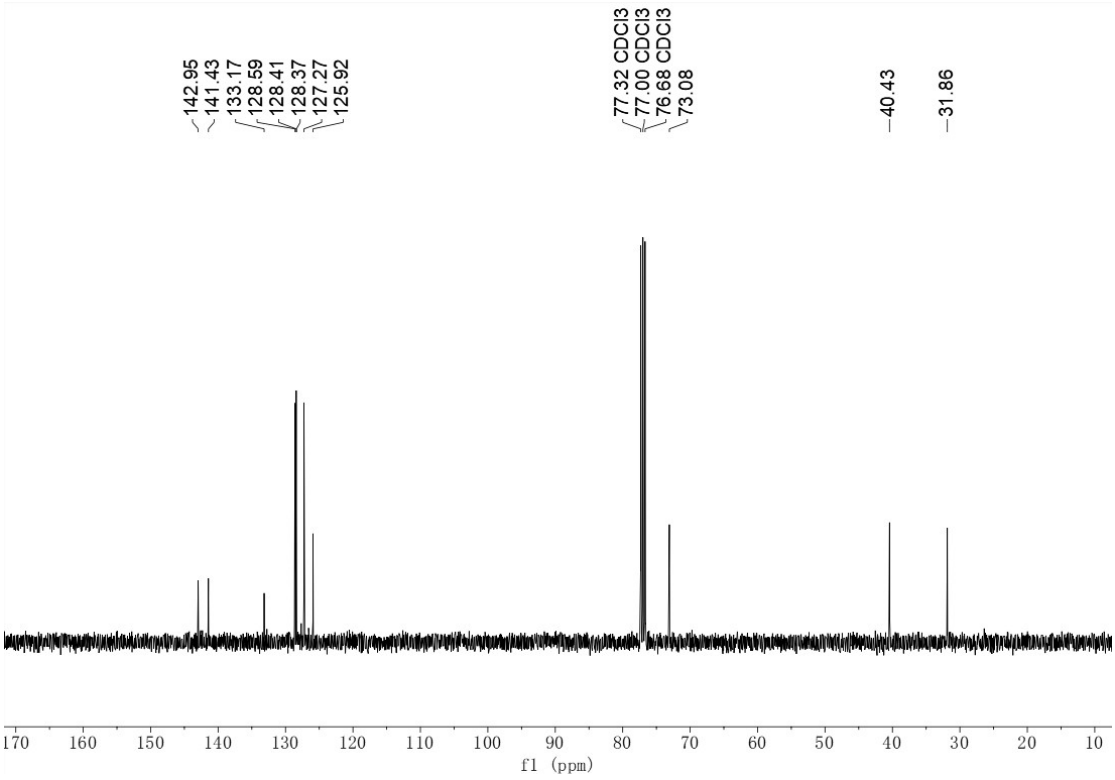
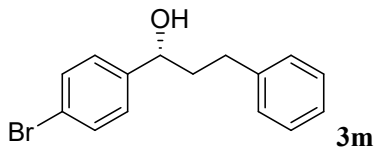
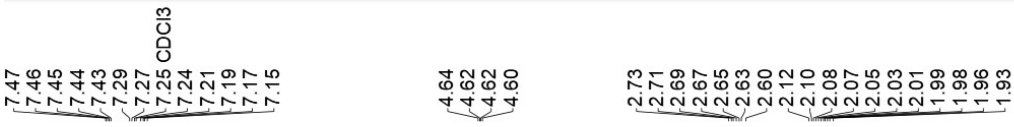
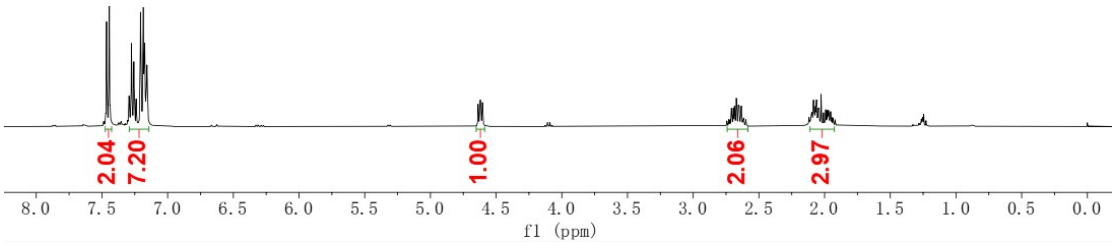
9.01
1.00
2.00
3.00
f1 (ppm)

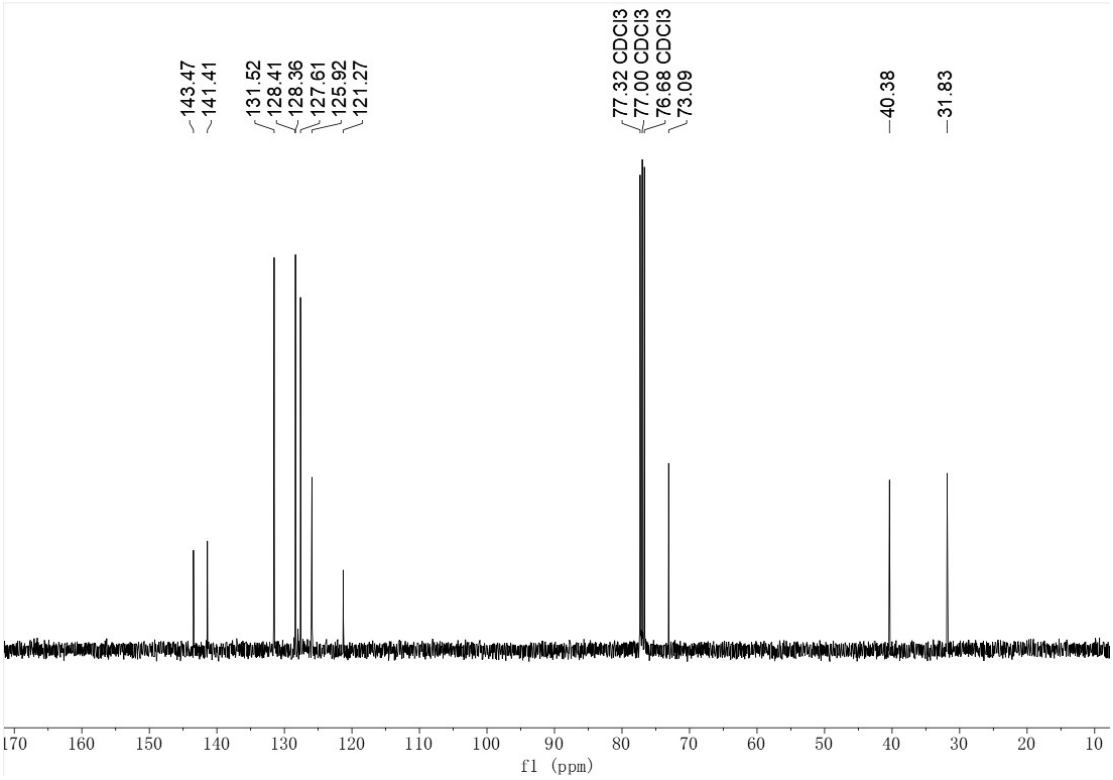

142.95
141.43
133.17
128.59
128.41
128.37
127.27
125.92
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.08
40.43
31.86
f1 (ppm)

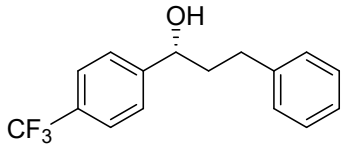

OH
Br

3m


7.47
7.46
7.45
7.44
7.43
7.29
7.27
7.25 CDCl3
7.24
7.21
7.19
7.17
7.15
4.64
4.62
4.62
4.60
2.73
2.71
2.69
2.67
2.65
2.63
2.60
2.12
2.10
2.08
2.07
2.05
2.03
2.01
1.99
1.98
1.96
1.93

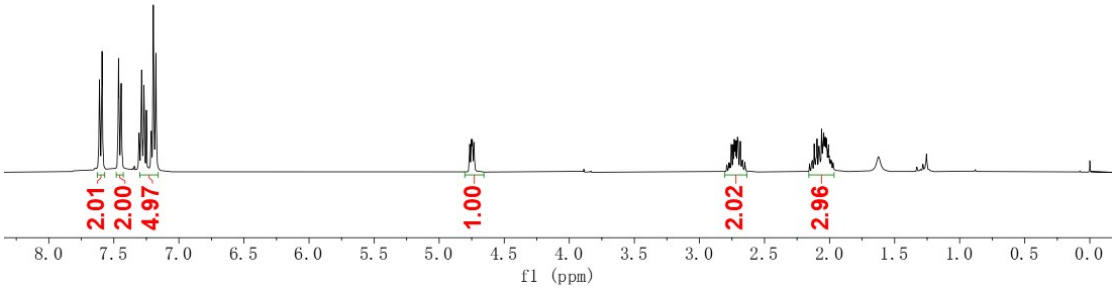

2.04
7.20
1.00
2.06
2.97
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


143.47
141.41
131.52
128.41
128.36
127.61
125.92
121.27
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.09
40.38
31.83
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


OH
CF3

3n


7.61
7.59
7.46
7.44
7.30
7.29
7.28
7.27
7.25
CDCl3
7.22
7.21
7.19
7.18
4.77
4.75
4.74
4.73
2.79
2.77
2.74
2.72
2.69
2.67
2.65
2.15
2.13
2.11
2.08
2.06
2.05
2.04
2.01
1.99
1.97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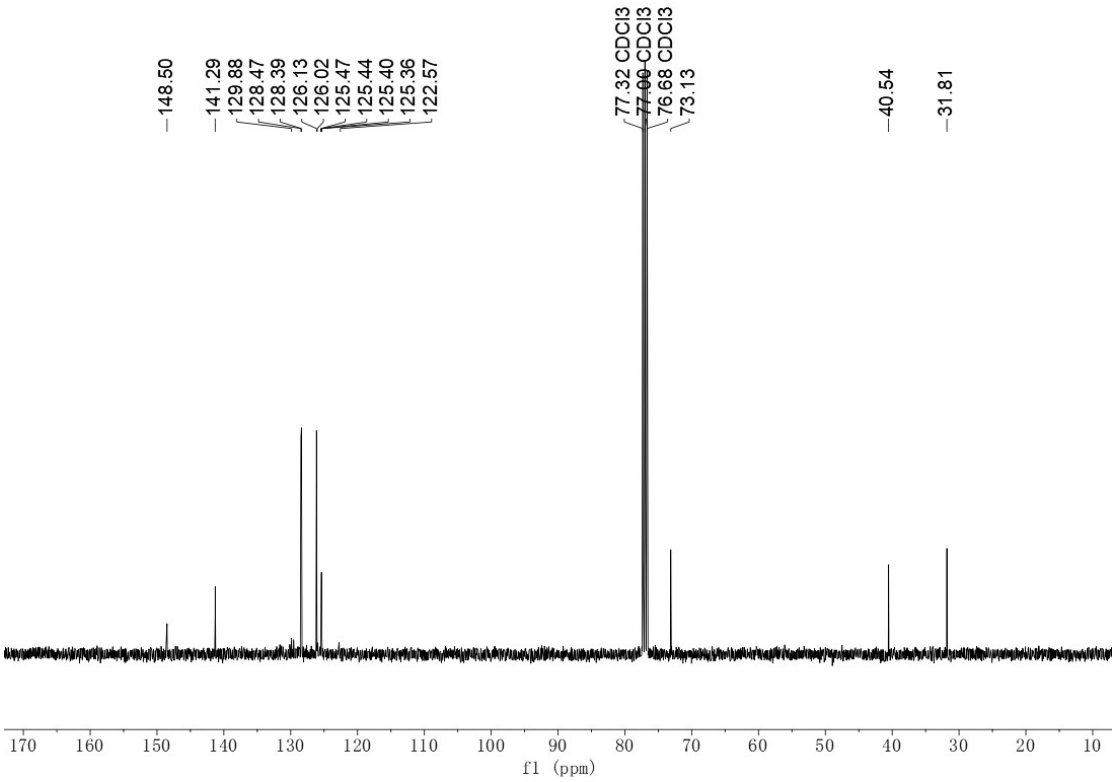
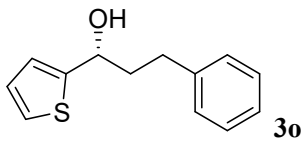
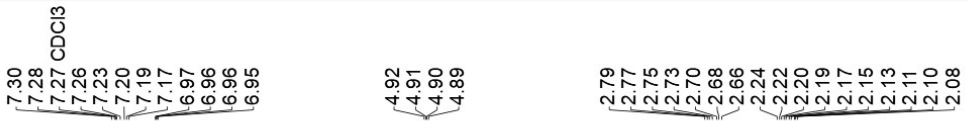
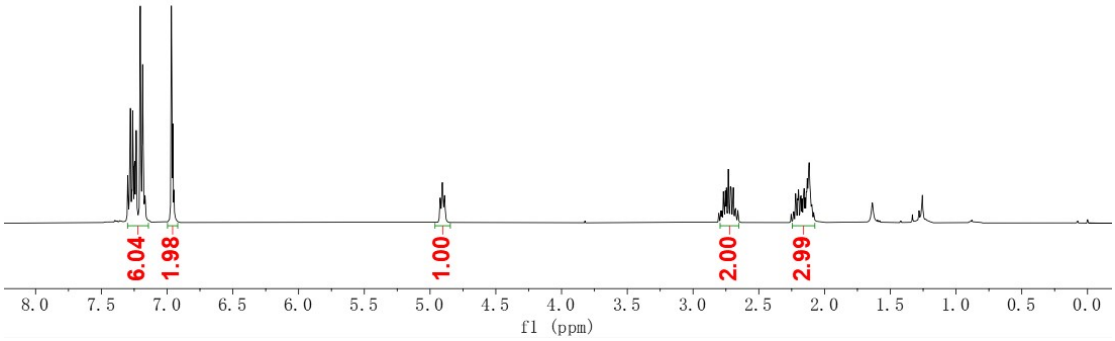
2.00
4.97
1.00
2.02
2.96
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

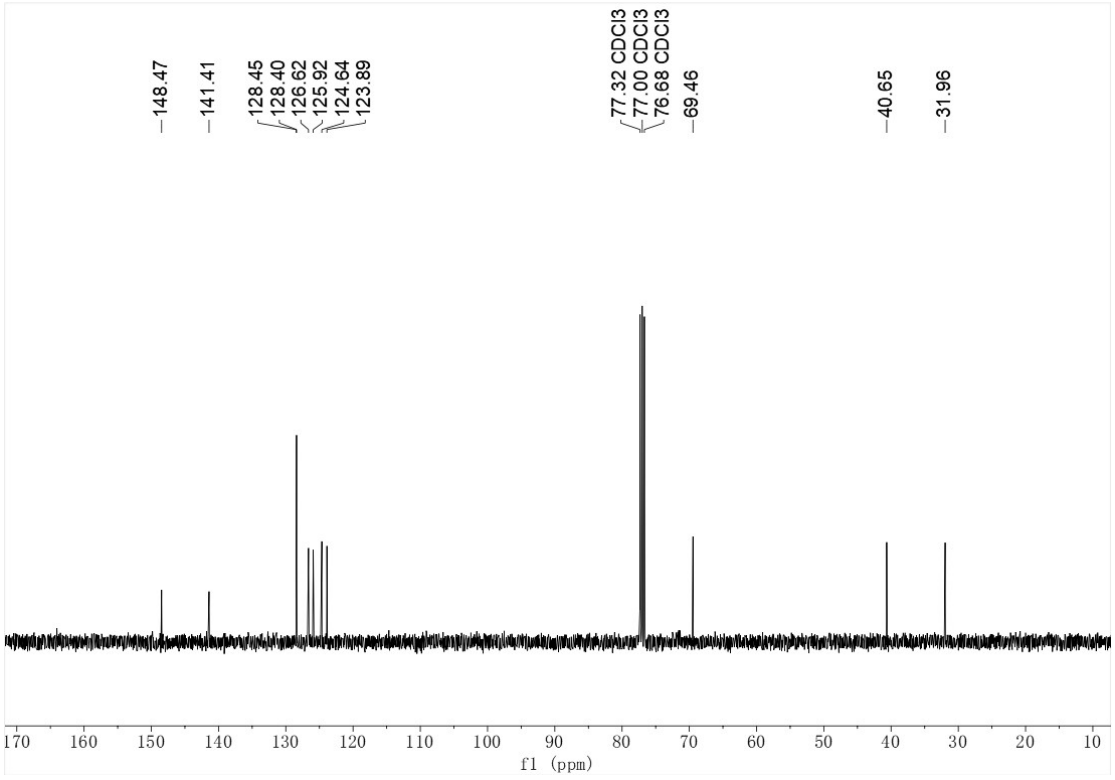

148.50
141.29
129.88
128.47
128.39
126.13
126.02
125.47
125.44
125.40
125.36
122.57
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.13
40.54
31.81
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

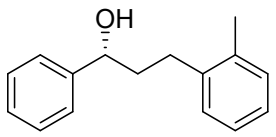

OH
S

3o

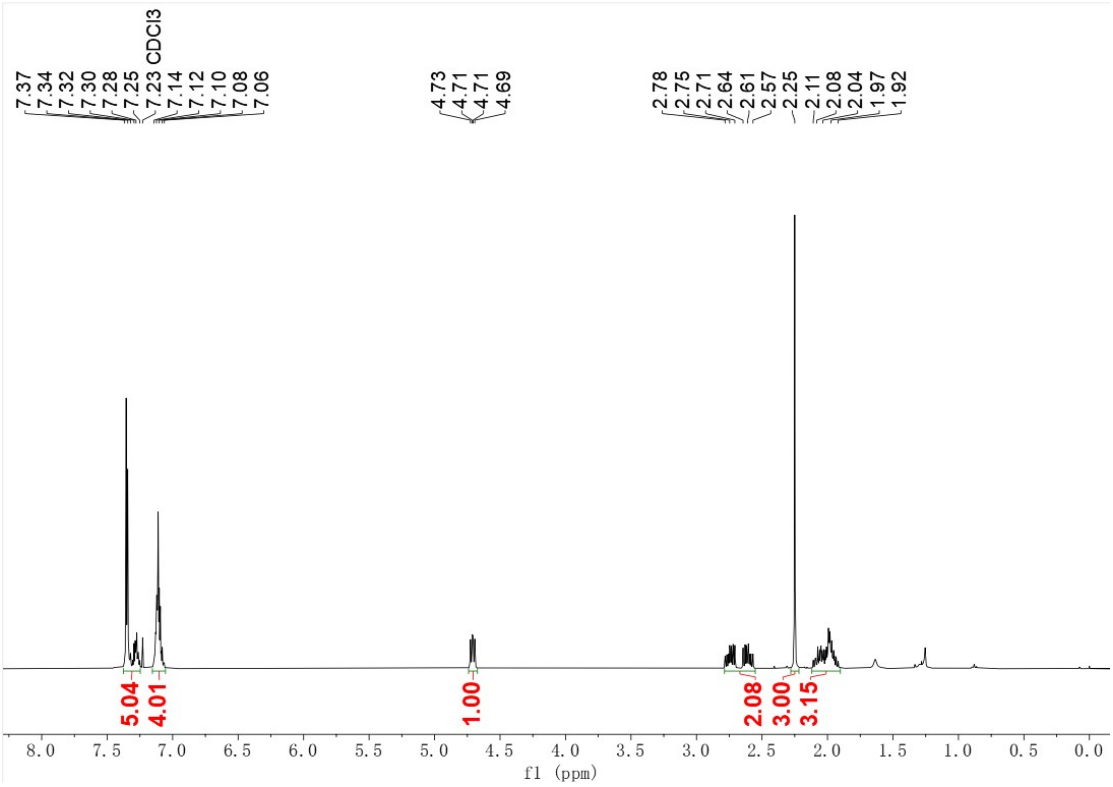

7.30
7.28
7.27 CDCl3
7.26
7.23
7.20
7.19
7.17
6.97
6.96
6.96
6.95
4.92
4.91
4.90
4.89
2.79
2.77
2.75
2.73
2.70
2.68
2.66
2.24
2.22
2.20
2.19
2.17
2.15
2.13
2.11
2.10
2.08

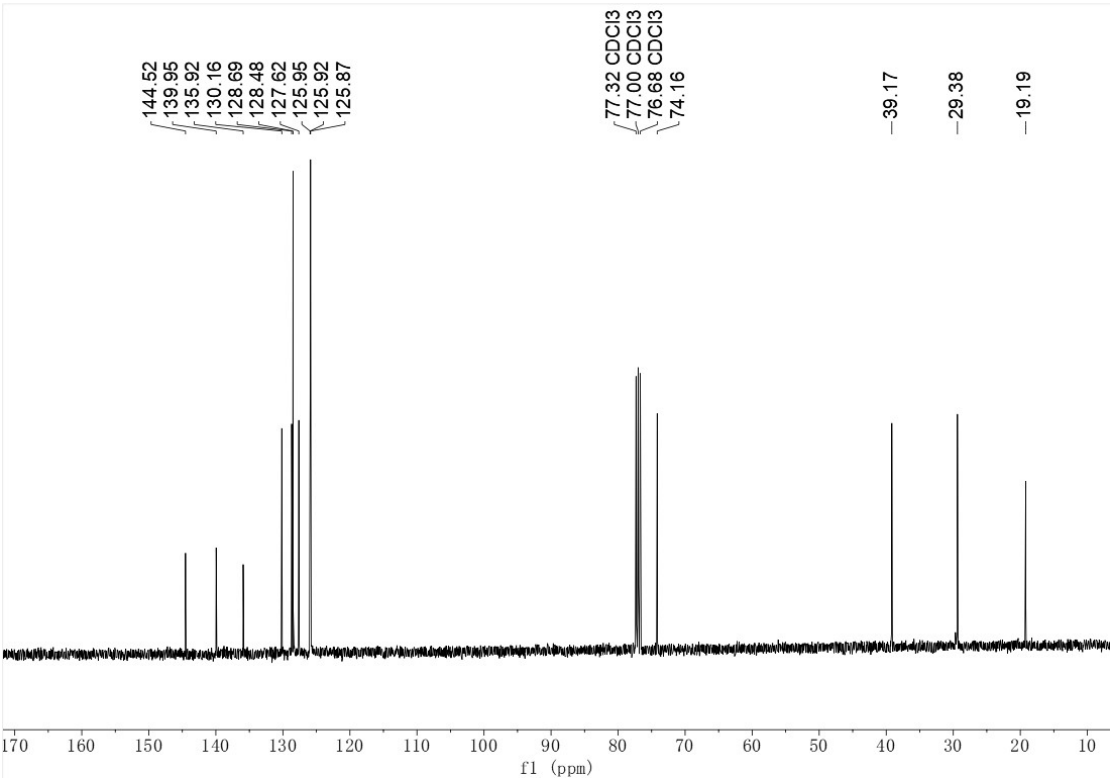

6.04
1.98
1.00
2.00
2.99
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


148.47
141.41
128.45
128.40
126.62
125.92
124.64
123.89
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
69.46
40.65
31.96
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


OH

4a


7.37
7.34
7.32
7.30
7.28
7.25
7.23 CDCl3
7.14
7.12
7.10
7.08
7.06
4.73
4.71
4.71
4.69
2.78
2.75
2.71
2.64
2.61
2.57
2.25
2.11
2.08
2.04
1.97
1.92
5.04
4.01
1.00
2.08
3.00
3.15
f1 (ppm)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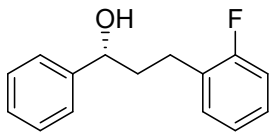
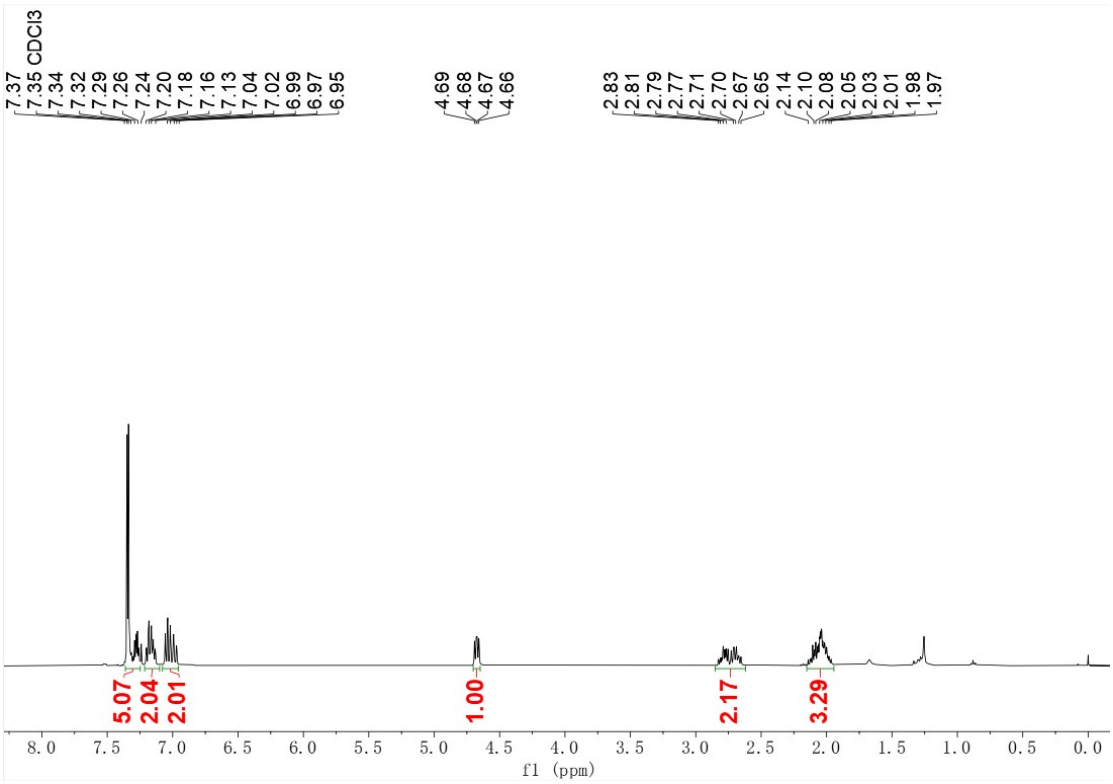
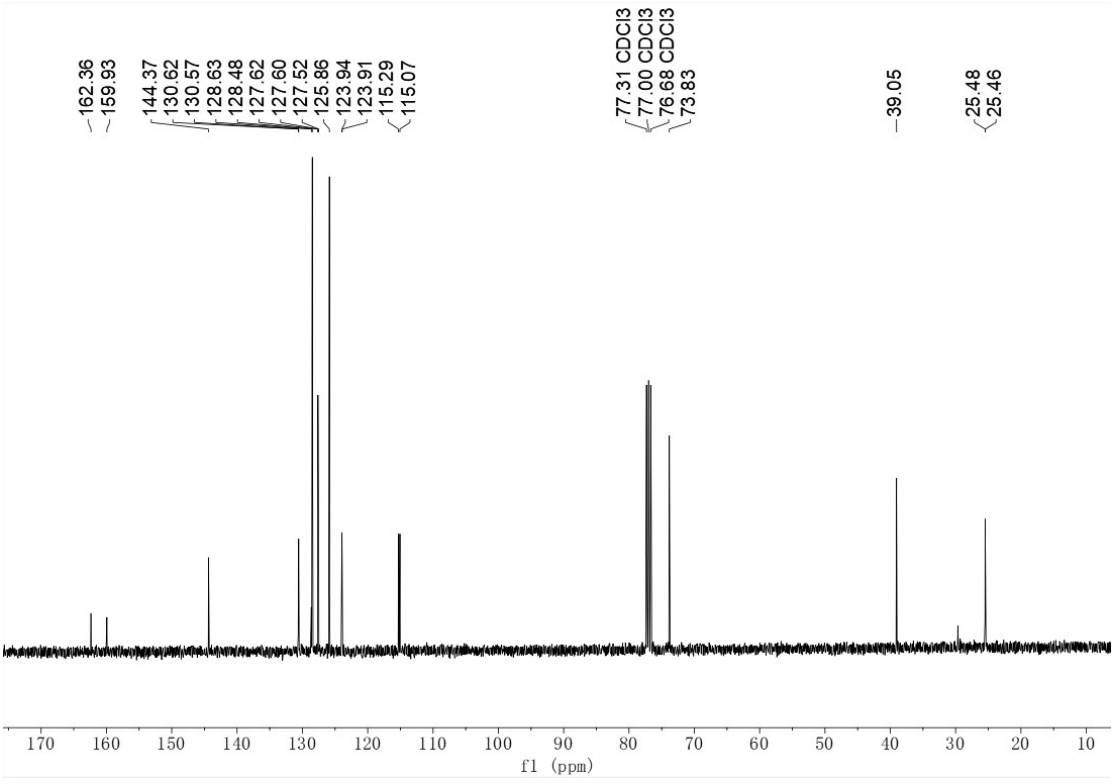
130.16
128.69
128.48
127.62
125.95
125.92
125.87
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
74.16
39.17
29.38
19.19
f1 (ppm)


OH
F

4b


7.37
7.35 CDCl3
7.34
7.32
7.29
7.26
7.24
7.20
7.18
7.16
7.13
7.04
7.02
6.99
6.97
6.95
4.69
4.68
4.67
4.66
2.83
2.81
2.79
2.77
2.71
2.70
2.67
2.65
2.14
2.10
2.08
2.05
2.03
2.01
1.98
1.97
5.07
2.04
2.01
1.00
2.17
3.29
f1 (ppm)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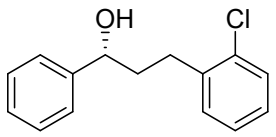
144.37
130.62
130.57
128.63
128.48
127.62
127.60
127.52
125.86
123.94
123.91
115.29
115.07
77.31 CDCl3
77.00 CDCl3
76.68 CDCl3
73.83
39.05
25.48
25.46
f1 (ppm)


OH
Cl

4c


7.37
7.36
7.33
7.30
7.28
7.25
7.22
7.18
7.16
7.14
7.12
4.72
4.71
4.70
4.69
2.93
2.90
2.89
2.87
2.85
2.80
2.78
2.76
2.74
2.73
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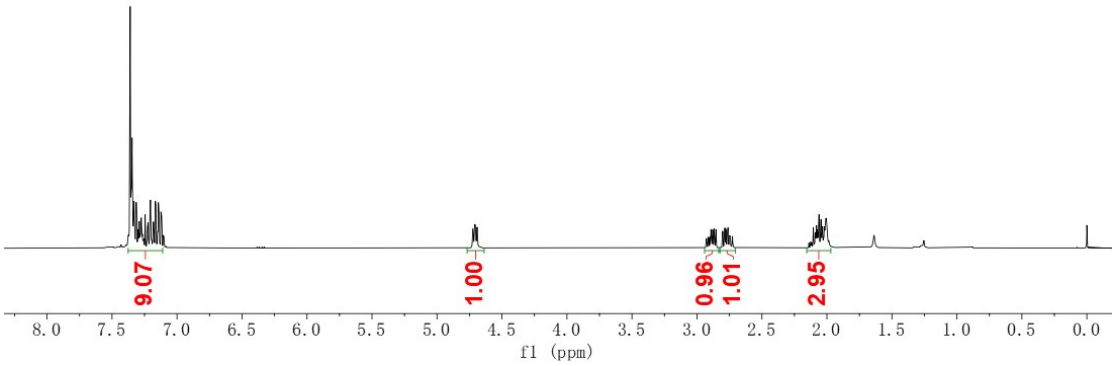
2.12
2.11
2.10
2.09
2.08
2.07
2.06
2.04
2.02
2.00
1.99


9.07
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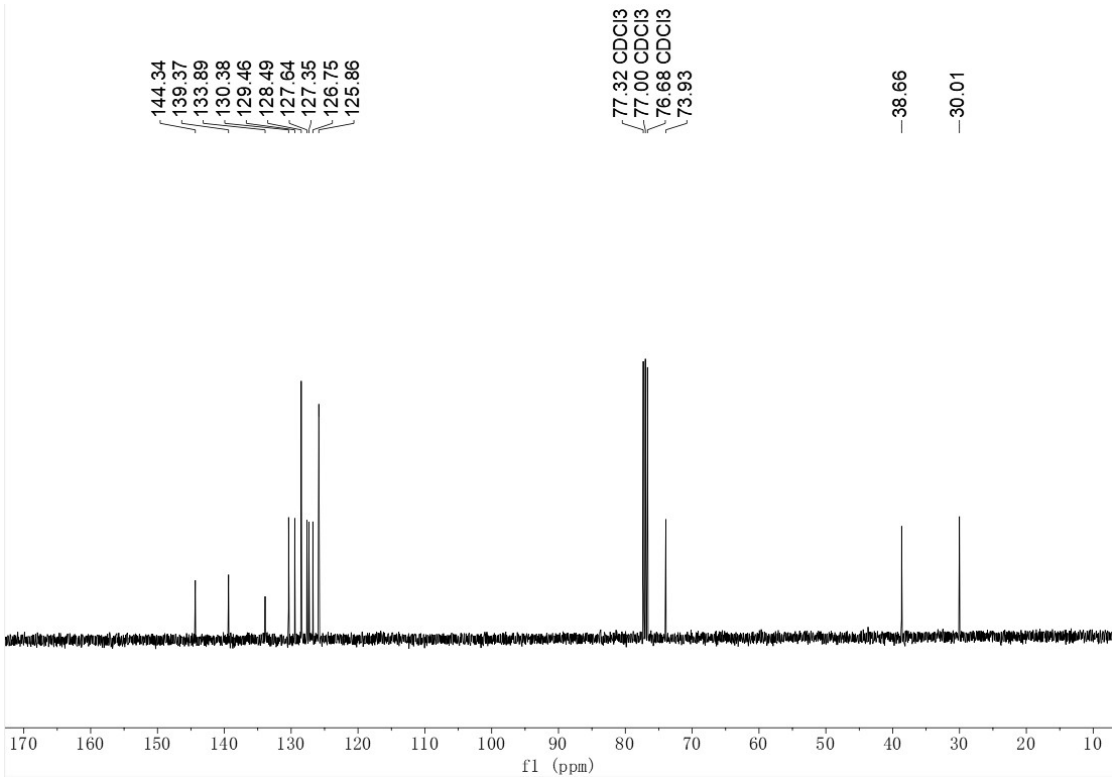
2.95
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


