

Supporting Information:

**Chiral benzene backbone-based sulfoxide-olefin ligands for highly
enantioselective Rh-catalyzed addition of arylboronic acids to
N-tosylarylimines**

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1. General

All reactions were carried out under an atmosphere of nitrogen using the standard Schlenk techniques, unless otherwise noted. Solvents were dried and distilled by standard procedures. ¹H NMR and ¹³C NMR spectra were recorded at room temperature in CDCl₃ on 400 MHz and 600 MHz instrument with tetramethylsilane (TMS) as internal standard. Enantiomeric excess was determined by HPLC analysis, using chiral column described below in detail. Optical rotations were measured by polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh). All reactions were monitored by TLC analysis.

Commercially available reagents were used throughout without further purification other than those detailed below. THF, Et₂O and toluene were distilled over sodium benzophenone ketyl under nitrogen. Methylene chloride was distilled over calcium hydride. Arylboronic acids were recrystallized from water.

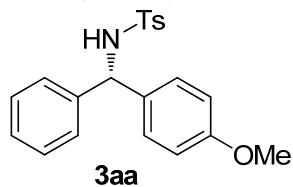
N-tosylarylimines **1** can be conveniently synthesized according to the known literature procedures.^[1] Ligands **L1-6** were prepared according to literature procedures.^[2]

2. General Procedure for the enantioselective Rh-catalyzed addition of arylboronic acids to *N*-tosylarylimines

Under nitrogen atmosphere, a mixture of [RhCl(C₂H₄)₂]₂ (1.8 mg, 0.0045 mmol) and ligand **L6f** (4.7 mg, 0.0099 mmol) in 1 mL toluene was stirred at room temperature for 1 h. At which time arylboronic acid (0.45 mmol) was added, followed by *N*-tosylarylimines (0.30 mmol), aqueous KF (1.5 M in H₂O, 0.20 mL, 0.30 mmol) and toluene (1 mL). The reaction was stirred at 50 °C for 5-6 h. When the reaction was over, the reaction mixture was concentrated in vacuo and purified by silica gel flash column chromatography (petroleum ether/ethyl acetate as eluent) to afford the product.

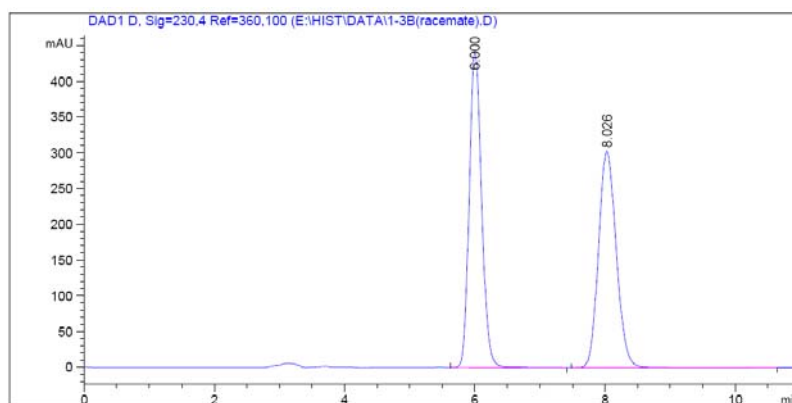
3. Characterization and HPLC of the obtained adducts

(*S*)-*N*-((4-methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (**3aa**).^[6] White solid, 106 mg, 96% yield, 97% ee, m.p. 130–132 °C. $[\alpha]_D^{24} = -17.0$ ($c = 1.00$, CHCl_3). HPLC: Chiracel



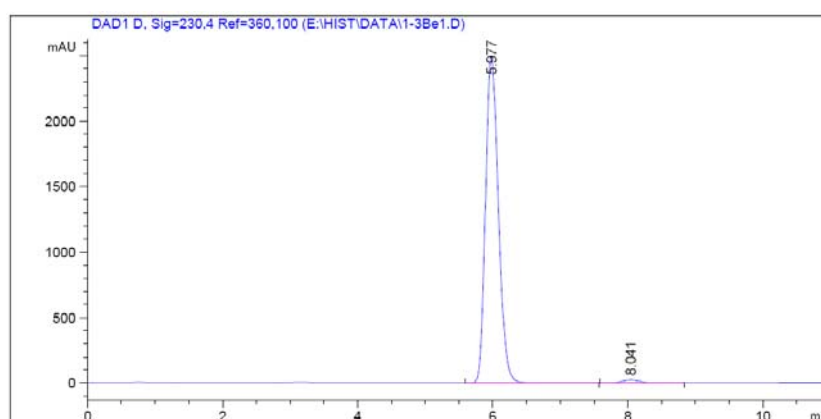
OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.97$ min (major) and 8.04 min (minor). ^1H NMR (400 MHz, CDCl_3) δ 7.55 (d, $J = 8.3$ Hz, 2H), 7.23 – 7.16 (m, 3H), 7.15 – 7.07 (m, 4H), 7.02 – 6.95 (m, 2H), 6.75 – 6.68 (m, 2H), 5.51 (d, $J = 7.1$ Hz, 1H), 5.27 (d, $J = 6.9$ Hz, 1H), 3.74 (s, 3H), 2.37 (s, 3H).

^{13}C NMR (100 MHz, CDCl_3) δ 159.1, 143.3, 140.9, 137.5, 132.9, 129.5, 128.7, 128.6, 127.6, 127.4, 127.3, 114.0, 60.9, 55.4, 21.6.



Results

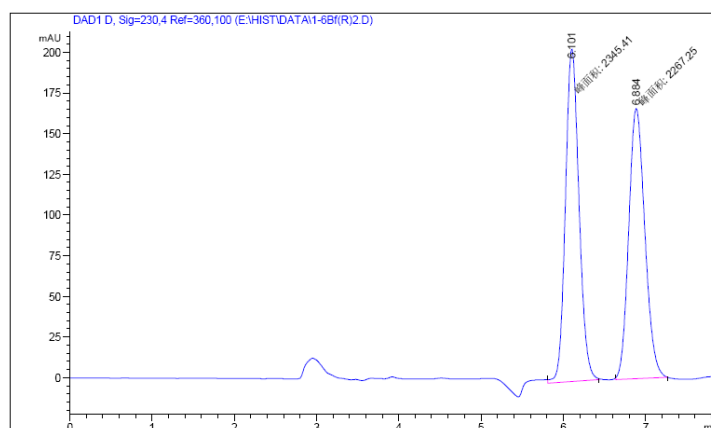
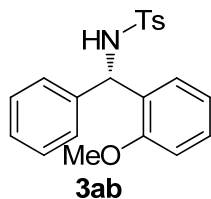
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.000	441.56912	5828.17871	50.3994
2		8.026	302.51950	5735.79639	49.6006
Total			744.08862	1.15640e4	100.000



Results

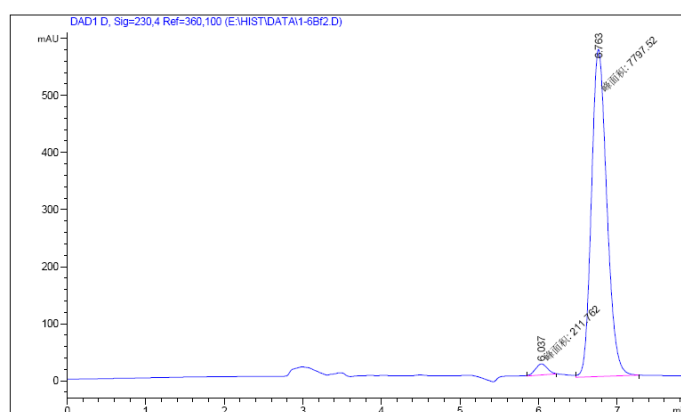
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		5.977	2498.24023	3.31195e4	98.5579
2		8.041	25.50181	484.58978	1.4421
Total			2523.74205	3.36041e4	100.000

(*S*)-*N*-((2-methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(**3ab**).^[5] White solid, 102 mg, 93% yield, 96% ee, m.p. 119–121 °C. $[\alpha]_D^{24} = -25.1$ ($c = 1.00$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.04$ min (minor) and 6.76 min (major). ^1H NMR (600 MHz, CDCl_3) δ 7.51 (d, $J = 7.5$ Hz, 2H), 7.25 – 7.12 (m, 6H), 7.04 (d, $J = 7.6$ Hz, 2H), 6.98 (d, $J = 7.3$ Hz, 1H), 6.77 (t, $J = 7.3$ Hz, 1H), 6.67 (d, $J = 8.2$ Hz, 1H), 5.87 – 5.75 (m, 1H), 5.65 (d, $J = 9.1$ Hz, 1H), 3.59 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 156.5, 142.9, 140.7, 137.6, 129.7, 129.2, 129.1, 128.3, 127.8, 127.2, 127.1, 126.9, 120.8, 111.2, 59.2, 55.4, 21.5.



Results

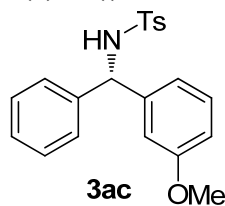
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.101	204.80034	2345.40869	50.8472
2		6.884	166.39490	2267.24731	49.1528
Total			371.19524	46612.65601	100.000



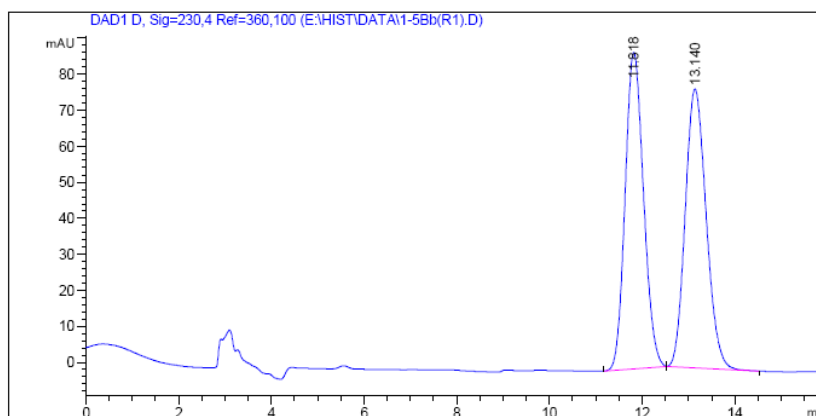
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.037	19.66265	211.76219	2.6440
2		6.763	574.44745	7797.52490	97.3560
Total			594.11010	8009.28709	100.000

(*S*)-*N*-((3-methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide (**3ac**).^[5] White solid,

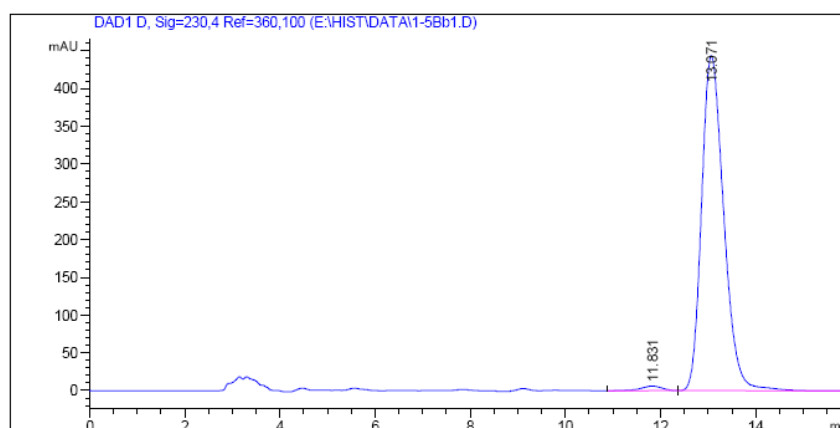


105 mg, 95% yield, 97% ee, m.p. 151–153 °C. $[\alpha]_D^{24} = -1.6$ ($c = 0.82$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 90/10, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 11.83$ min (minor) and 13.07 min (major). $^1\text{H NMR}$ (600 MHz, CDCl_3) δ 7.56 (d, $J = 8.3$ Hz, 2H), 7.25 – 7.17 (m, 3H), 7.14 – 7.10 (m, 5H), 6.73 – 6.71 (m, 1H), 6.67 (d, $J = 7.6$ Hz, 1H), 6.63 – 6.59 (m, 1H), 5.53 (d, $J = 7.1$ Hz, 1H), 5.10 (d, $J = 7.0$ Hz, 1H), 3.68 (s, 3H), 2.37 (s, 3H). $^{13}\text{C NMR}$ (150 MHz, CDCl_3) δ 159.8, 143.4, 142.2, 140.6, 137.5, 129.7, 129.5, 128.7, 127.8, 127.5, 127.4, 119.9, 113.2, 113.1, 61.4, 55.3, 21.6.



Results

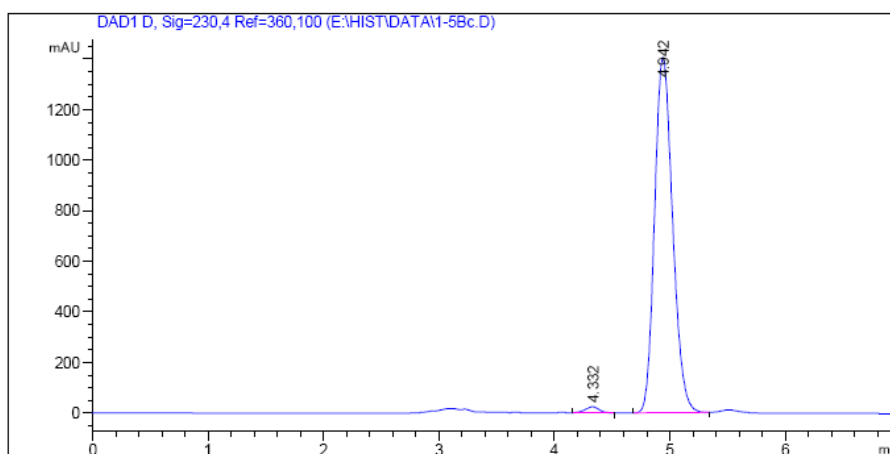
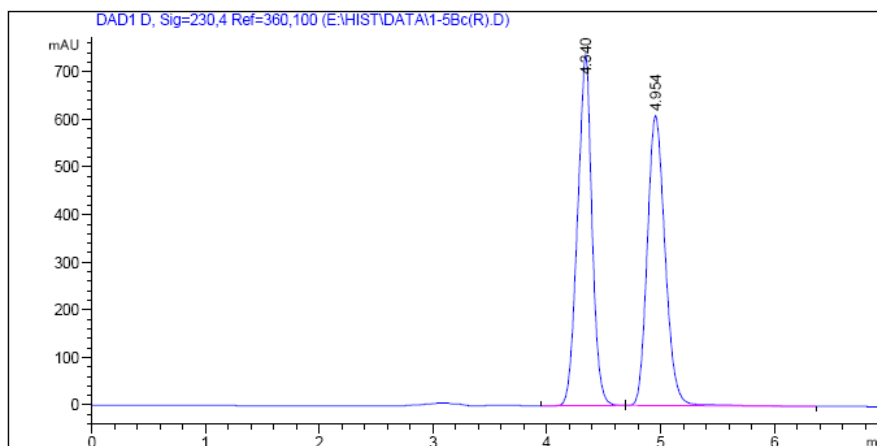
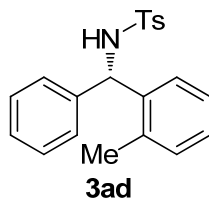
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		11.818	87.73759	2418.31567	49.9408
2		13.140	77.31465	2424.04712	50.0592
Total			165.05225	4842.36279	100.000



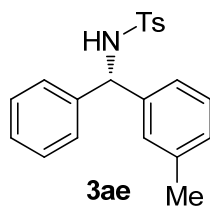
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		11.831	6.10408	194.35416	1.3347
2		13.071	443.29144	1.43669e4	98.6653
Total			449.39552	1.45613e4	100.000

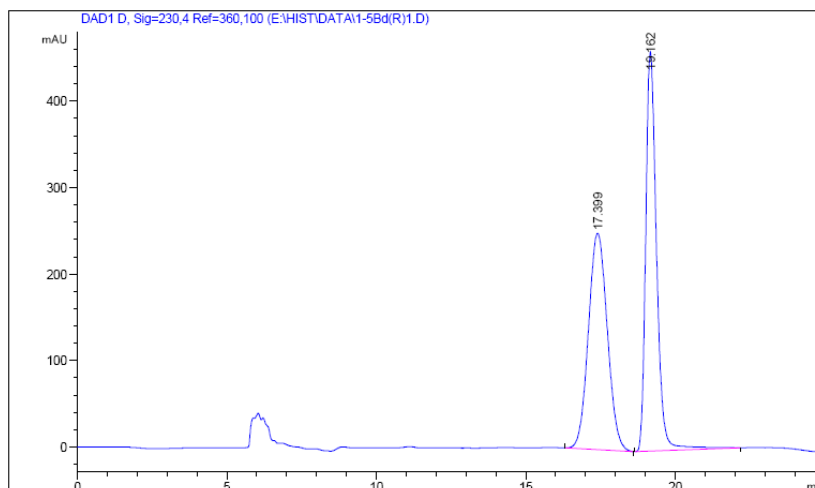
(S)-4-methyl-N-(phenyl(*o*-tolyl)methyl)benzenesulfonamide(3ad). ^[6] White solid, 99 mg, 94% yield, 97% ee, m.p. 137–139 °C. $[\alpha]_D^{24} = +9.3$ ($c = 0.72$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 4.33$ min (minor) and 4.94 min (major). ¹H NMR (600 MHz, CDCl_3) δ 7.54 (d, $J = 7.5$ Hz, 2H), 7.18 (s, 3H), 7.11 (d, $J = 7.8$ Hz, 4H), 7.06 – 7.03 (m, 4H), 5.79 (d, $J = 6.8$ Hz, 1H), 5.27 – 5.03 (m, 1H), 2.36 (s, 3H), 2.15 (s, 3H). ¹³C NMR (150 MHz, CDCl_3) δ 143.3, 140.1, 138.4, 137.6, 135.6, 130.8, 129.4, 128.7, 127.7, 127.3, 127.2, 126.3, 58.2, 21.6, 19.5.



