Supporting Information

Iridium-catalyzed Enantioselective Reductive Amination of Aromatic Ketones

Ruixia Liu[a,+], Bin Li[b,+], Jingkuo Han[a], Dongxu Zhang[a], Muqiong Li[a], Lin Yao[a], Wei Zhao[a], Qiaofeng Wang[a], Ru Jiang[a,*], Huifang Nie[a,*]
[a]School of Pharmacy, Fourth Military Medical University, Xi'an, 710032, China
[b]Key Laboratory of Resource Biology and Biotechnology in Western China, Ministry of Education, The College of Life Sciences, Northwest University, Xi'an 710069, PR China
[+]These authors contributed equally.
*Corresponding author.
E-mail addresses: jiangru@fmmu.edu.cn; niehuifang@fmmu.edu.cn

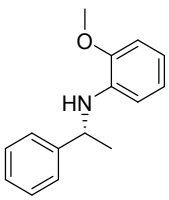
Contents

1. General remarks

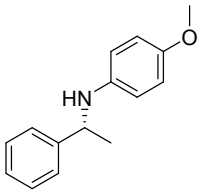
Unless otherwise specified, all experiments dealing with air- or moisture-sensitive compounds were performed using standard Schlenk techniques. All other commercial chemicals were purchased from J&K or Energy Chemical (Shanghai, China) in the highest purity and used without purification. THF, *t*-butyl methyl ether (TBME) and toluene were distilled from sodium benzophenone ketyl. CH_2Cl_2, $CHCl_3$ and ethyl acetate were distilled form CaH_2 under an atmosphere of argon. NMR spectra were recorded on a Bruker 400 MHz NMR spectrometer. Optical rotations were measured on a PERKIN ELMER polarimeter 343 instrument. HRMS were recorded on ZAB-HS spectrometer with ES ionization (ESI). Enantiomeric excesses were determined by Daicel chiral column on an Agilent 1260 Series HPLC instrument.

2. General procedure for DARA of aromatic ketones[1]

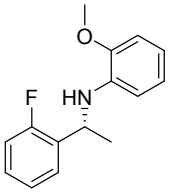
In a glass tube equipped with a stir bar, the catalyst(1 mol %) was prepared *in situ* from $[Ir(COD)Cl]_2$ (0.0025 mmol, 1.6 mg) and (*R*)-Cy-ax-Josiphos (0.0055 mmol, 4.0 mg) in anhydrous toluene (1 mL) over 30min, then aromatic ketone (0.5 mmol), *o*-anisidine (0.6 mmol), $Ti(O^iPr)_4$ (0.5 mmol, 142 mg), I_2 (0.05 mmol, 12.7 mg) and toluene (1 mL) was added subsequently. The glass tube was then placed into an autoclave, followed by replacing air with H_2 three times. The autoclave was charged with hydrogen to 50 atm, and then the reaction mixture was stirred at 50 ℃ for 20 h. After releasing the hydrogen, the solution was neutralized with saturated $NaHCO_3$, extracted with EtOAc and concentrated to afford the crude product. After flash chromatography with a column of silica gel, the desired amine products (yield: 80 − 97 %) were obtained.



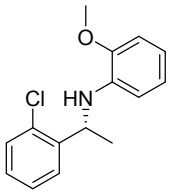
(*R*)-2-methoxy-*N*-(1-phenylethyl)aniline (**3a**)[2]: white solid; 107.9 mg, 95 % yield, 89 % *ee*; **^{1}H NMR** (400 Hz, $CDCl_3$) δ 7.41-7.34 (m, 2H), 7.34-7.26 (m, 2H), 7.21 (m, 1H), 6.76 (m, 1H), 6.69 (m, 1H), 6.60 (td, J = 7.7, 1.6 Hz, 1H), 6.33 (m,1H), 4.63 (s, 1H), 4.47 (m, 1H), 3.88 (s, 3H), 1.55 (d, J = 6.7 Hz, 3H); Enantiomeric excess was determined by HPLC on a Chiralpak OD-H column, Hex/IPA = 90: 10, 1 mL/min, 254 nm, t_S = 4.95 min (minor), t_R = 6.11 min (major).



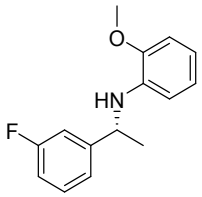
(*R*)-4-methoxy-*N*-(1-phenylethyl)aniline (**3a′**)[3]: white solid; 90.8 mg, 80 % yield, 77 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.34 (m, 4H), 7.26-7.13 (m, 1H), 6.77-6.63 (m, 2H), 6.55-6.38 (m, 2H), 4.49-4.33 (m, 1H), 3.88-3.72 (m, 1H), 3.69 (d, J = 2.8 Hz, 3H), 1.50 (dd, J = 6.8, 2.9 Hz, 3H). Enantiomeric excess was determined by HPLC on a Chiralpak OD-H column, Hex/IPA = 97: 3, 1 mL/min, 254 nm, t_S = 11.11 min (major), t_R = 12.65 min (minor).



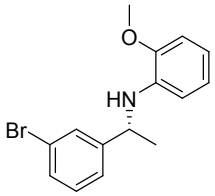
(*R*)-*N*-(1-(2-fluorophenyl)ethyl)-2-methoxyaniline (**3b**)[1]: white solid; 104.2 mg, 85 % yield, 91 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37-7.30 (m, 1H), 7.17 (ddd, J = 13.5, 6.3, 1.7 Hz, 1H), 7.06-6.96 (m, 2H), 6.76 (dd, J = 7.8, 1.2 Hz, 1H), 6.70 (td, J = 7.7, 1.4 Hz, 1H), 6.61 (td, J = 7.7, 1.5 Hz, 1H), 6.33 (dd, J = 7.8, 1.4 Hz, 1H), 4.86-4.78 (m, 1H), 4.62 (s, 1H), 3.88 (s, 3H), 1.56 (d, J = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1mL/min, 254 nm, t_S = 10.59 min (minor), t_R = 13.15 min (major).



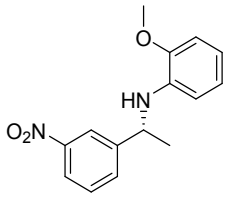
(*R*)-*N*-(1-(2-chlorophenyl)ethyl)-2-methoxyaniline (**3c**): white solid; 104.4 mg, 80 % yield, 70 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.42 (dd, J = 7.2, 2.2 Hz, 1H), 7.39-7.27 (m, 1H), 7.21-7.03 (m, 2H), 6.75 (dd, J = 7.8, 1.4 Hz, 1H), 6.68 (td, J = 7.6, 1.5 Hz, 1H), 6.60 (td, J = 7.7, 1.6 Hz, 1H), 6.19 (dd, J = 7.8, 1.6 Hz, 1H), 4.89 (q, J = 6.7 Hz, 1H), 4.68 (s, 1H), 3.89 (s, 3H), 1.53 (d, J = 6.6 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 146.54, 142.26, 136.67, 132.50, 129.59, 127.91, 127.35, 126.69, 121.26, 116.55, 110.92, 109.28, 55.45, 50.03, 23.01; **HRMS (ESI)** calcd for $C_{15}H_{17}ClNO$ $[M+H]^+$: 262.0999, Found: 262.0992. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1mL/min, 254 nm, t_S = 4.96 min (minor), t_R = 6.20 min (major).



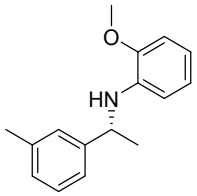
(*R*)-*N*-(1-(3-fluorophenyl)ethyl)-2-methoxyaniline (**3e**): white solid; 116.4 mg, 95 % yield; 92 % *ee*; **$[\alpha]_D^{25}$** -66.0 (c = 0.41, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.29-7.21 (m, 1H), 7.14 (d, J = 7.7 Hz, 1H), 7.11-7.02 (m, 1H), 6.94-6.83 (m, 1H), 6.78-6.75 (m, 1H), 6.69 (m, 1H), 6.66-6.56 (m, 1H), 6.29 (m, 1H), 4.61 (s, 1H), 4.44 (q, J = 6.8 Hz, 1H), 3.88 (s, 3H), 1.53 (d, J = 6.7 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 163.26 (d, J = 245.7 Hz), 148.53 (d, J = 6.5 Hz), 146.56, 136.91, 130.06 (d, J = 8.1 Hz), 121.46 (d, J = 2.7 Hz), 121.12, 116.61, 113.64 (d, J = 21.1 Hz), 112.65 (d, J = 21.8 Hz), 110.97, 109.32, 55.40, 53.05, 25.09; **HRMS (ESI)** calcd for : $C_{15}H_{16}FNO$ $[M+H]^+$: 246.1294, Found: 246.1294 . Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 254 nm, t_S = 6.22 min (minor), t_R = 10.06 min (major).



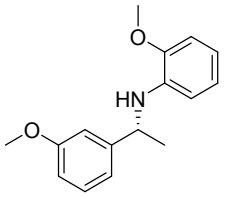
(*R*)-*N*-(1-(3-bromophenyl)ethyl)-2-methoxyaniline (**3f**): colorless oil; 147.9 mg, 97 % yield; 93 % *ee*; **[α]**$_D^{25}$ -44.8 (*c* = 0.5, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.56 (t, *J* = 1.9 Hz, 1H), 7.38 (m, 1H), 7.33 (m, 1H), 7.21 (t, *J* = 7.8 Hz, 1H), 6.81 (dd, *J* = 7.8, 1.5 Hz, 1H), 6.75 (td, *J* = 7.3, 1.2 Hz, 1H), 6.67 (td, *J* = 7.7, 1.6 Hz, 1H), 6.32 (dd, *J* = 7.7, 1.6 Hz, 1H), 4.65 (s, 1H), 4.44 (m, 1H), 3.93 (s, 3H), 1.57 (d, *J* = 6.8 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 147.95, 146.34, 136.65, 130.03, 129.73, 128.73, 124.27, 122.59, 120.93, 116.46, 110.77, 109.11, 55.20, 52.88, 24.97; **HRMS (ESI)** calcd for $C_{15}H_{16}BrNO$ $[M+H]^+$: 306.0494, Found: 306.0486. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 215 nm, t_S = 9.47 min (minor), t_R = 16.78 min (major).



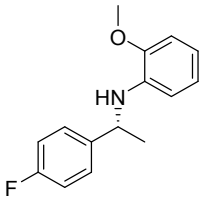
(*R*)-2-methoxy-*N*-(1-(3-nitrophenyl)ethyl)aniline (**3g**)[4]: white solid; 129.3 mg, 95 % yield; 91 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.28-8.19 (m, 1H), 8.08 (d, *J* = 8.1 Hz, 1H), 7.71 (d, *J* = 7.6 Hz, 1H), 7.47 (t, *J* = 7.9 Hz, 1H), 6.78 (m, 1H), 6.72-6.54 (m, 2H), 6.21 (m, 1H), 4.69 (s, 1H), 4.55 (p, *J* = 6.5 Hz, 1H), 3.90 (s, 3H), 1.58 (d, *J* = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 90: 10, 1 mL/min, 254 nm, t_S = 11.11 min (minor), t_R = 19.28 min (major).



(*R*)-2-methoxy-N-(1-(m-tolyl)ethyl)aniline (**3h**)[4]: white solid; 108.5 mg, 90 % yield; 94 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.22-7.11 (m, 3H), 7.06-6.97 (m, 1H), 6.75 (dd, J = 7.9, 1.4 Hz, 1H), 6.70 (td, J = 7.7, 1.4 Hz, 1H), 6.60 (td, J = 7.7, 1.6 Hz, 1H), 6.35 (dd, J = 7.8, 1.5 Hz, 1H), 4.60 (s, 1H), 4.41 (q, J = 6.7 Hz, 1H), 3.87 (s, 3H), 2.32 (s, 3H), 1.53 (d, J = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 215 nm, t_S = 10.58 min (minor), t_R = 13.60 min (major).

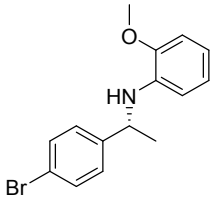


(*R*)-2-methoxy-*N*-(1-(3-methoxyphenyl)ethyl)aniline (**3i**): white solid; 123.4 mg, 96 % yield; 95 % *ee*; **[α]**$_D^{25}$ -62.4 (c = 0.62, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.36-7.25 (m, 2H), 6.94-6.81 (m, 2H), 6.75 (m, 1H), 6.70 (m, 1H), 6.60 (m, 1H), 6.36 (dd, J = 7.8, 1.6 Hz, 1H), 4.58 (s, 1H), 4.43 (q, J = 6.8 Hz, 1H), 3.87 (s, 3H), 3.77 (s, 3H), 1.52 (d, J = 6.7 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 159.78, 147.25, 146.42, 137.09, 129.43, 121.01, 118.05, 116.19, 111.75, 111.49, 110.90, 109.13, 55.22, 54.93, 53.22, 24.92; **HRMS (ESI)** calcd for $C_{16}H_{19}NO_2$ $[M+H]^+$: 258.1494, Found: 258.1490. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 90: 10, 1 mL/min, 254 nm, t_S = 6.66 min (minor), t_R = 8.74 min (major).

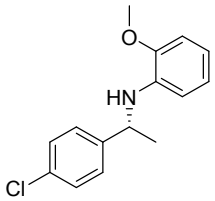


(*R*)-*N*-(1-(4-fluorophenyl)ethyl)-2-methoxyaniline (**3j**)[2]**:** white solid; 118.9 mg, 97 % yield; 95 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.32 (m, 2H), 7.09-6.88 (m, 2H), 6.83-6.74 (m, 1H), 6.74-6.66 (m, 1H), 6.62 (m, 1H), 6.29 (m, 1H), 4.71-4.53 (m, 1H), 4.51-4.34 (m, 1H), 3.88 (s, 3H), 1.52 (d, J = 6.7 Hz, 3H). Enantiomeric excess was

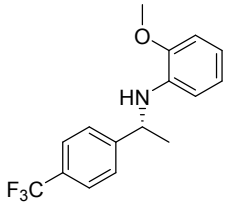
determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 254 nm, t_S = 8.60 min (minor), t_R = 13.69 min (major).



(*R*)-*N*-(1-(4-bromophenyl)ethyl)-2-methoxyaniline (**3k**)[5]: yellow oil; 144.9 mg, 95 % yield; 99 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.42 (d, J = 8.2 Hz, 2H), 7.24 (d, J = 8.3 Hz, 2H), 6.77 (m, 1H), 6.69 (m, 1H), 6.62 (m, 1H), 6.27 (d, J = 7.8, 1H), 4.60 (s, 1H), 4.42 (p, J = 6.5 Hz, 1H), 3.89 (s, 3H), 1.52 (d, J = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 254 nm, t_S = 6.75 min (minor), t_R = 10.39 min (major).

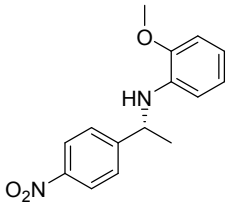


(*R*)-*N*-(1-(4-chlorophenyl)ethyl)-2-methoxyaniline (**3l**)[2]: yellow oil; 125.3 mg, 96 % yield; 93 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.34-7.20 (m, 4H), 6.76 (d, J = 7.8 Hz, 1H), 6.69 (m, 1H), 6.62 (m, 1H), 6.26 (m, 1H), 4.60 (s, 1H), 4.43 (m, 1H), 3.88 (s, 3H), 1.52 (d, J = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 254 nm, t_S = 6.39 min (minor), t_R = 9.69 min (major).

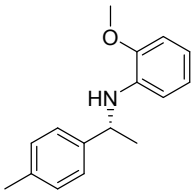


(*R*)-2-methoxy-*N*-(1-(4-(trifluoromethyl)phenyl)ethyl)aniline (**3m**)[2]: white solid; 141.7 mg, 96 % yield; 96 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.56 (d, J = 8.0 Hz,

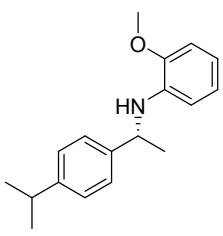
2H), 7.48 (d, J = 8.0 Hz, 2H), 6.78 (m, 1H), 6.66 (m, 2H), 6.23 (m, 1H), 4.65 (d, J = 4.8 Hz, 1H), 4.51 (p, J = 6.5 Hz, 1H), 3.90 (s, 3H), 1.55 (s, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 6.61 min (minor), t_R = 11.26 min (major).



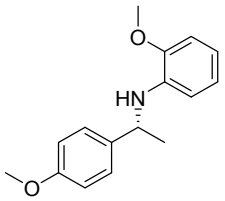
(*R*)-2-methoxy-*N*-(1-(4-nitrophenyl)ethyl)aniline (**3n**)[5]: yellow oil; 129.3 mg, 95 % yield; 96 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.24-8.07 (m, 2H), 7.60-7.44 (m, 2H), 6.78 (m, 1H), 6.73-6.57 (m, 2H), 6.16 (dd, J = 7.2, 2.0 Hz, 1H), 4.68 (s, 1H), 4.61-4.46 (m, 1H), 3.90 (s, 3H), 1.57 (d, J = 6.8 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 90: 10, 1 mL/min, 254 nm, t_S = 8.58 min (minor), t_R = 9.69 min (major).



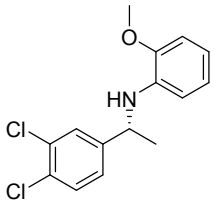
(*R*)-2-methoxy-*N*-(1-(p-tolyl)ethyl)aniline (**3o**)[2]: white solid; 117.0 mg, 97 % yield; 96 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.37-7.19 (m, 2H), 7.11 (d, J = 8.0 Hz, 2H), 6.75 (m, 1H), 6.70 (m, 1H), 6.59 (m, 1H), 6.35 (m, 1H), 4.60 (s, 1H), 4.44 (p, J = 6.3 Hz, 1H), 3.87 (s, 3H), 2.31 (s, 3H), 1.53 (d, J = 6.8, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 99: 1, 1 mL/min, 254 nm, t_S = 5.24 min (minor), t_R = 6.46 min (major).



(*R*)-*N*-(1-(4-isopropylphenyl)ethyl)-2-methoxyaniline (**3p**): white solid; 129.2 mg, 96 % yield; 95 % *ee*; $[\alpha]_D^{25}$ -32.4 (*c* = 0.6, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.28 (d, *J* = 7.9 Hz, 2H), 7.16 (d, *J* = 8.0 Hz, 2H), 6.88-6.65 (m, 2H), 6.60 (m, 1H), 6.38 (m, 1H), 4.59 (s, 1H), 4.45 (q, *J* = 6.8 Hz, 1H), 3.87 (s, 3H), 2.87 (hept, *J* = 6.9 Hz, 1H), 1.53 (d, *J* = 6.7 Hz, 3H), 1.22 (d, *J* = 6.9 Hz, 6H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 147.22, 146.56, 142.67, 137.34, 126.58, 125.77, 121.17, 116.16, 110.96, 109.27, 55.41, 52.93, 33.68, 24.94, 24.01, 23.97; **HRMS (ESI)** calcd for $C_{18}H_{23}NO$ $[M+H]^+$: 270.1858, Found: 270.1851. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 4.63 min (minor), t_R = 5.73 min (major).

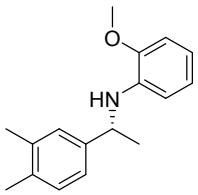


(*R*)-2-methoxy-*N*-(1-(4-methoxyphenyl)ethyl)aniline (**3q**)[2]: white solid; 123.4 mg, 96 % yield; 90 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.36-7.25 (m, 2H), 6.94-6.81 (m, 2H), 6.75 (m, 1H), 6.70 (m, 1H), 6.60 (m, 1H), 6.36 (dd, *J* = 7.8, 1.6 Hz, 1H), 4.58 (s, 1H), 4.43 (q, *J* = 6.8 Hz, 1H), 3.87 (s, 3H), 3.77 (s, 3H), 1.52 (d, *J* = 6.7 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 7.18 min (minor), t_R = 8.90 min (major).

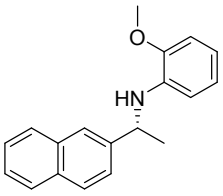


(*R*)-*N*-(1-(3,4-dichlorophenyl)ethyl)-2-methoxyaniline (**3r**): yellow oil; 141.6 mg, 96 % yield; 94 % *ee*; $[\alpha]_D^{25}$ -12.8 (*c* = 0.6, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.46 (m, 1H), 7.36 (m, 1H), 7.20 (m, 1H), 6.78 (m, 1H), 6.70 (m, 1H), 6.64 (m, 1H), 6.24 (m, 1H), 4.60 (s, 1H), 4.39 (m, 1H), 3.89 (s, 3H), 1.52 (d, *J* = 6.7, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 146.52, 146.11, 136.61, 132.60, 130.59, 130.48, 127.85, 125.26,

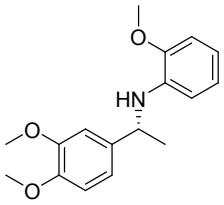
121.08, 116.87, 110.92, 109.30, 55.38, 52.68, 25.10; **HRMS (ESI)** calcd for $C_{15}H_{15}Cl_2NO$ $[M+H]^+$: 296.0603, Found: 296.0604. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 7.51 min (minor), t_R = 12.50 min (major).



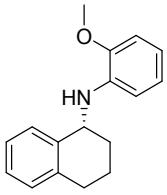
(*R*)-*N*-(1-(3,4-dimethylphenyl)ethyl)-2-methoxyaniline (**3s**): white solid; 121.2 mg, 95 % yield; 92 % *ee*; $[\alpha]_D^{25}$ -57.9 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.10 (m, 3H), 6.74 (m, 2H), 6.61 (m,1H), 6.47-6.28 (m, 1H), 4.59 (s, 1H), 4.50-4.31 (m, 1H), 3.89 (m, 3H), 2.24 (m, 6H), 1.53 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 146.70, 143.11, 137.56, 136.75, 135.03, 129.95, 127.27, 123.32, 121.33, 116.28, 111.14, 109.37, 55.50, 53.20, 25.30, 20.01, 19.50; **HRMS (ESI)** calcd for $C_{17}H_{21}NO$ $[M+H]^+$: 256.1701, Found: 256.1716. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 5.15 min (minor), t_R = 6.35 min (major).



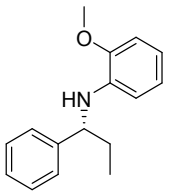
(*R*)-2-methoxy-*N*-(1-(naphthalen-2-yl)ethyl)aniline (**3t**)[2]: white solid; 124.7 mg, 90 % yield; 89 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.10-7.65 (m, 4H), 7.51 (dt, *J* = 8.5, 1.9 Hz, 1H), 7.48-7.31 (m, 2H), 6.77 (dt, *J* = 7.7, 1.7 Hz, 1H), 6.74-6.51 (m, 2H), 6.37 (m, 1H), 4.72 (s, 1H), 4.63 (m, 1H), 3.91 (d, *J* = 1.4 Hz, 3H), 1.62 (dd, *J* = 6.8, 1.9 Hz, 3H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm, t_S = 6.92 min (minor), t_R = 9.22 min (major).



(*R*)-*N*-(1-(3,4-dimethoxyphenyl)ethyl)-2-methoxyaniline (**3u**)：white solid; 139.3 mg, 97 % yield; 88 % *ee*; $[\alpha]_D^{25}$ -65.2 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 6.91 (m, 2H), 6.85-6.77 (m, 1H), 6.76 (m, 1H), 6.71 (td, *J* = 7.6, 1.4 Hz, 1H), 6.61 (m, 1H), 6.38 (m, 1H), 4.57 (s, 1H), 4.40 (q, *J* = 6.7 Hz, 1H), 3.88 (s, 3H), 3.85 (d, *J* = 2.2 Hz, 3H), 1.53 (d, *J* = 6.7 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.21, 147.85, 146.63, 138.26, 137.42, 121.20, 117.78, 116.41, 111.28, 109.26, 55.91, 55.44, 53.29, 25.17; **HRMS (ESI)** calcd for $C_{17}H_{21}NO_3$ $[M+Na]^+$: 310.1419, Found: 310.1389. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 90: 10, 1 mL/min, 254 nm, t_S = 13.29 min (minor), t_R = 15.47 min (major).



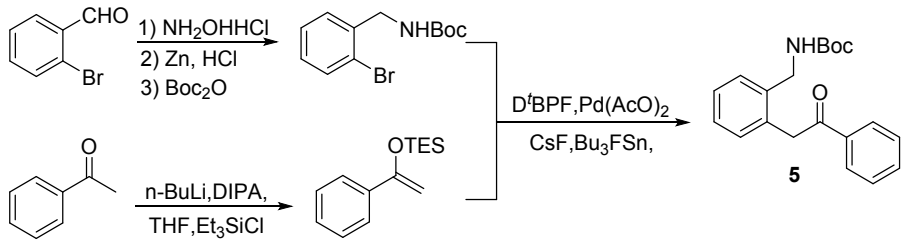
(*R*)-*N*-(2-methoxyphenyl)-1,2,3,4-tetrahydronaphthalen-1-amine (**3v)**: white solid; 113.9 mg, 90 % yield; 96 % *ee*; $[\alpha]_D^{25}$ -12.6 (*c* = 1.0, $CHCl_3$); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.58-7.29 (m, 1H), 7.30-7.02 (m, 3H), 6.98-6.83 (m, 1H), 6.83-6.73 (m, 2H), 6.73-6.57 (m, 1H), 4.62 (m, 1H), 4.51 (m, 1H), 3.79 (s, 3H), 2.81 (m, 2H), 2.08-1.67 (m, 4H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 146.67, 138.37, 137.68, 137.46, 129.38, 128.95, 127.00, 126.07, 121.25, 115.95, 109.67, 109.62, 55.36, 50.64, 29.39, 28.63, 19.45; **HRMS (ESI)** calcd for $C_{17}H_{19}NO$ $[M+H]^+$: 254.1545, Found: 254.1543. Enantiomeric excess was determined by chiral HPLC on a Chiralpak OD-H column, Hex/IPA = 95: 5, 1 mL/min, 254 nm,t_S = 6.20 min (minor), t_R = 13.38 min (major).



(*R*)-2-methoxy-*N*-(1-phenylpropyl)aniline (**3w**)[2]: white solid; 73.5 mg, 61 % yield; 87 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.32 (m, 4H), 7.21 (t, J = 6.4 Hz, 1H), 6.75 (d, J = 7.8 Hz, 1H), 6.68 (t, J = 7.6 Hz, 1H), 6.59 (t, J = 7.7 Hz, 1H), 6.34 (d, J = 7.8 Hz, 1H), 4.69 (s, 1H), 4.21 (t, J = 6.1 Hz, 1H), 3.88 (s, 3H), 1.86 (tq, J = 13.7, 6.8 Hz, 2H), 0.97 (t, J = 7.4 Hz, 3H).

3. Intramolecular asymmetric reductive amination reaction

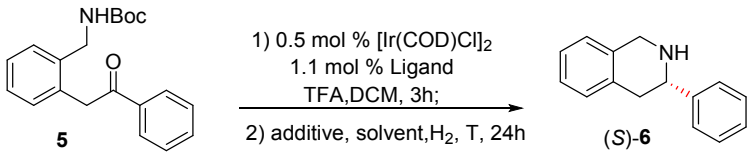
3.1 Synthesis of *tert*-butyl (2-(2-oxo-2-phenylethyl) benzyl) carbamate 5[6]



The substrate (**5**) of intramolecular asymmetric reductive amination reaction was prepared according to the literature procedure without modification.

