Supporting information for

Mesoporous silica KIT-6 supported superparamagnetic $CuFe_2O_4$ nanoparticles for catalytic asymmetric hydrosilylation of ketones in air

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Table of Contents

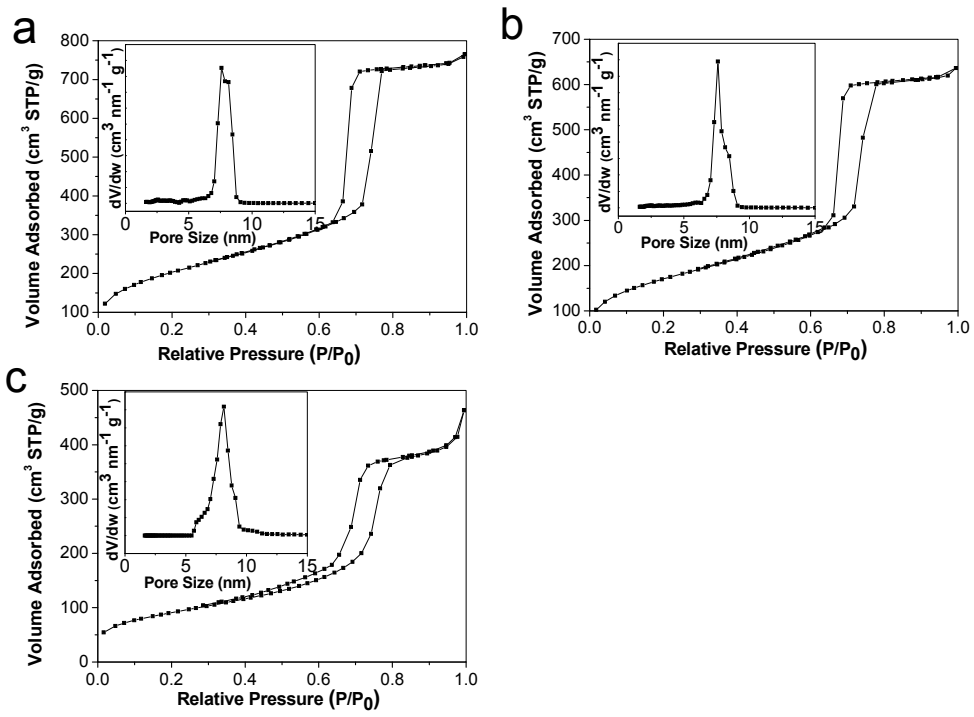


Figure S1 Nitrogen sorption isotherms and the corresponding pore size distribution curves of (a) mesoporous silica KIT-6 support, (b) as-made $CuFe_2O_4$@KIT-6 sample, (c) and the recycled $CuFe_2O_4$@KIT-6 sample after the catalytic reaction.

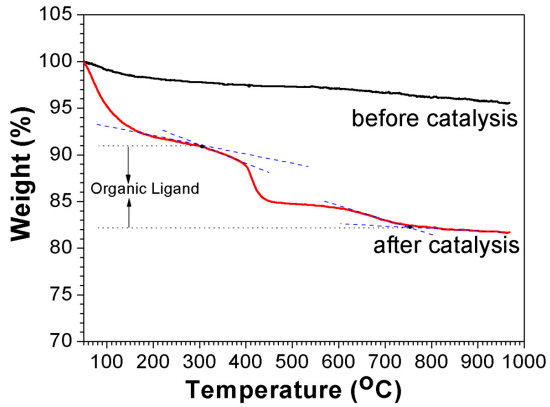
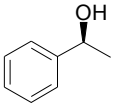


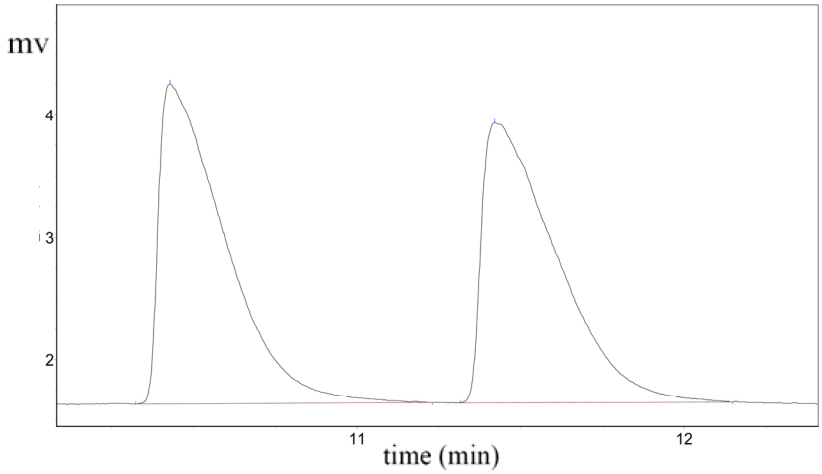
Figure S2 TGA curve of $CuFe_2O_4$@KIT-6 catalyst before and after the catalytic reaction under air gas flow with a ramp of 20 °C/min.

(*S*)-1-Phenylethanol (2a)[1]

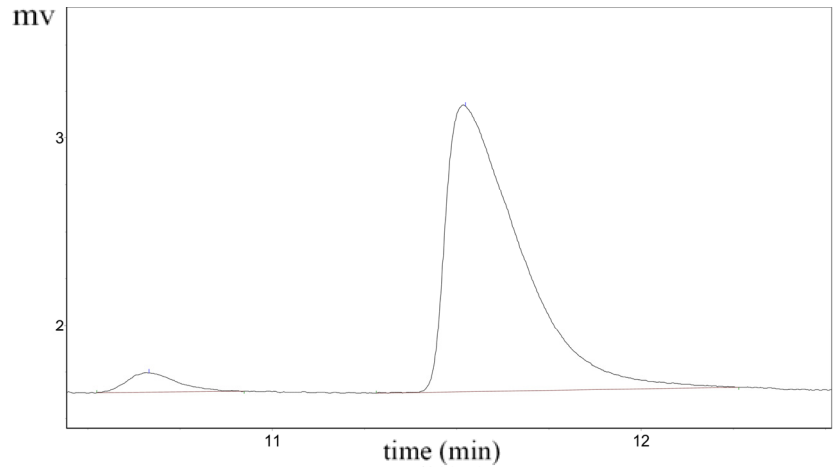


^{1}H NMR (500 MHz, $CDCl_3$): δ 1.49–1.50 (d, J = 6.5 Hz, 3H), 2.01 (s, 1H), 4.91 (q, J = 6.5 Hz, 1H), 7.26–7.39 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.1, 70.4, 125.4, 127.4, 128.5, 145.9. IR (thin film): ν_{max} (cm^{-1}) = 3364, 3030, 1493, 1452, 1007, 761, 699.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 115 °C; isothermal; t_R (**1a**) = 4.62 min; t_R (*R*) = 10.43 min; t_R (*S*) = 11.42 min. Chromatograms are illustrated below for a 91% *ee* sample:

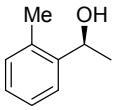


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	10.428	2614.500	36485.988	50.3541
2	11.420	2285.994	35972.902	49.6459
Totals:		4900.494	72458.891	100.0000



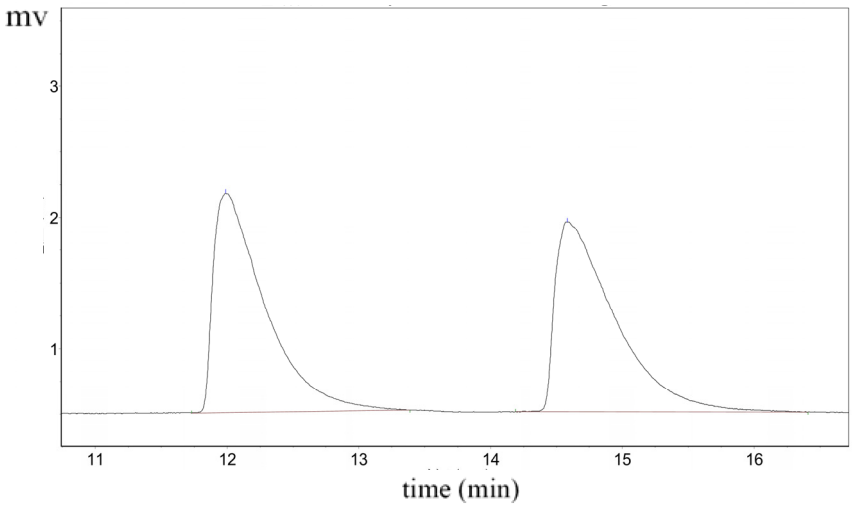
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	10.665	104.521	1026.400	4.5917
2	11.523	1530.381	21327.000	95.4083
Totals:		1634.902	22353.400	100.0000

(*S*)-1-(2-Methylphenyl)ethanol (2b)[2]

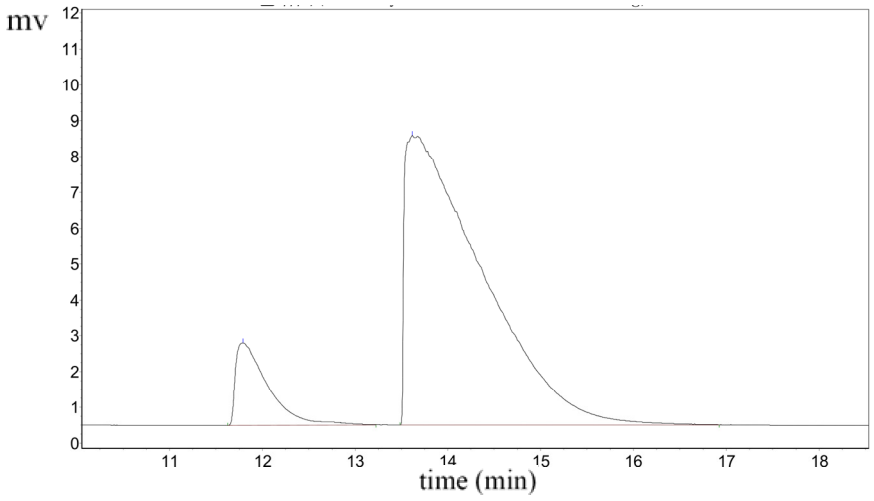


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.47 (d, J = 6.4 Hz, 3H), 1.82 (s, 1H), 2.34 (s, 3H), 5.10–5.15 (m, 1H), 7.12–7.25 (m, 3H), 7.52(d, J = 7.2 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 18.9, 23.9, 66.8, 124.5, 126.4, 127.2, 130.4, 134.2, 143.9. IR (thin film): ν_{max} (cm^{-1}) = 3357, 3025, 1488, 1460, 1077, 759.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 125 °C; isothermal; t_R (**1b**) = 4.24 min; t_R (*R*) = 12.00 min; t_R (*S*) = 14.58 min. Chromatograms are illustrated below for a 79% *ee* sample:

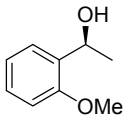


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	11.988	1669.908	45484.402	49.8718
2	14.583	1447.709	45718.203	50.1282
Totals:		3117.617	91202.605	100.0000



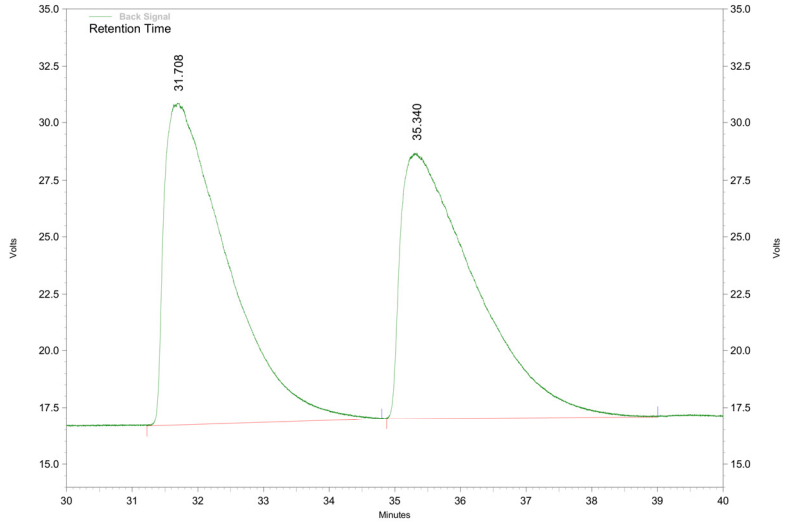
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	11.788	2305.043	55913.852	10.6377
2	13.615	8097.768	469704.563	89.3623
Totals:		10402.810	525618.414	100.0000

(*S*)-1-(2-Methoxyphenyl)ethanol (2c)[3]



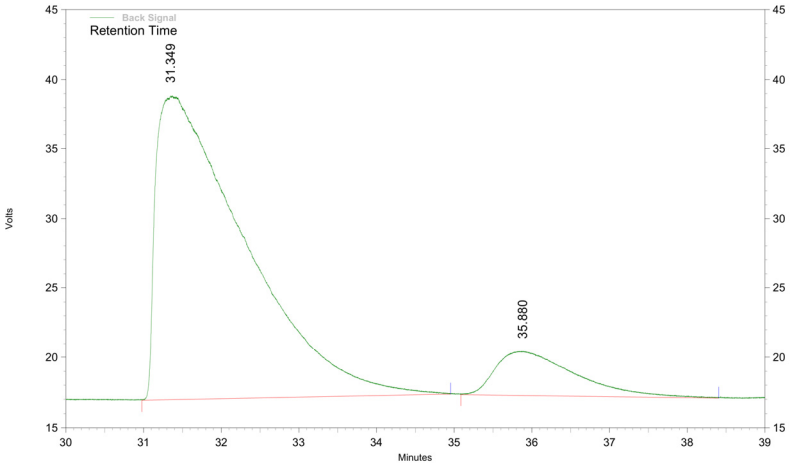
^{1}H NMR (400 MHz, $CDCl_3$): δ 1.49 (d, J = 6.4 Hz, 3H), 2.68 (s, 1H), 3.86 (s, 3H), 5.08–5.10 (m, 1H), 6.87–6.98 (m, 2H), 7.22–7.34 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 22.9, 55.3, 66.6, 110.4, 120.8, 126.1, 128.3, 133.4, 155.6. IR (thin film): ν_{max} (cm^{-1}) = 3387, 1601, 1492, 1464, 1079, 755.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 115 °C; isothermal; t_R (**1c**) = 13.97 min; t_R (*R*) = 31.71 min; t_R (*S*) = 35.34 min. Chromatograms are illustrated below for a 75% *ee* sample:



Back Signal
Results

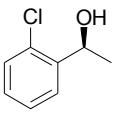
Retention Time	Area	Area %	Height	Height %
31.708	7253371	50.72	108783	54.81
35.340	7047736	49.28	89700	45.19



Back Signal
Results

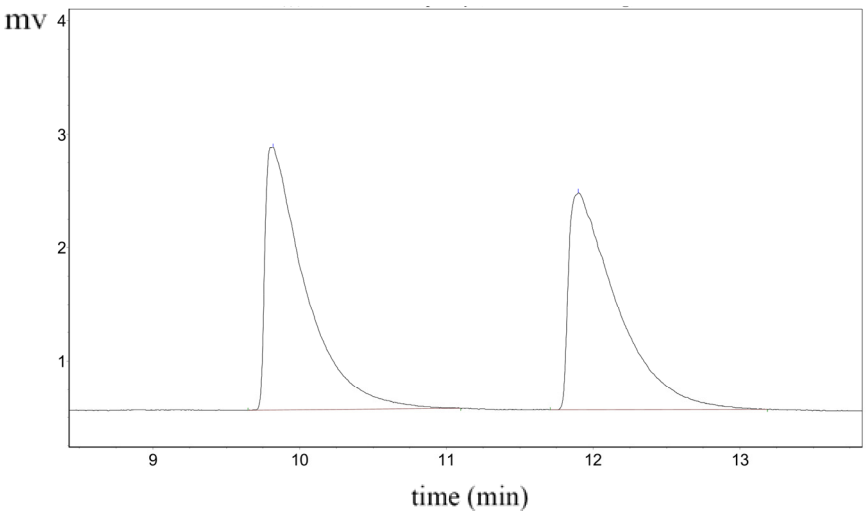
Retention Time	Area	Area %	Height	Height %
31.349	13366836	88.59	168007	87.35
35.880	1721859	11.41	24333	12.65

(*S*)-1-(2-Chlorophenyl)ethanol (2d)[1,4]

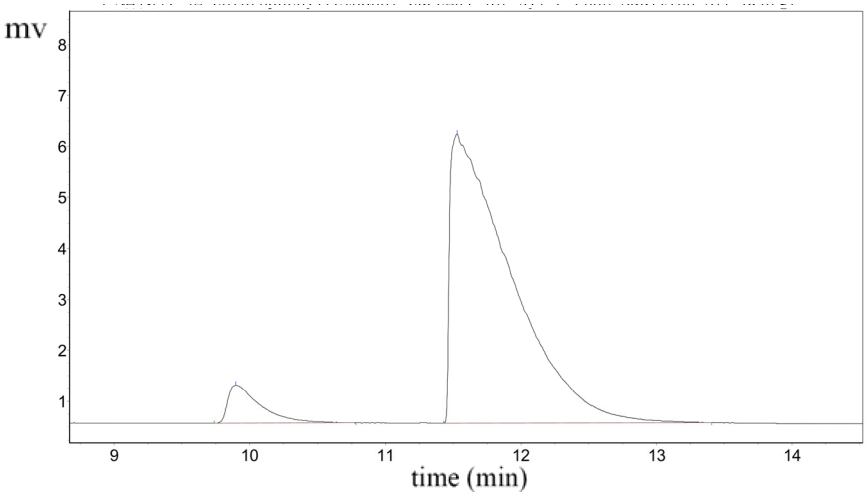


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.50 (d, J = 6.4 Hz, 3H), 2.05 (s, 1H), 5.32 (q, J = 6.4 Hz, 1H), 7.20 (t, J = 7.6 Hz, 1H), 7.28–7.34 (m, 2H), 7.60 (d, J= 7.6 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 23.5, 66.9, 126.4, 127.2, 128.4, 129.4, 131.6, 143.1. IR (thin film): ν_{max} (cm^{-1}) = 3357, 3069, 1474, 1437, 1048, 754,692.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 120 °C; isothermal; t_R (**1d**) = 3.95 min; t_R (*R*) = 9.82 min; t_R (*S*) = 11.90 min. Chromatograms are illustrated below for an 87% *ee* sample:

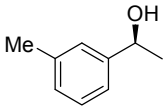


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	9.818	2317.126	44411.703	50.3484
2	11.900	1912.479	43797.094	49.6516
Totals:		4229.605	88208.797	100.0000



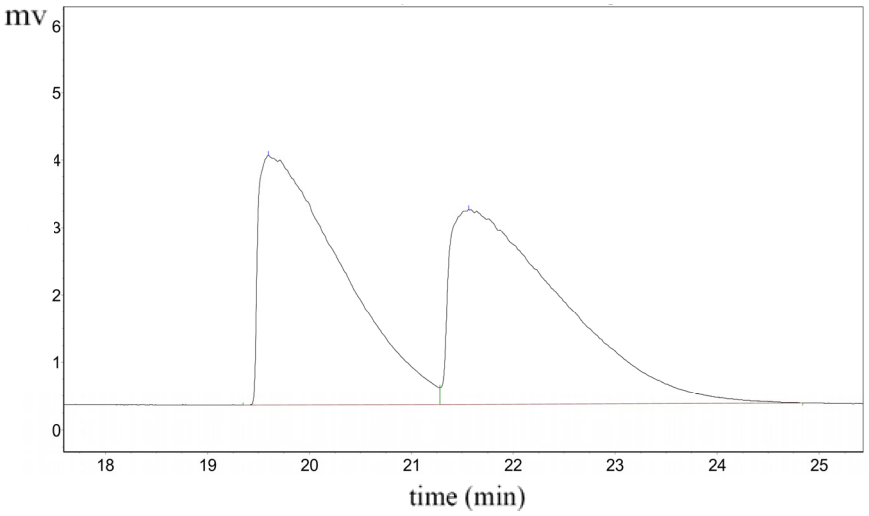
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	9.898	744.089	12342.499	6.5324
2	11.530	5667.652	176599.813	93.4676
Totals:		6411.741	188942.312	100.0000

(*S*)-1-(3-Methylphenyl)ethanol (2e)[3]

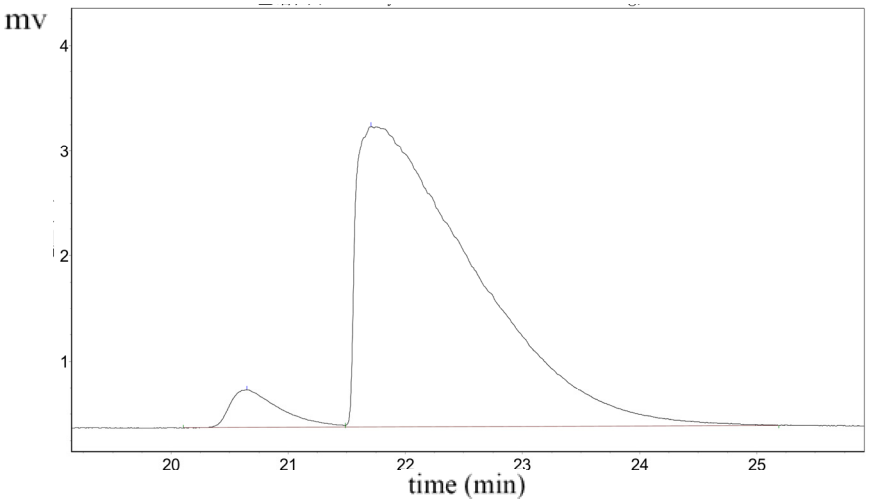


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.49 (d, J = 6.8 Hz, 3H), 1.88 (s, 1H), 2.36 (s, 3H), 4.86 (q, J = 6.4 Hz, 1H), 7.08–7.10 (m, 1H), 7.16–7.26 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 21.5, 25.1, 70.5, 122.4, 126.1, 128.2, 138.1, 145.8. IR (thin film): ν_{max} (cm^{-1}) = 3363, 3027, 1489, 1453, 1077, 857, 786, 703.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 110 °C; isothermal; t_R (**1e**) = 8.15 min; t_R (*R*) = 19.60 min; t_R (*S*) = 21.56 min. Chromatograms are illustrated below for a 90% *ee* sample:

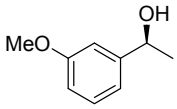


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	19.597	3707.554	211238.125	48.8696
2	21.563	2897.094	221010.625	51.1304
Totals:		6604.648	432248.750	100.0000



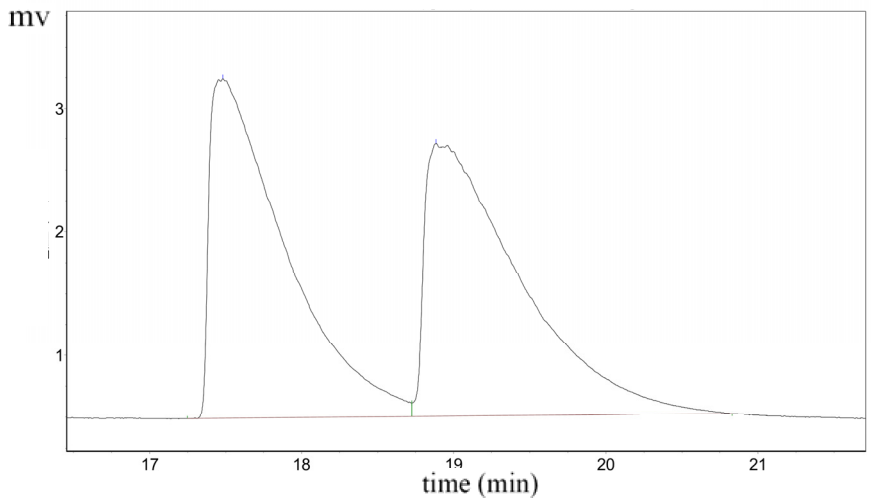
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	20.645	356.461	10496.729	5.0052
2	21.708	2859.438	199219.813	94.9948
Totals:		3215.900	209716.541	100.0000

(*S*)-1-(3-Methoxyphenyl)ethanol (2f)[1,4]

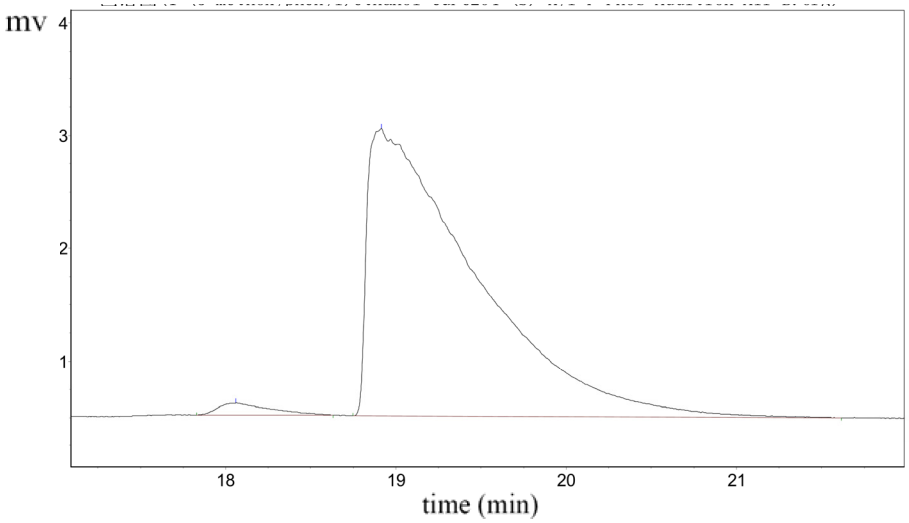


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.49 (d, J = 6.4 Hz, 3H), 2.0 (s, 1H), 3.81 (s, 3H), 4.89 (q, J = 6.4 Hz, 1H), 6.80–6.82 (m, 1H), 6.93–6.95 (m, 2H), 7.24–7.28 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.2, 55.3, 70.4, 110.9, 112.9, 117.7, 129.6, 147.6, 159.8. IR (thin film): ν_{max} (cm^{-1}) = 3386, 1602, 1488, 1456, 1158, 857, 785, 699.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 130 °C; isothermal; t_R (**1f**) = 7.88 min; t_R (*R*) = 17.48 min; t_R (*S*) = 18.89 min. Chromatograms are illustrated below for a 96% *ee* sample:

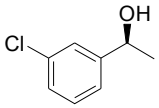


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	17.482	2746.333	94662.750	49.7064
2	18.885	2202.275	95781.102	50.2936
Totals:		4948.608	190443.852	100.0000



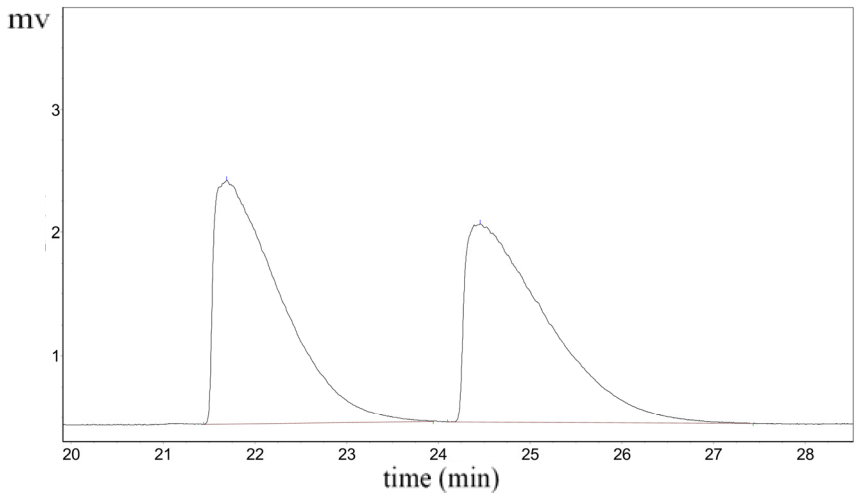
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	18.060	106.854	2271.950	1.9884
2	18.915	2550.930	111989.297	98.0116
Totals:		2657.784	114261.247	100.0000

(*S*)-1-(3-Chlorophenyl)ethanol (2g)[1]

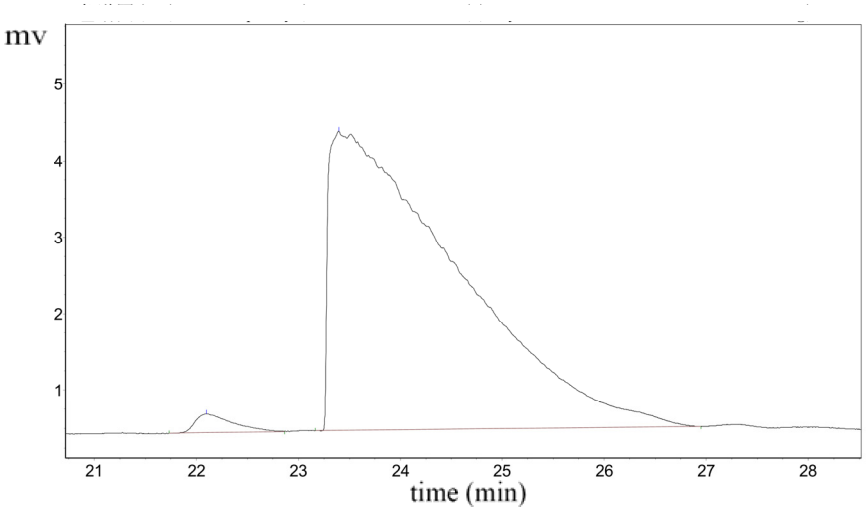


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.49 (d, J = 6.4 Hz, 3H), 1.93 (s, 1H), 4.88 (q, J = 6.4 Hz, 1H), 7.23–7.30 (m, 3H), 7.38 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.2, 69.8, 123.6, 125.6, 127.5, 129.8, 134.4, 147.9. IR (thin film): ν_{max} (cm^{-1}) = 3355, 1598, 1574, 1477, 1079, 811, 786, 697.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 125 °C; isothermal; t_R (**1g**) = 7.10 min; t_R (*R*) = 21.69 min; t_R (*S*) = 24.46 min. Chromatograms are illustrated below for a 97% *ee* sample:

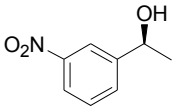


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	21.693	1981.376	99548.492	50.0325
2	24.457	1606.289	99419.305	49.9675
Totals:		3587.665	198967.797	100.0000



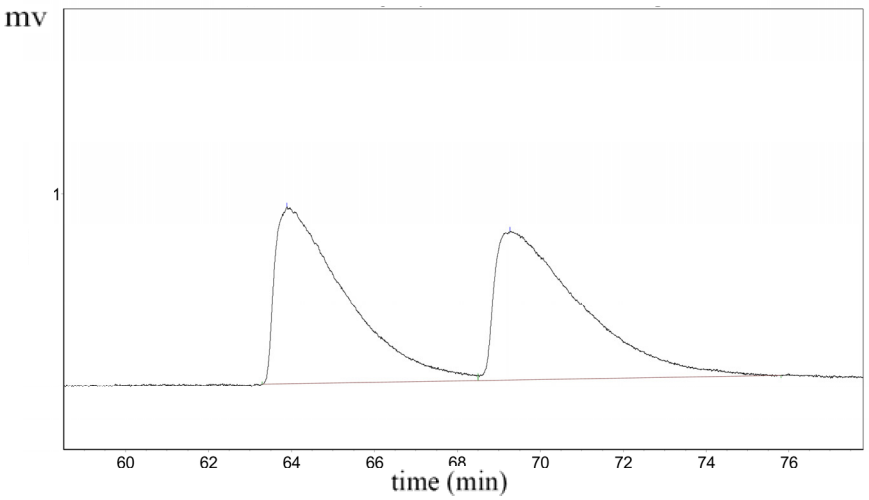
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	22.098	239.247	6068.899	1.7357
2	23.397	3915.756	343591.969	98.2643
Totals:		4155.003	349660.868	100.0000

(*S*)-1-(3-Nitrophenyl)ethanol (2h)[5,6]

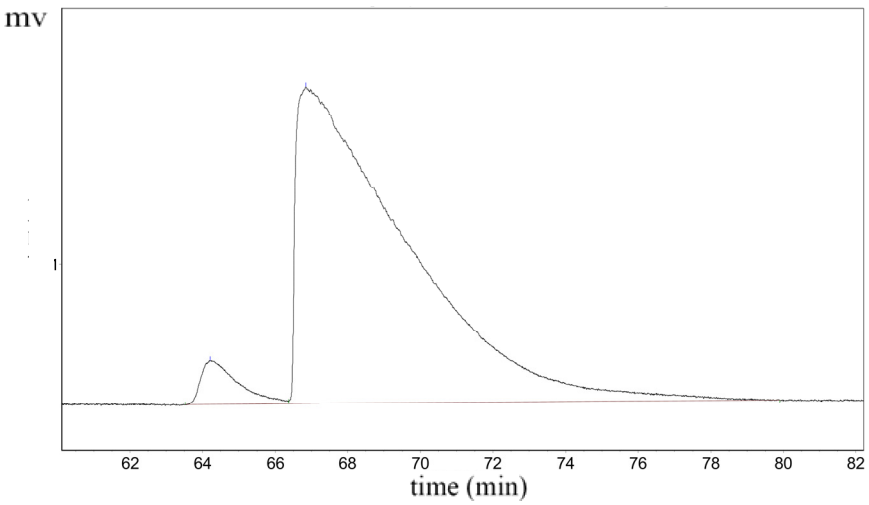


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.55 (d, J = 6.8 Hz, 3H), 2.05 (s, 1H), 5.03 (q, J = 6.4 Hz, 1H), 7.50–7.54 (m, 1H), 7.72 (d, J = 7.6 Hz, 1H), 8.11 (m, 1H), 8.25 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.5, 69.4, 120.4, 122.4, 129.5, 131.6, 147.9, 148.3. IR (thin film): ν_{max} (cm^{-1}) = 3385, 1531, 1480, 1445, 1069, 875, 809, 739, 689.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 140 °C; isothermal; t_R (**1h**) = 16.60 min; t_R (*R*) = 63.89 min; t_R (*S*) = 69.27 min. Chromatograms are illustrated below for a 91% *ee* sample:

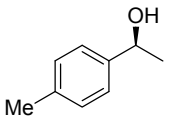


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	63.888	405.988	47905.391	49.5295
2	69.267	339.968	48815.441	50.4705
Totals:		745.956	96720.832	100.0000



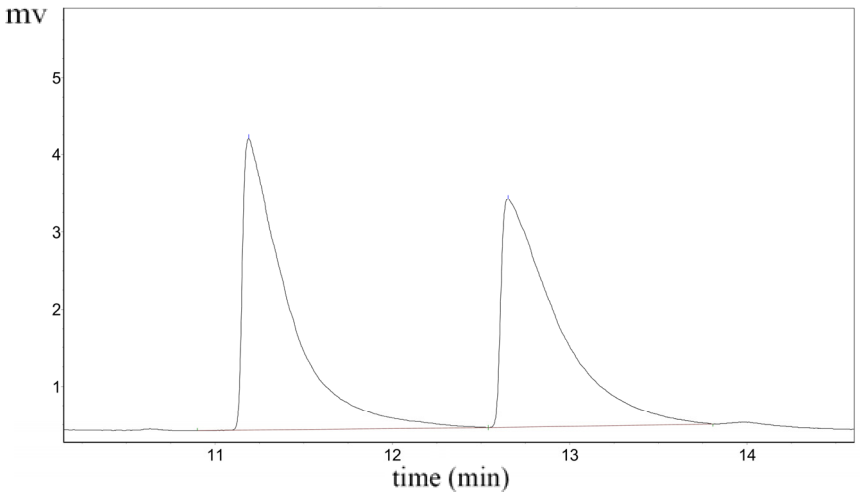
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	64.207	139.371	9866.404	4.4346
2	66.843	1005.956	212618.500	95.5654
Totals:		1145.327	222484.904	100.0000

(*S*)-1-(4-Methylphenyl)ethanol thanol (2i)[4]

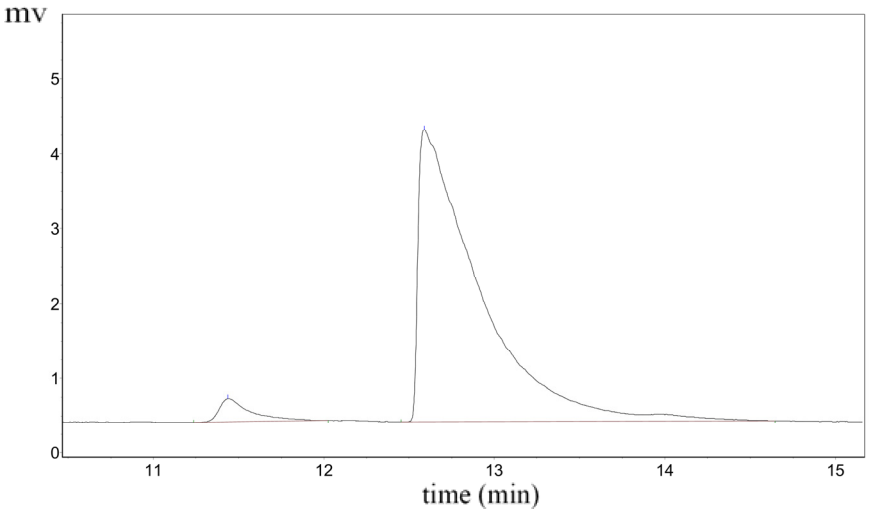


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.48 (d, J = 6.4 Hz, 3H), 1.91 (s, 1H), 2.35 (s, 3H), 4.85 (q, J = 4.8 Hz, 1H), 7.16 (d, J = 7.6 Hz, 2H), 7.26 (d, J = 7.2 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 21.1, 25.1, 70.3, 125.4, 129.2, 137.2, 142.9. IR (thin film): ν_{max} (cm^{-1}) = 3364, 1514, 1451, 1089, 817, 728.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 120 °C; isothermal; t_R (**1i**) = 6.58 min; t_R (*R*) = 11.19 min; t_R (*S*) = 12.65 min. Chromatograms are illustrated below for a 92% *ee* sample:

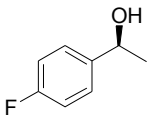


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	11.188	3769.235	66057.398	50.8387
2	12.652	2957.126	63877.902	49.1613
Totals:		6726.362	129935.301	100.0000



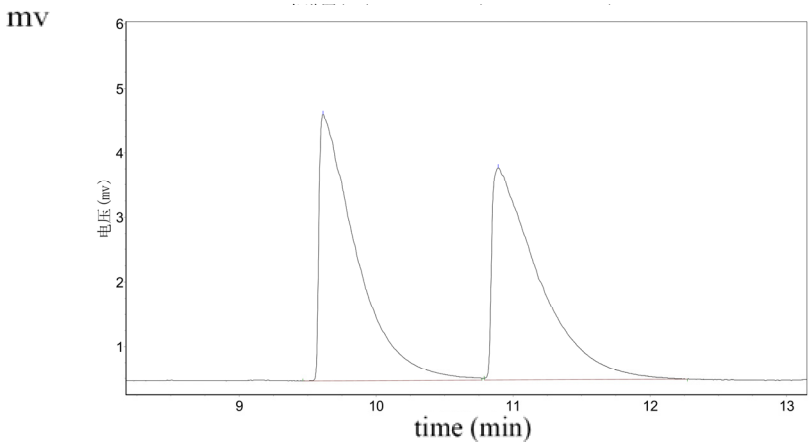
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	11.437	313.459	3977.000	3.9512
2	12.588	3905.128	96677.203	96.0489
Totals:		4218.587	100654.203	100.0000

(*S*)-1-(4-Fluorophenyl)ethanol (2j)[6,7]

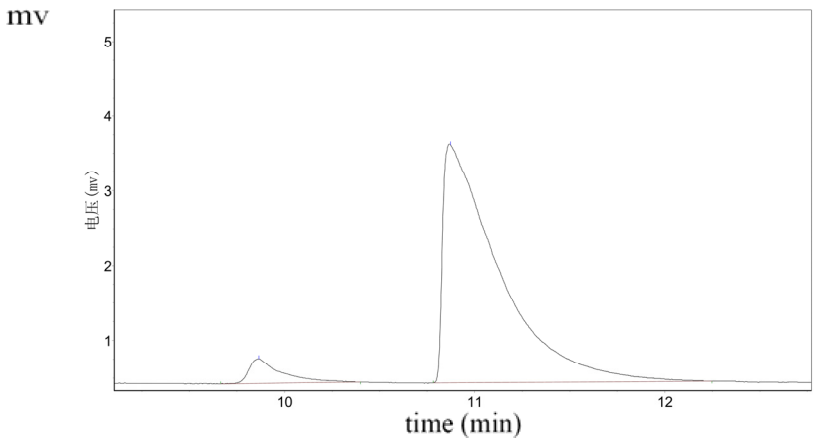


^{1}H NMR (500 MHz, $CDCl_3$): δ1.46 (d, J = 6.4 Hz, 3H), 2.02 (s, 1H), 4.85 (q, J = 6.4 Hz, 1H), 7.00–7.04(m, 2H), 7.31–7.35(m, 2H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 25.3, 69.8, 115.2, 127.0, 141.5, 160.1. IR (thin film): ν_{max} (cm^{-1}) = 3363, 1605, 1510, 1084, 836.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 120 °C; isothermal; t_R (**1j**) = 5.17 min; t_R (*R*) = 9.61 min; t_R (*S*) = 10.89 min. Chromatograms are illustrated below for an 89% *ee* sample:

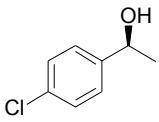


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	9.612	4150.540	78283.750	50.1285
2	10.892	3295.932	77882.469	49.8715
Totals:		7446.471	156166.219	100.0000



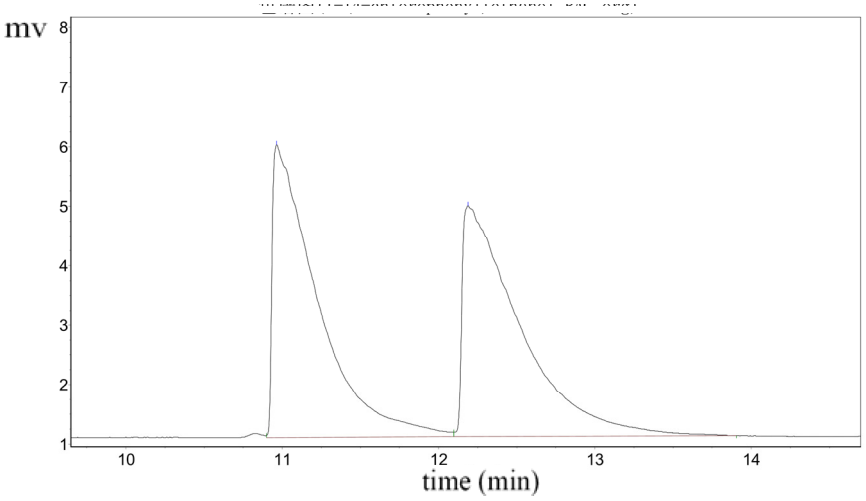
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	9.865	324.273	3881.200	5.5940
2	10.873	3185.438	65500.199	94.4060
Totals:		3509.710	69381.399	100.0000

(*S*)-1-(4-Chlorophenyl)ethanol (2k)[1,6]

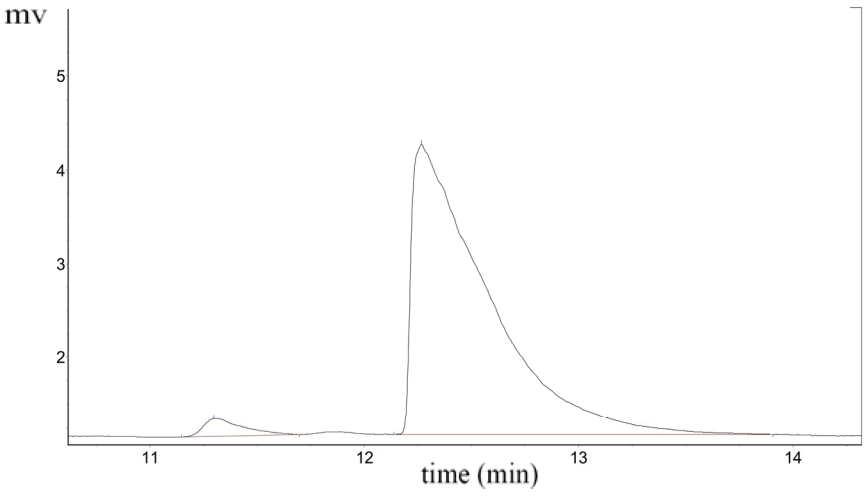


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.48 (d, J = 6.4 Hz, 3H), 1.88 (s, 1H), 4.89 (q, J = 6.4 Hz, 1H), 7.26–7.33(m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.3, 69.7, 126.8, 128.6, 133.0, 144.3. IR (thin film): ν_{max} (cm^{-1}) = 3356, 1598, 1493, 1452, 1089, 829.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 140 °C; isothermal; t_R (**1k**) = 5.17 min; t_R (*R*) = 10.97 min; t_R (*S*) = 12.19 min. Chromatograms are illustrated below for a 94% *ee* sample:

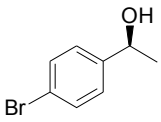


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	10.965	4920.660	98528.719	49.7370
2	12.188	3881.573	99570.578	50.2630
Totals:		8802.233	198099.297	100.0000



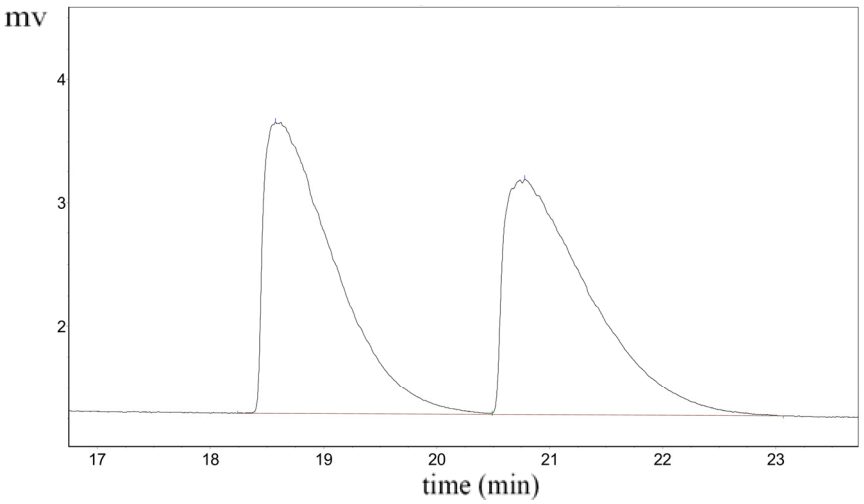
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	11.298	187.659	2397.147	3.0713
2	12.267	3087.000	75653.602	96.9287
Totals:		3274.659	78050.749	100.0000

(*S*)-1-(4-Bromophenyl)ethanol (2l)[1,6]

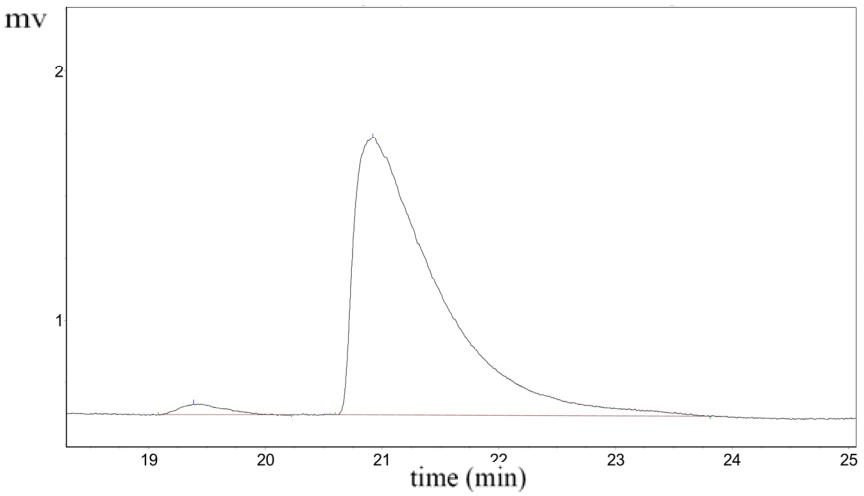


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.48 (d, J = 6.8 Hz, 3H), 1.85 (s, 1H), 4.88 (q, J = 6.4 Hz, 1H), 7.26 (d, J = 7.6 Hz, 2H), 7.49 (d, J = 8.0 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.2, 69.8, 121.1, 127.2, 131.5, 144.8. IR (thin film): ν_{max} (cm^{-1}) = 3356, 1593, 1489, 1403, 1086, 824.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 140 °C; isothermal; t_R (**1l**) = 9.02 min; t_R (*R*) = 18.58 min; t_R (*S*) = 20.78 min. Chromatograms are illustrated below for a 96% *ee* sample:

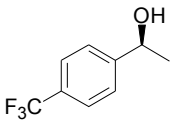


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	18. 575	2365. 387	102084. 102	50. 4770
2	20. 780	1906. 528	100154. 727	49. 5230
Totals:		4271. 915	202238. 828	100. 0000



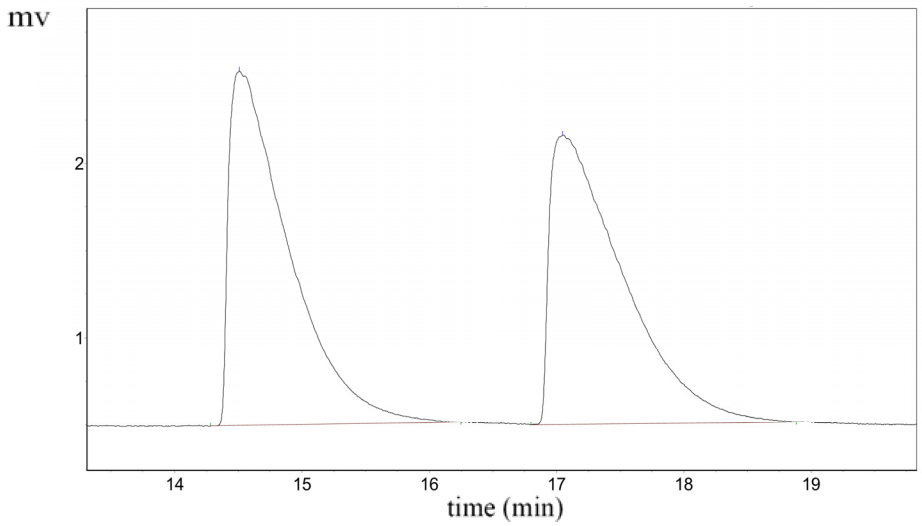
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	19. 382	43. 000	1135. 499	2. 0384
2	20. 918	1115. 597	54569. 094	97. 9616
Totals:		1158. 597	55704. 593	100. 0000

(*S*)-1-(4-(Trifluoromethyl)phenyl)ethanol (2m)[1,6]

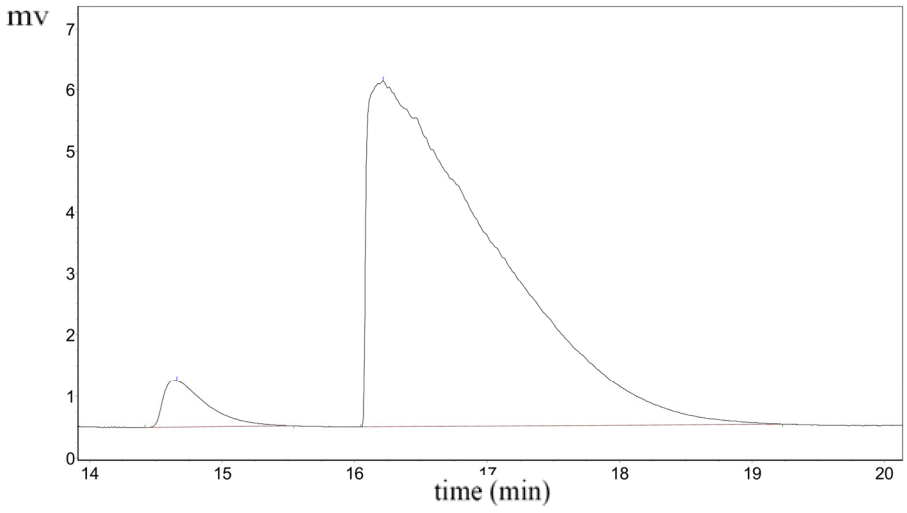


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.51 (d, J = 6.4 Hz, 3H), 1.92 (s, 1H), 4.98 (q, J = 6.4 Hz, 1H), 7.50 (d, J = 8.0 Hz, 3H), 7.62(d, J = 8.0 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.4, 69.8, 122.8, 125.5, 129.5, 149.7. IR (thin film): ν_{max} (cm^{-1}) = 3356, 1621, 1416, 1126, 842.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 120 °C; isothermal; t_R (**1m**) = 4.94 min; t_R (*R*) = 14.51 min; t_R (*S*) = 17.05 min. Chromatograms are illustrated below for a 91% *ee* sample:

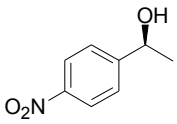


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	14. 507	2032. 599	66710. 445	50. 1550
2	17. 047	1658. 213	66298. 250	49. 8451
Totals:		3690. 813	133008. 695	100. 0000



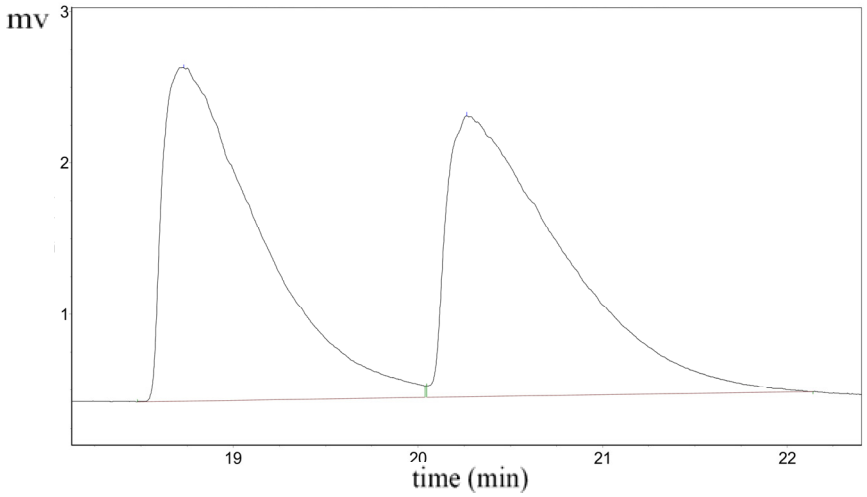
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	14. 657	764. 415	17129. 301	4. 4114
2	16. 215	5659. 539	371167. 594	95. 5886
Totals:		6423. 954	388296. 895	100. 0000

(*S*)-1-(4-Nitrophenyl)ethanol (2n)[1,6]

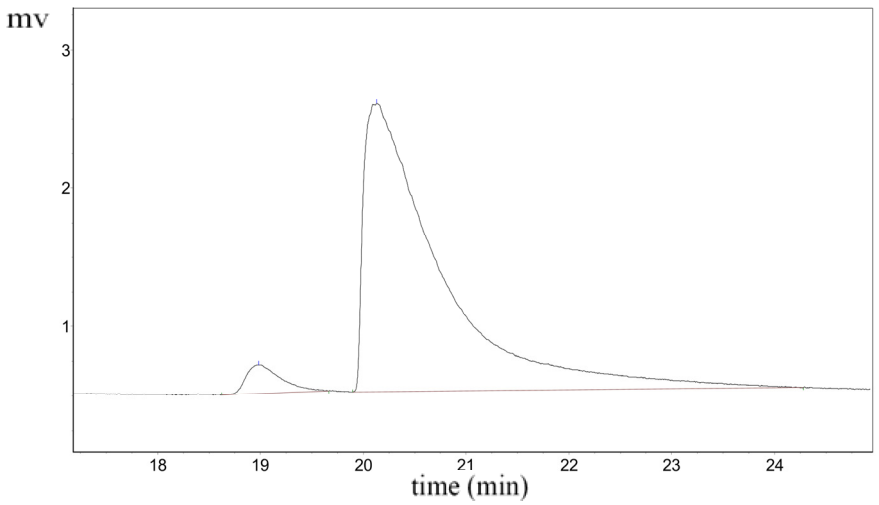


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.52 (d, J = 6.4 Hz, 3H), 2.10 (s, 1H), 5.02 (q, J = 6.4 Hz, 1H), 7.54 (d, J = 8.0 Hz, 2H), 8.20 (d, J = 7.6 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.5, 69.5, 123.7, 126.2, 147.1, 153.2. IR (thin film): ν_{max} (cm^{-1}) = 3383, 2965, 1605, 1519, 1454, 1090, 856, 700.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 170 °C; isothermal; t_R (**1n**) = 7.66 min; t_R (*R*) = 18.73 min; t_R (*S*) = 20.26 min. Chromatograms are illustrated below for a 91% *ee* sample:

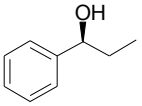


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	18.725	2202.410	81111.430	48.6282
2	20.262	1876.357	85687.797	51.3718
Totals:		4078.767	166799.227	100.0000



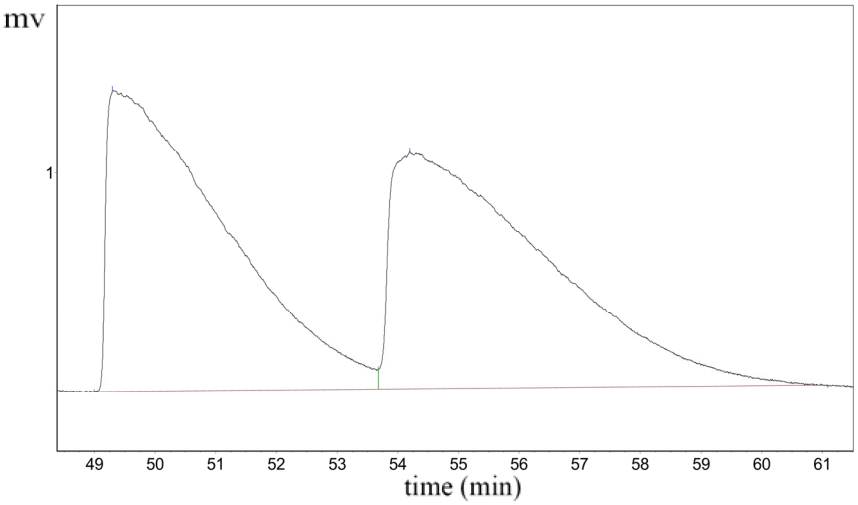
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	18.983	206.994	4818.201	4.2944
2	20.132	2078.350	107378.836	95.7056
Totals:		2285.344	112197.037	100.0000

(*S*)-1-Phenylpropan-1-ol (2o)[4,8]

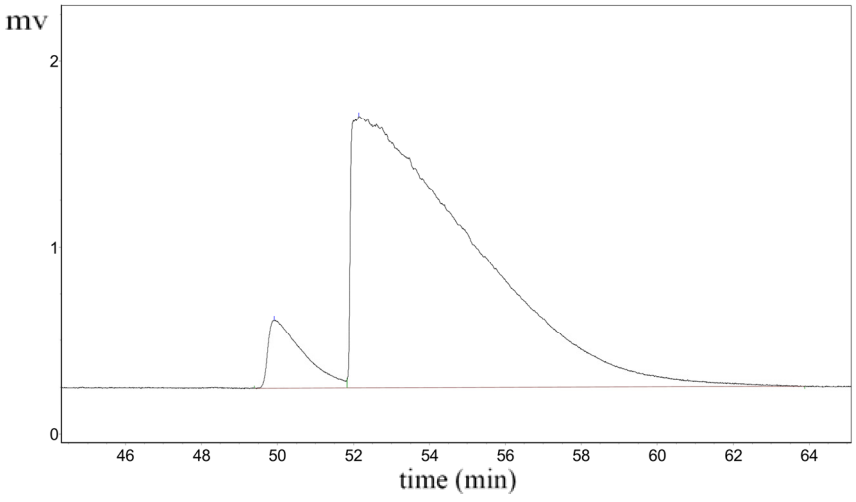


^{1}H NMR (400 MHz, $CDCl_3$): δ 0.94 (t, J = 7.2 Hz, 3H), 1.73–1.88 (m, 3H), 4.61 (t, J = 6.6 Hz, 1H), 7.26–7.35 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 10.2, 31.9, 76.0, 126.0, 127.5, 128.4, 144.6. IR (thin film): ν_{max} (cm^{-1}) = 3383, 3063, 2965, 1493, 1454, 1096, 762, 700.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 95 °C; isothermal; t_R (**1o**) = 17.00 min; t_R (*R*) = 49.30 min; t_R (*S*) = 54.20 min. Chromatograms are illustrated below for an 87% *ee* sample:

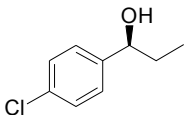


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	49.302	1030.918	139191.516	49.2825
2	54.197	809.796	143244.703	50.7175
Totals:		1840.714	282436.219	100.0000



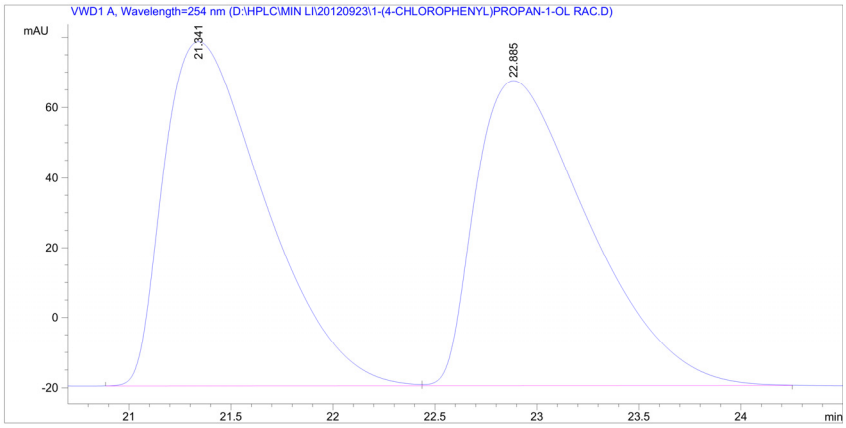
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	49.910	363.641	23375.859	6.7314
2	52.138	1453.103	323888.219	93.2686
Totals:		1816.744	347264.078	100.0000

(*S*)-1-(4-Chlorophenyl)propan-1-ol (2p)[9]

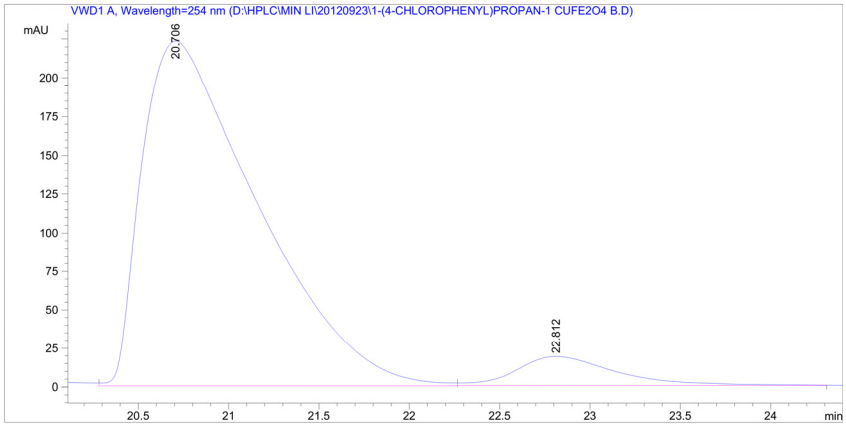


^{1}H NMR (400 MHz, $CDCl_3$): δ 0.90 (t, J = 7.2 Hz, 3H), 1.65–1.80 (m, 2H), 1.96 (br, 1H), 4.56 (m, 1H), 7.25–7.32(m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 10.0, 31.9, 75.3, 127.4, 128.5, 133.1, 143.0. IR (thin film): ν_{max} (cm^{-1}) = 3375, 1598, 1492, 1463, 1091, 825.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 200 °C; isothermal; t_R (**1p**) = 3.04 min; t_R (**2p**) = 4.75 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OJ-H column (eluent, 2-propanol/hexane 5:95; flow rate: 0.5 mL•min^{-1}; detection: 254 nm light); t_R (*S*) = 20.71 min; t_R (*R*) = 22.81 min. Chromatograms are illustrated below for an 87% *ee* sample:

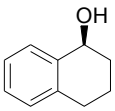


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	21.341	BV	0.5280	3396.32422	98.36356	50.1747
2	22.885	VB	0.6018	3372.67090	87.08093	49.8253



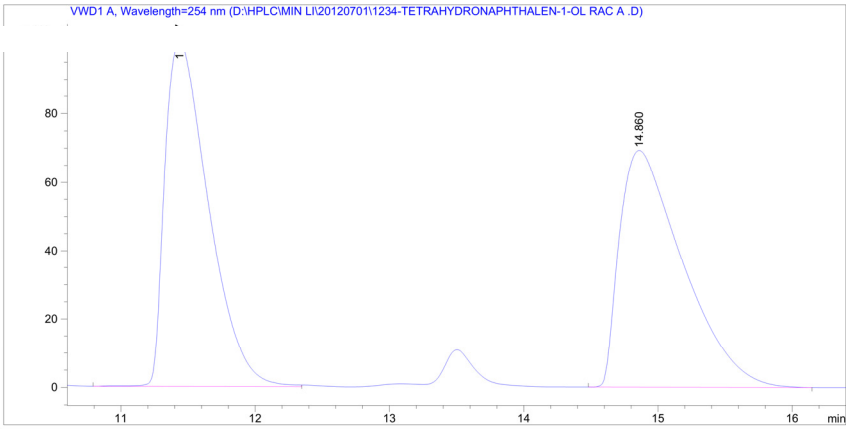
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	20.706	VB	0.6607	9930.90137	223.01698	93.2512
2	22.812	BB	0.5646	718.72601	18.77134	6.7488

(*S*)-1,2,3,4-Tetrahydronaphthalen-1-ol (4a)[10]

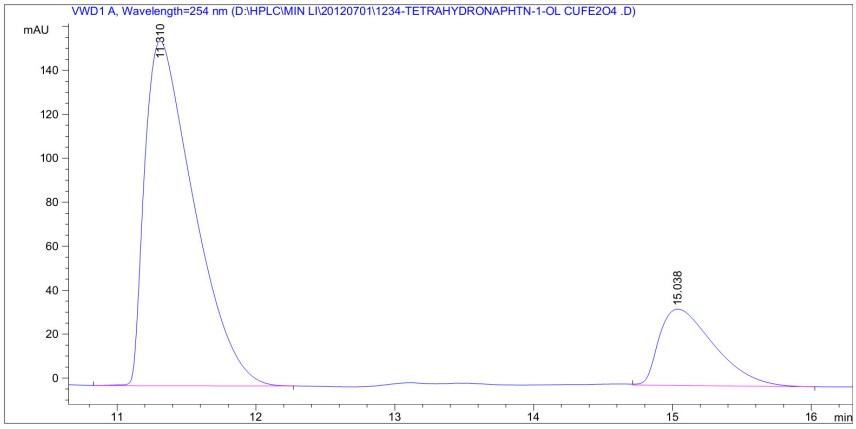


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.62-2.01 (m, 5H), 2.70-2.87 (m, 2H), 4.78 (t, J = 4.0 Hz, 1H), 7.11-7.22 (m, 3H), 7.42-7.45 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 18.8, 29.3, 32.3, 68.1, 126.2, 127.6, 128.7, 129.0, 137.1, 138.8. IR (thin film): ν_{max} (cm^{-1}) = 3356, 3020, 1605, 1490, 1455, 1067, 739.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 200 °C; isothermal; t_R (**3a**) = 4.56 min; t_R (**4a**) = 5.41 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OJ-H column (eluent, 2-propanol/hexane 5:95; flow rate: 1.0 mL•min^{-1}; detection: 254 nm light); t_R (*R*) = 11.44 min; t_R (*S*) = 14.86 min. Chromatograms are illustrated below for a 60% *ee* sample:

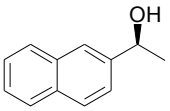


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.437	VB	0.3501	2282.12061	100.79305	50.1794
2	14.860	BB	0.4951	2265.80176	69.28400	49.8206



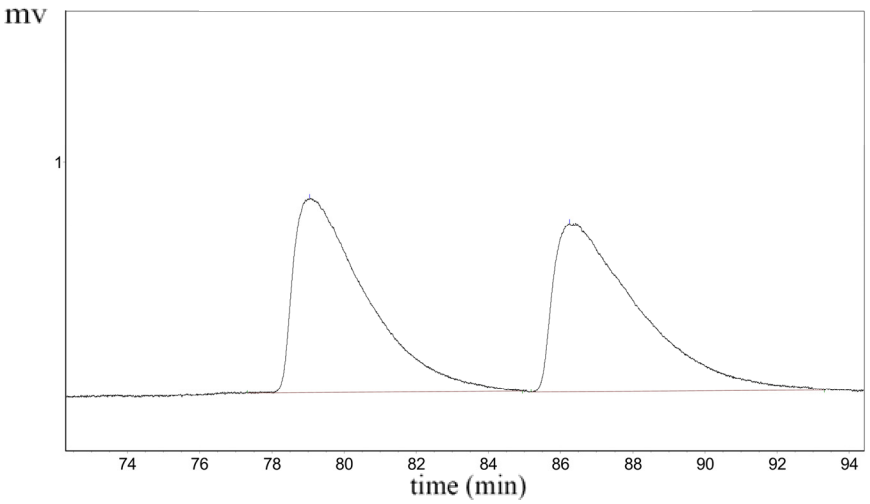
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.310	VB	0.3729	3859.33643	156.86226	80.1887
2	15.038	VB	0.4220	953.48053	34.74891	19.8113

(*S*)-1-(Naphthalen-2-yl)ethanol (4b)[1,4]

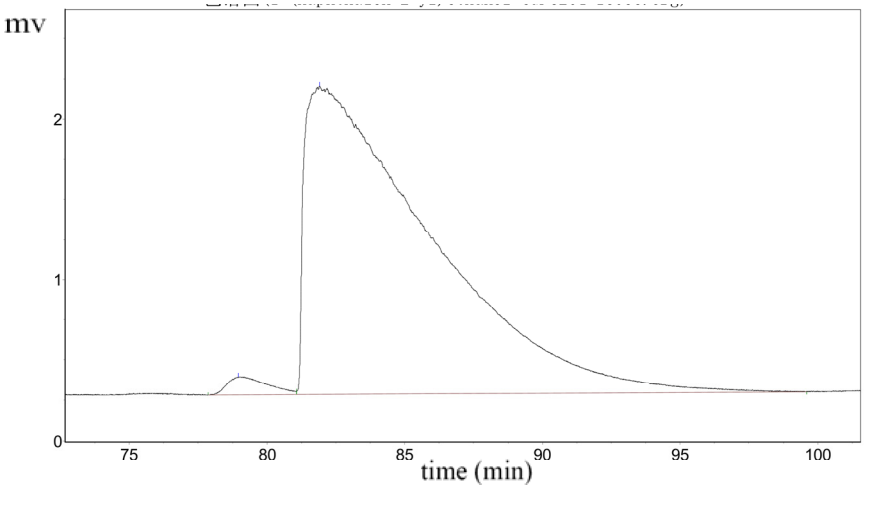


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.60 (d, J = 6.4 Hz, 3H), 1.98 (s, 1H), 5.06–5.08 (m, 1H), 7.47–7.52 (m, 3H), 7.81–7.85 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.2, 70.5, 123.8, 123.9, 125.8, 126.2, 127.8, 128.0, 128.3, 133.0, 133.4, 143.3. IR (thin film): ν_{max} (cm^{-1}) = 3357, 3055, 1602, 1508, 1449, 1072, 747.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 130 °C; isothermal; t_R (**3b**) = 39.91 min; t_R (*R*) = 79.05 min; t_R (*S*) = 86.25 min. Chromatograms are illustrated below for a 96% *ee* sample:

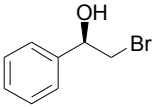


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	79.053	491.865	68884.102	49.9040
2	86.250	426.341	69149.148	50.0960
Totals:		918.206	138033.250	100.0000



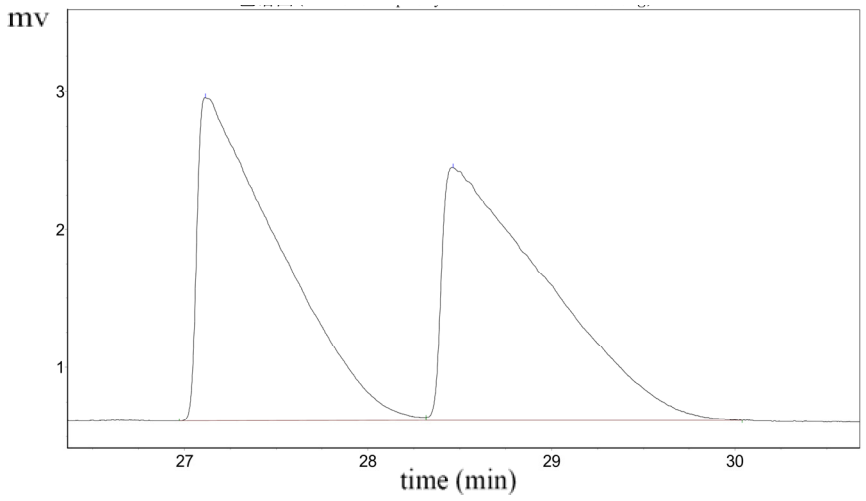
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	78.962	112.042	11273.298	1.8105
2	81.903	1915.470	611404.875	98.1895
Totals:		2027.511	622678.173	100.0000

(*R*)-2-Bromo-1-phenylethanol (4c)[11]

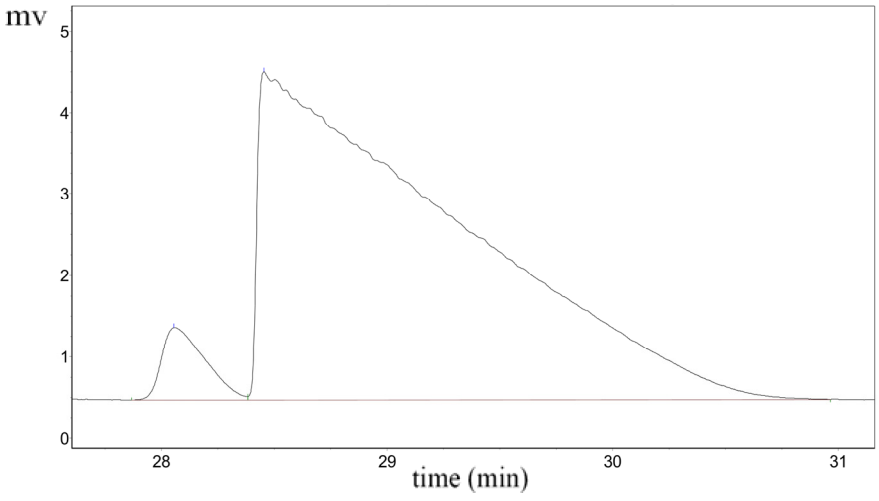


^{1}H NMR (400 MHz, $CDCl_3$): δ 2.65 (d, 1H), 3.55 (dd, J = 10.0, 9.2 Hz, 1H), 3.64 (dd, J = 8.0, 2.4 Hz, 1H), 4.92–4.94 (m, 1H), 7.32–7.39 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 40.2, 73.8, 126.0, 128.5, 128.7, 140.3. IR (thin film): ν_{max} (cm^{-1}) = 3407, 3031, 1493, 1454, 1420, 1061, 764, 701.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm CP-Cyclodex-β-236 column (Varian, carrier gas, N_2); 130 °C; isothermal; t_R (**3c**) = 19.27 min; t_R (*R*) = 27.12 min; t_R (*S*) = 28.47 min. Chromatograms are illustrated below for a 91% *ee* sample:

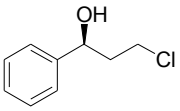


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	27.115	2343.815	72753.461	50.0437
2	28.465	1837.054	72626.438	49.9563
Totals:		4180.870	145379.898	100.0000



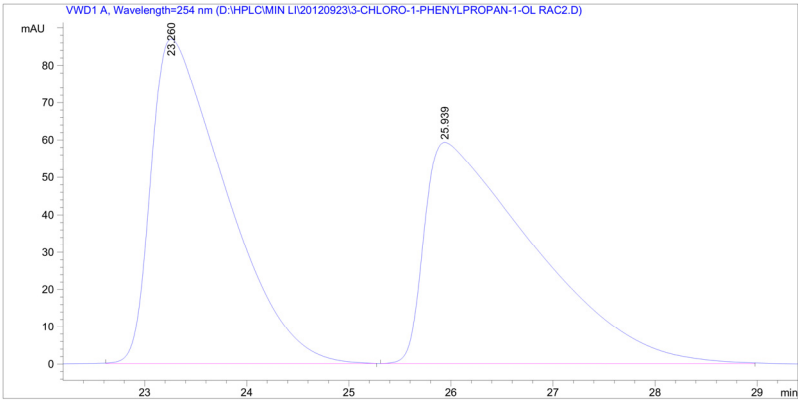
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	28.055	890.572	11851.157	4.6023
2	28.453	4026.672	245653.766	95.3977
Totals:		4917.244	257504.923	100.0000

(*S*)-3-Chloro-1-phenylpropan-1-ol (4d)[12]

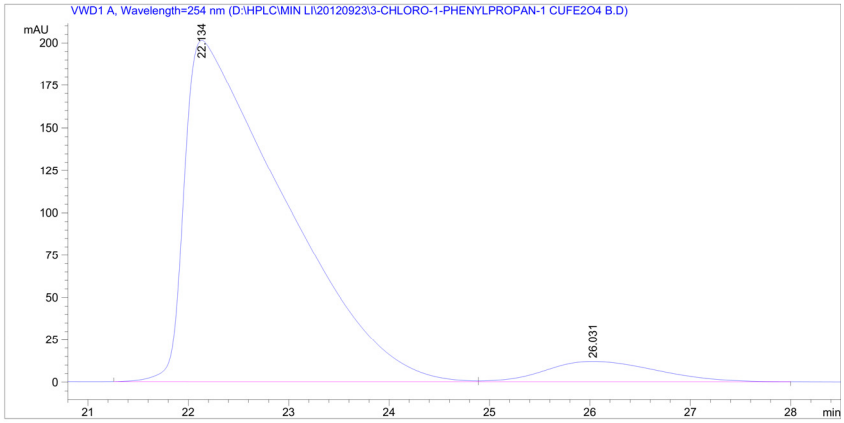


^{1}H NMR (400 MHz, $CDCl_3$): δ 2.03–2.10 (m, 2H), 2.21–2.25 (br, 1H), 3.55–3.59 (m, 1H), 3.71–3.76 (m, 1H), 4.94–4.96 (m, 1H), 7.29–7.38 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 41.5, 41.7, 71.3, 125.8, 127.9, 128.7, 143.7. IR (thin film): ν_{max} (cm^{-1}) = 3385, 3031, 1493, 1454, 1054, 765, 701.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 180 °C; isothermal; t_R (**3d**) = 2.74 min; t_R (**4d**) = 13.36 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OD column (eluent, 2-propanol/hexane 2:98; flow rate: 1.0 mL•min^{-1}; detection: 254 nm light); t_R (*S*) = 22.13 min; t_R (*R*) = 26.03 min. Chromatograms are illustrated below for an 88% *ee* sample:

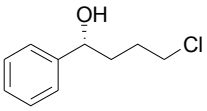


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	23.260	BB	0.7733	4422.94189	86.83219	50.0511
2	25.939	BB	1.0101	4413.91113	59.16990	49.9489



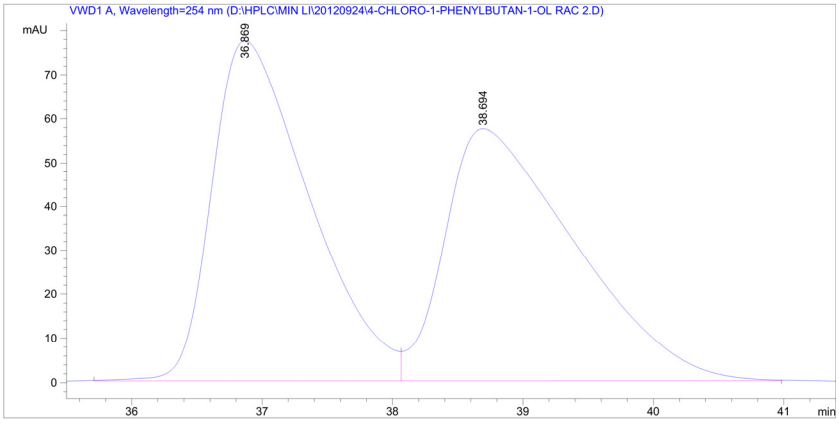
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	22.134	BB	0.9538	1.39073e4	201.11388	93.8486
2	26.031	BB	1.1296	911.56494	11.90011	6.1514

(*R*)-4-Chloro-1-phenylbutan-1-ol (4e)[12]

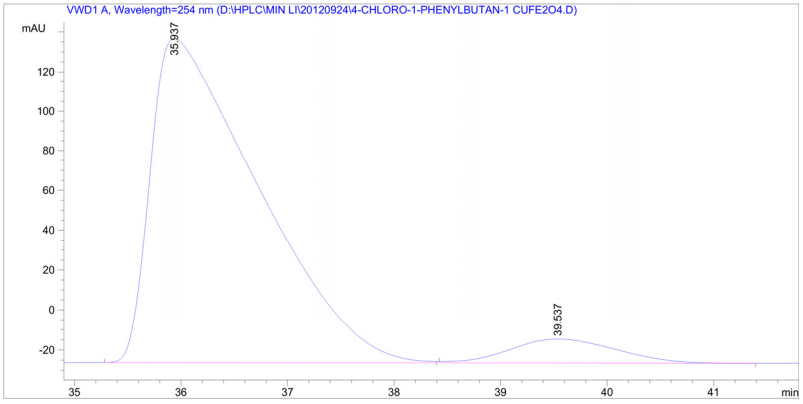


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.79–1.96 (m, 5H), 3.54–3.59 (m, 2H), 4.70–4.74 (m, 1H), 7.28–7.42 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 29.0, 36.2, 45.0, 73.9, 125.8, 127.8, 128.6, 144.3. IR (thin film): ν_{max} (cm^{-1}) = 3386, 3029, 1493, 1454, 1063, 762, 701.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 180 °C; isothermal; t_R (**3e**) = 3.82 min; t_R (**4e**) = 2.79 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OD-H column (eluent, 2-propanol/hexane 4:96; flow rate: 0.5 mL•min^{-1}; detection: 254 nm light); t_R (*S*) = 35.94 min; t_R (*R*) = 39.54 min. Chromatograms are illustrated below for an 87% *ee* sample:

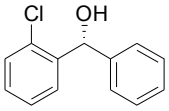


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	36.869	BV	0.7968	4008.35815	77.34275	50.2773
2	38.694	VB	0.9858	3964.13745	57.33021	49.7227



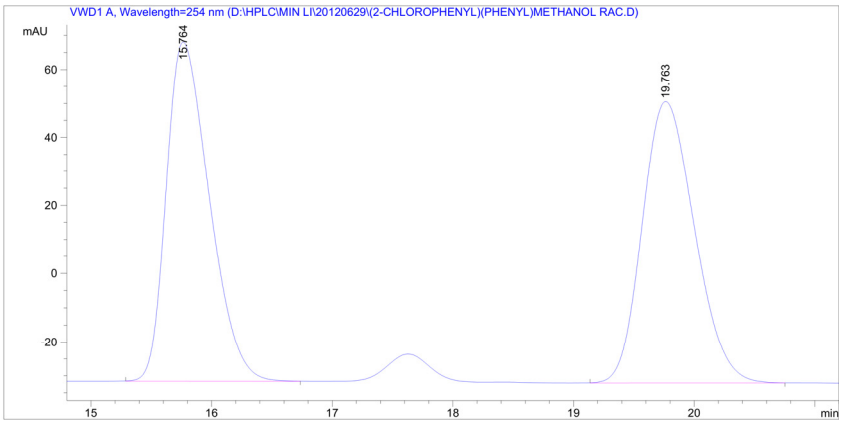
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	35.937	BB	1.0019	1.13855e4	162.88477	93.3053
2	39.537	BB	1.0331	816.92224	11.82502	6.6947

(*R*)-(2-Chlorophenyl)(phenyl)methanol (4f)[4,13]

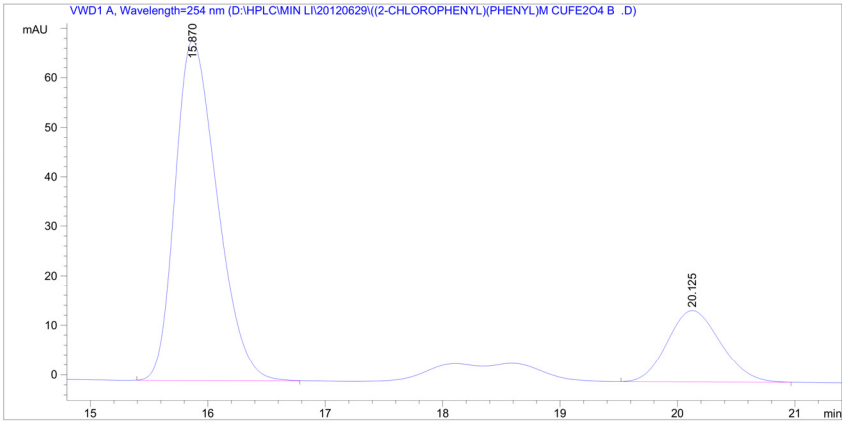


^{1}H NMR (400 MHz, $CDCl_3$): δ 2.37 (s, 1H), 6.23 (d, J = 3.2 Hz, 1H), 7.21–7.41 (m, 8H), 7.60–7.62 (m, 2H). ^{13}C NMR (125 MHz, $CDCl_3$): δ 72.70, 126.98, 127.15, 127.82, 128.07, 128.52, 128.80, 129.60, 132.54, 141.02, 142.26. IR (thin film): ν_{max} (cm^{-1}) = 3355, 3064, 3031, 1494, 1469, 1441, 752, 699.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 230 °C; isothermal; t_R (**3f**) = 7.69 min; t_R (**4f**) = 13.35 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OD-H column (eluent, 2-propanol/hexane 5:95; flow rate: 0.5 mL•min^{-1}; detection: 254 nm light); t_R (*R*) = 15.76 min; t_R (*S*) = 19.76 min. Chromatograms are illustrated below for a 58% *ee* sample:

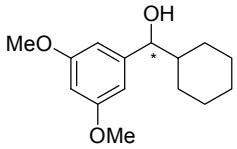


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	15.764	BB	0.3846	2479.07983	99.75894	49.8453
2	19.763	BB	0.4697	2494.47070	82.72376	50.1547



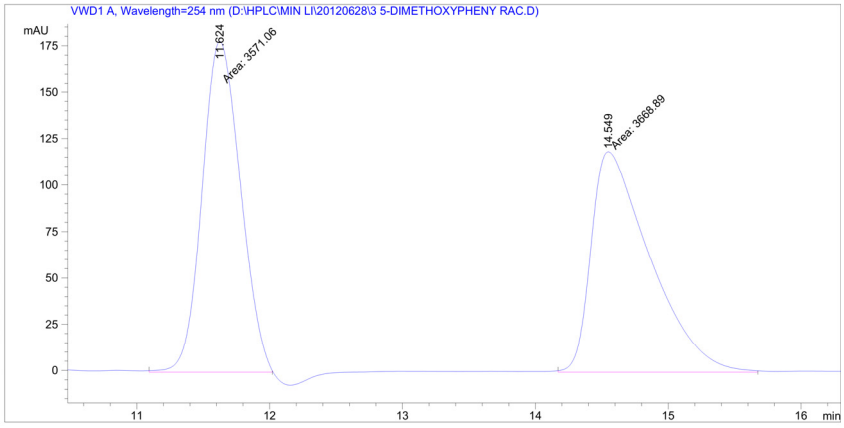
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	15.870	BB	0.3848	1708.53516	68.68942	79.1338
2	20.125	BB	0.4873	450.51154	14.34235	20.8662

(–)-Cyclohexyl(3,5-dimethoxyphenyl)methanol (4g)[14]

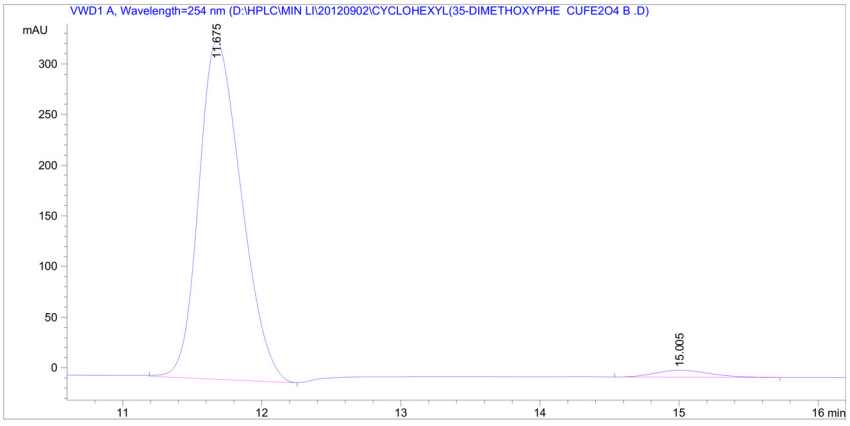


^{1}H NMR (400 Hz, $CDCl_3$): δ 0.93–1.96 (m, 12H), 3.79 (s, 6H), 4.28 (d, J =6.8 Hz, 1H), 6.37–6.47 (m, 3H). ^{13}C NMR (100 Hz, $CDCl_3$): δ 160.6, 146.3, 104.6, 99.2, 79.4, 76.8, 55.3, 44.8, 29.4, 28.8, 26.4, 26.1, 26.0. IR (thin film): ν_{max} (cm^{-1}) = 3443, 2927, 1462, 1429, 1064, 697.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 250 °C; isothermal; t_R (**3g**) = 8.06 min; t_R (**4g**) = 11.57 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel AD column (eluent, 2-propanol/hexane 10:90; flow rate: 1.0 mL•min^{-1}; detection: 254 nm light); t_R (major) = 11.62 min; t_R (minor) = 14.55 min. $[\alpha]_D^{20}$ = –5.8° (c = 1, $CHCl_3$). Literature data:[14] $[\alpha]_D^{20}$ = –5.4 (c = 0.33 in $CHCl_3$) for an (–)-enantiomer sample with the optical value of 92%. Chromatograms are illustrated below for a 95% *ee* sample:

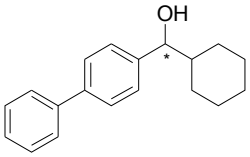


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.624	MM	0.3339	3571.06055	178.25470	49.3244
2	14.549	MM	0.5145	3668.88599	118.85889	50.6756



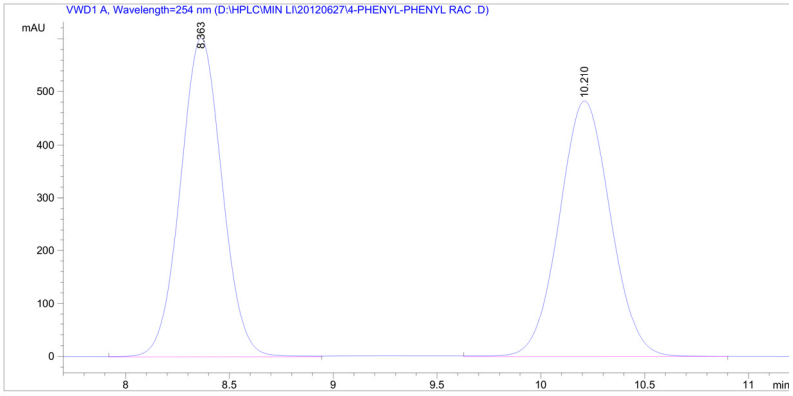
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	11.675	BV	0.3287	7074.97266	333.91675	97.4646
2	15.005	VB	0.4206	184.04871	6.79963	2.5354

(–)-Cyclohexyl[4-(phenyl)phenyl]methanol (4h)[14]

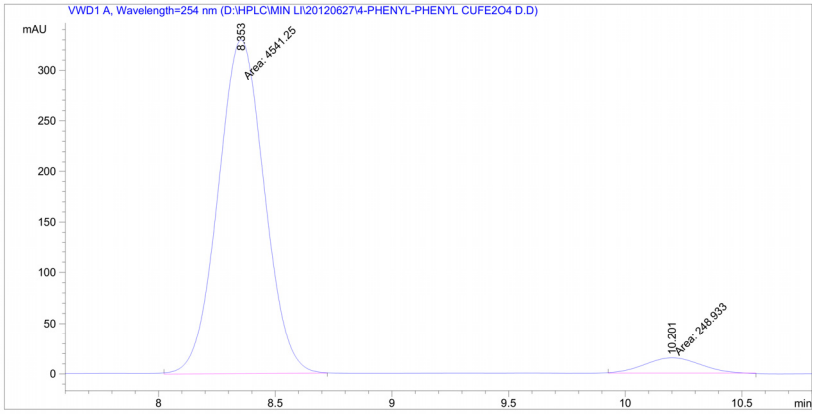


^{1}H NMR (400 Hz, $CDCl_3$): δ 0.96–2.03 (m, 12H), 4.42 (d, J = 6.8Hz, 1H), 7.32–7.46 (m, 5H), 7.56–7.61 (m, 4H). ^{13}C NMR (100 Hz, $CDCl_3$): δ 142.7, 140.9, 140.3, 128.8, 127.3, 127.1, 127.1, 127.0, 79.2, 45.0, 29.4, 28.9, 26.5, 26. 2, 26.1. IR (thin film): ν_{max} (cm^{-1}) = 3405, 3028, 1486, 1449, 1007, 765, 697.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 250 °C; isothermal; t_R (**3h**) = 10.66 min; t_R (**4h**) = 21.20 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel AD column (eluent, 2-propanol/hexane 10:90; flow rate: 1.0 mL•min^{-1}; detection: 254 nm light); t_R (major) = 8.36 min; t_R (minor) = 10.21 min. $[\alpha]_D^{20}$ = –17.3° (c = 1.0 in $CHCl_3$). Literature data:[14] $[\alpha]_D^{20}$ = –19.4 (c = 1.0 in $CHCl_3$) for an (–)-enantiomer sample with the optical value of 95%. Chromatograms are illustrated below for a 90% *ee* sample:

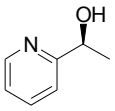


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.363	VB	0.2163	8385.68848	602.15326	50.3098
2	10.210	VB	0.2673	8282.40820	482.28613	49.6902



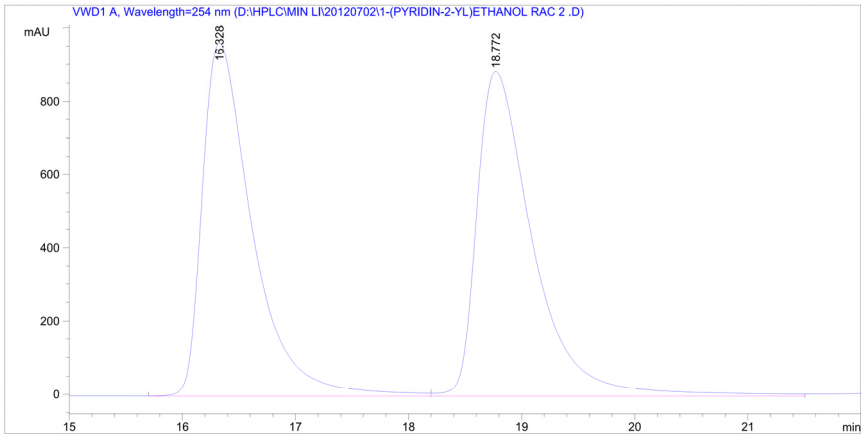
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	8.353	MM	0.2295	4541.25488	329.83319	94.8033
2	10.201	MM	0.2739	248.93338	15.14599	5.1967

(*S*)-1-(Pyridin-2-yl)ethanol (4i)[15]

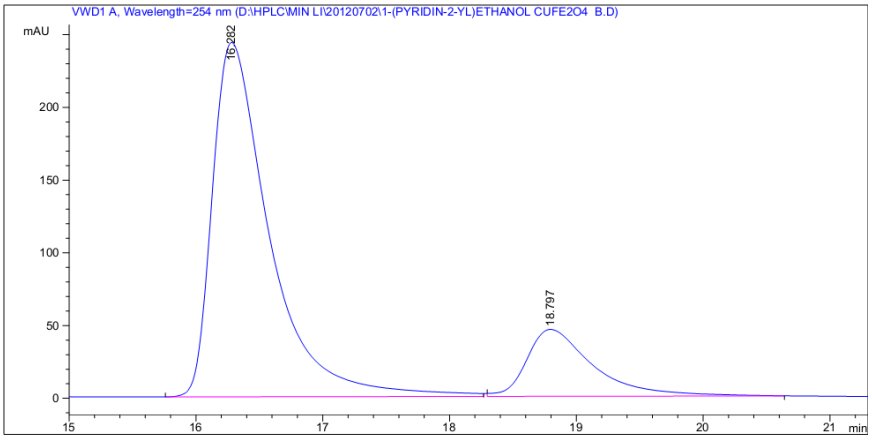


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.51 (d, J = 6.4 Hz, 3H), 1.80 (s, 1H), 4.88 (q, J = 6.4 Hz, 1H), 7.17-7.21 (m, 1H), 7.28 (m, 1H), 7.66-7.70 (m, 1H), 8.52 (d, J =4.8 Hz, 1H) ^{13}C NMR (100 MHz, $CDCl_3$): δ 24.1, 69.0, 119.8, 122.2, 136.8, 148.1, 163.2. IR (thin film): ν_{max} (cm^{-1}) = 3357, 1596, 1572, 1436, 1083, 787, 752.

The conversion was determined by capillary GC with a 30 m × 0.25 mm J & W Scientific INNOWAX column; 140 °C; isothermal; t_R (**3i**) = 4.06 min; t_R (**4i**) = 7.13 min. The *ee* value was determined by chiral HPLC analysis with a 25 cm × 4.6 mm Daicel Chiralcel OB-H column (eluent, 2-propanol/hexane 10:90; flow rate: 0.5 mL•min^{-1}; detection: 254 nm light); t_R (*S*) = 16.33 min; t_R (*R*) = 18.77 min. Chromatograms are illustrated below for a 64% *ee* sample:

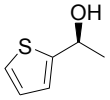


Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	16.328	BV	0.4631	2.97128e4	963.59387	49.2278
2	18.772	VB	0.5218	3.06449e4	885.27405	50.7722



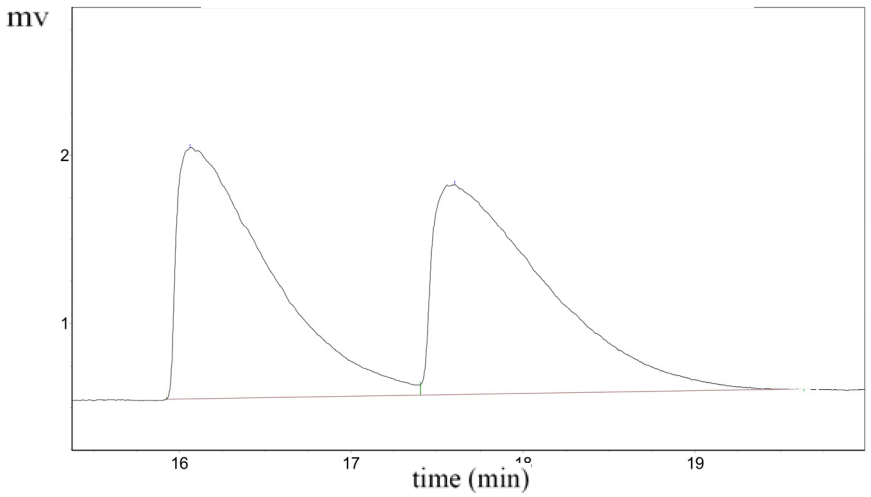
Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	16.282	BB	0.4654	7617.18945	243.53262	82.0284
2	18.797	BB	0.5350	1668.84863	46.03841	17.9716

(*S*)-1-(Thiophen-2-yl)ethanol (4j)[15]

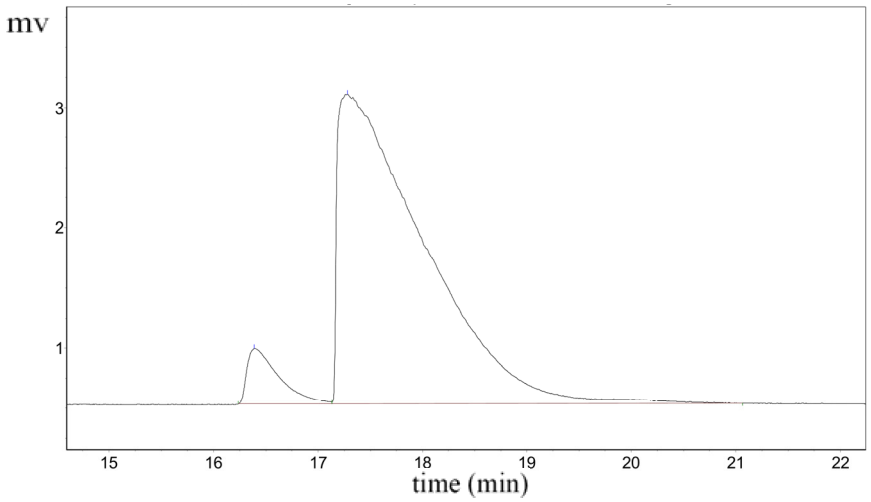


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.60 (d, J = 6.4 Hz, 3H), 2.09 (d, J = 4.0 Hz, 1H), 5.10-5.14 (m, 1H), 6.95–6.97 (m, 2H), 7.23-7.26 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 25.2, 66.2, 123.2, 124.4, 126.7, 149.9. IR (thin film): ν_{max} (cm^{-1}) = 3363, 1436, 1070, 850, 700.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 110 °C; isothermal; t_R (**3j**) = 8.61 min; t_R (*R*) = 16.06 min; t_R (*S*) = 17.60 min. Chromatograms are illustrated below for an 87% *ee* sample:

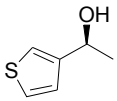


Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	16.063	1498.726	55962.082	49.3092
2	17.602	1251.411	57530.047	50.6908
Totals:		2750.137	113492.129	100.0000



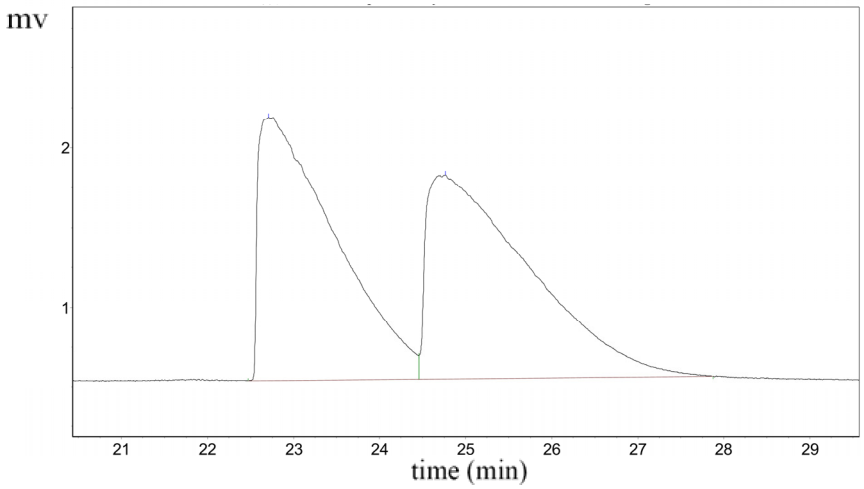
Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	16.390	461.810	9853.022	6.2576
2	17.282	2576.700	147603.047	93.7424
Totals:		3038.510	157456.069	100.0000

(*S*)-1-(Thiophen-3-yl)ethanol (4k)[15]

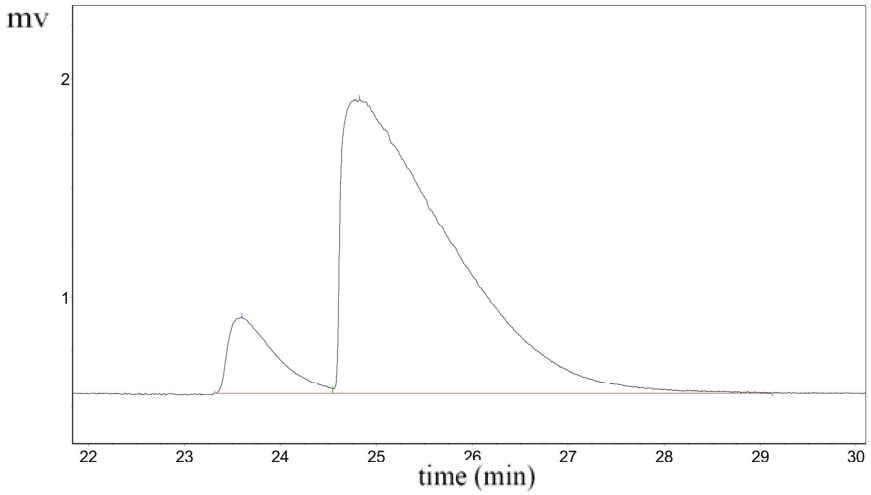


^{1}H NMR (400 MHz, $CDCl_3$): δ 1.52 (d, J = 6.8 Hz, 3H), 1.87 (s, 1H), 4.97 (q, J = 6.8 Hz, 1H), 7.08-7.11 (m, 1H), 7.19-7.20 (m, 1H), 7.30-7.31 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ 24.5, 66.5, 120.2, 125.7, 126.2, 147.3. IR (thin film): ν_{max} (cm^{-1}) = 3375, 3105, 1453, 1417, 1078, 858, 786.