144.34
139.37
133.89
130.38
129.46
128.49
127.64
127.35
126.75
125.86
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.93
38.66
30.01
170
160
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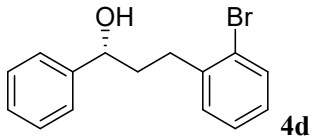
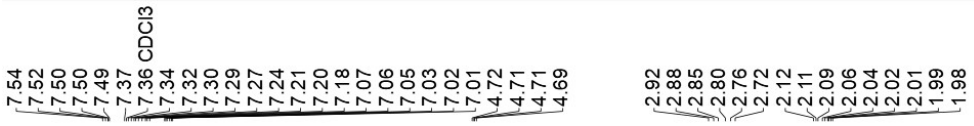
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


OH
Br

4d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7.50
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7.37
7.36 CDCl3
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7.32
7.30
7.29
7.27
7.24
7.21
7.20
7.18
7.07
7.06
7.05
7.03
7.02
7.01
4.72
4.71
4.71
4.69
2.92
2.88
2.85
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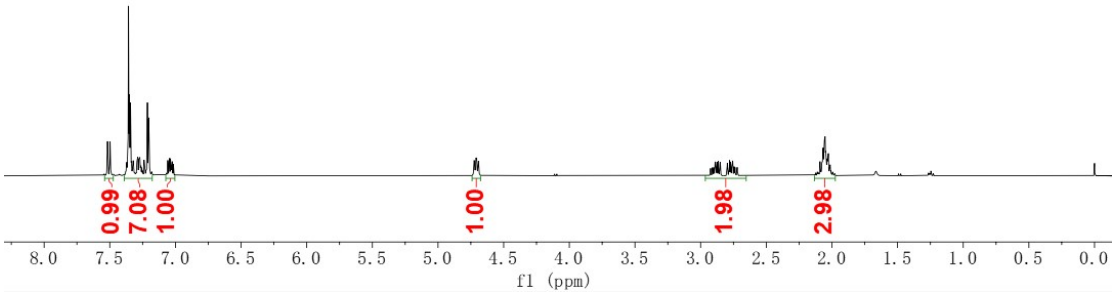
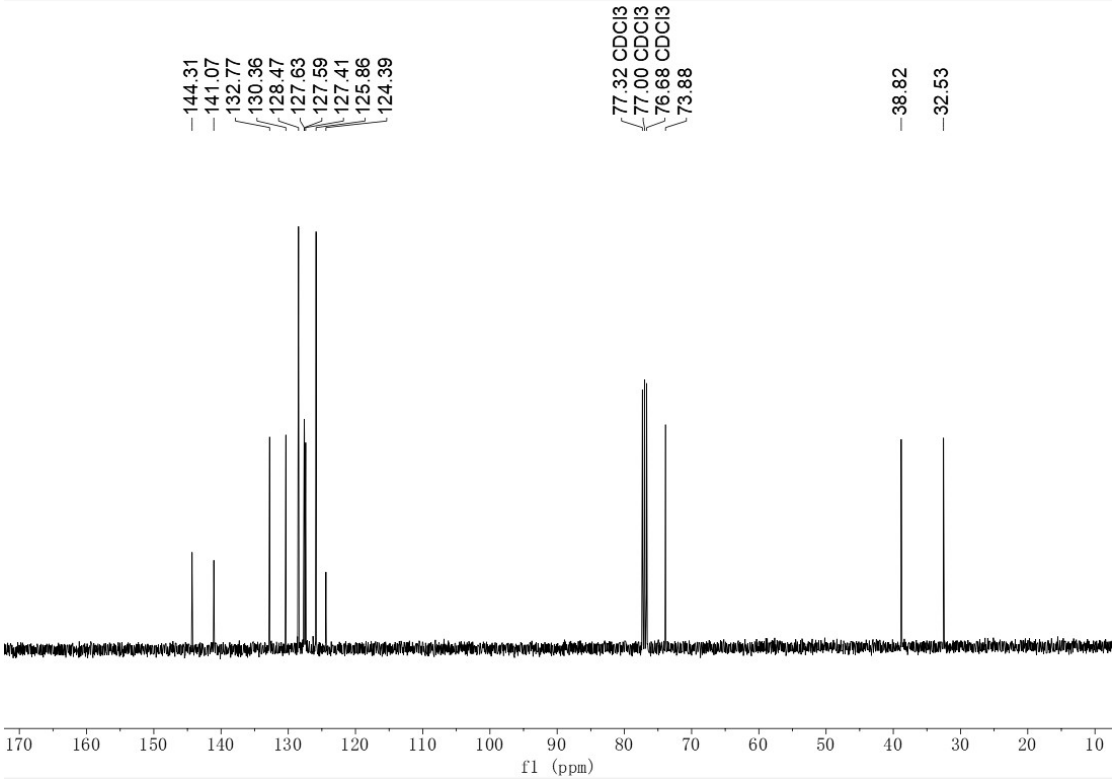
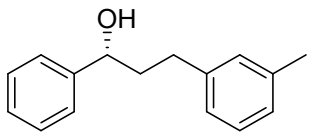
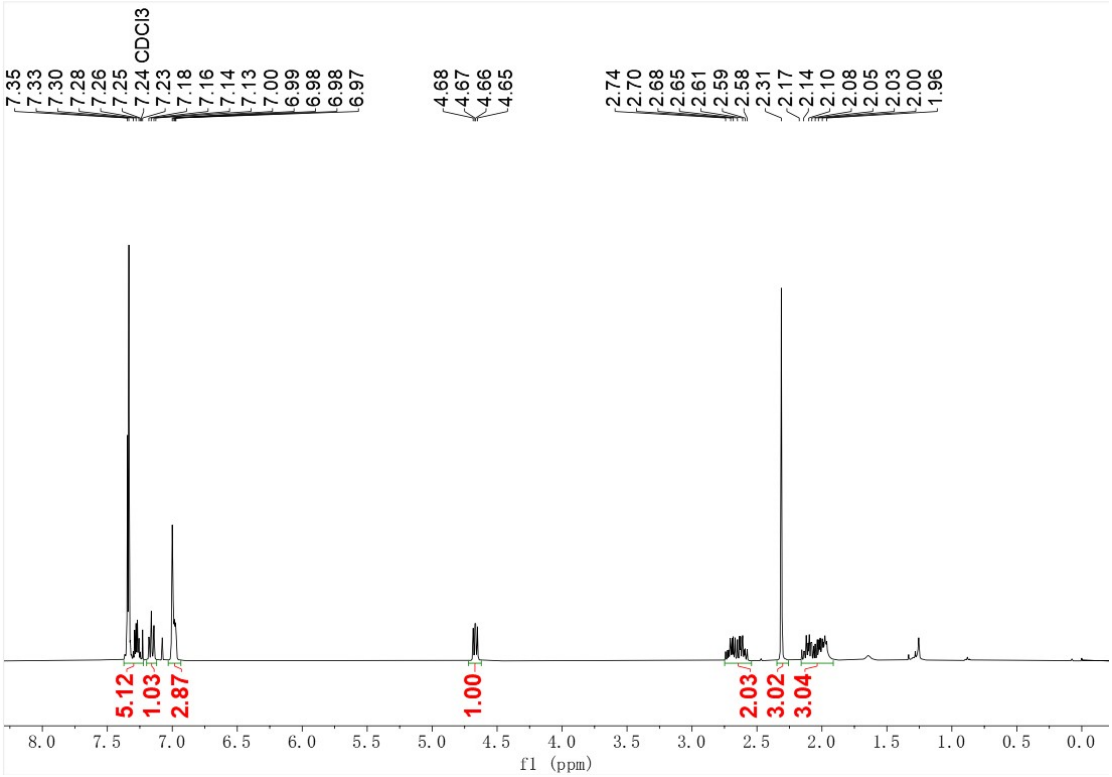
2.06
2.04
2.02
2.01
1.99
1.98

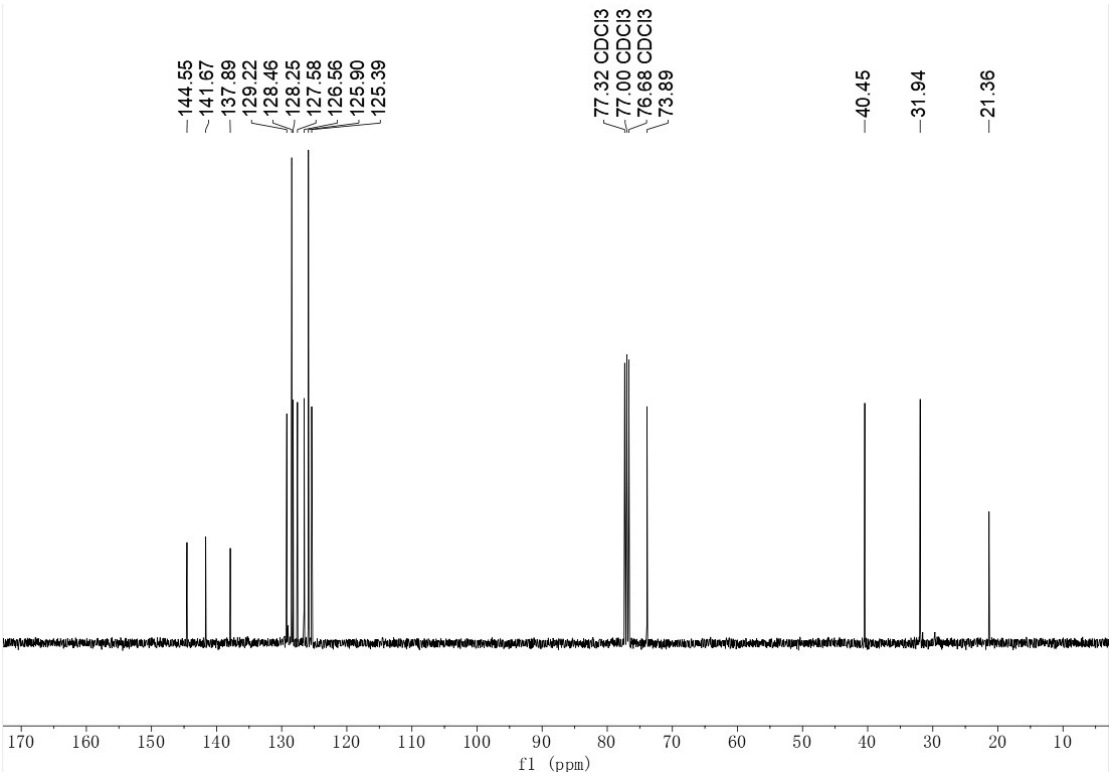

0.99
7.08
1.00
1.00
1.98
2.98
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

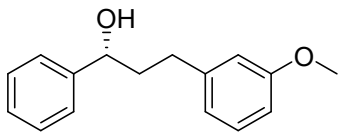

144.31
141.07
132.77
130.36
128.47
127.63
127.59
127.41
125.86
124.39
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.88
38.82
32.53
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


OH

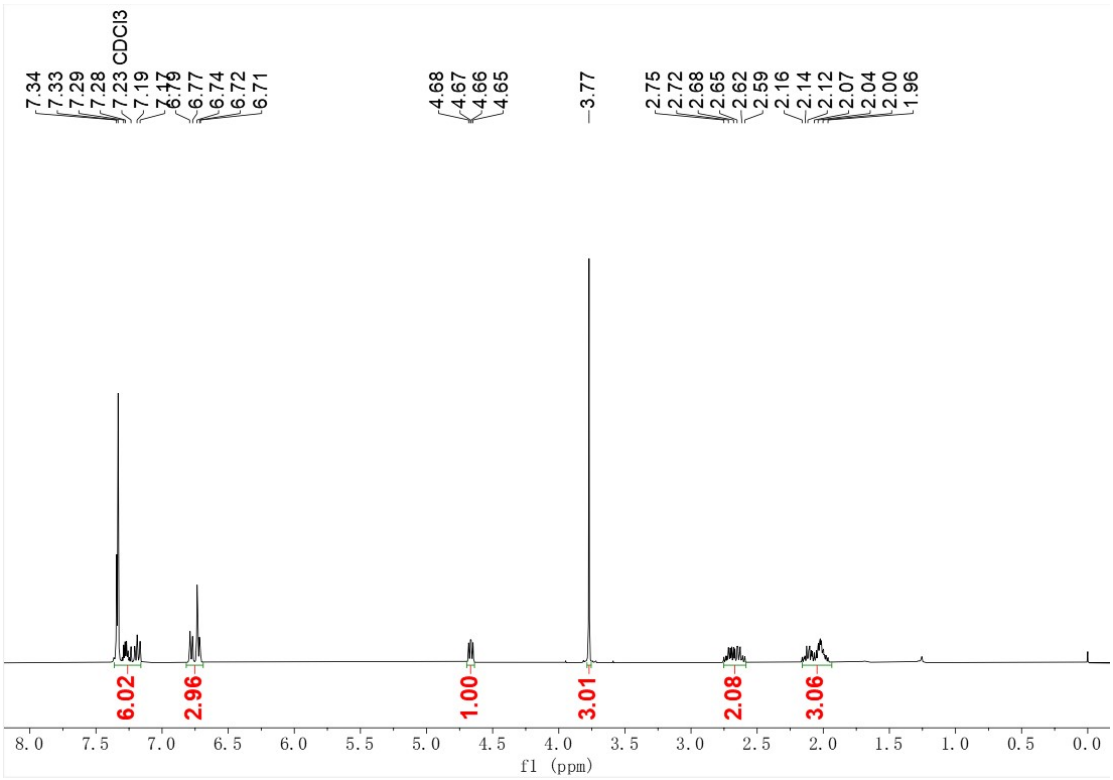
4e

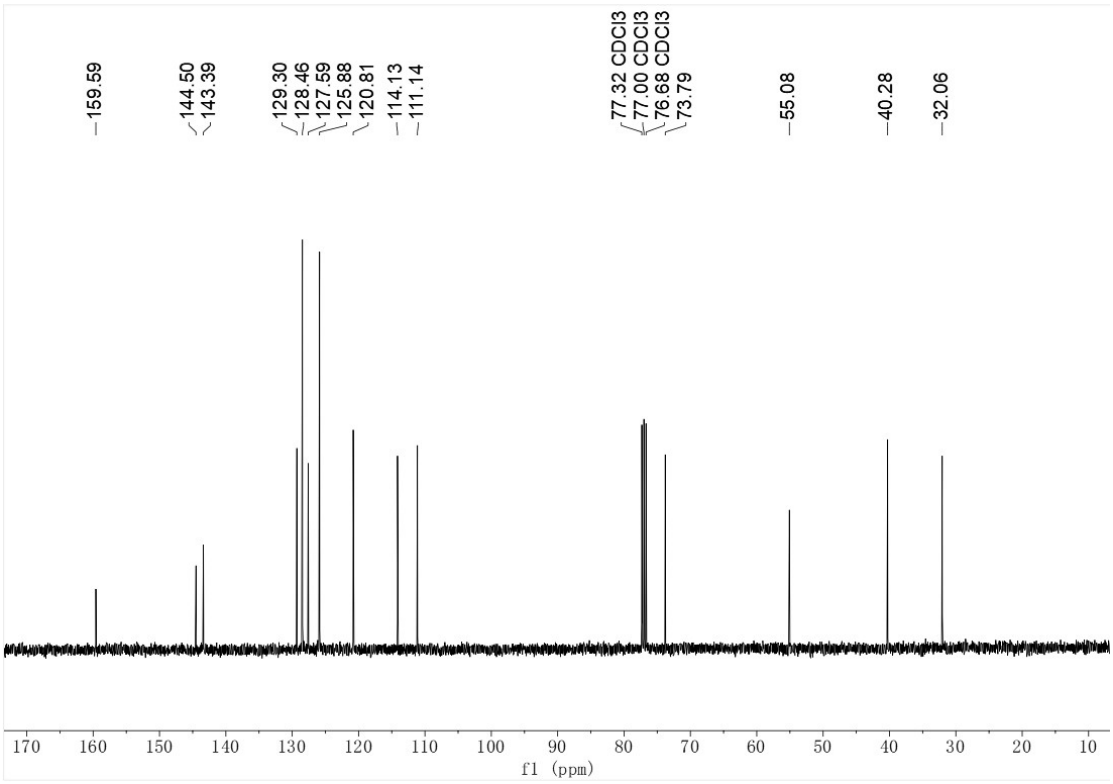

7.35
7.33
7.30
7.28
7.26
7.25
7.24 CDCl3
7.23
7.18
7.16
7.14
7.13
7.00
6.99
6.98
6.98
6.97
4.68
4.67
4.66
4.65
2.74
2.70
2.68
2.65
2.61
2.59
2.58
2.31
2.17
2.14
2.10
2.08
2.05
2.03
2.00
1.96
5.12
1.03
2.87
1.00
2.03
3.02
3.04
f1 (ppm)

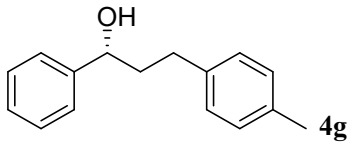

144.55
141.67
137.89
129.22
128.46
128.25
127.58
126.56
125.90
125.39
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.89
40.45
31.94
21.36
f1 (ppm)


OH
O

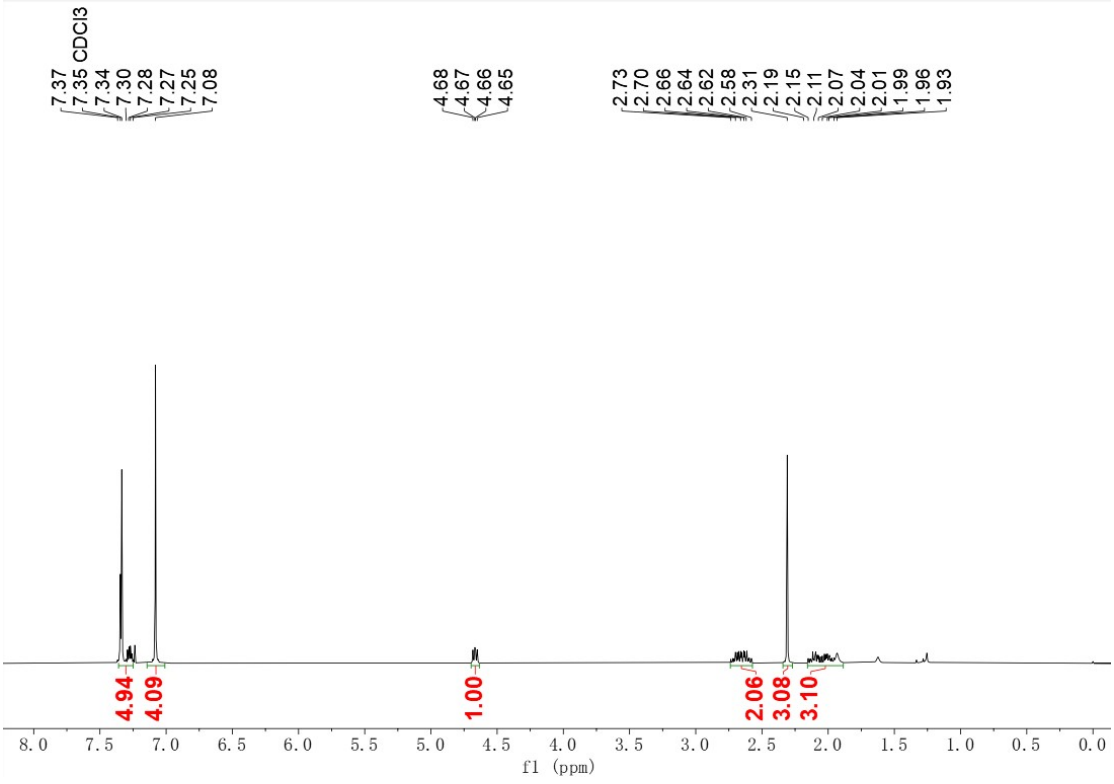
4f


7.34
7.33
7.29
7.28
7.23 CDCl3
7.19
6.77
6.74
6.72
6.71
4.68
4.67
4.66
4.65
3.77
2.75
2.72
2.68
2.65
2.62
2.59
2.16
2.14
2.12
2.07
2.04
2.00
1.96
6.02
2.96
1.00
3.01
2.08
3.06
f1 (ppm)


159.59
144.50
143.39
129.30
128.46
127.59
125.88
120.81
114.13
111.14
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.79
55.08
40.28
32.06
f1 (ppm)


OH

4g


7.37
7.35 CDCl3
7.34
7.30
7.28
7.27
7.25
7.08
4.68
4.67
4.66
4.65
2.73
2.70
2.66
2.64
2.62
2.58
2.31
2.19
2.15
2.11
2.07
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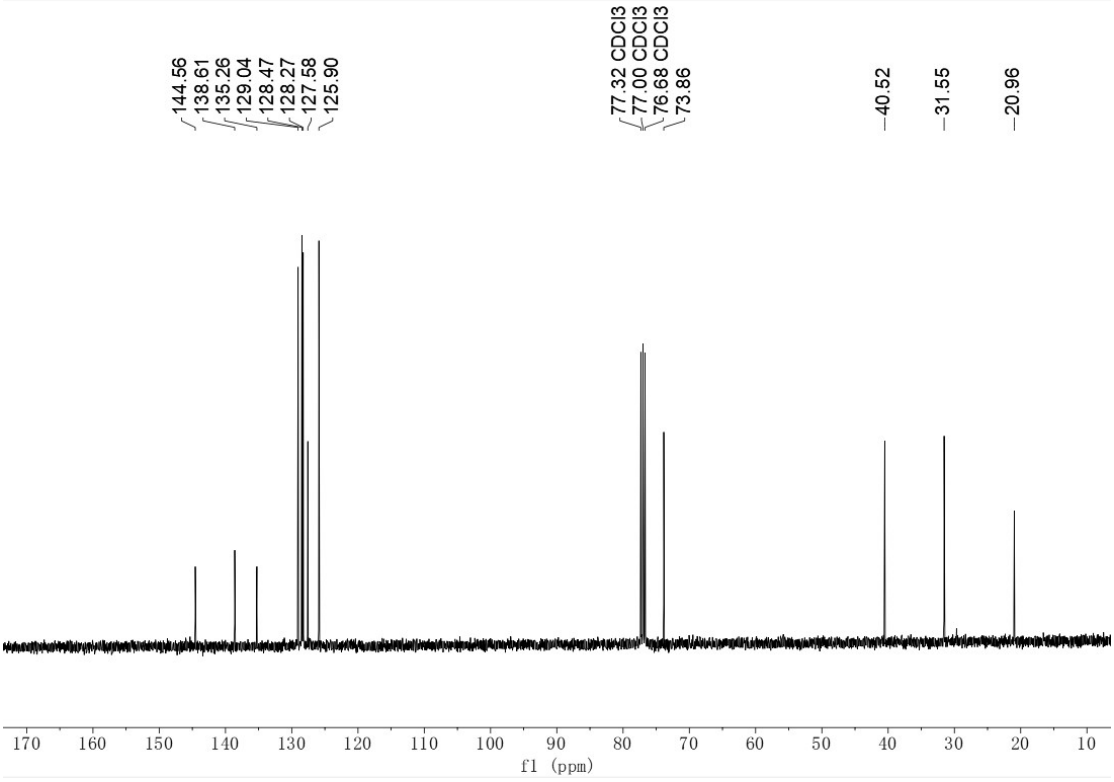
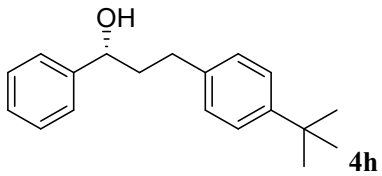
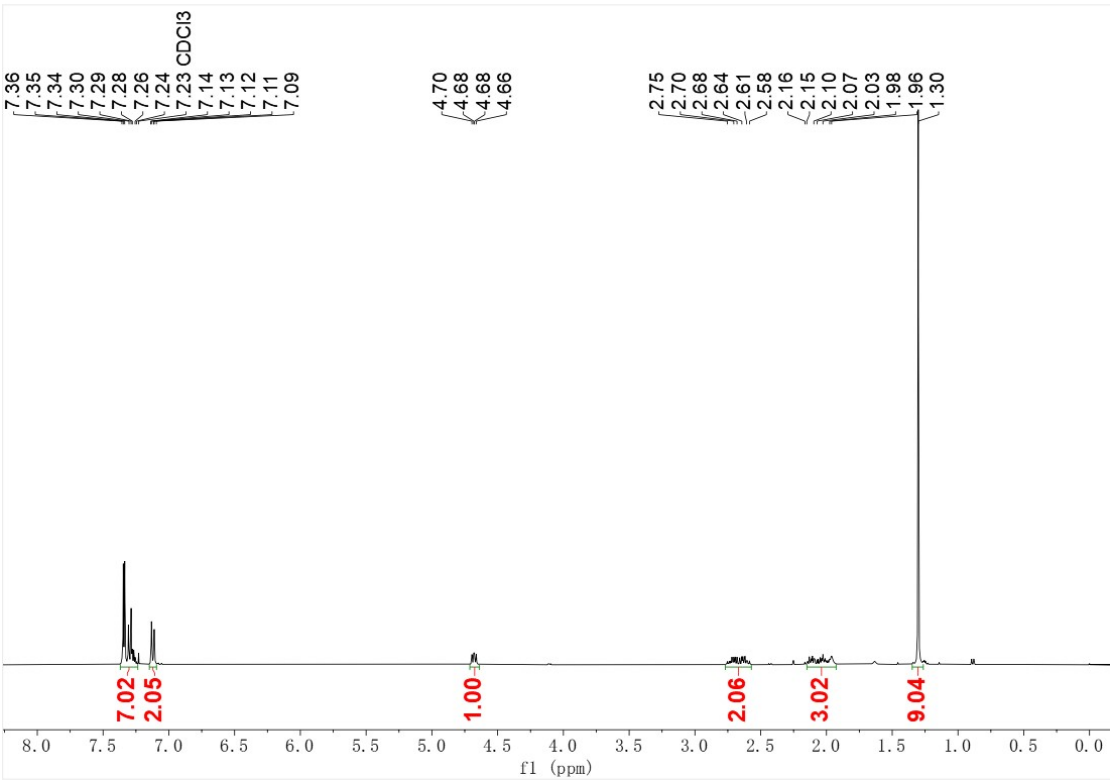
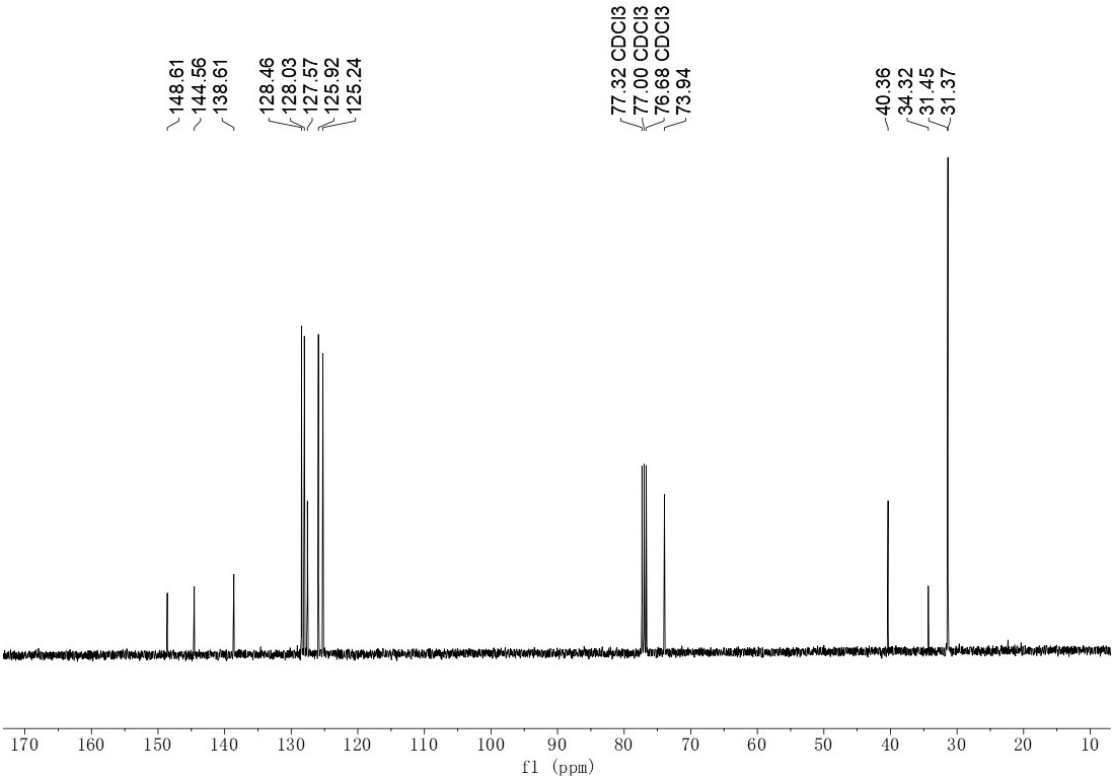
1.00
2.06
3.08
3.10
f1 (ppm)

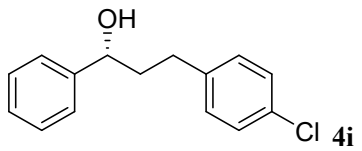

144.56
138.61
135.26
129.04
128.47
128.27
127.58
125.90
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.86
40.52
31.55
20.96
f1 (ppm)