(*S*)-4-methyl-*N*-(phenyl(*m*-tolyl)methyl)benzenesulfonamide(**3ae**).^[3] White solid, 101 mg, 96% yield, 98% ee, m.p. 98–99 °C. $[\alpha]_D^{24} = -4.9$ ($c = 0.35$, CHCl_3). HPLC:

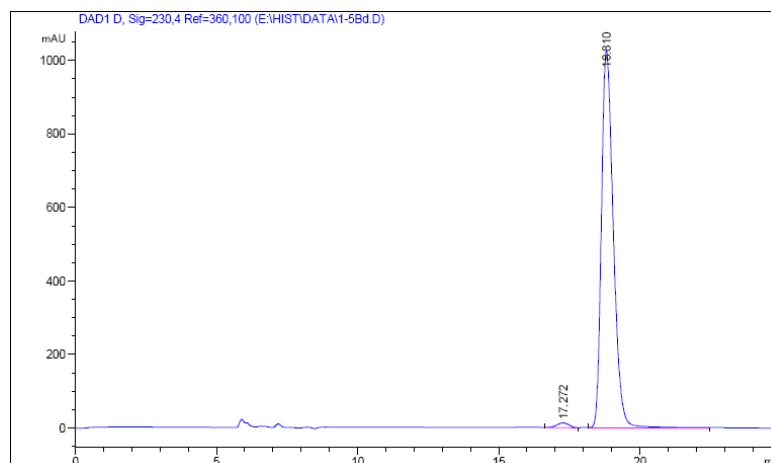


Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 90/10, flow = 0.5 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 17.23$ min (minor) and 18.81 min (major). ^1H NMR (600 MHz, CDCl_3) δ 7.55 (d, $J = 8.3$ Hz, 2H), 7.24 – 7.17 (m, 3H), 7.15 – 7.07 (m, 5H), 6.99 (d, $J = 7.5$ Hz, 1H), 6.89 – 6.83 (m, 2H), 5.52 (d, $J = 7.1$ Hz, 1H), 5.09 (d, $J = 6.7$ Hz, 1H), 2.37 (s, 3H), 2.20 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 143.3, 140.7, 140.5, 138.3, 137.5, 129.4, 128.6, 128.5, 128.2, 127.7, 127.5, 127.4, 124.6, 61.5, 21.6, 21.4.



Results

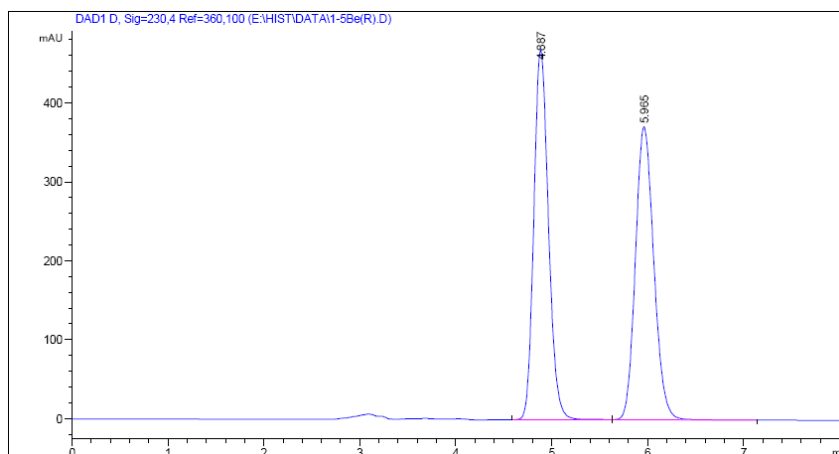
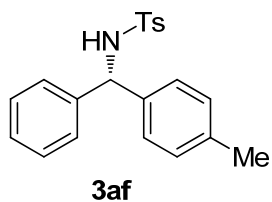
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		17.399	250.50386	1.09694e4	48.6416
2		19.162	461.51450	1.15821e4	51.3584
Total			712.01836	2.25515e4	100.000



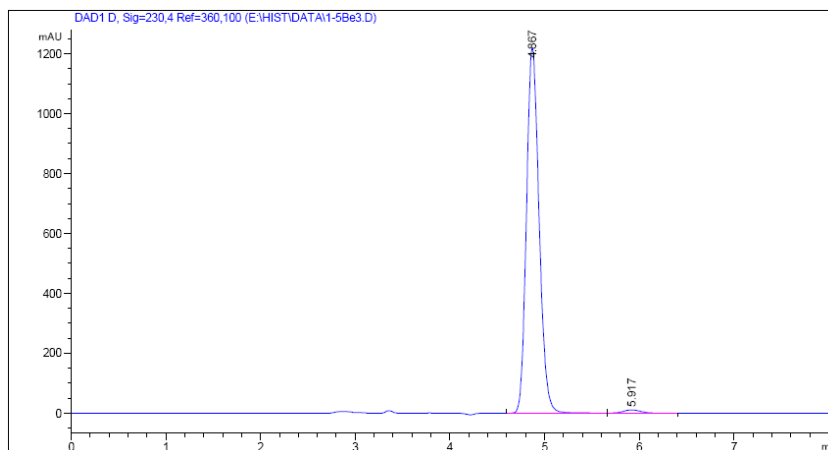
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		17.272	12.55040	377.05310	1.2419
2		18.810	1024.42297	2.99316e4	98.7581
Total			1036.97337	3.03087e4	100.000

(S)-4-methyl-N-(phenyl(*p*-tolyl)methyl)benzenesulfonamide(3af). ^[5] White solid, 103 mg, 98% yield, 98% ee, m.p. 118–121 °C. $[\alpha]_D^{24} = -12.5$ ($c = 1.10$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 4.88$ min (major) and 5.92 min (minor). ¹H NMR (600 MHz, CDCl_3) δ 7.56 (d, $J = 7.5$ Hz, 2H), 7.20 – 7.17 (m, 3H), 7.14 – 7.10 (m, 4H), 7.02 – 6.96 (m, 4H), 5.52 (d, $J = 6.8$ Hz, 1H), 5.09 (d, $J = 6.5$ Hz, 1H), 2.38 (s, 3H), 2.28 (s, 3H). ¹³C NMR (150 MHz, CDCl_3) δ 143.3, 140.8, 137.8, 137.6, 127.5, 129.5, 129.4, 128.6, 127.6, 127.5, 127.4, 127.3, 61.3, 21.6, 21.1.

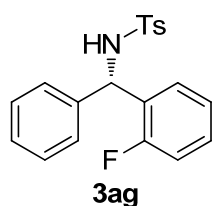


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		4.887	468.14828	4955.23486	50.1420
2		5.965	370.77689	4927.17432	49.8580
Total			838.92517	9882.40918	100.000



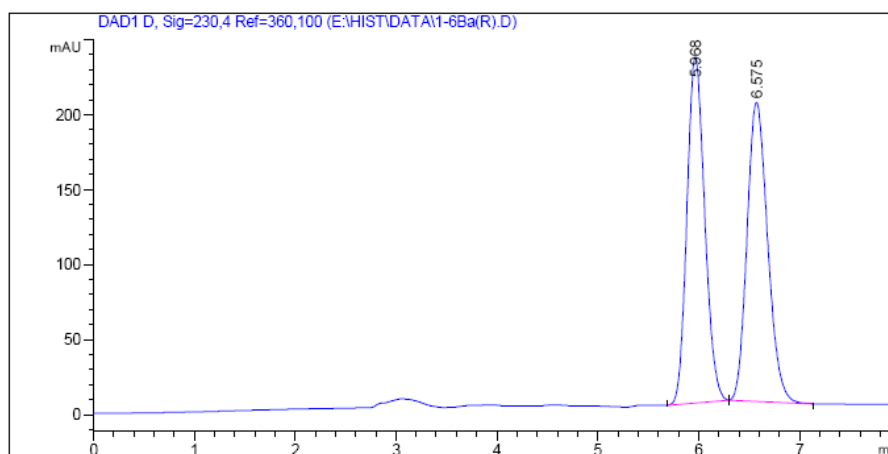
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		4.867	1219.68604	1.12880e4	98.8272
2		5.917	10.92273	133.95137	1.1728
Total			1230.60877	1.14220e4	100.000

(S)-N-((2-fluorophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3ag). White solid, 106



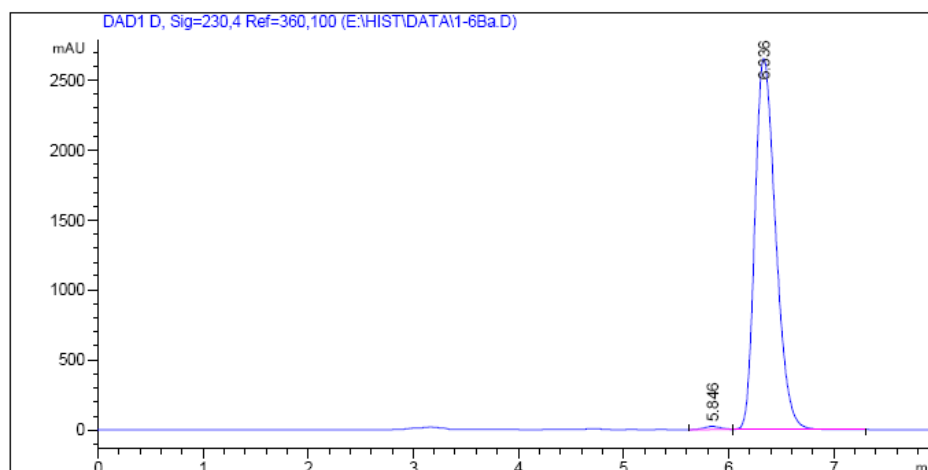
mg, 99% yield, 99% ee, m.p. 137–139 °C. $[\alpha]_D^{24} = -8.4$ ($c = 0.70$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.85$ min (minor) and 6.34 min (major). ^1H NMR (600 MHz, CDCl_3) δ 7.58 (d, $J = 8.3$ Hz, 2H), 7.27 – 7.15 (m, 5H), 7.14 – 7.11(m, 4H), 7.02 – 6.99 (m, 1H), 6.89 – 6.86 (m, 1H), 5.77 (d, $J = 8.1$ Hz, 1H), 5.32 (d, $J = 8.0$ Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3)

δ 160.9, 159.3, 143.4, 139.7, 137.2, 129.6, 129.5, 129.3, 129.3, 128.8, 127.9, 127.2, 127.0, 124.4, 115.9, 115.8, 56.7, 21.6. HRMS (ESI, m/z) calcd for $\text{C}_{20}\text{H}_{18}\text{FNNaO}_2\text{S}$ $[\text{M} + \text{Na}]^+$ 378.0940, found 378.0945.



Results

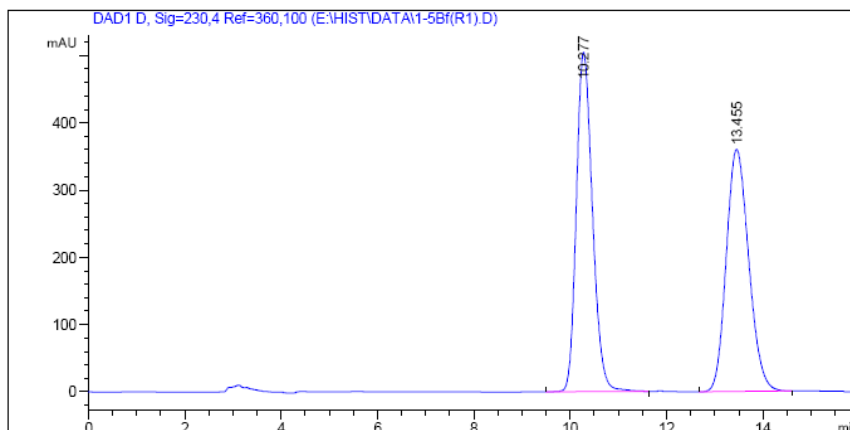
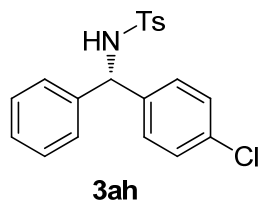
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		5.968	230.51093	2817.04810	49.9355
2		6.575	199.38506	2824.33032	50.0645
Total			429.89598	5641.37842	100.000



Results

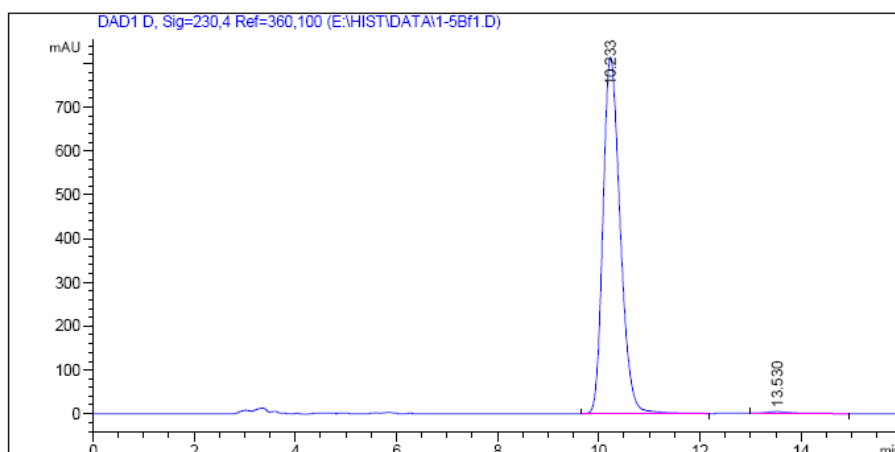
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		5.846	21.09604	224.47066	0.6155
2		6.336	2649.77588	3.62460e4	99.3845
Total			2670.87192	3.64705e4	100.000

(*S*)-*N*-((4-chlorophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(**3ah**).^[6] White solid, 110 mg, 99% yield, 98% ee, m.p. 123–125 °C. $[\alpha]_D^{24} = -4.4$ ($c = 0.88$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 90/10, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 10.23$ min (major) and 13.53 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.54 (d, $J = 8.2$ Hz, 2H), 7.25 – 7.18 (m, 3H), 7.18 – 7.11 (m, 4H), 7.09 – 7.01 (m, 4H), 5.53 (d, $J = 7.3$ Hz, 1H), 5.32 (d, $J = 7.2$ Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 143.6, 140.2, 139.1, 137.3, 133.6, 129.6, 129.0, 128.9, 128.8, 128.0, 127.4, 127.3, 60.9, 21.6.



Results

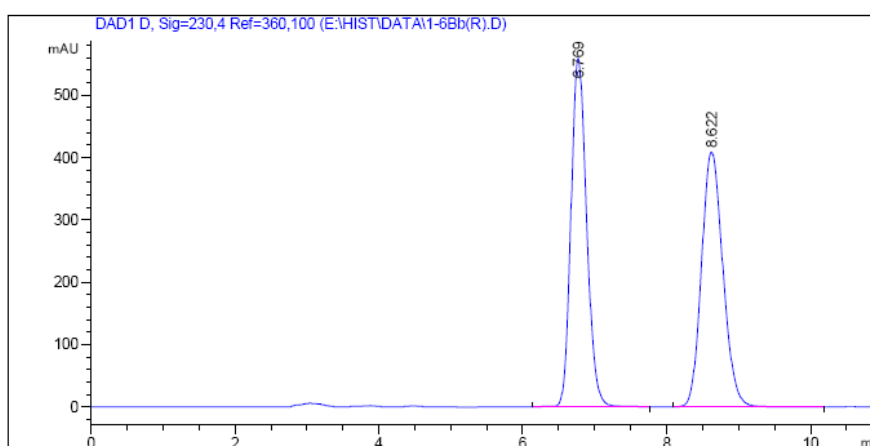
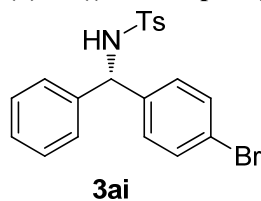
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		10.277	504.14920	1.17259e4	50.1806
2		13.455	359.83823	1.16415e4	49.8194
Total			863.98743	2.33674e4	100.000



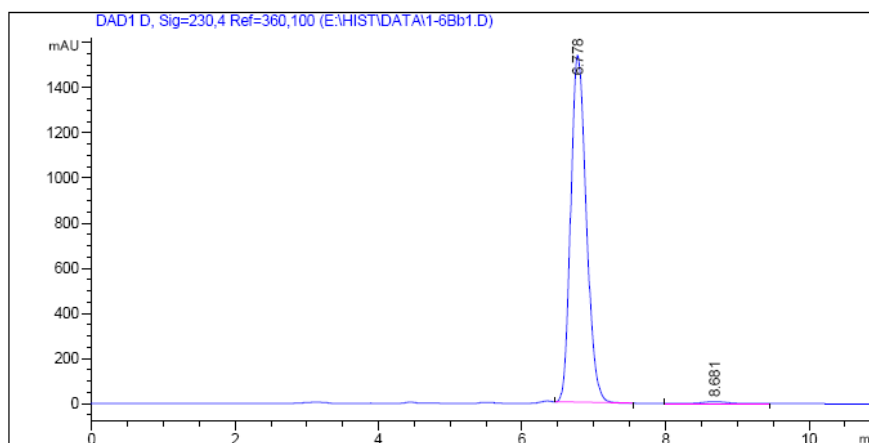
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		10.233	813.77356	1.91958e4	99.2356
2		13.530	4.29023	147.86830	0.7644
Total			818.06379	1.93436e4	100.000

(*S*)-*N*-((4-bromophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(**3ai**).^[6] White solid, 123 mg, 98% yield, 98% ee, m.p. 120–122 °C. $[\alpha]_D^{27} = -5.6$ ($c = 0.60$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.78$ min (major) and 8.68 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.54 (d, $J = 8.2$ Hz, 2H), 7.32 (d, $J = 8.4$ Hz, 2H), 7.21 (s, 3H), 7.14 (d, $J = 8.0$ Hz, 2H), 7.05 – 6.99 (m, 4H), 5.51 (d, $J = 7.0$ Hz, 1H), 5.21 (d, $J = 6.2$ Hz, 1H), 2.39 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 143.6, 140.1, 139.6, 137.3, 131.7, 129.6, 129.3, 128.9, 128.0, 127.4, 127.3, 121.7, 61.0, 21.6.

