Supporting Information

Ni-Catalyzed Asymmetric Reduction of α-Keto-β-Lactams via DKR Enabled by Proton Shuttling

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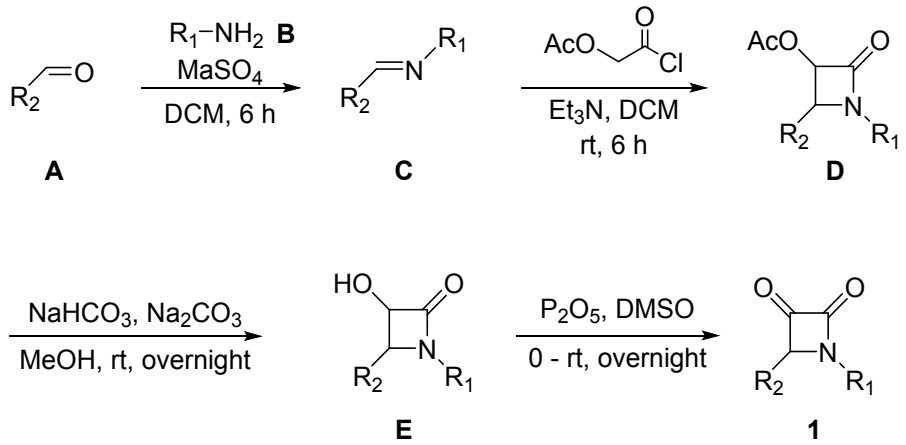
Content

1. General Information.

Unless otherwise mentioned, all experiments were carried out under an atmosphere of argon or using standard Schlenk techniques. Solvents and reagents were purchased from commercial suppliers and used without further purification. Column Chromatography was performed with silica gel Merck 60 (300-400 mesh). NMR spectra were recorded on a Bruker DPX 400 spectrometer at 400 MHz for ^{1}H NMR, 101 MHz for ^{13}C NMR and a Bruker DPX 600 spectrometer at 600 MHz for ^{1}H NMR, 151 MHz for ^{13}C NMR. $CDCl_3$ and d^6-DMSO was the solvent used for the NMR analysis, with tetramethylsilane (TMS) as the internal standard. Chemical shifts are reported in ppm and coupling constants are given in Hz. Chemical shifts were reported relative to TMS (0.00 ppm) for ^{1}H NMR and relative to $CDCl_3$ (77.0 ppm) for ^{13}C NMR. HPLC analysis was carried out on Agilent 1260 Series instrument using a chiral stationary phase IA or OD-3. PE refers to petroleum ether, and EA refers to ethyl acetate.

2. General Procedures for the Synthesis of Substrates.



Scheme S1. Synthetic Routes of Substrates

Compound C [1]：To a solution of aldehydes **A** (20 mmol, 1.0 equiv.), primary amines **B** (20 mmol, 1.0 equiv.) in DCM (50 mL) was added $MgSO_4$ (40 mmol, 2.0 equiv.). The mixture was stirred at room temperature for 2-16 hours until the start materials was consumed completely, the mixture was filtered and the filter liquor was concentrated under vacuum. The crude product was obtained and used into the next step directly.

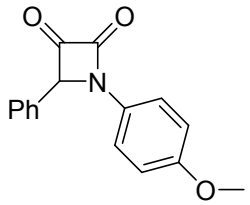
Compound D [1a]：To a solution of crude **C** (20 mmol, 1.0 equiv.) in DCM (50 mL) was added 2-chloro-2-oxoethyl acetate (30 mmol, 1.5 equiv.) and the mixture was cooled to 0 ℃. Et_3N (60 mmol, 3.0 equiv.) was added slowly by syringe and then the mixture was stirred at room temperature for 6 hours until the start materials was consumed completely. The mixture was quenched by 20 mL H_2O, and then extracted by DCM (50 mL*2). The combined organic layers were washed by NH_4Cl and brine, dried over anhydrous Na_2SO_4, filtered and concentrated under vacuum. The crude product was purified by chromatography (SiO_2, PE/EA from 20:1 to 4:1). Compound **D** was obtained as a light-yellow solid (57 - 84% yield).

Compound E [1a]：To a solution of **D** (10 mmol, 1.0 equiv.) in MeOH (30 mL) was added saturated $NaHCO_3$ aqueous solution (15 mL), then Na_2CO_3 (0.3 equiv.) was added into the mixture and the mixture was stirred at room temperature overnight until the start materials was consumed completely. The mixture was quenched by 20 mL H_2O, and the obtained clear liquid was concentrated under vacuum to remove most

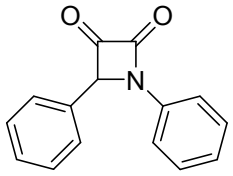
MeOH. After the above process, the mixture was extracted by DCM (50 mL*2), the combined organic layer was washed by NH_4Cl and brine, dried over anhydrous Na_2SO_4, filtered and concentrated under vacuum. The crude product was used into the next step without further purification.

Compound 1 [1b]**:** To a solution of **E** (10 mmol, 1.0 equiv.) in DMSO (20 mL) was cooled to 0℃ and added P_2O_5 (15 mol, 1.5 equiv.) under Ar. The mixture was stirred at room temperature overnight until the start material **E** was consumed completely. The mixture was quenched by saturated $NaHCO_3$ aqueous solution (20 mL) carefully, and extracted by DCM (50 mL*2). The combined organic layer was washed by NH_4Cl and brine, dried over anhydrous Na_2SO_4, filtered and concentrated under vacuum to give the crude product. The crude product was purified by chromatography (SiO_2, PE/EA from 15:1 to 2:1). Compound **1** was obtained as a yellow solid (56 - 82% yield).