OH

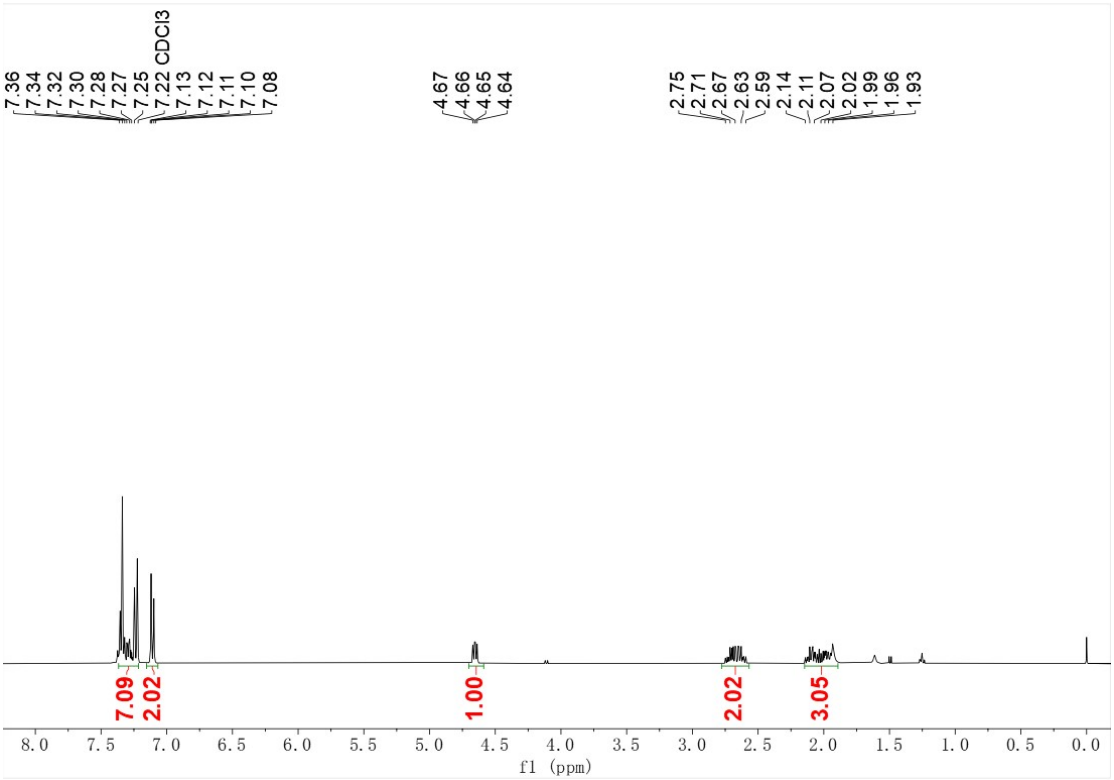
4h

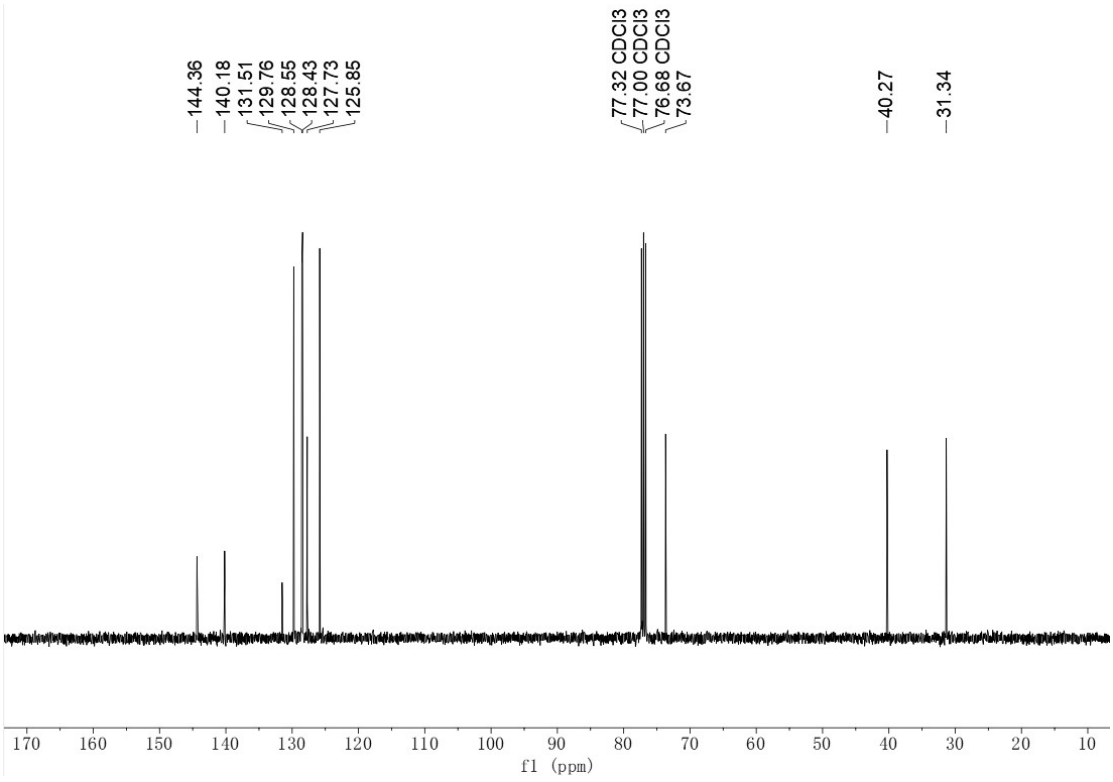

7.36
7.35
7.34
7.30
7.29
7.28
7.26
7.24
7.23 CDCl3
7.14
7.13
7.12
7.11
7.09
4.70
4.68
4.68
4.66
2.75
2.70
2.68
2.64
2.61
2.58
2.16
2.15
2.10
2.07
2.03
1.98
1.96
1.30
7.02
2.05
1.00
2.06
3.02
9.04
f1 (ppm)

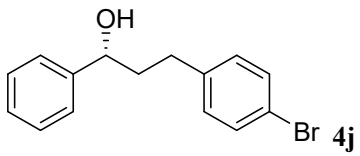

148.61
144.56
138.61
128.46
128.03
127.57
125.92
125.24
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.94
40.36
34.32
31.45
31.37
f1 (ppm)


OH
Cl

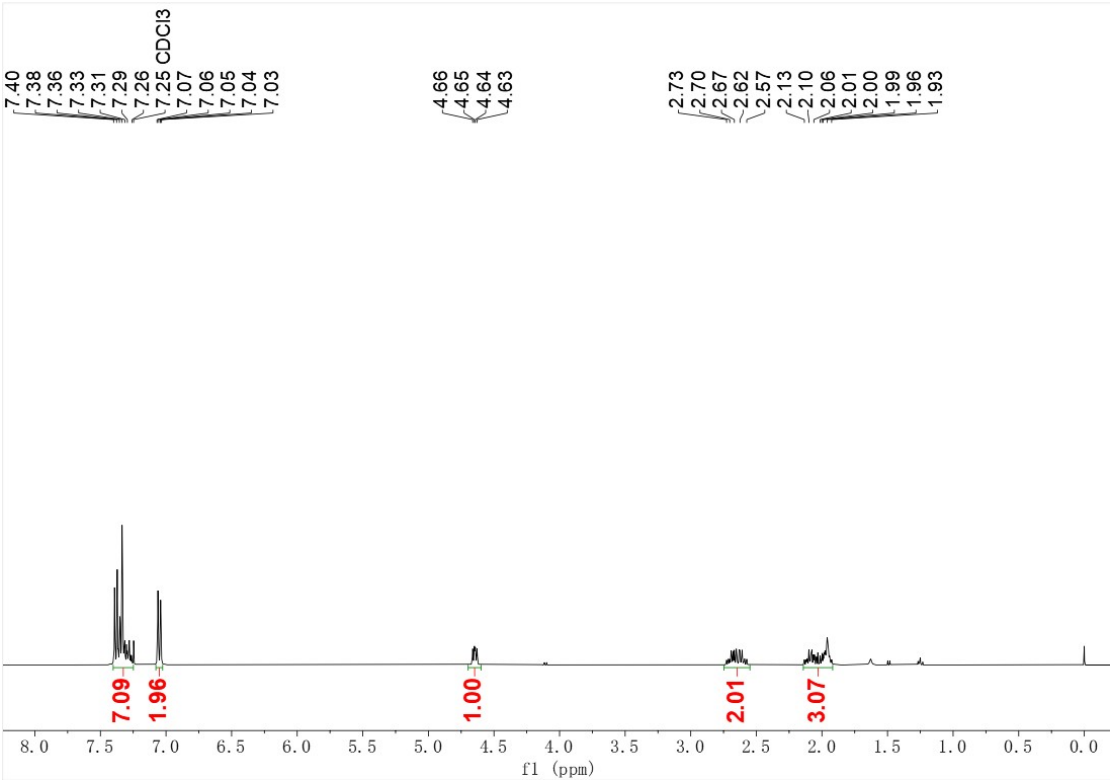
4i

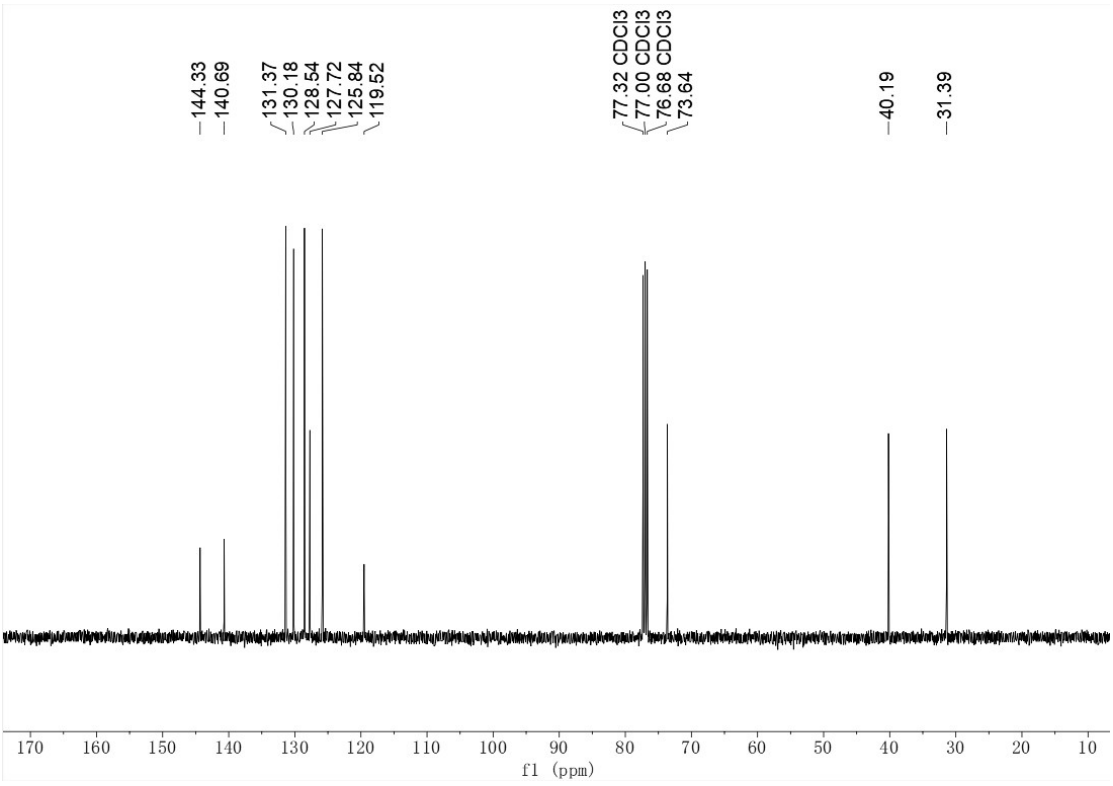

7.36
7.34
7.32
7.30
7.28
7.27
7.25
CDCl3
7.22
7.13
7.12
7.11
7.10
7.08
4.67
4.66
4.65
4.64
2.75
2.71
2.67
2.63
2.59
2.14
2.11
2.07
2.02
1.99
1.96
1.93
7.09
2.02
1.00
2.02
3.05
f1 (ppm)

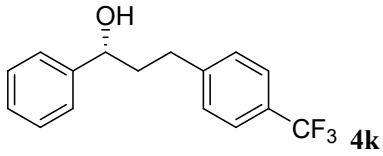

144.36
140.18
131.51
129.76
128.55
128.43
127.73
125.85
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.67
40.27
31.34
f1 (ppm)


OH
Br

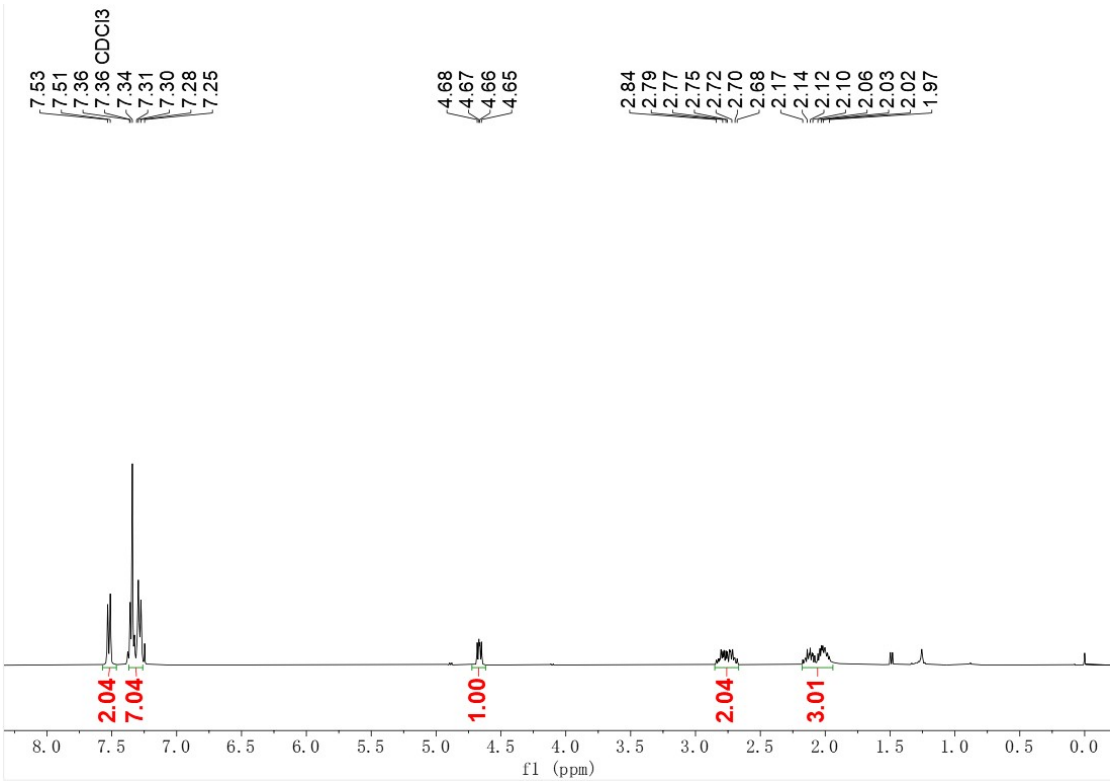
4j

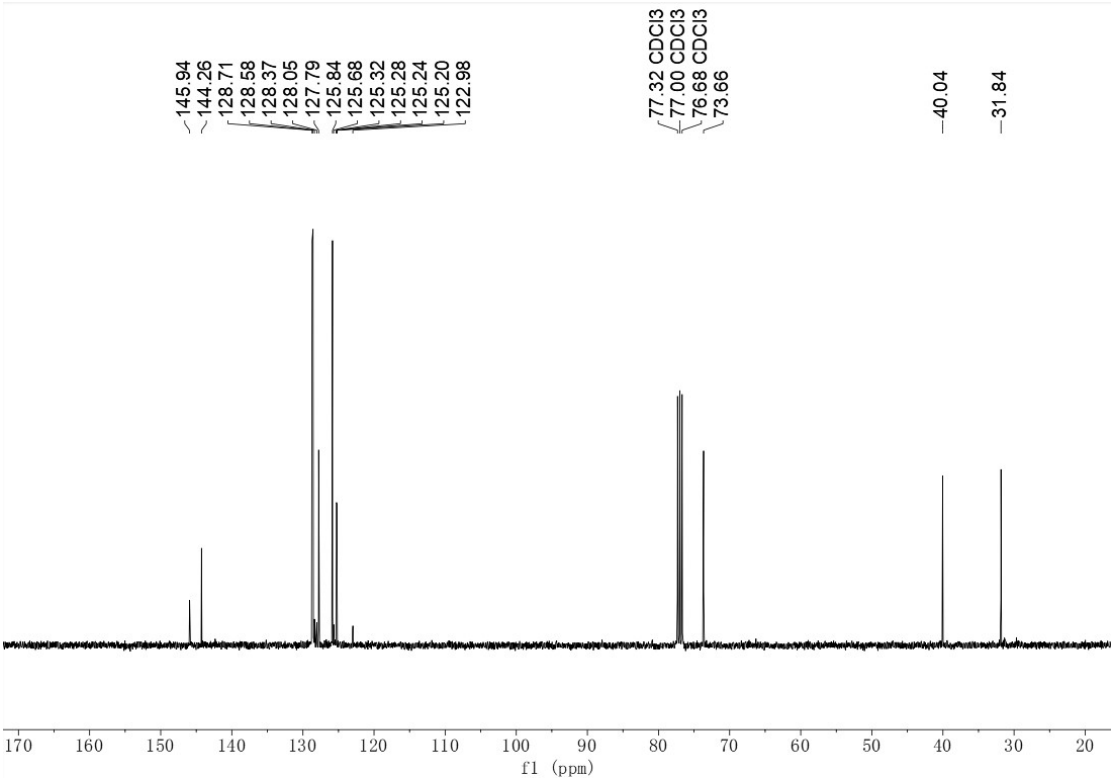

7.40
7.38
7.36
7.33
7.31
7.29
7.26
7.25 CDCl3
7.07
7.06
7.05
7.04
7.03
4.66
4.65
4.64
4.63
2.73
2.70
2.67
2.62
2.57
2.13
2.10
2.06
2.01
2.00
1.99
1.96
1.93
7.09
1.96
1.00
2.01
3.07
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

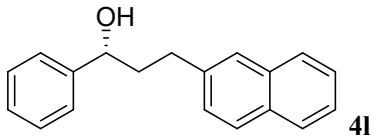

144.33
140.69
131.37
130.18
128.54
127.72
125.84
119.52
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.64
40.19
31.39
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)


OH
CF3

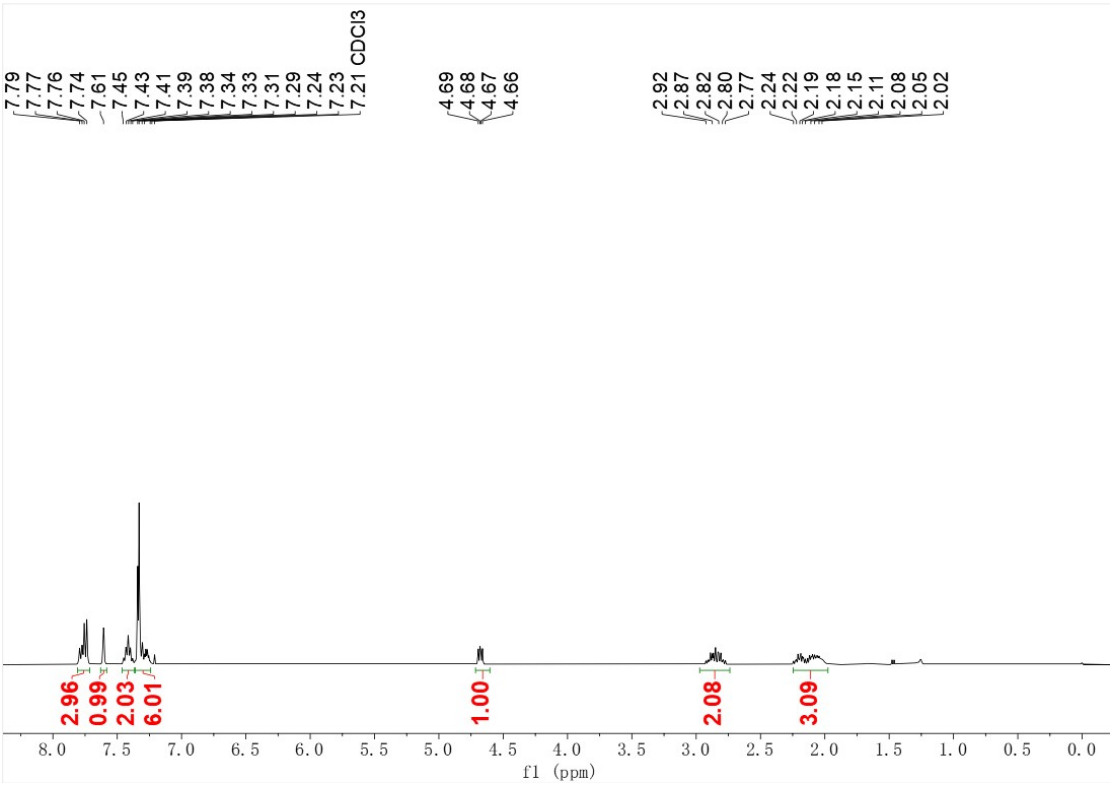
4k

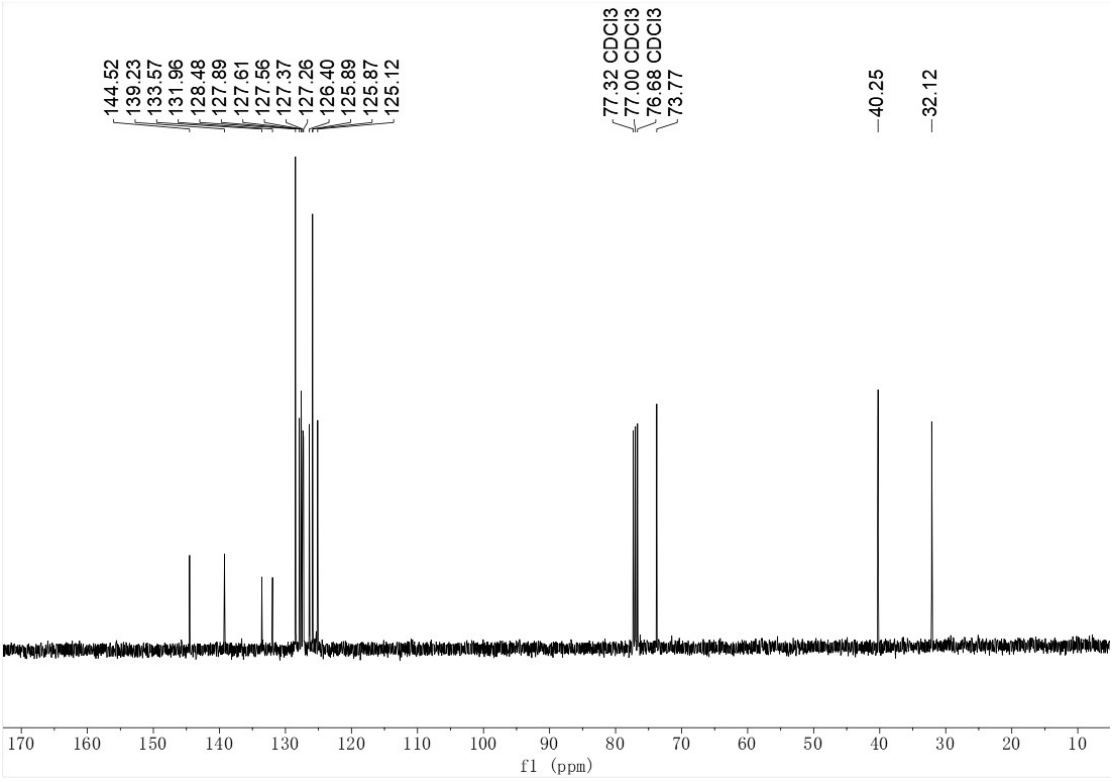

7.53
7.51
7.36
7.36 CDCl3
7.34
7.31
7.30
7.28
7.25
4.68
4.67
4.66
4.65
2.84
2.79
2.77
2.75
2.72
2.70
2.68
2.17
2.14
2.12
2.10
2.06
2.03
2.02
1.97
2.04
7.04
1.00
2.04
3.01
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

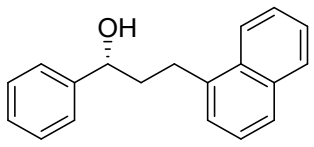

145.94
144.26
128.71
128.58
128.37
128.05
127.79
125.84
125.68
125.32
125.28
125.24
125.20
122.98
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.66
40.04
31.84
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20
f1 (ppm)


OH

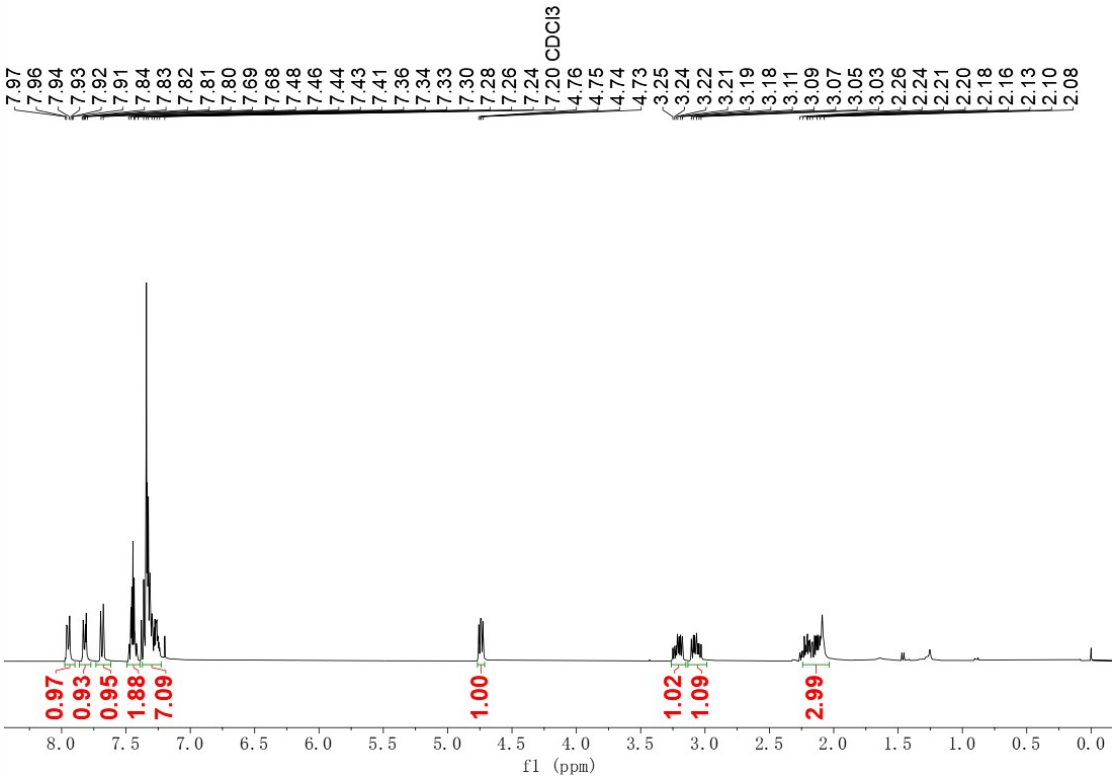
4l

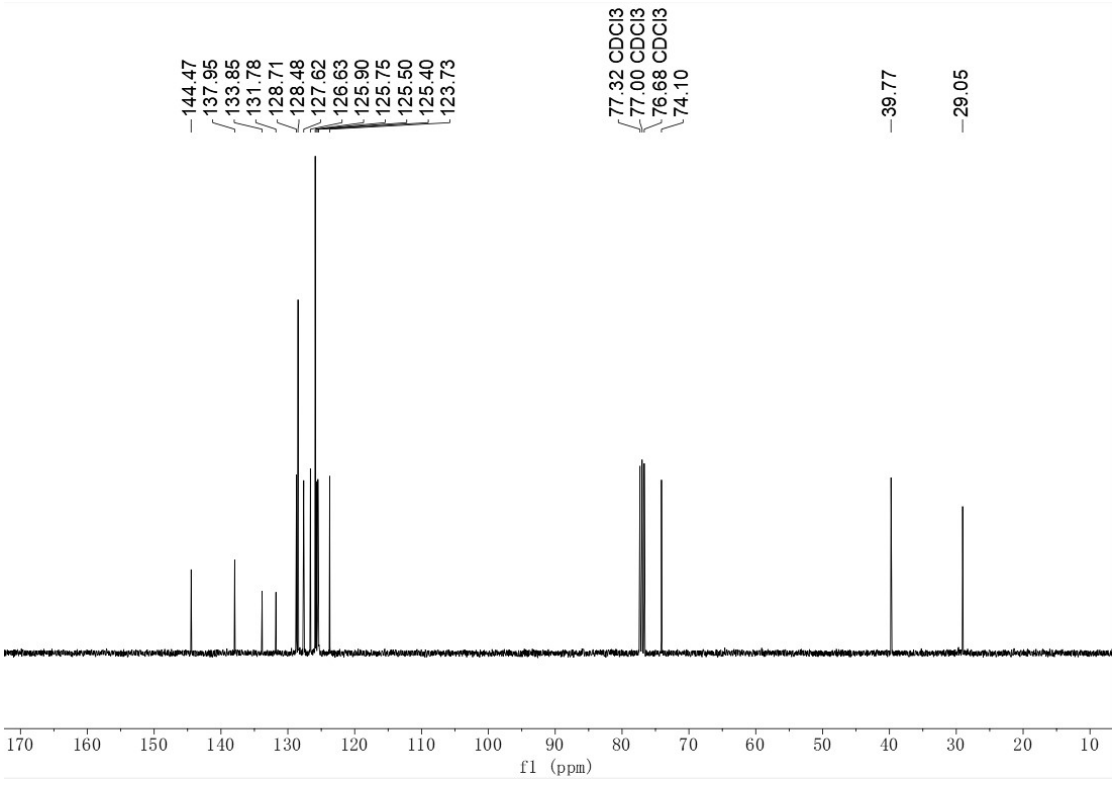

7.79
7.77
7.76
7.74
7.61
7.45
7.43
7.41
7.39
7.38
7.34
7.33
7.31
7.29
7.24
7.23
7.21 CDCl3
4.69
4.68
4.67
4.66
2.92
2.87
2.82
2.80
2.77
2.24
2.22
2.19
2.18
2.15
2.11
2.08
2.05
2.02
2.96
0.99
2.03
6.01
1.00
2.08
3.09
f1 (ppm)

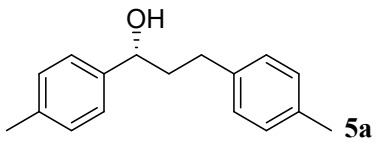

144.52
139.23
133.57
131.96
128.48
127.89
127.61
127.56
127.37
127.26
126.40
125.89
125.87
125.12
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.77
40.25
32.12
f1 (ppm)


OH

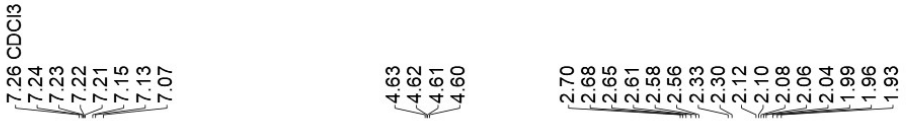
4m


7.97
7.96
7.94
7.93
7.92
7.91
7.84
7.83
7.82
7.81
7.80
7.69
7.68
7.48
7.46
7.44
7.43
7.41
7.36
7.34
7.33
7.30
7.28
7.26
7.24
CDCl3
7.20
4.76
4.75
4.74
4.73
3.25
3.24
3.22
3.21
3.19
3.18
3.11
3.09
3.07
3.05
3.03
2.26
2.24
2.21
2.20
2.18
2.16
2.13
2.10
2.08
0.97
0.93
0.95
1.88
7.09
1.00
1.02
1.09
2.99
f1 (ppm)


144.47
137.95
133.85
131.78
128.71
128.48
127.62
126.63
125.90
125.75
125.50
125.40
123.73
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
74.10
39.77
29.05
f1 (ppm)