The conversion and *ee* value were determined by Capillary GC with a 25m × 0.25 mm Chirasil-DEX CB column (Varian, carrier gas, N_2); 105 °C; isothermal; t_R (**3k**) = 10.02 min; t_R (*R*) = 22.71 min; t_R (*S*) = 24.76 min. Chromatograms are illustrated below for an 80% *ee* sample:



Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	22.710	1650.774	102124.195	49.0574
2	24.763	1280.127	106048.883	50.9426
Totals:		2930.901	208173.078	100.0000



Peak	RetTime (min)	Height (mv)	Area (mv)	Area (%)
1	23.598	348.951	11970.958	10.2102
2	24.823	1351.740	105273.695	89.7898
Totals:		1700.692	117244.653	100.0000

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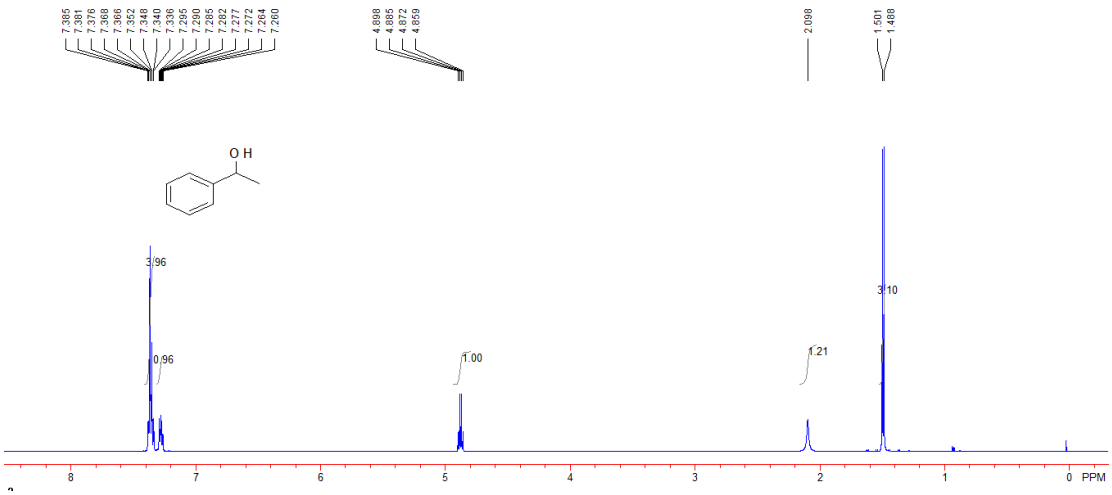
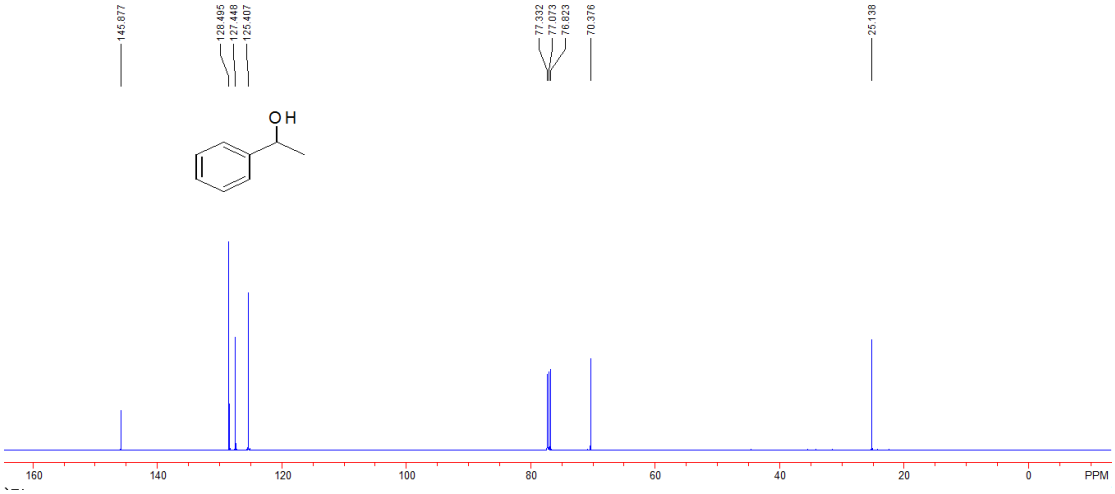
^{1}H NMR and ^{13}C NMR Spectra of Alcohols

(*S*)-1-Phenylethanol (2a)





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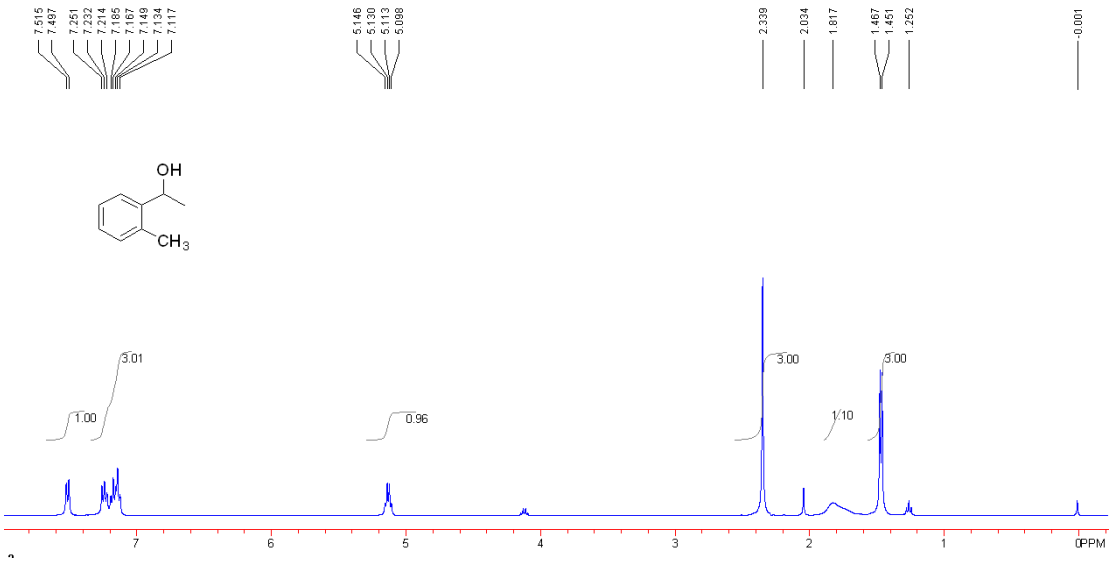

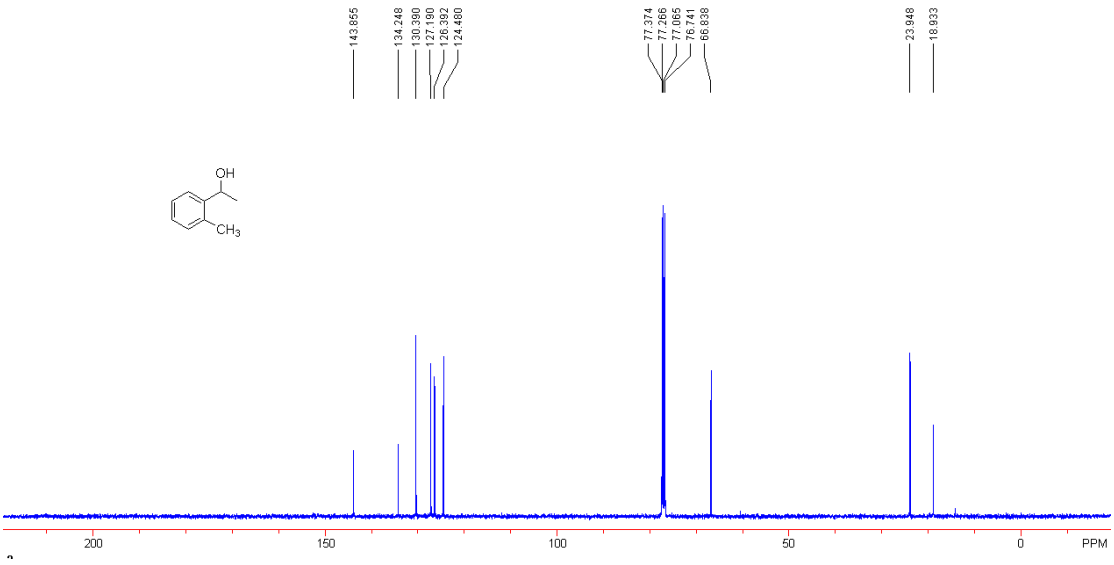

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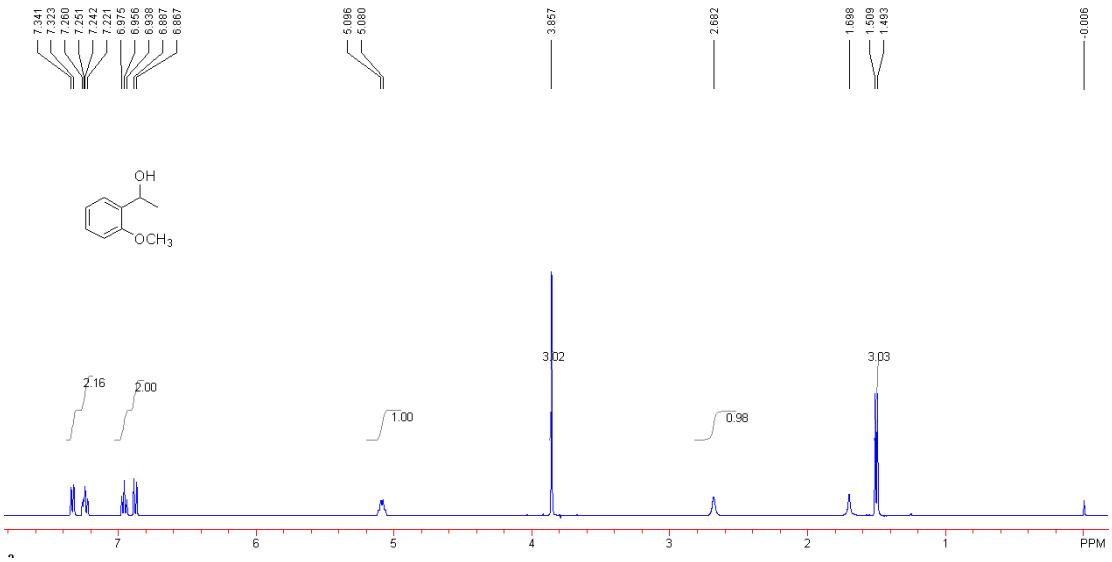

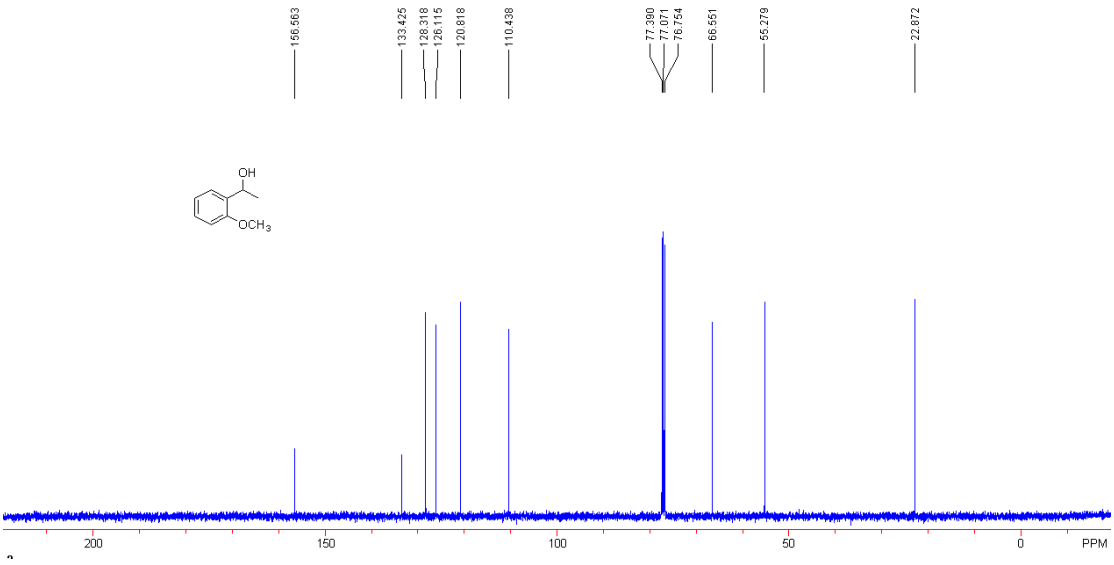

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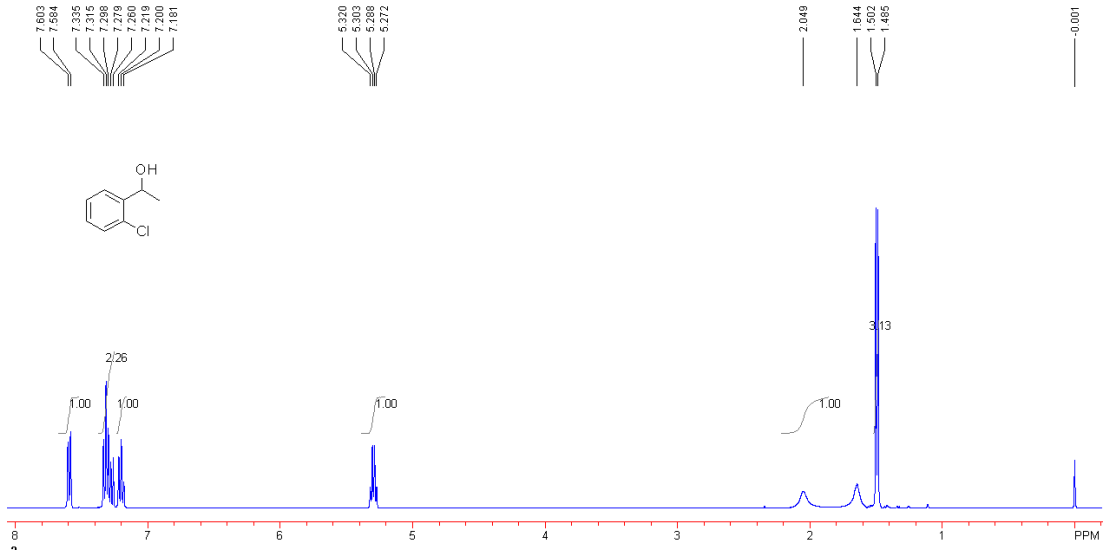

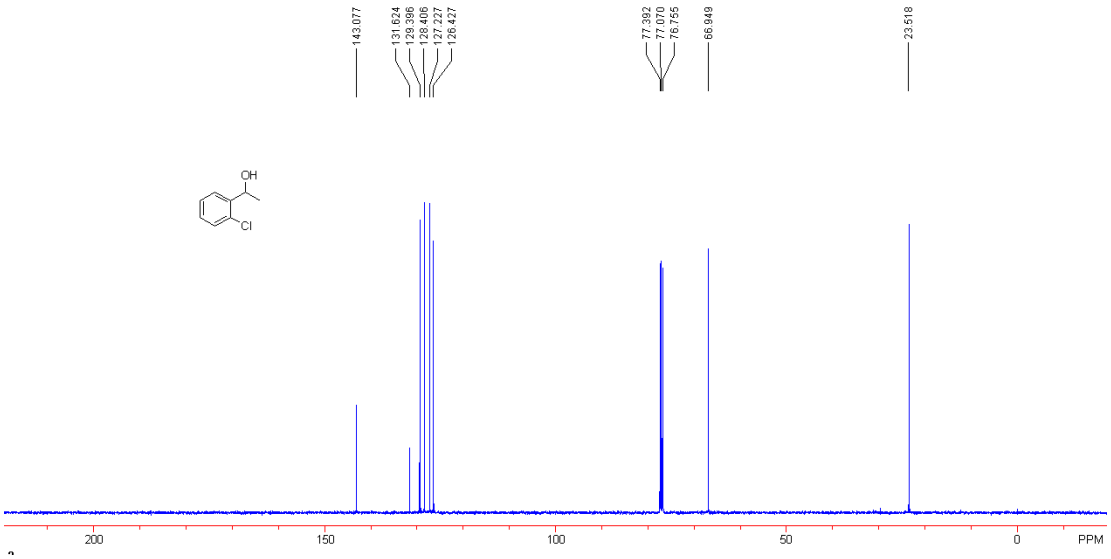

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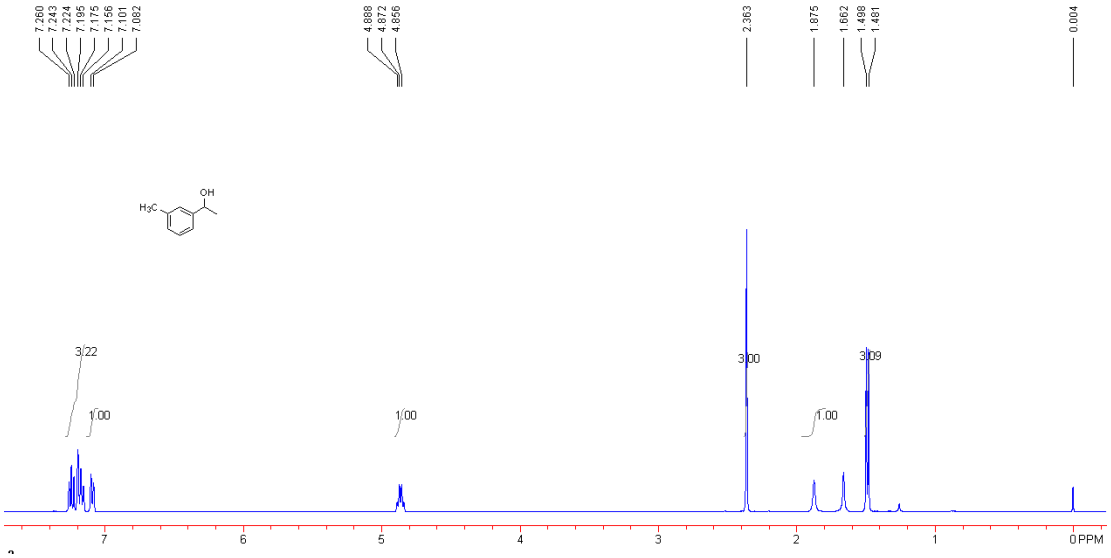

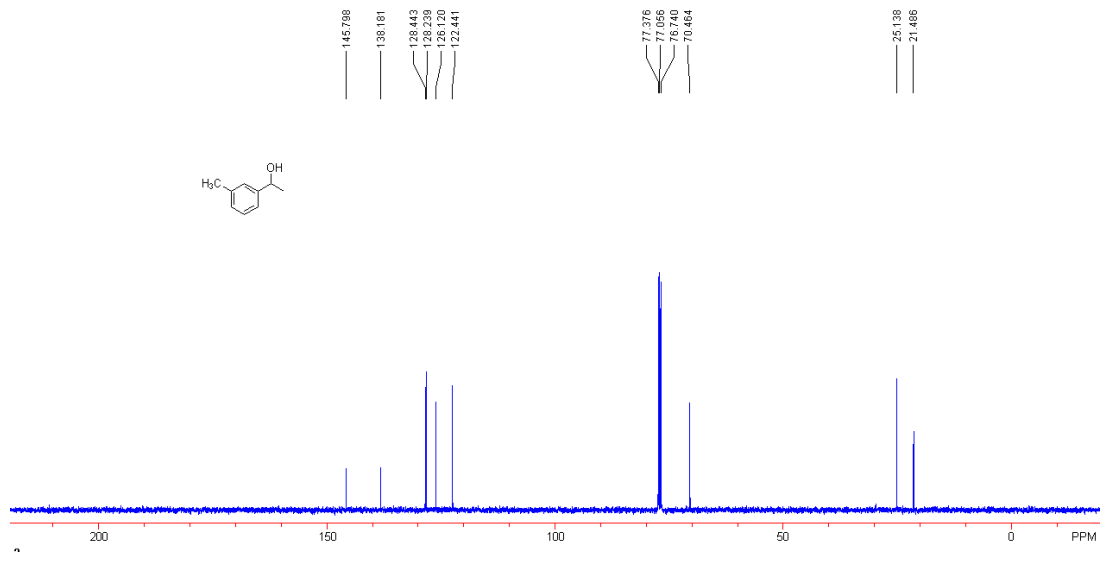

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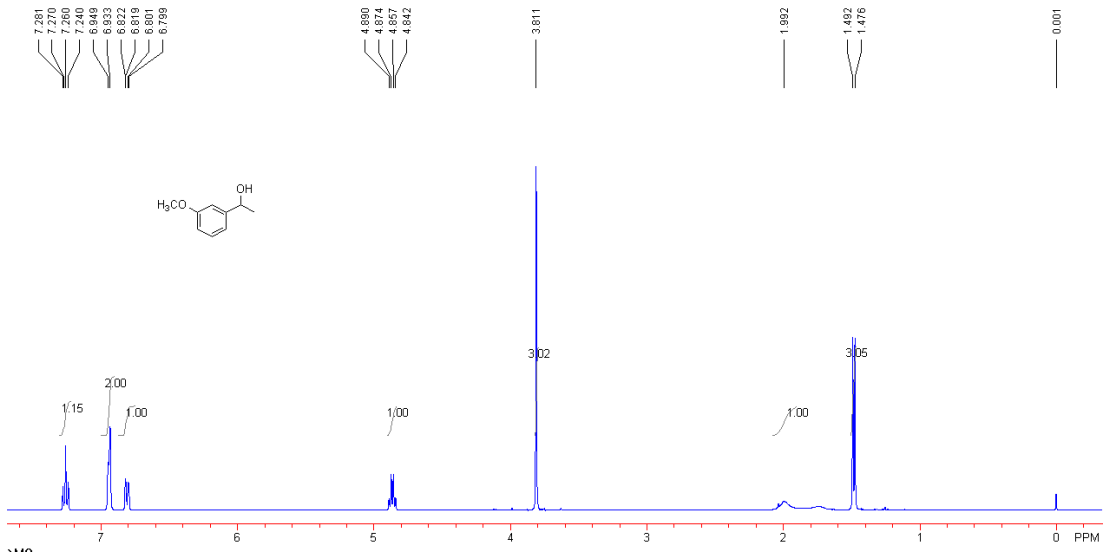

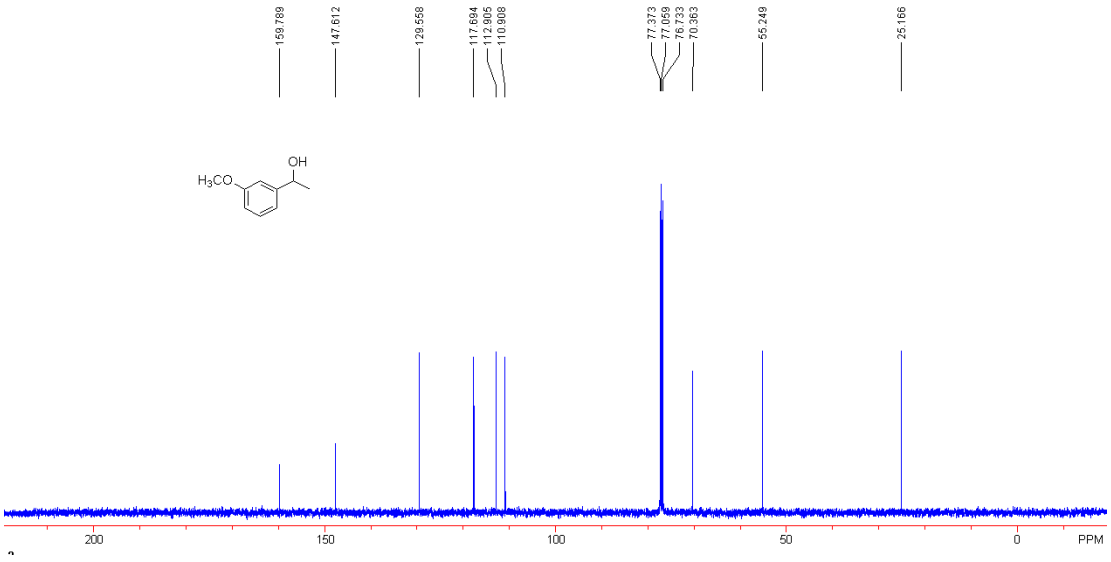

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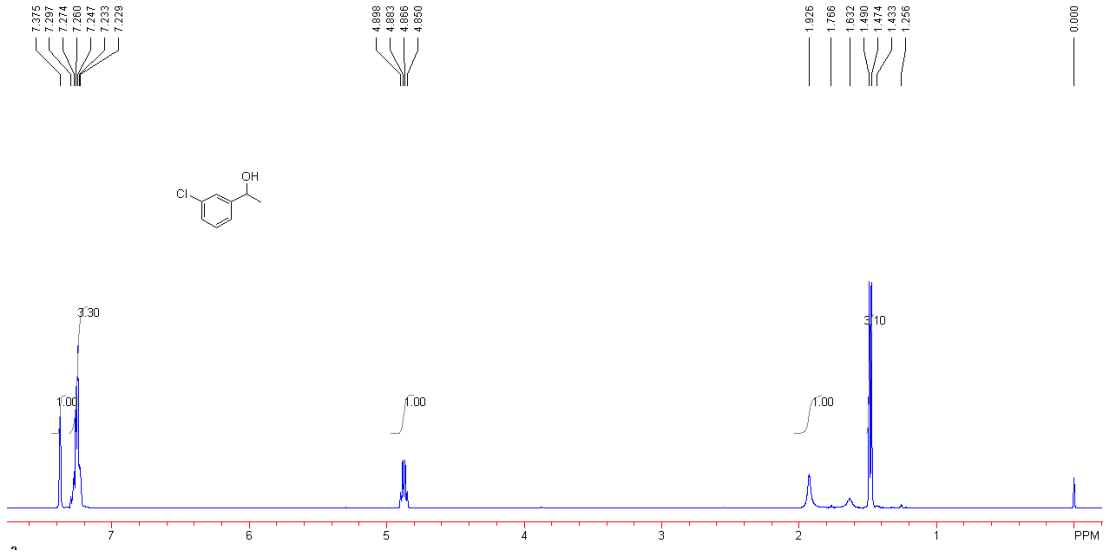