3.2 Condition optimization of intramolecular asymmetric reductive amination

Table S1: Optimization of intramolecular asymmetric reductive amination[a]



Entry	Ligand	Additive	Solvent	T (°C)/ P (atm)	Yield[b] (%)	*Ee*[c] (%)
1	(*R*)-^{t}Bu-ax-Josiphos	10 % I_2, $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	55	29

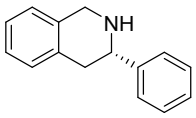
2	(*R*)-Cy-ax-Josiphos	10 % I_2, $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	52	19
3	(*R*)-Ph-ax-Josiphos	10 % I_2, $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	53	65
4	(*R*)-Xyl-ax-Josiphos	10 % I_2, $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	58	58
5	(*R*)-Ph-ax-Josiphos	10 % I_2, 5 % (m/v) 4Å MS $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	42	83
6	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS $Ti(O^iPr)_4$ (1.0 equiv)	toluene	50/50	49	82
7	(*R*)-Ph-ax-Josiphos	10 % I_2, 5 % (m/v) 4Å MS	toluene	50/50	68	84
8	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	toluene	50/50	70	84
9	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	DCM	50/50	52	64
10	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	THF	50/50	50	75
11	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	TBME	50/50	62	74
12	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	1,4-Dioxane	50/50	55	75
13	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	EtOAc	50/50	42	81
14	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	$CHCl_3$	50/50	50	62
15	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	toluene	30/50	69	83
16	(*R*)-Ph-ax-Josiphos	5 % (m/v) 4Å MS	toluene	30/20	30	84

[a]Reaction conditions: Ir/ligand/substrate = 1:2.2:200, (substrate) = 0.25 M.
[b]Isolated yields after column chromatography [c]Eantiomeric excesses were determined by chiral HPLC after the products were converted into the corresponding acetamides. The absolute configuration is assigned by comparison of the rotation sign with literature.[7]

3.3 Procedure for one-pot *N*-Boc deprotection and intramolecular asymmetric reductive amination.

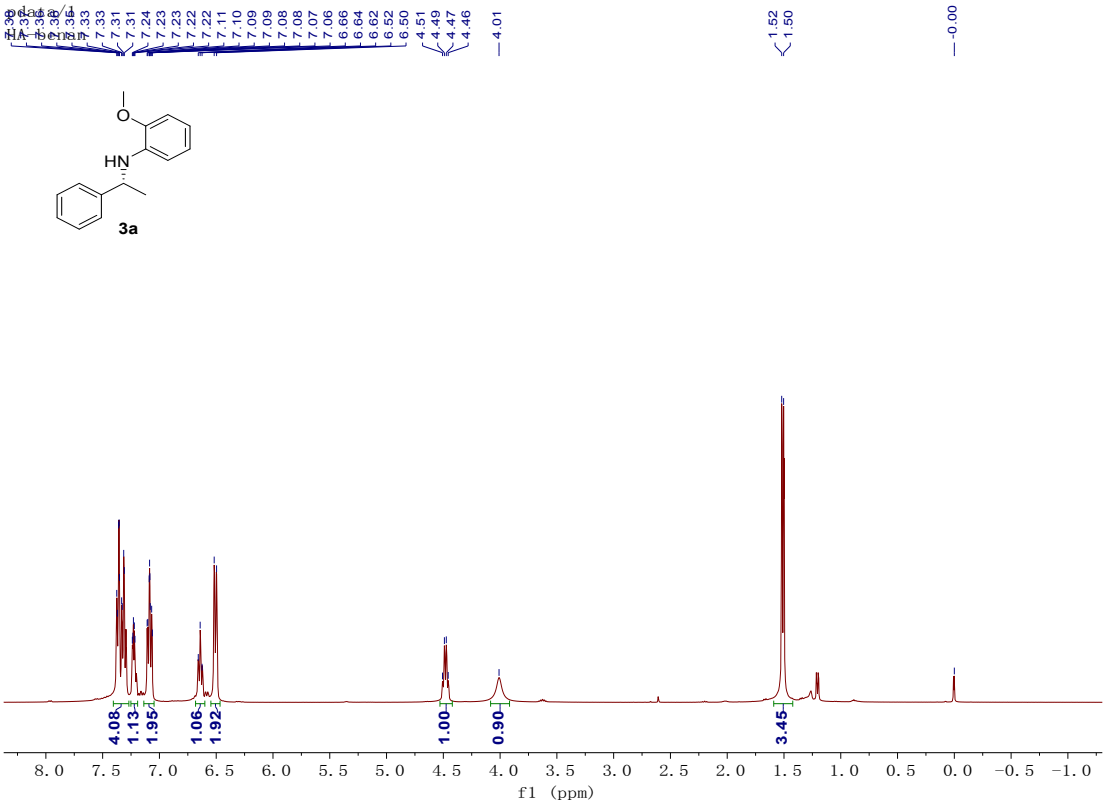
Substrate **5** (0.5 mmol) and TFA (3 mmol) were stirred in CH_2Cl_2 under argon for 3 h,

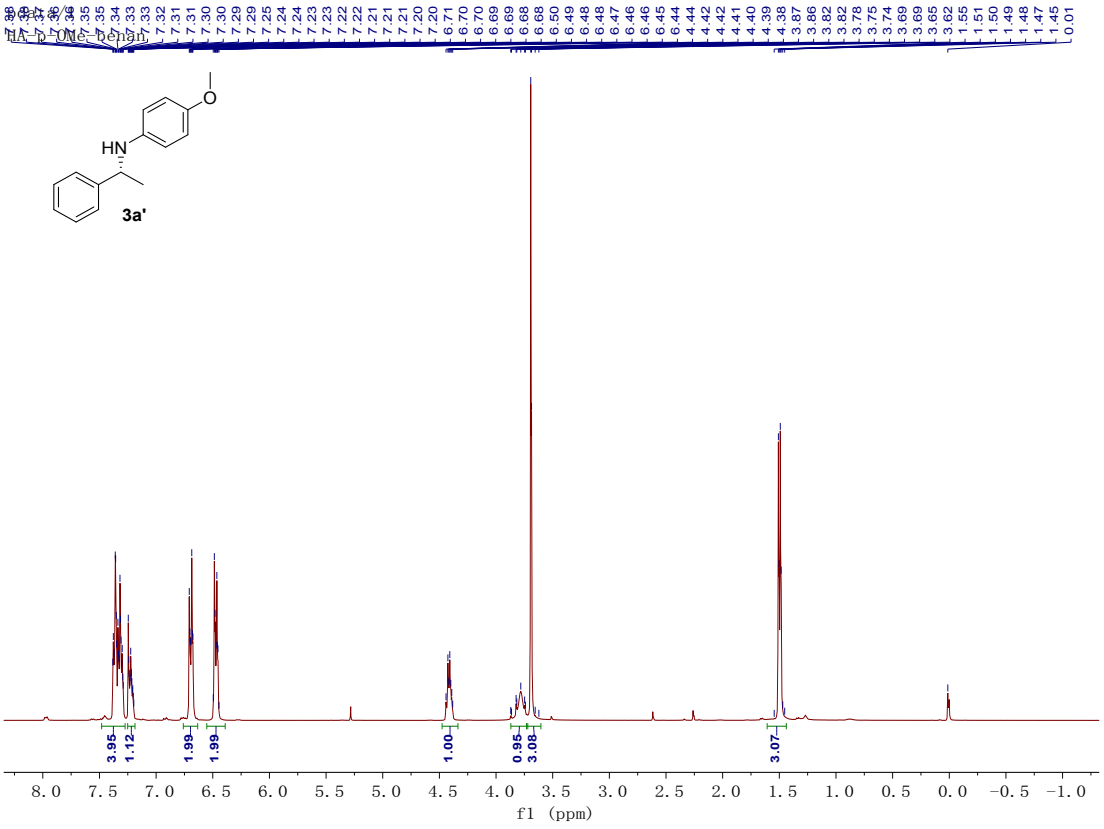
and then all volatiles were removed. In a glass tube equipped with a stir bar, the catalyst (1 mol %) was prepared *in situ* from $[Ir(COD)Cl]_2$ and (*R*)-Cy-ax-Josiphos in anhydrous toluene (1 mL) over 30min. The obtained *N*-Boc deprotected substance was dissolved in toluene (1 mL) and then transferred to the above catalyst solution followed by the addition of 4Å molecular sieves (5 % m/v, 100 mg). The glass tube was then placed into an autoclave, followed by replacing air with H_2 three times. The autoclave was charged with hydrogen to 50 atm, and then the reaction mixture was stirred at room temperature for 24 h. The resulted solution was neutralized with aqueous sodium bicarbonate solution. The organic phase was concentrated and passed through a short column of silica gel to remove the metal complex to give the chiral tetrahydroisoquinoline product, which was then converted to the corresponding acetamide and analyzed by chiral HPLC to determine the enantiomeric excess.



(*S*)-3-phenyl-1,2,3,4-tetrahydroisoquinoline (**6**)[7]: white solid; 73 mg, 70 % yield; 84 % *ee*; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.44 (d, J = 7.9 Hz, 2H), 7.37 (t, J = 7.4 Hz, 2H), 7.33-7.27 (m, 1H), 7.13 (m, 4H), 4.28 (d, J = 15.6 Hz, 1H), 4.17 (d, J = 15.6 Hz, 1H), 4.02 (t, J = 7.4 Hz, 1H), 2.99 (d, J = 7.3 Hz, 2H). Enantiomeric excess was determined by chiral HPLC on a Chiralpak AS-H column, Hex/IPA = 75: 25, 1 mL/min, 215 nm, t_R = 19.06 min (minor), t_S = 26.88 min (major).

4. NMR spectra and HRMS




HA-b-OMe-benan
HN
O
3a'
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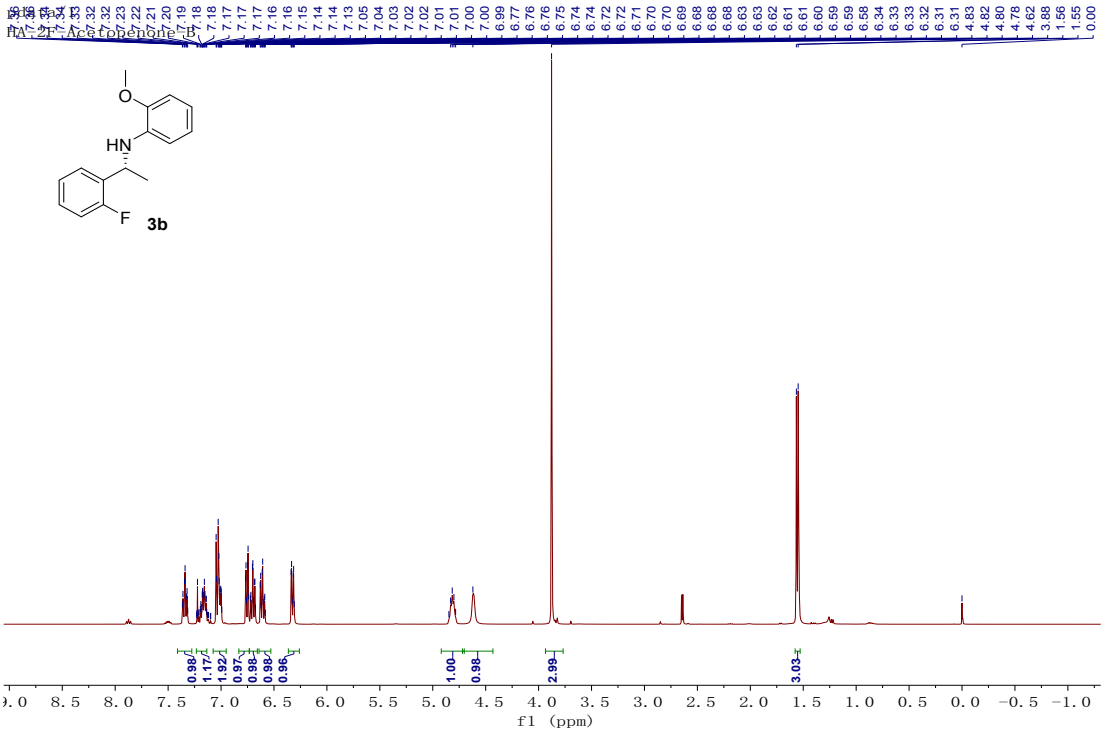
1.12
1.99
1.99
1.00
0.95
3.08
3.07
f1 (ppm)


HA-2F-Acetophone-B
O
HN
F
3b
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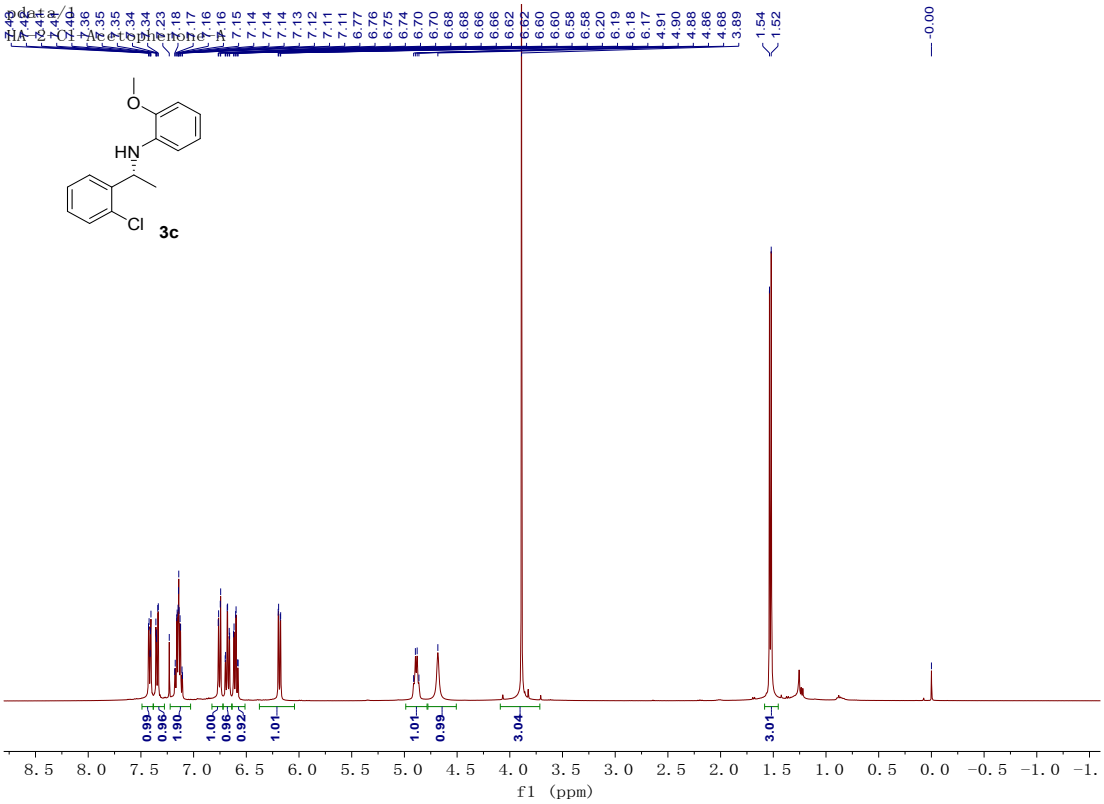
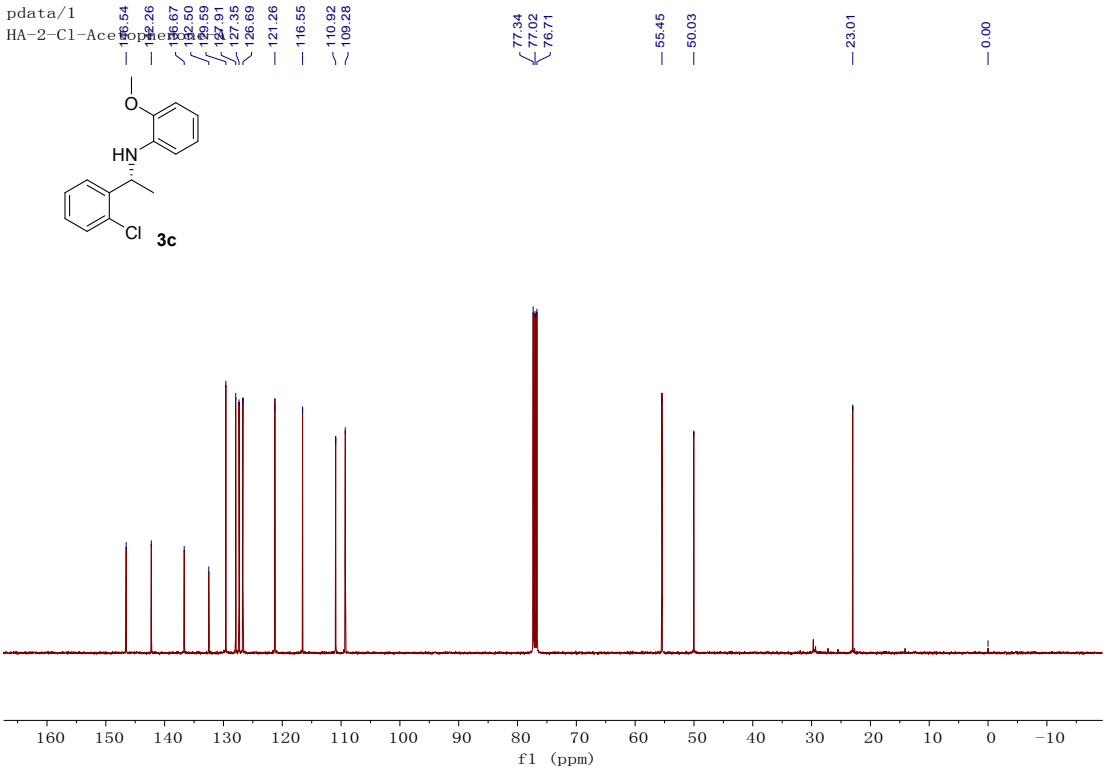
1.17
1.92
0.97
0.98
0.98
0.96
1.00
0.98
2.99
3.03
f1 (ppm)


pdata/1
HA-2-Cl-Acetophenone-A
3c
f1 (ppm)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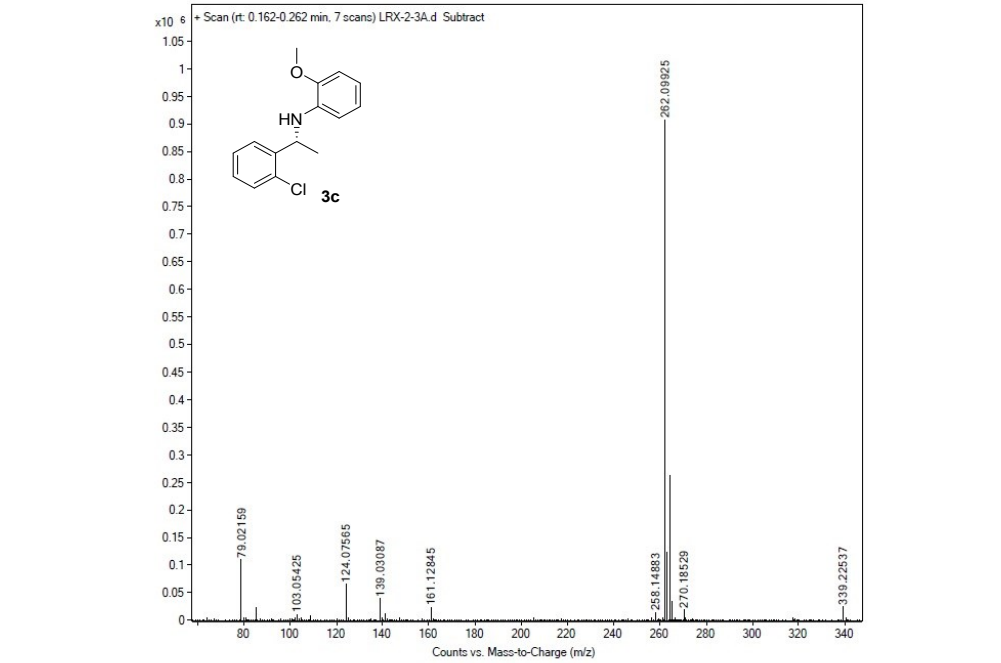
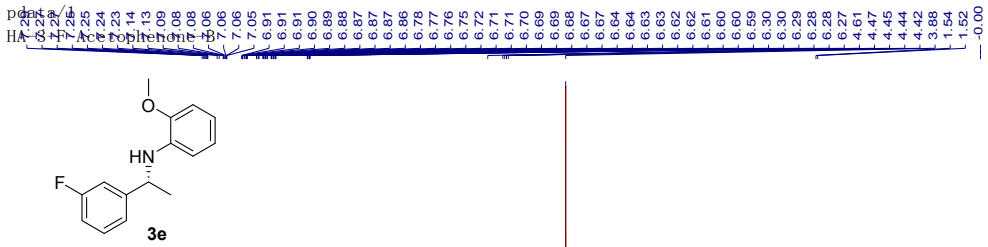
HA-2-Cl-Acetophenone-A
3c
f1 (ppm)

Sample Name	LRX-2-3A	**Position**	Vial 26	**Instrument Name**	Instrument 1
User Name		**Inj Vol**	1	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	LRX-2-3A.d
ACQ Method	method-POSI.m	**Comment**		**Acquired Time**	7/18/2019 11:30:02 AM (UTC+08:00)

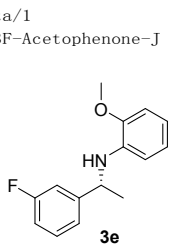


3c



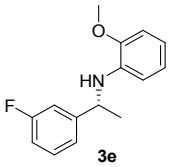
3e

pdata/1
HA-3F-Acetophenone-J



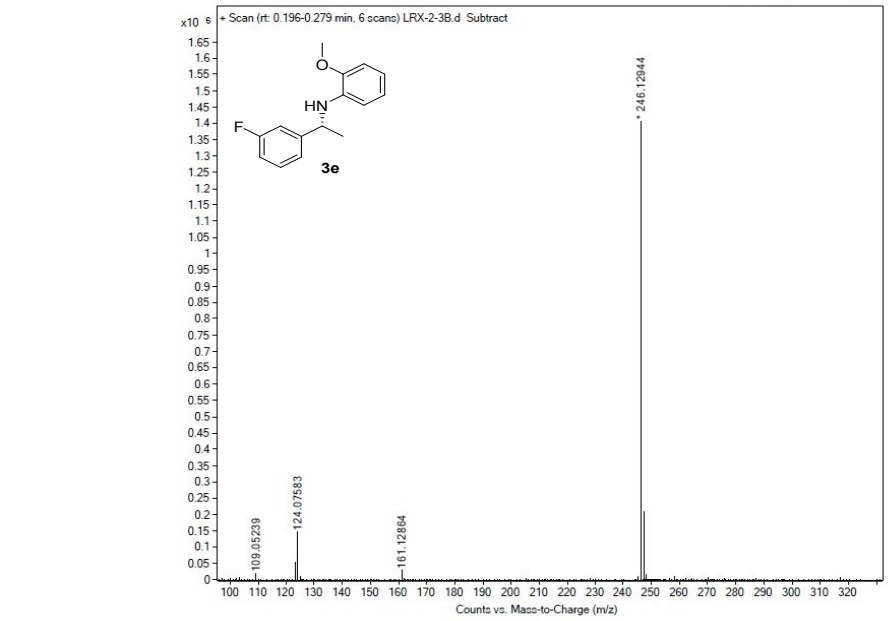
3e

pdata/1
HA-3-F-Acetopenone-F



3e

Sample Name	LRX-2-3B	**Position**	Vial 27	**Instrument Name**	Instrument 1
User Name		**Inj Vol**	1	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	LRX-2-3B.d
ACQ Method	method-POSI.m	**Comment**		**Acquired Time**	7/18/2019 11:32:33 AM (UTC+08:00)



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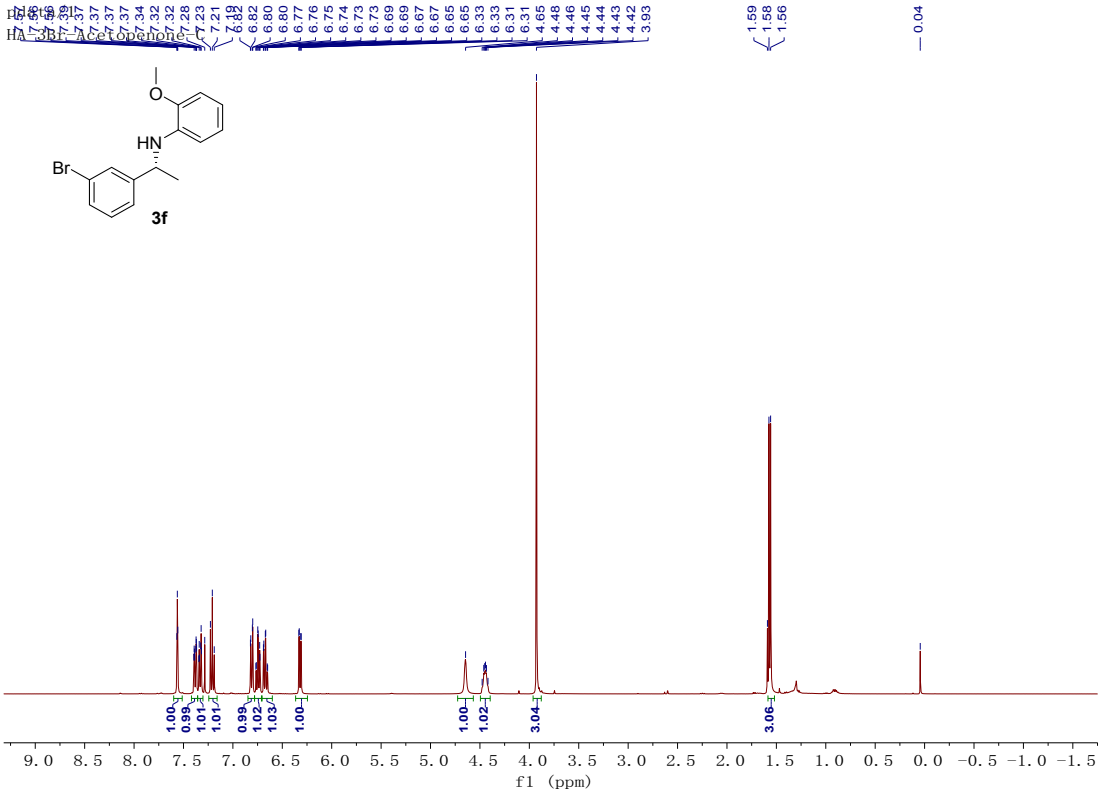

3f

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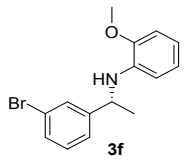
HA-3Br-Acetophenone-I