OH

5a


7.26 CDCl3
7.24
7.23
7.22
7.21
7.15
7.13
7.07
4.63
4.62
4.61
4.60
2.70
2.68
2.65
2.61
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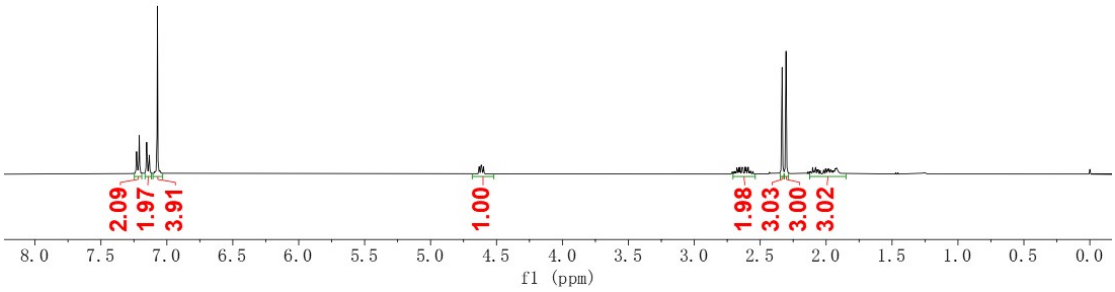
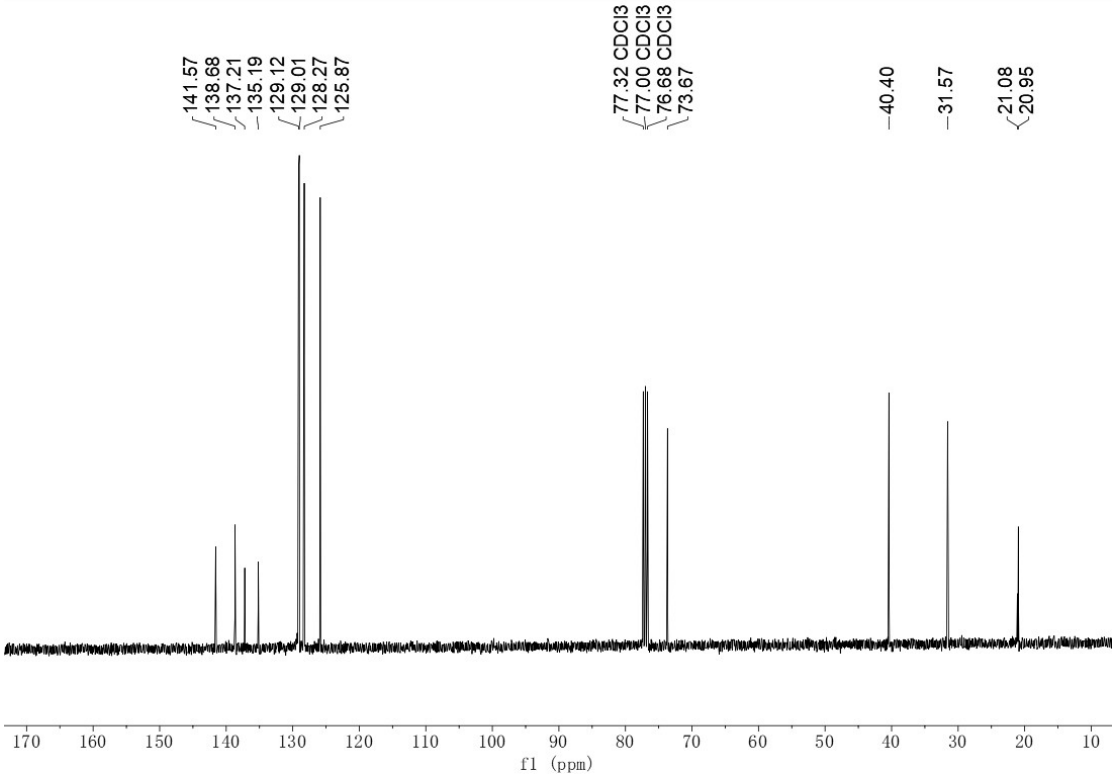
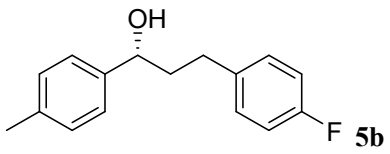
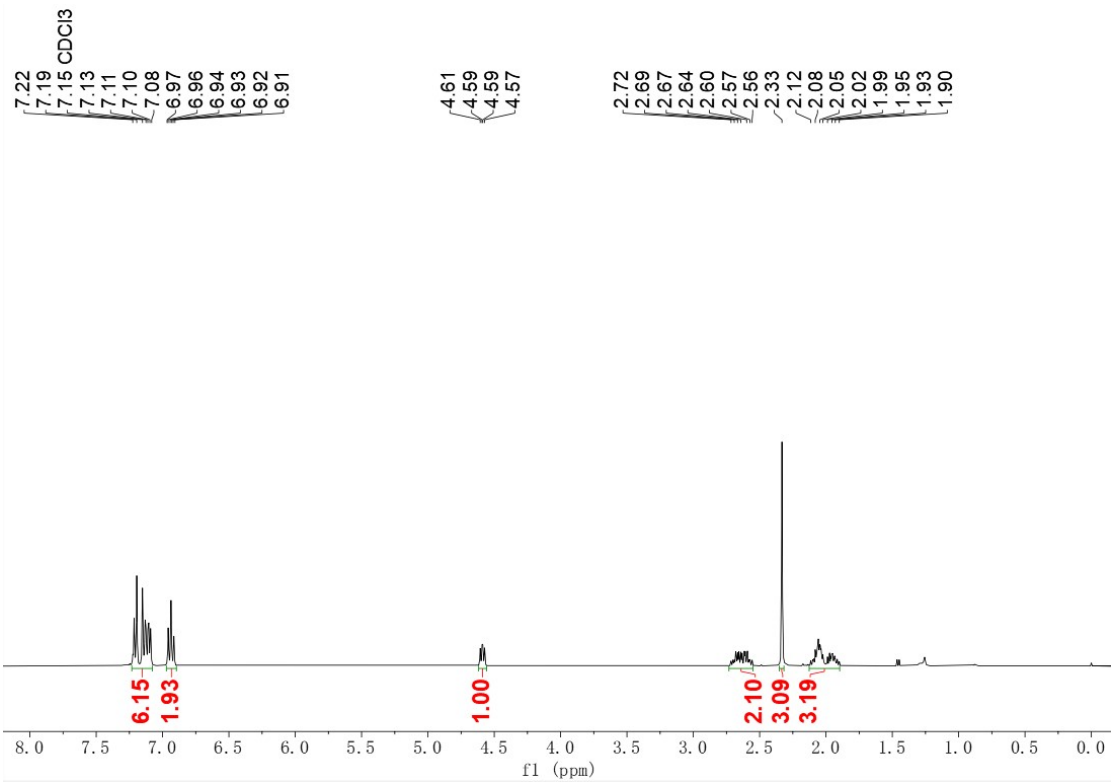
2.08
2.06
2.04
1.99
1.96
1.93


2.09
1.97
3.91
1.00
1.98
3.03
3.00
3.02
f1 (ppm)


141.57
138.68
137.21
135.19
129.12
129.01
128.27
125.87
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.67
40.40
31.57
21.08
20.95
f1 (ppm)


OH
F

5b


7.22
7.19
7.15 CDCl3
7.13
7.11
7.10
7.08
6.97
6.96
6.94
6.93
6.92
6.91
4.61
4.59
4.59
4.57
2.72
2.69
2.67
2.64
2.60
2.57
2.56
2.33
2.12
2.08
2.05
2.02
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1.90
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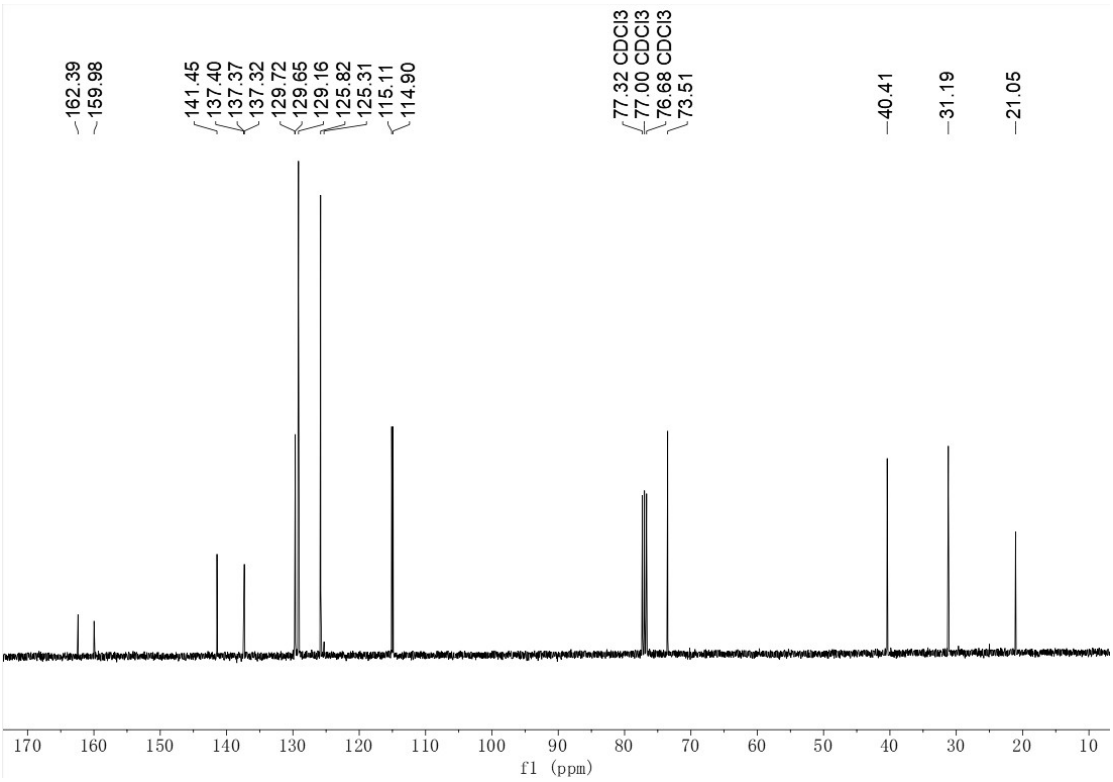
1.93
1.00
2.10
3.09
3.19
f1 (ppm)


162.39
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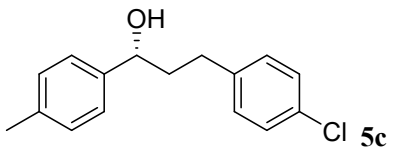
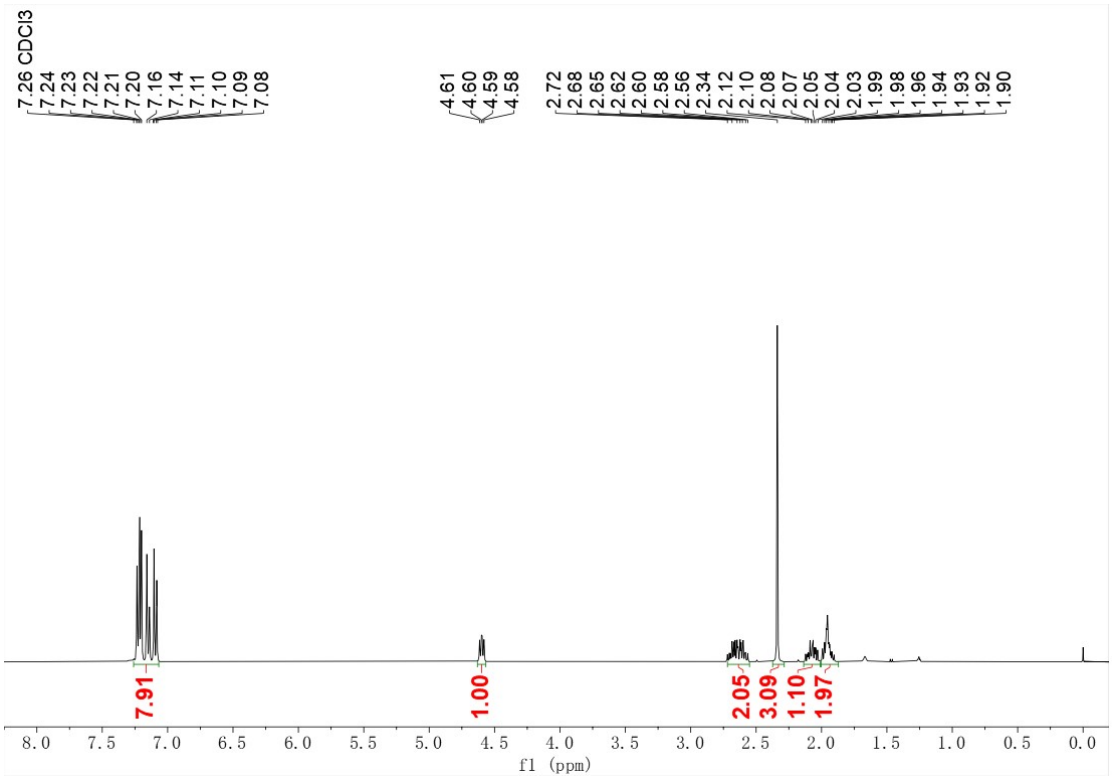
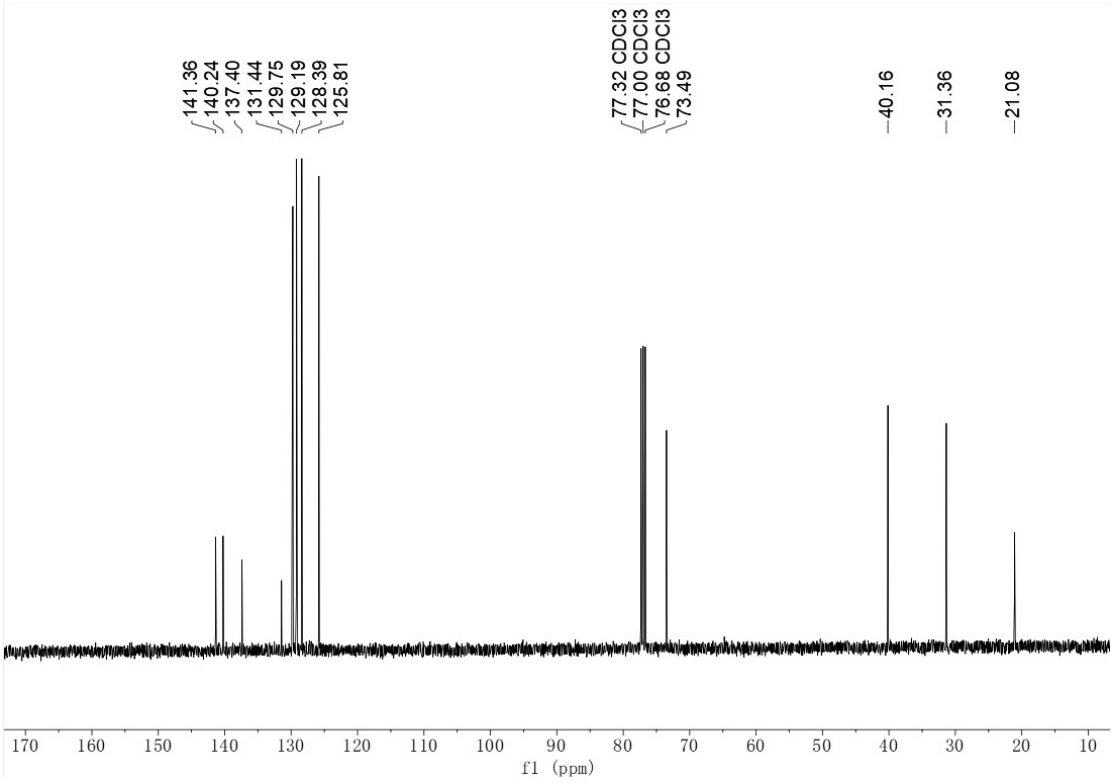
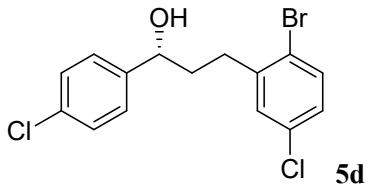
137.40
137.37
137.32
129.72
129.65
129.16
125.82
125.31
115.11
114.90
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.51
40.41
31.19
21.05
f1 (ppm)


OH
Cl

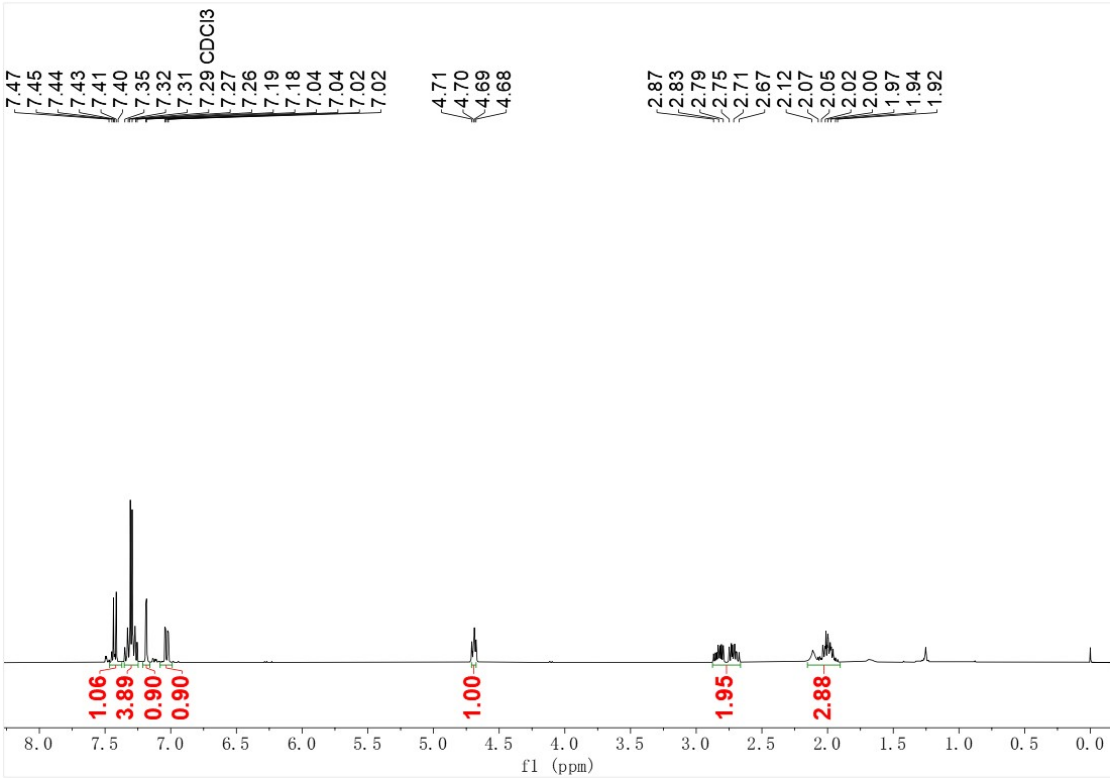
5c

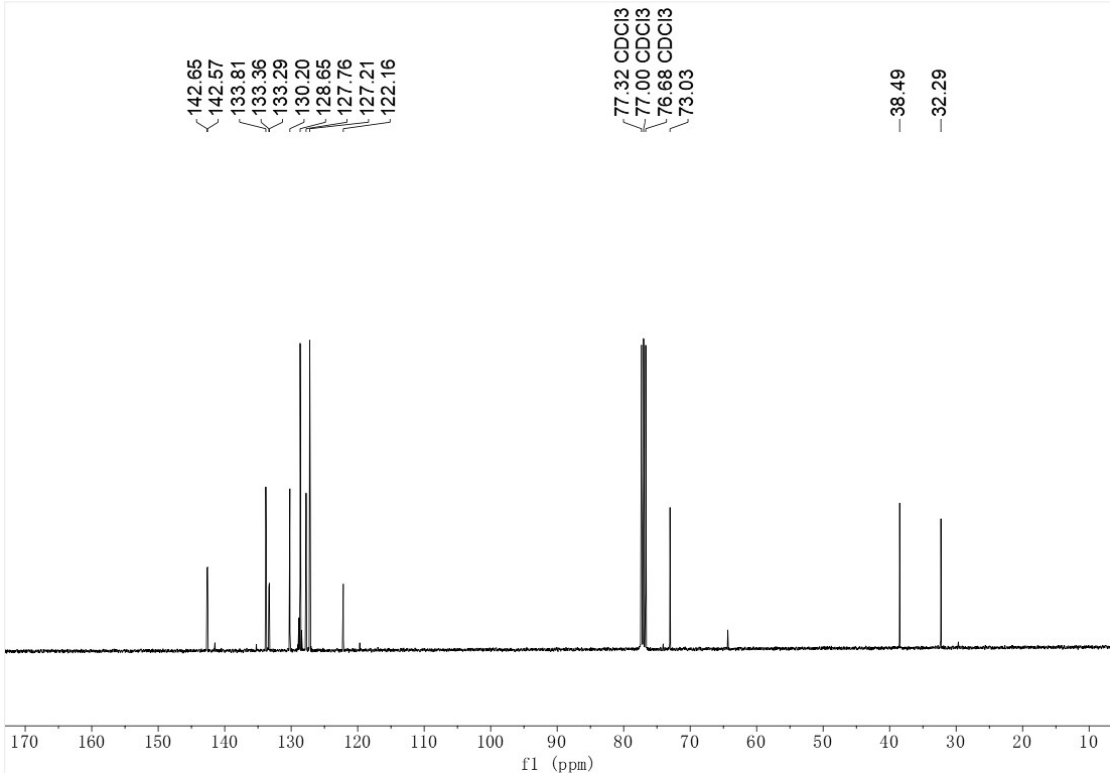

7.26 CDCl3
7.24
7.23
7.22
7.21
7.20
7.16
7.14
7.11
7.10
7.09
7.08
4.61
4.60
4.59
4.58
2.72
2.68
2.65
2.62
2.60
2.58
2.56
2.34
2.12
2.10
2.08
2.07
2.05
2.04
2.03
1.99
1.98
1.96
1.94
1.93
1.92
1.90
7.91
1.00
2.05
3.09
1.10
1.97
f1 (ppm)

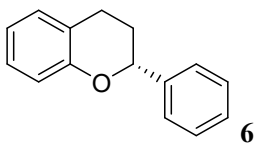

141.36
140.24
137.40
131.44
129.75
129.19
128.39
125.81
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.49
40.16
31.36
21.08
f1 (ppm)


OH
Br
Cl
Cl

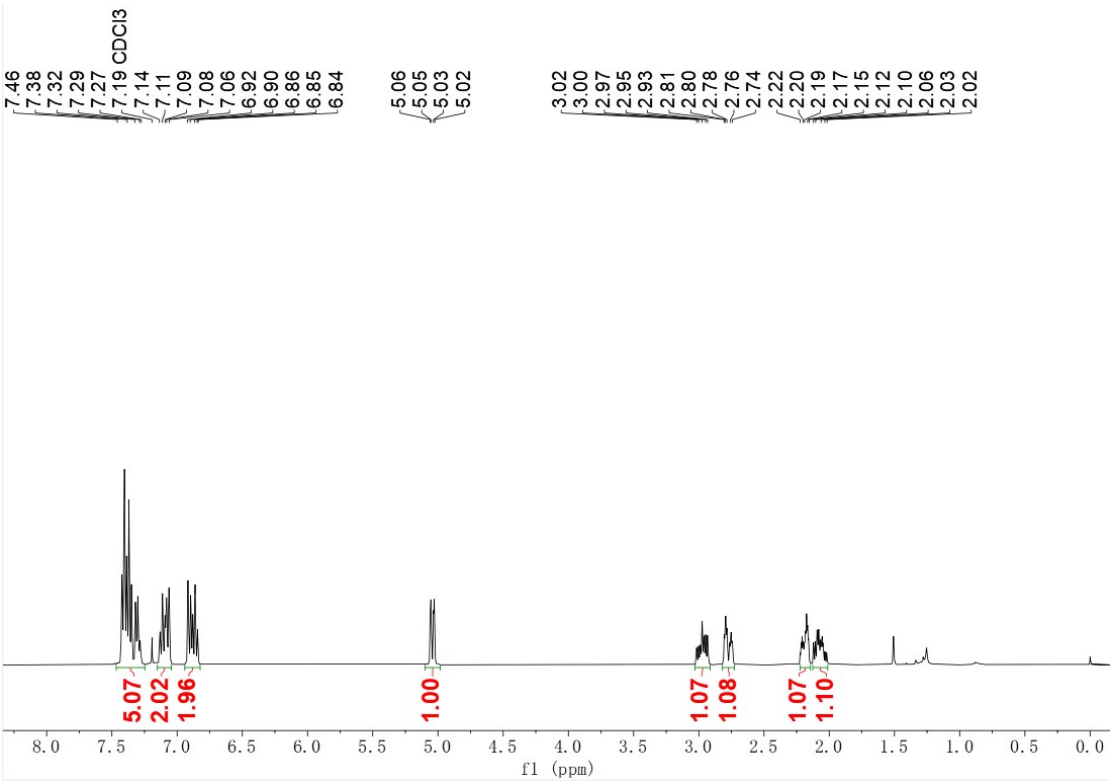
5d

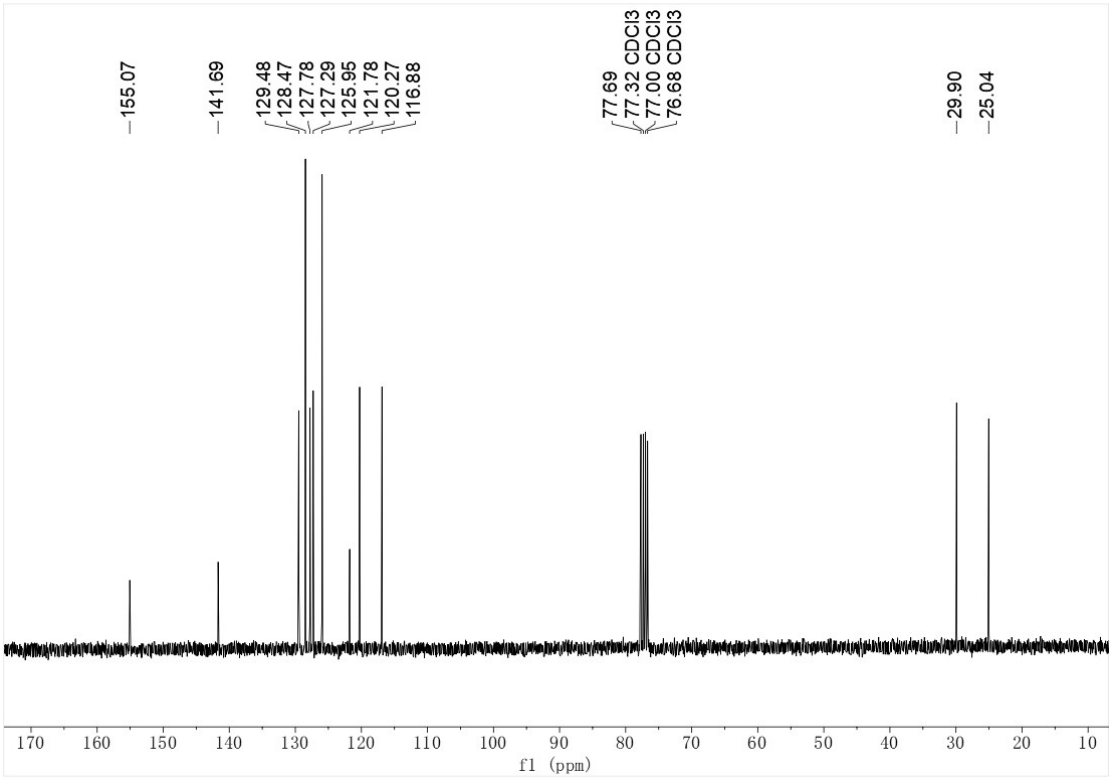

7.47
7.45
7.44
7.43
7.41
7.40
7.35
7.32
7.31
CDCl3
7.29
7.27
7.26
7.19
7.18
7.04
7.04
7.02
7.02
4.71
4.70
4.69
4.68
2.87
2.83
2.79
2.75
2.71
2.67
2.12
2.07
2.05
2.02
2.00
1.97
1.94
1.92
1.06
3.89
0.90
0.90
1.00
1.95
2.88
f1 (ppm)

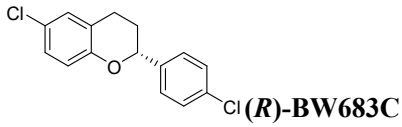

142.65
142.57
133.81
133.36
133.29
130.20
128.65
127.76
127.21
122.16
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
73.03
38.49
32.29
f1 (ppm)



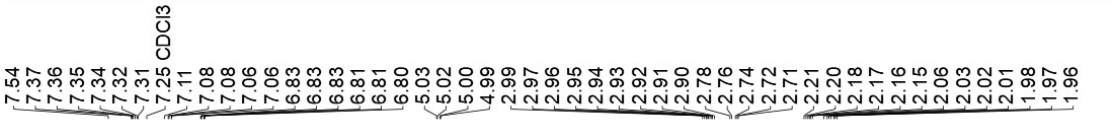
6

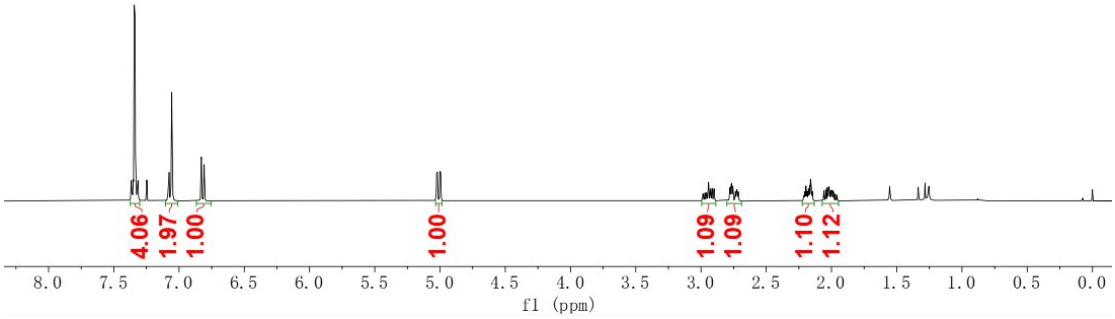

7.46
7.38
7.32
7.29
7.27
7.19 CDCl3
7.14
7.11
7.09
7.08
7.06
6.92
6.90
6.86
6.85
6.84
5.06
5.05
5.03
5.02
3.02
3.00
2.97
2.95
2.93
2.81
2.80
2.78
2.76
2.74
2.22
2.20
2.19
2.17
2.15
2.12
2.10
2.06
2.03
2.02
5.07
2.02
1.96
1.00
1.07
1.08
1.07
1.10
f1 (ppm)

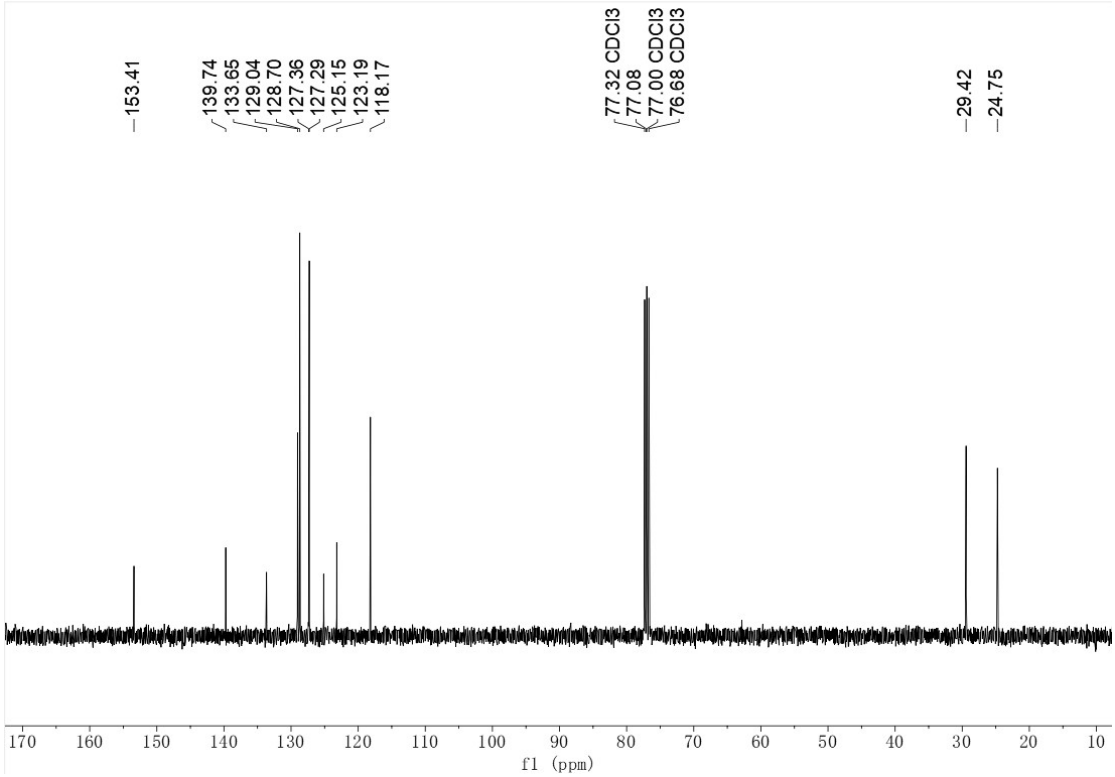

155.07
141.69
129.48
128.47
127.78
127.29
125.95
121.78
120.27
116.88
77.69
77.32 CDCl3
77.00 CDCl3
76.68 CDCl3
29.90
25.04
f1 (ppm)


Cl
O
Cl

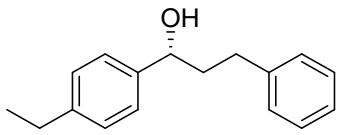
(*R*)-BW683C


7.54
7.37
7.36
7.35
7.34
7.32
7.31
CDCl3
7.25
7.11
7.08
7.08
7.06
7.06
6.83
6.83
6.81
6.81
6.80
5.03
5.02
5.00
4.99
2.99
2.97
2.96
2.95
2.94
2.93
2.92
2.91
2.90
2.78
2.76
2.74
2.72
2.71
2.21
2.20
2.18
2.17
2.16
2.15
2.06
2.03
2.02
2.01
1.98
1.97
1.96


4.06
1.97
1.00
1.00
1.09
1.09
1.10
1.12
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
f1 (ppm)


153.41
139.74
133.65
129.04
128.70
127.36
127.29
125.15
123.19
118.17
77.32 CDCl3
77.08
77.00 CDCl3
76.68 CDCl3
29.42
24.75
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