Characterization Data of Substrate

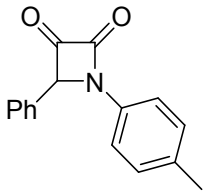


1-(4-methoxyphenyl)-4-phenylazetidine-2,3-dione (**1a)**: This is a known compound.[1b] Yellow powder, 2.1 g, 78% yield. ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.52 – 7.35 (m, 5H), 7.35 – 7.30 (m, 2H), 6.88 (dd, *J* = 9.0, 1.6 Hz, 2H), 5.55 (s, 1H), 3.78 (s, 3H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 190.6, 160.0, 158.0, 131.7, 129.9, 129.5, 129.4, 126.4, 119.8, 114.8, 74.9, 55.5. HRMS (ESI$^+$), m/z 268.0965 ([M+H]$^+$), calcd for $C_{16}H_{14}NO_3^+$: 268.0968.

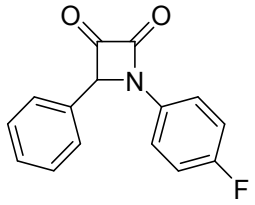


1,4-diphenylazetidine-2,3-dione (**1b)**: This is a known compound. [1b] White powder, 1.66 g, 70% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.51 (dd, *J* = 7.8, 1.7 Hz, 2H),

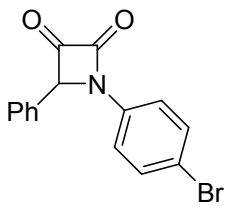
7.45 – 7.28 (m, 7H), 7.22 (t, *J* = 7.4 Hz, 1H), 5.60 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.9, 160.6, 136.4, 131.6, 129.6, 129.6, 129.5, 126.6, 126.3, 118.3, 74.9. HRMS (ESI+), m/z 238.0859 ([M+H]$^+$), calcd for $C_{15}H_{12}NO_2^+$: 238.0863.



4-phenyl-1-(*p*-tolyl) azetidine-2,3-dione (**1c**): This is a new compound. Yellow powder, 2.05 g, 82% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.28 (m, 7H), 7.21 – 7.12 (m, 2H), 5.56 (s, 1H), 2.32 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.9, 160.4, 136.8, 134.0, 131.7, 130.1, 129.5, 129.4, 126.3, 118.3, 74.9, 21.2. HRMS (ESI$^+$), m/z 252.1015 ([M+H]$^+$), calcd for $C_{16}H_{14}NO_2^+$: 252.1019.

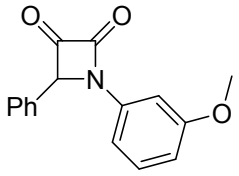


1-(4-fluorophenyl)-4-phenylazetidine-2,3-dione (**1d**): This is a known compound.[1a] Yellow powder, 1.58 g, 62% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.54 – 7.46 (m, 2H), 7.46 – 7.38 (m, 3H), 7.35 – 7.28 (m, 2H), 7.11 – 7.02 (m, 2H), 5.58 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.5, 160.3, 161.7, 159.3（d, *J* = 248.5 Hz), 132.7, 132.7（d, *J* = 3.0 Hz), 131.3, 129.7, 129.6, 126.3, 120.0, 119. 9（d, *J* = 8.1 Hz), 116.7, 116.5（d, *J* = 23.2 Hz). 75.1. HRMS (ESI$^+$), m/z 256.0764 ([M+H]$^+$), calcd for $C_{15}H_{11}FNO_2^+$: 256.0768.

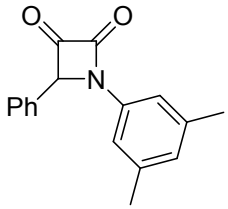


1-(4-bromophenyl)-4-phenylazetidine-2,3-dione (**1e**): This is a known compound.[4] Yellow powder, 1.85 g, 59% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.52 – 7.45

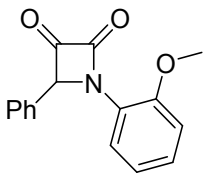
(m, 2H), 7.45 – 7.36 (m, 5H), 7.34 – 7.28 (m, 2H), 5.58 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.4, 160.6, 135.3, 132.7, 131.1, 129.8, 129.6, 126.3, 119.7, 119.7, 74.9. HRMS (ESI$^+$), m/z 315.9964 ([M+H]$^+$), calcd for $C_{15}H_{11}BrNO_2^+$: 315.9968.



1-(3-methoxyphenyl)-4-phenylazetidine-2,3-dione (**1f)**: This is a new compound. Yellow powder, 1.50 g, 56% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.44 – 7.37 (m, 3H), 7.35 – 7.29 (m, 2H), 7.25 – 7.20 (m, 2H), 6.96 – 6.90 (m, 1H), 6.80 – 6.74 (m, 1H), 5.58 (s, 1H), 3.78 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.9, 160.7, 160.4, 137.4, 131.6, 130.4, 129.6, 129.5, 126.3, 112.6, 110.6, 104.1, 75.1, 55.4. HRMS (ESI$^+$), m/z 268.0965 ([M+H]$^+$), calcd for $C_{16}H_{14}NO_3^+$: 268.0968.