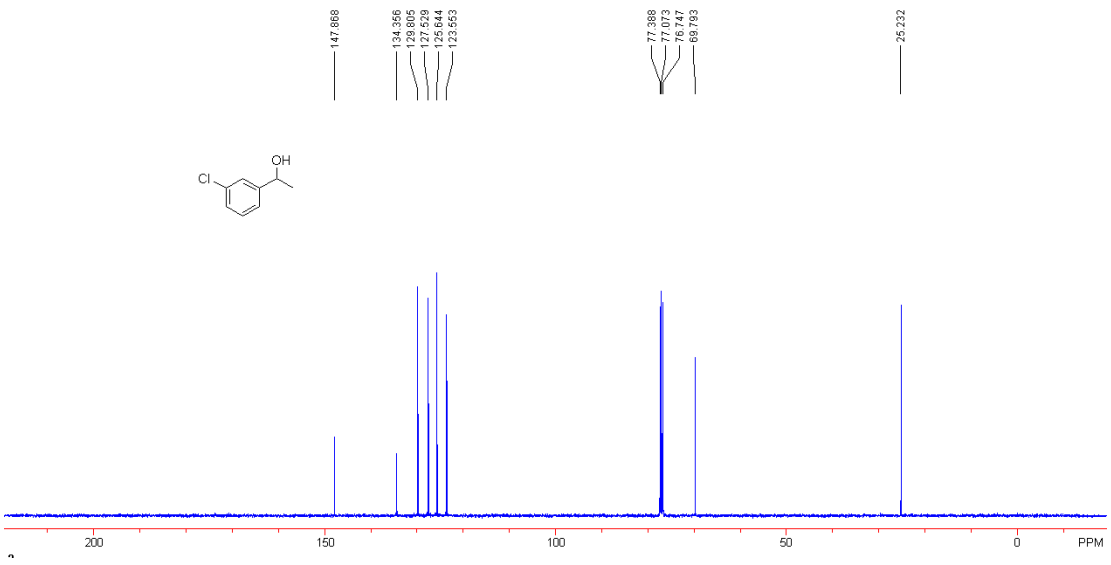

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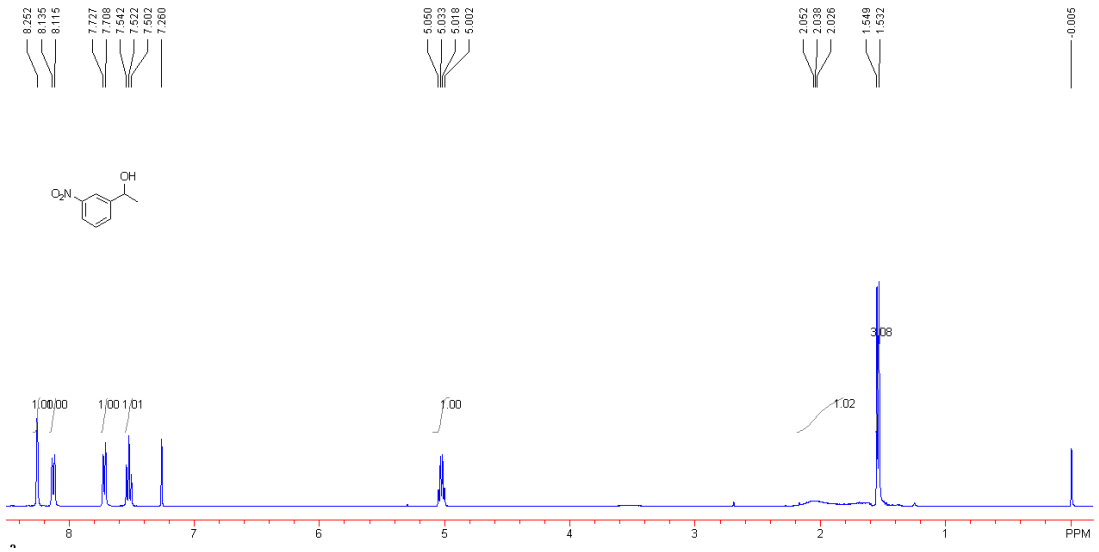
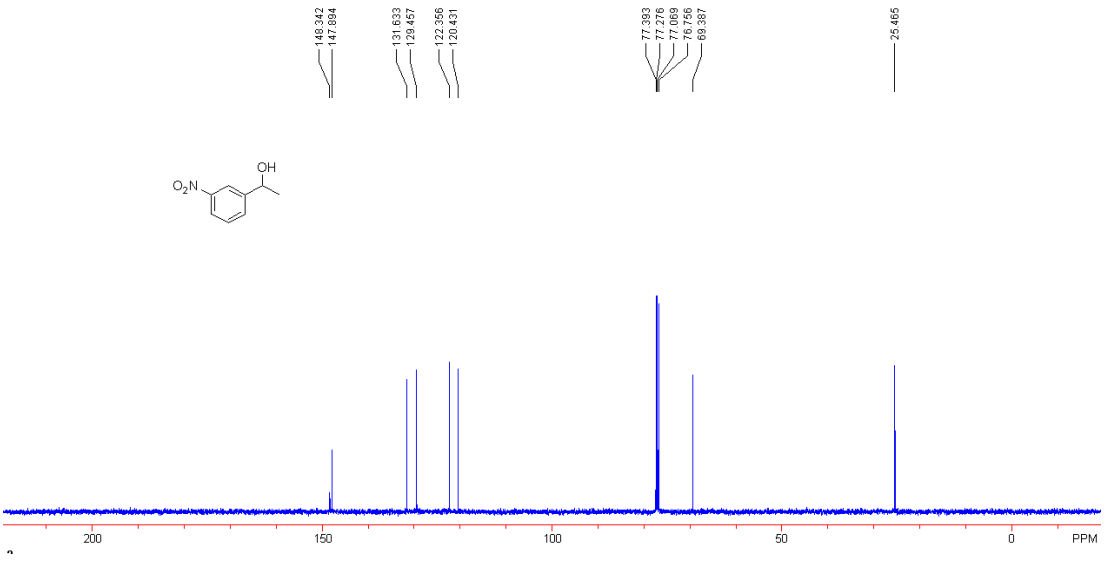
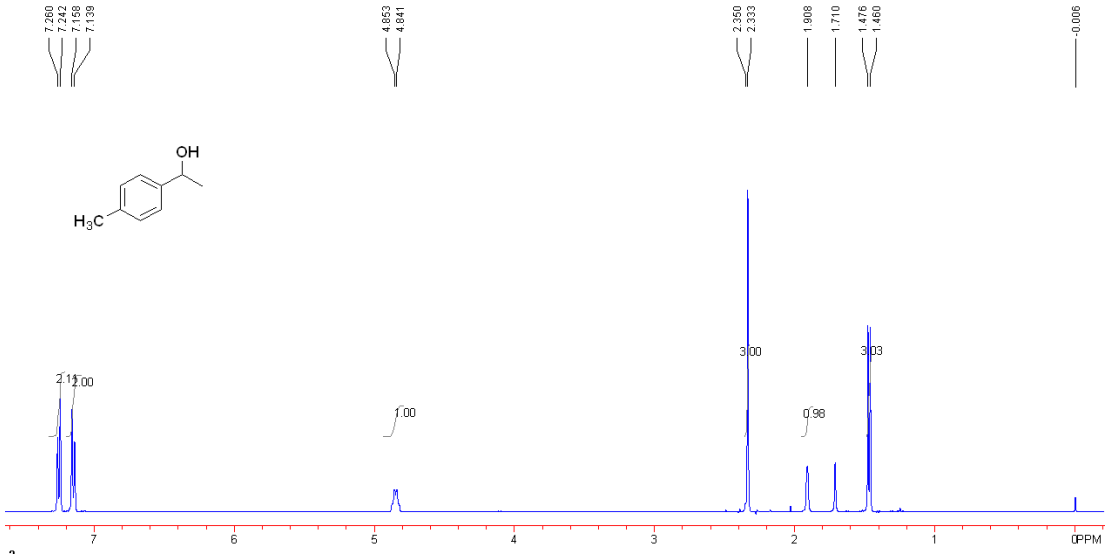
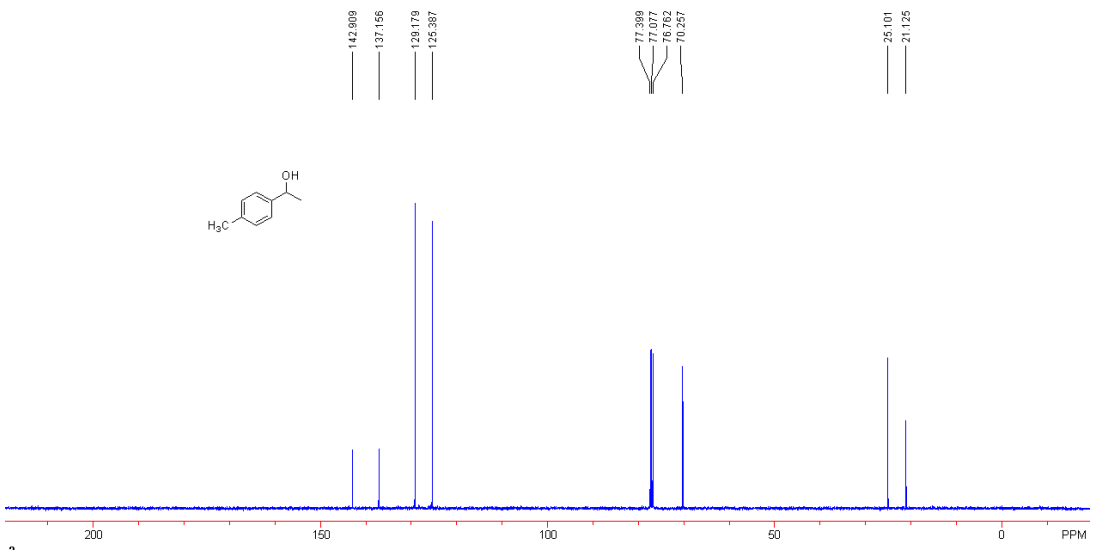




(*S*)-1-(4-Methylphenyl)ethanol thanol (2i)





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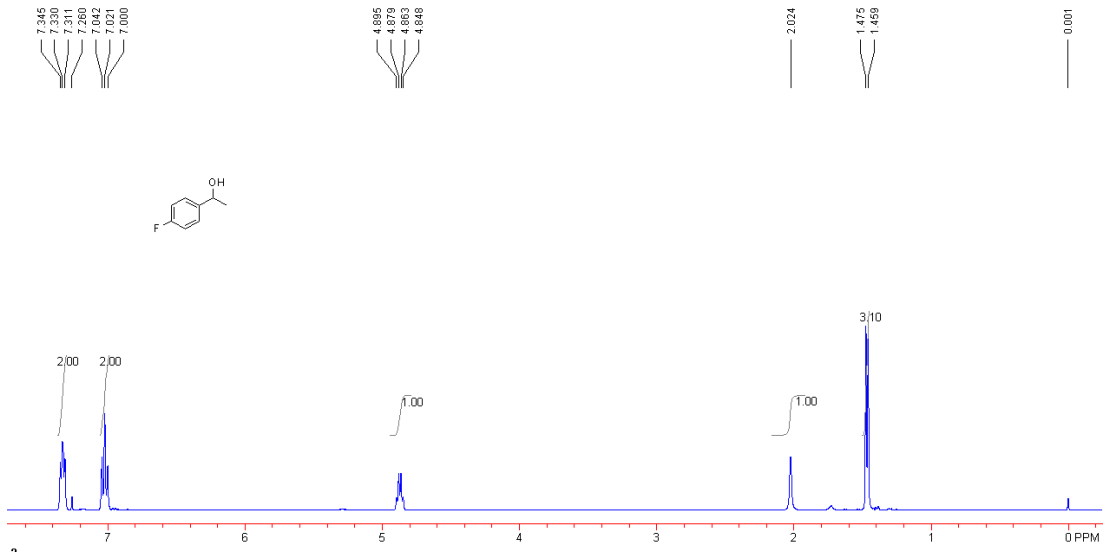

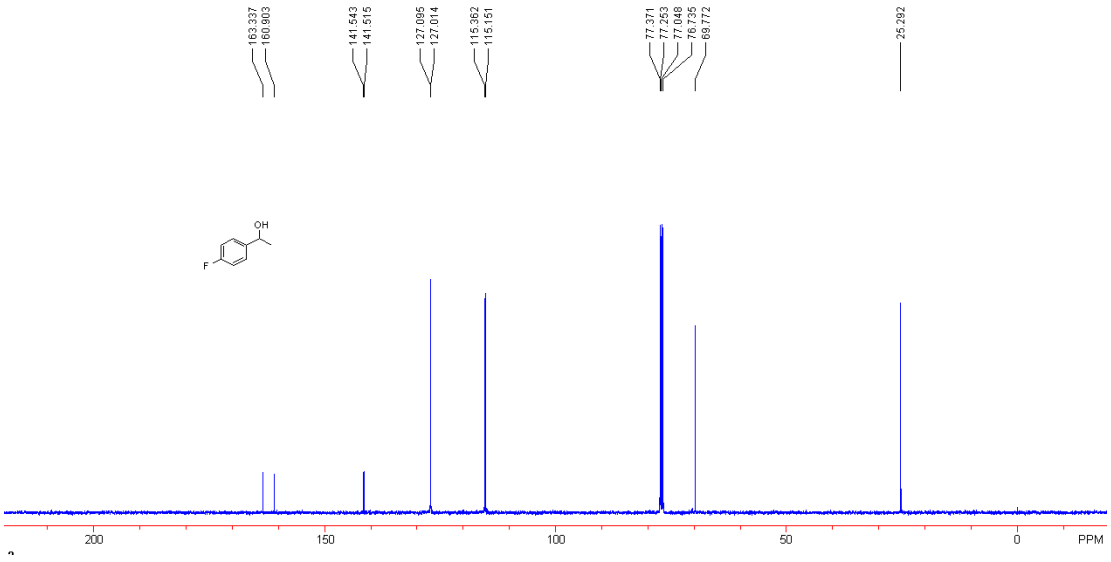

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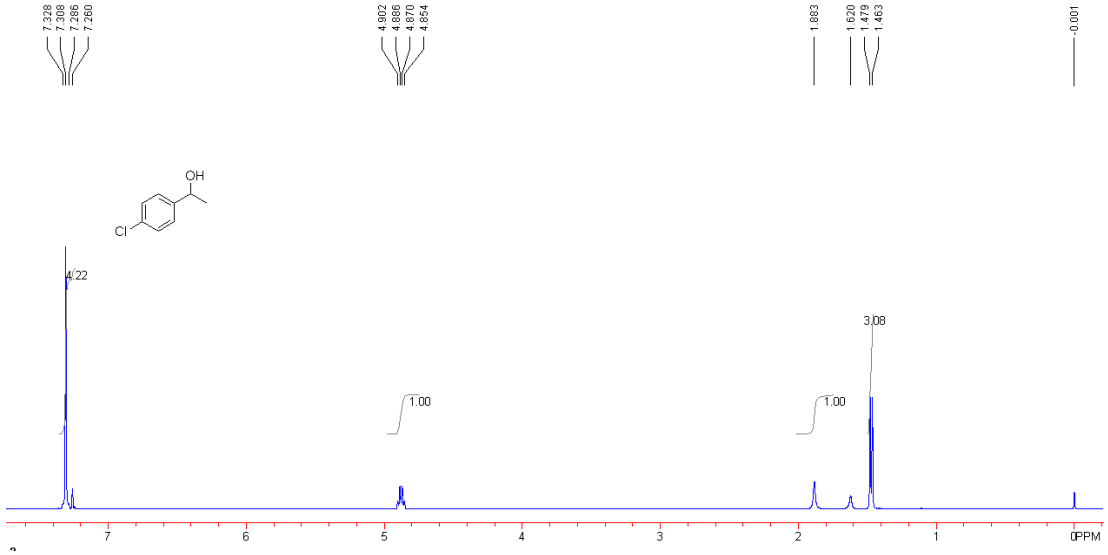

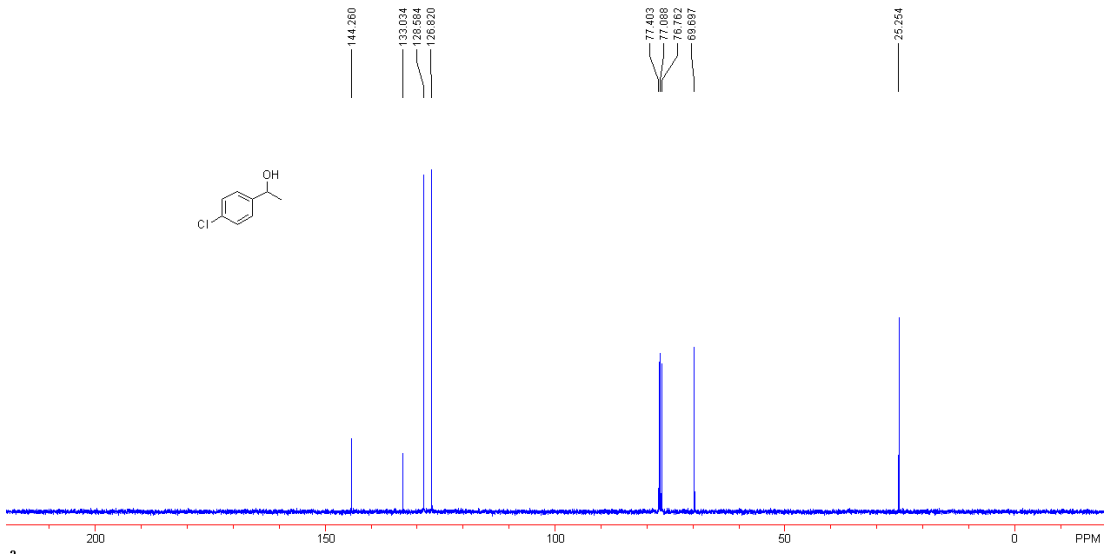

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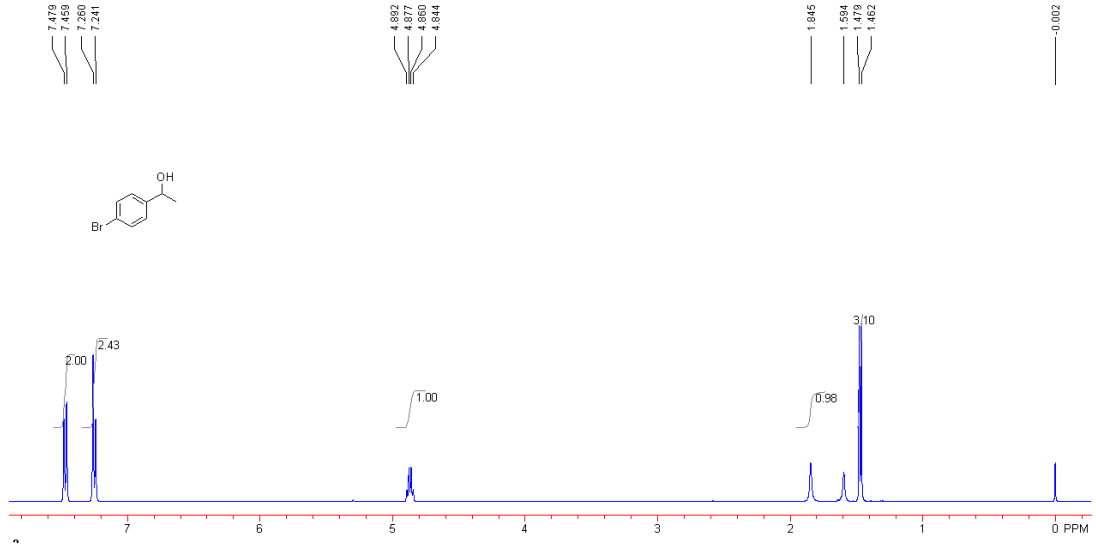
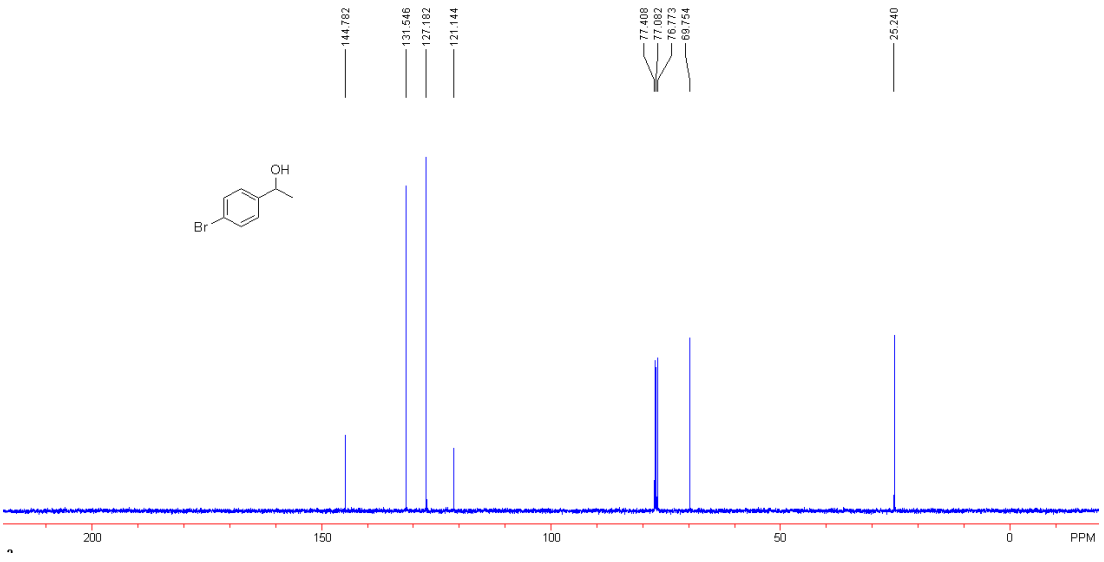
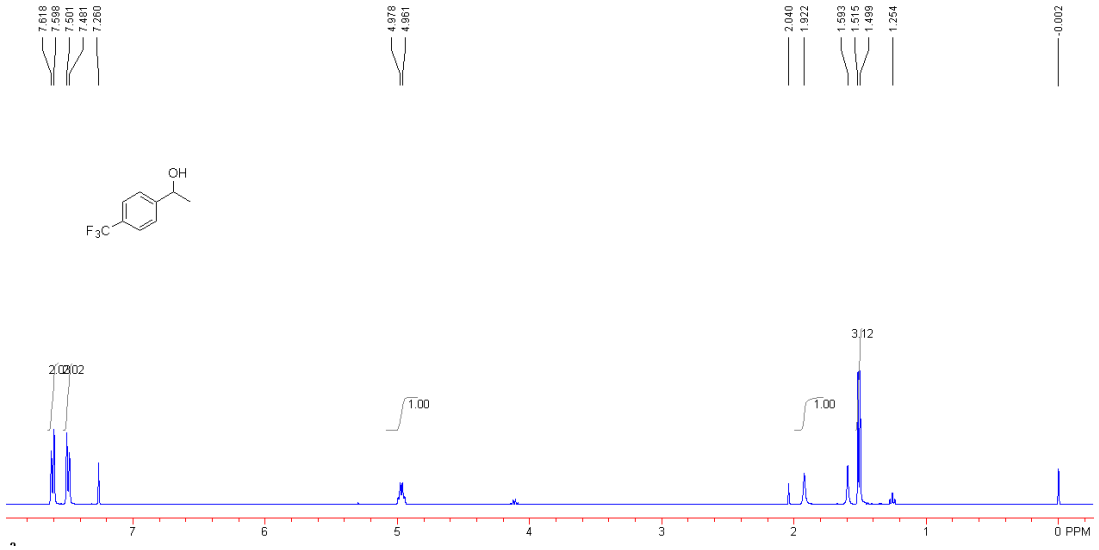
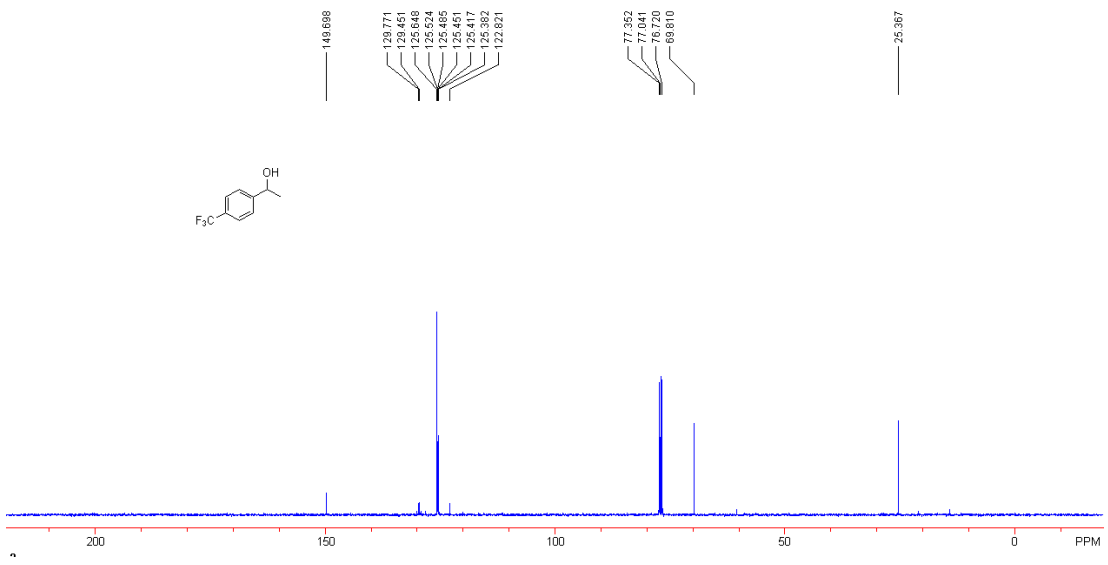