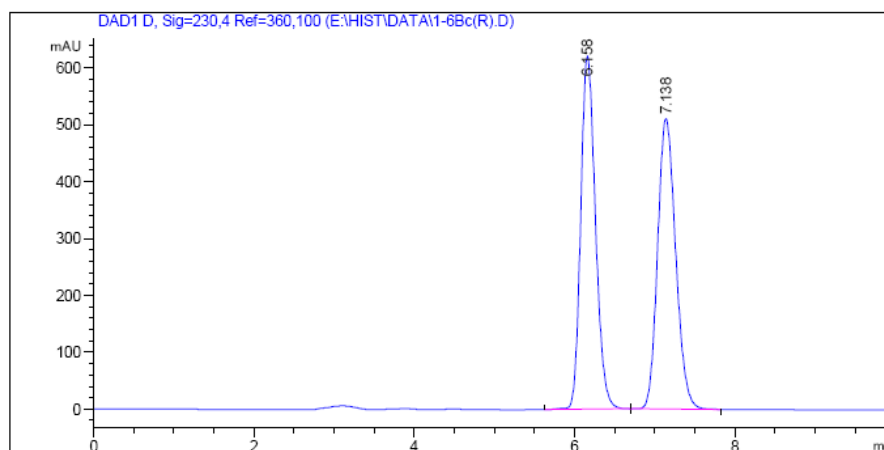
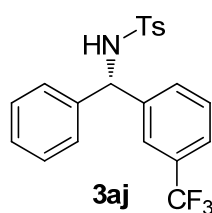


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		6.769	558.54700	8447.76270	50.0315
2		8.622	408.54092	8437.11230	49.9685
Total			967.08792	1.68849e4	100.000



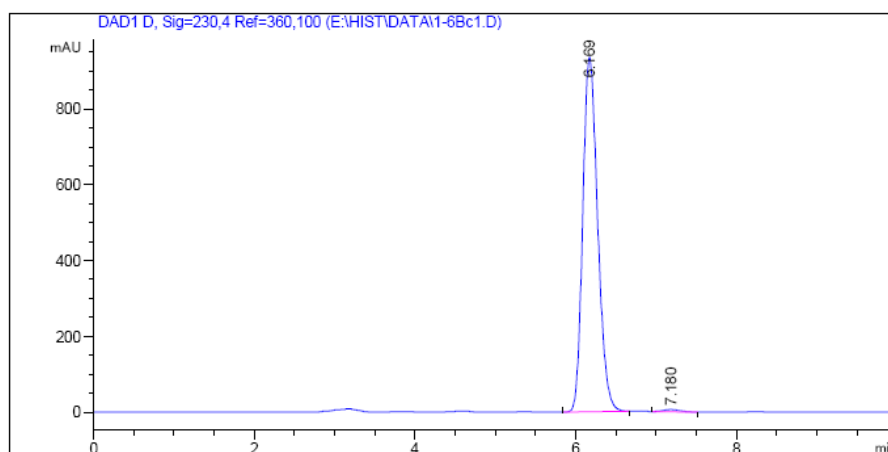
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		6.778	1536.66309	2.31726e4	99.1365
2		8.681	8.99589	201.84566	0.8635
Total			1545.65897	2.33744e4	100.000

(S)-4-methyl-N-(phenyl(3-(trifluoromethyl)phenyl)methyl)benzenesulfonamide(3aj).^[3] White solid, 116 mg, 95% yield, 99% ee, m.p. 109–110 °C. $[\alpha]_D^{24} = +3.9$ ($c = 0.75$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.17$ min (major) and 7.18 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.55 (d, $J = 7.5$ Hz, 2H), 7.20 (s, 3H), 7.14 (d, $J = 7.6$ Hz, 2H), 7.09 – 7.06 (m, 4H), 6.90 – 6.87 (m, 2H), 5.55 (d, $J = 7.0$ Hz, 1H), 5.27 (s, 1H), 2.38 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 163.0, 161.4, 143.5, 140.4, 137.4, 136.5, 129.5, 129.3, 129.2, 128.8, 127.9, 127.4, 127.3, 115.6, 115.4, 60.8, 21.6.



Results

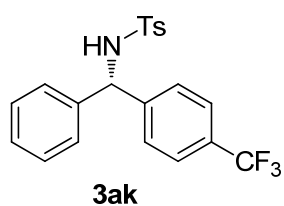
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.158	621.36182	7952.87744	49.9244
2		7.138	510.97720	7976.96973	50.0756
Total			1132.33902	1.59298e4	100.000



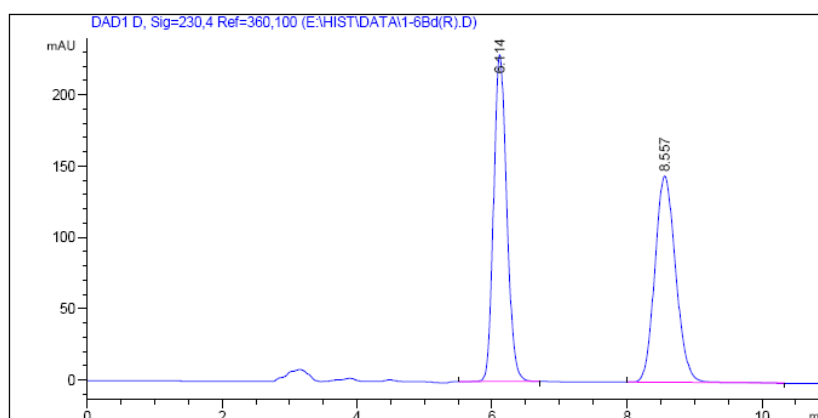
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.169	935.66437	1.20576e4	99.3103
2		7.180	5.86888	83.73341	0.6897
Total			941.53325	1.21413e4	100.000

(S)-4-methyl-N-(phenyl(4-(trifluoromethyl)phenyl)methyl)benzenesulfonamide(3ak).^[10]

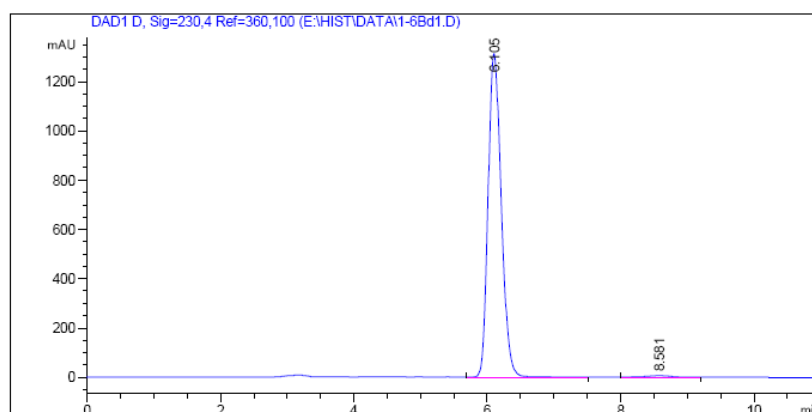


White solid, 117 mg, 96% yield, 98% ee, m.p. 138–141 °C. $[\alpha]_D^{24} = +9.4$ ($c = 0.82$, CHCl_3). HPLC: Chiracel OD-H Column, n -hexane/ i -propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.10$ min (major) and 8.58 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.53 (d, $J = 8.2$ Hz, 2H), 7.46 – 7.40 (m, 2H), 7.29 – 7.23 (m, 2H), 7.24 – 7.19 (m, 3H), 7.10 – 7.05 (m, 4H), 5.61 (d, $J = 7.0$ Hz, 2H), 5.51 (d, $J = 6.9$ Hz, 2H), 2.36 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 144.4, 143.7, 139.9, 137.2, 129.5, 129.0, 128.2, 127.9, 127.4, 127.3, 125.5 (q, $J = 3.8$ Hz), 61.1, 21.5.



Results

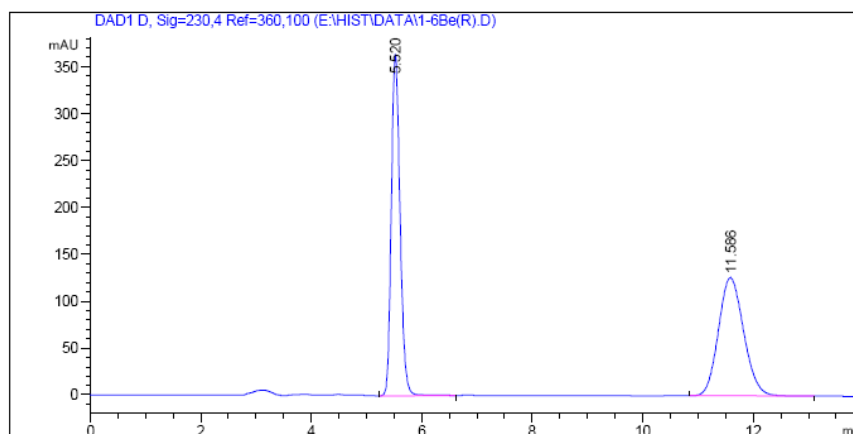
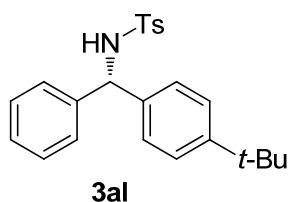
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.114	229.04887	3100.80640	49.9748
2		8.557	144.54916	3103.93848	50.0252
Total			373.59804	6204.74487	100.000



Results

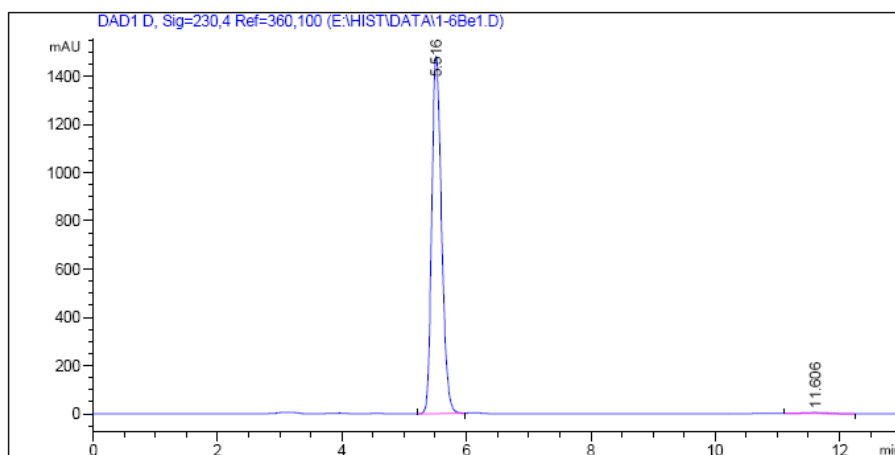
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.105	1314.38757	1.80017e4	99.0994
2		8.581	6.69849	163.58929	0.9006
Total			1321.08607	1.81653e4	100.000

(S)-N-((4-(tert-butyl)phenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3al). White solid, 111 mg, 94% yield, 98% ee, m.p. 124–126 °C. $[\alpha]_D^{25} = -10.2$ ($c = 0.80$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.52$ min (major) and 11.61 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.53 (d, $J = 7.5$ Hz, 2H), 7.19 – 7.18 (m, $J = 6.3$ Hz, 5H), 7.13 (d, $J = 6.6$ Hz, 2H), 7.09 (d, $J = 7.8$ Hz, 2H), 6.99 (d, $J = 7.6$ Hz, 2H), 5.55 (d, $J = 7.0$ Hz, 1H), 5.34 – 5.27 (m, 1H), 2.35 (s, 3H), 1.25 (s, 9H). ^{13}C NMR (150 MHz, CDCl_3) δ 150.6, 143.1, 140.8, 137.6, 137.5, 129.4, 128.6, 127.6, 127.3, 127.2, 125.5, 61.2, 34.5, 31.4, 21.6. HRMS (ESI, m/z) calcd for $\text{C}_{24}\text{H}_{27}\text{NNaO}_2\text{S} [\text{M} + \text{Na}]^+$ 416.1660, found 416.1662.



Results

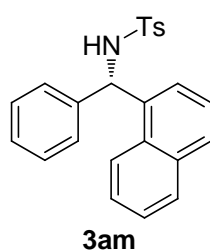
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		5.520	364.21729	4016.30127	50.1308
2		11.586	125.94168	3995.34766	49.8692
Total			490.15897	8011.64893	100.000



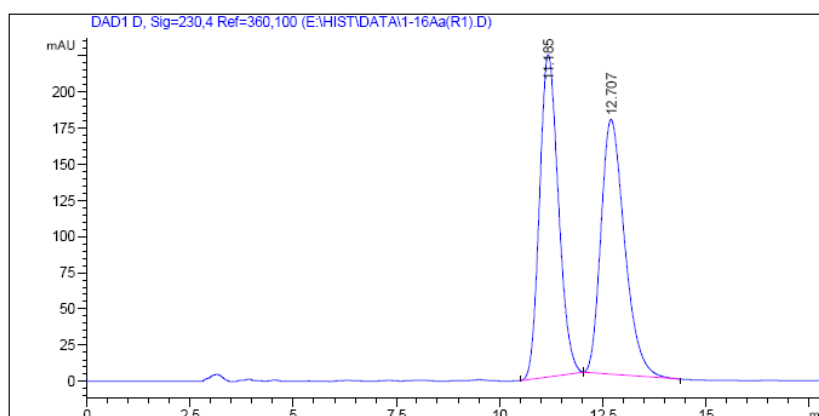
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		5.516	1481.52673	1.62518e4	99.2291
2		11.606	4.34759	126.25610	0.7709
Total			1485.87432	1.63781e4	100.000

(*S*)-4-methyl-*N*-(naphthalen-1-yl(phenyl)methyl)benzenesulfonamide(**3am**).^[5] White solid, 90%

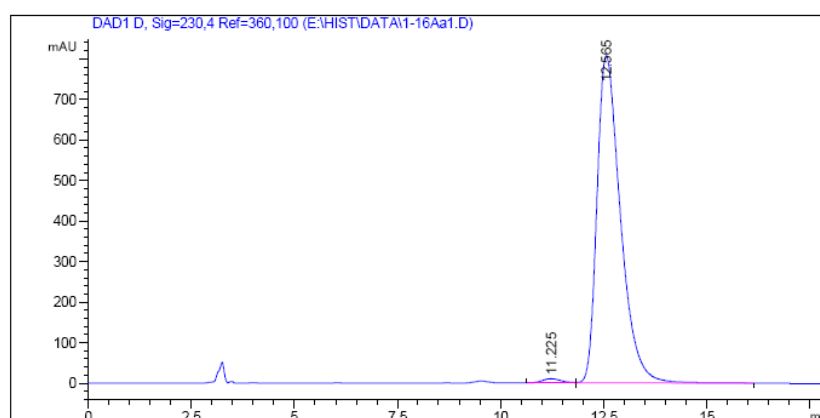


yield, 105 mg, 98% ee, m.p. 174–176 °C. $[\alpha]_D^{27} = -4.8$ ($c = 0.95$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 11.22$ min (minor) and 12.56 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.82 – 7.79 (m, 2H), 7.72 (d, $J = 8.0$ Hz, 1H), 7.50 (d, $J = 8.2$ Hz, 2H), 7.46 – 7.36 (m, 2H), 7.29 – 7.23 (m, 2H), 7.20 – 7.17 (m, 3H), 7.15 – 7.11 (m, 2H), 7.05 (d, $J = 8.1$ Hz, 2H), 6.31 (d, $J = 7.1$ Hz, 1H), 5.19 (d, $J = 7.1$ Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 143.3, 140.3, 137.4, 135.6, 134.1, 130.6, 129.4, 129.0, 128.8, 127.8, 127.6, 127.3, 126.7, 126.3, 125.9, 125.2, 123.5, 58.7, 21.6.