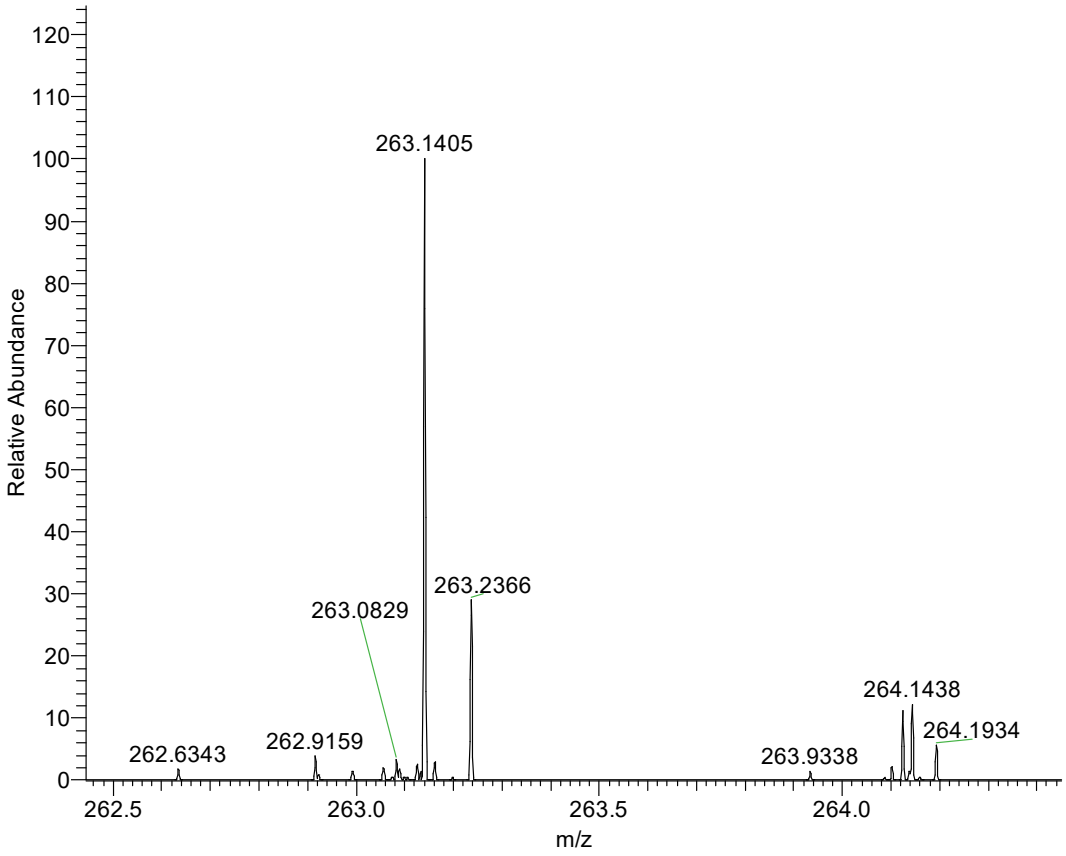
8. HRMS spectra of 3g



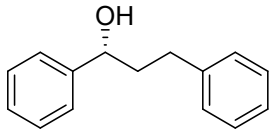
Na

3g

zhangdequan-20230824-54 #10-23 RT: 0.04-0.10 AV: 14 NL: 1.55E6
T: FTMS + p ESI Full ms [100.0000-1500.0000]

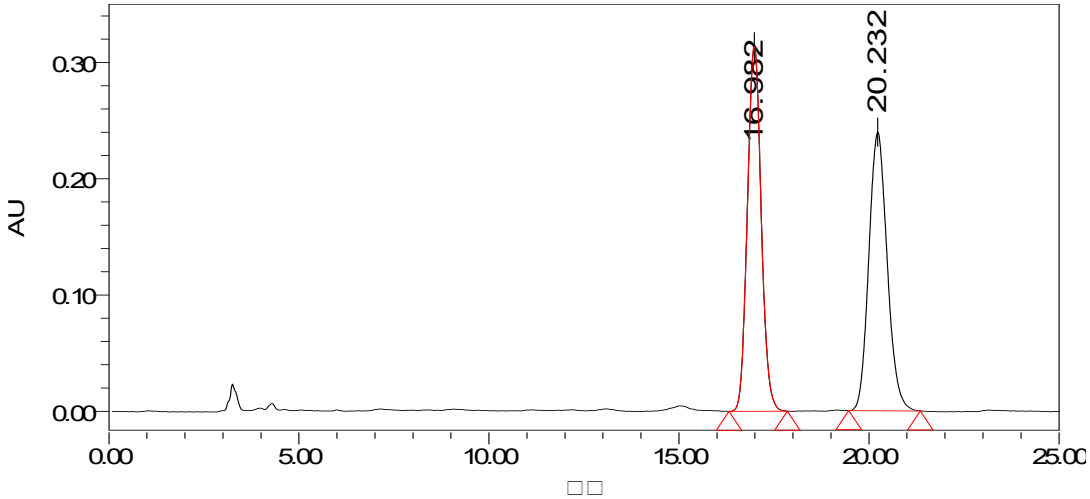


9. HPLC spectra of chiral alcohols

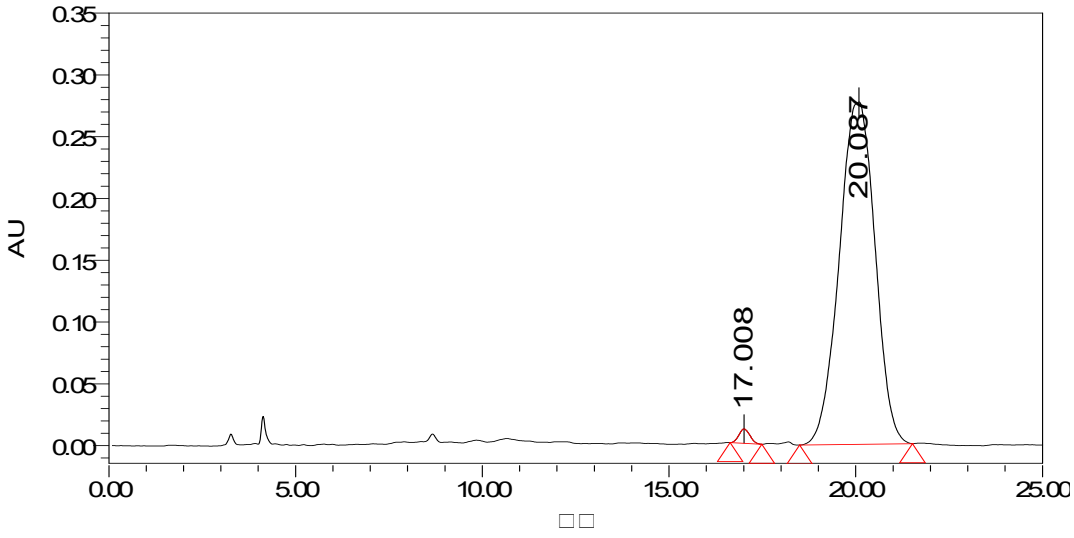


3a

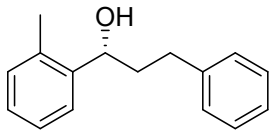
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	16.982	7961334	49.78	313551
2	20.232	8032529	50.22	239690

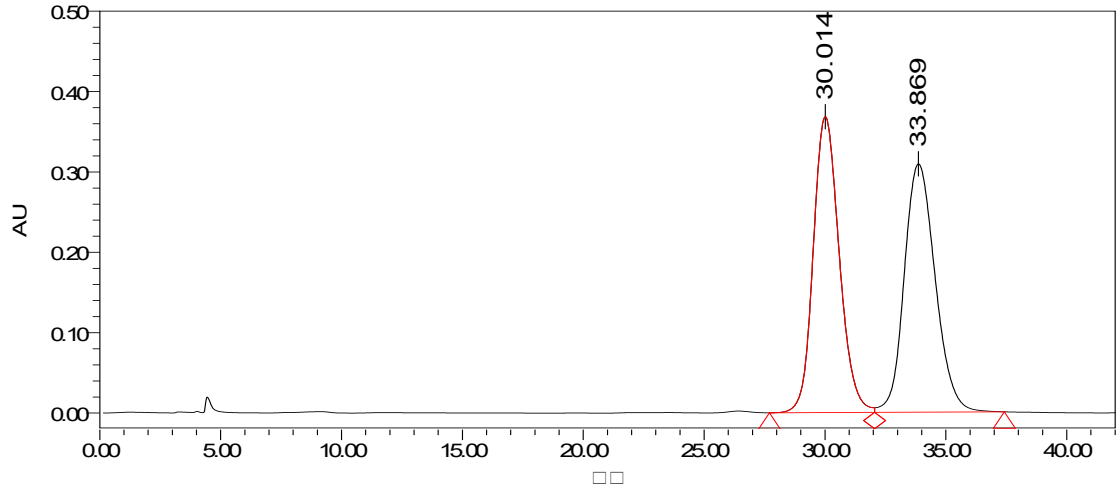


Peak	Ret Time[min]	Area	% Area	Height
1	17.008	179694	0.97	9973
2	20.087	18403209	99.03	277064

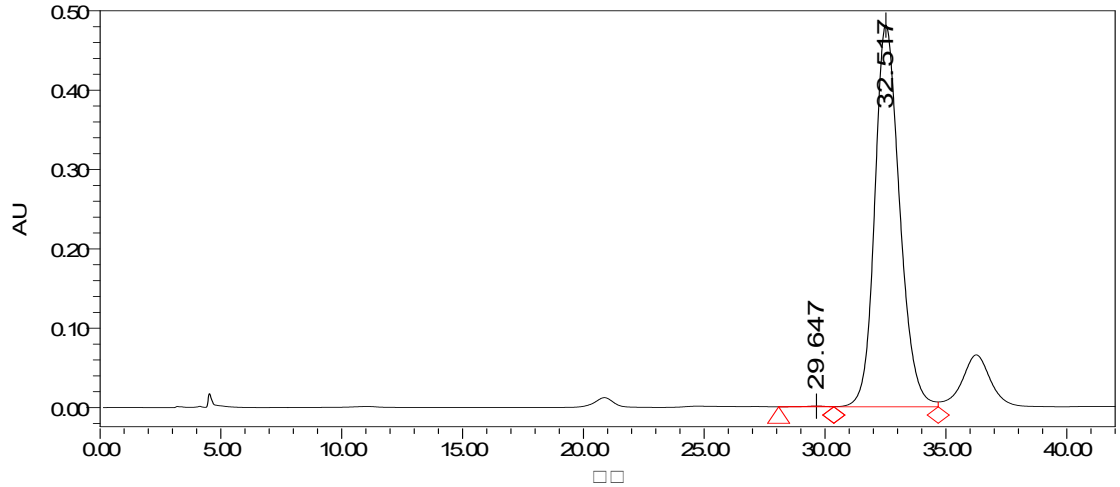


3b

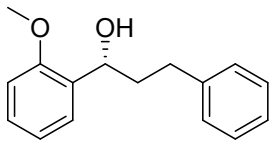
Chiralcel AD-H column, *n*-hexane/isopropanol = 99 : 1 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	30.014	27496738	49.98	368202
2	33.869	27516206	50.02	309012

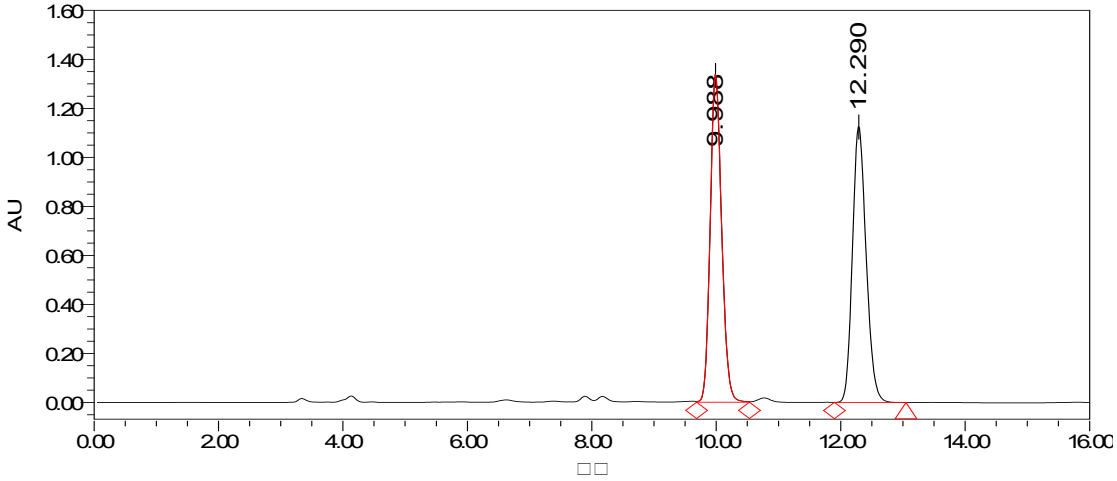


Peak	Ret Time[min]	Area	% Area	Height
1	29.647	56980	0.16	910
2	32.517	34502857	99.84	481193

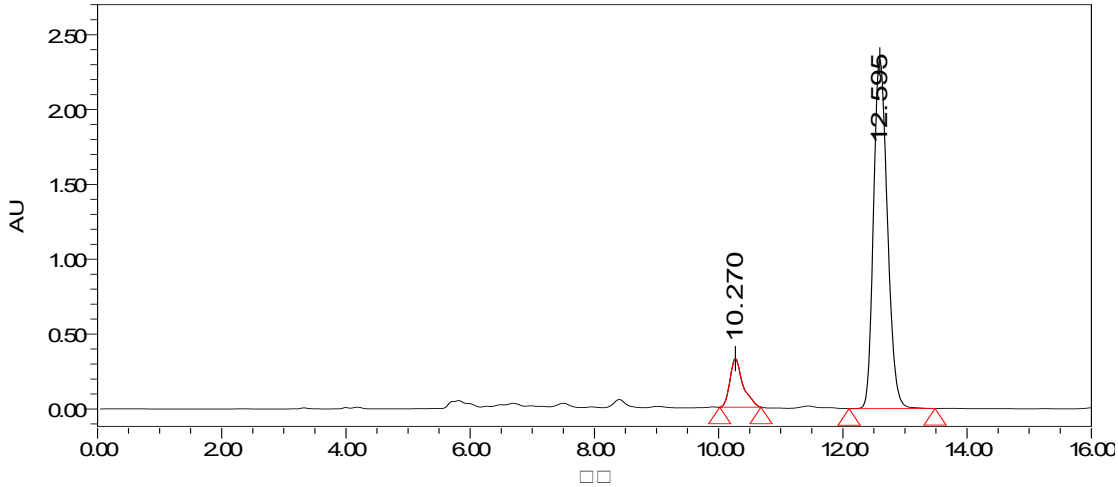


3c

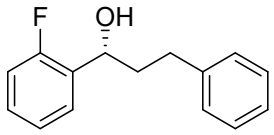
Chiralcel IB-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	9.988	17118465	49.80	1338900
2	12.290	17253207	50.20	1127823

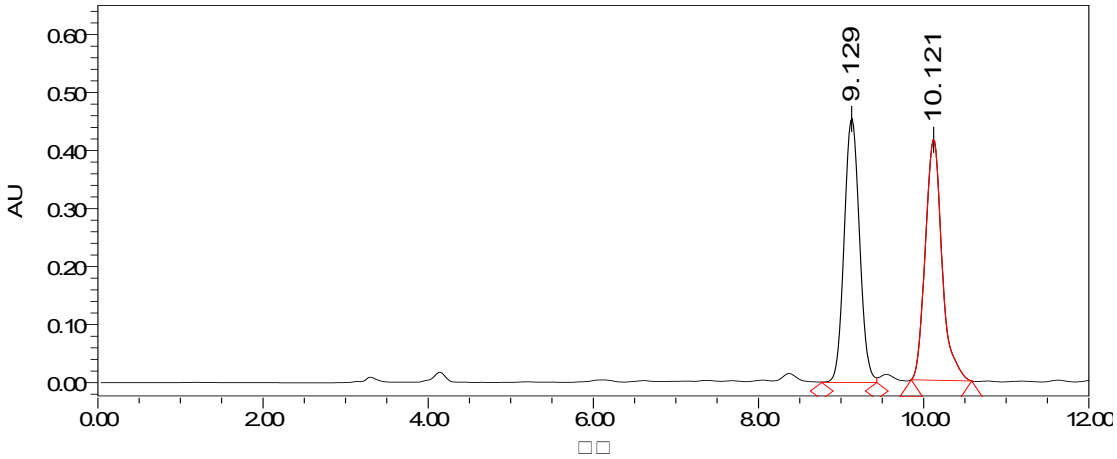


Peak	Ret Time[min]	Area	% Area	Height
1	10.270	4726280	11.53	325723
2	12.595	36279832	88.47	2334596

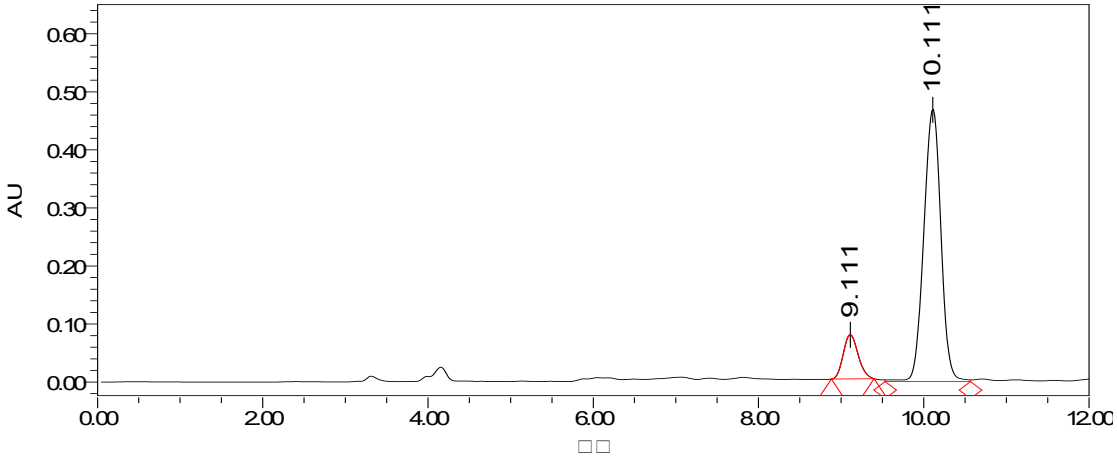


3d

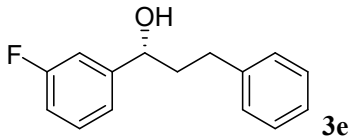
Chiralcel IA-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	9.129	5879751	50.15	455500
2	10.121	5843772	49.85	415329

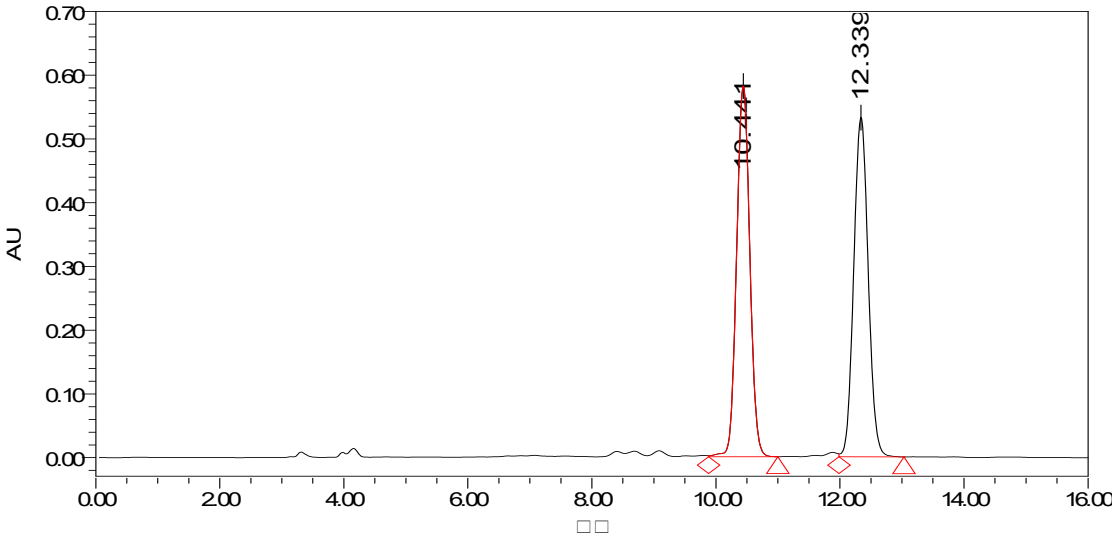


Peak	Ret Time[min]	Area	% Area	Height
1	9.111	952212	12.32	76230
2	10.111	6773738	87.68	469764

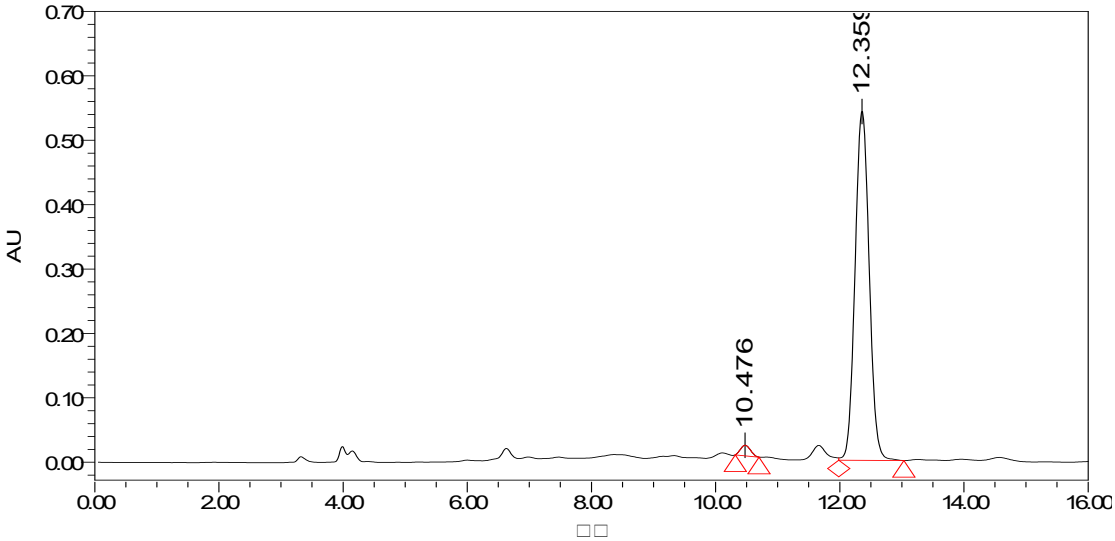


3e

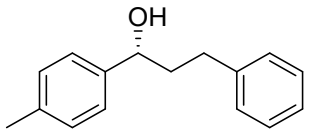
Chiralcel IA-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	10.441	8610979	49.93	583167
2	12.339	8633500	50.07	533425

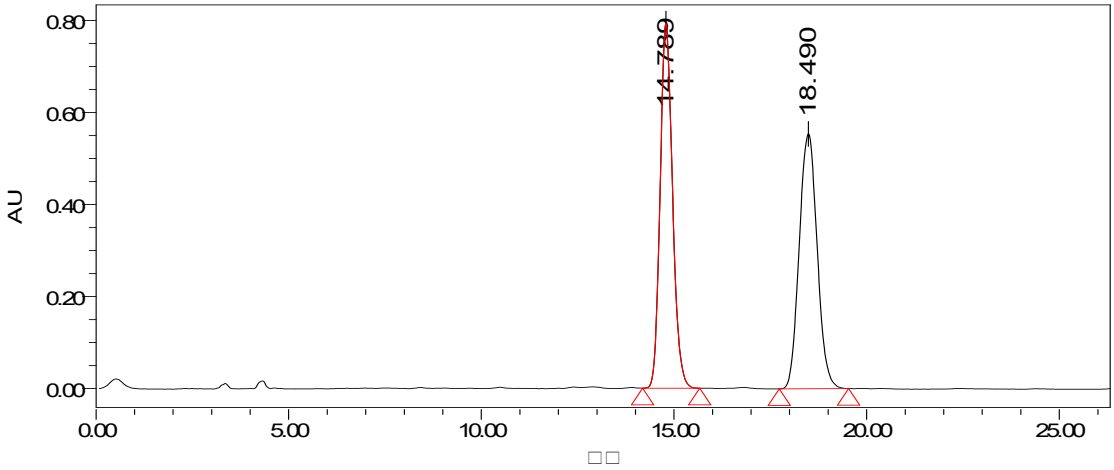


Peak	Ret Time[min]	Area	% Area	Height
1	10.476	182786	2.09	16406
2	12.359	8580609	97.91	542986

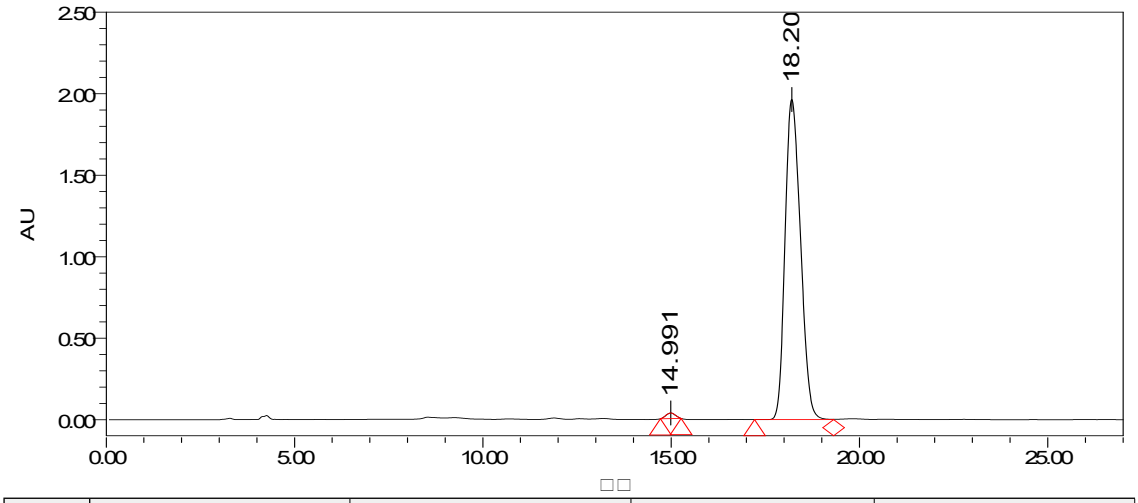


3f

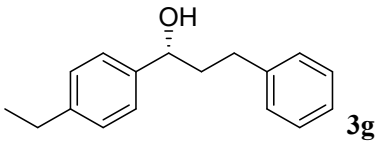
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	14.789	17747508	49.76	793713
2	18.490	17915521	50.24	554166

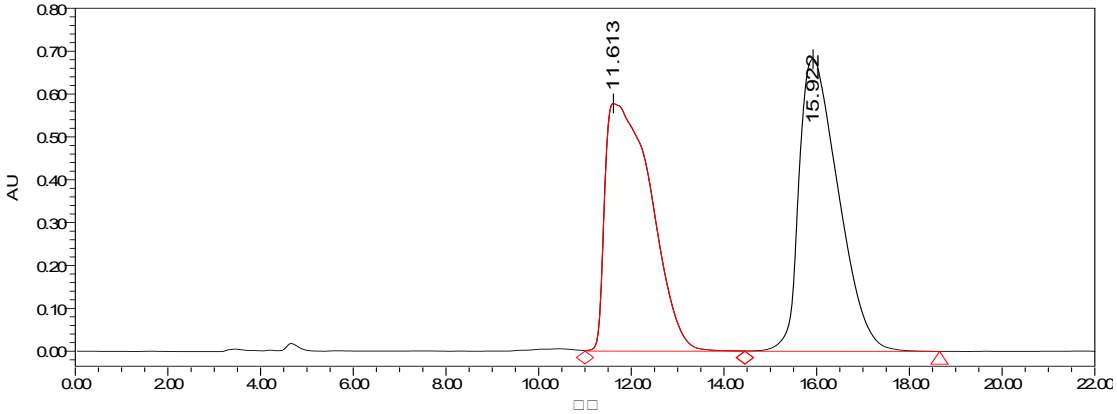


Peak	Ret Time[min]	Area	% Area	Height
1	14.991	595698	1.05	34065
2	18.204	56053546	98.95	1965474

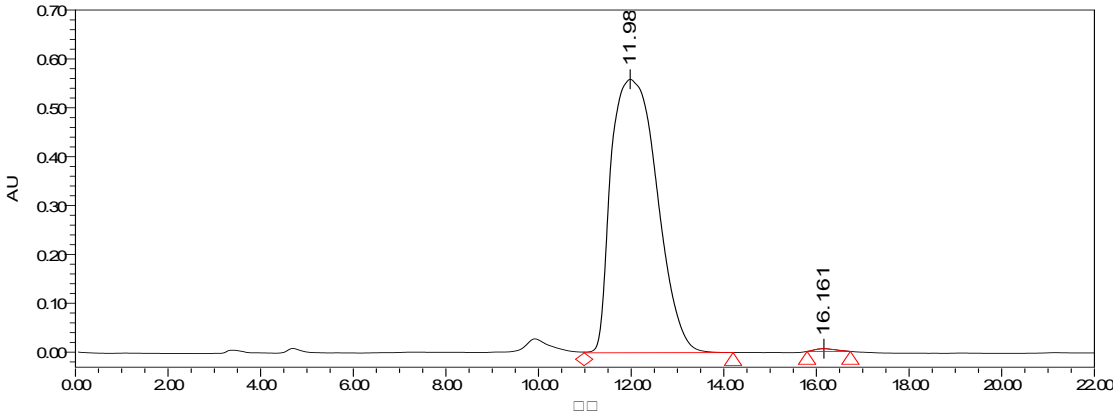


3g

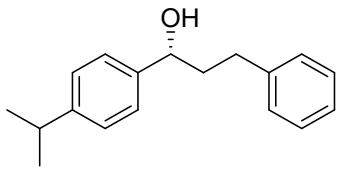
Chiralcel OJ-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	11.613	40059571	49.87	578149
2	15.922	40270071	50.13	681625

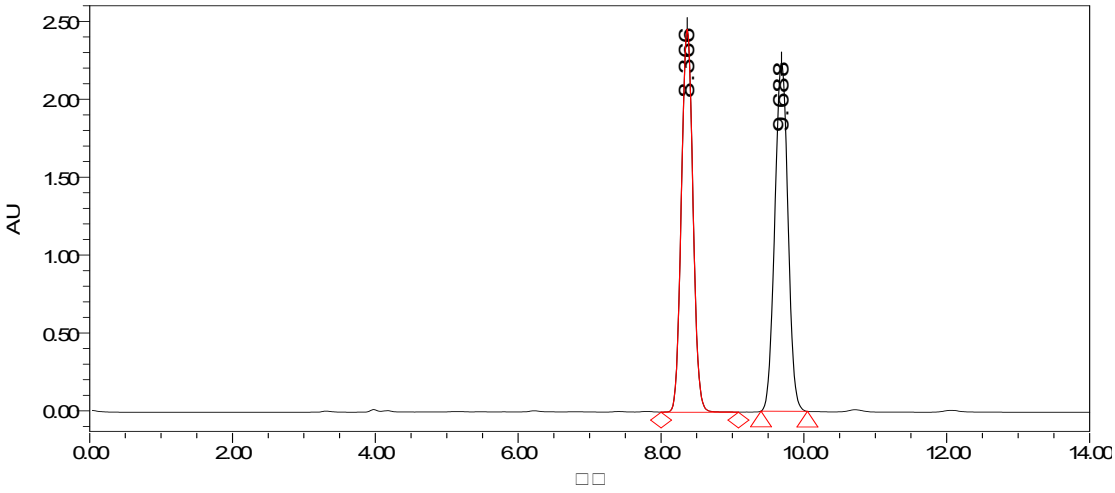


Peak	Ret Time[min]	Area	% Area	Height
1	11.980	38608598	99.56	559652
2	16.161	169214	0.44	5604

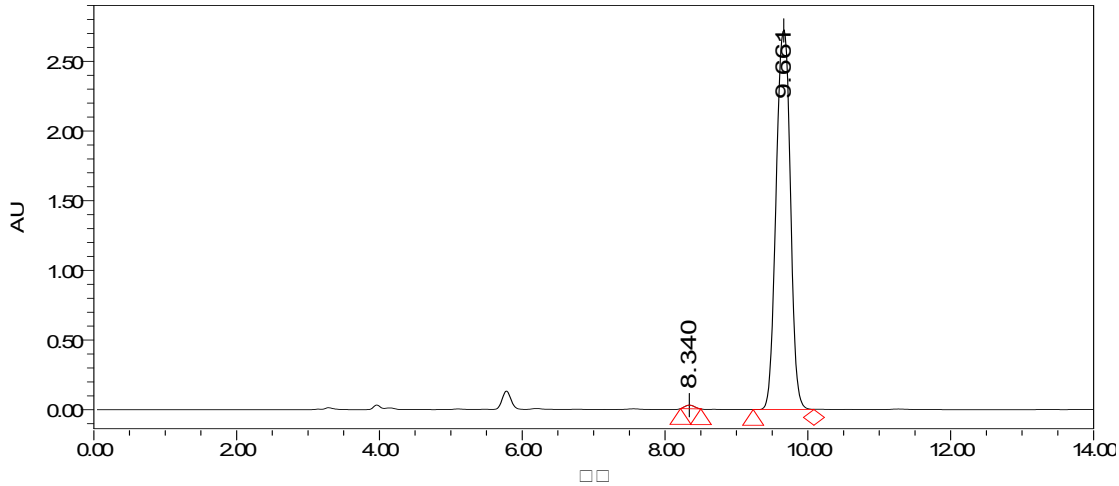


3h

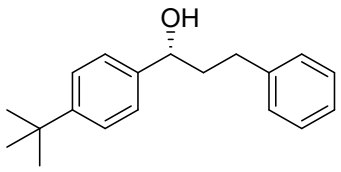
Chiralcel IB-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	8.366	27757800	49.21	2458396
2	9.688	28651207	50.79	2237007