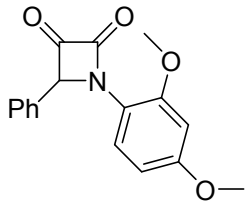


1-(3,5-dimethylphenyl)-4-phenylazetidine-2,3-dione (**1g)**: This is a new compound. Yellow powder, 1.96 g, 0.74% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.34 (m, 3H), 7.35 – 7.28 (m, 2H), 7.15 – 7.09 (m, 2H), 6.86 (dt, *J* = 1.7, 0.8 Hz, 1H), 5.57 (s, 1H), 2.28 (s, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 191.0, 160.6, 139.5, 136.3, 131.8, 129.4, 128.6, 126.2, 116.0, 74.9, 21.4. HRMS (ESI$^+$), m/z 266.1171 ([M+H]$^+$), calcd for $C_{17}H_{16}NO_2^+$: 266.1176.

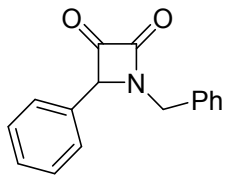


1-(2-methoxyphenyl)-4-phenylazetidine-2,3-dione (**1h)**: This is a known compound. [4] Yellow powder, 1.52 g, 57% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.06 (dd, *J*

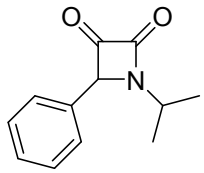
= 7.9, 1.7 Hz, 1H), 7.35 – 7.28 (m, 3H), 7.24 – 7.19 (m, 3H), 7.08– 6.98 (m, 1H), 6.89–6.83 (m, 1H), 5.95 (s, 1H), 3.66 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 193.6, 162.3, 149.8, 133.6, 129.1, 129.0, 128.4, 126.4, 124.3, 123.2, 121.4, 112.3, 77.7, 55.6. HRMS (ESI$^+$), m/z 268.0965 ([M+H]$^+$), calcd for $C_{16}H_{14}NO_3^+$: 268.0968.



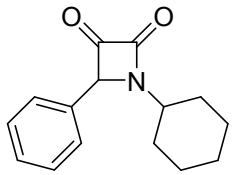
1-(2,4-dimethoxyphenyl)-4-phenylazetidine-2,3-dione (**1i)**: This is a new compound. Yellow powder, 1.75 g, 59% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.93 (d, *J* = 8.8 Hz, 1H), 7.36 – 7.28 (m, 3H), 7.25 – 7.19 (m, 2H), 6.54 (dd, *J* = 8.8, 2.6 Hz, 1H), 6.40 (d, *J* = 2.6 Hz, 1H), 5.88 (s, 1H), 3.79 (s, 3H), 3.67 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 193.5, 162.0, 159.9, 151.4, 133.5, 129.0, 129.0, 126.5, 124.2, 117.7, 105.0, 99.7, 77.4, 55.6. HRMS (ESI$^+$), m/z 298.1070 ([M+H]$^+$), calcd for $C_{17}H_{16}NO_4^+$: 298.1074.



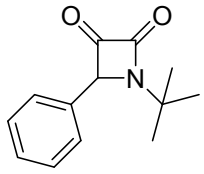
1-benzyl-4-phenylazetidine-2,3-dione (**1j)**: This is a known compound. [5] White powder, 1.43 g, 57% yield. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.44 – 7.14 (m, 10H), 5.29 (s, 1H), 5.02 (d, *J* = 15.3 Hz, 1H), 4.37 (d, *J* = 15.4 Hz, 1H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 195.0, 164.4, 134.7, 133.1, 129.5, 129.1, 128.8, 128.3, 127.6, 73.8, 45.4. HRMS (ESI$^+$), m/z 252.1015 ([M+H]$^+$), calcd for $C_{16}H_{14}NO_2^+$: 252.1019.



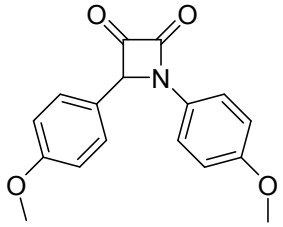
1-isopropyl-4-phenylazetidine-2,3-dione (**1k)**: This is a known compound. [1a] White powder, 1.14 g, 56% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.48 – 7.36 (m, 3H), 7.34 – 7.25 (m, 2H), 5.13 (s, 1H), 4.19 (p, *J* = 6.7 Hz, 1H), 1.42 (d, *J* = 6.7 Hz, 3H), 1.17 (d, *J* = 6.7 Hz, 3H). 13C NMR (101 MHz, Chloroform-*d*) δ 193.5, 163.9, 133.8, 129.5, 129.2, 127.1, 73.3, 46.6, 21.4, 20.1. HRMS (ESI$^+$), m/z 204.1017 ([M+H]$^+$), calcd for $C_{12}H_{14}NO_2^+$: 204.1019.



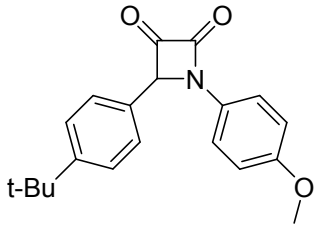
1-cyclohexyl-4-phenylazetidine-2,3-dione (**1l)**: This is a known compound.[4] White powder, 1.85 g, 76% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.48 – 7.36 (m, 3H), 7.34 – 7.24 (m, 2H), 5.13 (s, 1H), 3.94 – 3.75 (m, 1H), 2.09 – 1.99 (m, 1H), 1.92 – 1.77 (m, 2H), 1.75 – 1.67 (m, 2H), 1.65 – 1.55 (m, 1H), 1.39 – 1.03 (m, 4H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 193.5, 164.0, 133.9, 129.5, 129.2, 127.1, 77.3, 73.5, 54.3, 31.6, 30.4, 25.0, 24.9. HRMS (ESI$^+$), m/z 244.1328 ([M+H]$^+$), calcd for $C_{15}H_{18}NO_2^+$: 244.1332.