3f

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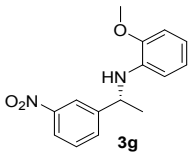
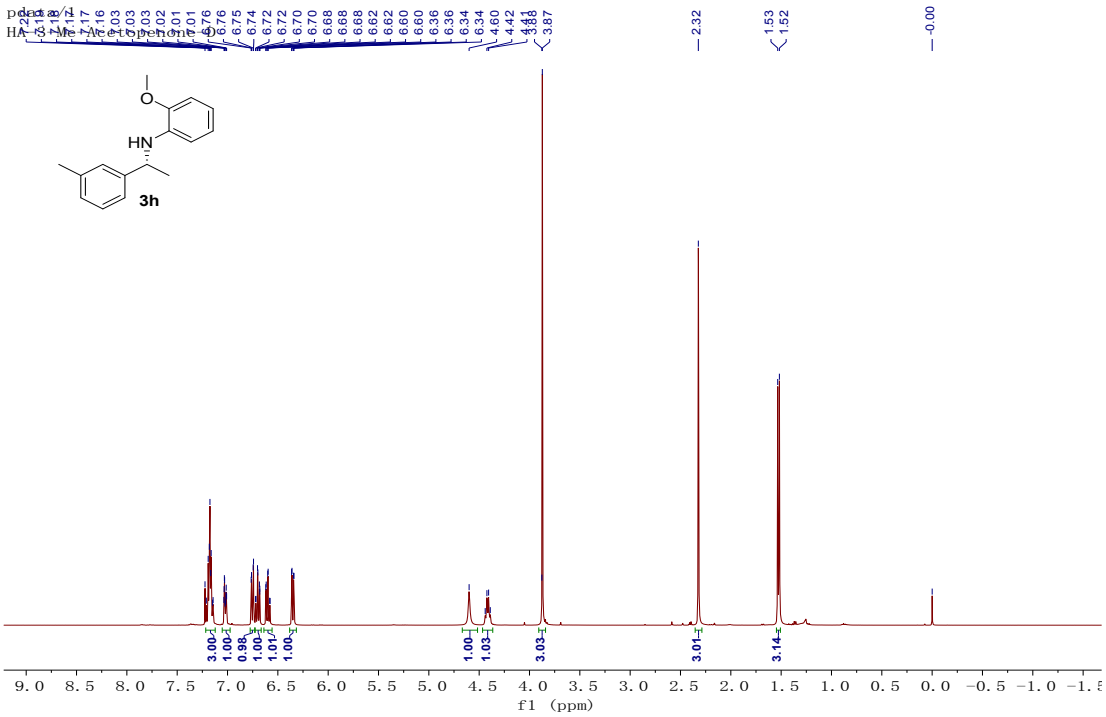
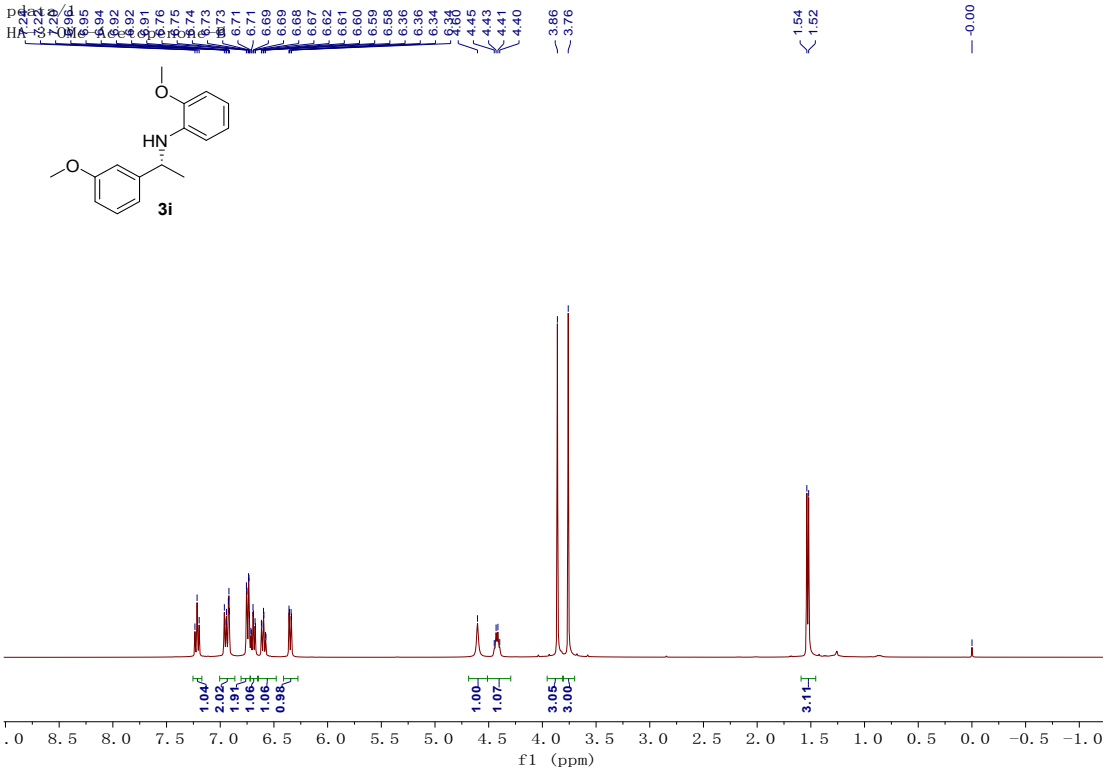
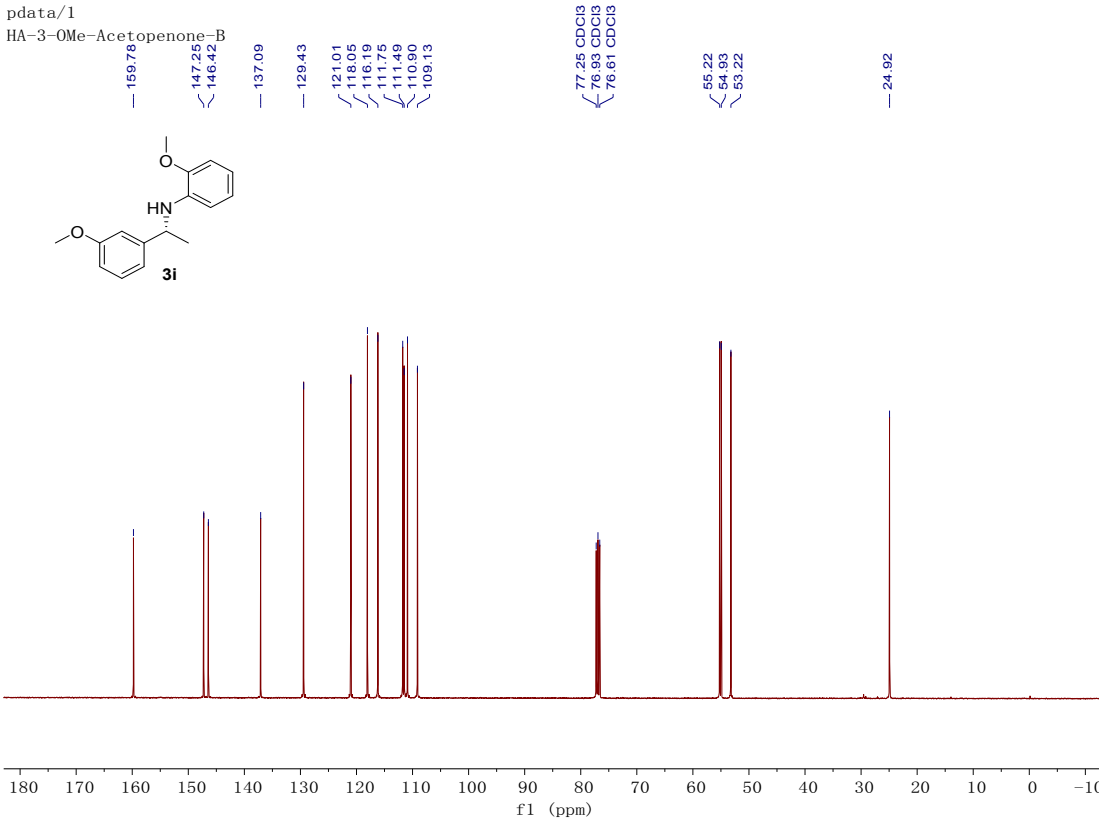
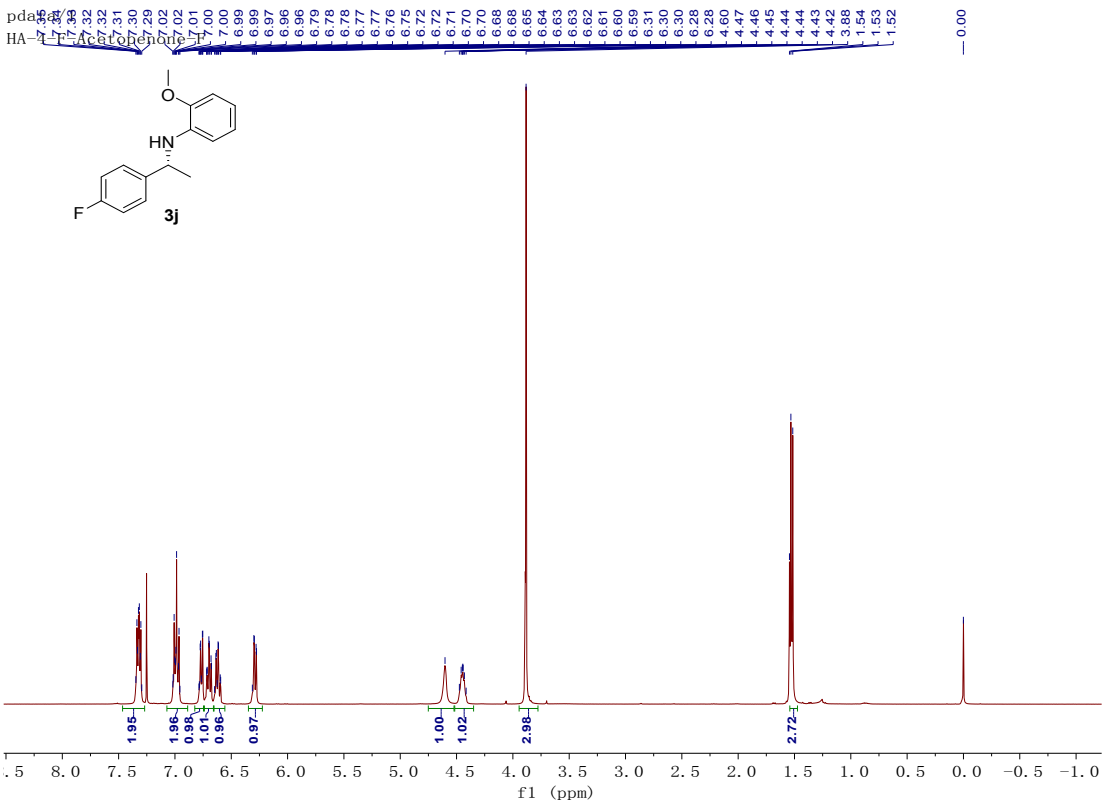


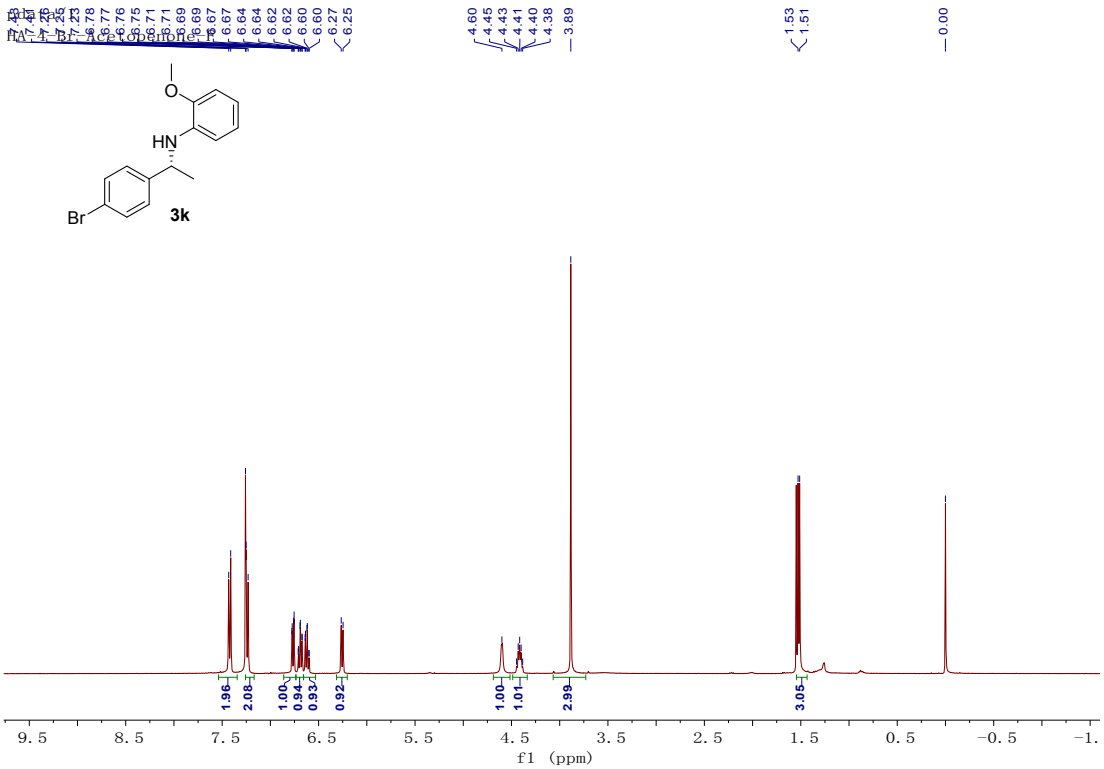
3g

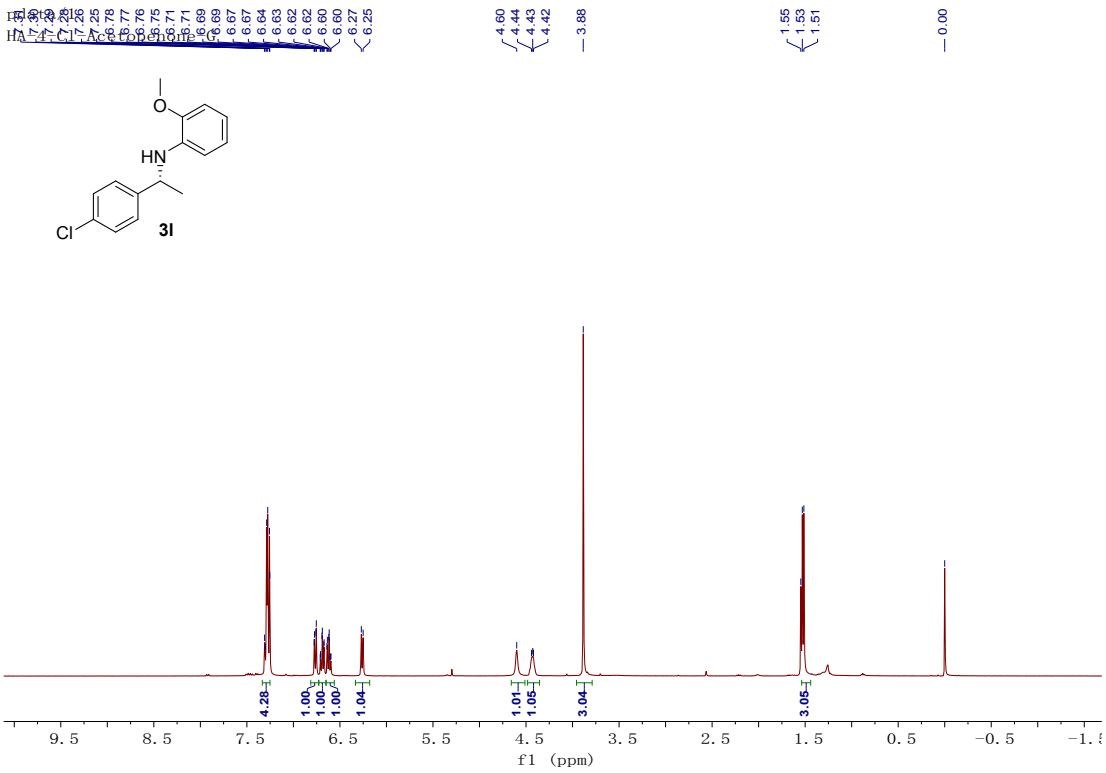

HN
O
3h
f1 (ppm)

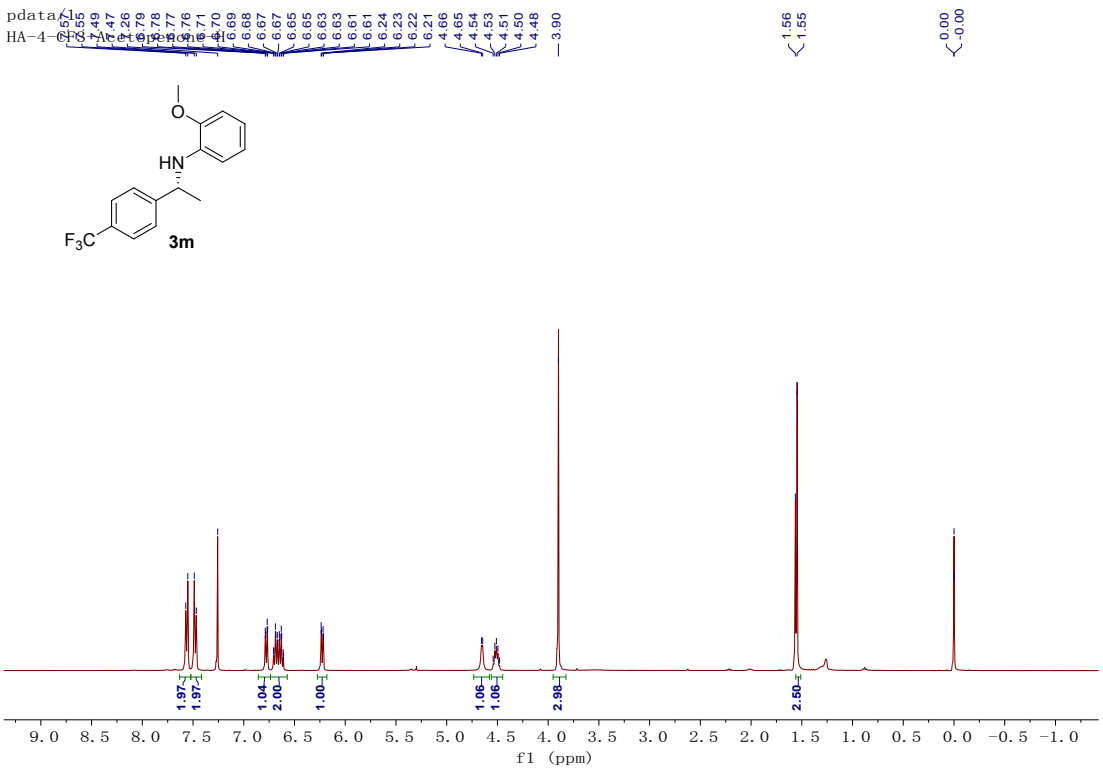

HN
O
O
3i
f1 (ppm)

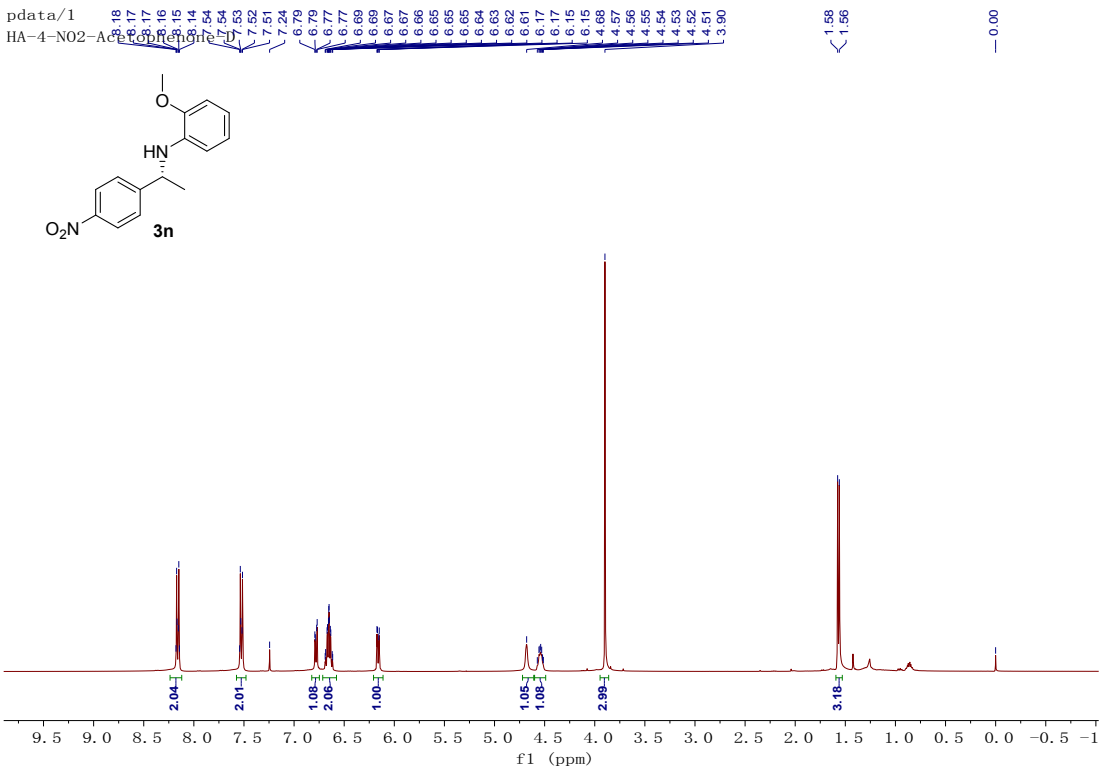

pdata/1
HA-3-OMe-Acetopenone-B
159.78
147.25
146.42
137.09
129.43
121.01
118.05
116.19
111.75
111.49
110.90
109.13
77.25 CDCl3
76.93 CDCl3
76.61 CDCl3
55.22
54.93
53.22
24.92
3i
f1 (ppm)

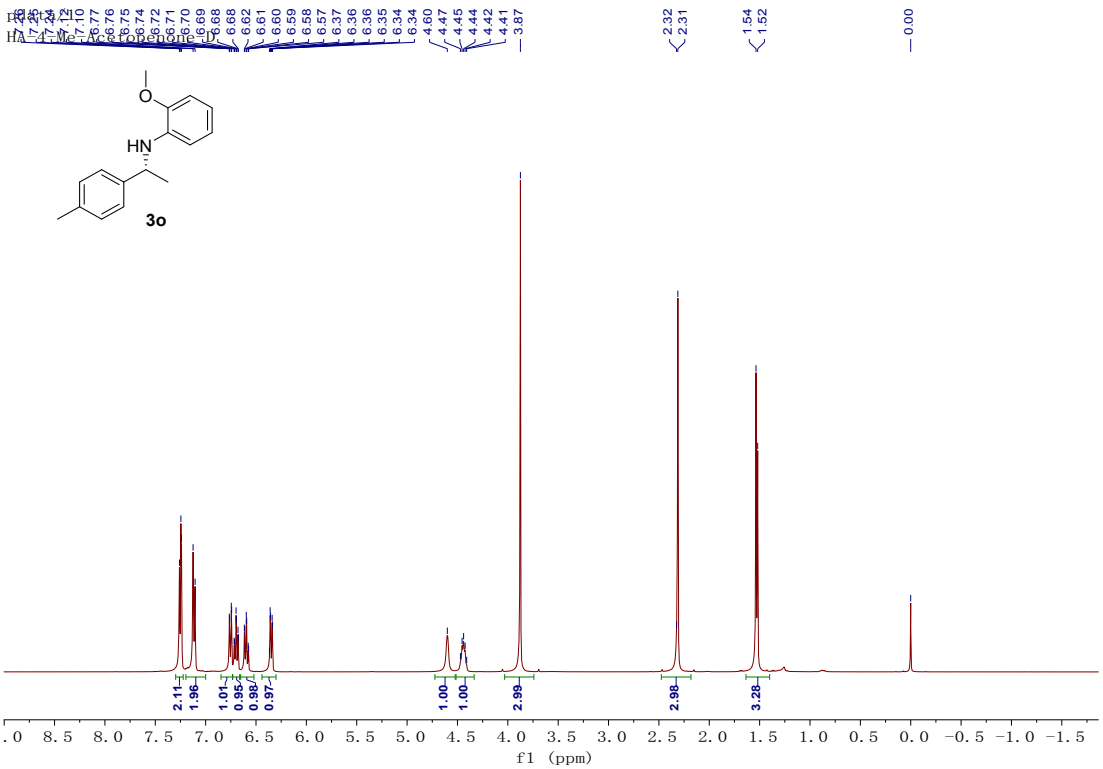

0.00
3j
1.95
1.96
0.98
1.01
0.96
0.97
1.00
1.02
2.98
2.72
f1 (ppm)

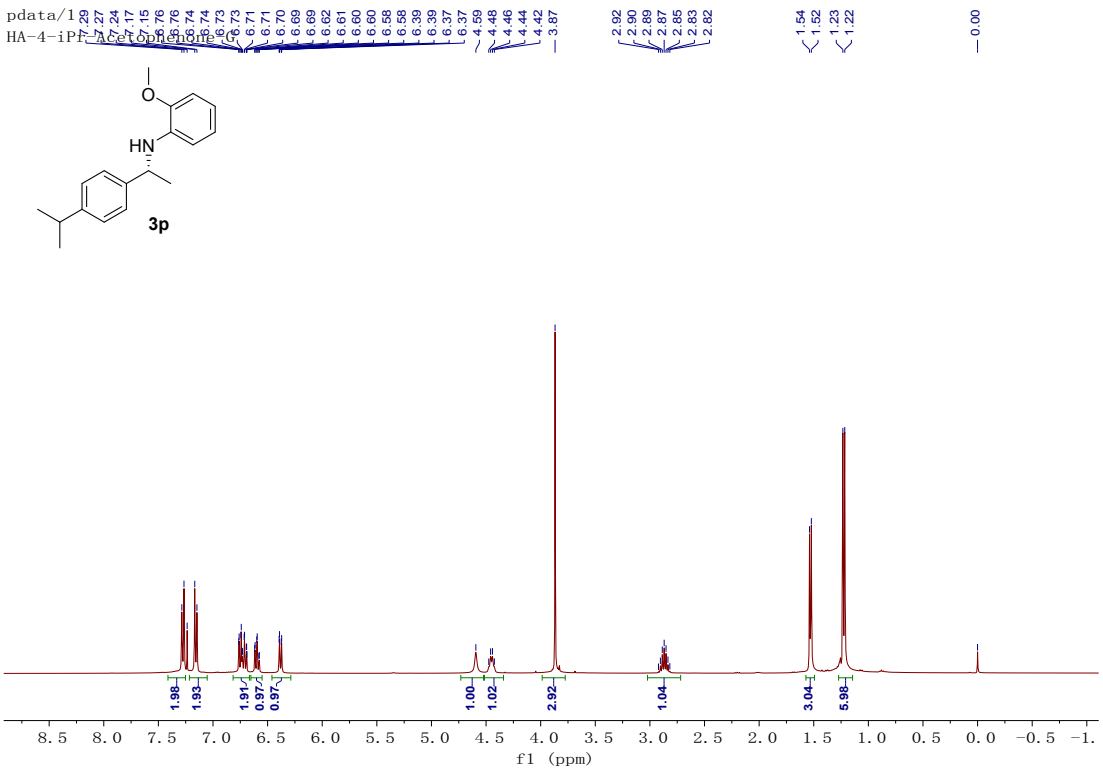

7.26
7.23
6.78
6.77
6.76
6.75
6.71
6.69
6.67
6.64
6.62
6.60
6.27
6.25
4.60
4.45
4.43
4.41
4.40
4.38
3.89
1.53
1.51
0.00
O
HN
Br
3k
1.96
2.08
1.00
0.94
0.93
0.92
1.00
1.01
2.99
3.05
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
−0.5
f1 (ppm)

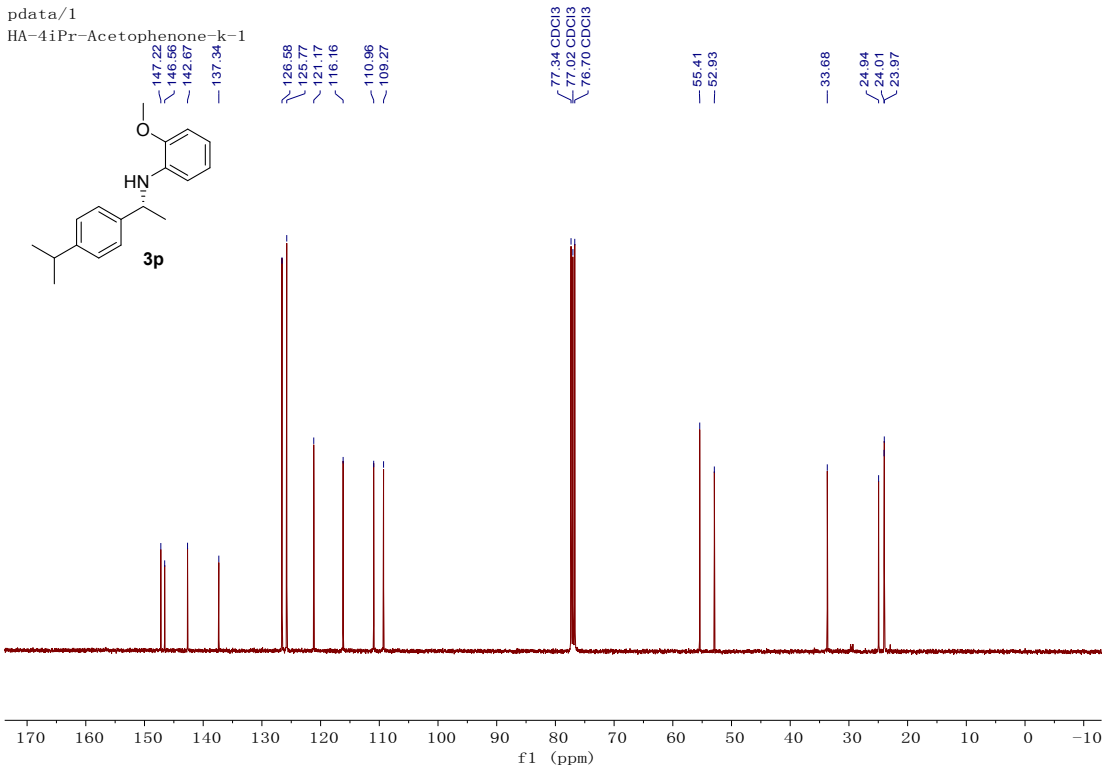

7.26
7.25
6.78
6.77
6.76
6.75
6.71
6.69
6.67
6.64
6.63
6.62
6.60
6.27
6.25
4.60
4.44
4.43
4.42
3.88
1.55
1.53
1.51
0.00
O
HN
Cl
3l
4.28
1.00
1.00
1.00
1.04
1.01
1.05
3.04
3.05
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
−0.5
f1 (ppm)

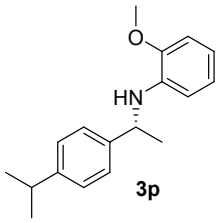

pdata/1
HA-4-CF3-Acetophenone-d
7.55
7.49
7.47
7.26
6.79
6.78
6.77
6.76
6.71
6.70
6.69
6.68
6.67
6.67
6.65
6.65
6.63
6.63
6.61
6.61
6.24
6.23
6.22
6.21
4.66
4.65
4.54
4.53
4.51
4.50
4.48
3.90
1.56
1.55
0.00
-0.00
O
HN
F3C
3m
1.97
1.97
1.04
2.00
1.00
1.06
1.06
2.98
2.50
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

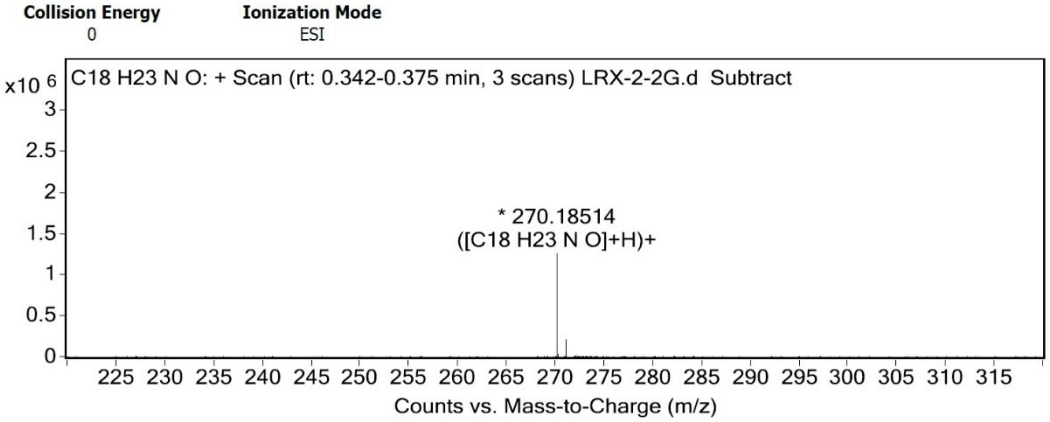

pdata/1
HA-4-NO2-Acetophenone-D
8.18
8.17
8.17
8.16
8.15
8.14
7.54
7.53
7.52
7.51
7.24
6.79
6.77
6.77
6.69
6.69
6.67
6.67
6.66
6.65
6.65
6.64
6.63
6.62
6.61
6.17
6.17
6.15
6.15
4.68
4.57
4.56
4.55
4.54
4.53
4.52
4.51
3.90
1.58
1.56
0.00
O
HN
O2N
3n
2.04
2.01
1.08
2.06
1.00
1.05
1.08
2.99
3.18
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