(*S*)-1-(4-(Trifluoromethyl)phenyl)ethanol (2m)





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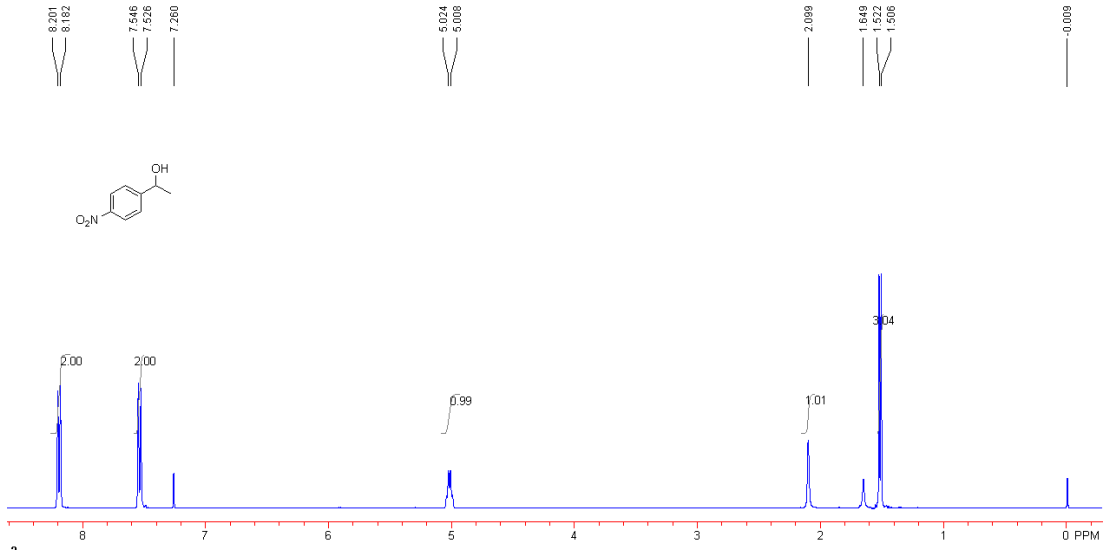
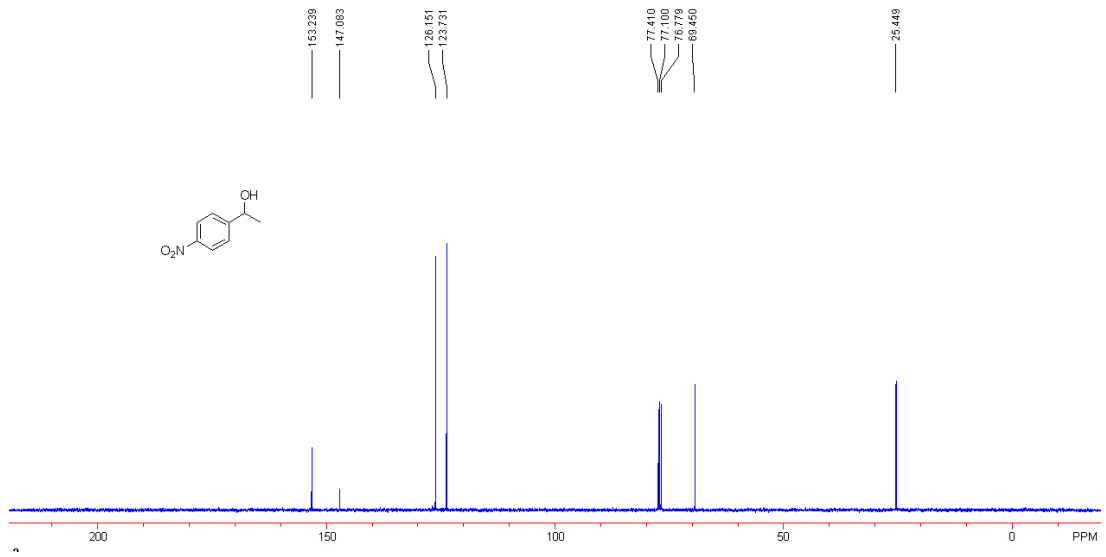
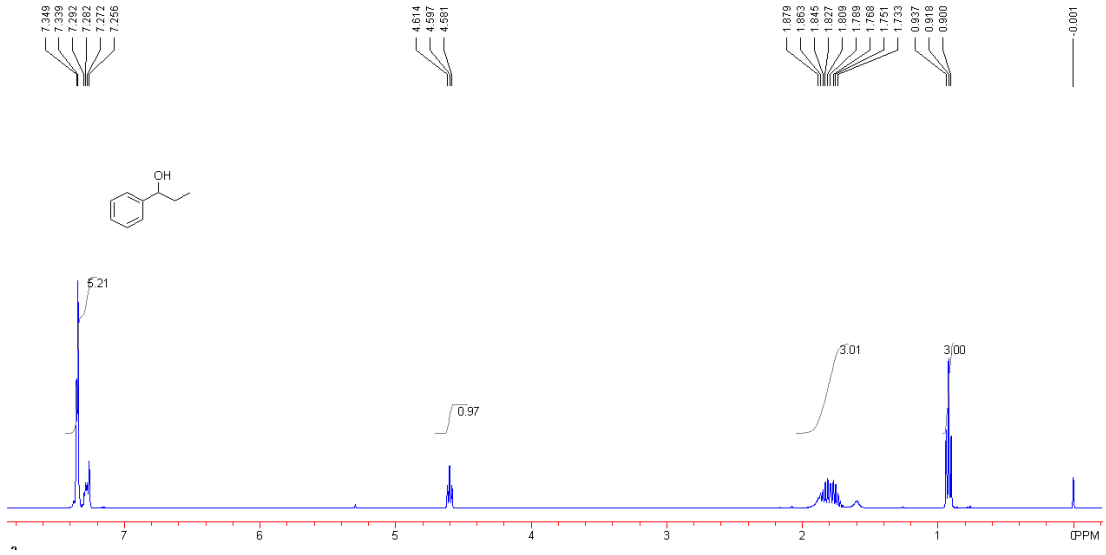
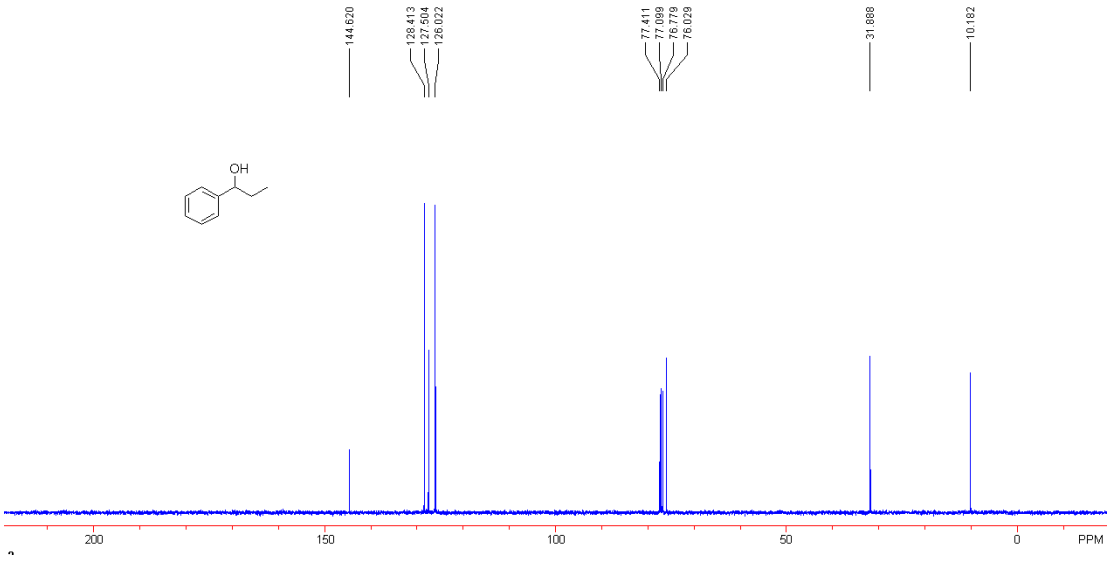


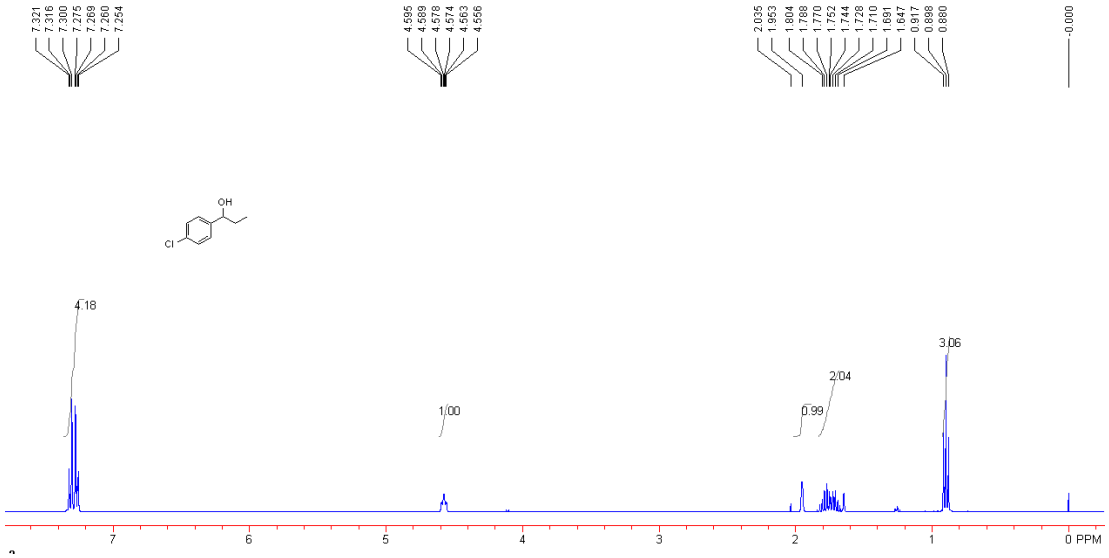


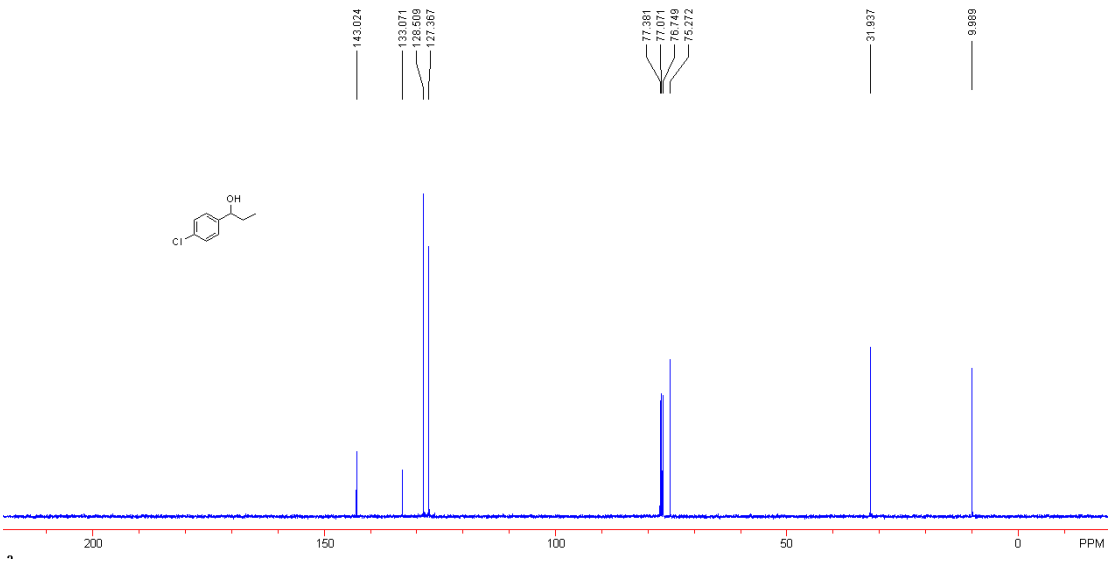
(*S*)-1-Phenylpropan-1-ol (2o)



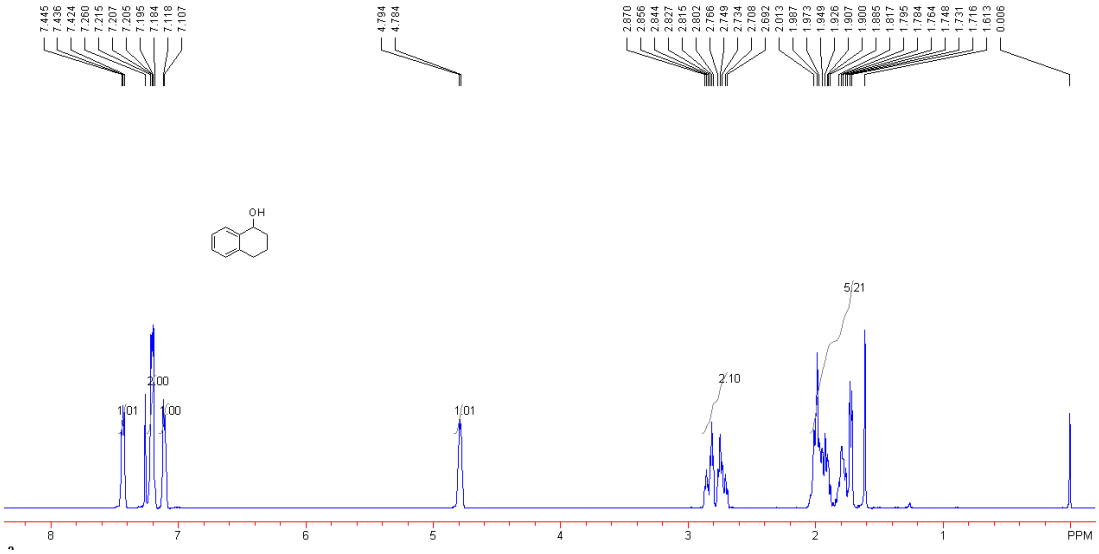


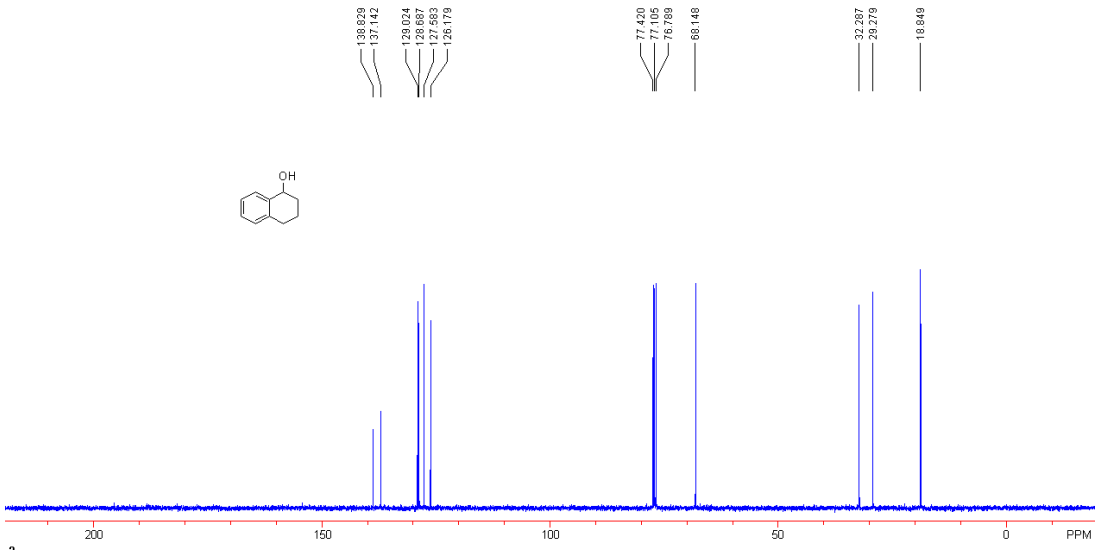
(*S*)-1-(4-Chlorophenyl)propan-1-ol (2p)



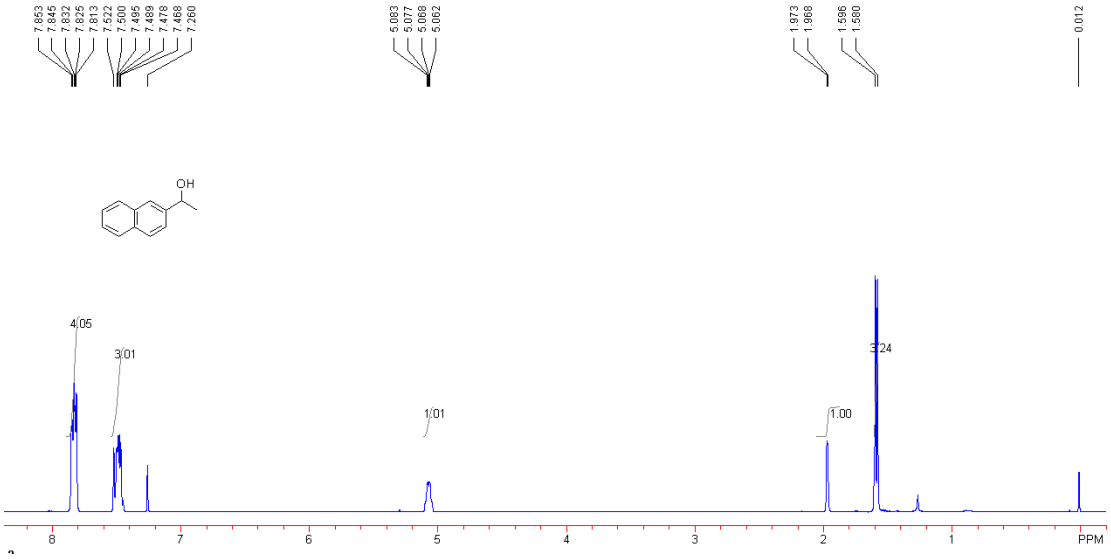


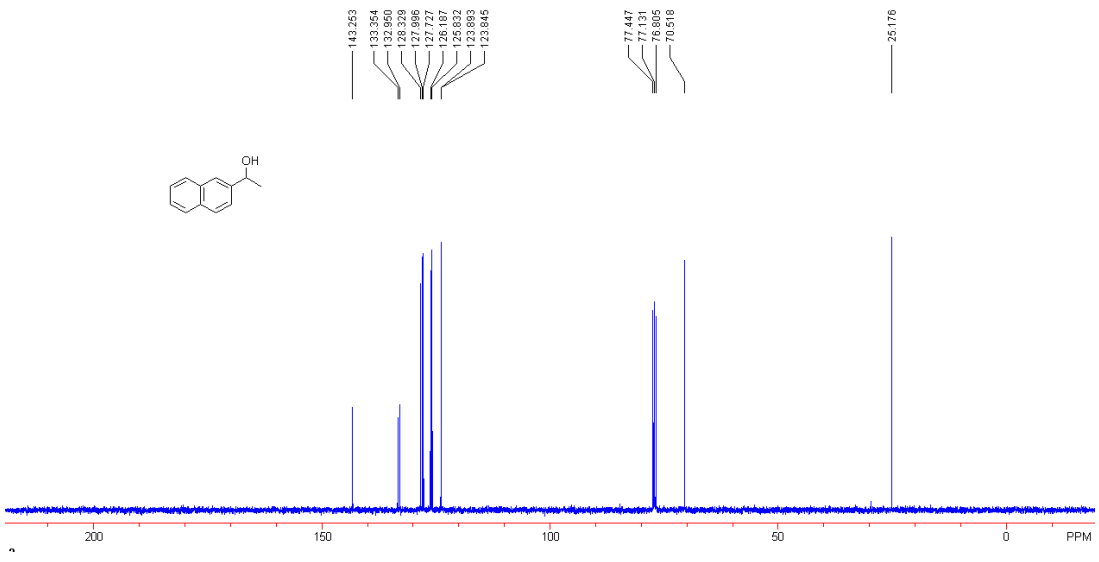
(*S*)-1,2,3,4-Tetrahydronaphthalen-1-ol (4a)



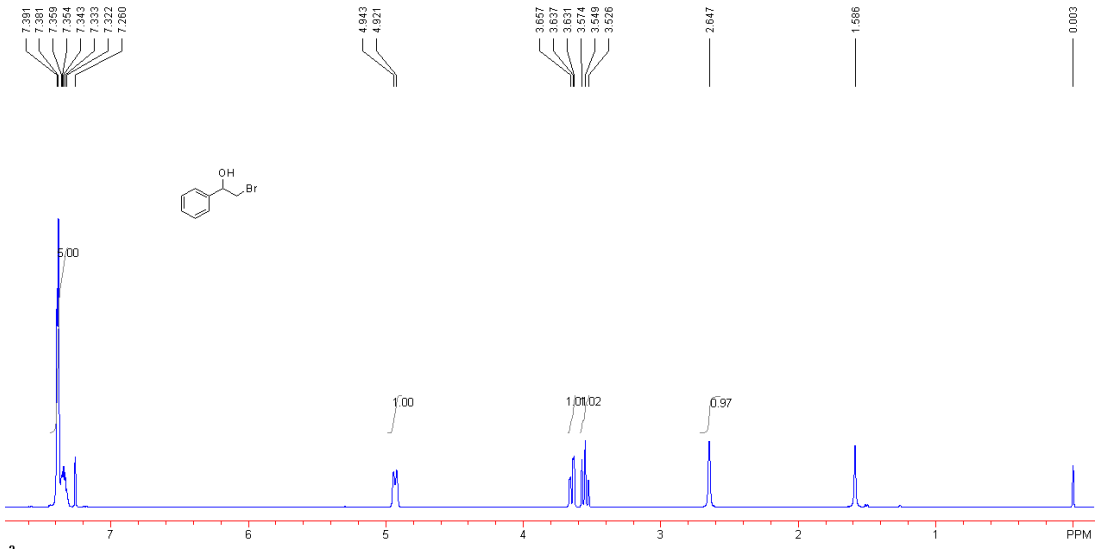


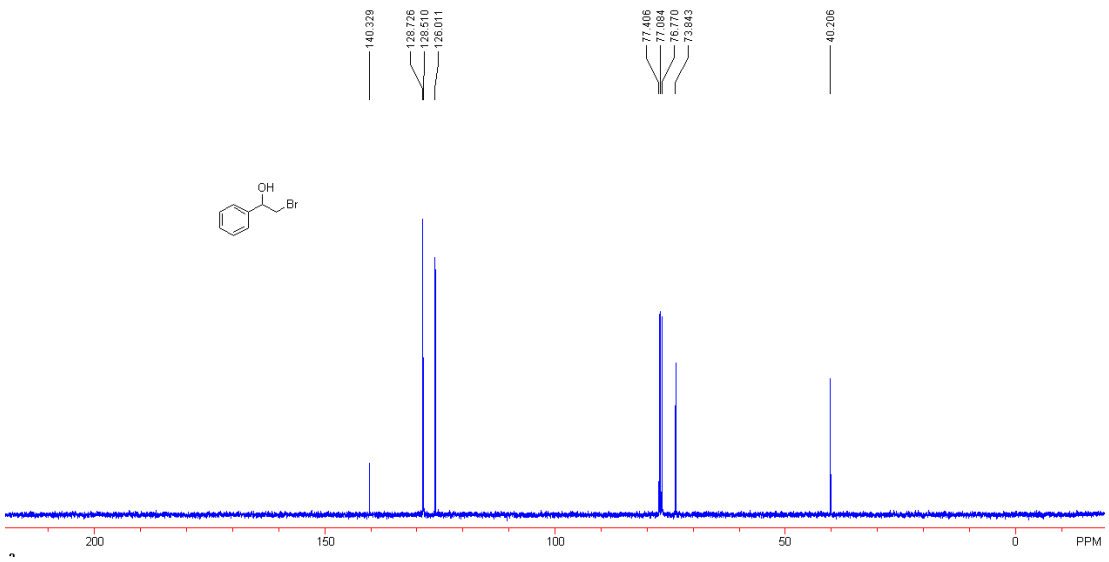
(*S*)-1-(Naphthalen-2-yl)ethanol (4b)