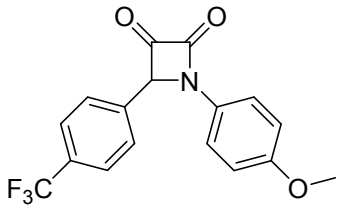
1-(tert-butyl)-4-phenylazetidine-2,3-dione (**1m)**: This is a new compound. white powder, 1.56 g, 72% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.36 (m, 3H), 7.35 – 7.26 (m, 2H), 5.15 (s, 1H), 1.41 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 193.9, 163.7, 135.0, 129.4, 129.2, 127.0, 74.1, 56.8, 28.4. HRMS (ESI$^+$), m/z 218.1173 ([M+H]$^+$), calcd for $C_{13}H_{16}NO_2^+$: 218.1176.



1,4-bis(4-methoxyphenyl) azetidine-2,3-dione (**1n)**: This is a known compound. [1b] Yellow powder, 2.1 g, 72% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 (d, *J* = 9.1 Hz, 2H), 7.29 – 7.21 (m, 2H), 6.96 – 6.85 (m, 4H), 5.51 (s, 1H), 3.79 (s, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 191.5, 160.6, 160.2, 157.9, 129.9, 127.8, 123.6, 119.8, 114.9, 114.7, 74.6, 55.5, 55.4. HRMS (ESI^{+}), m/z 298.1070 ([M+H]$^{+}$), calcd for $C_{17}H_{16}NO_4^{+}$: 298.1074.

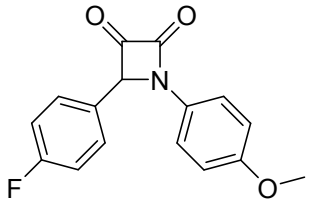


4-(4-(tert-butyl)phenyl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1o)**: This is a new compound. Yellow powder, 2.4 g, 75% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.52 – 7.45 (m, 2H), 7.43 – 7.38 (m, 2H), 7.26 – 7.20 (m, 2H), 6.92 – 6.84 (m, 2H), 5.53 (s, 1H), 3.79 (s, 3H), 1.30 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 191.10, 160.12, 157.94, 152.71, 130.03, 128.61, 126.39, 126.09, 119.78, 114.74, 55.51, 34.74, 31.22. HRMS (ESI^{+}), m/z 324.1591 ([M+H]$^{+}$), calcd for $C_{20}H_{22}NO_3^{+}$: 324.1594.

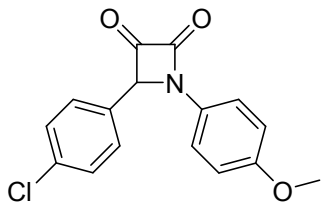


1-(4-methoxyphenyl)-4-(4-(trifluoromethyl) phenyl) azetidine-2,3-dione (**1p)**: This is a new compound. Yellow powder, 1.87 g, 56% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 (d, *J* = 8.1 Hz, 2H), 7.49 – 7.38 (m, 4H), 6.96 – 6.86 (m, 2H),

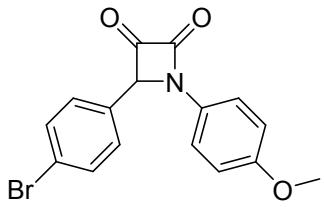
5.62 (s, 1H), 3.80 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 189.2, 159.5, 158.2, 135.7, 131.8, 131.5, 129.6, 126.6, {126.5, 126.4, 126.4, 126.4 (q, *J* = 3.5 Hz)}, 125.0, 122.3, 119.7, 114.9, 74.2, 55.5. HRMS (ESI$^+$), m/z 336.0836 ([M+H]$^+$), calcd for $C_{17}H_{13}F_3NO_3^+$: 336.0842.



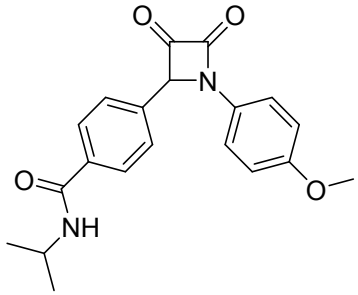
4-(4-fluorophenyl)-1-(4-methoxyphenyl) azetidine-2,3-dione (**1q**): This is a new compound. Yellow powder, 1.9 g, 67% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.41 (m, 2H), 7.34 – 7.27 (m, 2H), 7.14 – 7.05 (m, 2H), 6.92 – 6.86 (m, 2H), 5.55 (s, 1H), 3.79 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.5, 164.6, 162.1 (d, *J* = 250.5 Hz), 159.8, 158.1, 129.8, 128.3, 128.2 (d, *J* = 9.1 Hz), 127.6 (d, *J* = 3.0 Hz), 119.7, 116.7, 116.5 (d, *J* = 22.2 Hz), 114.8, 74.1, 55.5. HRMS (ESI$^+$), m/z 286.0871 ([M+H]$^+$), calcd for $C_{16}H_{13}FNO_3^+$: 286.0874.