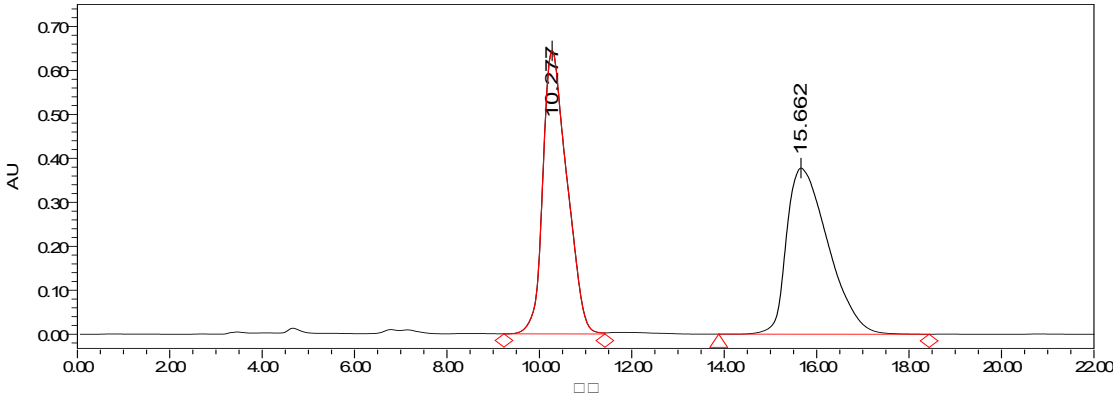


Peak	Ret Time[min]	Area	% Area	Height
1	8.340	240601	0.63	26171
2	9.661	37755822	99.37	2728474

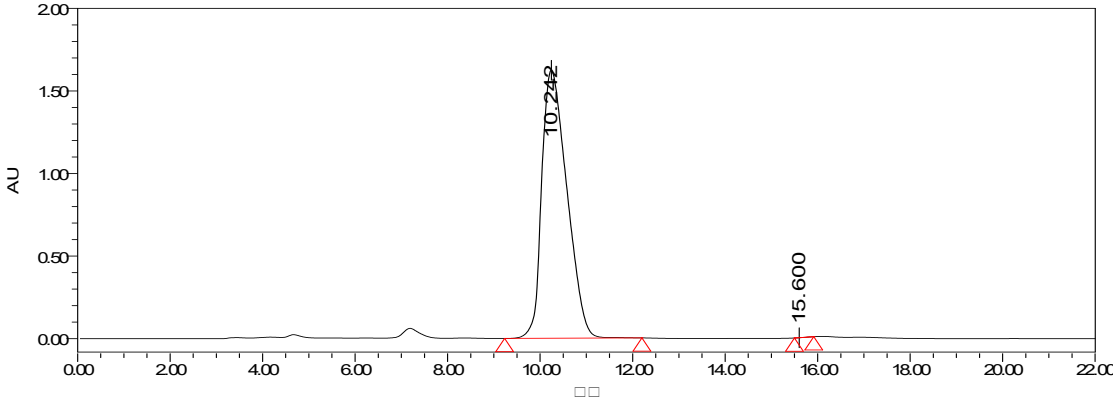


3i

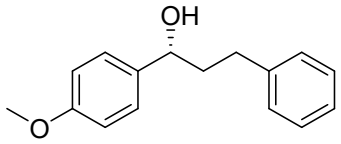
Chiralcel OJ-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	10.277	23356855	49.76	644343
2	15.662	23586520	50.24	378008

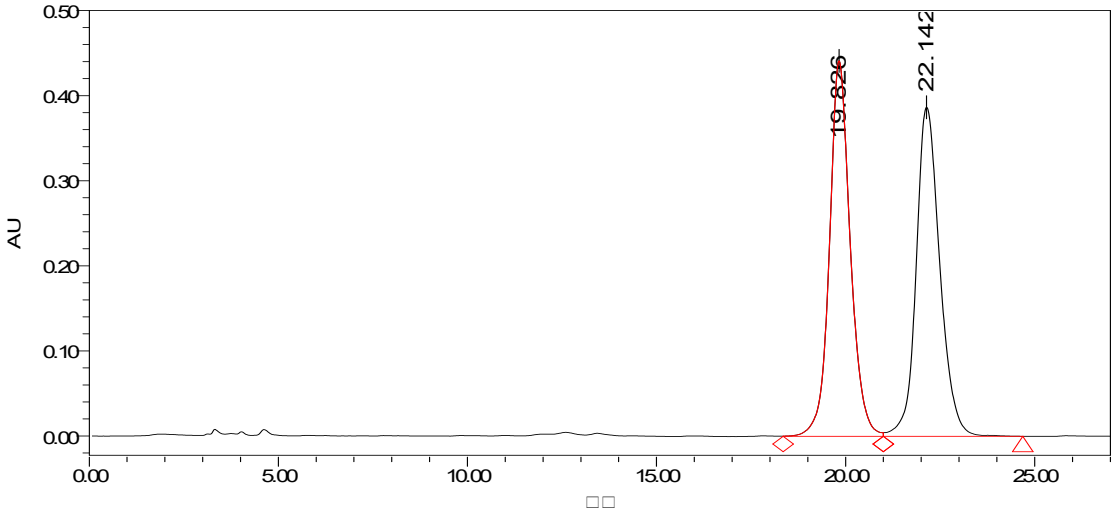


Peak	Ret Time[min]	Area	% Area	Height
1	10.242	61273139	99.99	1624165
2	15.600	4287	0.01	390

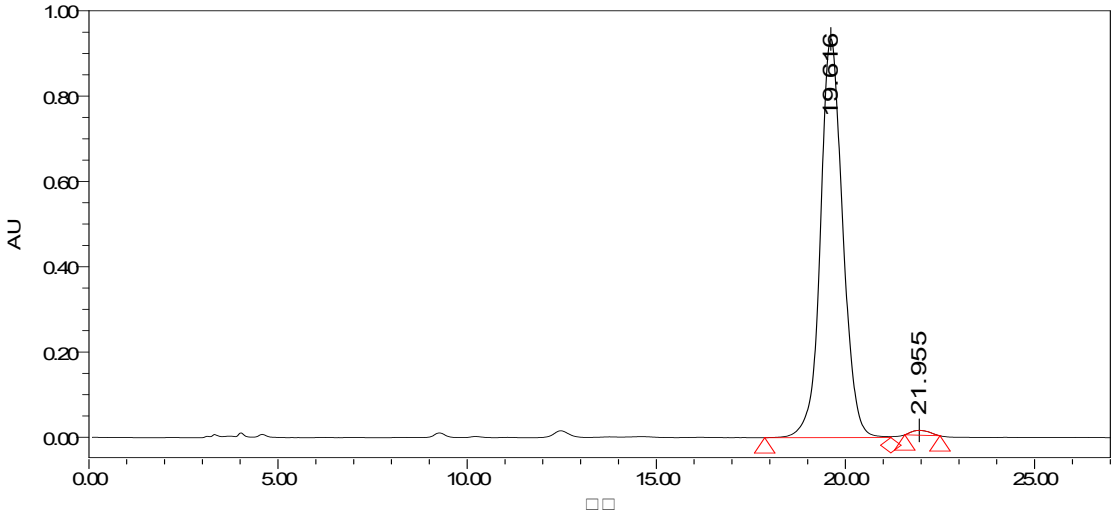


3j

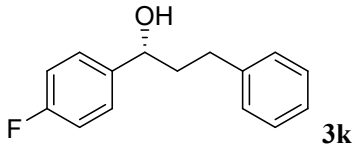
Chiralcel AD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	19.826	16890353	50.08	441484
2	22.142	16833467	49.92	386838

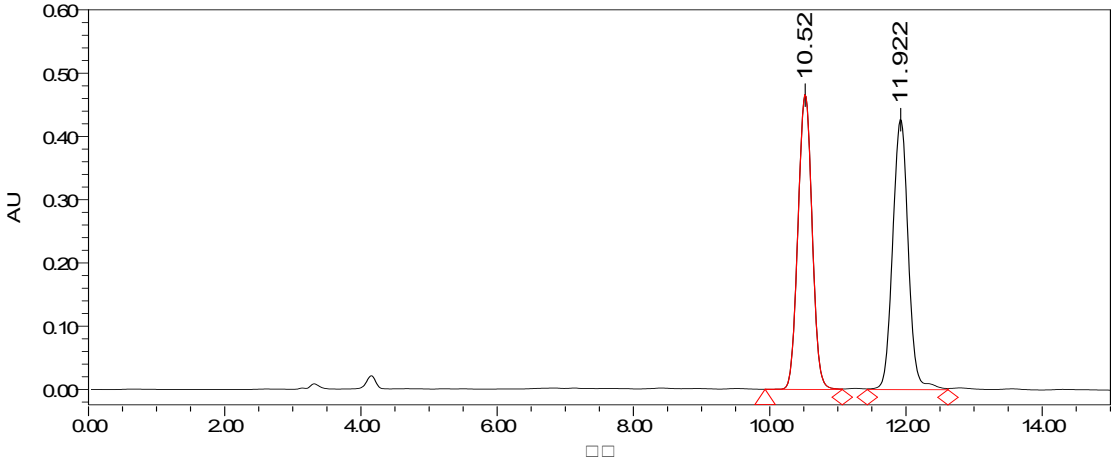


Peak	Ret Time[min]	Area	% Area	Height
1	19.616	38417128	99.02	934913
2	21.955	381332	0.98	11271

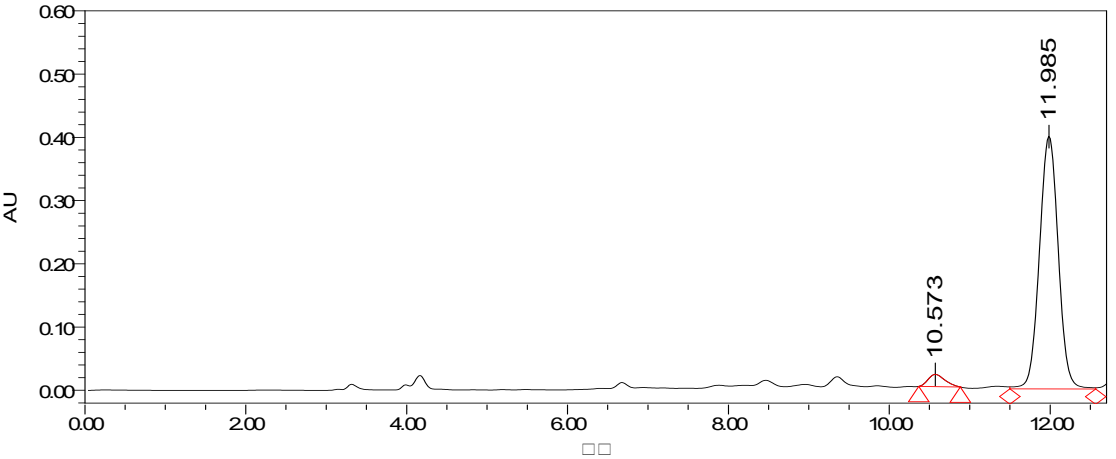


3k

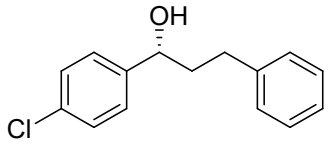
Chiralcel IA-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	10.521	6721214	49.69	466265
2	11.922	6806138	50.31	427656

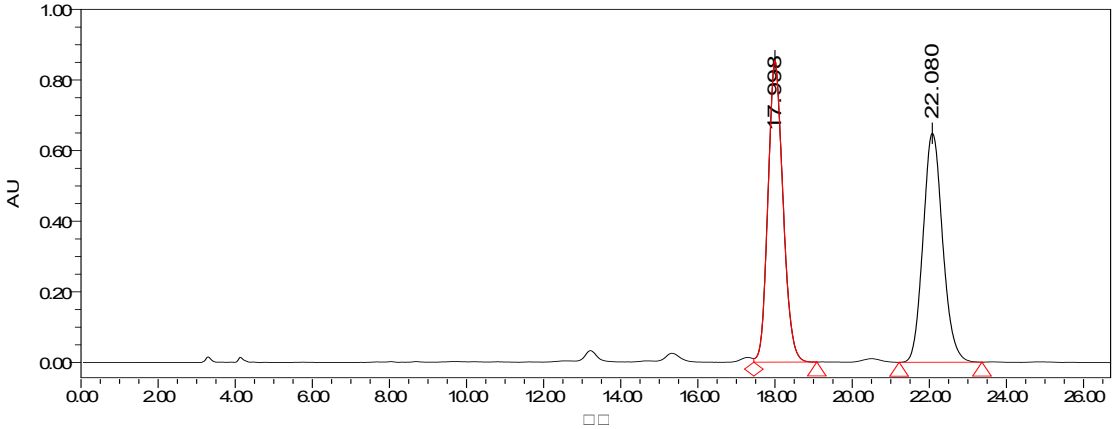


Peak	Ret Time[min]	Area	% Area	Height
1	10.573	280492	4.13	19414
2	11.985	6506196	95.87	399576

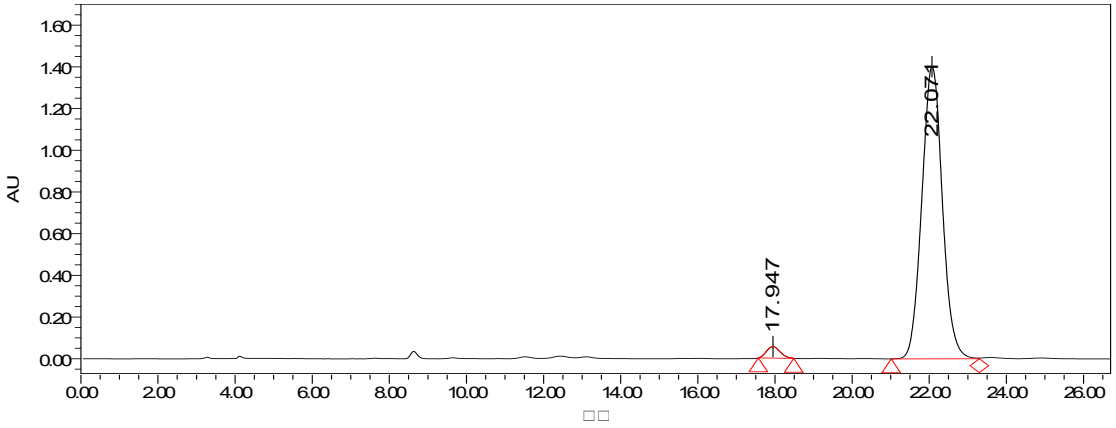


3l

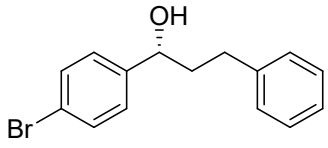
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	17.998	23076013	50.17	854289
2	22.080	22920351	49.83	648719

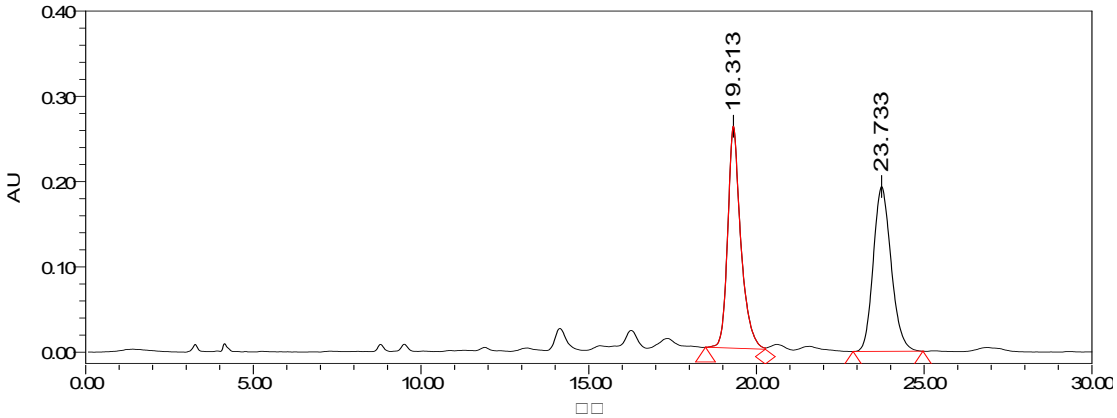


Peak	Ret Time[min]	Area	% Area	Height
1	17.947	1341968	2.52	54977
2	22.071	51894151	97.48	1401879

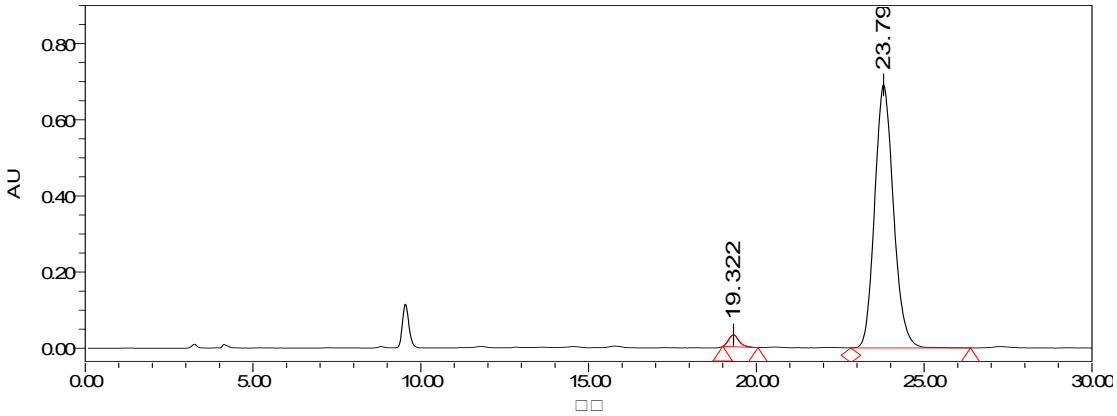


3m

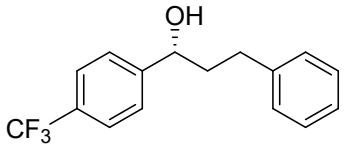
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	19.313	7056678	49.65	260588
2	23.733	7157096	50.35	193259

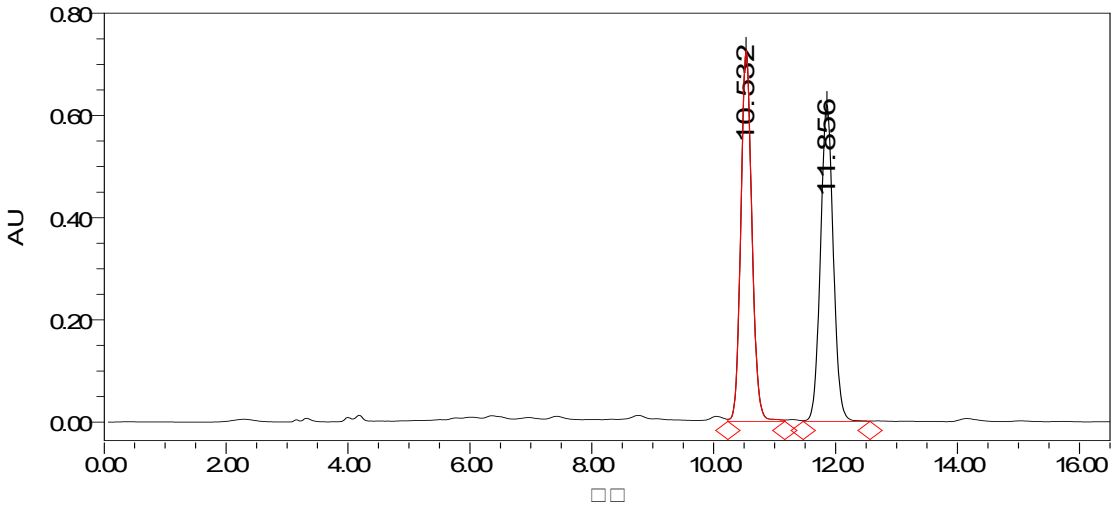


Peak	Ret Time[min]	Area	% Area	Height
1	19.322	670677	2.43	31225
2	23.792	26875930	97.57	691488

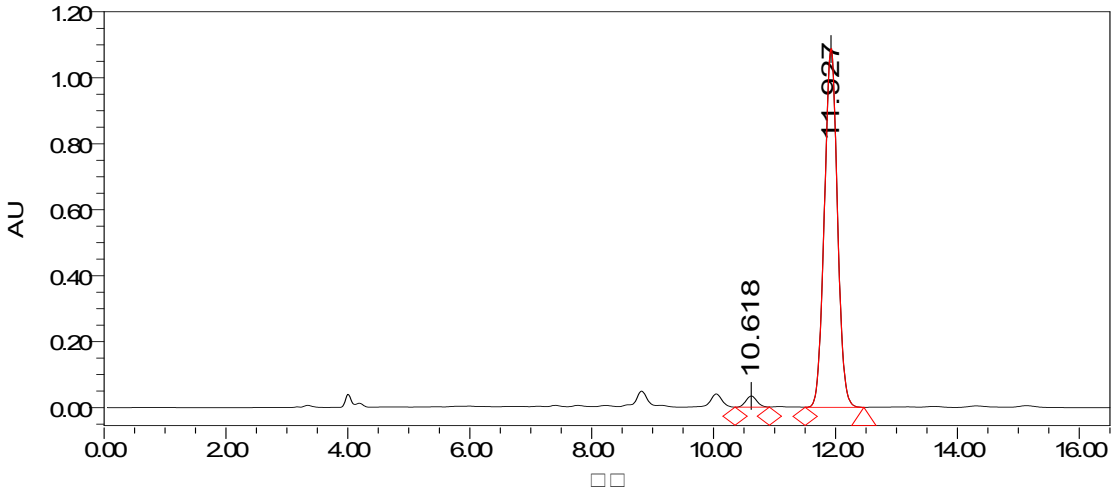


3n

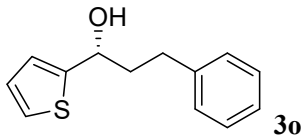
Chiralcel IB-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	10.532	9193096	50.30	725684
2	11.856	9083974	49.70	621387

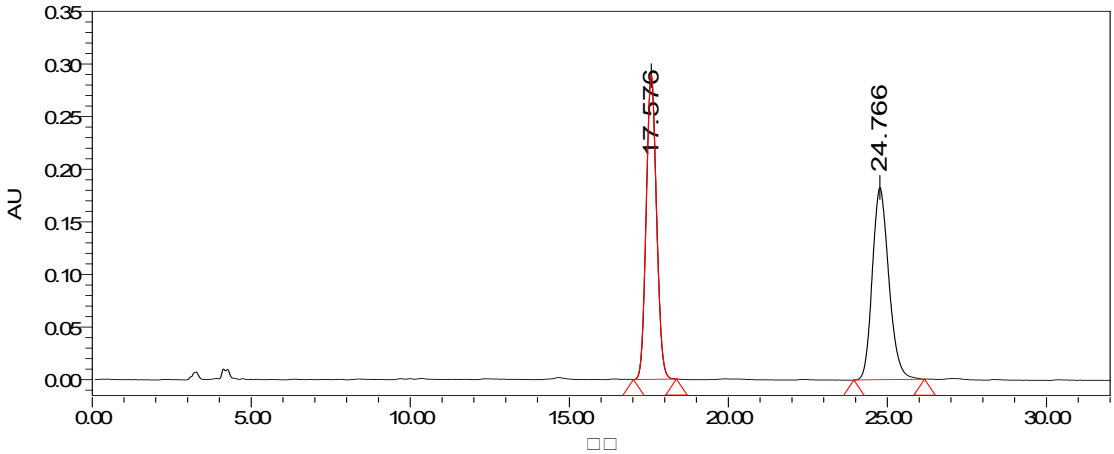


Peak	Ret Time[min]	Area	% Area	Height
1	10.618	378324	2.28	32046
2	11.927	16231256	97.72	1089578

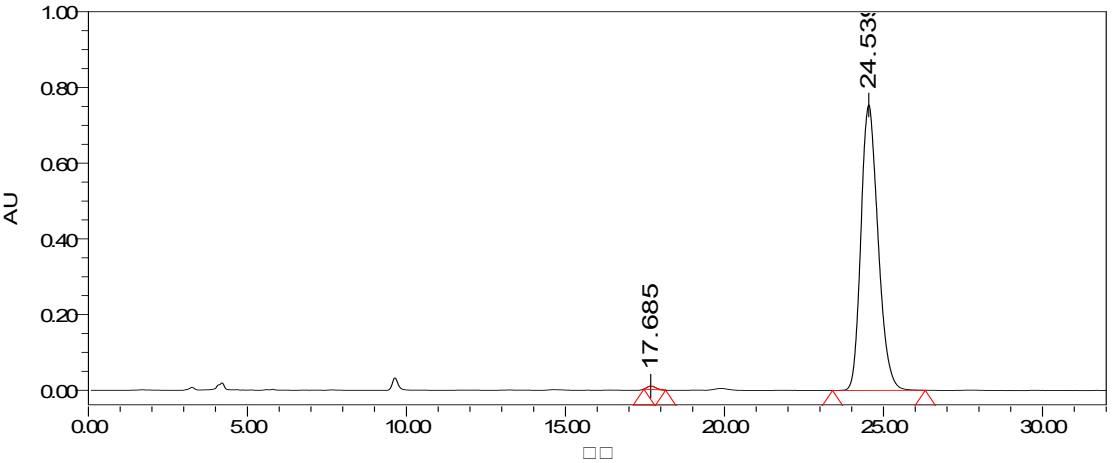


3o

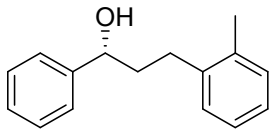
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	17.576	6513370	49.72	289001
2	24.766	6586665	50.28	182714

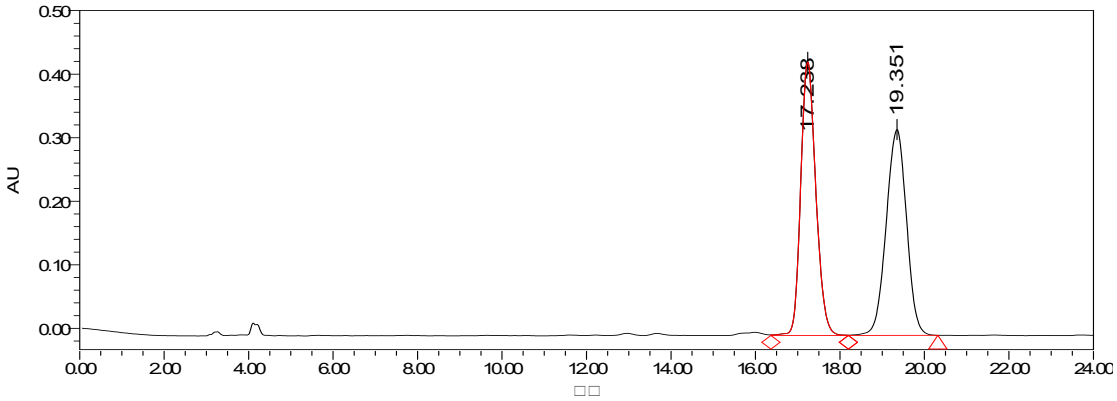


Peak	Ret Time[min]	Area	% Area	Height
1	17.685	165790	0.58	8907
2	24.539	28237388	99.42	754469

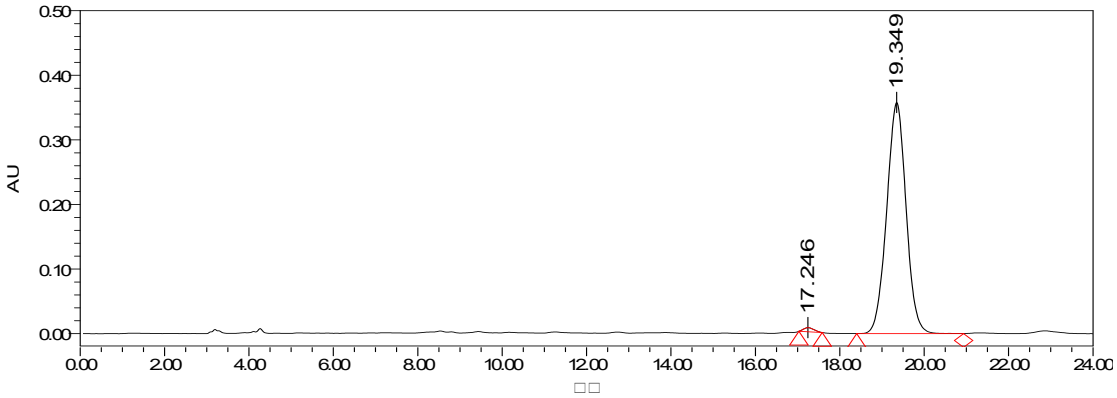


4a

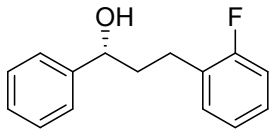
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	17.238	10675398	49.64	430240
2	19.351	10828971	50.36	323789

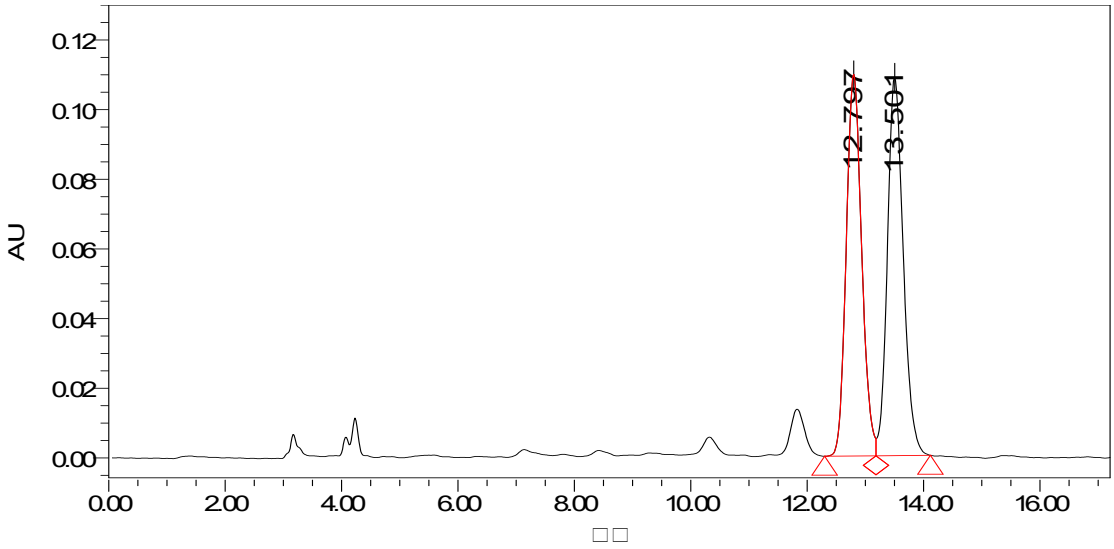


Peak	Ret Time[min]	Area	% Area	Height
1	17.246	111675	0.97	6443
2	19.349	11416530	99.03	357973

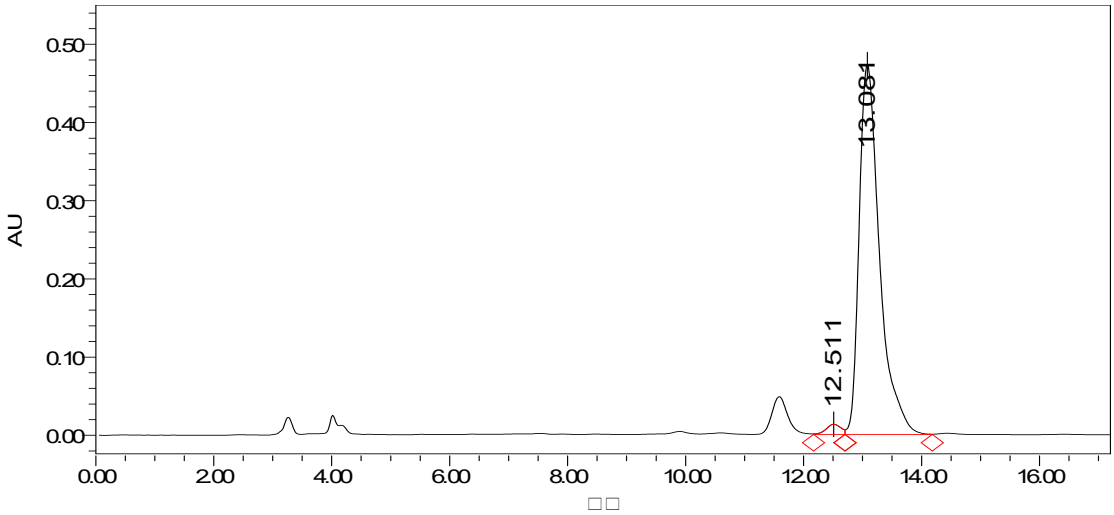


4b

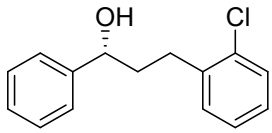
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	12.797	2019330	49.57	109553
2	13.501	2054432	50.43	108669