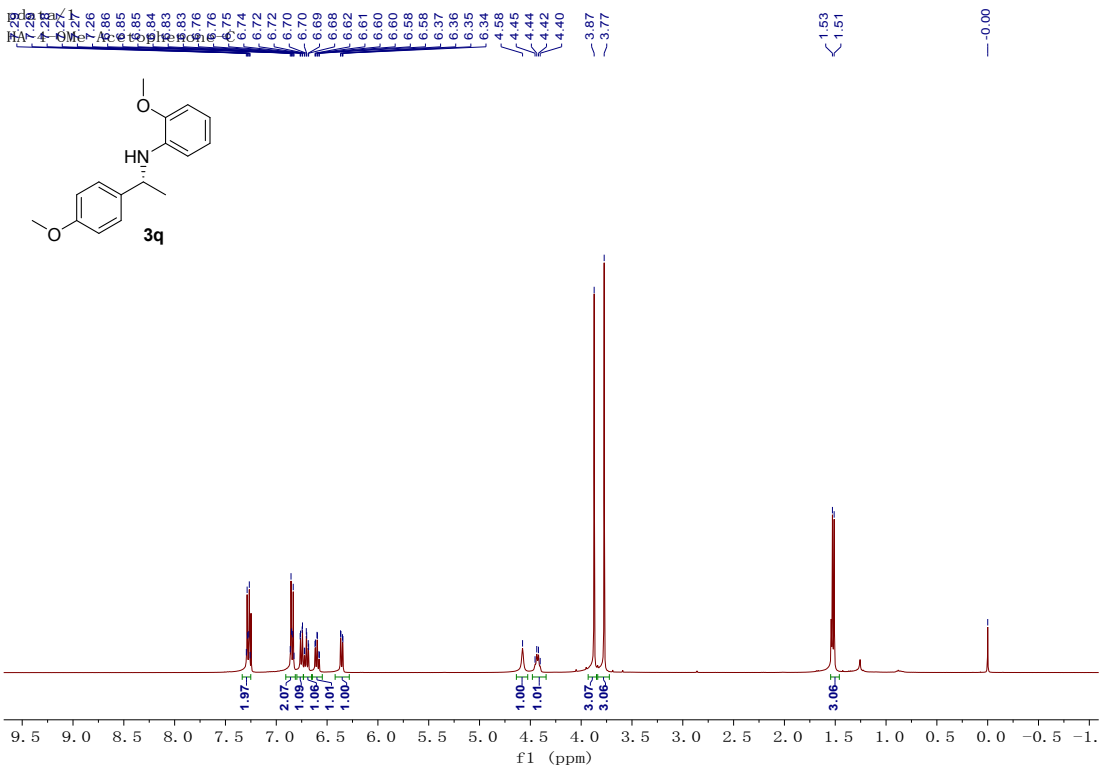

HA-4-Me-Acetophenone-1
O
HN
3o
2.11
1.96
1.01
0.95
0.98
0.97
1.00
1.00
2.99
2.98
3.28
f1 (ppm)

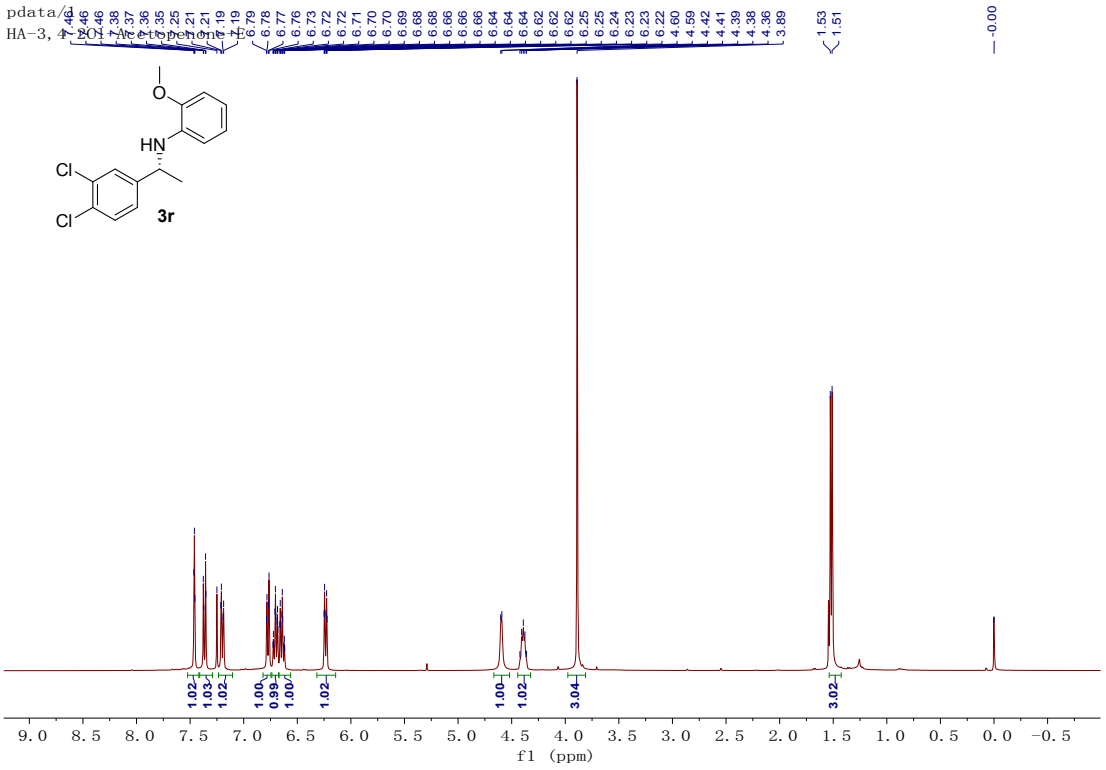

pdata/1
HA-4-iPr-Acetophenone-1
O
HN
3p
1.98
1.93
1.91
0.97
0.97
1.00
1.02
2.92
1.04
3.04
5.98
f1 (ppm)

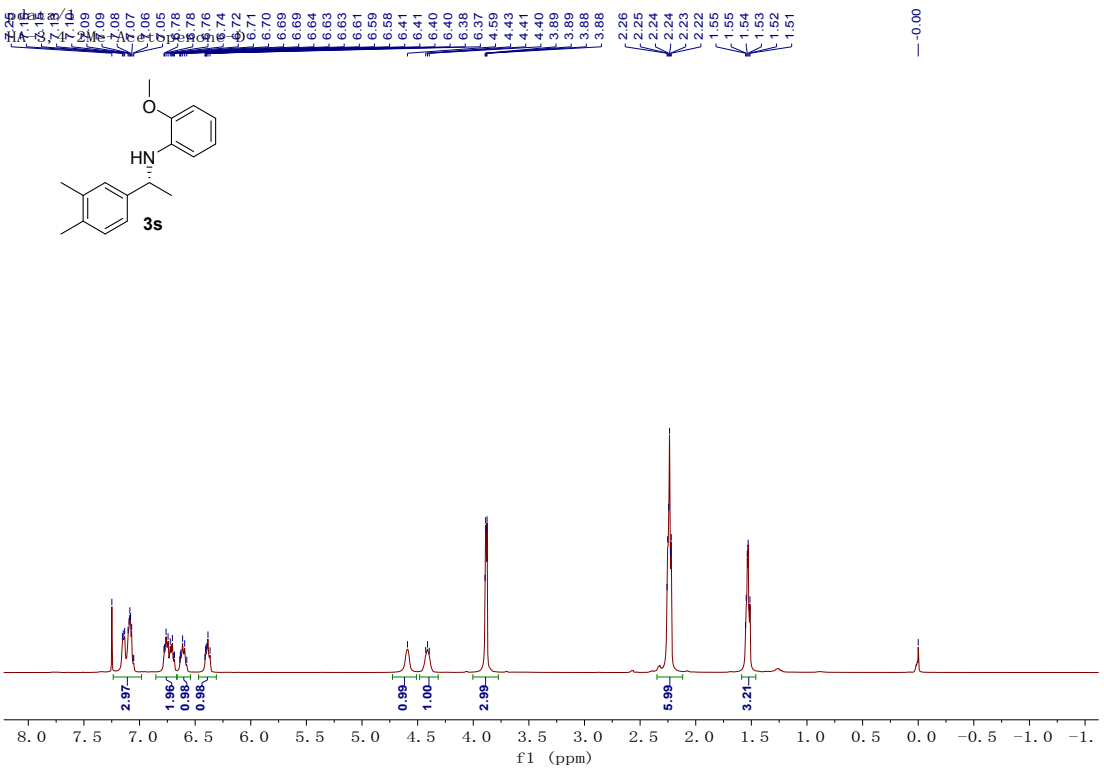

pdata/1
HA-4iPr-Acetophenone-k-1
147.22
146.56
142.67
137.34
126.58
125.77
121.17
116.16
110.96
109.27
77.34 CDCl3
77.02 CDCl3
76.70 CDCl3
55.41
52.93
33.68
24.94
24.01
23.97
3p
f1 (ppm)


3p

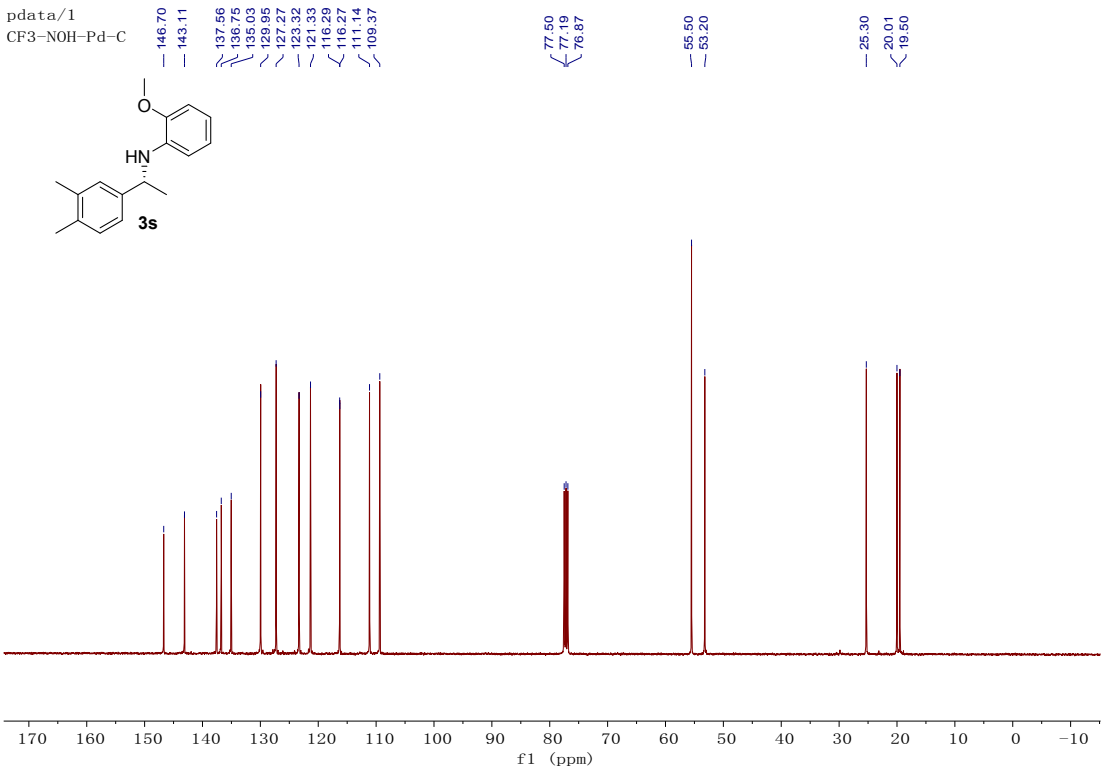

Collision Energy
0
Ionization Mode
ESI
C18 H23 N O: + Scan (rt: 0.342-0.375 min, 3 scans) LRX-2-2G.d Subtract
x10 6
* 270.18514
([C18 H23 N O]+H)+
Counts vs. Mass-to-Charge (m/z)


pdata/1
HA-4-OMe-Acetophenone-6
7.27
7.26
6.86
6.85
6.85
6.84
6.83
6.83
6.76
6.76
6.75
6.74
6.72
6.72
6.70
6.70
6.69
6.68
6.62
6.61
6.60
6.60
6.58
6.58
6.37
6.36
6.35
6.34
4.58
4.45
4.44
4.42
4.40
3.87
3.77
1.53
1.51
0.00
O
HN
O
3q
1.97
2.07
1.09
1.06
1.01
1.00
1.00
1.01
3.07
3.06
3.06
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.
f1 (ppm)

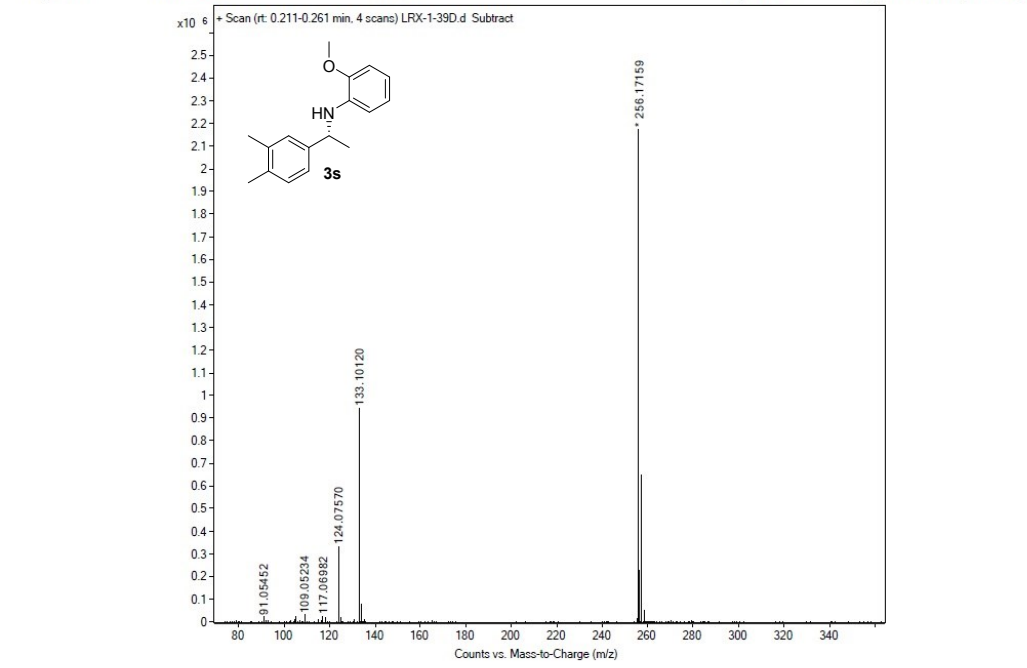

pdata/1
HA-3, 4-2Cl-Acetophenone-7
7.46
7.46
7.38
7.37
7.36
7.35
7.25
7.21
7.21
7.19
6.79
6.78
6.77
6.76
6.73
6.72
6.72
6.71
6.70
6.70
6.69
6.68
6.68
6.66
6.66
6.66
6.64
6.64
6.62
6.62
6.62
6.25
6.25
6.24
6.23
6.22
4.60
4.59
4.42
4.41
4.39
4.38
4.36
3.89
1.53
1.51
0.00
O
HN
Cl
Cl
3r
1.02
1.03
1.02
1.00
0.99
1.00
1.02
1.00
1.02
3.04
3.02
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)

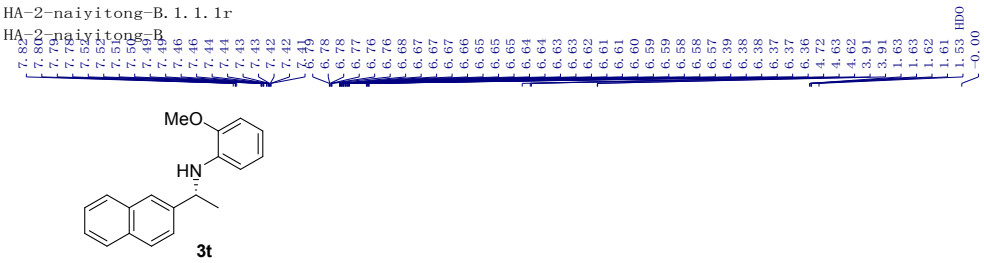

3s

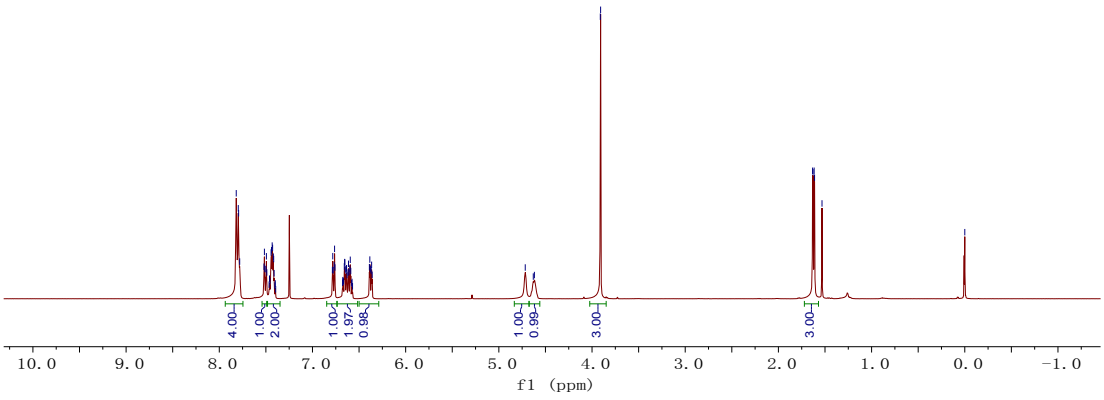
2.97
1.96
0.98
0.98
0.99
1.00
2.99
5.99
3.21
f1 (ppm)

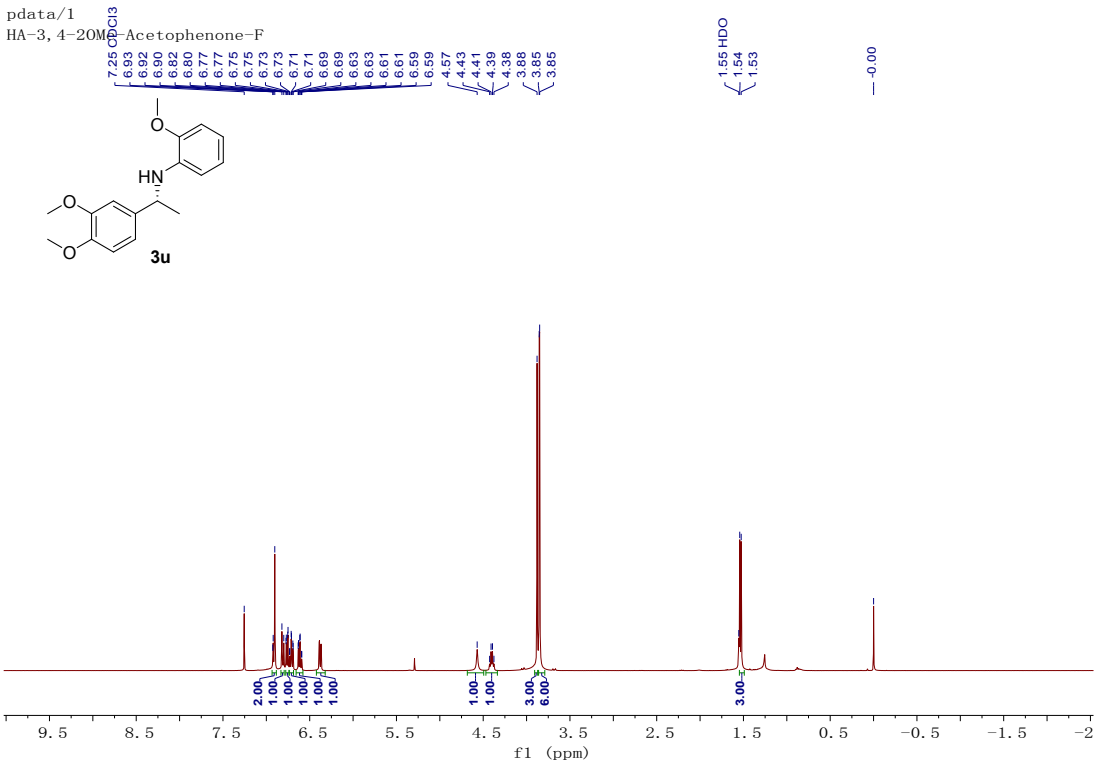

pdata/1
CF3-NOH-Pd-C
146.70
143.11
137.56
136.75
135.03
129.95
127.27
123.32
121.33
116.29
116.27
111.14
109.37
77.50
77.19
76.87
55.50
53.20
25.30
20.01
19.50
3s
f1 (ppm)

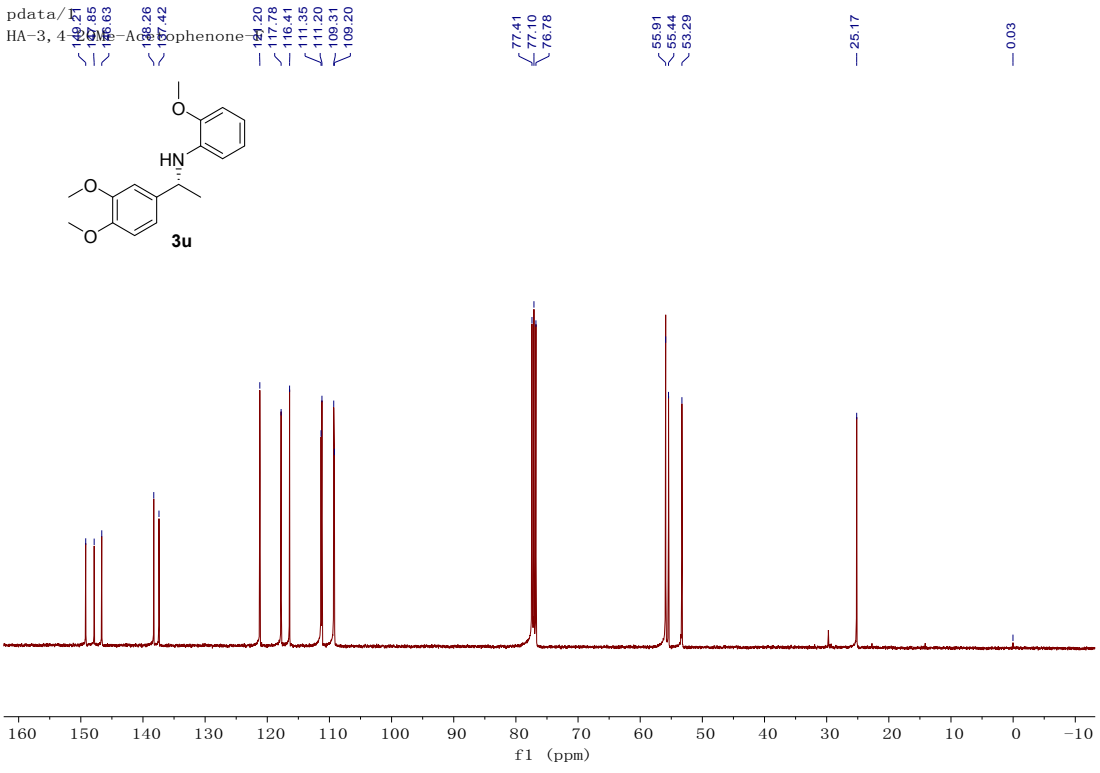
Sample Name	LRX-1-39D	**Position**	Vial 22	**Instrument Name**	Instrument 1
User Name		**Inj Vol**	1	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	LRX-1-39D.d
ACQ Method	method-POSI.m	**Comment**		**Acquired Time**	7/18/2019 11:19:51 AM (UTC+08:00)



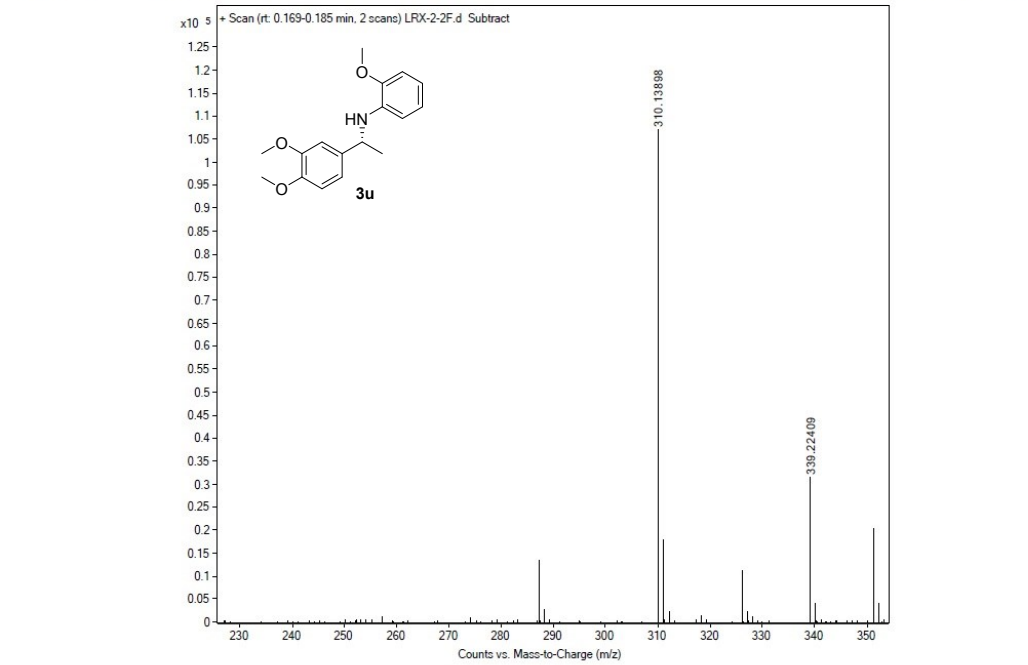




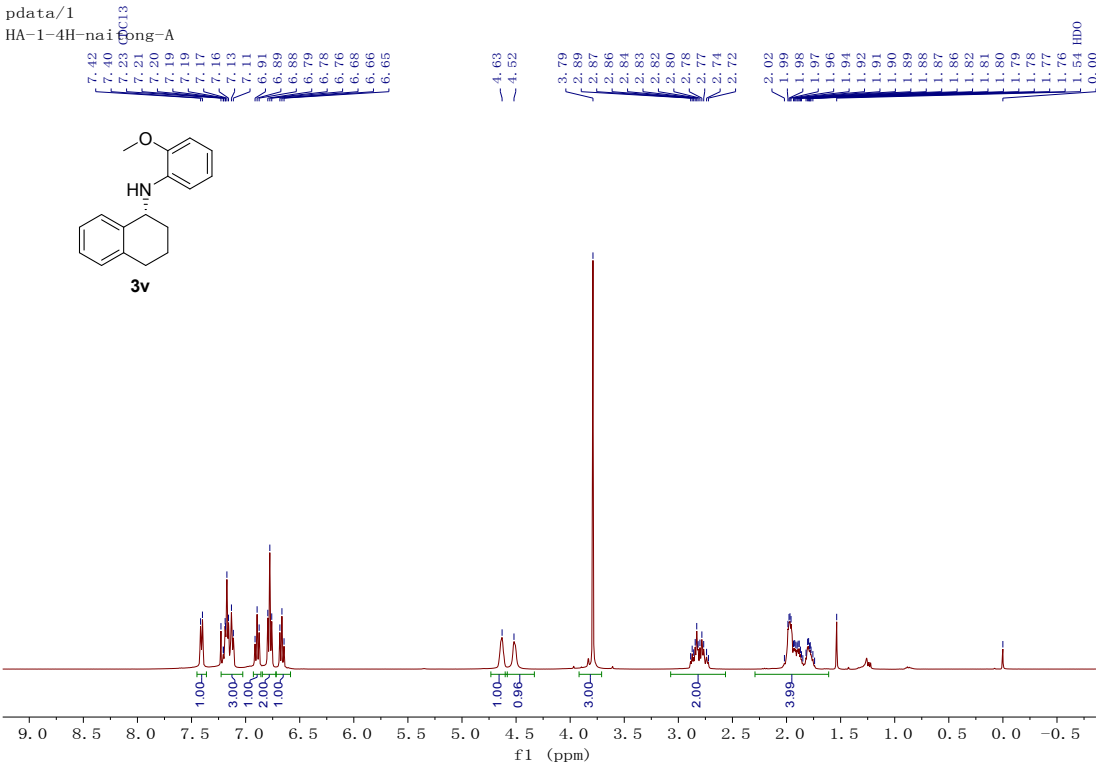

pdata/1
HA-3,4-20Me-Acetophenone-F
7.25 CDCl3
6.93
6.92
6.90
6.82
6.80
6.77
6.77
6.75
6.75
6.73
6.73
6.71
6.71
6.69
6.69
6.63
6.63
6.61
6.61
6.59
6.59
4.57
4.43
4.41
4.39
4.38
3.88
3.85
3.85
1.55 HDO
1.54
1.53
-0.00
O
HN
O
O
3u
2.00
1.00
1.00
1.00
1.00
1.00
1.00
1.00
3.00
6.00
3.00
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
-1.5
-2
f1 (ppm)


pdata/1
HA-3,4-20Me-Acetophenone-F
159.21
155.85
146.63
138.26
137.42
121.20
117.78
116.41
111.35
111.20
109.31
109.20
77.41
77.10
76.78
55.91
55.44
53.29
25.17
0.03
O
HN
O
O
3u
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