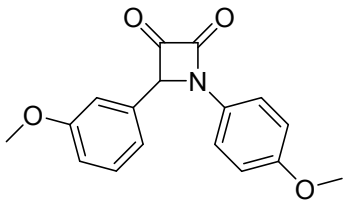
4-(4-chlorophenyl)-1-(4-methoxyphenyl) azetidine-2,3-dione (**1r**): This is a new compound. Yellow powder, 1.81 g, 60% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 (dd, *J* = 18.8, 8.8 Hz, 4H), 7.32 – 7.20 (m, 3H), 6.89 (d, *J* = 9.1 Hz, 2H), 5.53 (s, 1H), 3.80 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.0, 159.7, 158.1, 135.6, 130.3, 129.7, 129.7, 127.7, 119.7, 114.9, 55.5. HRMS (ESI$^+$), m/z 302.0575 ([M+H]$^+$), calcd for $C_{16}H_{13}ClNO_3^+$: 302.0578.



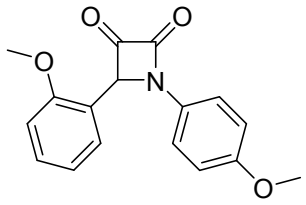
4-(4-bromophenyl)-1-(4-methoxyphenyl) azetidine-2,3-dione (**1s)**: This is a known compound. [2] Yellow powder, 1.93 g, 56% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.60 – 7.51 (m, 2H), 7.47 – 7.36 (m, 2H), 7.25 – 7.14 (m, 2H), 6.95 – 6.85 (m, 2H), 5.51 (s, 1H), 3.80 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 189.9, 159.7, 158.1, 132.7, 130.8, 1297, 127.9, 123.7, 119.7, 114.9, 55.6. HRMS (ESI^{+}), m/z 346.0070 ([M+H]$^{+}$), calcd for $C_{16}H_{13}BrNO_3^{+}$: 346.0073.



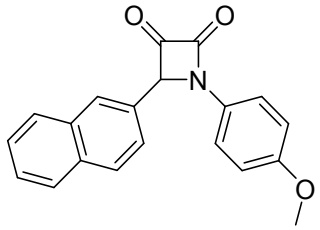
4-(tert-butyl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1t)**: This is a new compound. Yellow powder, 1.4 g, 40% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.8 (d, *J* = 8.1 Hz, 2H), 7.4 (dd, *J* = 25.5, 8.6 Hz, 4H), 6.9 (d, *J* = 9.0 Hz, 2H), 6.1 (d, *J* = 7.4 Hz, 1H), 5.6 (s, 1H), 4.3 (dq, *J* = 13.3, 6.6 Hz, 1H), 3.8 (s, 3H), 1.2 (dd, *J* = 6.5, 1.8 Hz, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 189.8, 165.9, 159.7, 158.1, 136.2, 134.9, 129.7, 128.0, 126.5, 119.7, 114.8, 74.5, 55.5, 42.1, 22.8. HRMS (ESI^{+}), m/z 353.1490 ([M+H]$^{+}$), calcd for $C_{20}H_{21}N_2O_4^{+}$: 353.1496.



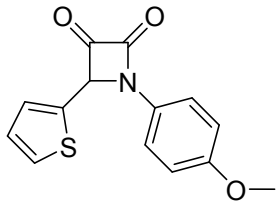
4-(3-methoxyphenyl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1u)**: This is a new compound. Yellow powder, 1.9 g, 65% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.51 – 7.40 (m, 2H), 7.31 (t, *J* = 8.0 Hz, 1H), 6.97 – 6.76 (m, 5H), 5.51 (s, 1H), 3.79 (s, 3H), 3.78 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.5, 160.4, 160.0, 158.0, 133.3, 130.6, 129.9, 119.7, 118.6, 114.9, 114.8, 112.0, 55.5, 55.4. HRMS (ESI^{+}), m/z 298.1070 ([M+H]$^{+}$), calcd for $C_{17}H_{16}NO_4^{+}$: 298.1074.



4-(2-methoxyphenyl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1v)**: This is a new compound. Yellow powder, 2.1 g, 72% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.48 – 7.42 (m, 2H), 7.38 – 7.30 (m, 1H), 7.30 – 7.23 (m, 1H), 7.01 – 6.92 (m, 1H), 6.92 – 6.87 (m, 1H), 6.87 – 6.81 (m, 2H), 5.71 (s, 1H), 3.81 (s, 3H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 192.2, 160.8, 158.2, 157.6, 131.1, 130.3, 129.9, 121.1, 120.2, 119.4, 114.6, 111.6, 72.4, 55.9, 55.5. HRMS (ESI^{+}), m/z 298.1070 ([M+H]$^{+}$), calcd for $C_{17}H_{16}NO_4^{+}$: 298.1074.

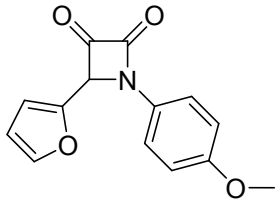


1-(4-methoxyphenyl)-4-(naphthalen-2-yl) azetidine-2,3-dione (**1w)**: This is a new compound. Yellow powder, 2.6 g, 82% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.92 – 7.77 (m, 4H), 7.57 – 7.46 (m, 4H), 7.41 – 7.34 (m, 1H), 6.91 – 6.82 (m, 2H), 5.70 (s, 1H), 3.76 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 190.6, 160.1, 158.0, 133.7, 133.3, 130.0, 129.6, 129.3, 128.0, 127.9, 127.0, 126.4, 123.0, 119.8, 114.8, 55.5. HRMS (ESI^{+}), m/z 318.1119 ([M+H]$^{+}$), calcd for $C_{20}H_{16}NO_3^{+}$: 318.1125.