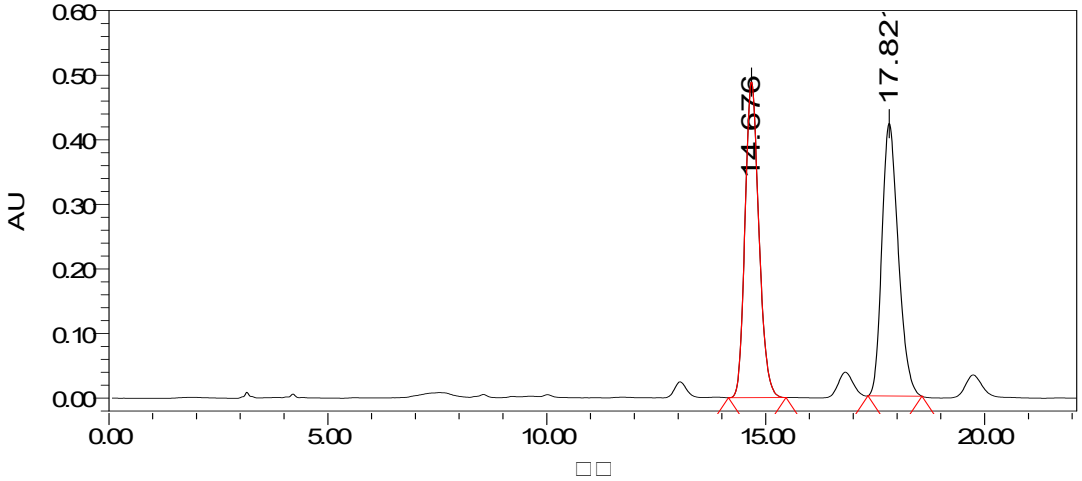


Peak	Ret Time[min]	Area	% Area	Height
1	12.511	179068	1.55	13015
2	13.081	11396790	98.45	473172

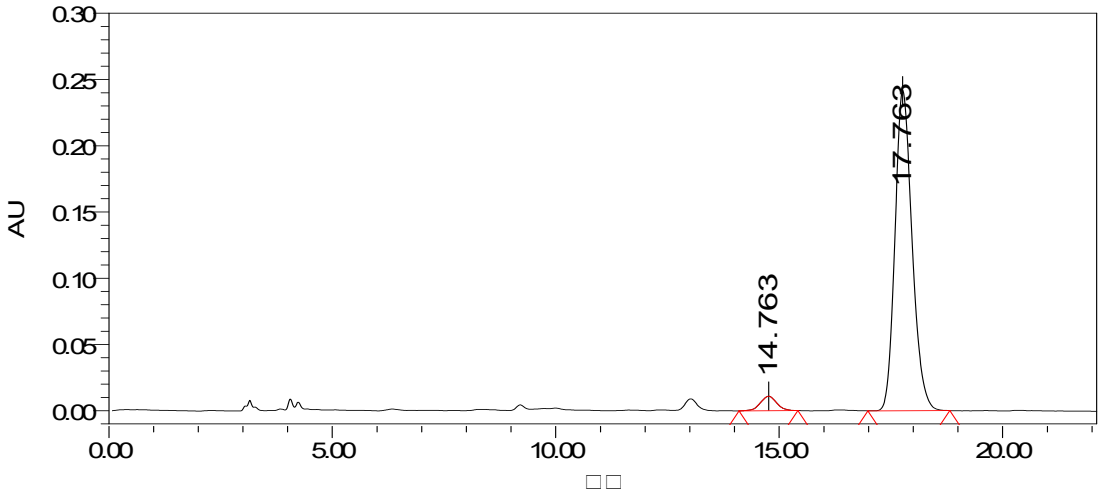


4c

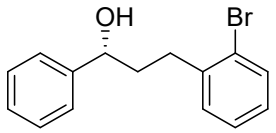
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	14.676	10788816	49.56	489300
2	17.821	10982317	50.44	421915

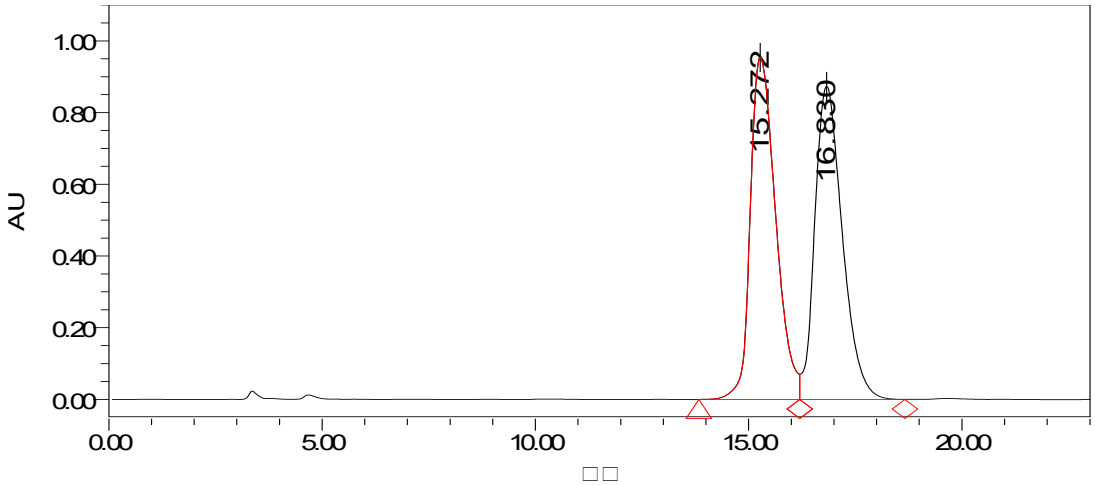


Peak	Ret Time[min]	Area	% Area	Height
1	14.763	171048	2.59	8650
2	17.763	6443081	97.41	241733

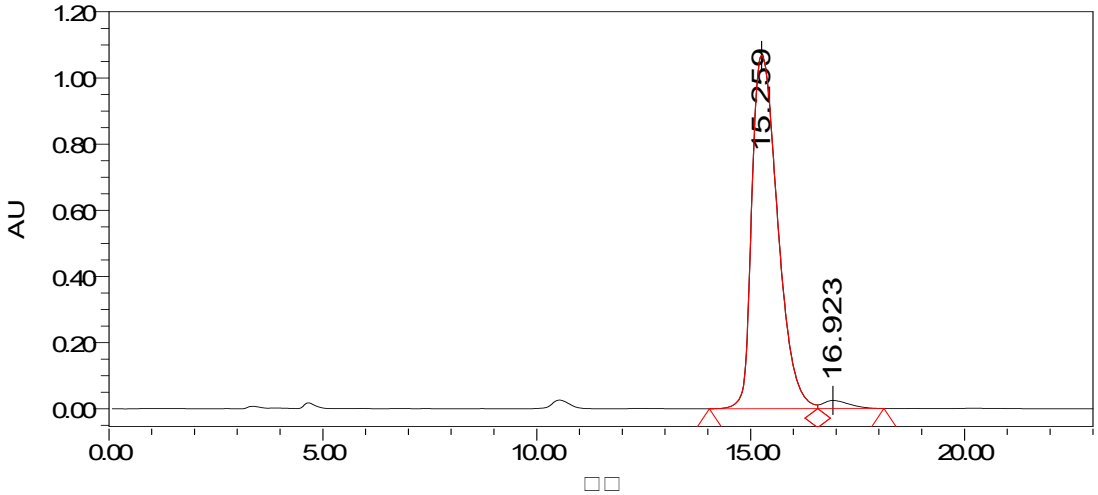


4d

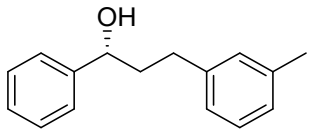
Chiralcel OJ-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	15.272	39340111	50.14	953936
2	16.830	39114716	49.86	872928

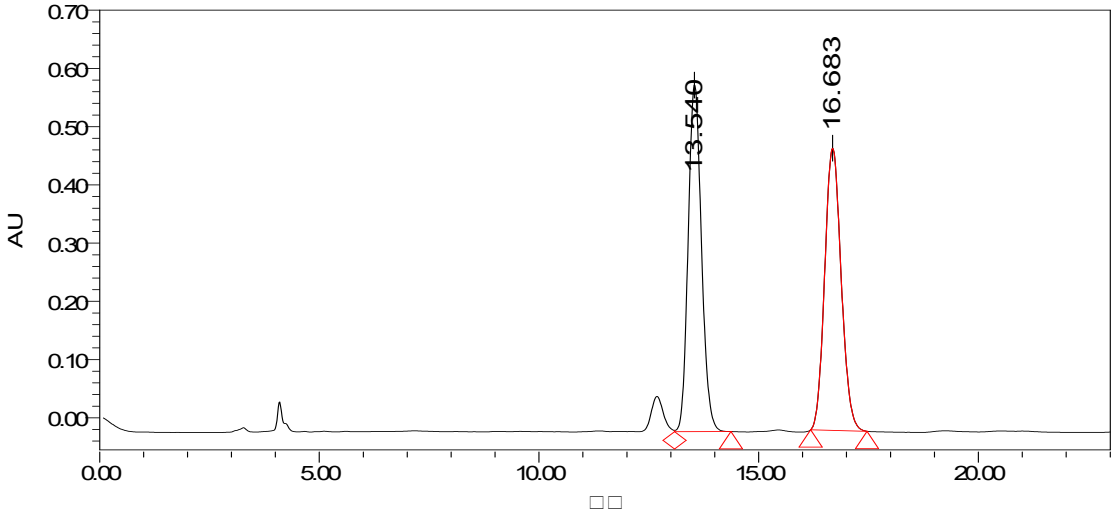


Peak	Ret Time[min]	Area	% Area	Height
1	15.259	45099553	98.38	1068026
2	16.923	741348	1.62	24529

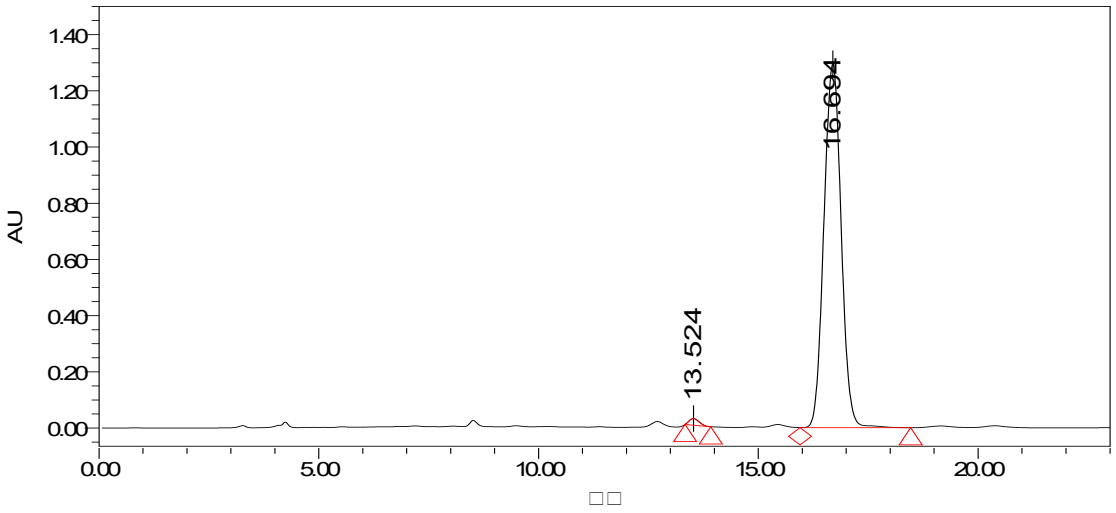


4e

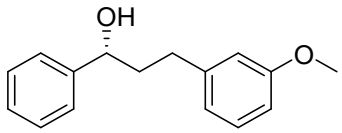
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	13.540	12536857	49.75	596005
2	16.683	12664301	50.25	484791

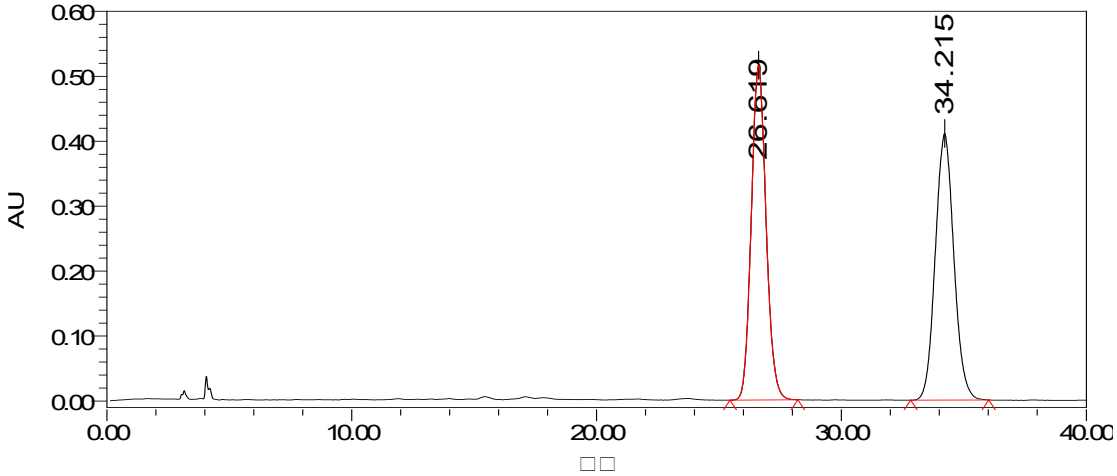


Peak	Ret Time[min]	Area	% Area	Height
1	13.524	370186	1.04	23499
2	16.694	35252532	98.96	1296359

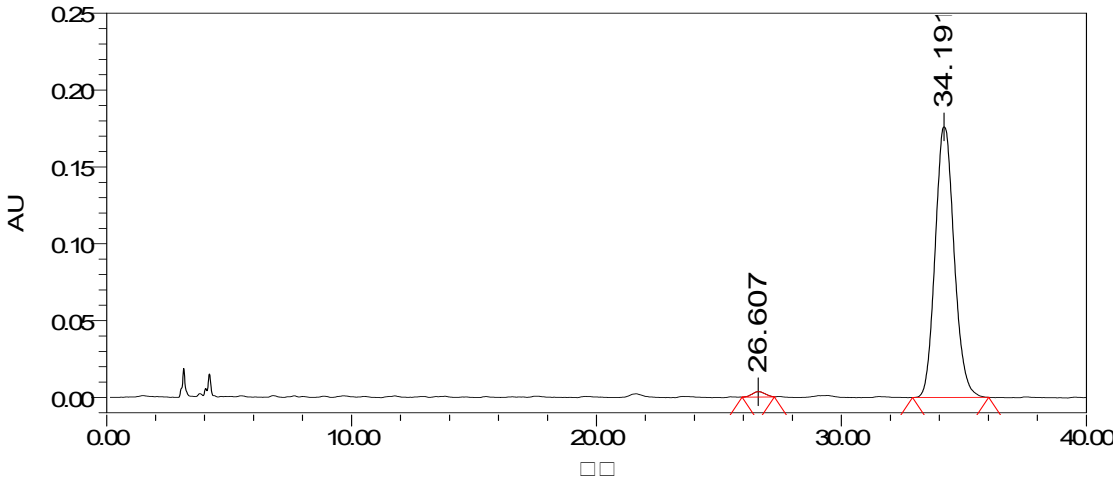


4f

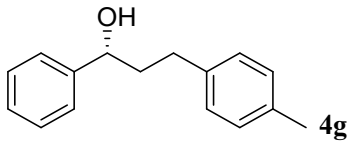
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	26.619	21574763	50.03	515653
2	34.215	21546738	49.97	410396

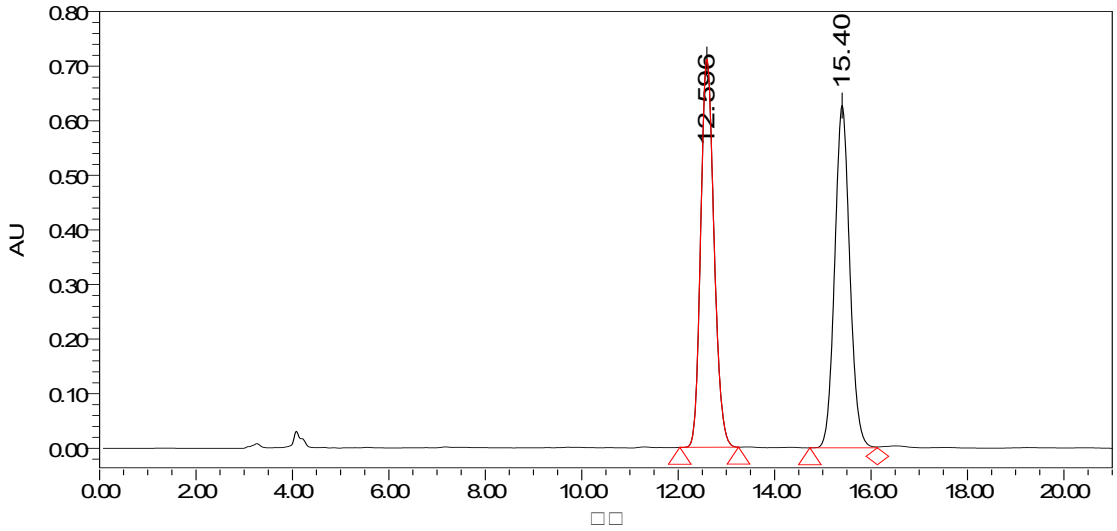


Peak	Ret Time[min]	Area	% Area	Height
1	26.609	100734	1.05	2989
2	34.191	9485781	98.95	176099

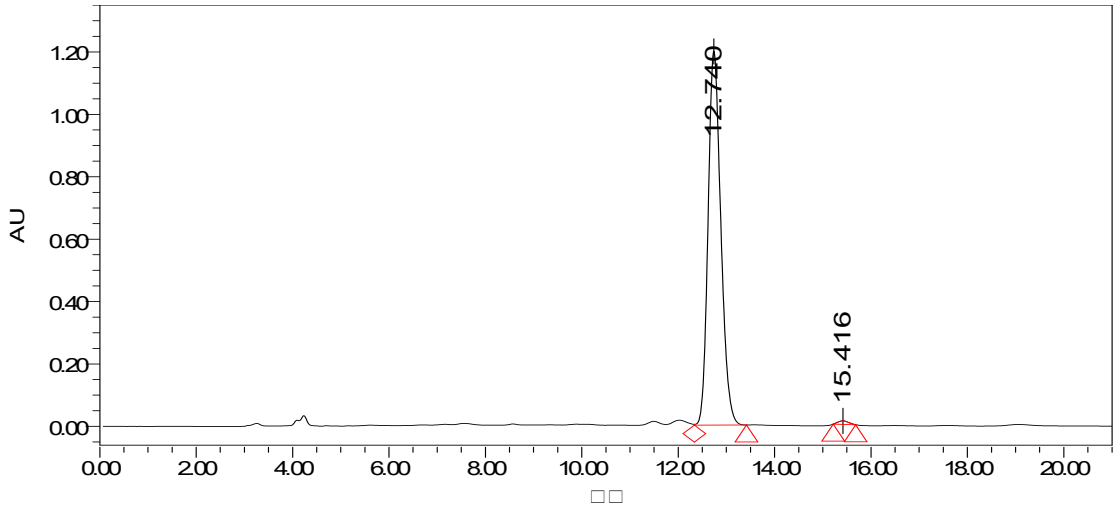


4g

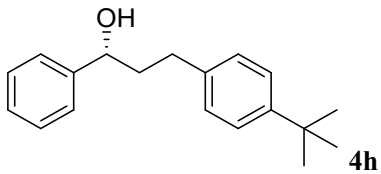
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	12.596	13677958	50.04	711241
2	15.401	13655448	49.96	627257

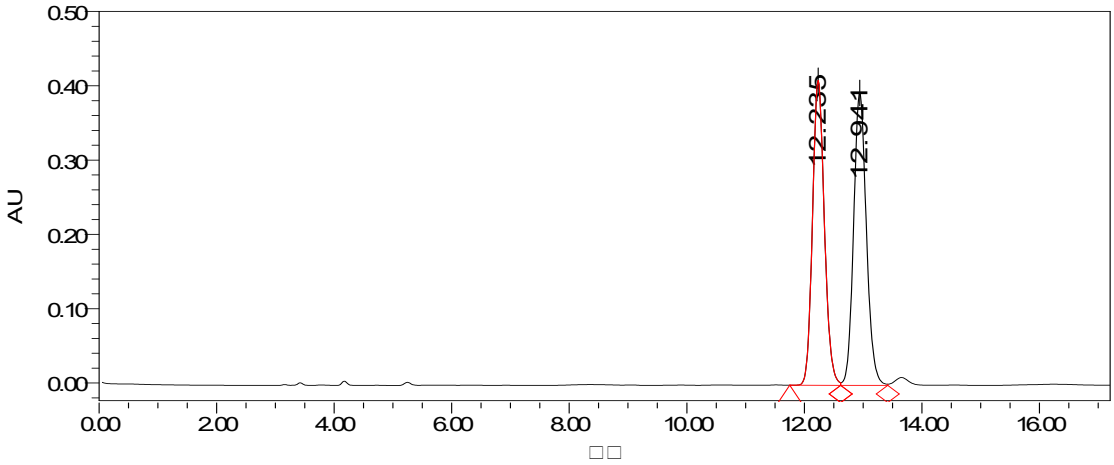


Peak	Ret Time[min]	Area	% Area	Height
1	12.740	22039388	99.20	1200956
2	15.416	177932	0.80	11491

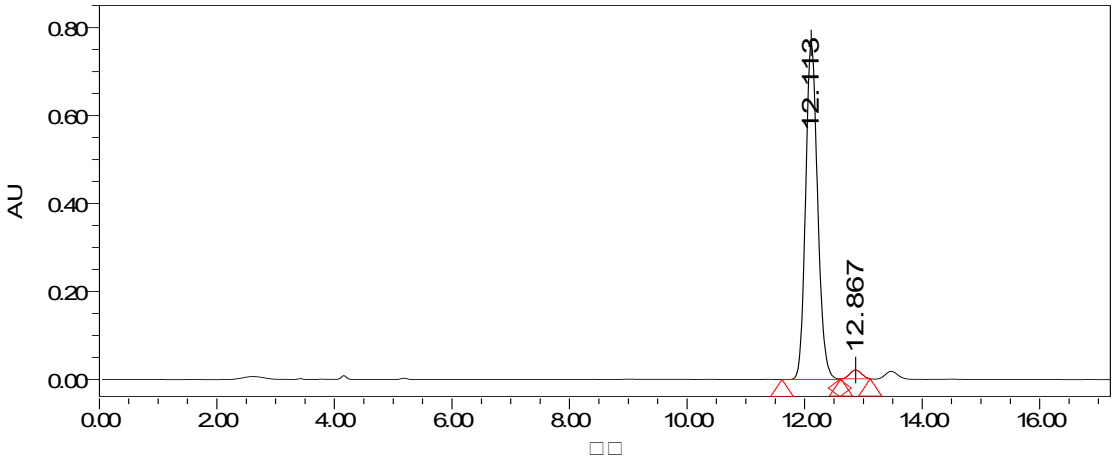


4h

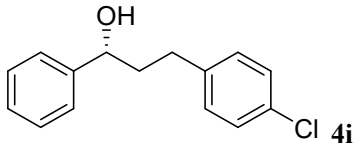
Chiralcel IB-H column, *n*-hexane/isopropanol = 98 : 2 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	12.235	5764138	49.22	410200
2	12.941	5947595	50.78	394837

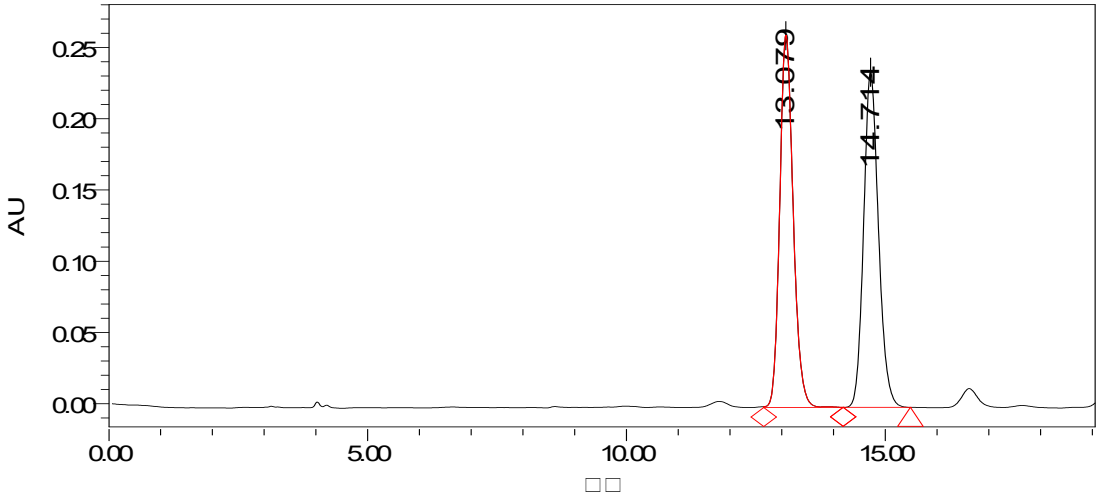


Peak	Ret Time[min]	Area	% Area	Height
1	12.113	10919254	98.20	766892
2	12.867	199857	1.80	16662

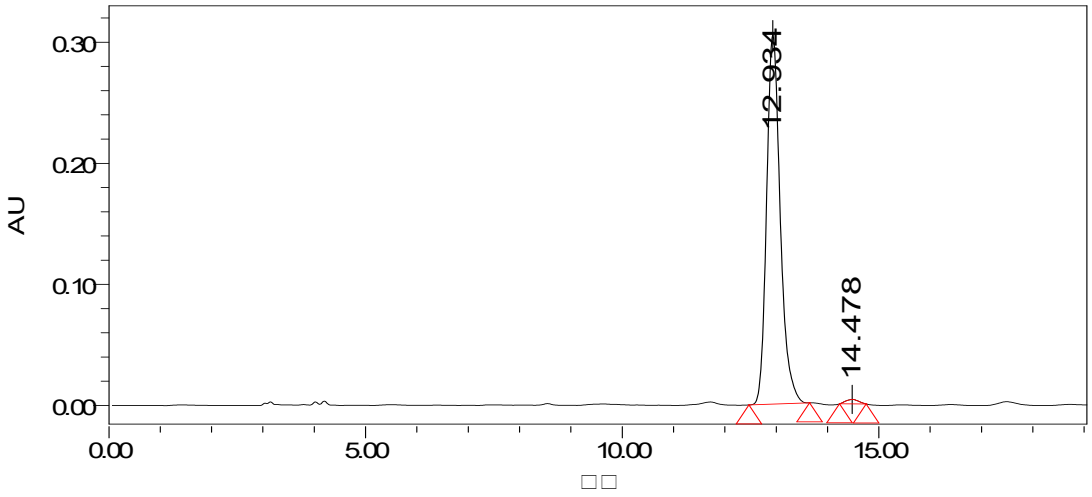


4i

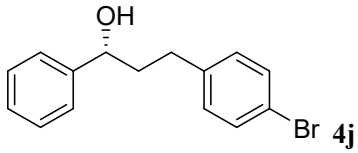
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	13.079	4734327	50.15	261352
2	14.714	4705559	49.85	235474

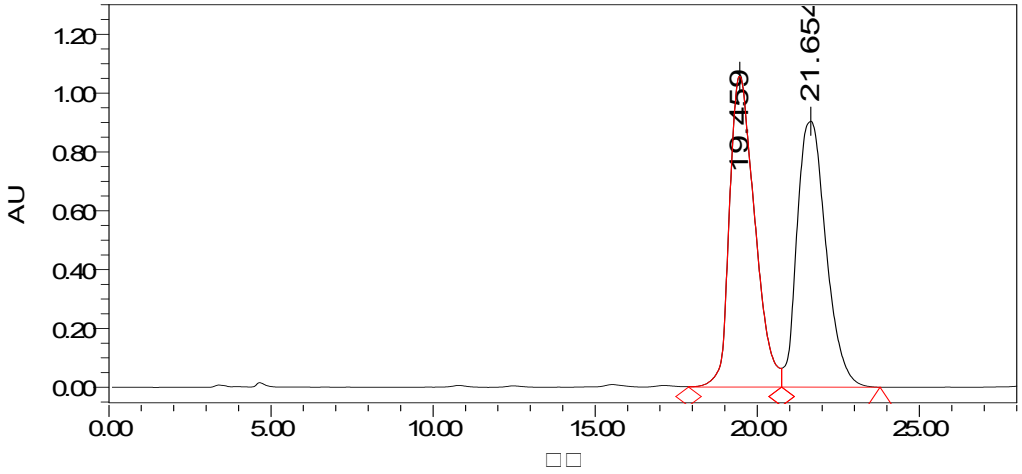


Peak	Ret Time[min]	Area	% Area	Height
1	12.934	5643564	99.17	305287
2	14.478	47074	0.83	2993

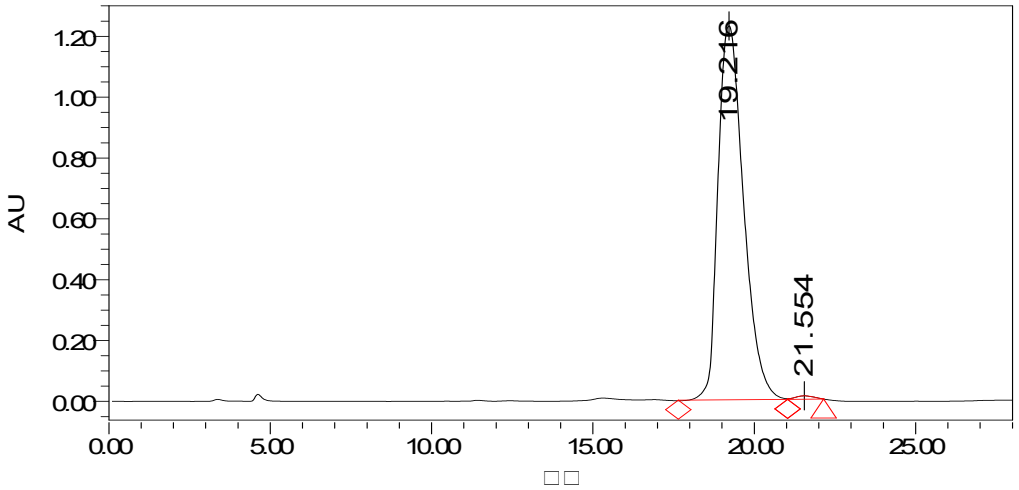


4j

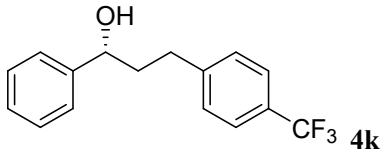
Chiralcel OJ-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	19.459	56916218	50.12	1056871
2	21.654	56650674	49.88	903851

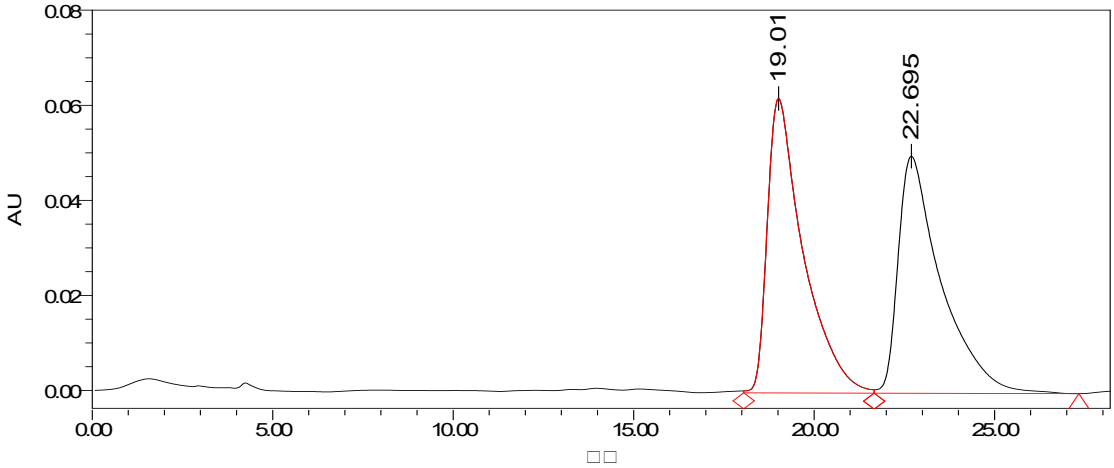


Peak	Ret Time[min]	Area	% Area	Height
1	19.216	67665602	99.35	1229415
2	21.554	440358	0.65	11108