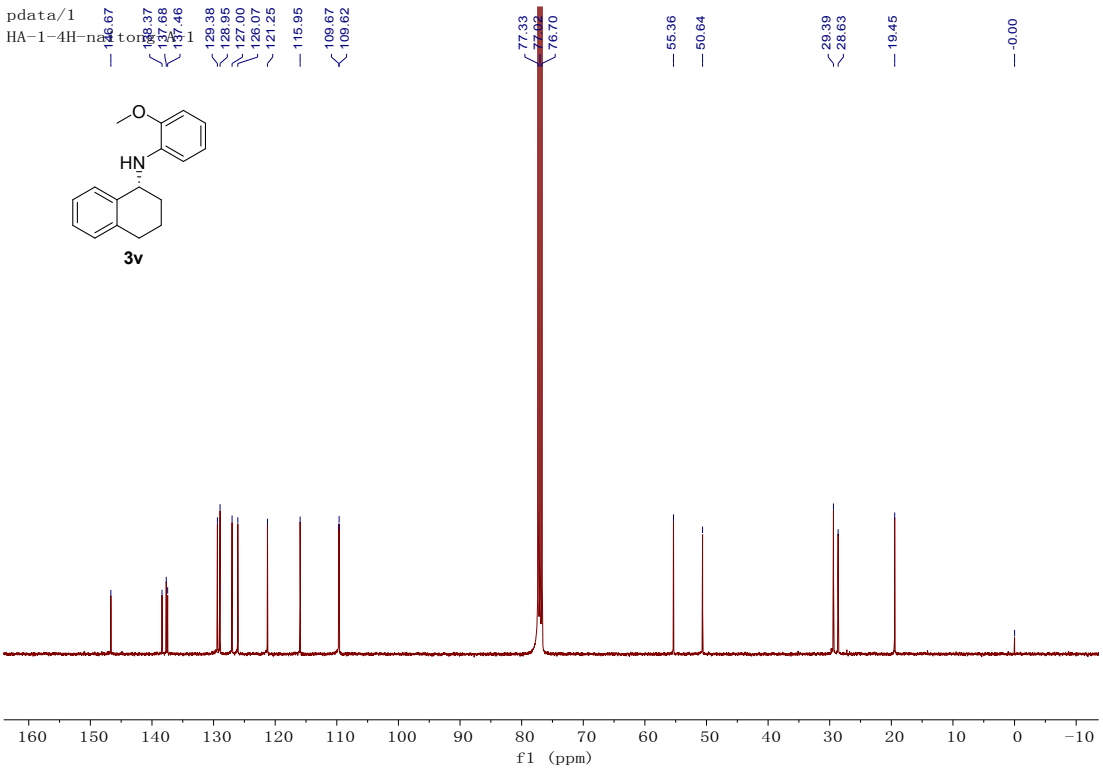
Sample Name	LRX-2-2F	**Position**	Vial 24	**Instrument Name**	Instrument 1
User Name		**Inj Vol**	1	**InjPosition**	
Sample Type	Sample	**IRM Calibration Status**	Success	**Data Filename**	LRX-2-2F.d
ACQ Method	method-POSI.m	**Comment**		**Acquired Time**	7/18/2019 11:24:57 AM (UTC+08:00)

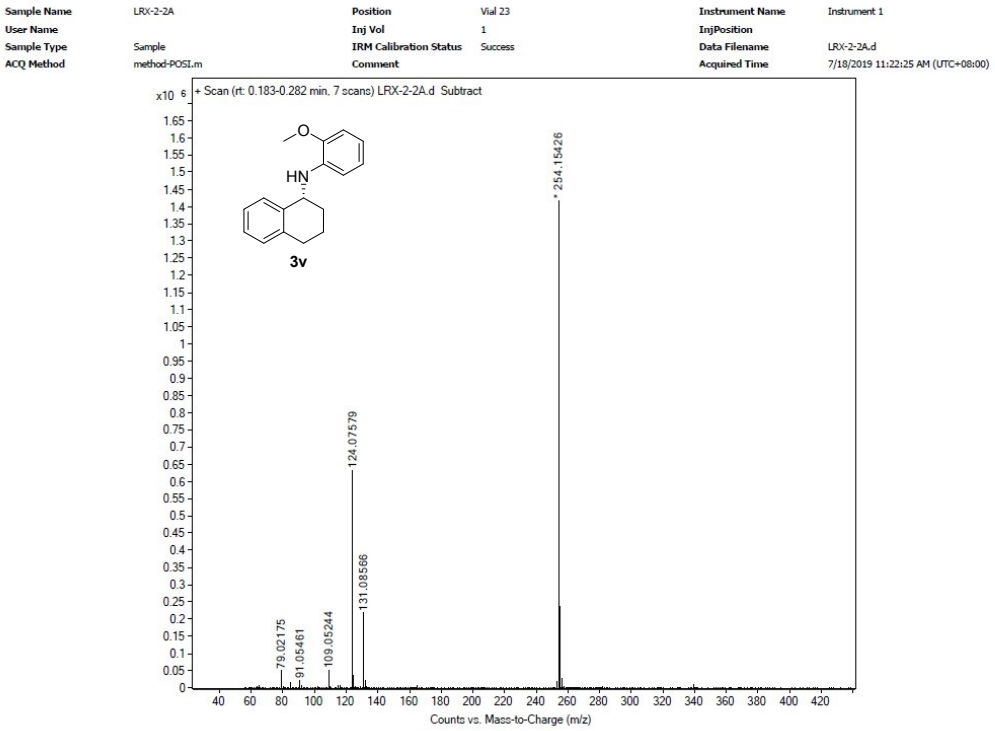


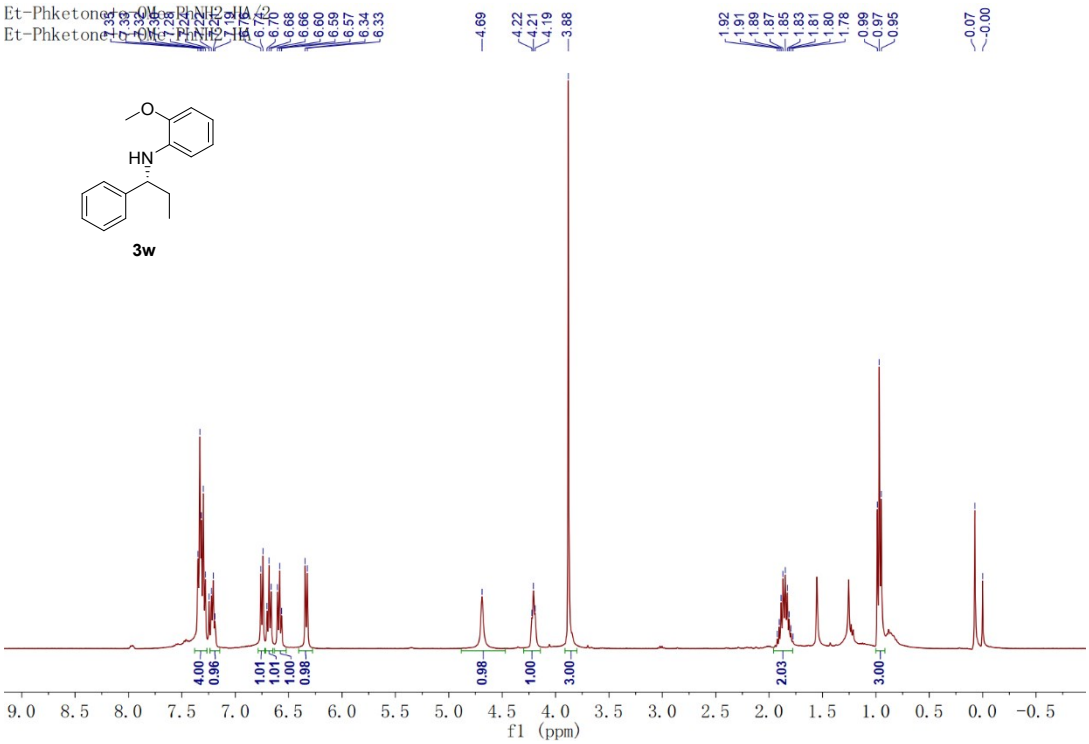
3u

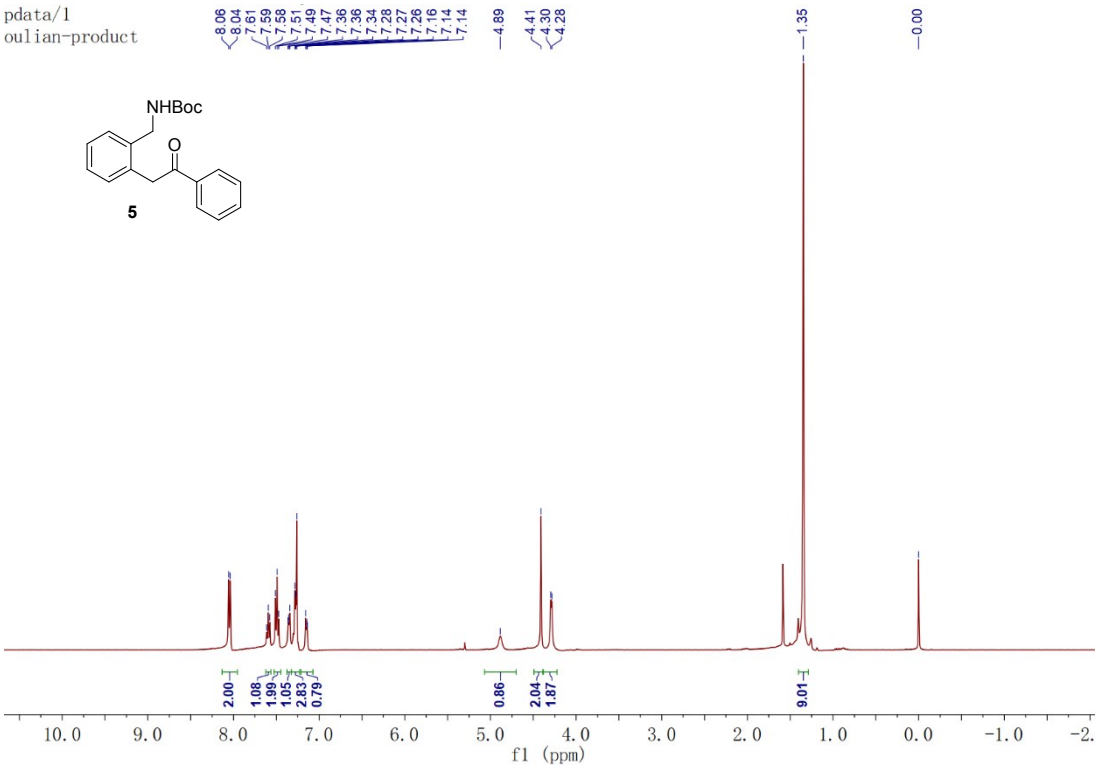


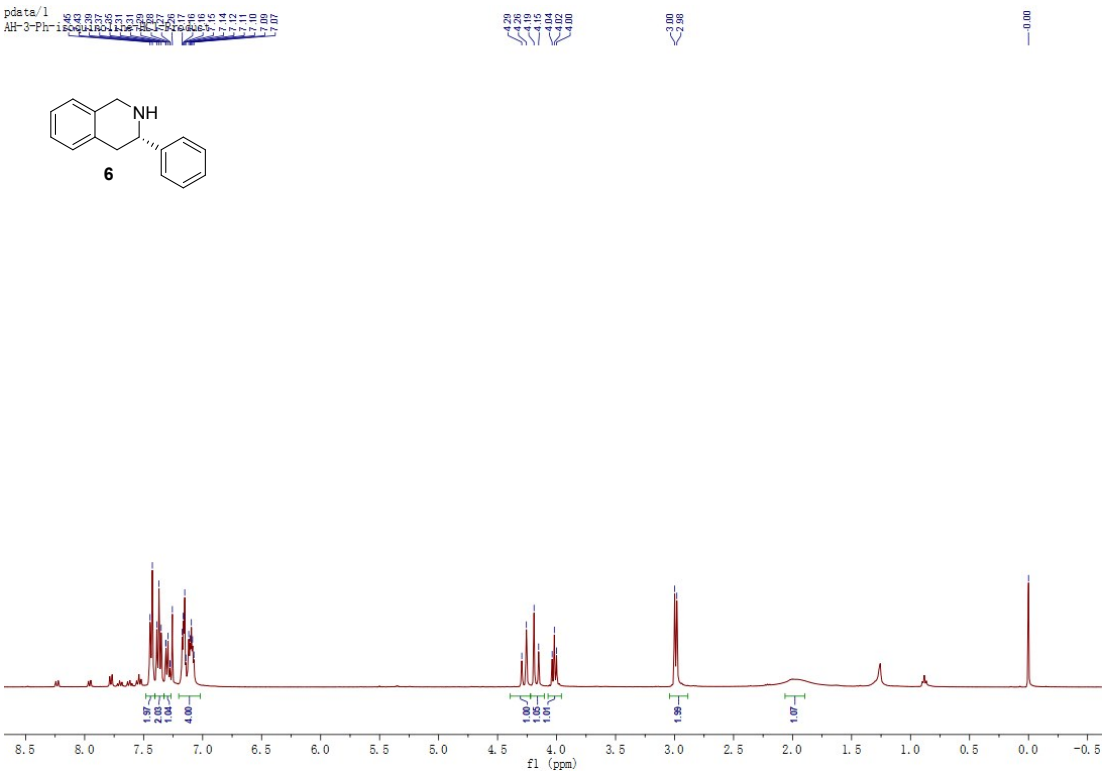
3v


pdata/1
HA-1-4H-natom-1
146.67
138.37
137.68
137.46
129.38
128.95
127.00
126.07
121.25
115.95
109.67
109.62
77.33
77.02
76.70
55.36
50.64
29.39
28.63
19.45
-0.00
O
HN
3v
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

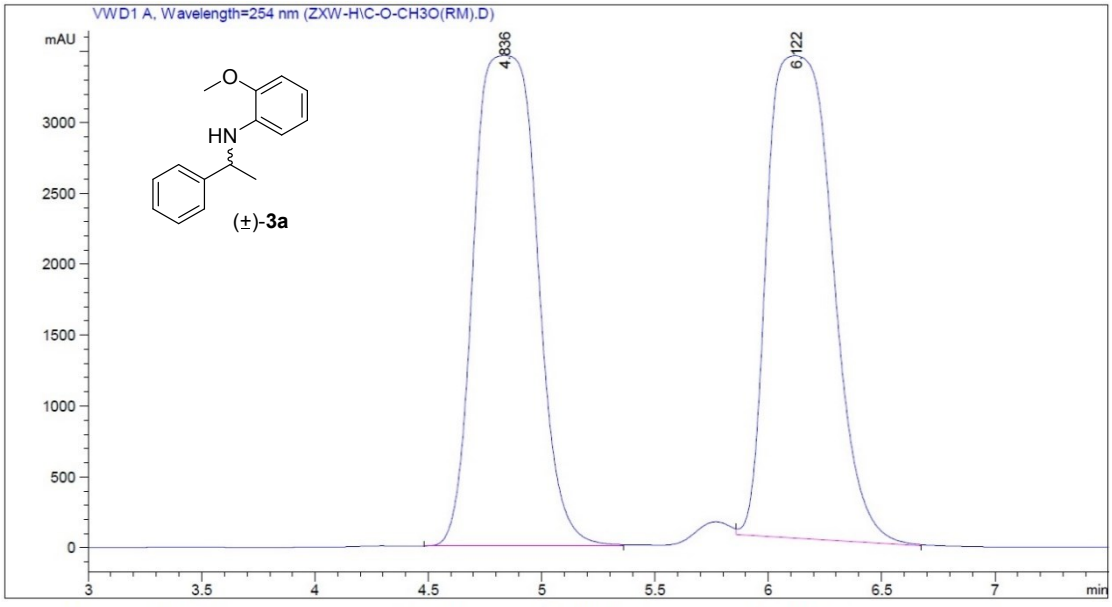

Sample Name LRX-2-2A
User Name
Sample Type Sample
ACQ Method method-POSI.m
Position Vial 23
Inj Vol 1
IRM Calibration Status Success
Comment
Instrument Name Instrument 1
InjPosition
Data Filename LRX-2-2A.d
Acquired Time 7/18/2019 11:22:25 AM (UTC+08:00)
+ Scan (rt: 0.183-0.282 min, 7 scans) LRX-2-2A.d Subtract
x10 6
O
HN
3v
254.15426
124.07579
131.08566
79.02175
91.05461
109.05244
40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420
Counts vs. Mass-to-Charge (m/z)


Et-Phketone-1r-OMe-PhNH2-HA-2
6.75
6.70
6.68
6.66
6.60
6.59
6.57
6.34
6.33
4.69
4.22
4.21
4.19
3.88
1.92
1.91
1.89
1.87
1.85
1.83
1.81
1.80
1.78
0.99
0.97
0.95
0.07
0.00
O
HN
3w
4.00
0.96
1.01
1.01
1.00
0.98
0.98
1.00
3.00
2.03
3.00
f1 (ppm)

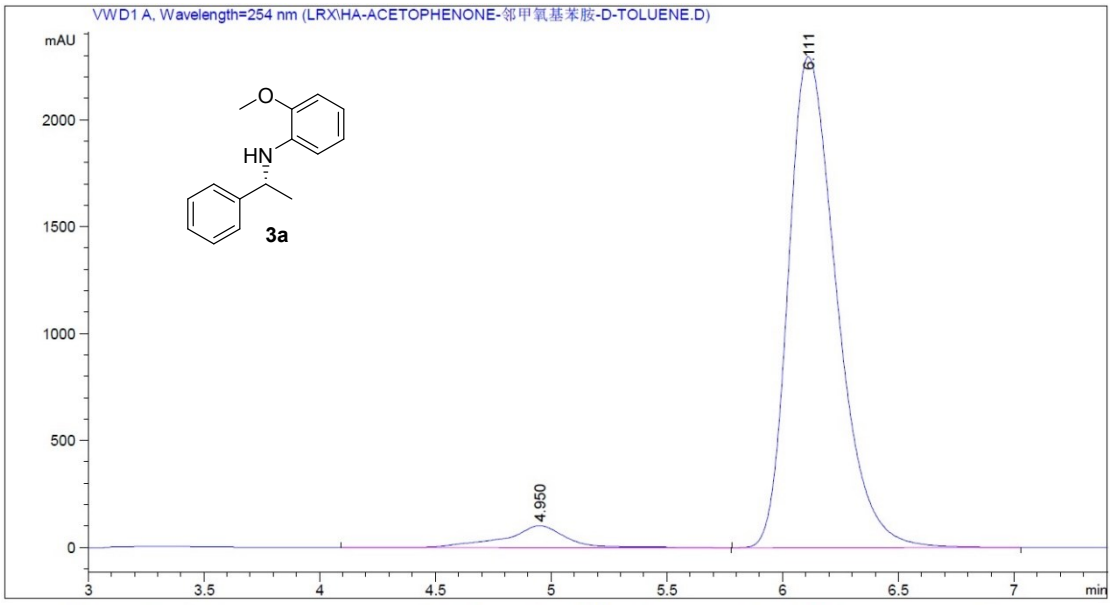

pdata/1
oulian-product
8.06
8.04
7.61
7.59
7.58
7.51
7.49
7.47
7.36
7.36
7.34
7.28
7.27
7.26
7.16
7.14
7.14
4.89
4.41
4.30
4.28
1.35
0.00
NHBoc
O
5
2.00
1.08
1.99
1.05
2.83
0.79
0.86
2.04
1.87
9.01
f1 (ppm)



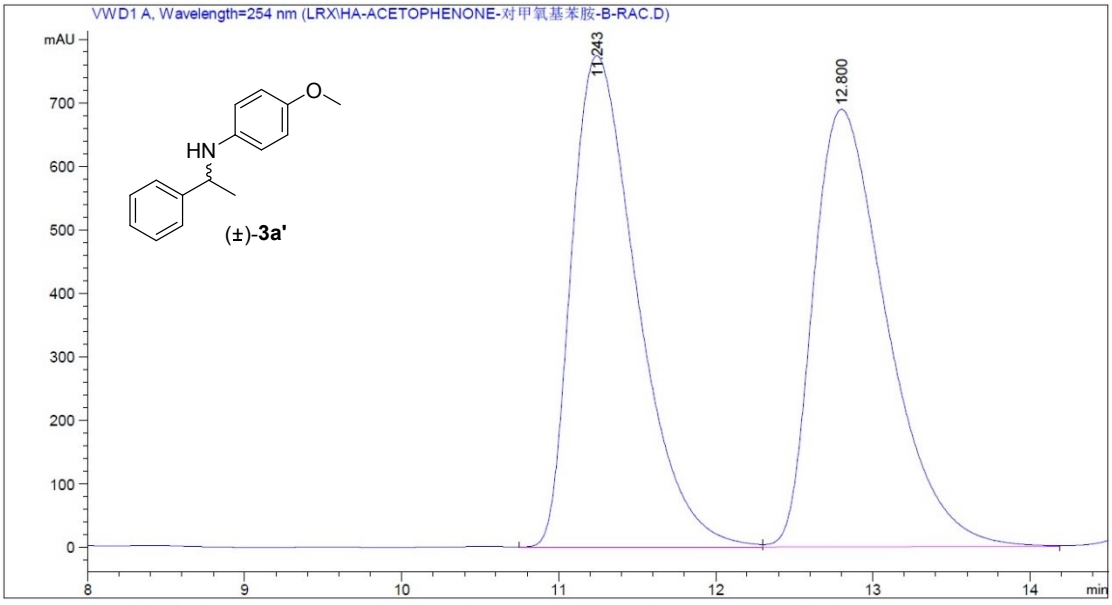
5. HPLC spectra



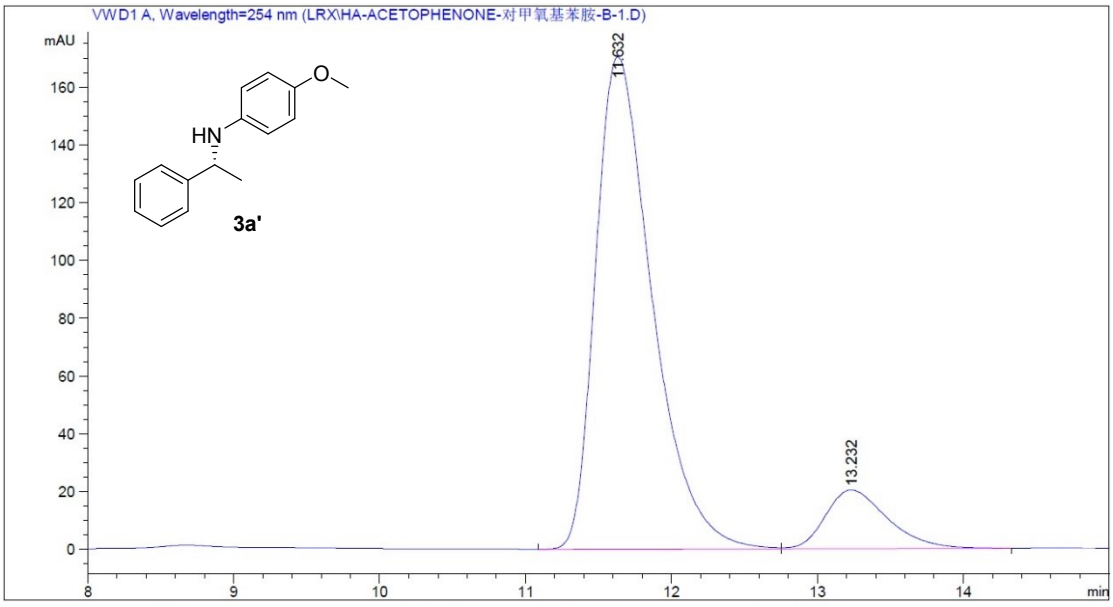
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.836	MM R	0.3210	6.66002e4	3458.39209	49.5152
2	6.122	MM R	0.3323	6.79045e4	3405.38843	50.4848



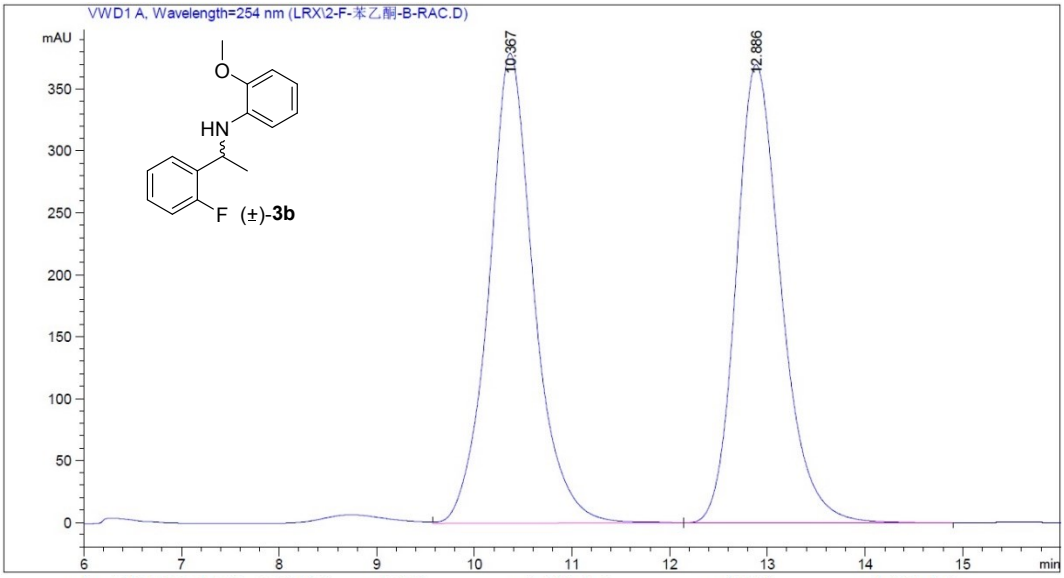
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.950	BB	0.2618	1894.49976	101.94369	5.3861
2	6.111	BV	0.2230	3.32794e4	2296.92090	94.6139



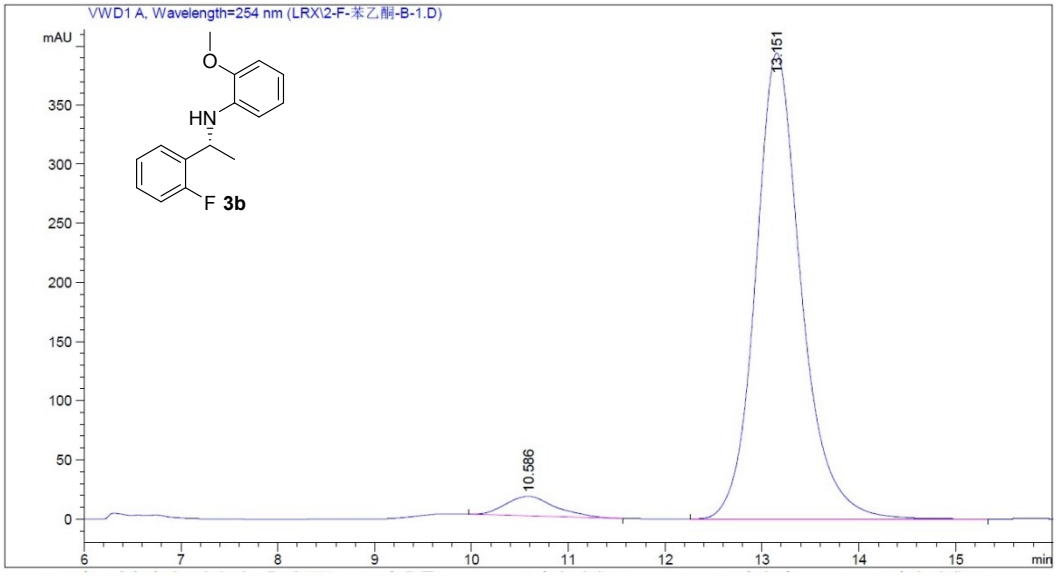
#	[min]		[min]	[mAU*s]	[mAU]	%
1	11.243	VV	0.4486	2.23873e4	773.57593	49.8552
2	12.800	VV	0.5043	2.25174e4	688.87933	50.1448