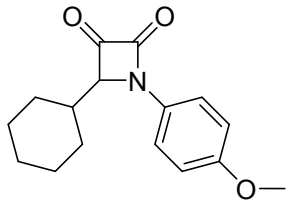


1-(4-methoxyphenyl)-4-(thiophen-2-yl) azetidine-2,3-dione (**1x)**: This is a known compound.[3] Yellow powder, 1.91 g, 70% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.54 – 7.47 (m, 2H), 7.36 (dd, *J* = 5.1, 1.2 Hz, 1H), 7.16 (ddd, *J* = 3.6, 1.3, 0.6 Hz, 1H),

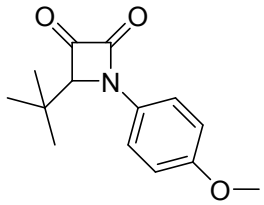
7.05 (dd, J = 5.1, 3.6 Hz, 1H), 6.93 – 6.85 (m, 2H), 5.82 (s, 1H), 3.80 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 189.6, 159.6, 158.1, 134.7, 129.6, 127.8, 127.3, 127.2, 119.7, 114.8, 70.6, 55.5. HRMS (ESI$^+$), m/z 274.0529 ([M+H]$^+$), calcd for $C_{14}H_{12}NO_3S^+$: 274.0532.



4-(furan-2-yl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1y)**: This is a known compound.[4] Yellow powder, 1.54 g, 60% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.6 – 7.5 (m, 2H), 7.5 – 7.4 (m, 1H), 7.0 – 6.8 (m, 2H), 6.6 (d, J = 3.3 Hz, 1H), 6.4 (dd, J = 3.3, 1.9 Hz, 1H), 5.6 (s, 1H), 3.8 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 189.3, 159.8, 158.1, 145.3, 144.3, 130.0, 119.3, 114.7, 111.6, 111.0, 68.1, 55.5.



4-cyclohexyl-1-(4-methoxyphenyl) azetidine-2,3-dione (**1z)**: This is a new compound. Yellow powder, 1.93 g, 71% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.60 – 7.45 (m, 2H), 7.02 – 6.91 (m, 2H), 4.56 (d, J = 4.0 Hz, 1H), 3.84 (s, 3H), 2.21 – 2.07 (m, 1H), 1.87 – 1.62 (m, 5H), 1.54 – 0.77 (m, 5H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 195.4, 159.8, 158.0, 130.1, 119.3, 114.8, 55.6, 36.8, 28.9, 27.1, 26.1, 25.9, 25.6. HRMS (ESI$^+$), m/z 274.1432 ([M+H]$^+$), calcd for $C_{16}H_{20}NO_3^+$: 274.1438.

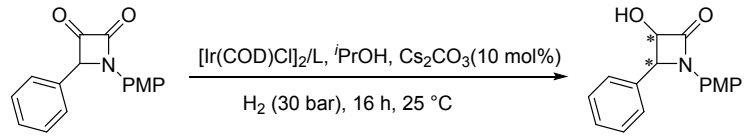


4-(tert-butyl)-1-(4-methoxyphenyl)azetidine-2,3-dione (**1aa)**: This is a known compound.[4] Yellow powder, 1.85 g, 75% yield. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.5 – 7.4 (m, 2H), 7.0 (d, J = 9.0 Hz, 2H), 4.6 (s, 1H), 3.8 (s, 3H), 1.1 (s, 9H). ^{13}C NMR

(101 MHz, Chloroform-*d*) δ 195.7, 161.0, 158.1, 129.7, 121.5, 114.5, 80.4, 55.6, 35.2, 27.0.

3. Detailed Optimization of the Reaction Conditions.

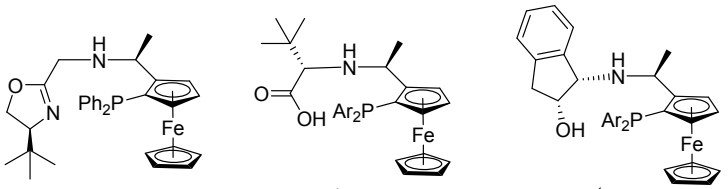
Table S1. Evaluation of the effects of ligands in the Ir-Catalyzed Hydrogenation of **1a**[a]



1a **2a**

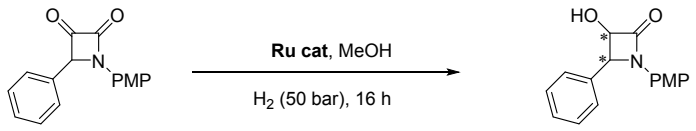
entry	L	conv. (%)[b]	dr[c]	ee (%)[d]
1	*f*-amphox	>99	>20:1	1
2	*f*-amphol	42	>20:1	2
3	*f*-ampha	26	>20:1	13

[a] Reaction conditions: 0.1 mmol of substrate **1a**, 0.25 mol % $[Ir(COD)Cl]_2$, 0.5 mol % ligand, 10 mol % Cs_2CO_3, ^{i}PrOH (1.0 mL). [b] Conversions were determined by ^{1}H NMR spectroscopy. [c] Diastereomeric ratio (dr) were determined by ^{1}H NMR spectroscopy. [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase.