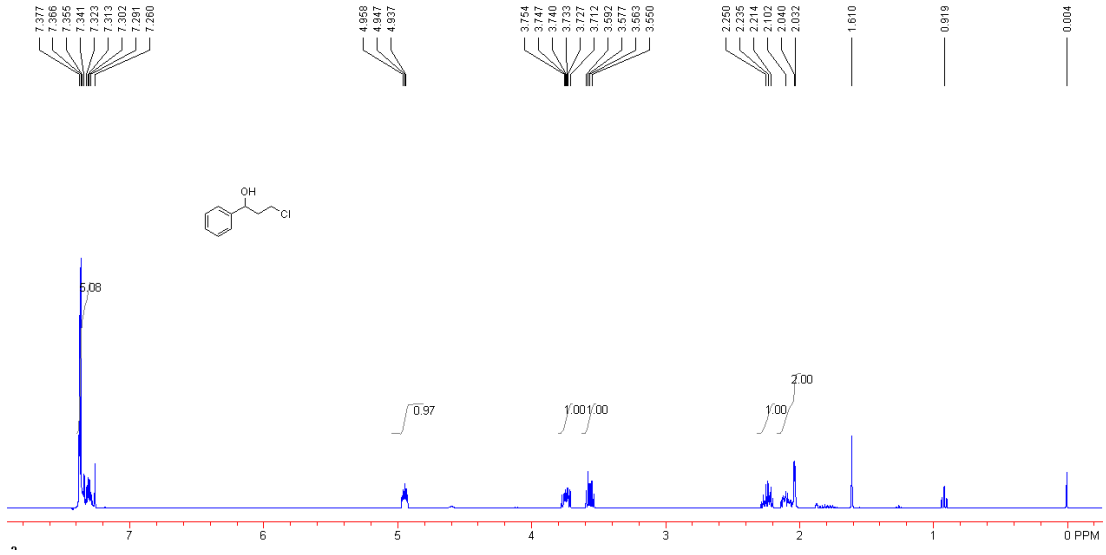


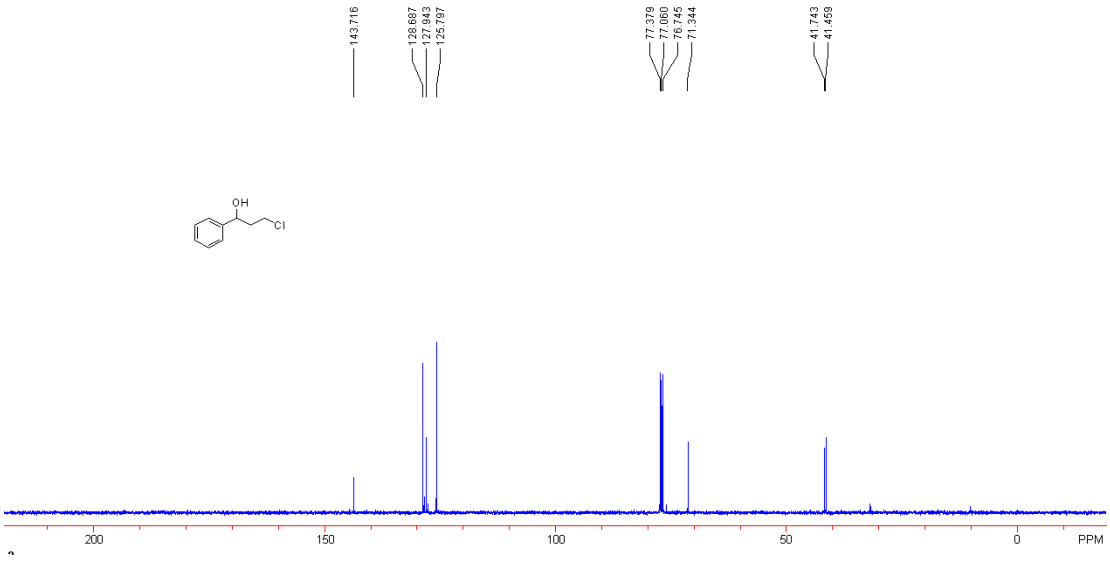
(*R*)-2-Bromo-1-phenylethanol (4c)



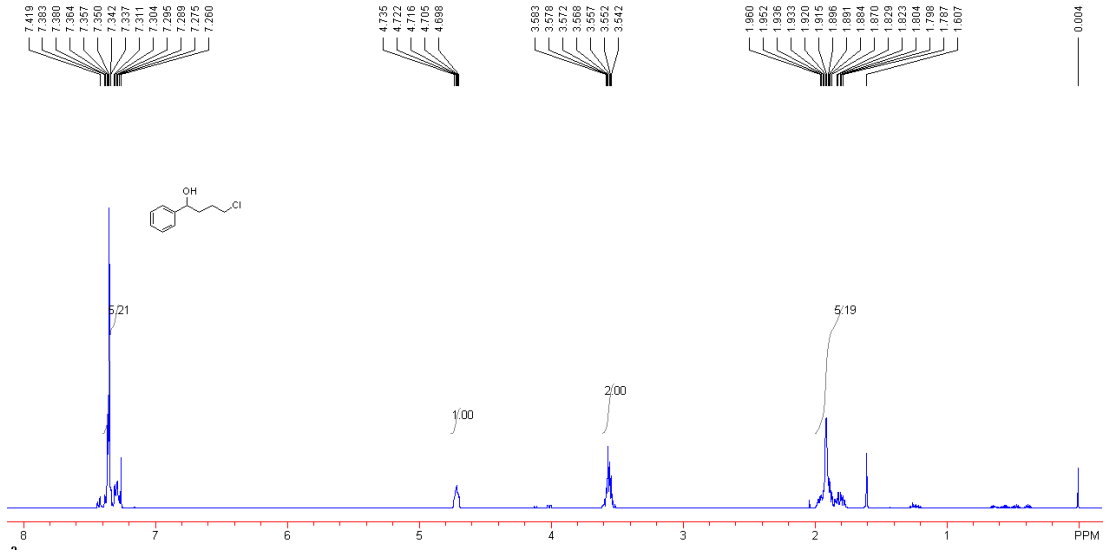


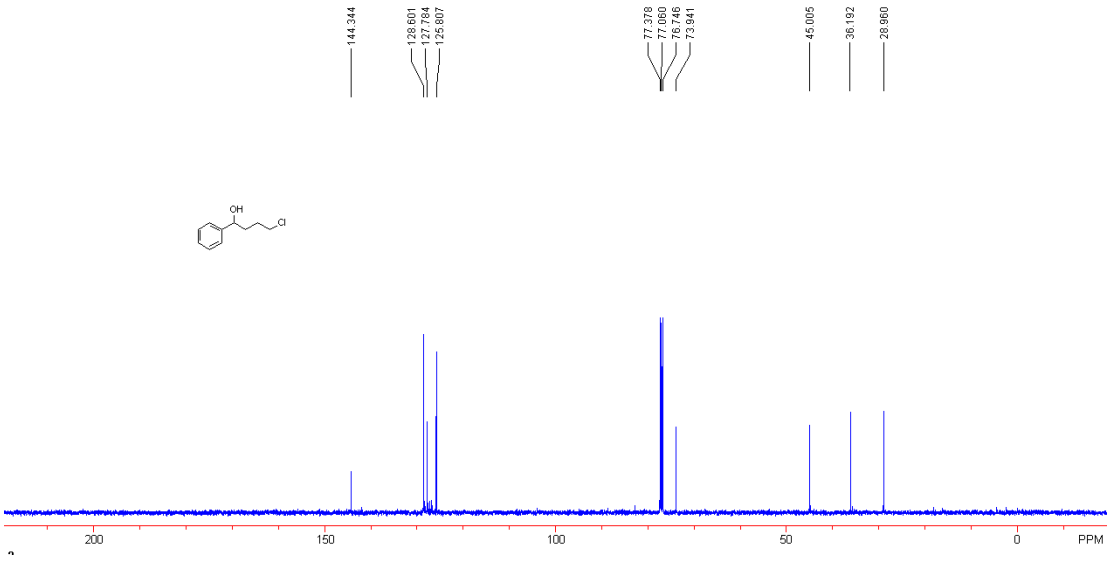
(*S*)-3-Chloro-1-phenylpropan-1-ol (4d)



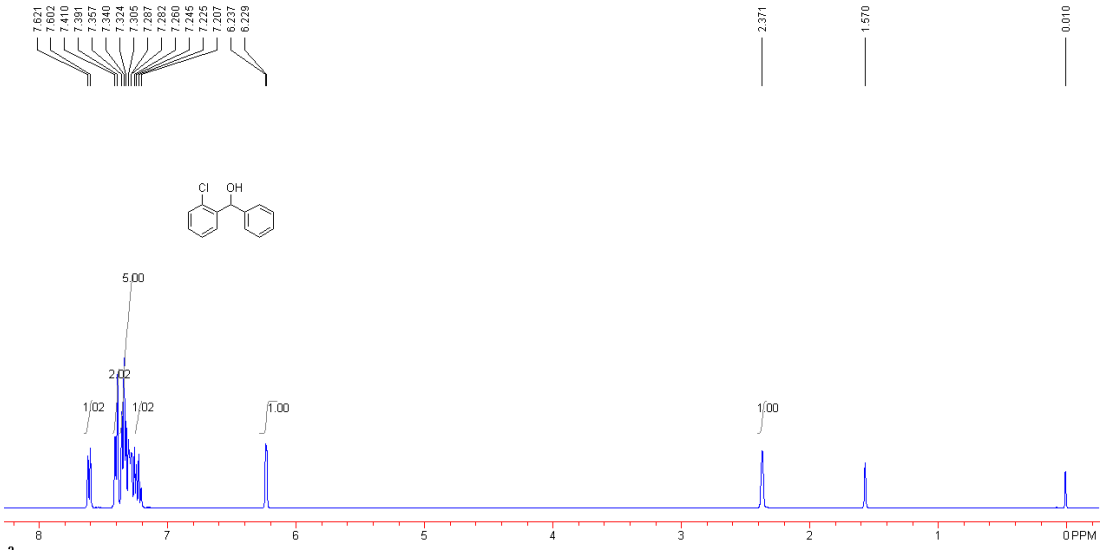


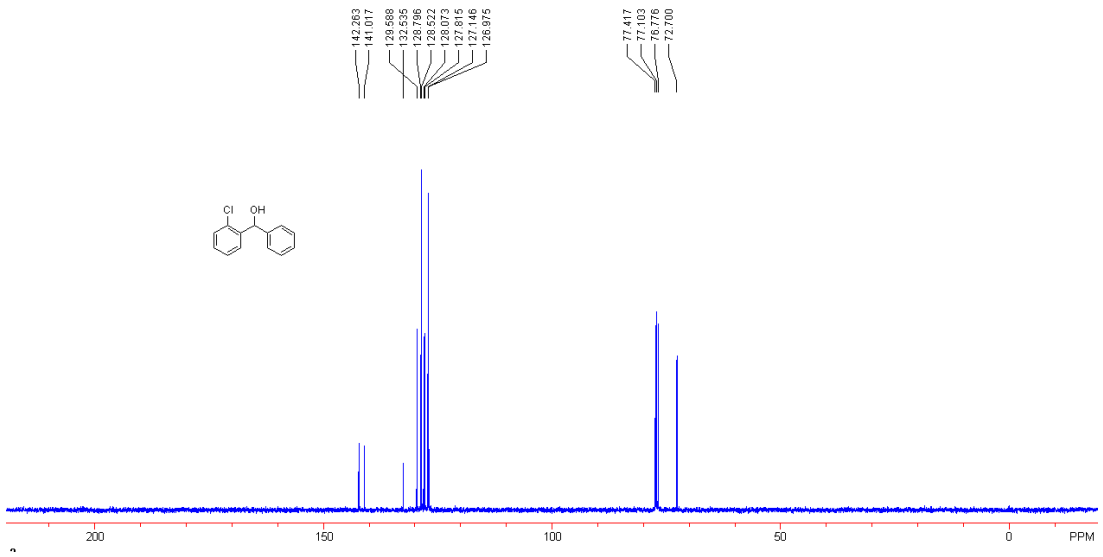
(*R*)-4-Chloro-1-phenylbutan-1-ol (4e)



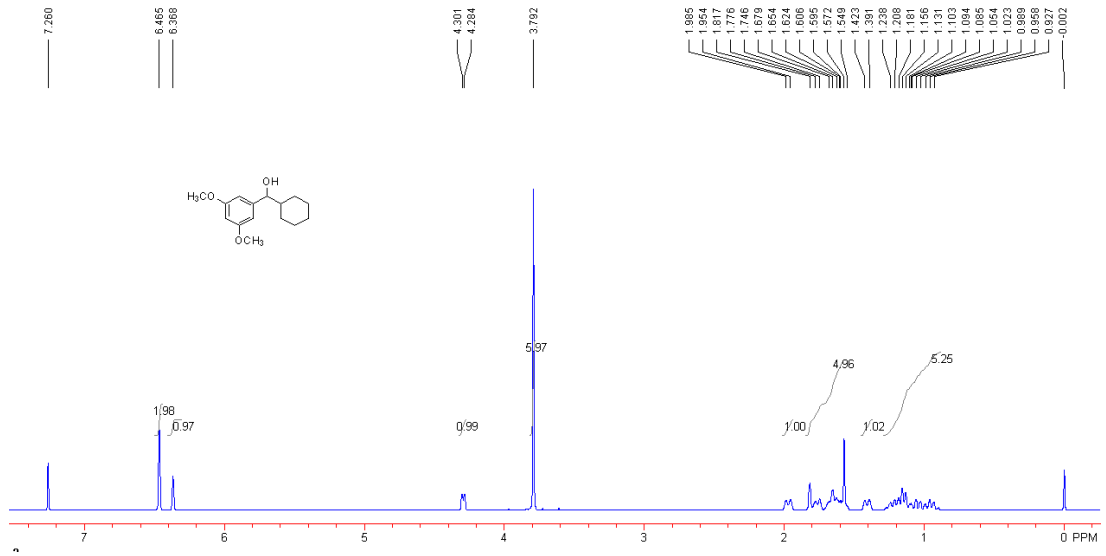


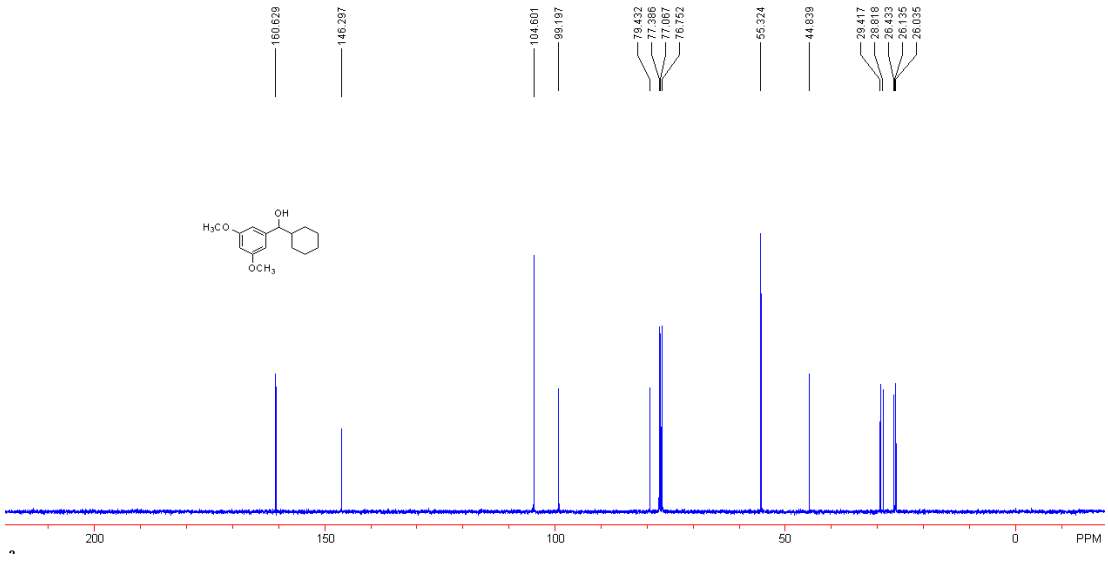
(*R*)-(2-Chlorophenyl)(phenyl)methanol (4f)



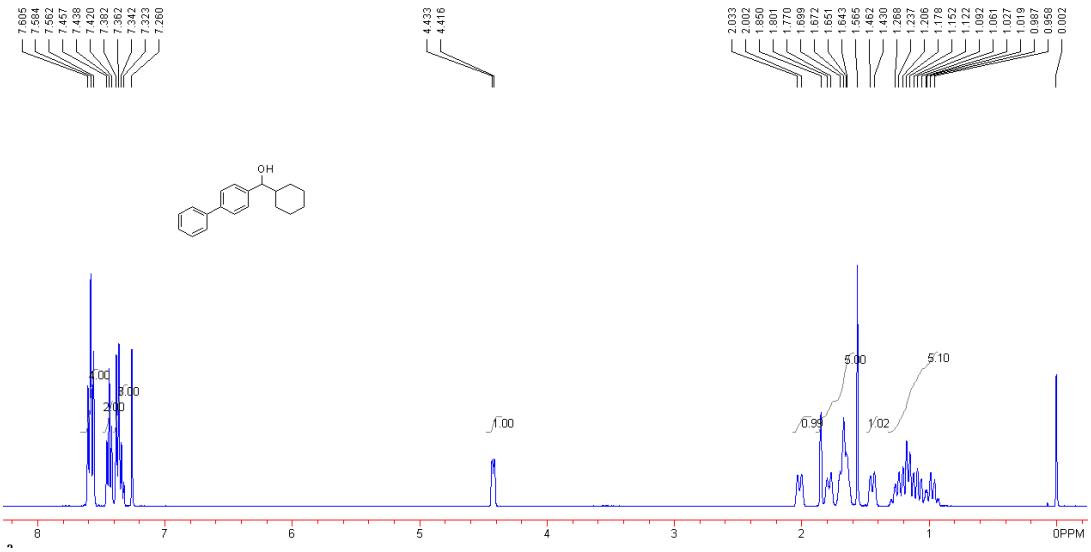


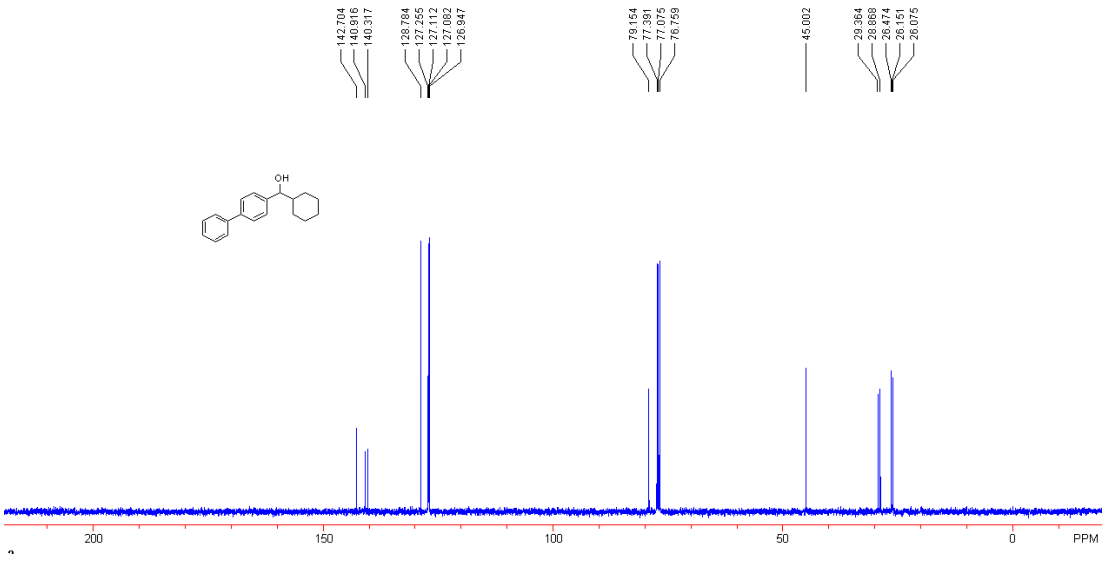
(–)-Cyclohexyl(3,5-dimethoxyphenyl)methanol (4g)



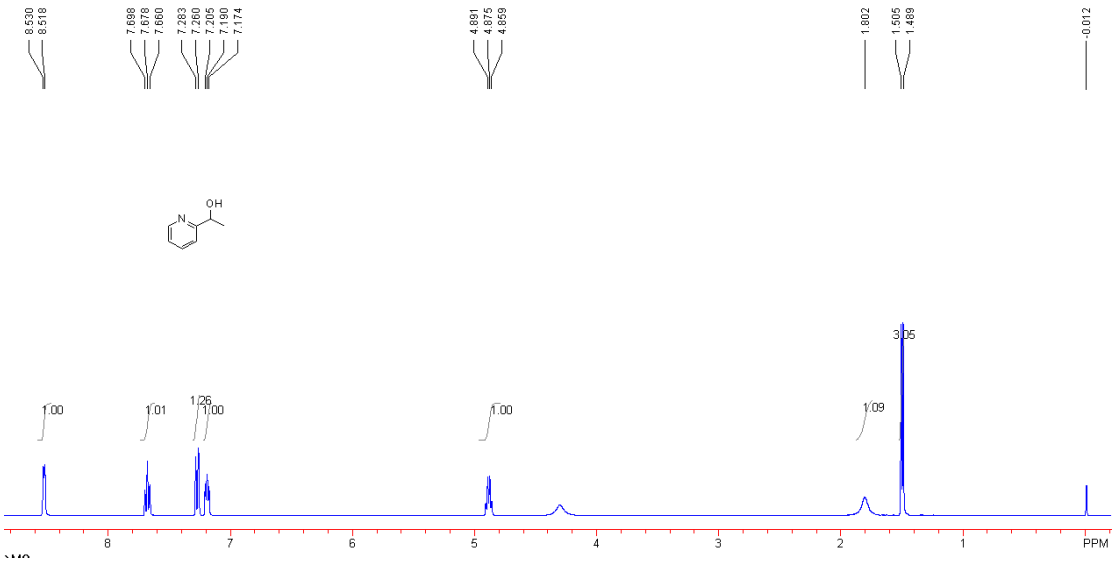


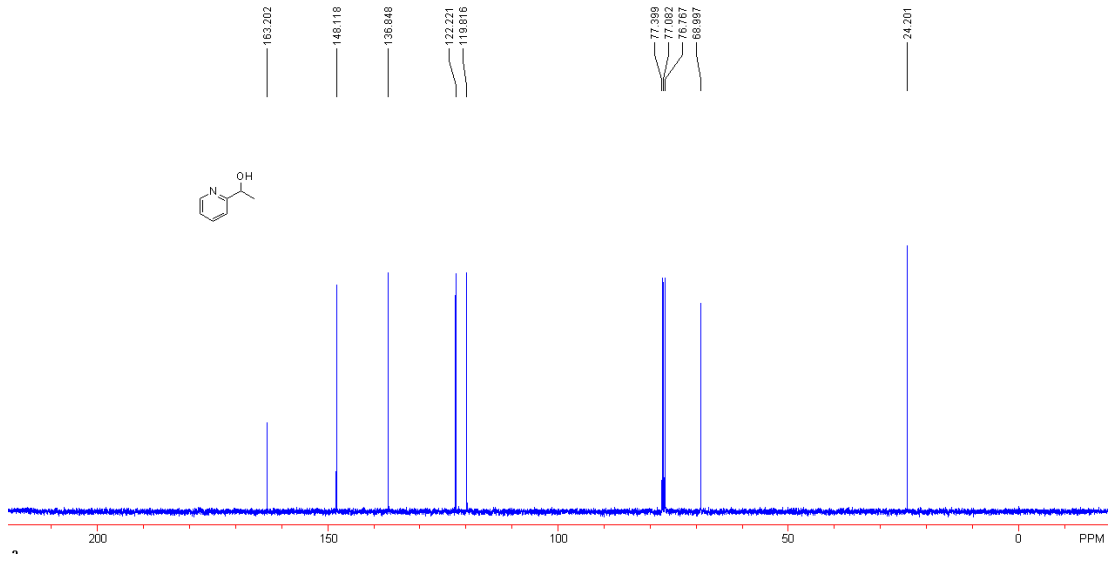
(–)-Cyclohexyl[4-(phenyl)phenyl]methanol (4h)



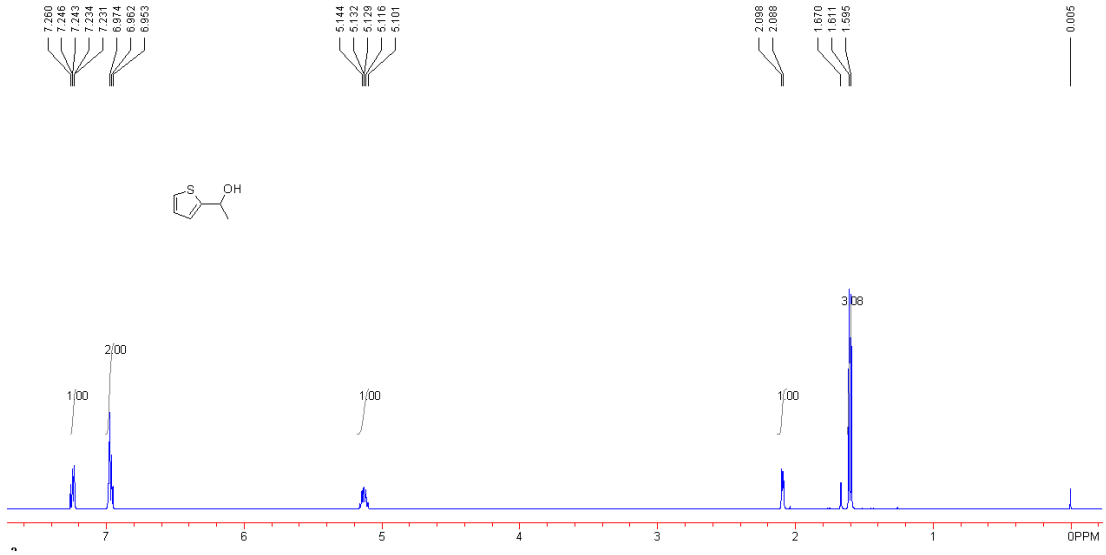


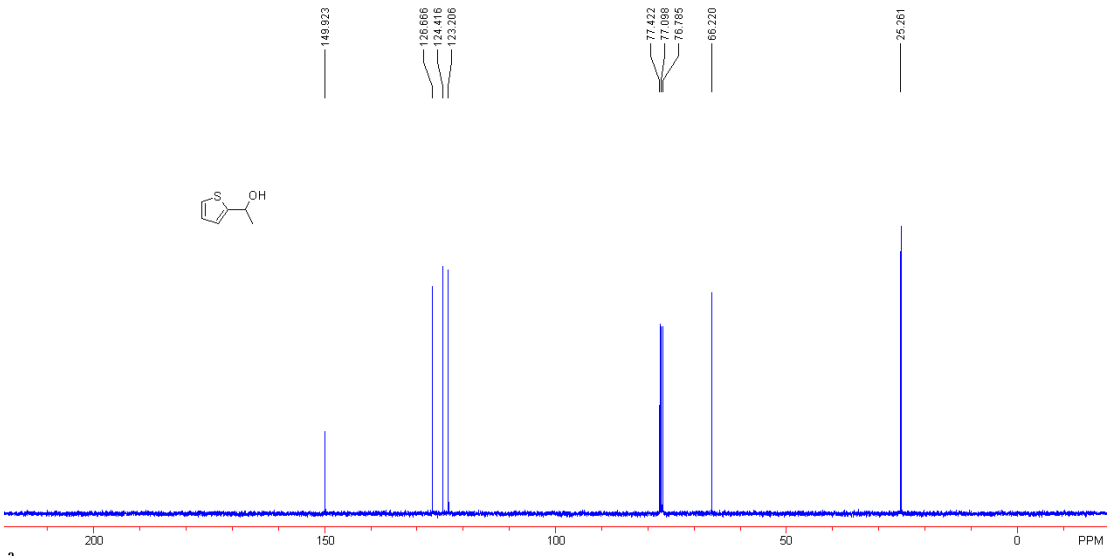
(*S*)-1-(Pyridin-2-yl)ethanol (4i)





(*S*)-1-(Thiophen-2-yl)ethanol (4j)





(*S*)-1-(Thiophen-3-yl)ethanol (4k)