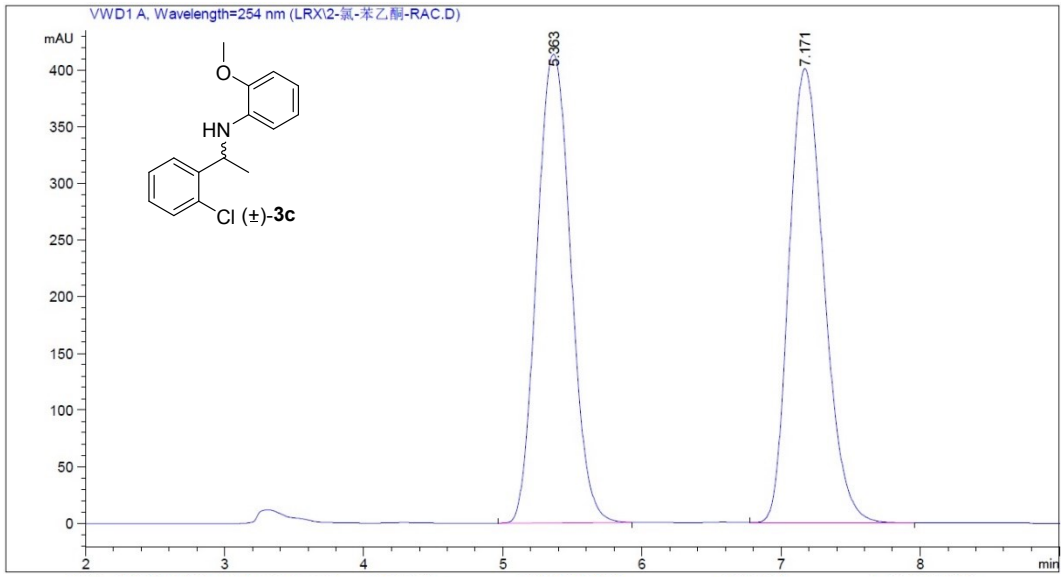
#	[min]		[min]	[mAU*s]	[mAU]	%
1	11.632	BV	0.4115	4594.40039	170.41066	88.4598
2	13.232	VB	0.4510	599.36890	20.32453	11.5402



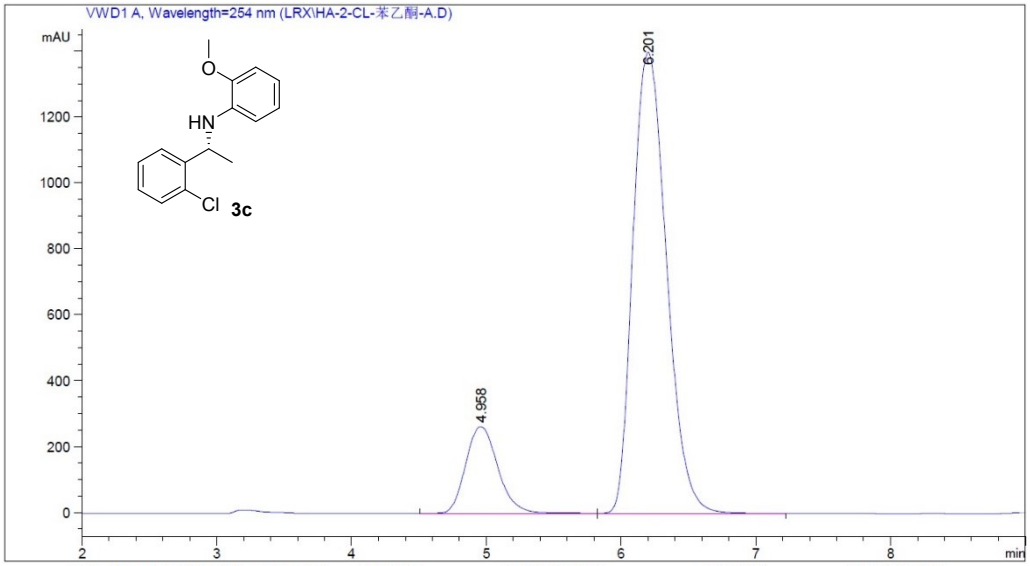
#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.367	VB	0.4736	1.21863e4	379.56299	50.5801
2	12.886	BB	0.4911	1.19067e4	370.37100	49.4199



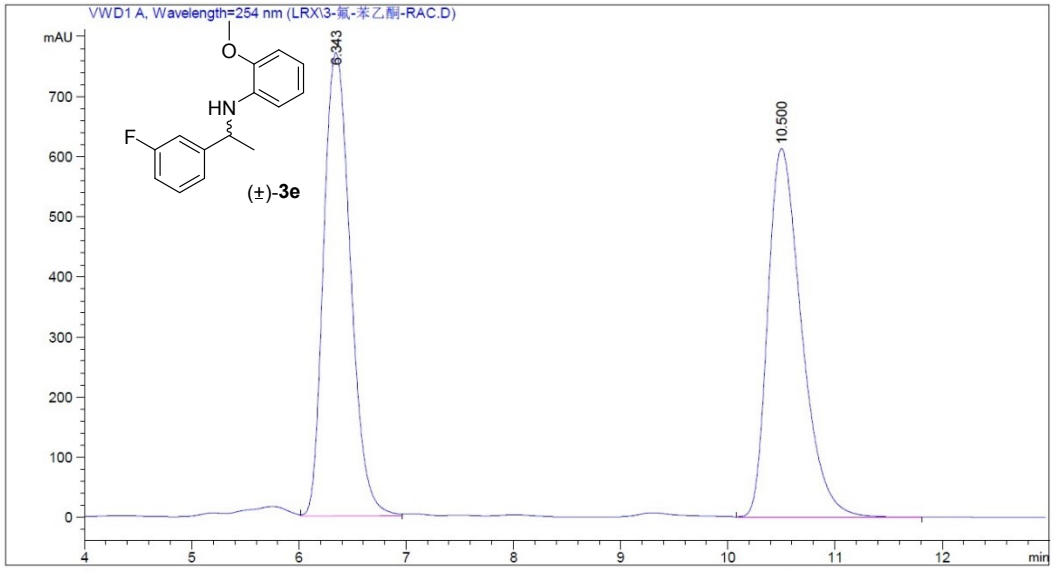
#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.586	BB	0.5399	588.90289	16.55986	4.3660
2	13.151	BB	0.4919	1.28994e4	394.08328	95.6340



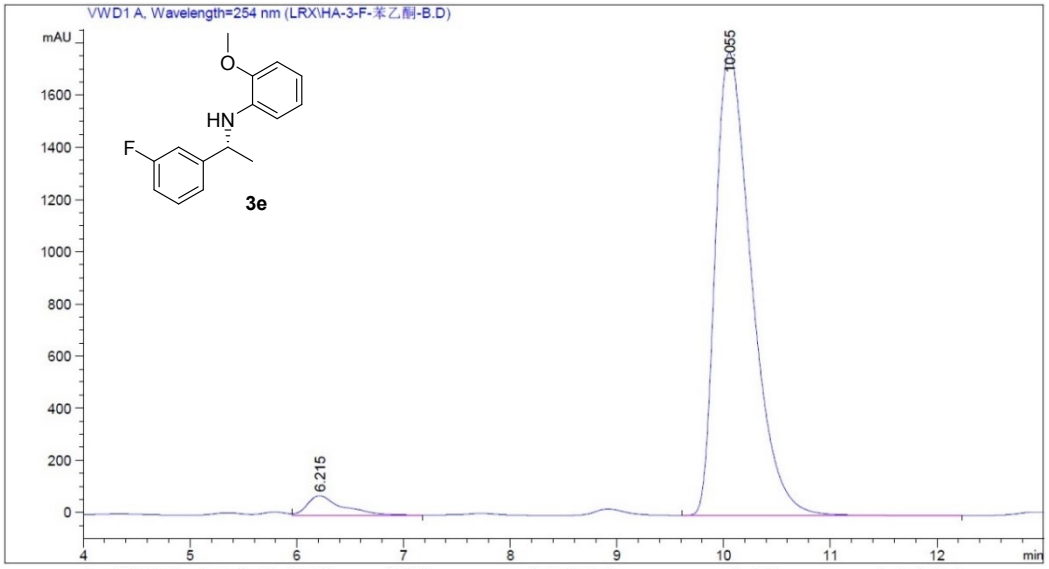
#	[min]		[min]	[mAU*s]	[mAU]	%
1	5.363	BB	0.2685	7001.63135	413.62698	50.0040
2	7.171	VB	0.2737	7000.50830	400.98199	49.9960



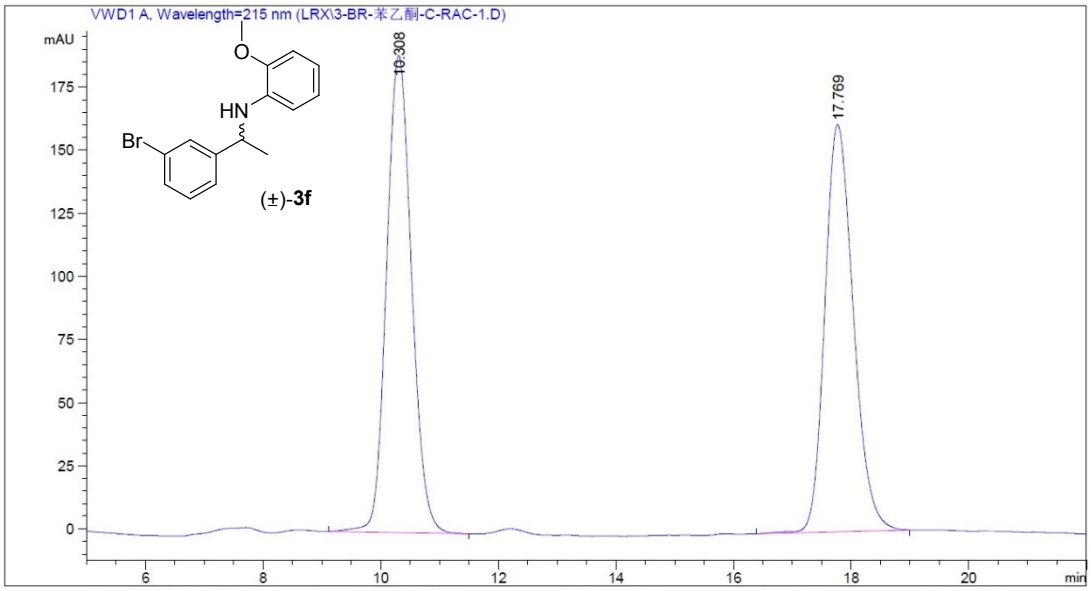
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.958	BB	0.2612	4348.52832	262.59390	15.2253
2	6.201	BB	0.2750	2.42127e4	1398.24023	84.7747



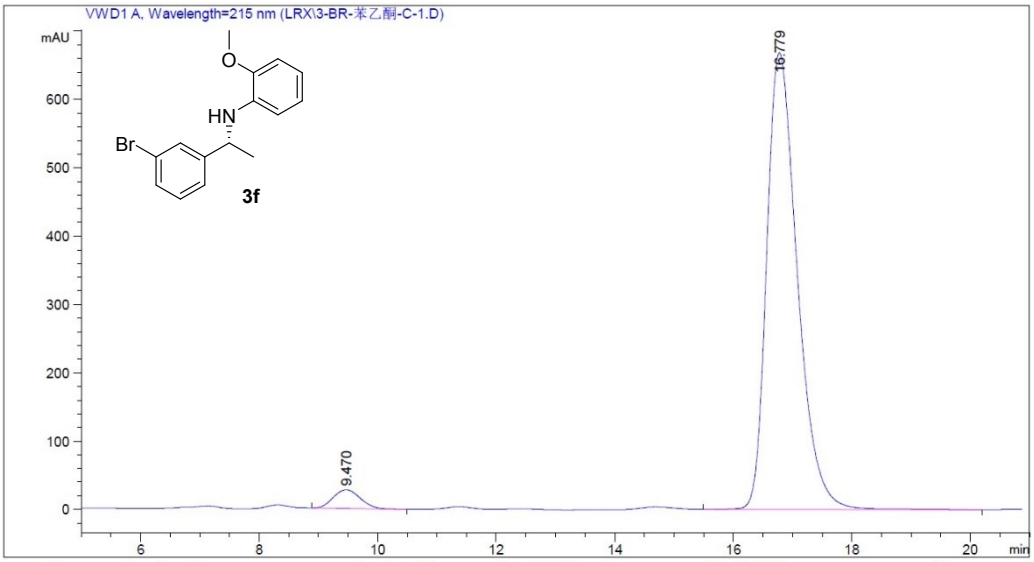
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.343	VV	0.2755	1.34555e4	771.24469	50.1195
2	10.500	VB	0.3356	1.33913e4	613.66998	49.8805



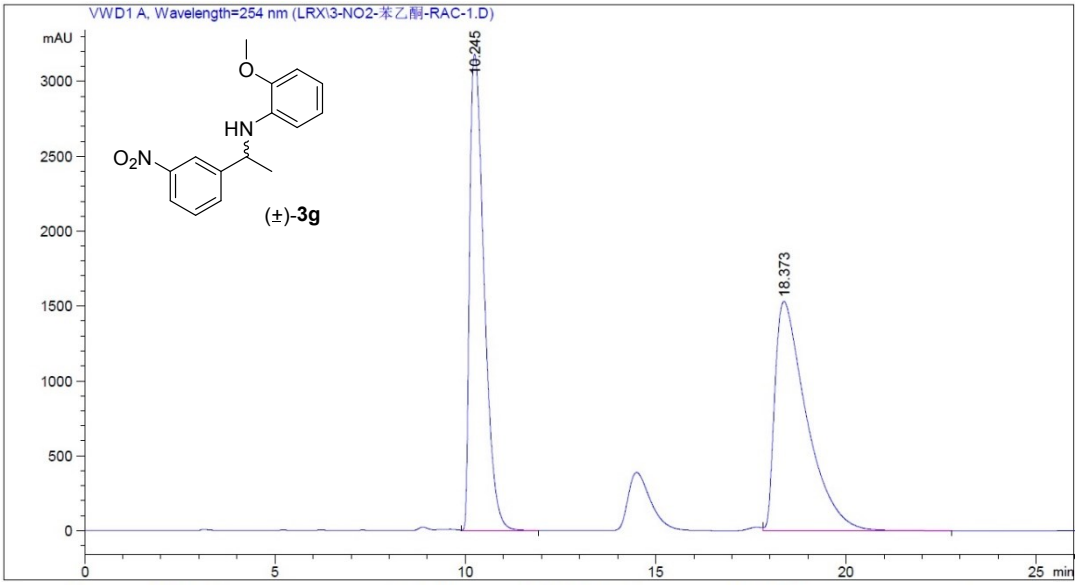
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.215	VB	0.3241	1661.57739	74.24078	3.8296
2	10.055	VB	0.3634	4.17262e4	1774.06531	96.1704



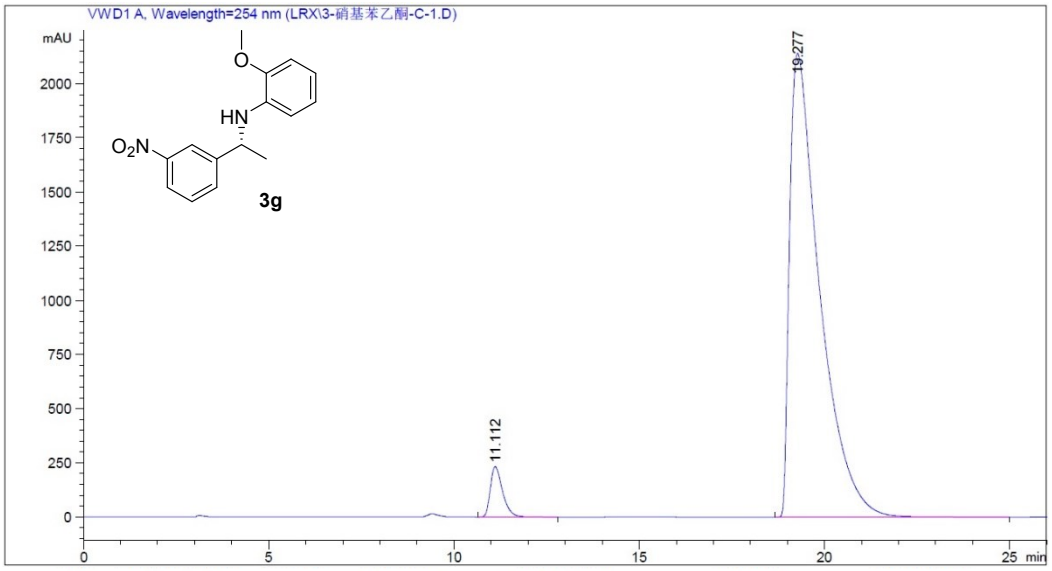
#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.308	BB	0.4616	5584.38672	189.05338	50.7025
2	17.769	BB	0.5249	5429.63135	161.23955	49.2975



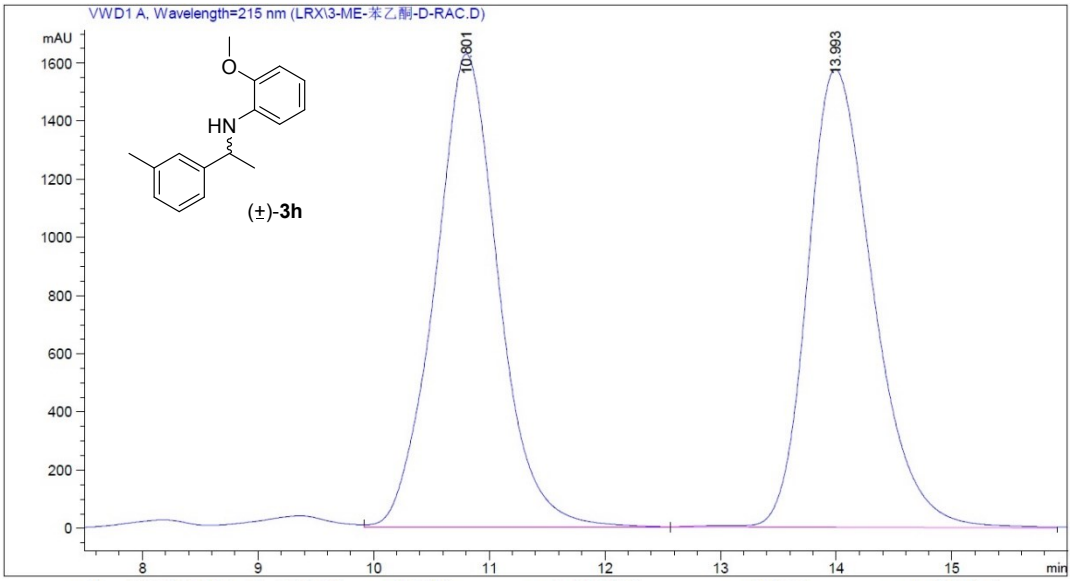
#	[min]		[min]	[mAU*s]	[mAU]	%
1	9.470	BB	0.5071	863.08997	27.20926	3.4730
2	16.779	BB	0.5517	2.39880e4	668.47650	96.5270



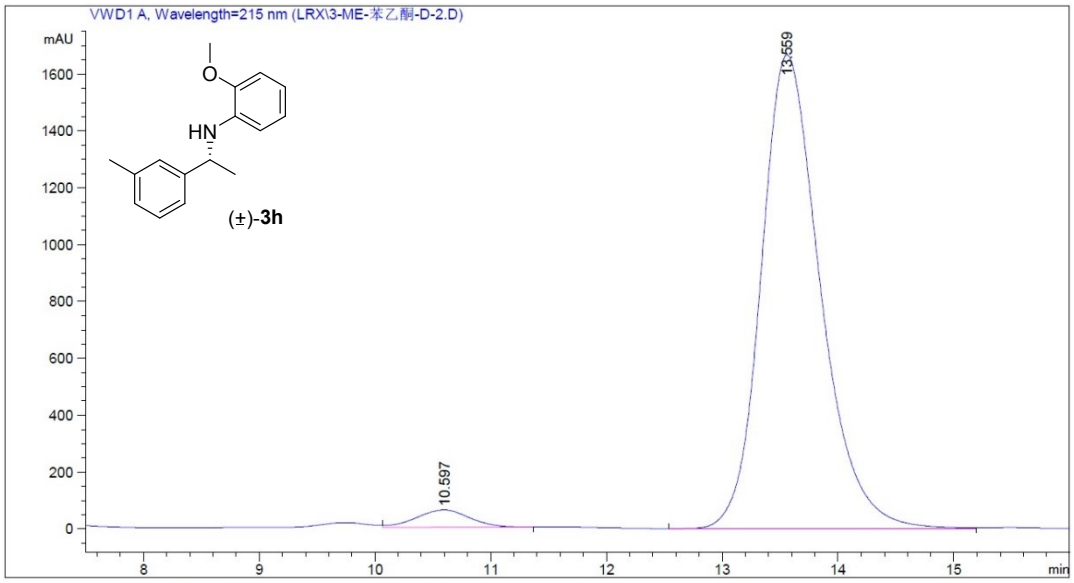
#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.245	BB	0.4088	8.36663e4	3181.93066	48.5835
2	18.373	VB	0.8662	8.85452e4	1532.28345	51.4165



#	[min]		[min]	[mAU*s]	[mAU]	%
1	11.112	BB	0.3505	5373.68115	233.52473	4.2687
2	19.277	BB	0.8258	1.20512e5	2140.52319	95.7313

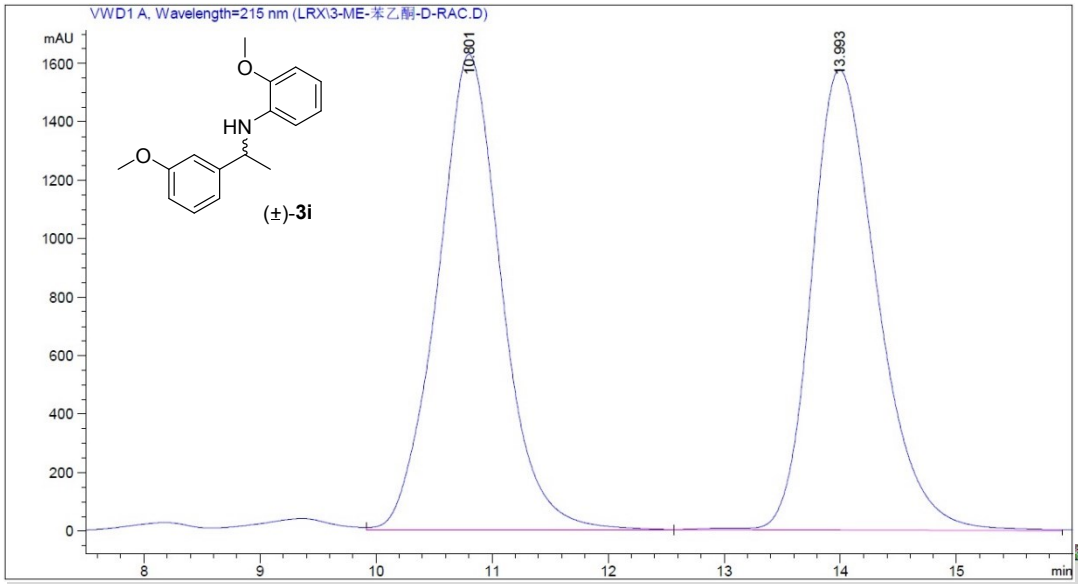


#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.801	VB	0.5721	6.22163e4	1627.00195	50.1101
2	13.993	BV	0.6069	6.19430e4	1574.79199	49.8899

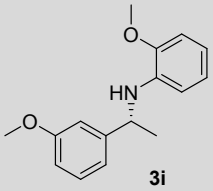


(±)-**3h**

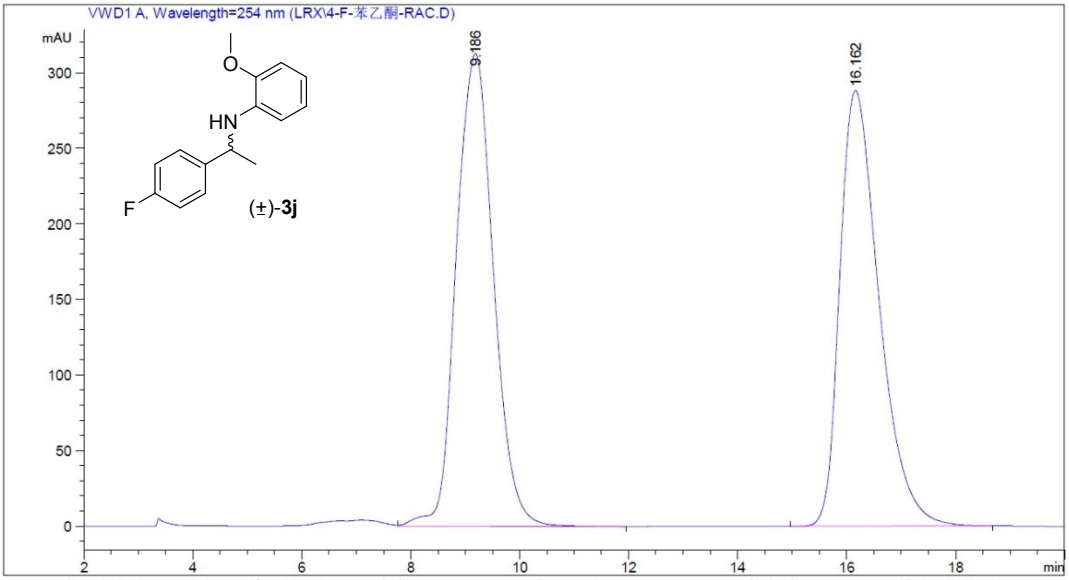
#	[min]		[min]	[mAU*s]	[mAU]	%
1	10.597	VB	0.4990	1956.88892	60.88713	3.2087
2	13.559	BV	0.5422	5.90301e4	1666.53638	96.7913



(±)-**3i**

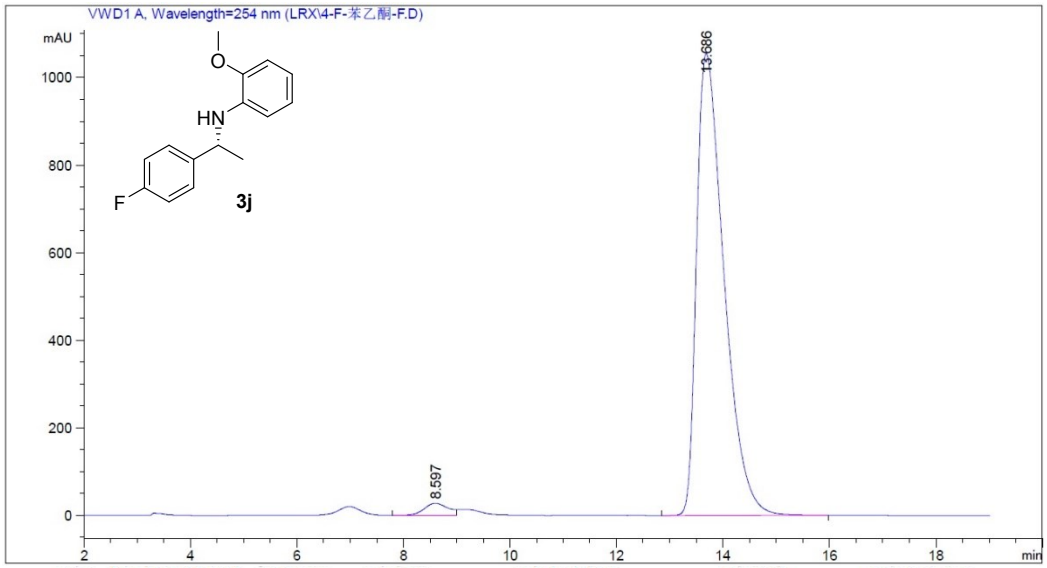


3i

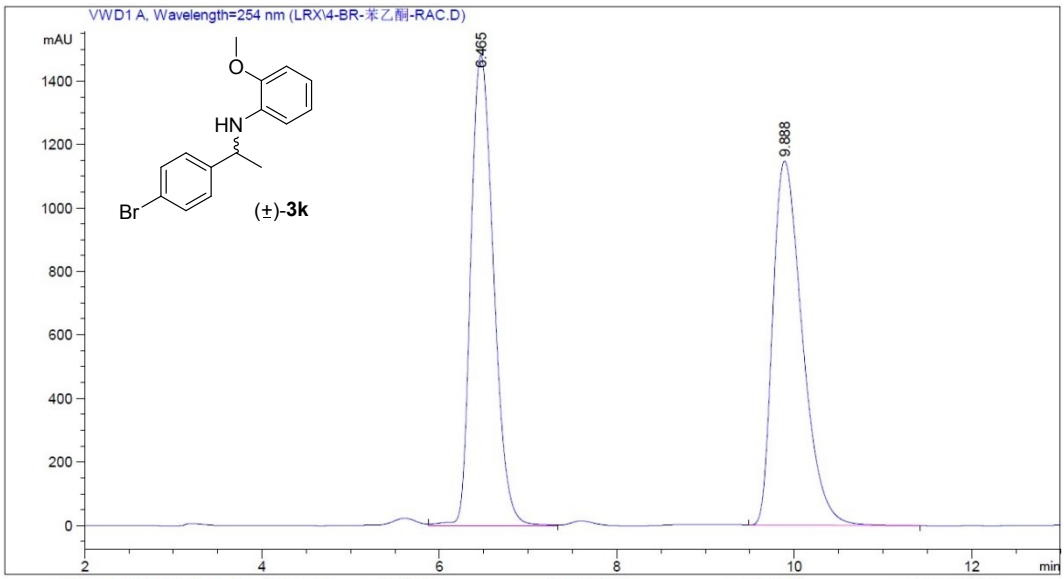


(±)-**3j**

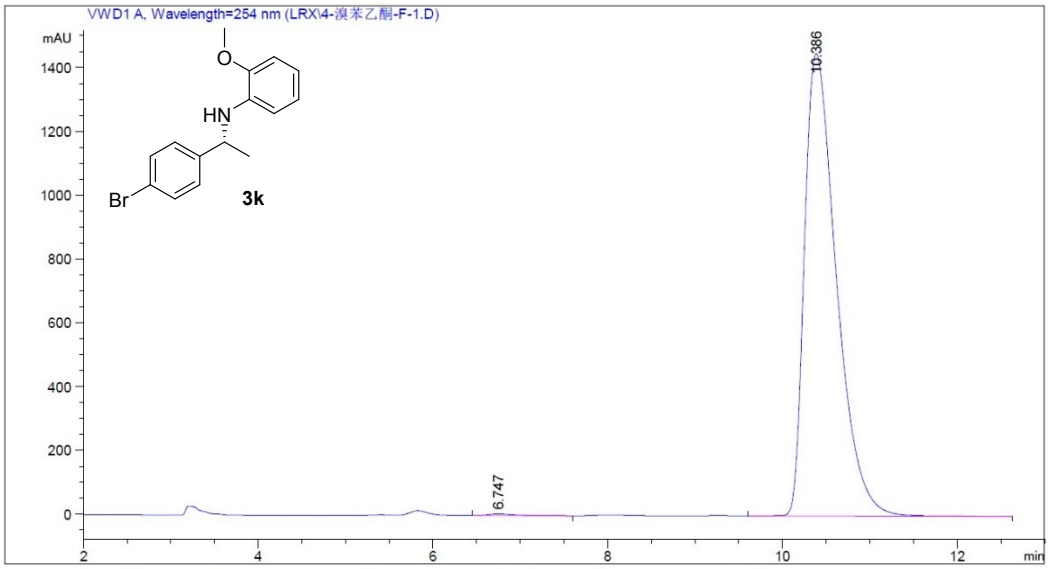
#	[min]		[min]	[mAU*s]	[mAU]	%
1	9.186	VB	0.7565	1.48349e4	312.66891	50.6498
2	16.162	BB	0.7743	1.44543e4	288.12140	49.3502