***f*-amphox** ***f*-ampha** ***f*-amphol**

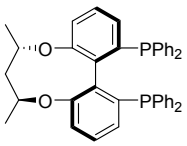
Table S2. Evaluation of the effects of additive in the Ru-Catalyzed Hydrogenation of **1a**[a]



1a **2a**

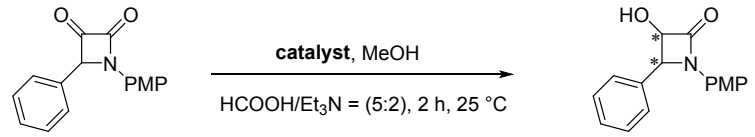
entry	**Ru cat**	additive	temp. (°C)	conv.%[b]	dr[c]	ee (%)[d]
1	$RuCl_2$(Ph-C_3-TunePhos)$(DMF)_2$	–	50	>95	>20:1	5
2	$Ru(OAc)_2$(Ph-C_3-TunePhos)	–	50	>95	>20:1	8
3	$RuCl_2$(Ph-C_3-TunePhos)$(DMF)_2$	$CeCl_3 \cdot 7H_2O$	25	>95	>20:1	7
4	$RuCl_2$(Ph-C_3-TunePhos)$(DMF)_2$	*p*-TsOH•H_2O	25	56	>20:1	10
5	$RuCl_2$(Ph-C_3-TunePhos)$(DMF)_2$	AcOH	25	53	>20:1	33

[a] Reaction conditions: **1a** (0.1 mmol), [Ru] (1 mol%), additive (10 mol%) in MeOH (1 mL) for 16 h. [b] Conversions were determined by ^{1}H NMR spectroscopy. [c] Diastereomeric ratio (dr) were determined by ^{1}H NMR spectroscopy. [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase.



Ph-C_3-TunePhos

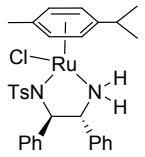
Table S3. Evaluation of the effects of additive in the Ru-Catalyzed Hydrogenation of **1a**[a]



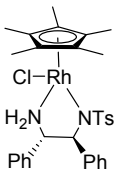
1a **2a**

entry	**catalyst**	conv.(%)[b]	dr[c]	ee (%)[d]
1	**cat.1**	>95	>20:1	0
2	**cat.2**	>95	>20:1	3
3	**cat.3**	>95	>20:1	2
4	**cat.4**	>95	>20:1	1

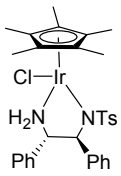
[a] Reaction conditions: **1a** (0.1 mmol), catalyst (1 mol%), $HCOOH/Et_3N$ = (5:2) (25 uL), MeOH (1 mL), 2 h. [b] Conversions were determined by ^1H NMR spectroscopy. [c] Diastereomeric ratio (dr) were determined by ^1H NMR spectroscopy. [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase.



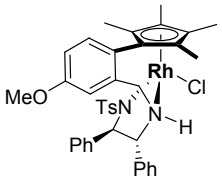
(*R*, *R*)-**cat.1**



(*S*, *S*)-**cat.2**

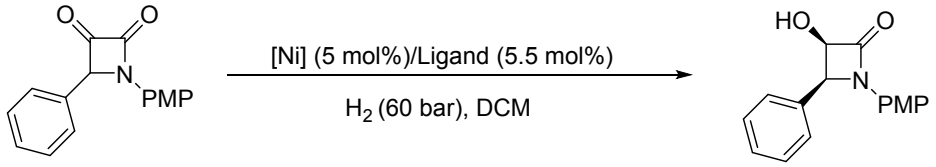


(*S*, *S*)-**cat.3**



(*R*, *R*)-**cat.4**

Table S4. Evaluation of the effects of ligands in the Ni-Catalyzed Hydrogenation of **1a**[a]

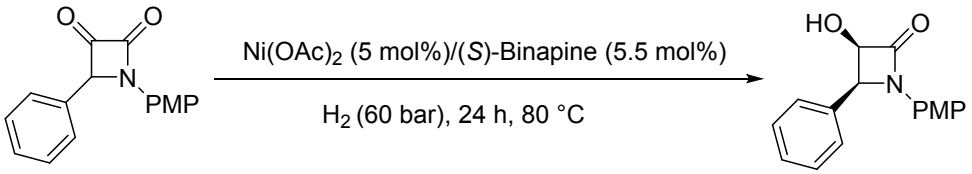


1a **2a**

entry	[Ni]	Ligand	T (°C)	time (h)	conv. (%)[b]	dr[c]	ee (%)[d]
1	$Ni(OAc)_2$	(*S*)-Ph-BPE	80	24	<5	--	--
2	$Ni(OAc)_2$	(*S*,*S*)-Me-DuPhos	80	24	<5	--	--
3	$Ni(OAc)_2$	(*S*)-SegPhos	80	24	<5	--	--
4	$Ni(OAc)_2$	(*R*)-Binap	80	24	<5	--	--
5	$Ni(OAc)_2$	(*R*, *S*)-JosiPhos	80	24	18	5:1	23
6	$Ni(OAc)_2$	(*R*, *R*)-QuinoxP*	80	24	19	>20:1	77
7	$Ni(OAc)_2$	(*S*)-Binapine	80	24	35	>20:1	95
8	$Ni(OAc)_2$	(*R*c, *S*p)-DuanPhos	80	24	41	>20:1	79
9	$Ni(OAc)_2$	(*S*)-Binapine	65	36	17	>20:1	90
10	$Ni(OAc)_2$	(*R*c, *S*p)-DuanPhos	65	36	50	>20:1	85
11	$Ni(OAc)_2$	(*S*)-Binapine	75	48	43	>20:1	95
12	$Ni(OAc)_2$	(*R*c, *S*p)-DuanPhos	75	48	47	>20:1	82
13	$Ni(OAc)_2$	(*S*)-Binapine	100	24	58	>20:1	95
14	$Ni(OAc)_2$	(*R*c, *S*p)-DuanPhos	100	24	87	>20:1	31
15	$Ni(OAc)_2$	(*S*)-Binapine	100	36	85	>20:1	37
16	$Ni(OAc)_2$	(*S*)-Binapine	100	72	>95	>20:1	12
17	$Ni(OTf)_2$	(*S*)-Binapine	100	48	95	4:1	rac
18	$Ni(COD)_2$	(*S*)-Binapine	100	48	23	>20:1	94
19	$Ni(acac)_2$	(*S*)-Binapine	100	48	89	>20:1	58