Results

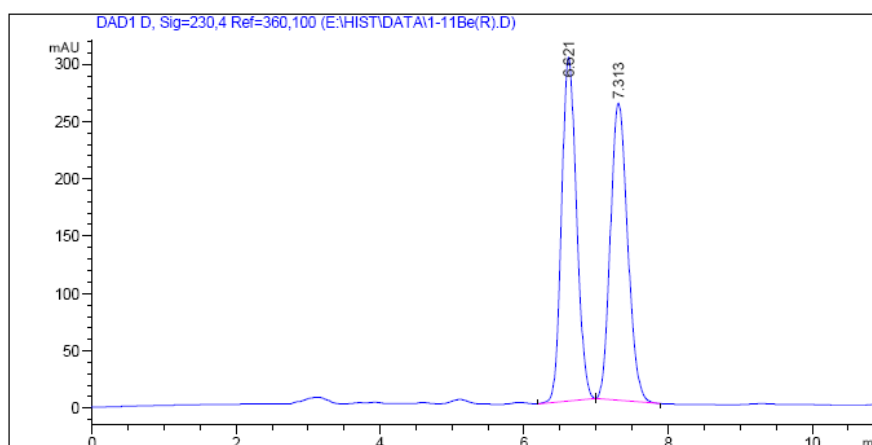
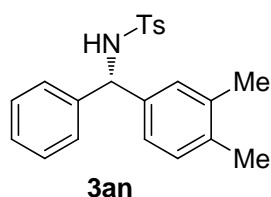
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		11.185	222.84117	7076.34326	50.2239
2		12.707	176.09012	7013.23828	49.7761
Total			398.93129	1.40896e4	100.000



Results

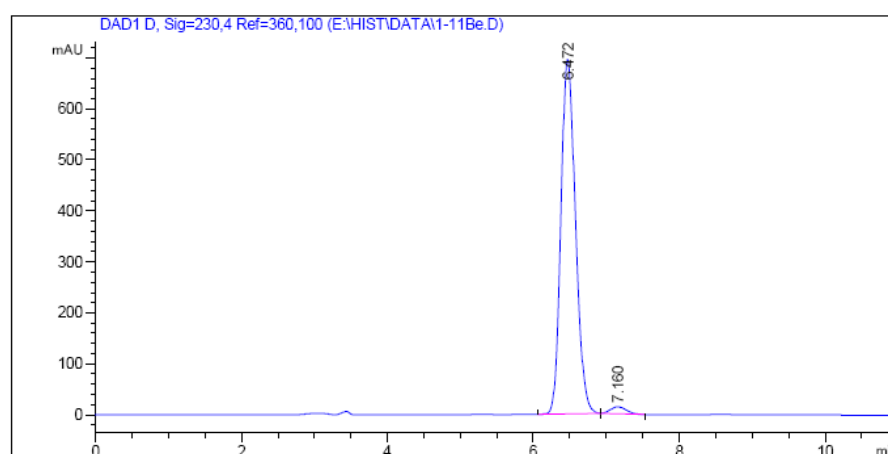
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		11.225	10.05758	303.97372	0.9480
2		12.565	806.39563	3.17605e4	99.0520
Total			816.45321	3.20645e4	100.000

(S)-N-((3,4-dimethylphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3an). White solid, 100 mg, 91% yield, 96% ee, m.p. 109–112 °C. $[\alpha]_D^{25} = -8.2$ ($c = 0.80$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.47$ min (major) and 7.16 min (minor). ^1H NMR (600 MHz, CDCl_3) δ 7.55 (d, $J = 8.2$ Hz, 2H), 7.24 – 7.15 (m, 3H), 7.13 – 7.10 (m, 4H), 6.99 – 6.92 (m, 1H), 6.78 (d, $J = 5.6$ Hz, 2H), 5.49 (d, $J = 7.0$ Hz, 1H), 5.12 (d, $J = 7.0$ Hz, 1H), 2.37 (s, 3H), 2.17 (s, 3H), 2.10 (s, 3H). ^{13}C NMR (150 MHz, CDCl_3) δ 143.2, 140.9, 138.1, 137.6, 136.8, 136.1, 129.9, 129.4, 128.7, 128.6, 127.4, 127.3, 127.2, 124.9, 61.3, 21.6, 19.8, 19.5. HRMS (ESI, m/z) calcd for $\text{C}_{22}\text{H}_{23}\text{NNaO}_2\text{S}$ $[\text{M} + \text{Na}]^+$ 388.1347, found 388.1351.



Results

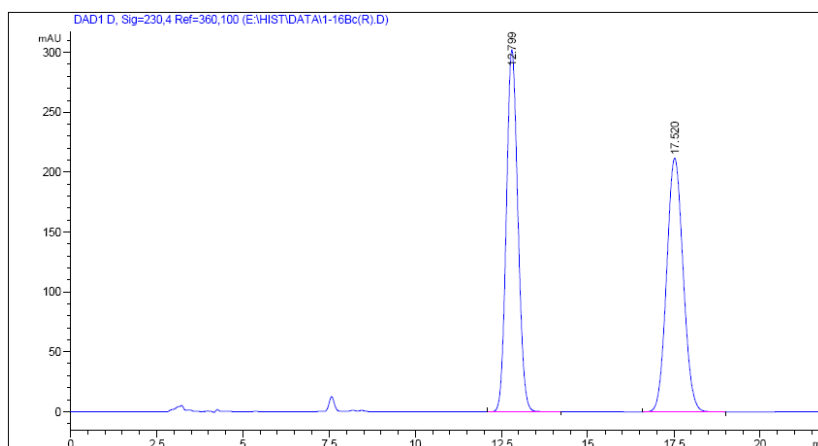
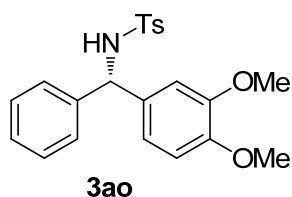
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.621	299.76224	4317.64355	50.0435
2		7.313	259.07275	4310.13867	49.9565
Total			558.83499	8627.78223	100.000



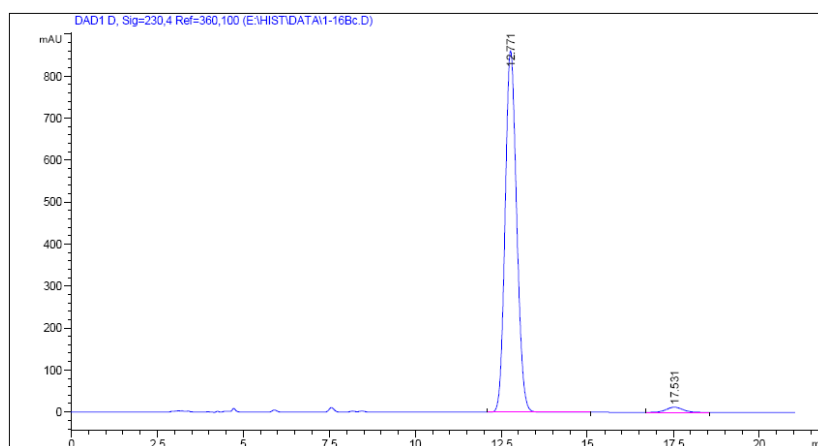
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.472	694.70880	9644.75781	97.9510
2		7.160	13.66240	201.75311	2.0490
Total			708.37121	9846.51093	100.000

(*S*)-*N*-((3,4-dimethoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(**3ao**).^[9] White solid, 110 mg, 92% yield, 96% ee, m.p. 142–144 °C. $[\alpha]_D^{25} = -18.5$ ($c = 1.00$, CHCl_3). HPLC: Chiracel AD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 12.77$ min (major) and 17.53 min (minor). ^1H NMR (400 MHz, CDCl_3) δ 7.56 (d, $J = 7.8$ Hz, 2H), 7.24 – 7.19 (m, 3H), 7.14 – 7.12 (m, 4H), 6.68 – 6.66 (m, 1H), 6.59 – 6.57 (m, 2H), 5.53 (d, $J = 7.2$ Hz, 1H), 5.31 (d, $J = 7.1$ Hz, 1H), 3.81 (s, 3H), 3.69 (s, 3H), 2.37 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 149.0, 148.5, 143.2, 140.8, 137.6, 133.2, 129.4, 128.6, 127.6, 127.3, 119.9, 110.9, 110.6, 61.2, 56.0, 55.8, 21.5.

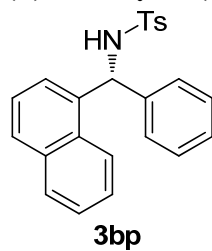


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		12.799	302.15225	7040.13770	49.9750
2		17.520	211.87657	7047.18457	50.0250
Total			514.02882	1.40873e4	100.000

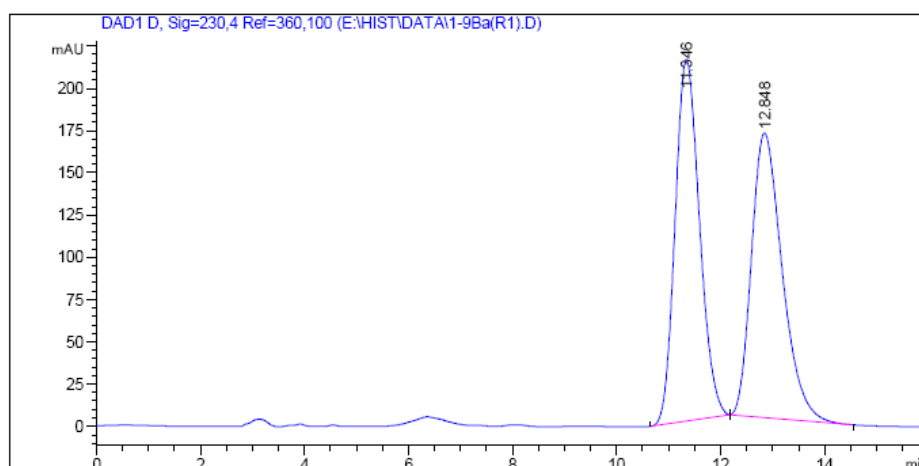


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		12.771	860.65210	2.00701e4	98.0325
2		17.531	12.10685	402.80875	1.9675
Total			872.75895	2.04729e4	100.000

(R)-4-methyl-N-(naphthalen-1-yl(phenyl)methyl)benzenesulfonamide(3bp).^[5] White solid, 97% yield, 113 mg, 99% ee, m.p. 175–177 °C. $[\alpha]_D^{20} = +5.0$ ($c = 1.00$, CHCl_3).

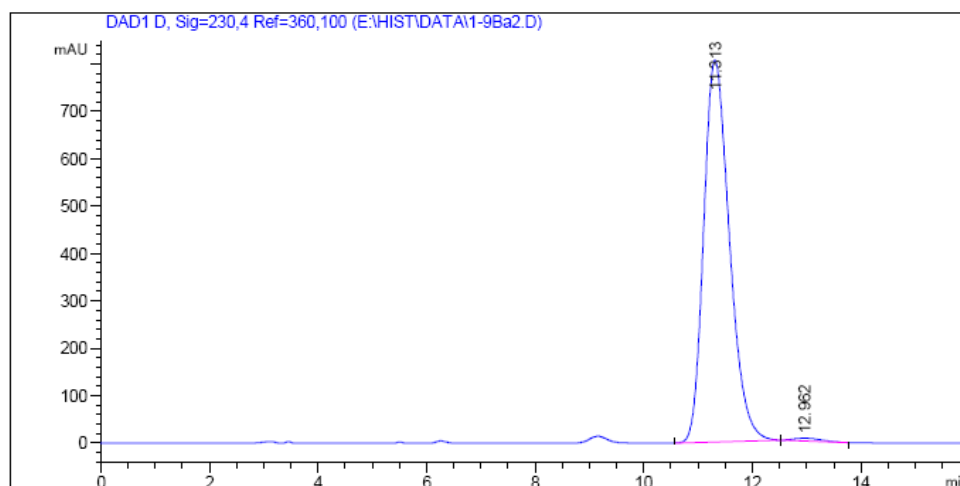


Characterization data is the same with **3am** (with a reverse configuration of **3am**). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 11.3$ min (major) and 12.96 min (minor).



Results

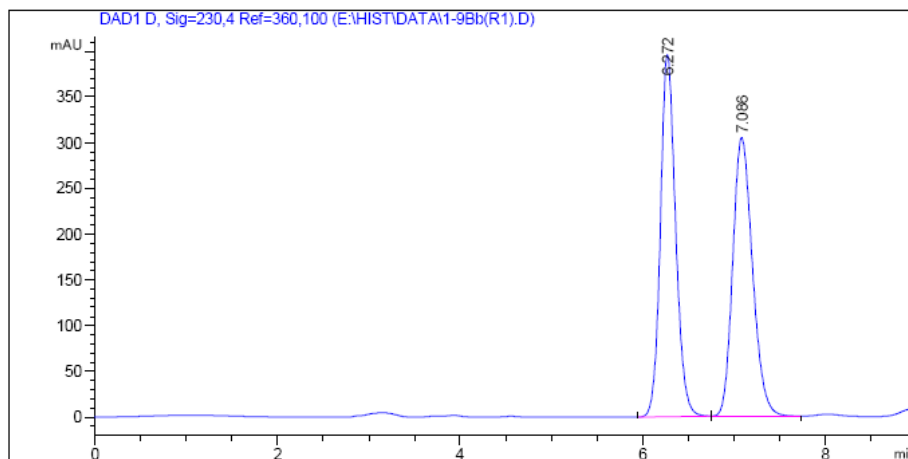
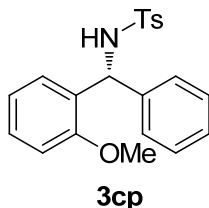
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		11.346	213.97372	6967.26270	50.2220
2		12.848	168.41354	6905.66797	49.7780
Total			382.38727	1.38729e4	100.000



Results

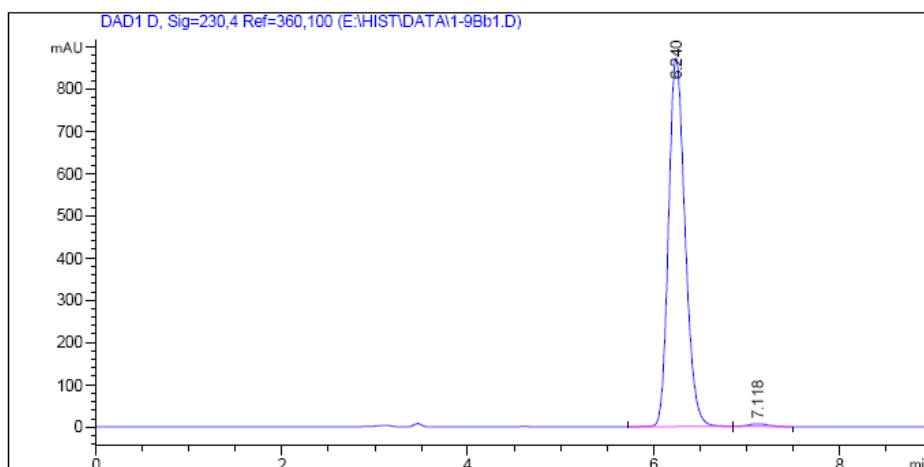
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		11.313	806.08911	2.65397e4	99.2748
2		12.962	5.55978	193.88078	0.7252
Total			811.64889	2.67336e4	100.000

(R)-N-((2-methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3cp).^[5] White solid, 105 mg, 95% yield, 98% ee, m.p. 120–122 °C. $[\alpha]_D^{24} = +29.1$ ($c = 1.00$, CHCl_3). Characterization data is the same with **3ab** (with a reverse configuration of **3ab**). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.24$ min (major) and 7.12 min (minor).



Results

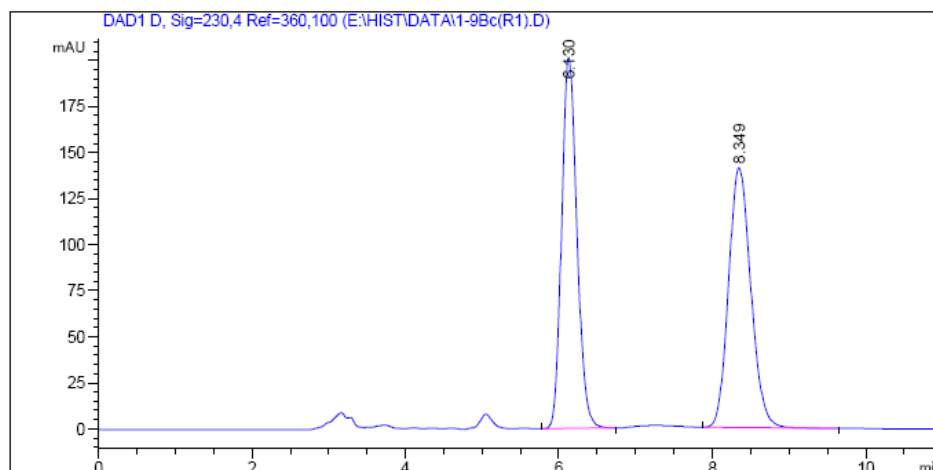
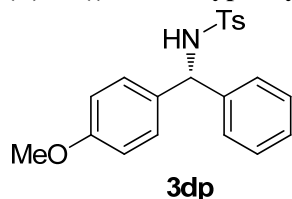
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.272	395.81021	4582.38281	50.0084
2		7.086	304.54929	4580.83936	49.9916
Total			700.35950	9163.22217	100.000



Results

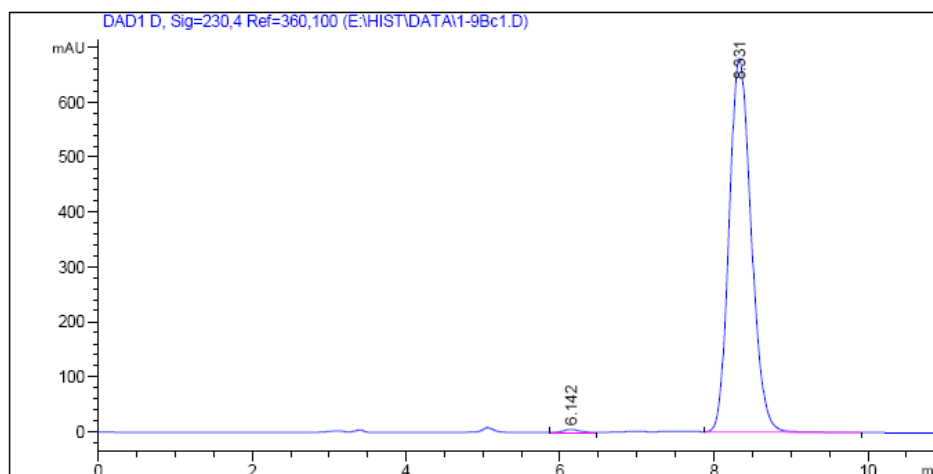
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.240	872.05170	1.07945e4	99.1262
2		7.118	6.65698	95.15427	0.8738
Total			878.70868	1.08896e4	100.000

(R)-N-((4-methoxyphenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3dp).^[6] White solid, 106 mg, 96% yield, 99% ee, m.p. 132–134 °C. $[\alpha]_D^{26} = +15.1$ ($c = 0.57$, CHCl_3). Characterization data is the same with **3aa** (with a reverse configuration of **3aa**). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.14$ min (minor) and 8.33 min (major).