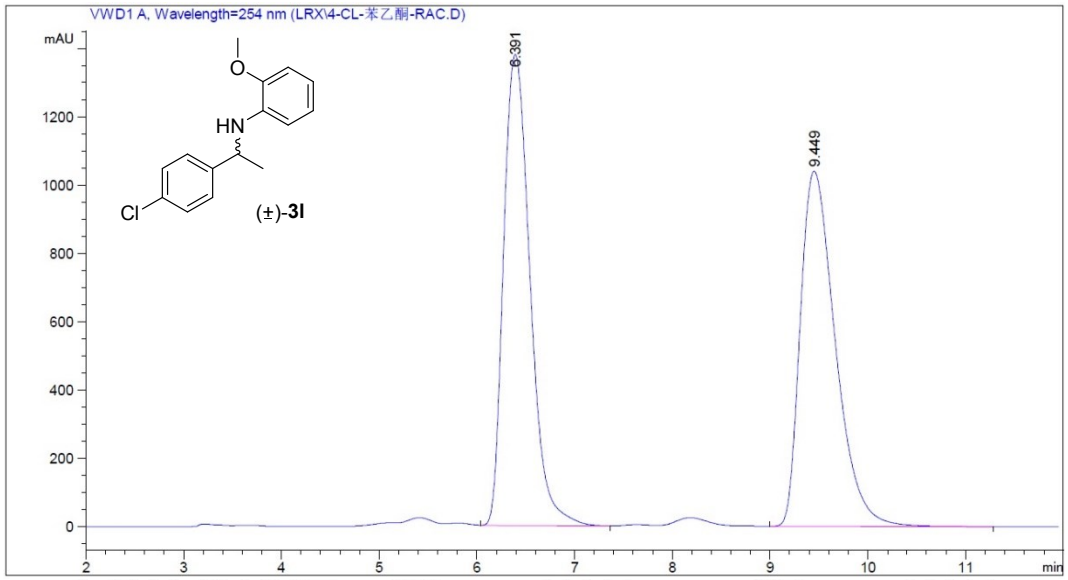
#	[min]		[min]	[mAU*s]	[mAU]	%
1	8.597	BV	0.4732	875.10132	27.72708	2.2677
2	13.686	BB	0.5470	3.77148e4	1055.10608	97.7323



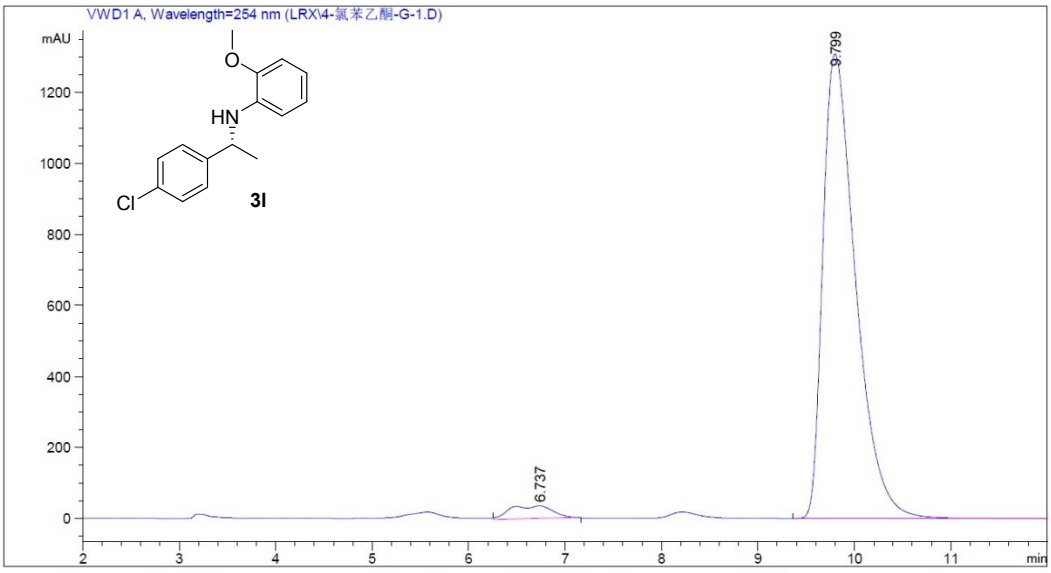
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.465	VV	0.2826	2.64953e4	1481.83789	49.9165
2	9.888	BB	0.3604	2.65839e4	1146.83618	50.0835



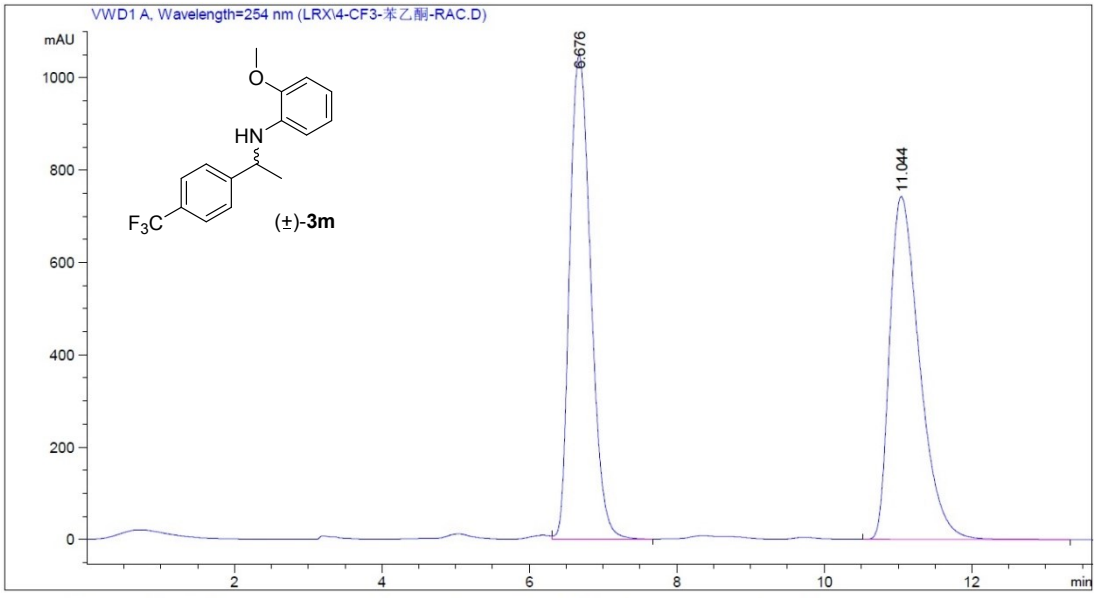
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.747	VB	0.2920	121.32605	5.99804	0.3296
2	10.386	BBA	0.3892	3.66868e4	1449.97498	99.6704



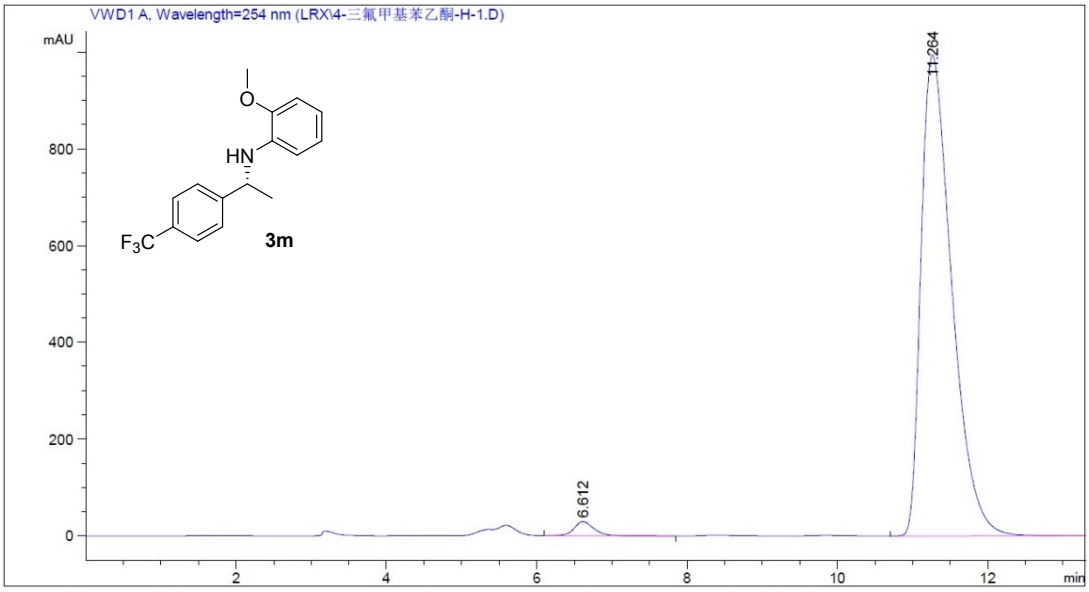
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.391	BB	0.2985	2.59550e4	1379.25244	50.1054
2	9.449	BB	0.3860	2.58459e4	1039.93701	49.8946



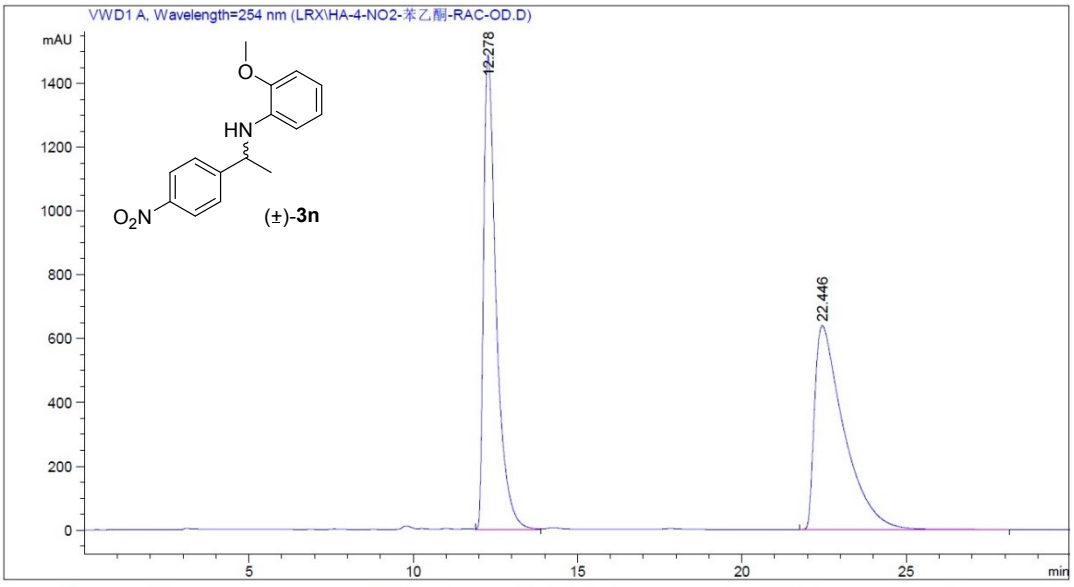
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.737	MM R	0.5114	1078.89270	35.16355	3.3780
2	9.799	BBA	0.3609	3.08600e4	1309.51074	96.6220



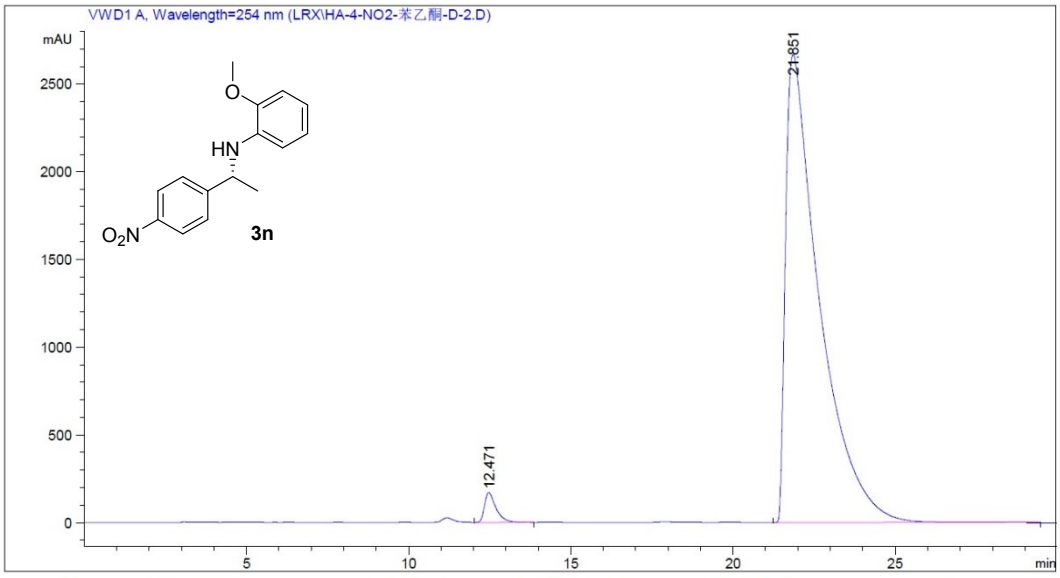
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.676	VB	0.3162	2.08689e4	1048.62830	49.9179
2	11.044	BB	0.4348	2.09375e4	742.99725	50.0821



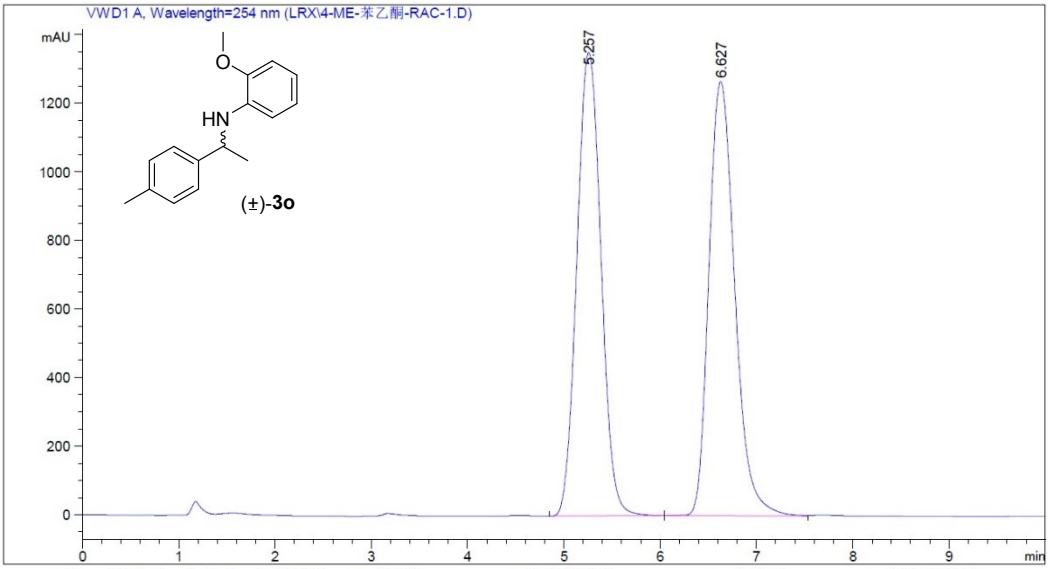
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.612	VB	0.2781	549.79486	29.53858	1.9096
2	11.264	BBA	0.4375	2.82408e4	993.90442	98.0904



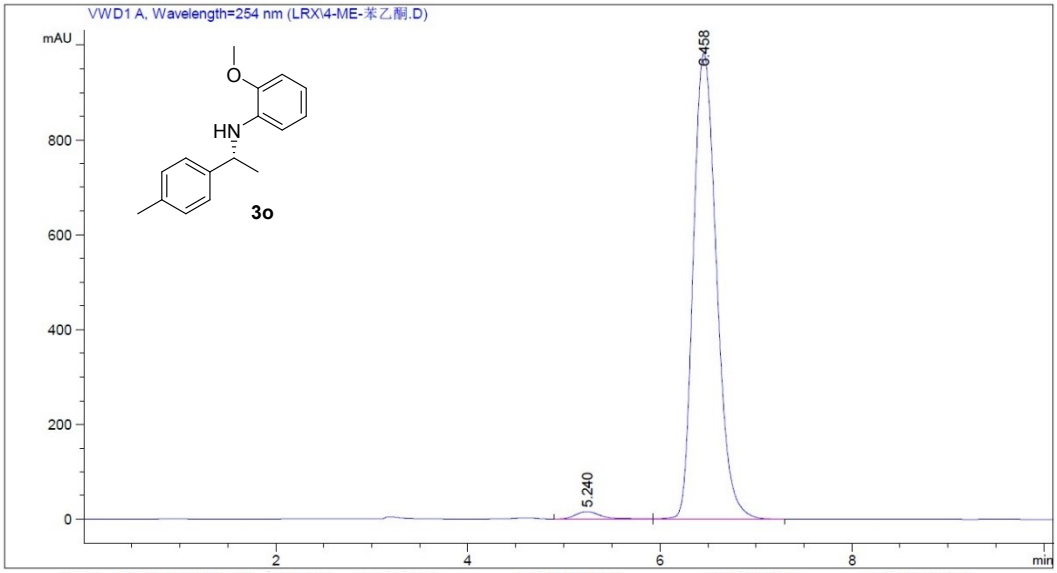
#	[min]		[min]	[mAU*s]	[mAU]	%
1	12.278	VV	0.4054	3.95459e4	1486.36365	50.0097
2	22.446	BB	0.8977	3.95305e4	639.02570	49.9903



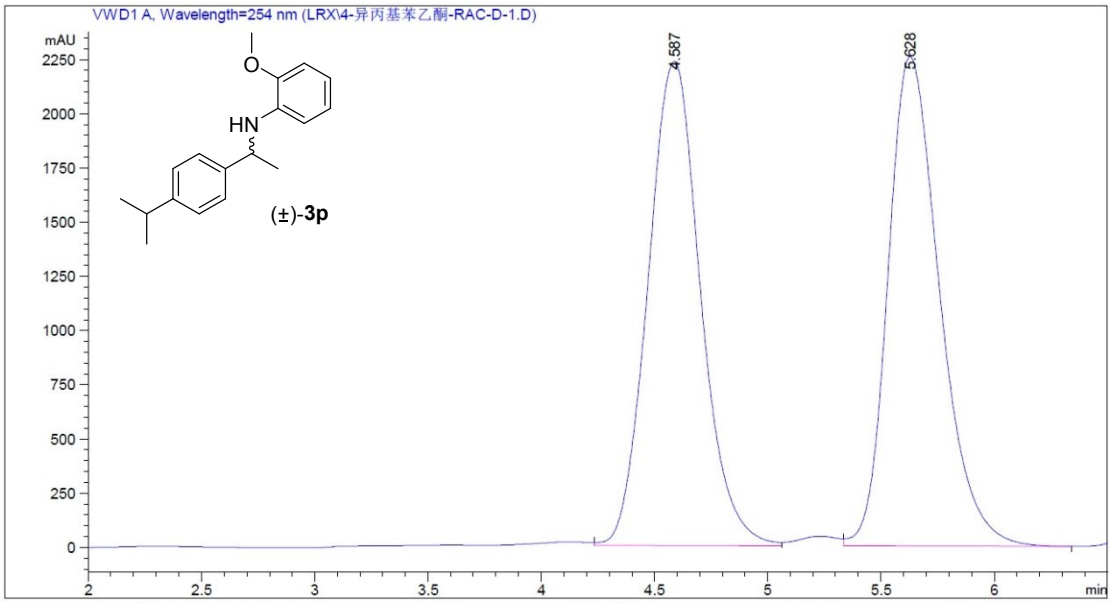
#	[min]		[min]	[mAU*s]	[mAU]	%
1	12.471	VB	0.3649	4210.71924	170.60930	2.1387
2	21.851	BB	1.0160	1.92670e5	2669.58032	97.8613



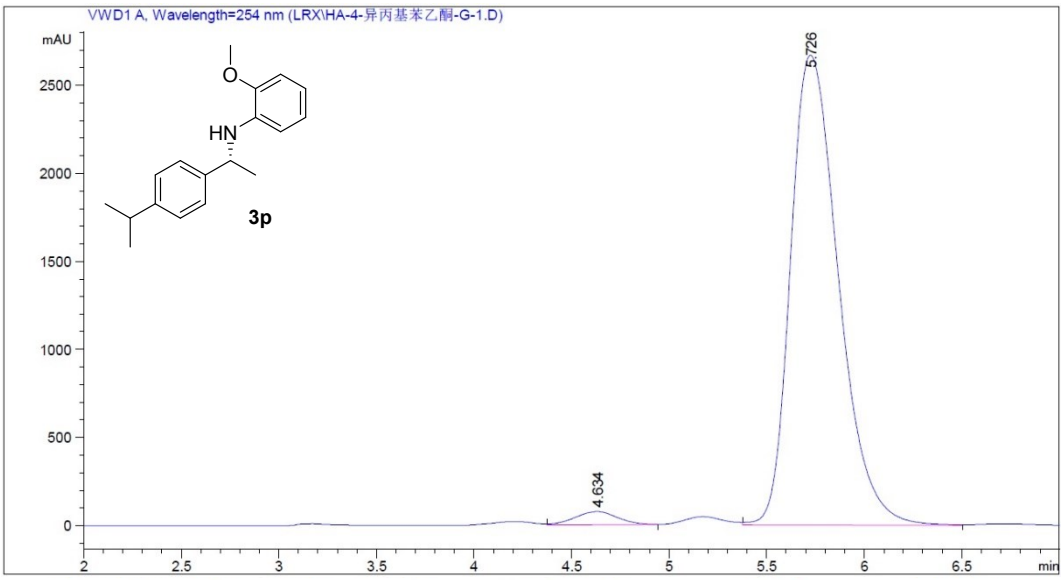
#	[min]		[min]	[mAU*s]	[mAU]	%
1	5.257	BB	0.2755	2.35722e4	1351.11389	49.8868
2	6.627	BV	0.2930	2.36792e4	1267.34607	50.1132



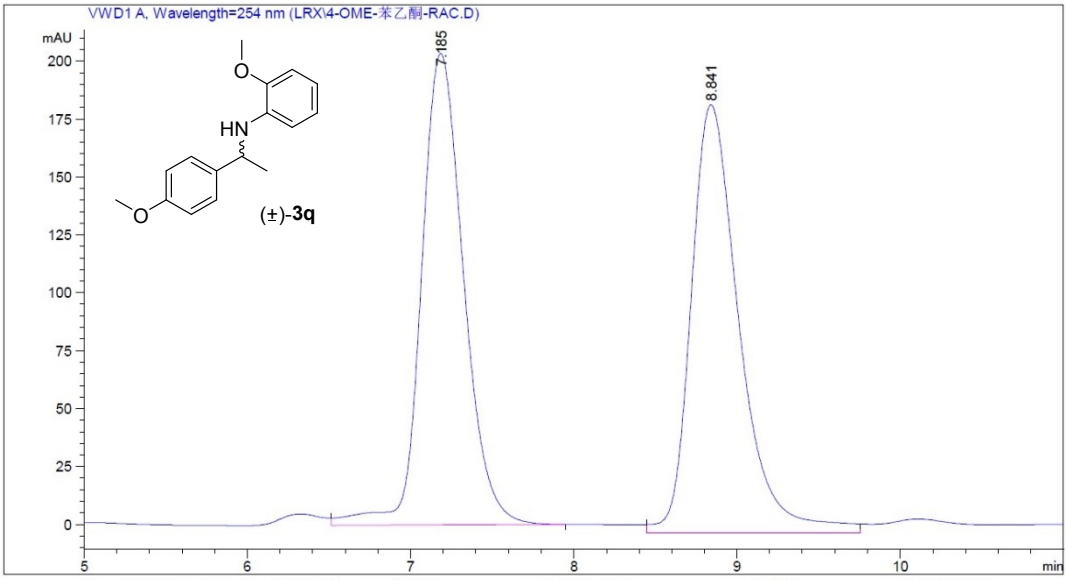
#	[min]		[min]	[mAU*s]	[mAU]	%
1	5.240	VV	0.2946	316.21246	16.27814	1.8780
2	6.458	VB	0.2651	1.65215e4	982.99371	98.1220



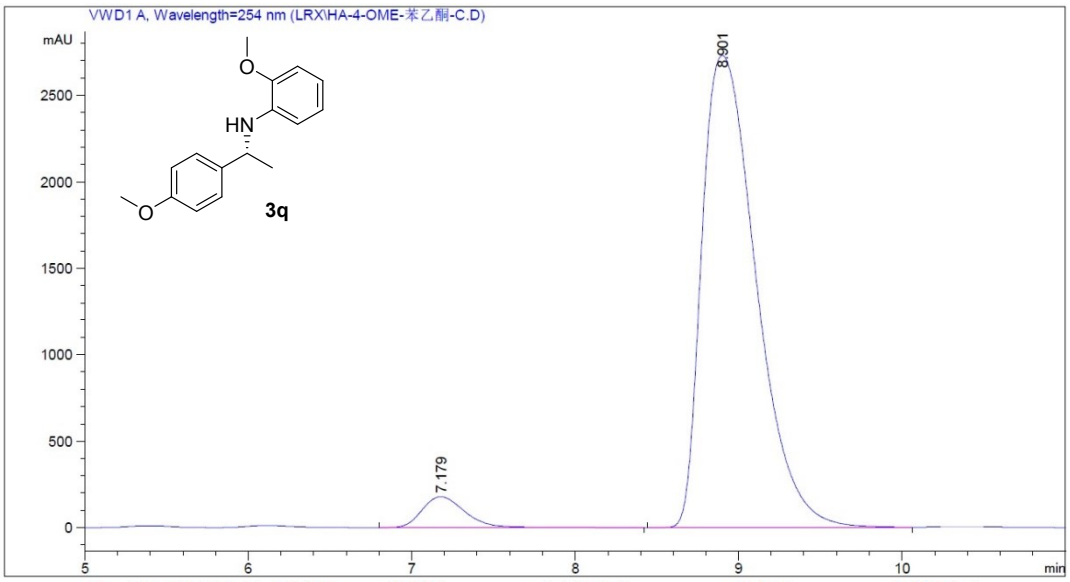
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.587	VV	0.2446	3.59038e4	2233.15112	50.0717
2	5.628	VB	0.2439	3.58010e4	2258.41479	49.9283



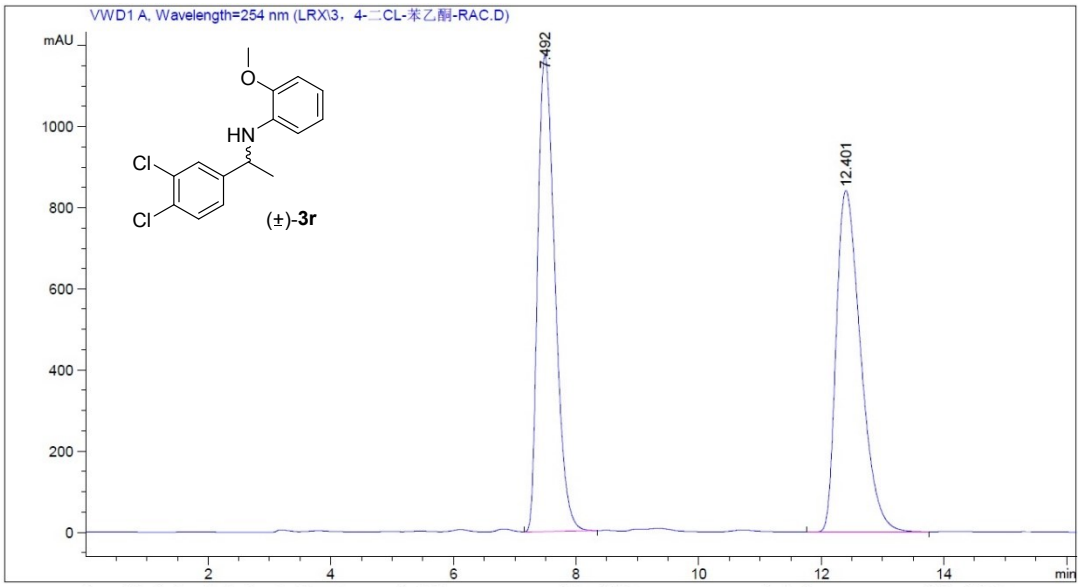
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.634	VB	0.2324	1136.10864	75.11845	2.4385
2	5.726	VV	0.2649	4.54543e4	2666.32349	97.5615