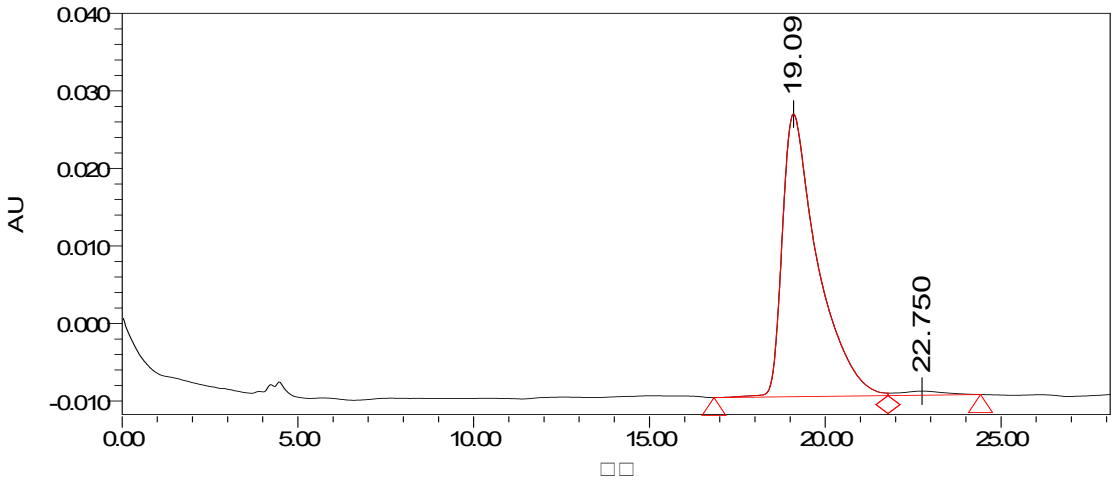


4k

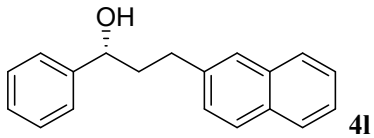
Chiralcel FLM-H column, *n*-hexane/isopropanol = 98 : 2 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	19.017	4290632	50.98	61964
2	22.695	4124951	49.02	49891

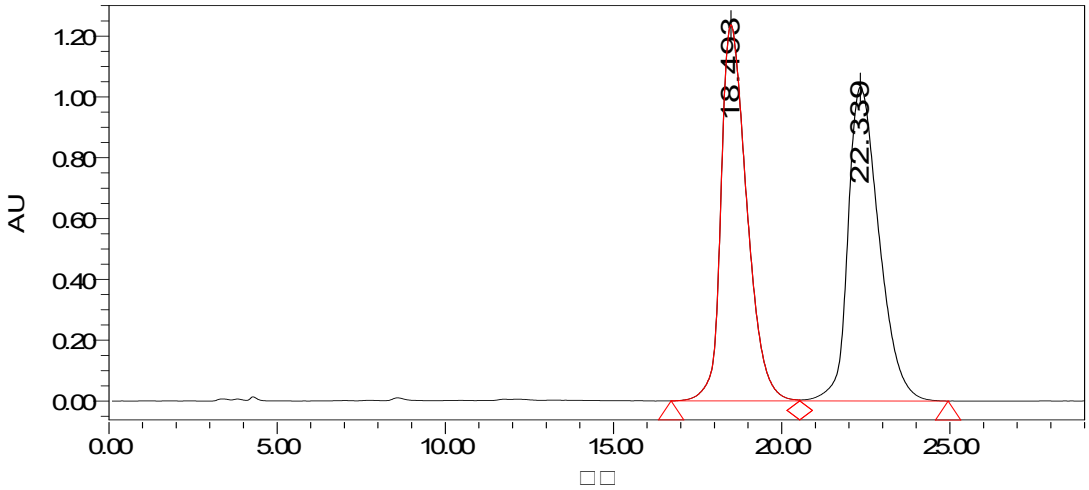


Peak	Ret Time[min]	Area	% Area	Height
1	19.097	2550602	98.17	36474
2	22.750	47484	1.83	536

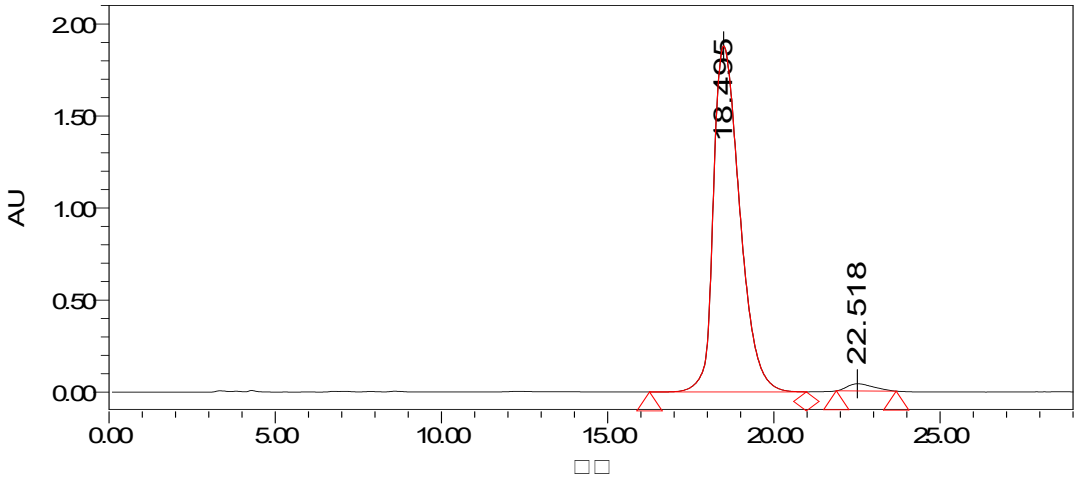


4l

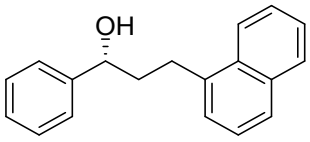
Chiralcel OJ-H column, *n*-hexane/isopropanol = 85 : 15 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	18.493	66124859	49.90	1237118
2	22.339	66377080	50.10	1031649

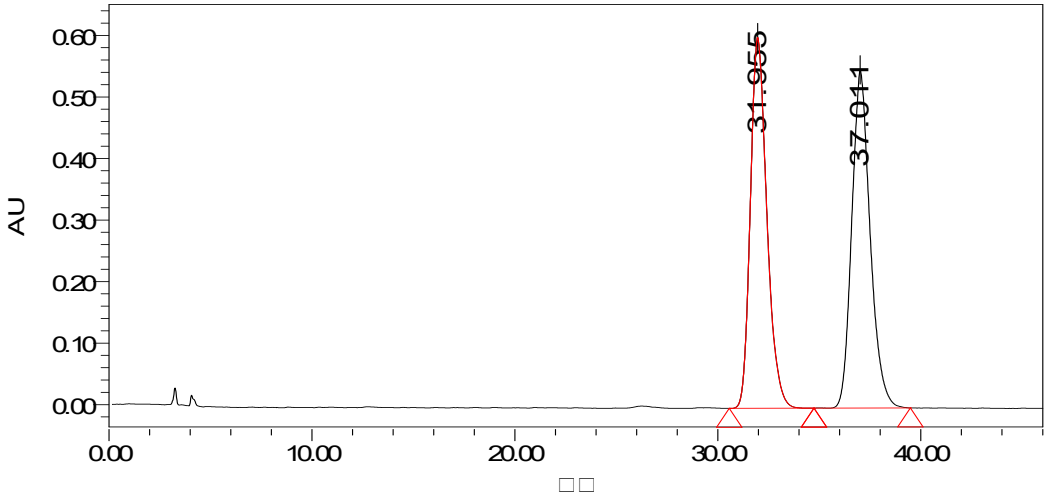


Peak	Ret Time[min]	Area	% Area	Height
1	18.495	103751321	98.00	1880633
2	22.518	2117634	2.00	39258

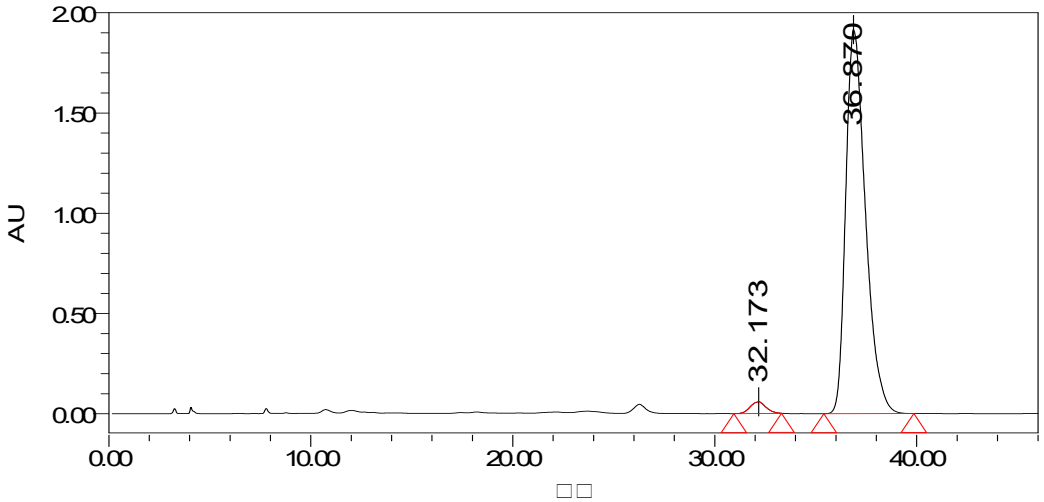


4m

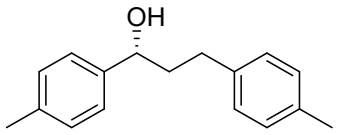
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	31.955	34107960	49.73	602771
2	37.011	34479410	50.27	549585

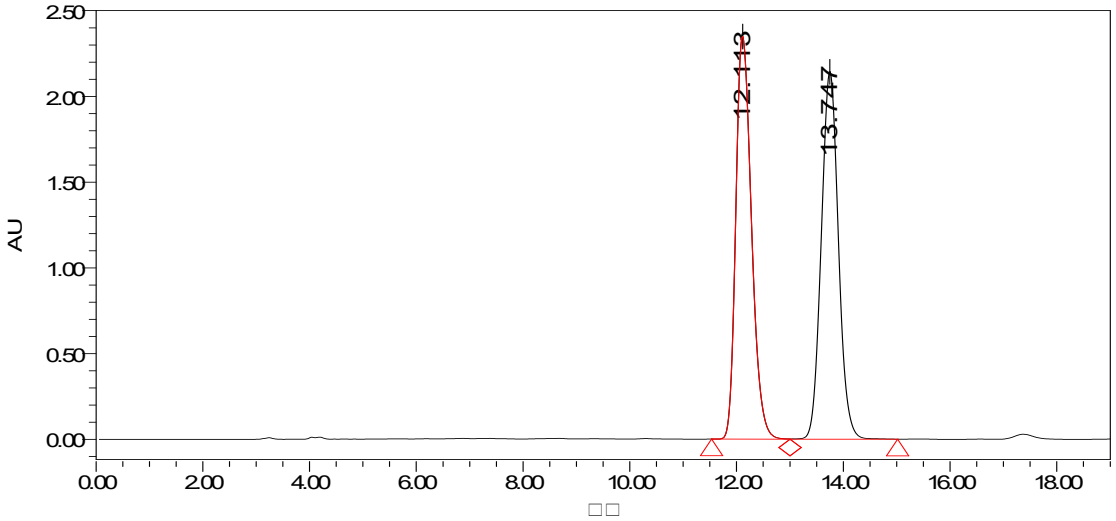


Peak	Ret Time[min]	Area	% Area	Height
1	32.173	2718747	2.05	54422
2	36.870	130042178	97.95	1915640

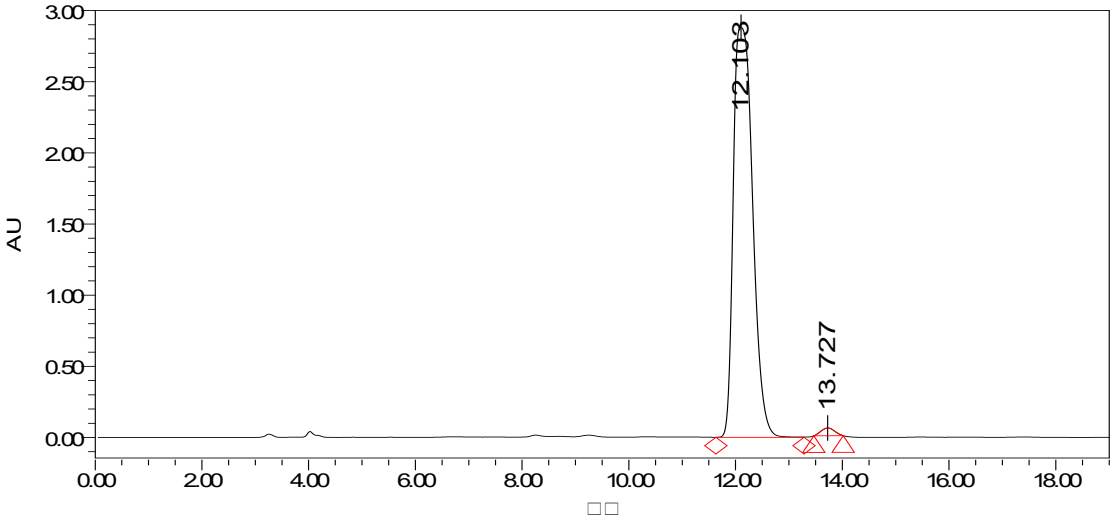


5a

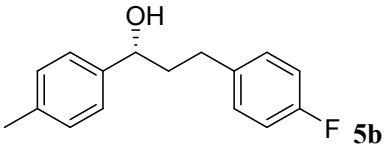
Chiralcel OD-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	12.113	48044101	50.13	2349228
2	13.747	47795516	49.87	2144208

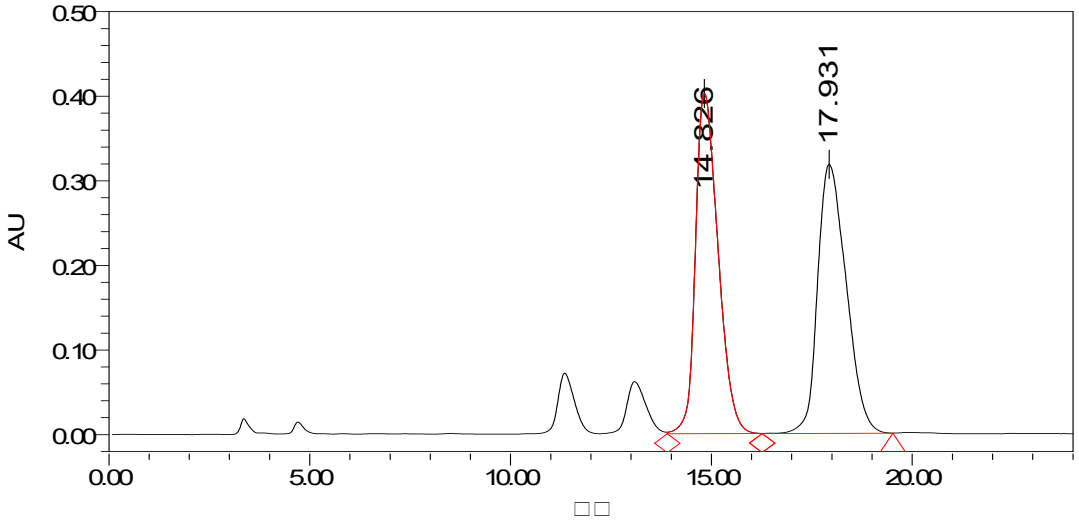


Peak	Ret Time[min]	Area	% Area	Height
1	12.103	72492981	98.68	2881945
2	13.727	970543	1.32	55216

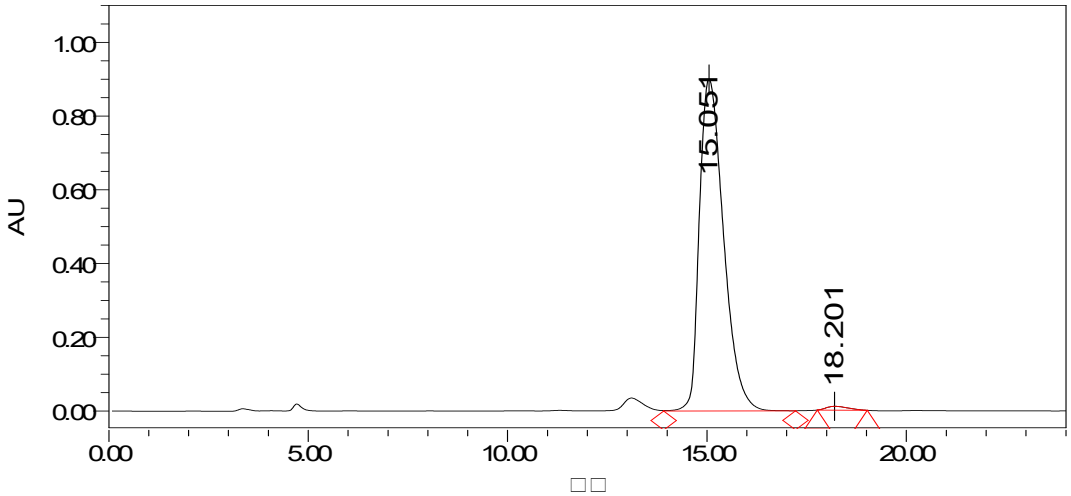


5b

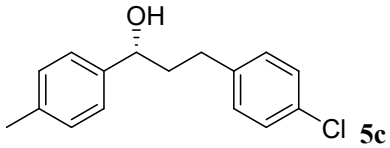
Chiralcel OJ-H column, *n*-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	14.826	15708003	50.02	402202
2	17.931	15694642	49.98	318097

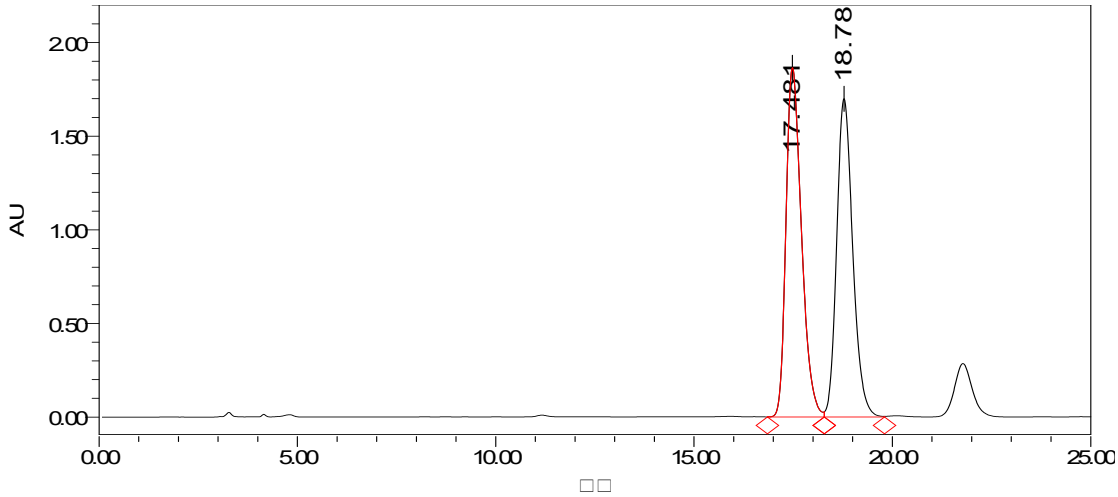


Peak	Ret Time[min]	Area	% Area	Height
1	15.051	37841196	98.99	900052
2	18.201	386419	1.01	10420

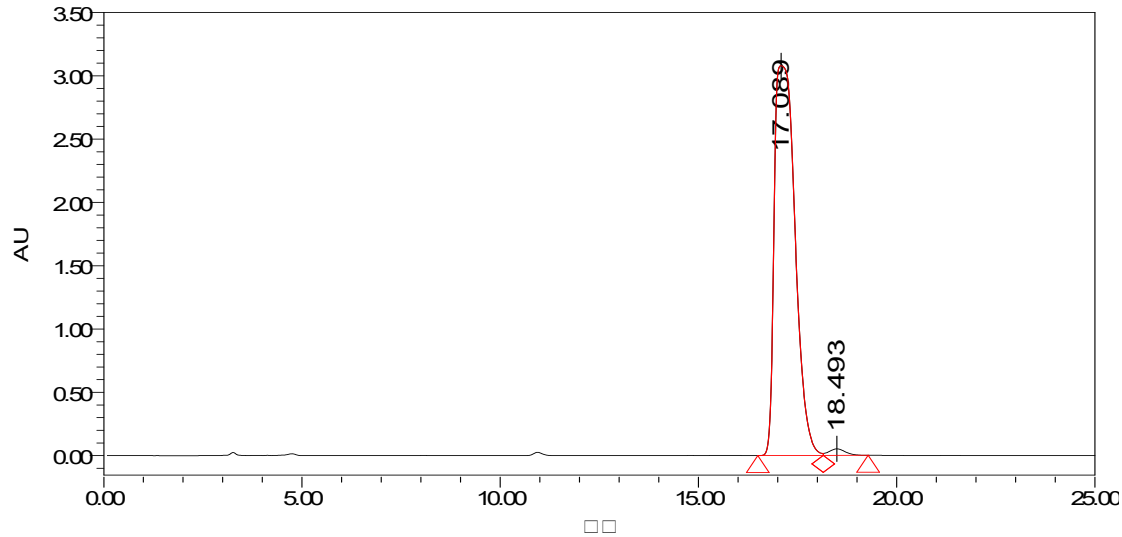


5c

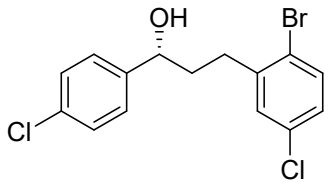
Chiralcel OD-H column, *n*-hexane/isopropanol = 97 : 3 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	17.481	49412086	50.09	1866264
2	18.782	49235413	49.91	1699877

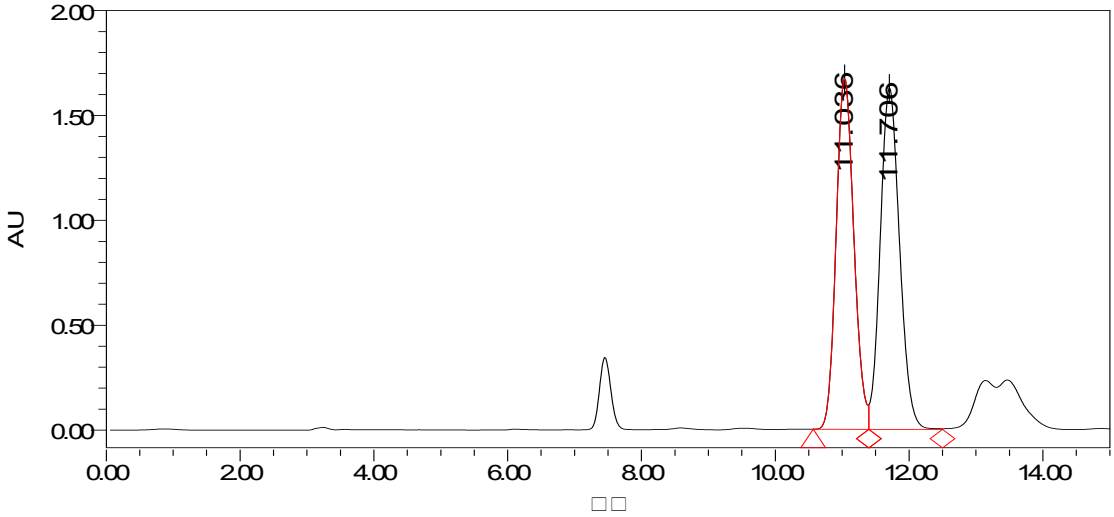


Peak	Ret Time[min]	Area	% Area	Height
1	17.089	112375328	98.85	3078089
2	18.493	1307109	1.15	51434

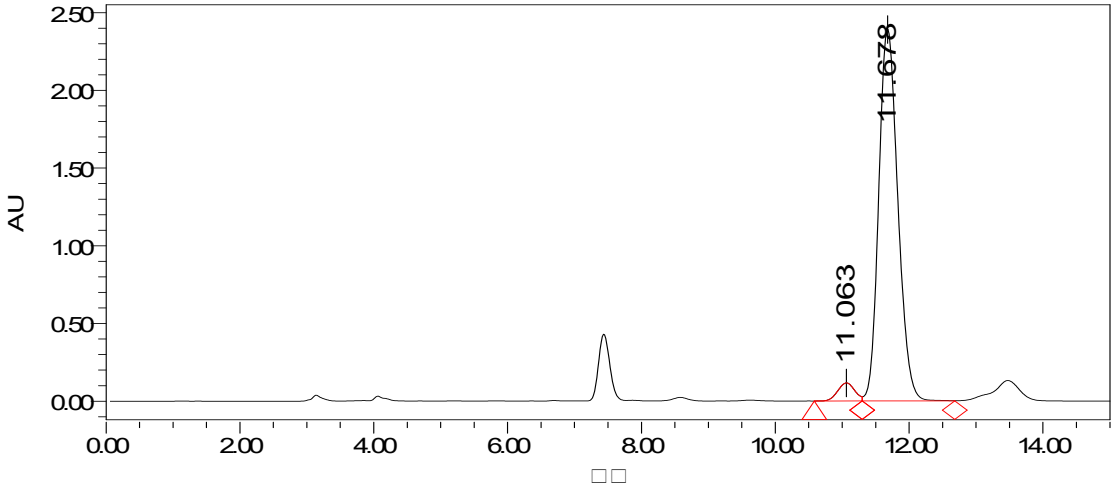


5d

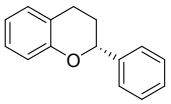
Chiralcel OD-H column, n-hexane/isopropanol = 95 : 5 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	11.036	31509684	49.77	1672826
2	11.706	31804260	50.23	1627204

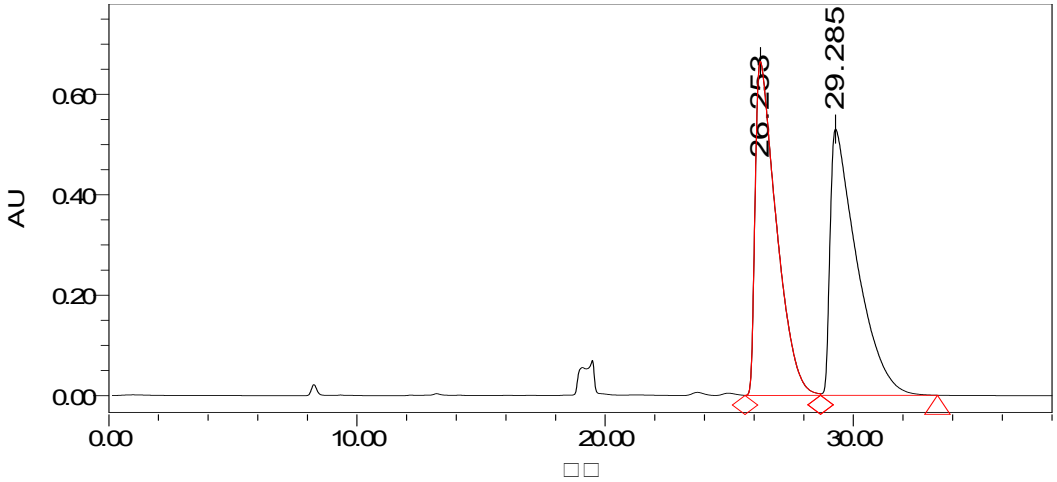


Peak	Ret Time[min]	Area	% Area	Height
1	11.063	1746154	3.52	116685
2	11.678	47892715	96.48	2393764

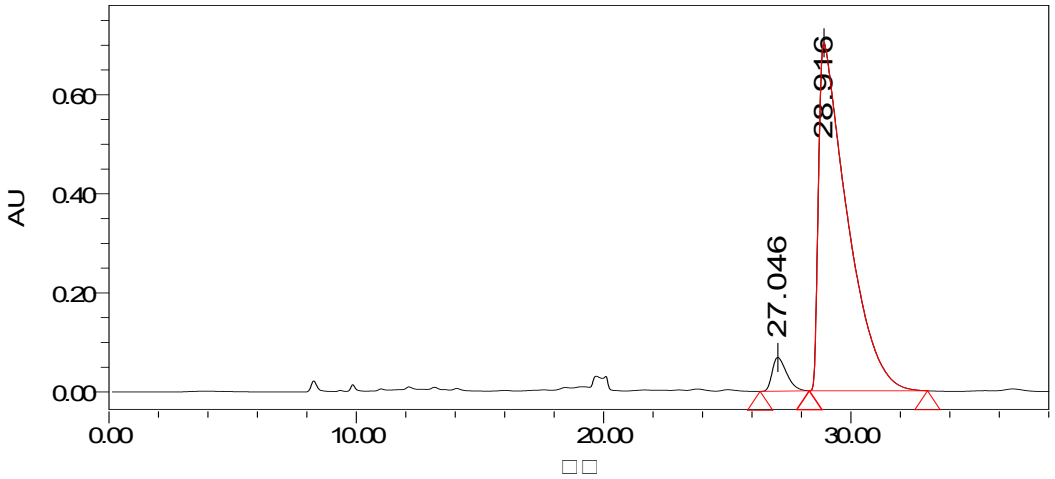


6

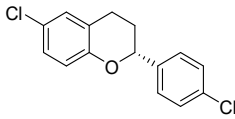
Chiralcel IA-H column, n-hexane, 0.4 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	26.253	39247620	49.61	665171
2	29.285	39872483	50.39	530588

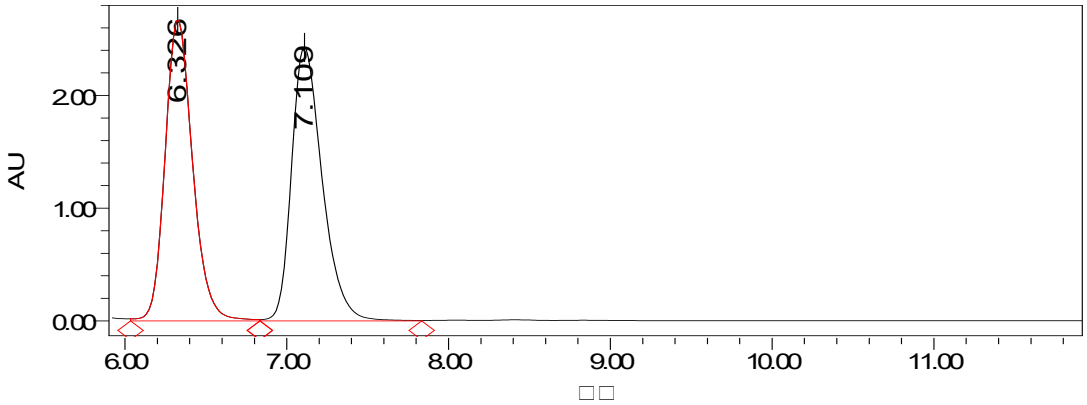


Peak	Ret Time[min]	Area	% Area	Height
1	27.046	2098016	3.58	58377
2	28.916	56483433	96.42	702367

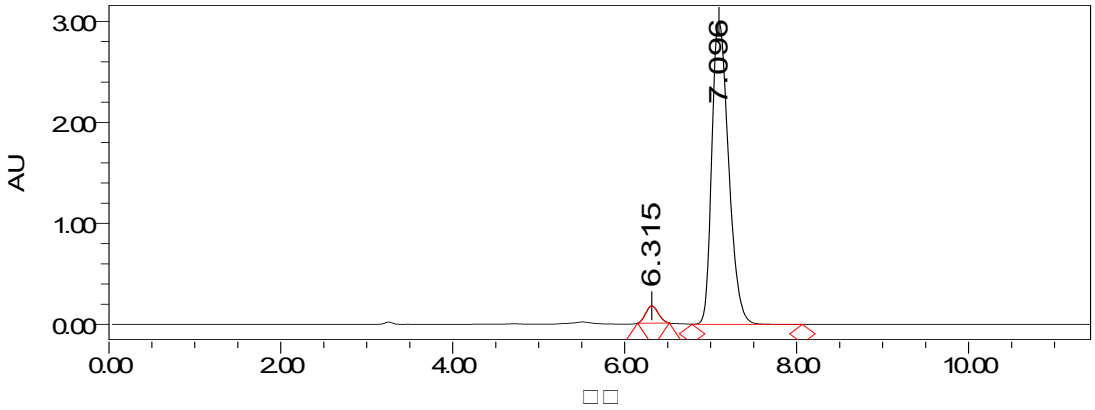


(*R*)-BW683C

Chiralcel IA-H column, n-hexane/isopropanol = 99 : 1 (v/v), 1.0 mL/min, 220 nm, 30 ℃



Peak	Ret Time[min]	Area	% Area	Height
1	6.326	31673110	49.75	2674662
2	7.109	31989169	50.25	2439120



Peak	Ret Time[min]	Area	% Area	Height
1	6.315	1734234	4.08	171711
2	7.096	40817158	95.92	3009615