Results

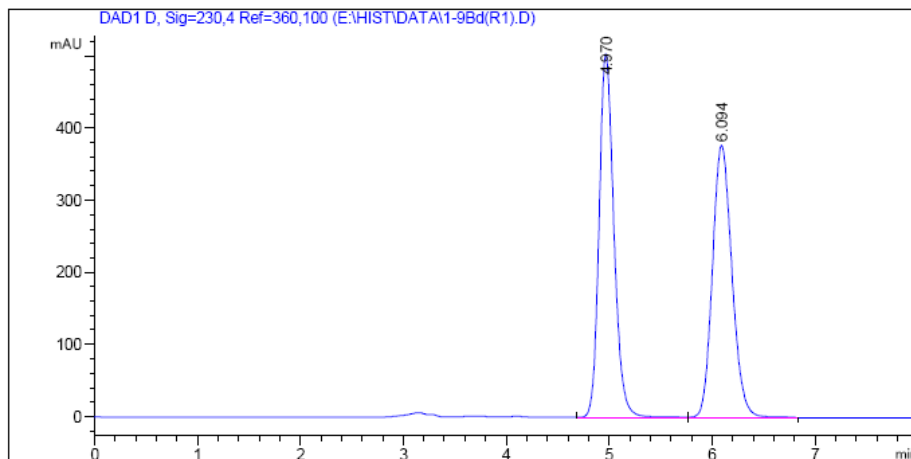
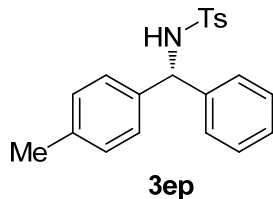
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%).
1		6.130	201.46455	2789.05493	49.4966
2		8.349	140.97107	2845.79199	50.5034
Total			342.43562	5634.84692	100.000



Results

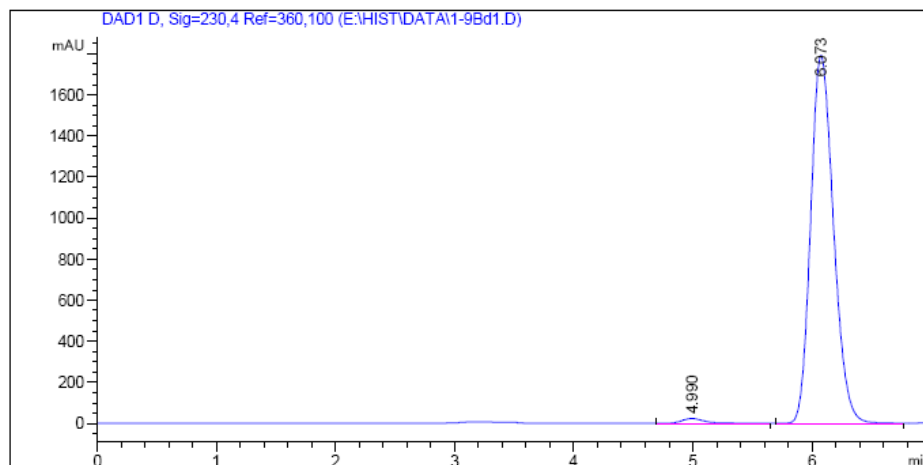
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%).
1		6.142	5.51340	75.47466	0.5541
2		8.331	680.11841	1.35446e4	99.4459
Total			685.63181	1.36200e4	100.000

(R)-4-methyl-N-(phenyl(*p*-tolyl)methyl)benzenesulfonamide(3ep).^[5] White solid, 100 mg, 95% yield, 97% ee, m.p. 119–120 °C. $[\alpha]_D^{24} = + 11.8$ ($c = 0.75$, CHCl_3). Characterization data is the same with **3af** (with a reverse configuration of **3af**). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 4.99$ min (minor) and 6.07 min (major).



Results

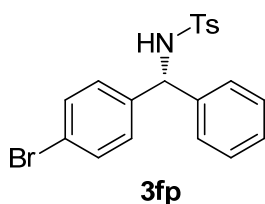
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		4.970	503.61029	5027.95410	50.4563
2		6.094	376.82278	4937.00635	49.5437
Total			880.43307	9964.96045	100.000



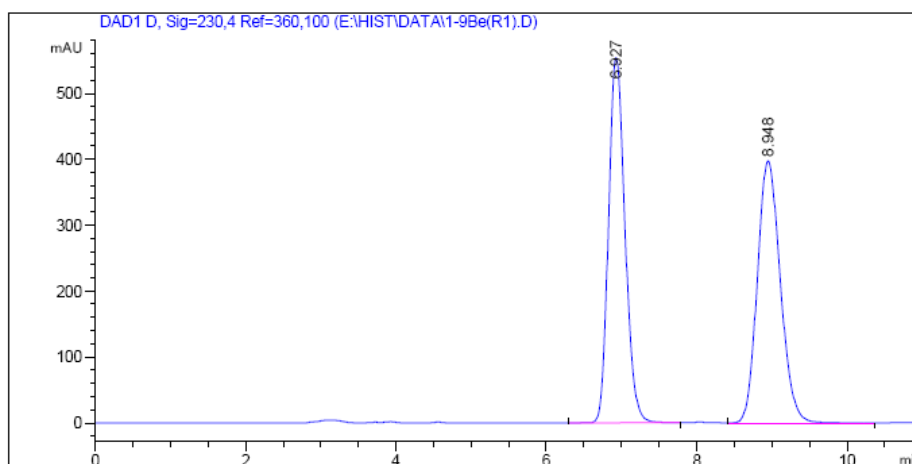
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%).
1		4.990	23.47141	326.46097	1.3512
2		6.073	1790.65210	2.38351e4	98.6488
Total			1814.12350	2.41616e4	100.000

(R)-N-((4-bromophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3fp).^[6] White solid,

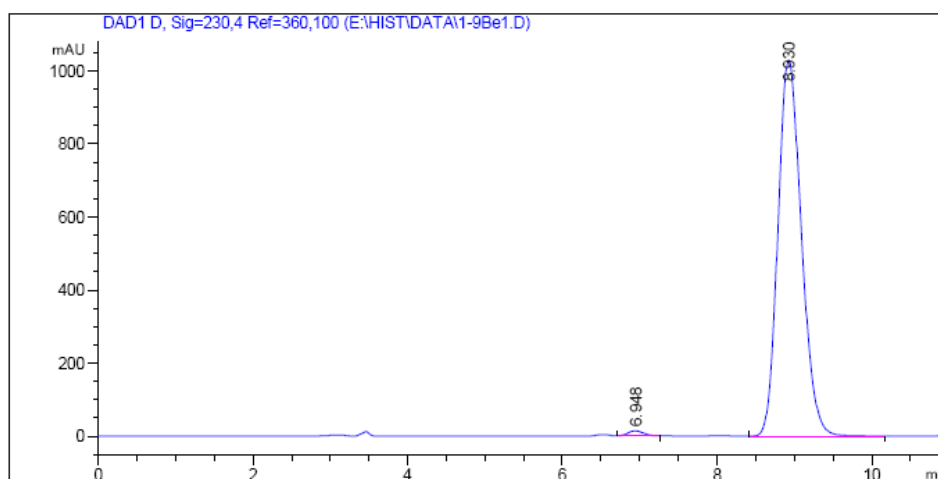


122 mg, 97% yield, 98% ee, m.p. 119–120 °C. $[\alpha]_D^{27} = +7.9$ ($c = 0.65$, CHCl_3). Characterization data is the same with **3ai** (with a reverse configuration of **3ai**). HPLC: Chiracel OD-H Column, n -hexane/ i -propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 6.95$ min (minor) and 8.93 min (major).



Results

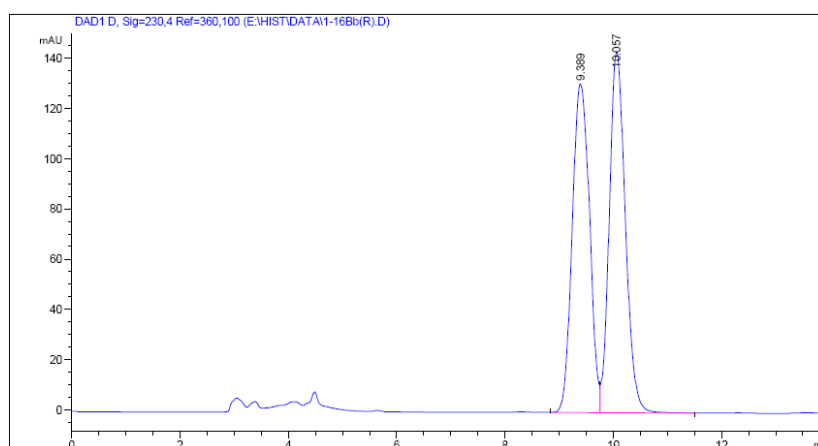
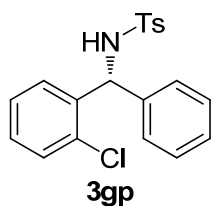
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.927	553.46588	8438.40820	49.9928
2		8.948	397.28143	8440.83496	50.0072
Total			950.74731	1.68792e4	100.000



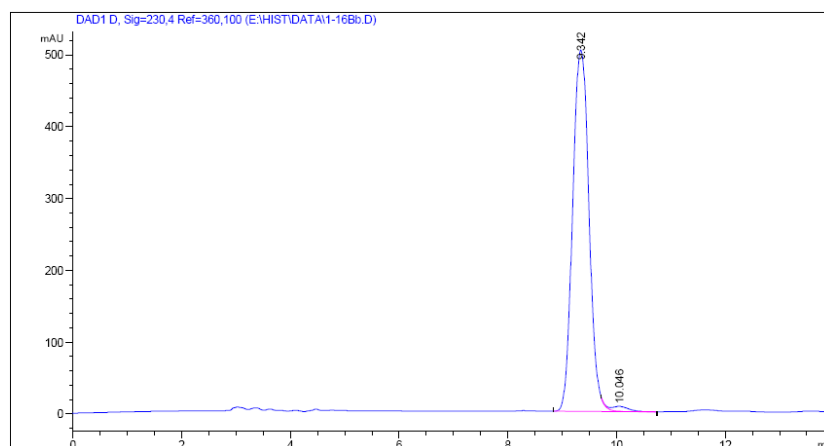
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		6.948	13.60280	188.75549	0.8641
2		8.930	1028.25061	2.16562e4	99.1359
Total			1041.85341	2.18450e4	100.000

(R)-N-((2-chlorophenyl)(phenyl)methyl)-4-methylbenzenesulfonamide(3gp).^[5] White solid, 106 mg, 95% yield, 97% ee, m.p. 165–167 °C. $[\alpha]_D^{25} = -23.5$ ($c = 0.20$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 90/10, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 9.34$ min (major) and 10.05 min (minor). $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.61 (d, $J = 8.2$ Hz, 2H), 7.35 – 7.32 (m, 1H), 7.26 – 7.19 (m, 4H), 7.20 – 7.11 (m, 4H), 7.11 – 7.03 (m, 2H), 5.91 (d, $J = 7.2$ Hz, 1H), 5.30 (d, $J = 7.1$ Hz, 1H), 2.38 (s, 3H). $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 143.5, 139.4, 137.6, 137.0, 132.9, 130.0, 129.5, 129.0, 128.8, 128.0, 127.39, 127.36, 127.1, 58.8, 21.6.

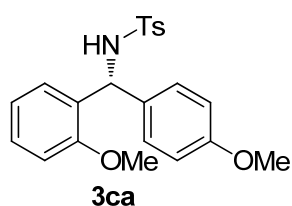


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		9.389	130.91856	2887.63672	49.3914
2		10.057	143.72466	2958.80444	50.6085
Total			274.64322	5846.44116	100.000

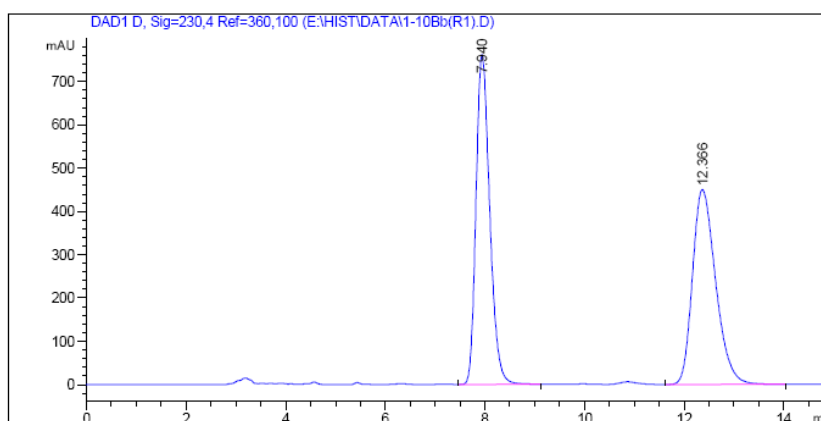


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		9.342	502.91412	1.05288e4	98.6253
2		10.046	6.78513	146.75848	1.3747
Total			509.69926	1.06756e4	100.000

(R)-N-((2-methoxyphenyl)(4-methoxyphenyl)methyl)-4-methylbenzenesulfonamide(3ca).^[9]

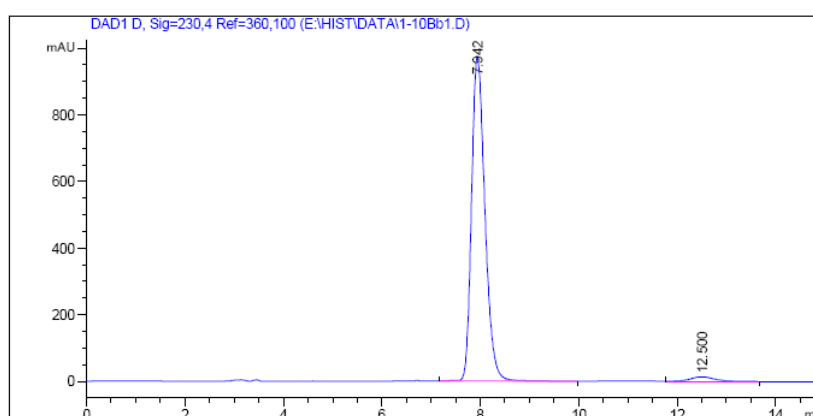


White solid, 111 mg, 93% yield, 95% ee, m.p. 130–132 °C. $[\alpha]_D^{27} = +11.6$ ($c = 0.52$, CHCl_3). HPLC: Chiracel OD-H Column, n -hexane/ i -propanol = 80/20, $\lambda = 230$ nm, flow = 1.0 mL/min, 25 °C, $t_R = 7.94$ min (major) and 12.50 min (minor). ^1H NMR (400 MHz, CDCl_3) δ 7.50 (d, $J = 8.3$ Hz, 2H), 7.18 – 7.11 (m, 1H), 7.11 – 7.02 (m, 4H), 6.98 – 6.96 (m, 1H), 6.83 – 6.72 (m, 3H), 6.67 (d, $J = 8.2$ Hz, 1H), 5.73 (d, $J = 9.0$ Hz, 1H), 5.60 (d, $J = 9.0$ Hz, 1H), 3.75 (s, 3H), 3.60 (s, 3H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 158.8, 156.5, 142.9, 137.6, 132.8, 129.6, 129.1, 129.0, 128.2, 127.8, 127.1, 120.8, 113.6, 111.1, 58.7, 55.4, 21.6.