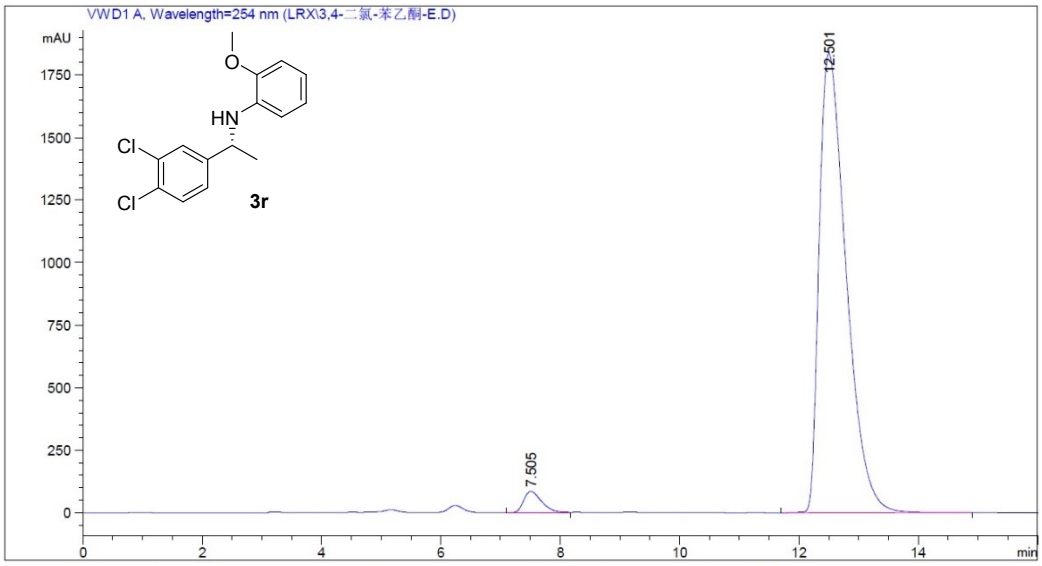
#	[min]		[min]	[mAU*s]	[mAU]	%
1	7.185	VB	0.2796	3671.21387	203.41328	49.2469
2	8.841	MM R	0.3413	3783.49365	184.77428	50.7531



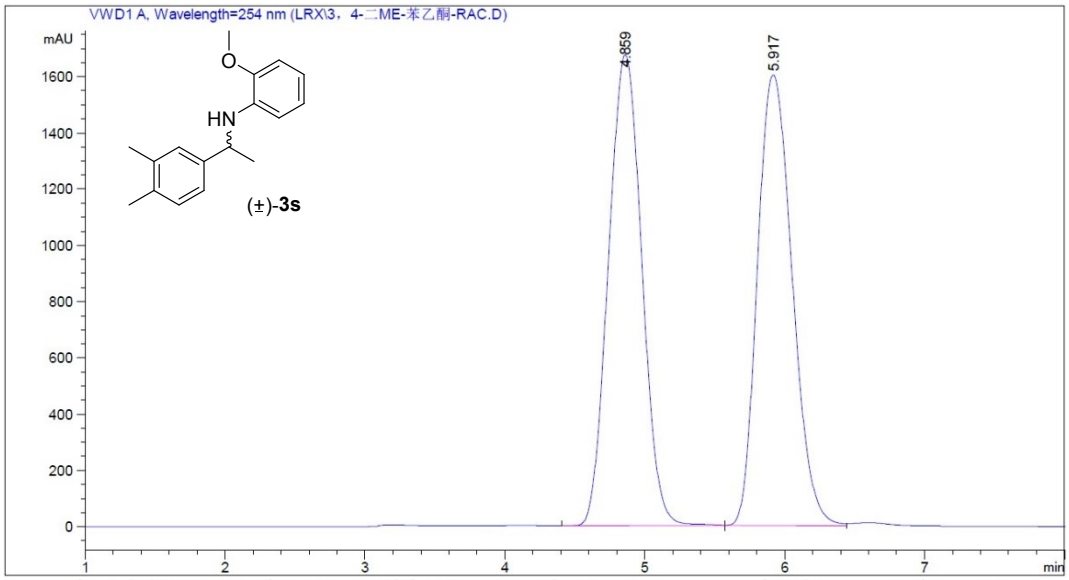
#	[min]		[min]	[mAU*s]	[mAU]	%
1	7.179	VB	0.2838	3253.48413	178.40804	4.9170
2	8.901	BV	0.3598	6.29148e4	2730.26172	95.0830



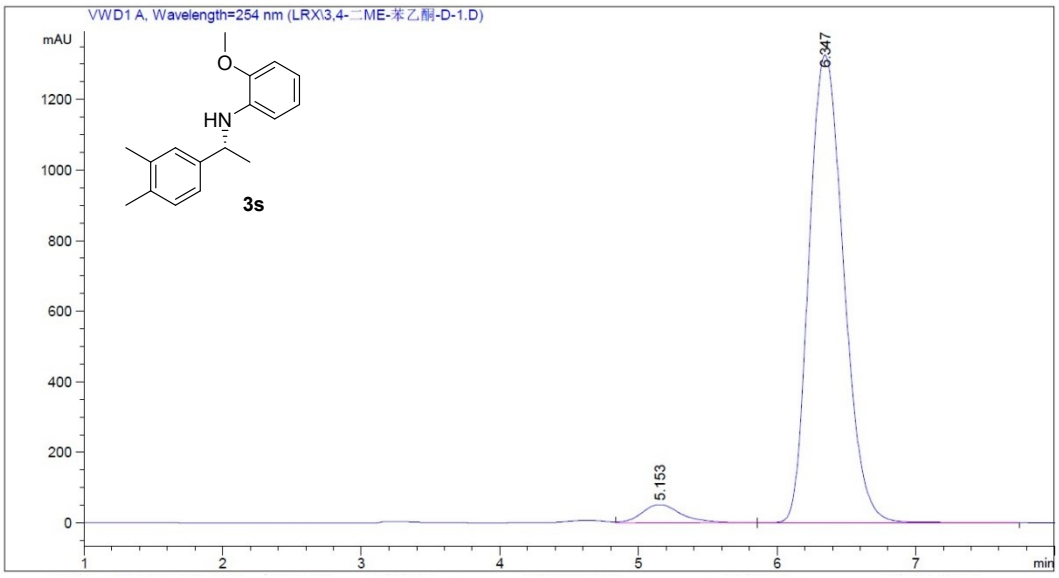
#	[min]		[min]	[mAU*s]	[mAU]	%
1	7.492	BB	0.3071	2.28500e4	1173.85925	49.5293
2	12.401	BB	0.4296	2.32843e4	842.00989	50.4707



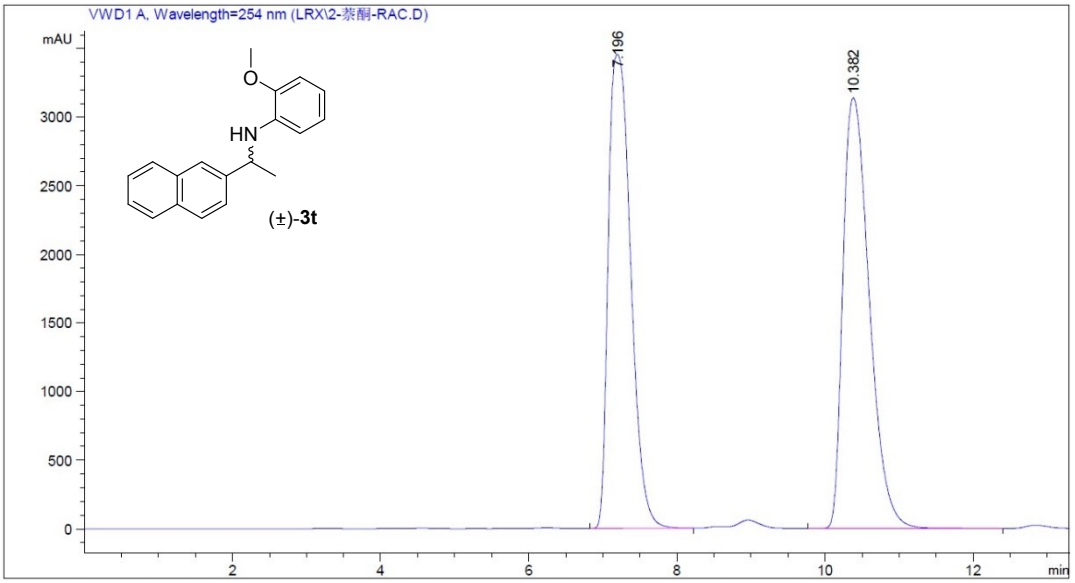
#	[min]		[min]	[mAU*s]	[mAU]	%
1	7.505	BB	0.3175	1745.93359	84.68049	2.9422
2	12.501	BB	0.4850	5.75947e4	1835.88843	97.0578



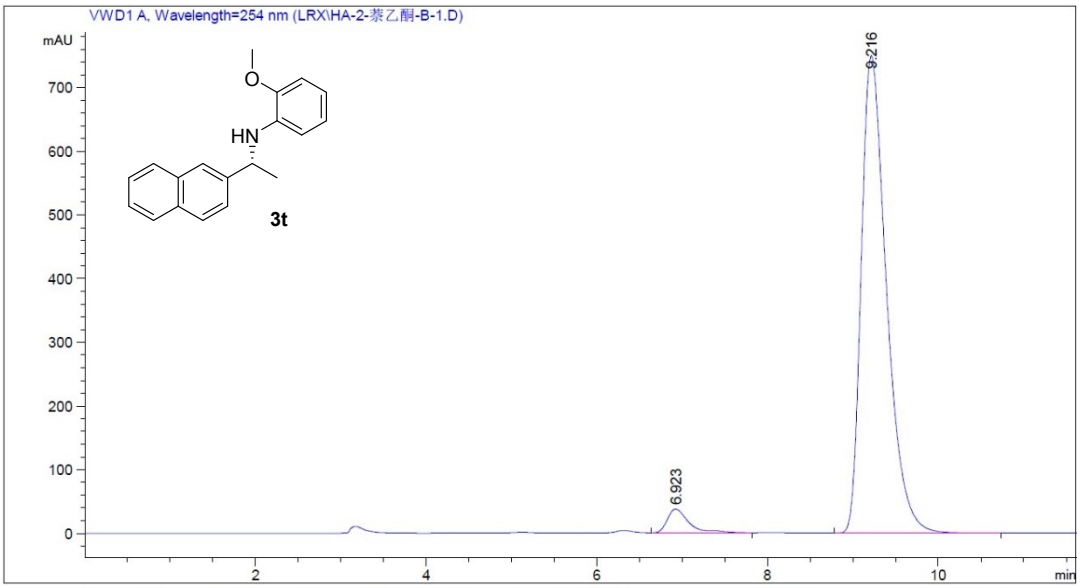
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.859	BB	0.2668	2.76724e4	1674.87744	50.0524
2	5.917	BV	0.2740	2.76144e4	1602.52588	49.9476



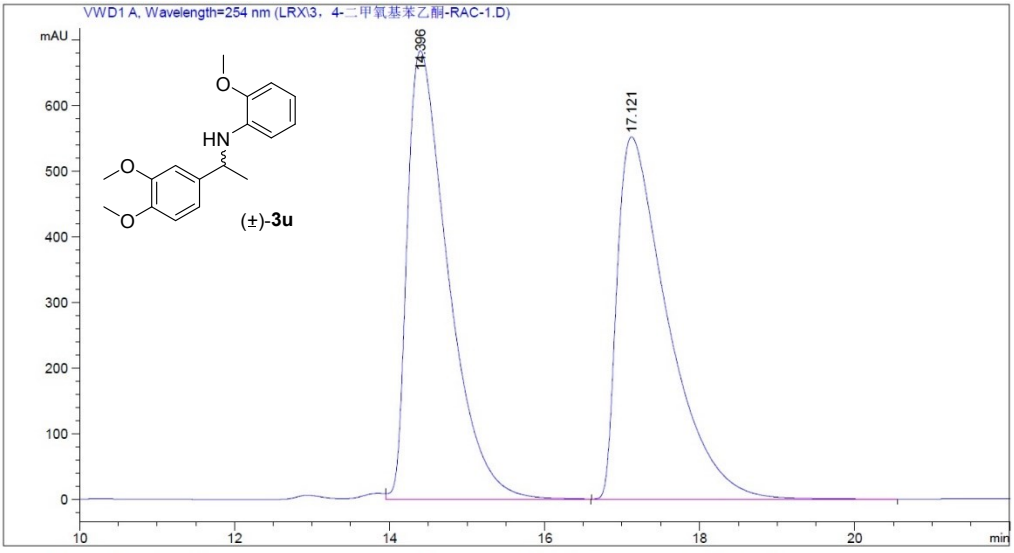
#	[min]		[min]	[mAU*s]	[mAU]	%
1	5.153	VV	0.3008	1020.41003	51.58646	4.2494
2	6.347	VB	0.2742	2.29927e4	1326.52148	95.7506



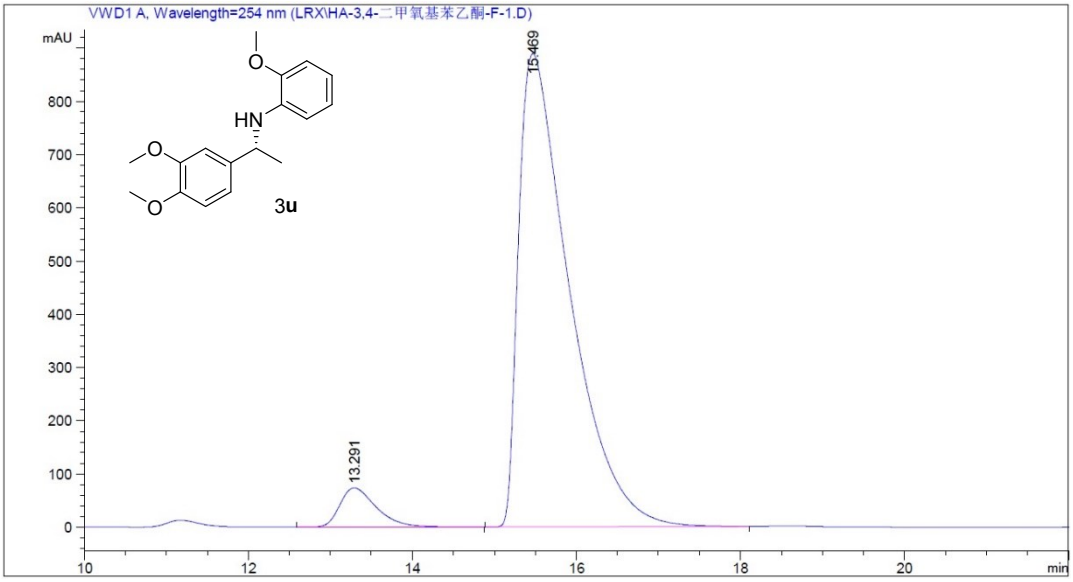
#	[min]		[min]	[mAU*s]	[mAU]	%
1	7.196	BB	0.3321	7.26166e4	3455.85376	48.3049
2	10.382	BB	0.3868	7.77130e4	3139.52124	51.6951



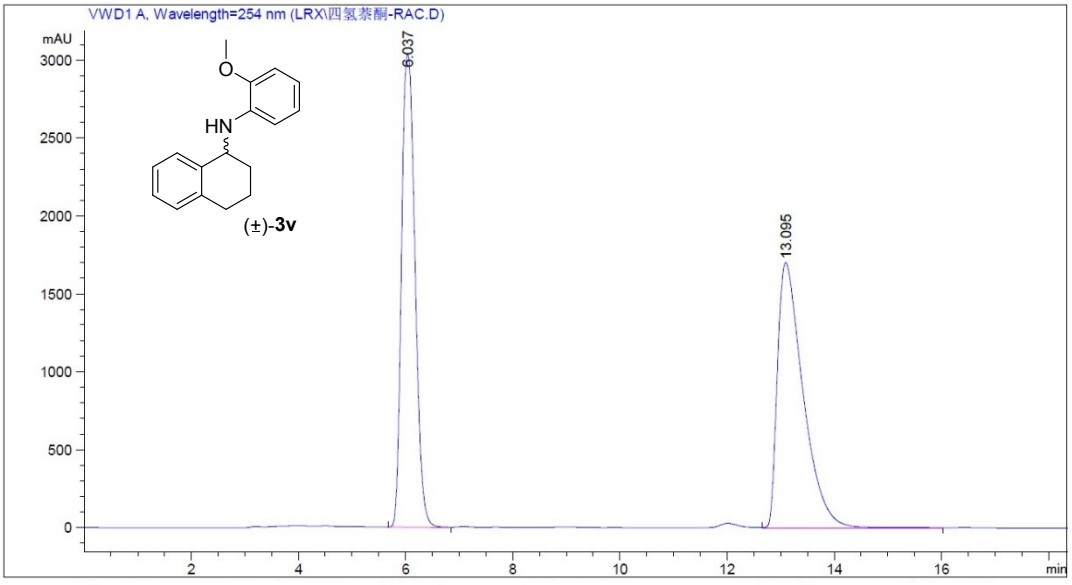
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.923	VV	0.2680	681.39539	37.85684	4.2467
2	9.216	BB	0.3131	1.53640e4	749.64996	95.7533



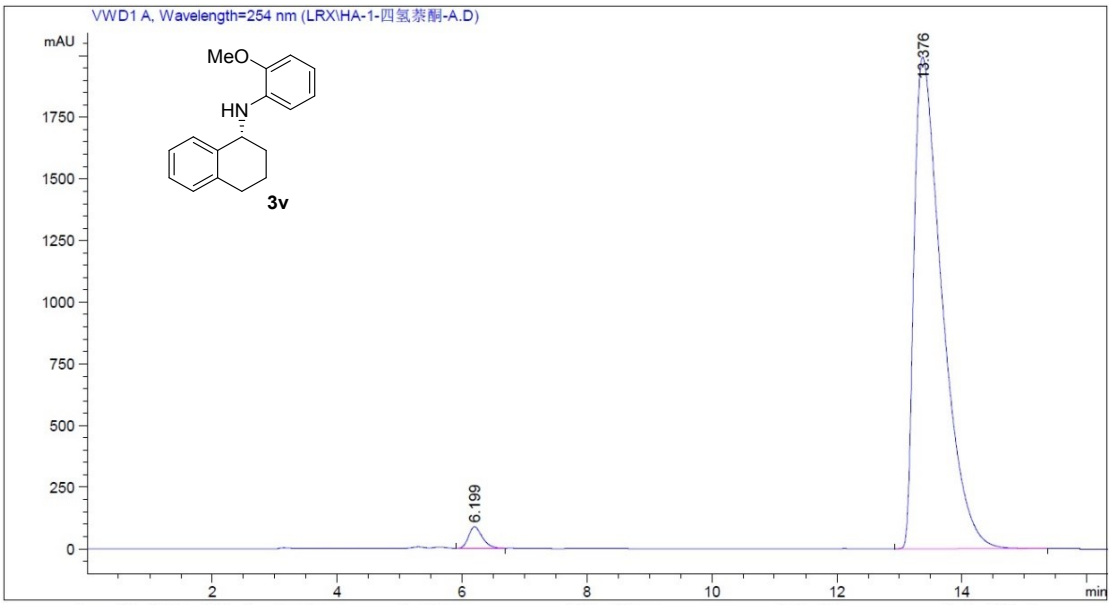
#	[min]		[min]	[mAU*s]	[mAU]	%
1	14.396	VB	0.5537	2.50676e4	683.71051	50.0701
2	17.121	BB	0.6701	2.49975e4	552.21906	49.9299



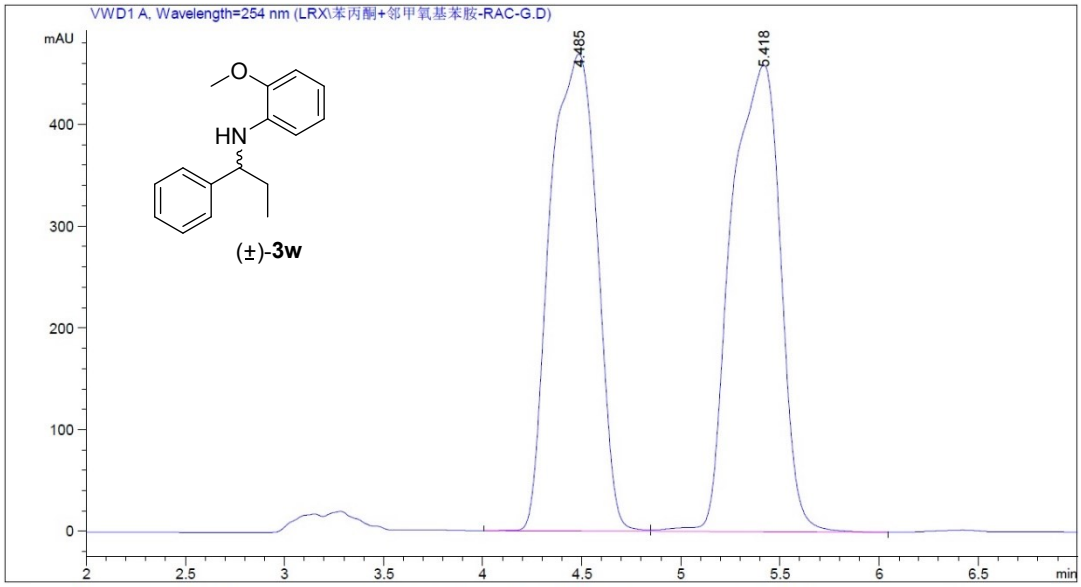
#	[min]		[min]	[mAU*s]	[mAU]	%
1	13.291	BB	0.4718	2283.27563	73.62685	5.6234
2	15.469	BB	0.6398	3.83196e4	889.22394	94.3766



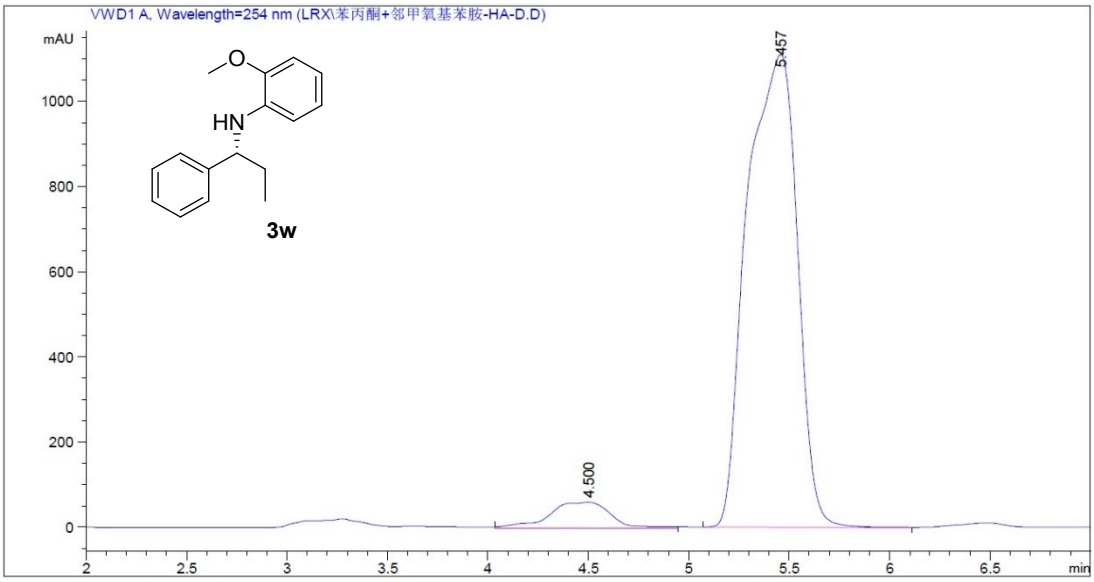
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.037	BV	0.2772	5.28851e4	3036.37988	48.3823
2	13.095	VB	0.5020	5.64215e4	1700.90662	51.6177



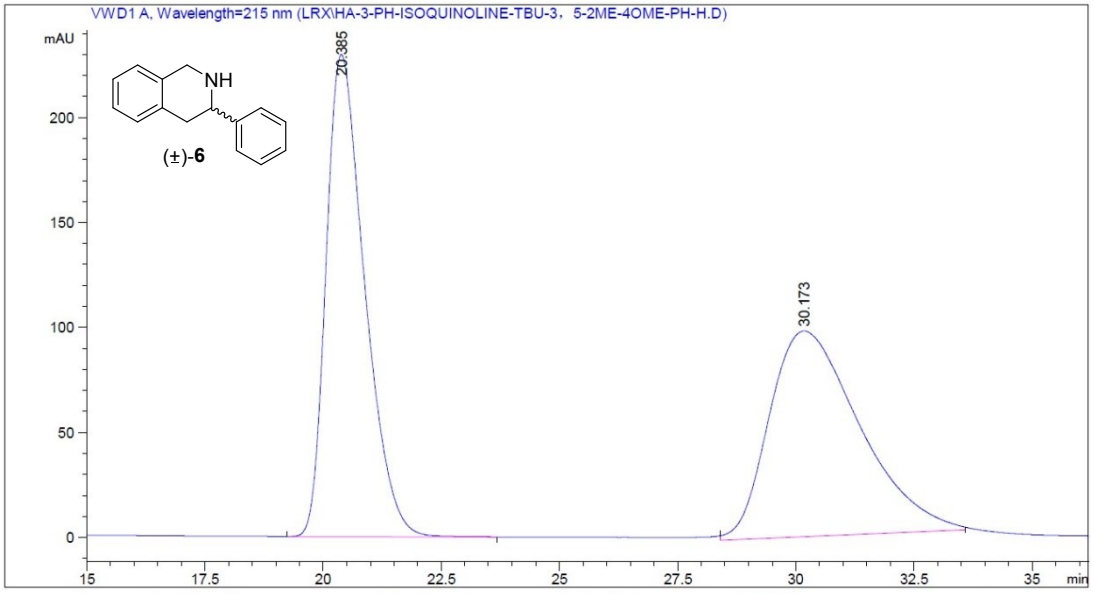
#	[min]		[min]	[mAU*s]	[mAU]	%
1	6.199	VV	0.2383	1404.33545	88.90347	2.2093
2	13.376	BB	0.4698	6.21592e4	1993.18677	97.7907



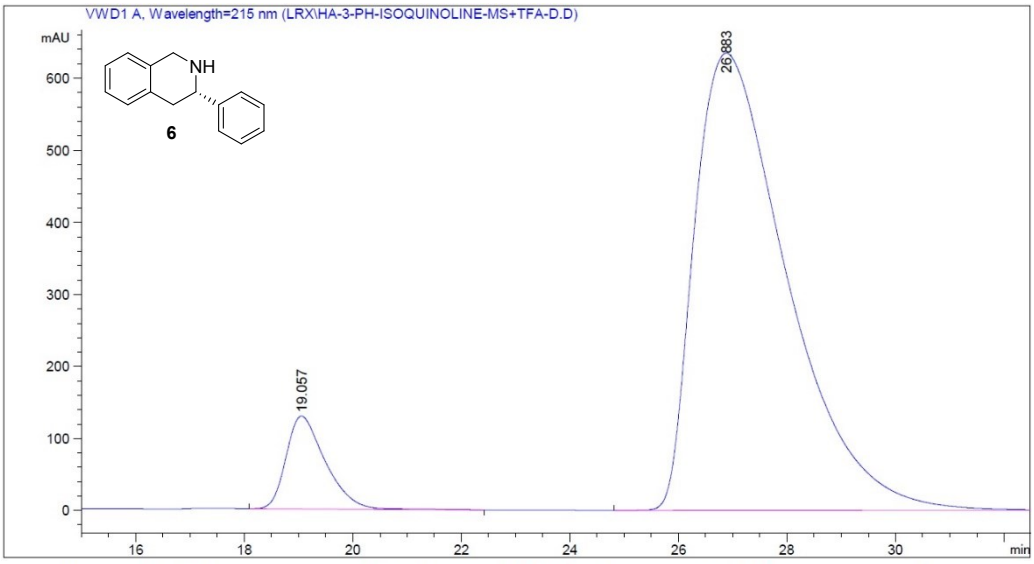
#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.485	BV	0.2362	7723.58252	468.80484	49.3783
2	5.418	VB	0.2422	7918.06641	459.11118	50.6217



#	[min]		[min]	[mAU*s]	[mAU]	%
1	4.500	MM R	0.3636	1350.06104	61.88451	6.5665
2	5.457	BB	0.2430	1.92097e4	1109.71814	93.4335



#	[min]		[min]	[mAU*s]	[mAU]	%
1	20.385	BB	0.8559	1.30069e4	229.61996	49.9241
2	30.173	MM R	2.2172	1.30464e4	98.07153	50.0759



#	[min]		[min]	[mAU*s]	[mAU]	%
1	19.057	BB	0.7515	6454.00244	128.81596	7.9127
2	26.883	BBA	1.7864	7.51110e4	634.82111	92.0873

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