Results

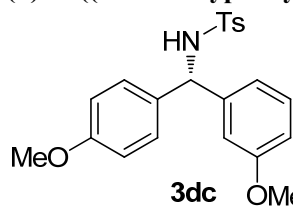
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.940	761.03497	1.45682e4	49.9961
2		12.366	449.81122	1.45705e4	50.0039
Total			1210.84619	2.91388e4	100.000



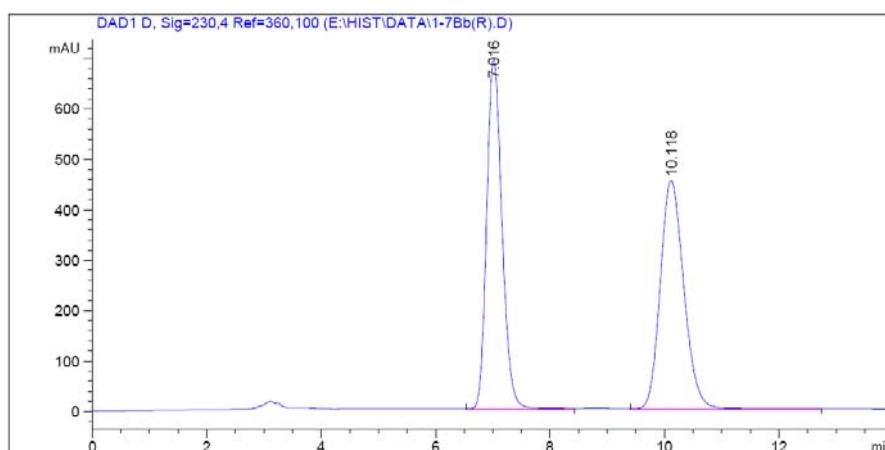
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.942	975.90387	1.84314e4	97.6746
2		12.500	13.17815	438.80249	2.3254
Total			989.08202	1.88702e4	100.000

(S)-N-((3-methoxyphenyl)(4-methoxyphenyl)methyl)-4-methylbenzenesulfonamide(3dc).

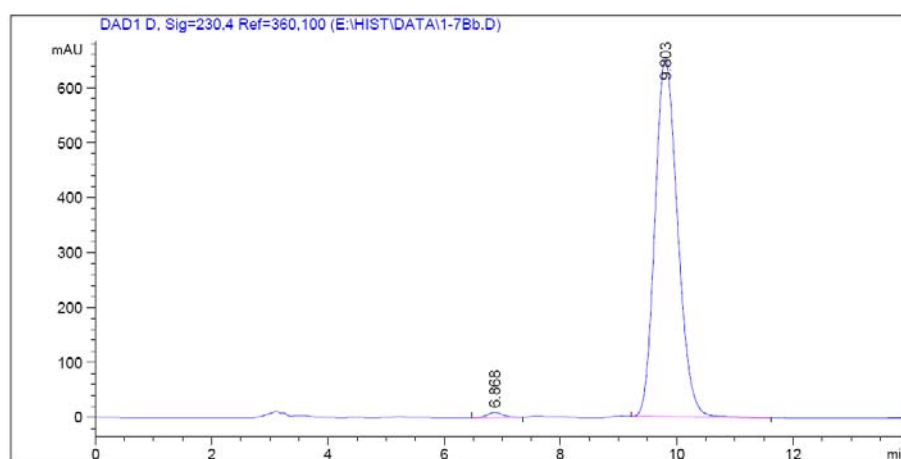


Colourless sticky oil, 113 mg, 95% yield, 98% ee. $[\alpha]_D^{27} = +15.0$ ($c = 0.55$, CHCl_3). HPLC: Chiracel OD-H Column, n-hexane/i-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, $t_R = 6.87$ min (minor) and 9.80 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.56 (d, $J = 8.3$ Hz, 2H), 7.22 – 7.07 (m, 3H), 7.01 (d, $J = 8.7$ Hz, 2H), 6.80 – 6.70 (m, 3H), 6.69 – 6.61 (m, 2H), 5.48 (d, $J = 6.9$ Hz, 1H), 5.07 (d, $J = 6.9$ Hz, 1H), 3.75 (s, 3H), 3.68 (s, 3H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.7, 159.1, 143.3, 142.4, 137.5, 132.7, 129.7, 129.5, 128.7, 127.4, 119.7, 114.0, 113.1, 113.0, 60.9, 55.4, 55.2, 21.6. HRMS (ESI, m/z) calcd for $\text{C}_{22}\text{H}_{23}\text{NNaO}_4\text{S}$ $[\text{M} + \text{Na}]^+$ 420.1245, found 420.1249.



Results

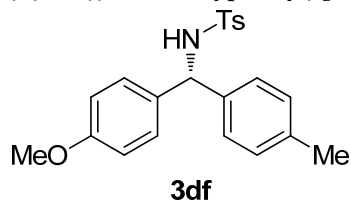
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.016	696.19525	1.28608e4	49.9296
2		10.118	453.22565	1.28970e4	50.0704
Total			1149.42090	2.57578e4	100.000



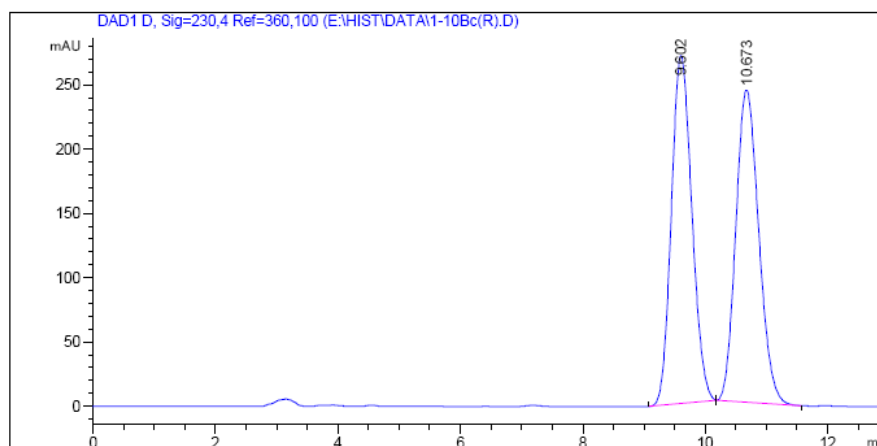
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		6.868	8.90098	161.07660	0.9055
2		9.803	650.18939	1.76268e4	99.0945
Total			659.09038	1.77879e4	100.000

(R)-N-((4-methoxyphenyl)(p-tolyl)methyl)-4-methylbenzenesulfonamide(3df).^[9] White solid,

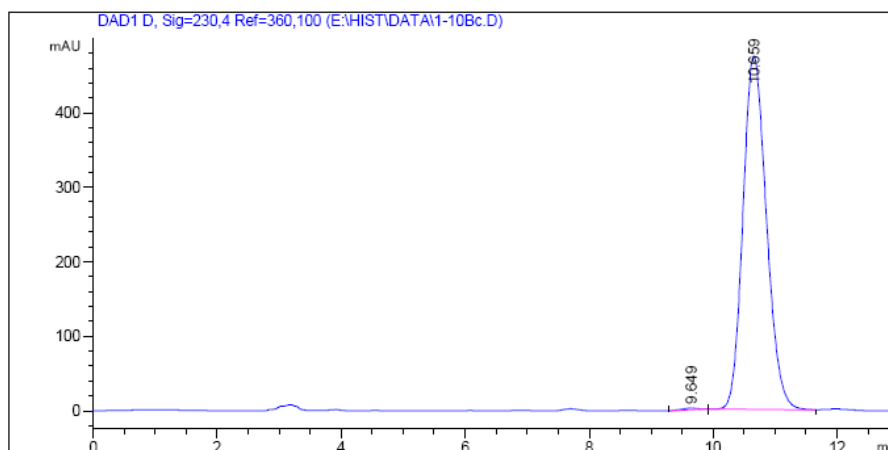


110 mg, 96% yield, 99% ee, m.p. 116–118 °C. $[\alpha]_D^{27} = +6.8$ ($c = 0.58$, CHCl_3). HPLC: Chiracel OD-H Column, n -hexane/ i -propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 9.65$ min (minor) and 10.66 min (major). ^1H NMR (600 MHz, CDCl_3) δ 7.56 (d, $J = 8.3$ Hz, 2H), 7.14 (d, $J = 8.3$ Hz, 2H), 7.07 – 6.94 (m, 6H), 6.77 – 6.69 (m, 2H), 5.47 (d, $J = 6.8$ Hz, 1H), 4.95 (d, $J = 6.7$ Hz, 1H), 3.75 (s, 3H), 2.38 (s, 3H), 2.28 (s, 3H). ^{13}C NMR (150MHz, CDCl_3) δ 159.1, 143.3, 137.4, 133.0, 129.5, 129.3, 128.7, 127.4, 127.3, 114.0, 60.8, 55.4, 21.6, 21.1



Results

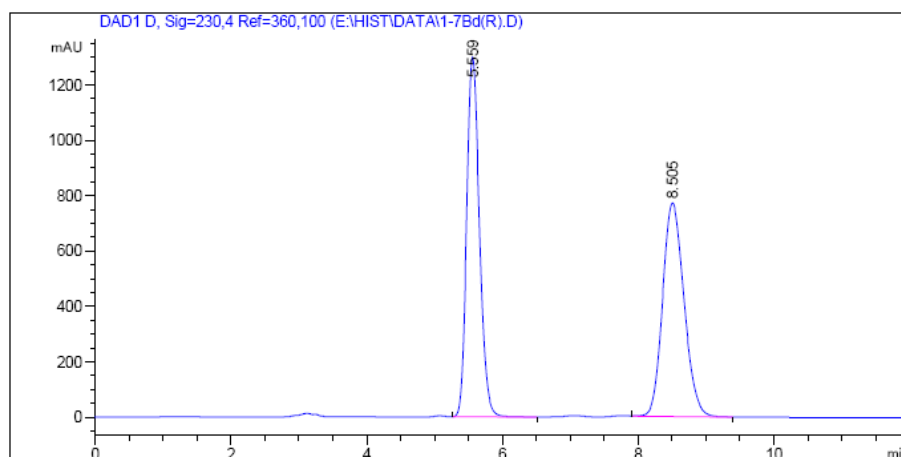
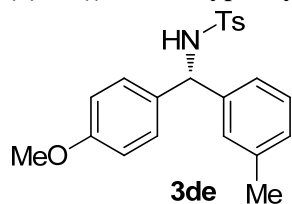
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		9.602	270.76440	6296.37598	49.9842
2		10.673	243.13013	6300.36377	50.0158
Total			513.89453	1.25967e4	100.000



Results

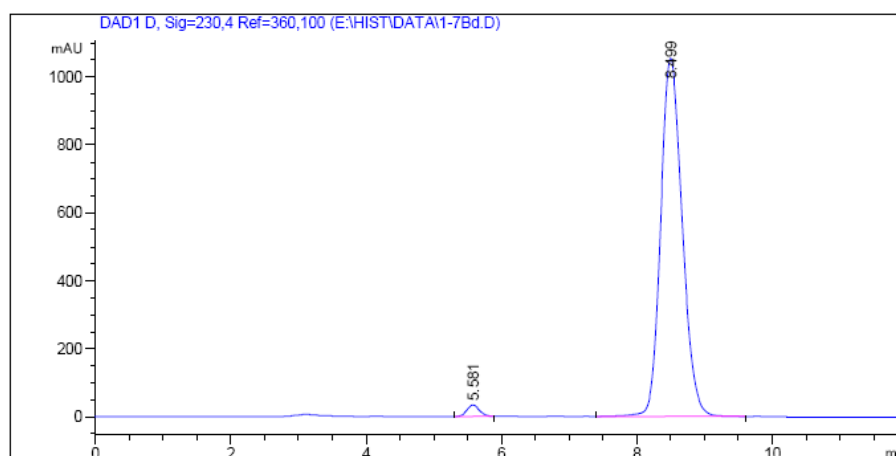
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		9.649	2.30597	43.35966	0.3468
2		10.659	474.43701	1.24586e4	99.6532
Total			476.74299	1.25019e4	100.000

(S)-N-((4-methoxyphenyl)(*m*-tolyl)methyl)-4-methylbenzenesulfonamide(3de). Colourless sticky oil, 109 mg, 95% yield. 96% ee. $[\alpha]_D^{27} = +14.8$ ($c = 0.44$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.58$ min (minor) and 8.50 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.54 (d, $J = 8.3$ Hz, 2H), 7.19 – 7.06 (m, 3H), 7.06 – 6.95 (m, 3H), 6.93 – 6.82 (m, 2H), 6.77 – 6.69 (m, 2H), 5.47 (d, $J = 7.1$ Hz, 1H), 5.12 (d, $J = 7.0$ Hz, 1H), 3.75 (s, 3H), 2.38 (s, 3H), 2.20 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.0, 143.2, 140.7, 138.2, 137.5, 132.9, 129.4, 128.7, 128.5, 128.3, 128.1, 127.3, 124.5, 113.9, 60.9, 55.4, 21.6, 21.4. HRMS (ESI, m/z) calcd for $\text{C}_{22}\text{H}_{23}\text{NNaO}_3\text{S}$ $[\text{M} + \text{Na}]^+$ 404.1296, found 404.1292.



Results

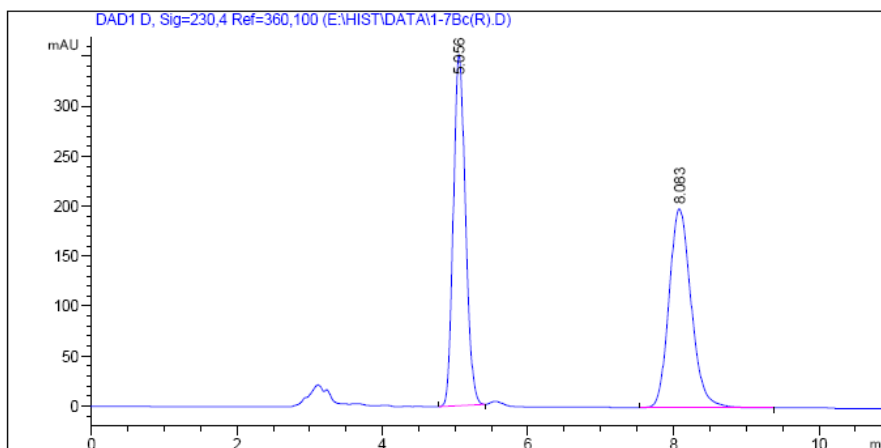
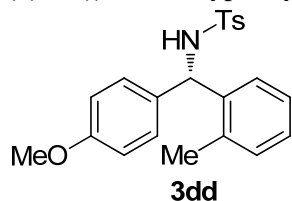
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.559	1299.42834	1.69193e4	50.0577
2		8.505	770.95630	1.68803e4	49.9423
Total			2070.38464	3.37995e4	100.000



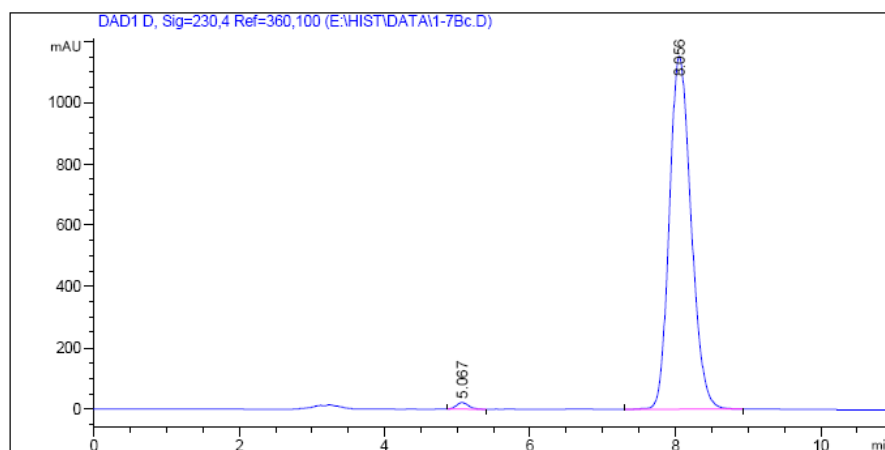
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.581	33.60473	431.24588	1.8157
2		8.499	1054.44812	2.33197e4	98.1843
Total			1088.05285	2.37509e4	100.000

(S)-N-((4-methoxyphenyl)(*o*-tolyl)methyl)-4-methylbenzenesulfonamide(3dd).^[6] Colourless sticky oil. 106 mg, 93% yield. 98% ee. $[\alpha]_D^{27} = +23.0$ ($c = 0.62$, CHCl_3). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.07$ min (minor) and 8.06 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.55 (d, $J = 8.3$ Hz, 2H), 7.15 – 7.04 (m, 6H), 7.00 – 6.91 (m, 2H), 6.79 – 6.69 (m, 2H), 5.73 (d, $J = 6.9$ Hz, 1H), 4.87 (d, $J = 6.6$ Hz, 1H), 3.75 (s, 3H), 2.38 (s, 1H), 2.13 (s, 1H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.1, 143.3, 138.5, 137.6, 135.5, 132.1, 130.8, 129.5, 129.0, 127.6, 127.3, 127.1, 114.0, 57.8, 55.4, 21.6, 19.5.

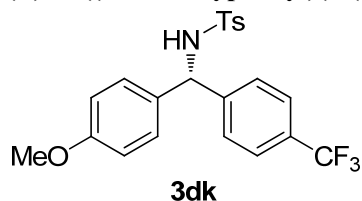


Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.056	351.29510	4078.09326	49.2607
2		8.083	198.84413	4200.49365	50.7393
Total			550.13924	8278.58691	100.000



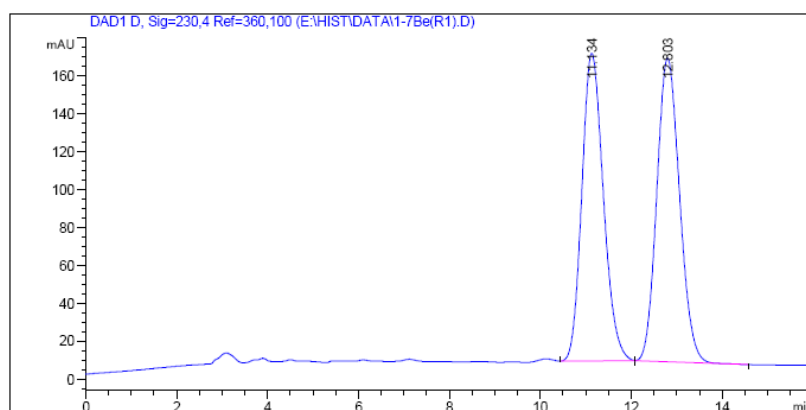
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.067	21.25774	242.20439	1.0032
2		8.056	1151.81201	2.39009e4	98.9968
Total			1173.06975	2.41431e4	100.000

(R)-N-((4-methoxyphenyl)(4-(trifluoromethyl)phenyl)methyl)-4-methylbenzenesulfonamide



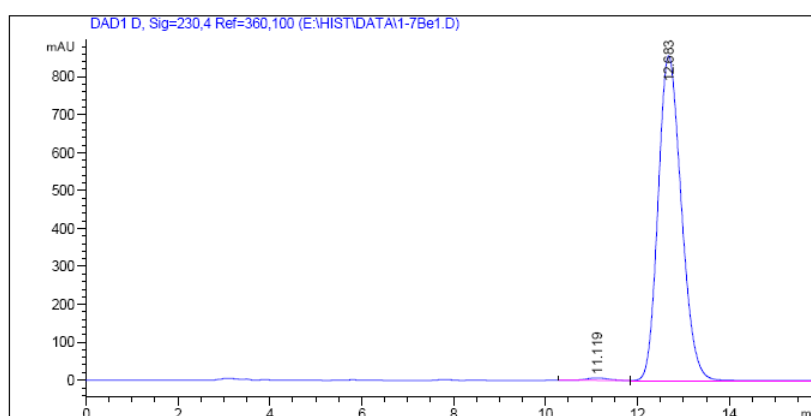
3dk

(3dk). White solid, 128 mg, 98% yield, 99% ee, m.p. 115–117 °C. $[\alpha]_D^{27} = +24.4$ ($c = 0.66$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 11.12$ min (minor) and 12.68 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.59 – 7.49 (m, 2H), 7.44 (d, $J = 8.2$ Hz, 2H), 7.32 – 7.22 (m, 2H), 7.13 (d, $J = 8.0$ Hz, 2H), 7.00 – 6.91 (m, 2H), 6.81 – 6.71 (m, 2H), 5.56 (d, $J = 6.8$ Hz, 1H), 5.15 (d, $J = 6.7$ Hz, 1H), 3.75 (s, 3H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.5, 144.6, 143.7, 137.2, 132.0, 129.6, 128.7, 127.8, 127.3, 125.5 (q, $J = 3.8$ Hz), 114.3, 60.7, 55.4, 21.6. HRMS (ESI, m/z) calcd for $\text{C}_{22}\text{H}_{20}\text{F}_3\text{NNaO}_3\text{S}$ $[\text{M} + \text{Na}]^+$ 458.1014, found 458.1019.



Results

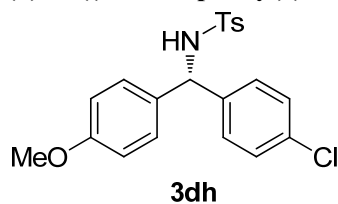
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		11.134	162.29820	5333.61963	48.9173
2		12.803	160.17889	5569.71924	51.0827
Total			322.47710	1.09033e4	100.000



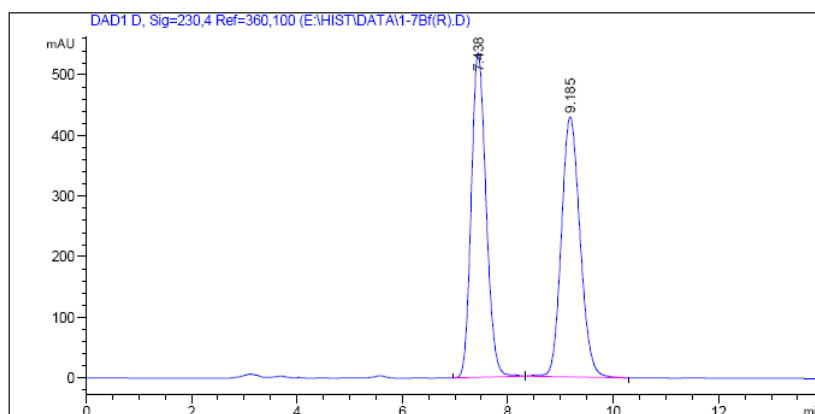
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		11.119	6.87175	225.73616	0.7459
2		12.683	856.82690	3.00384e4	99.2541
Total			863.69865	3.02641e4	100.000

(S)-N-((4-chlorophenyl)(4-methoxyphenyl)methyl)-4-methylbenzenesulfonamide(3dh).^[6]

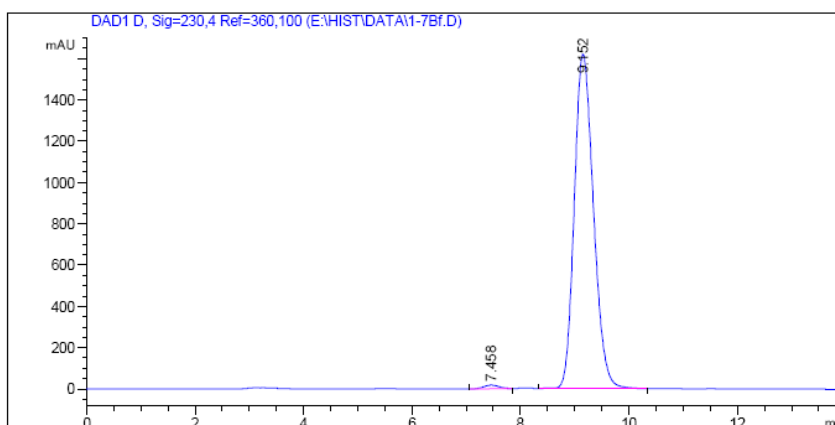


White solid, 119 mg, 99% yield, 98% ee, m.p. 96–97 °C. $[\alpha]_D^{27} = +14.1$ ($c = 0.65$, CHCl_3). HPLC: Chiralcel OD-H Column, n -hexane/ i -propanol = 70/30, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 7.45$ min (minor) and 9.15 min (major). $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.54 (d, $J = 8.3$ Hz, 2H), 7.17 – 7.13 (m, 4H), 7.06 (d, $J = 8.5$ Hz, 2H), 7.00 – 6.91 (m, 2H), 6.80 – 6.65 (m, 2H), 5.48 (d, $J = 7.0$ Hz, 1H), 5.28 (d, $J = 7.1$ Hz, 1H), 3.74 (s, 3H), 2.39 (s, 3H). $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 159.3, 143.5, 139.3, 137.3, 133.4, 132.4, 129.5, 128.8, 128.7, 127.3, 114.1, 60.4, 55.4, 21.6.



Results

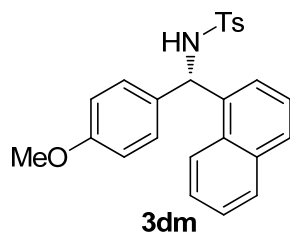
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.438	535.14221	1.04416e4	49.7213
2		9.185	429.19498	1.05586e4	50.2787
Total			964.33719	2.10002e4	100.000



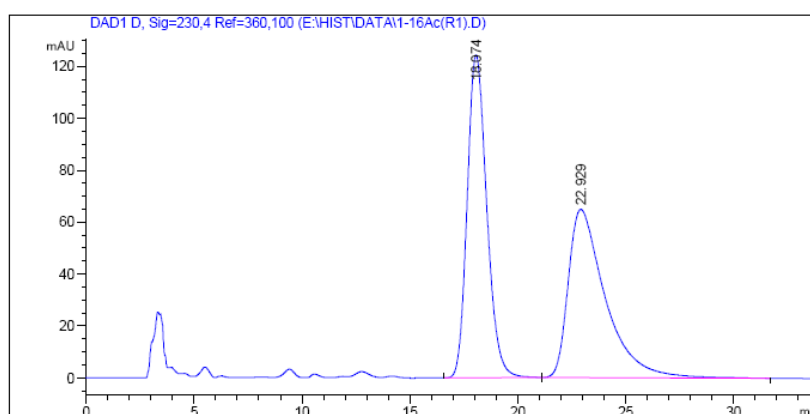
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.458	17.30678	343.43430	0.8569
2		9.152	1618.85278	3.97333e4	99.1431
Total			1636.15956	4.00767e4	100.000

(S)-N-((4-methoxyphenyl)(naphthalen-1-yl)methyl)-4-methylbenzenesulfonamide(3dm).^[8]

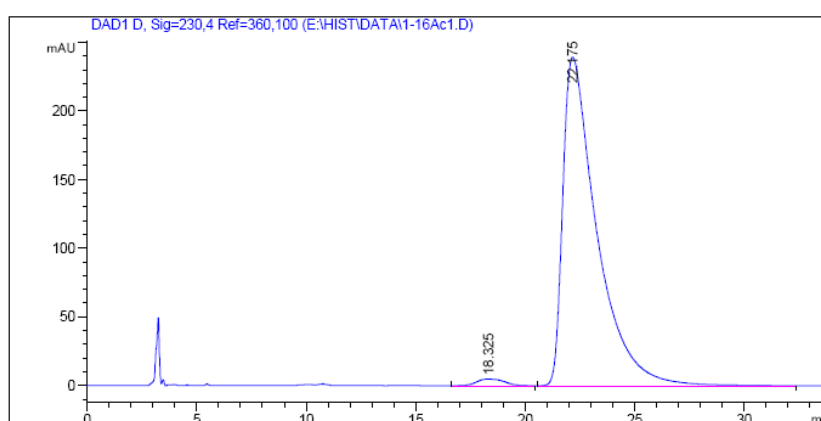


White solid, 113 mg, 90% yield, 97% ee, m.p. 176–178 °C. $[\alpha]_D^{28} = +5.6$ ($c = 0.70$, CHCl_3). HPLC: Chiralcel OD-H Column, n -hexane/ i -propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 18.33$ min (minor) and 22.18 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.82 – 7.71 (m, 3H), 7.51 (d, $J = 8.3$ Hz, 2H), 7.45 – 7.35 (m, 2H), 7.34 – 7.24 (m, 2H), 7.07 – 6.98 (m, 4H), 6.73 – 6.69 (m, 2H), 6.25 (d, $J = 6.9$ Hz, 1H), 5.12 (d, $J = 6.9$ Hz, 1H), 3.74 (s, 3H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.1, 143.3, 137.4, 135.7, 134.1, 132.4, 130.5, 129.4, 128.9, 128.6, 127.3, 126.6, 126.0, 125.8, 125.2, 123.5, 114.1, 58.2, 55.4, 21.6.



Results

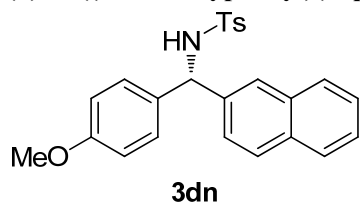
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		18.074	124.33814	7826.43701	50.3156
2		22.929	64.74956	7728.24805	49.6844
Total			189.08770	1.55547e4	100.000



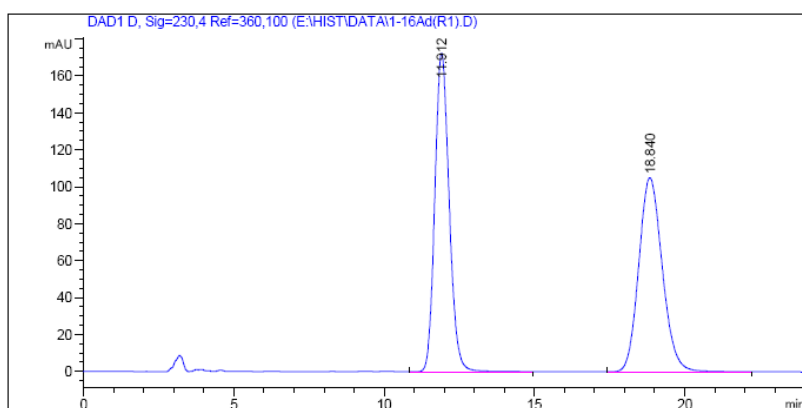
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		18.325	4.87382	424.79007	1.6182
2		22.175	239.27130	2.58260e4	98.3818
Total			244.14512	2.62508e4	100.000

(S)-N-((4-methoxyphenyl)(naphthalen-2-yl)methyl)-4-methylbenzenesulfonamide(3dn).^[8]

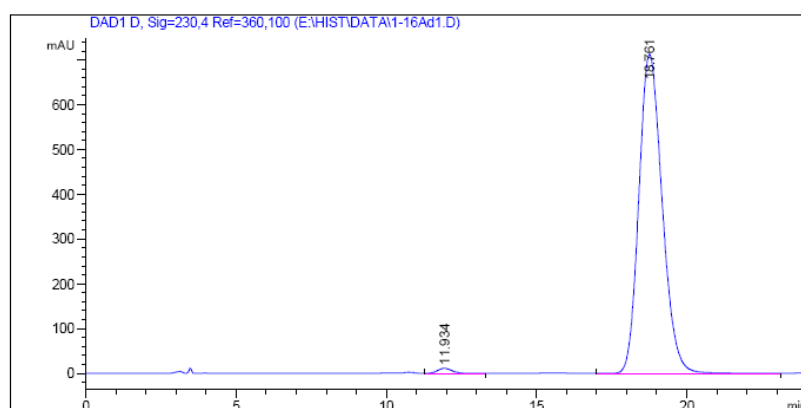


White solid, 116 mg, 93% yield, 98% ee, m.p. 147–149 °C. $[\alpha]_D^{28} = +8.1$ ($c = 0.55$, CHCl_3). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 11.93$ min (minor) and 18.76 min (major). ^1H NMR (400 MHz, CDCl_3) δ 7.81 – 7.74 (m, 1H), 7.67 – 7.62 (m, 2H), 7.55 – 7.50 (m, 3H), 7.46 – 7.42 (m, 2H), 7.18 – 7.15 (m, 1H), 7.05 – 7.02 (m, 4H), 6.75 – 6.72 (m, 2H), 5.68 (d, $J = 7.3$ Hz, 1H), 5.25 (d, $J = 7.2$ Hz, 1H), 3.75 (s, 1H), 2.26 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.2, 143.3, 137.8, 137.4, 133.1, 132.7 (d, $J = 2.9$ Hz), 129.4, 128.9, 128.6, 128.1, 127.7, 127.3, 126.4 (d, $J = 1.9$ Hz), 126.3, 125.3, 114.1, 61.1, 55.4, 21.5.



Results

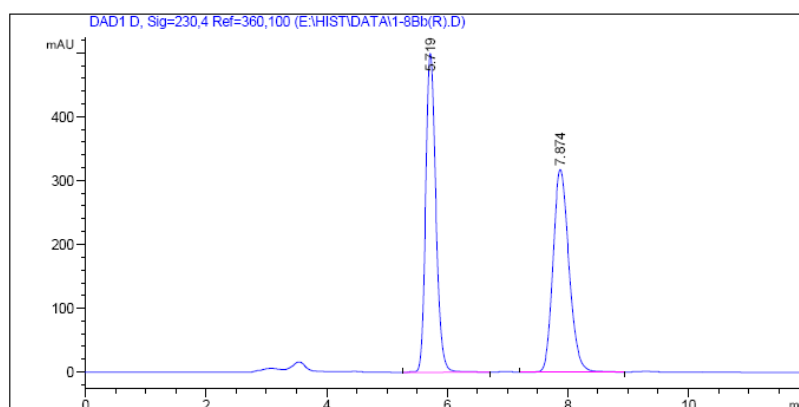
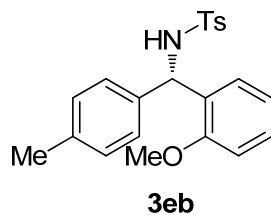
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		11.912	172.32610	5717.25244	50.0143
2		18.840	104.97494	5713.98047	49.9857
Total			277.30103	1.14312e4	100.000



Results

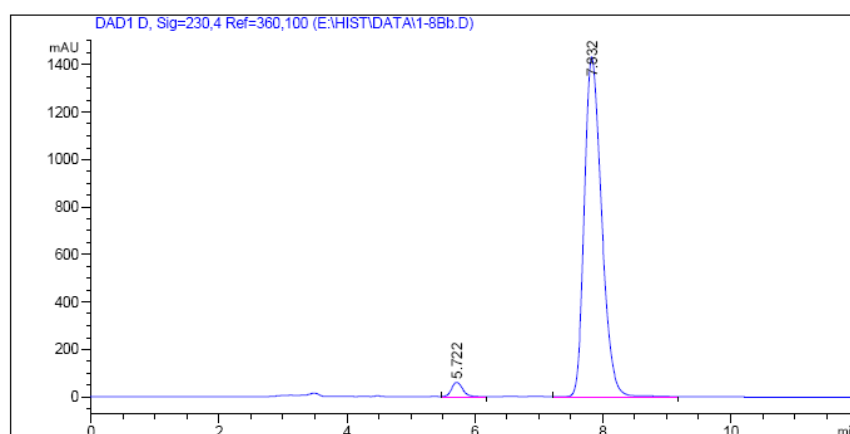
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		11.934	11.22298	369.45346	0.9541
2		18.761	712.84143	3.83527e4	99.0459
Total			724.06441	3.87221e4	100.000

(S)-N-((2-methoxyphenyl)(p-tolyl)methyl)-4-methylbenzenesulfonamide(3eb). White solid, 108 mg, 94% yield. 95% ee. m.p. 104–106 °C. $[\alpha]_D^{27} = -7.4$ (c = 0.54, CHCl₃). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 5.72$ min (minor) and 7.83 min (major). ¹H NMR (400 MHz, CDCl₃) δ 7.51 (d, *J* = 8.3 Hz, 2H), 7.18 – 7.12 (m, 1H), 7.07 – 6.96 (m, 7H), 6.79 – 6.75 (m, 1H), 6.65 (d, *J* = 8.1 Hz, 1H), 5.79 (d, *J* = 9.1 Hz, 1H), 5.62 (d, *J* = 9.0 Hz, 1H), 3.59 (s, 3H), 2.32 (s, 3H), 2.28 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 156.5, 142.8, 137.7, 137.6, 136.9, 129.7, 129.1, 129.0, 127.8, 127.1, 126.9, 120.7, 111.1, 58.9, 55.3, 21.5, 21.1. HRMS (ESI, *m/z*) calcd for C₂₂H₂₃NNaO₃S [M + Na]⁺ 404.1296, found 404.1292.



Results

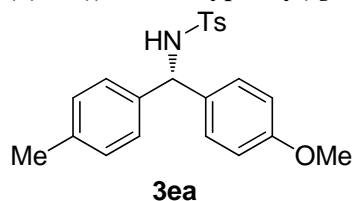
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.719	499.90292	5838.12061	50.1491
2		7.847	317.20984	5803.41211	49.8509
Total			817.11276	1.16415e4	100.000



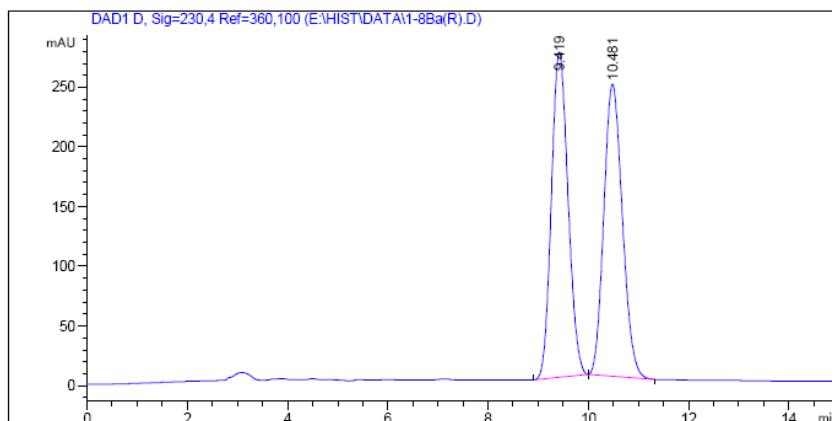
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		5.722	59.74057	710.10852	2.5850
2		7.832	1431.83801	2.67599e4	97.4150
Total			1491.57858	2.74700e4	100.000

(*S*)-*N*-((4-methoxyphenyl)(*p*-tolyl)methyl)-4-methylbenzenesulfonamide(**3ea**).^[8] White solid.

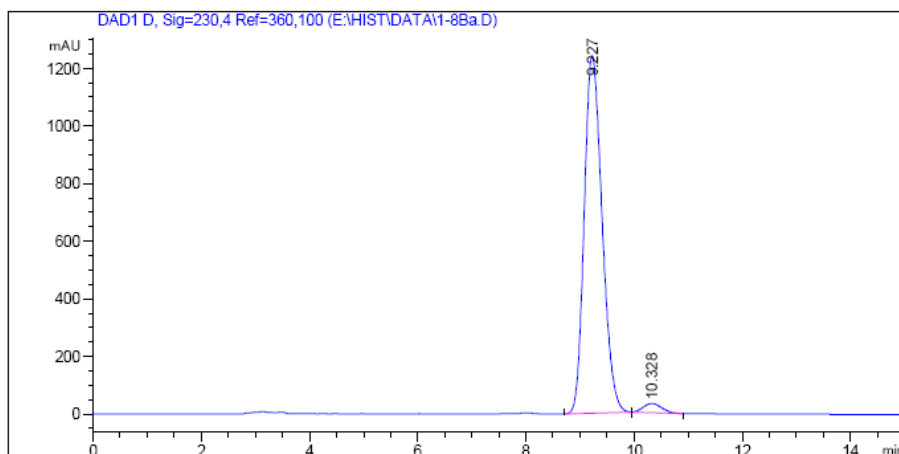


111 mg, 97% yield, 95% ee, m.p. 116–118 °C. $[\alpha]_D^{24} = -4.8$ ($c = 0.65$, CHCl_3). Characterization data is the same with **3df** (with a reverse configuration of **3df**). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 9.23$ min (major) and 10.33 min (minor).



Results

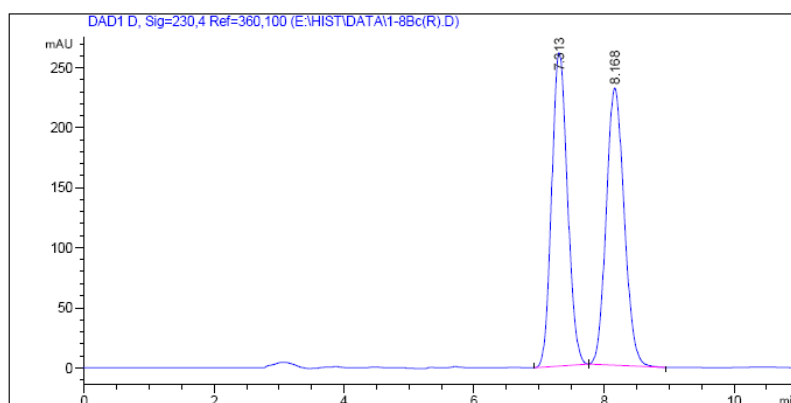
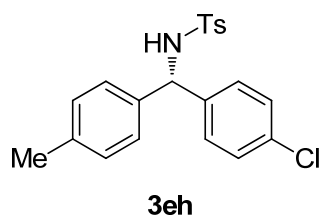
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		9.419	272.54245	6281.99805	49.9930
2		10.481	244.66333	6283.74512	50.0070
Total			517.20578	1.25657e4	100.000



Results

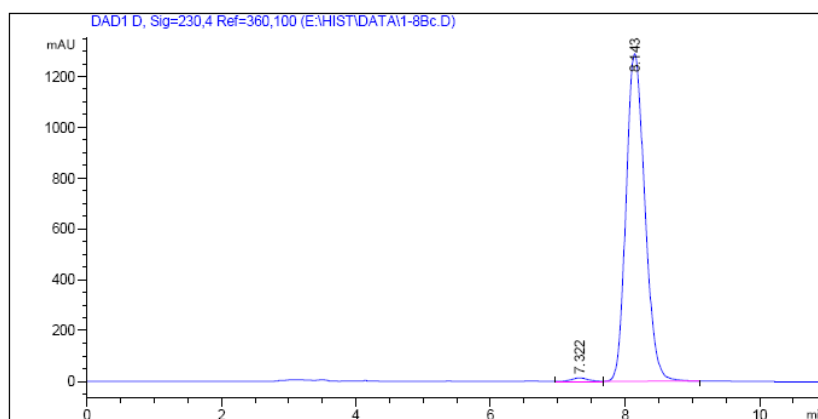
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU·s)	Conc (%)
1		9.227	1241.97168	2.84497e4	97.4174
2		10.328	31.72493	754.22119	2.5826
Total			1273.69661	2.92039e4	100.000

(S)-N-((4-chlorophenyl)(p-tolyl)methyl)-4-methylbenzenesulfonamide(3eh).^[7] White solid, 110 mg, 96% yield, 98% ee, m.p. 121–122 °C. $[\alpha]_D^{27} = +7.2$ (c = 0.64, CHCl₃). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 7.32$ min (minor) and 8.14 min (major). ¹H NMR (600 MHz, CDCl₃) δ 7.55 (d, *J* = 8.3 Hz, 2H), 7.20 – 7.12 (m, 4H), 7.09 – 6.99 (m, 4H), 6.91 (d, *J* = 8.1 Hz, 2H), 5.48 (d, *J* = 7.0 Hz, 1H), 5.12 (d, *J* = 6.0 Hz, 1H), 2.39 (s, 3H), 2.28 (s, 3H). ¹³C NMR (150 MHz, CDCl₃) δ 143.5, 139.3, 137.9, 137.4, 137.3, 133.5, 129.5, 128.9, 128.7, 127.3 (d, *J* = 3.1 Hz), 60.7, 21.6, 21.2.



Results

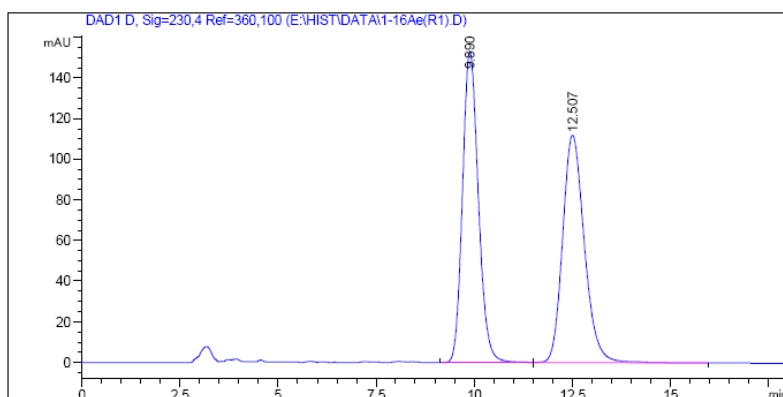
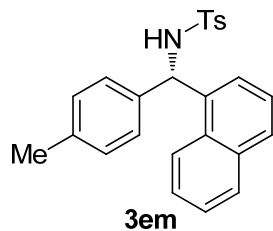
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.313	261.43140	4409.42285	49.7658
2		8.168	231.27983	4450.92480	50.2342
Total			492.71123	8860.34766	100.000



Results

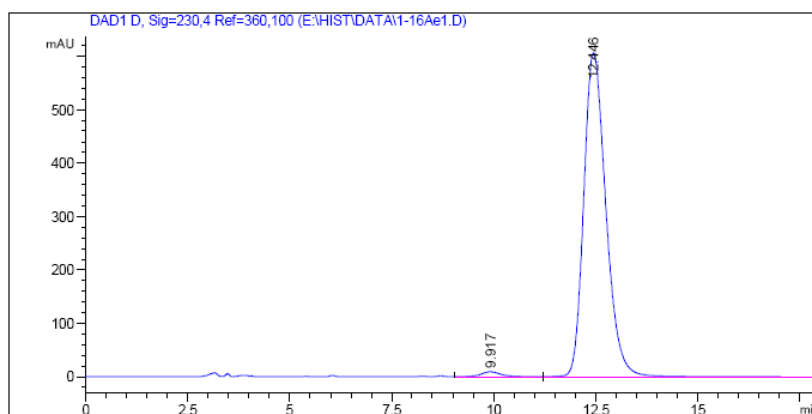
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		7.322	13.16964	216.13364	0.8572
2		8.143	1288.65222	2.49974e4	99.1428
Total			1301.82186	2.52135e4	100.000

(S)-4-methyl-N-(naphthalen-1-yl(*p*-tolyl)methyl)benzenesulfonamide (3em). White solid, 109 mg, 90% yield, 97% ee, m.p. 157–159 °C. $[\alpha]_D^{28} = +1.8$ (c = 0.60, CHCl₃). HPLC: Chiralcel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 9.92$ min (minor) and 12.45 min (major). ¹H NMR (400 MHz, CDCl₃) δ 7.81–7.77 (m, 2H), 7.73–7.70 (m, 1H), 7.50 (d, *J* = 8.2 Hz, 2H), 7.45–7.35 (m, 2H), 7.30–7.26 (m, 2H), 7.05 (d, *J* = 8.0 Hz, 2H), 7.02–6.97 (m, 4H), 6.26 (d, *J* = 7.0 Hz, 1H), 5.17 (d, *J* = 6.9 Hz, 1H), 2.35 (s, 3H), 2.27 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 143.2, 137.5, 137.4, 135.7, 134.1, 130.6, 129.41, 129.37, 129.0, 128.6, 127.6, 127.3, 126.6, 126.1, 125.8, 125.2, 123.5, 58.5, 21.6, 21.2. HRMS (ESI, *m/z*) calcd for C₂₅H₂₃NNaO₂S [M + Na]⁺ 424.1347, found 424.1343.



Results

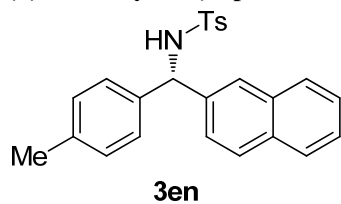
Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		9.890	153.19661	4298.52246	49.9783
2		12.507	111.84264	4302.25586	50.0217
Total			265.03925	8600.77832	100.000



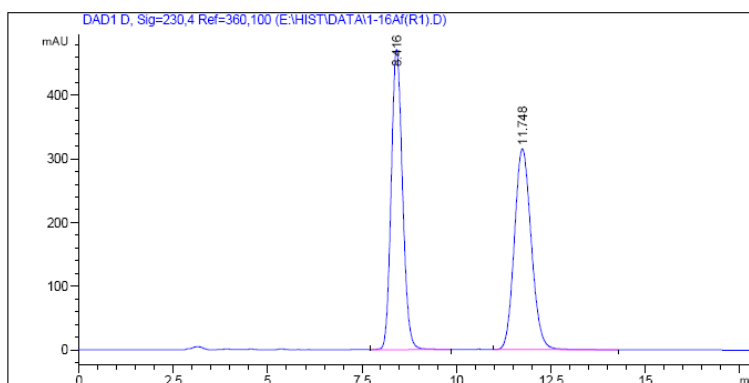
Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU.s)	Conc (%)
1		9.917	9.23605	309.30435	1.3371
2		12.446	606.55634	2.28237e4	98.6629
Total			615.79238	2.31330e4	100.000

(*S*)-4-methyl-*N*-(naphthalen-2-yl(*p*-tolyl)methyl)benzenesulfonamide(**3en**).^[7] White solid,

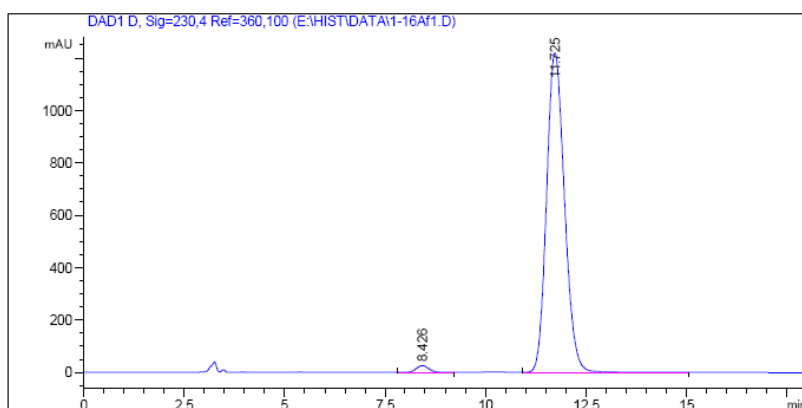


112 mg, 93% yield, 97% ee, m.p. 140–142 °C. $[\alpha]_D^{28} = -5.2$ (c = 1.02, CHCl₃). HPLC: Chiracel OD-H Column, *n*-hexane/*i*-propanol = 80/20, flow = 1.0 mL/min, $\lambda = 230$ nm, 25 °C, $t_R = 8.43$ min (minor) and 11.73 min (major). ¹H NMR (400 MHz, CDCl₃) δ 7.75 – 7.72 (m, 1H), 7.65 – 7.60 (m, 2H), 7.54 – 7.51 (m, 3H), 7.45 – 7.40 (m, 2H), 7.18 – 7.15 (m, 1H), 7.04 – 7.00 (m, 6H), 5.68 (d, $J = 7.3$ Hz, 1H), 5.38 (d, $J = 7.2$ Hz, 1H), 2.27 (s, 3H), 2.25 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 143.3, 137.8, 137.7, 137.6, 137.5, 133.1, 132.8, 129.42, 129.39, 128.5, 128.1, 127.7, 127.5, 127.3, 126.4, 126.3, 126.2, 125.3, 61.4, 21.5, 21.2.



Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		8.416	471.77914	9810.02832	49.9939
2		11.748	315.77045	9812.40332	50.0061
Total			787.54959	1.96224e4	100.000



Results

Peak No.	Peak ID	Ret Time (min)	Height (mAU)	Area (mAU*s)	Conc (%)
1		8.426	25.90806	557.27307	1.4541
2		11.725	1218.59045	3.77665e4	98.5459
Total			1244.49851	3.83238e4	100.000

4. References

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5. Copies of ^1H and ^{13}C NMR spectra of the obtained adducts