[a] All reactions were carried out with a $Ni(OAc)_2$/(*S*)-Binapine/substrate (0.1 mmol) ratio of 1:1.1:20 on 0.1 mmol scale. The catalyst was pre-complexed in DCM (0.1 mL for each reaction vial). [b] Conversions were determined by ^1H NMR spectroscopy. [c] Diastereomeric ratio (dr) were determined by ^1H NMR spectroscopy [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase.

Table S5. Evaluation of the effects of solvents in the Ni-Catalyzed Hydrogenation of **1a**[a]

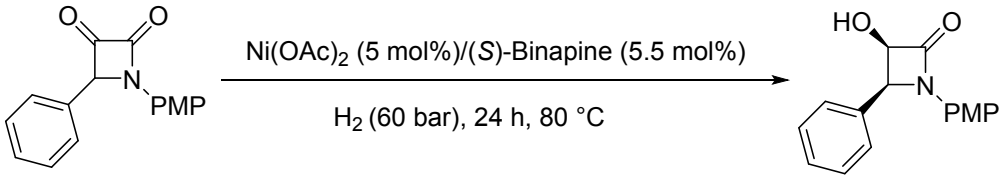


1a **2a**

entry	solvent	conv. (%)[b]	dr[c]	ee (%)[d]
1	DCM	42	>20:1	95
2	THF	35	>20:1	93
3	toluene	23	>20:1	96
4	dioxane	38	>20:1	80
5	EA	30	>20:1	92
6	MeCN	18	>20:1	74
7	hexane	<5	--	--
8	MeOH	messy	--	--
9	IPA	messy	--	--
10	CF_3COOH	messy	--	--

[a] All reactions were carried out with a $Ni(OAc)_2$/(*S*)-Binapine/substrate ratio of 1:1.1:20 on 0.1 mmol scale. The catalyst was pre-complexed in DCM (0.1 mL for each reaction vial). [b] Conversions were determined by ^1H NMR spectroscopy. [c] Diastereomeric ratio (dr) were determined by ^1H NMR spectroscopy [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase.

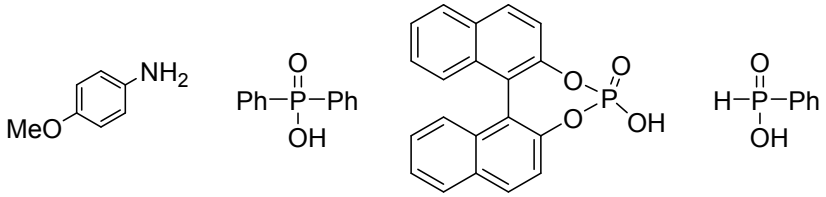
Table S6. Evaluation of the effects of additives in the Ni-Catalyzed DKR of **1a**[a]



1a **2a**

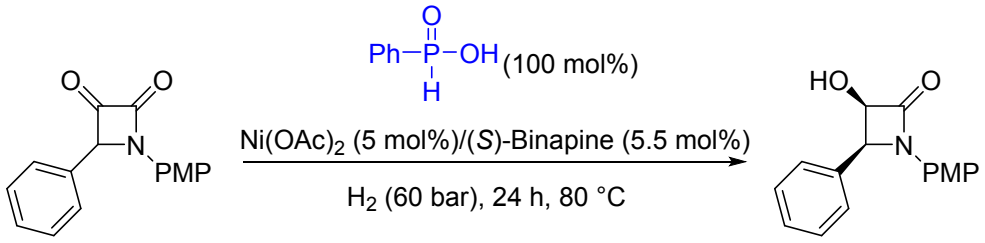
entry	additive	conv.(%)[b]	dr[c]	ee(%)[d]
1	DBU	messy	--	--
2	K_2CO_3	messy	--	--
3	$NaBAr_F$	84	3:1	45
4	AgOTf	>95	9:1	3
5	$AlCl_3$	<5	--	--
6[e]	TsOH• H_2O	56	>20:1	79
7	TsOH• H_2O	>95	>20:1	8
8	AcOH	56	>20:1	45
9[e]	BF_3• OEt_2	>95	1.3:1	3
10[f]	**A1**	messy	--	--
11[f]	**A2**	75	>20:1	65
12[f]	**A3**	7	>20:1	25
13[f]	**A4**	>95	>20:1	81
14	**A4**	>95	>20:1	83.5
15[g]	**A4**	85	>20:1	93

[a] All reactions were carried out with a $Ni(OAc)_2$/(*S*)-Binapine/substrate ratio of 1:1.1:20 on 0.1 mmol scale. Unless otherwise mentioned, the additives were 1.0 equiv. The catalyst was pre-complexed in DCM (0.1 mL for each reaction vial). Another 0.9 mL DCM for each entry [b] Conversions were determined by ^1H NMR spectroscopy. [c] Diastereomeric ratios (dr) were determined by ^1H NMR spectroscopy [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase. [e] 0.1 equiv of additive was added. [f] 2.0 equiv of additive was added. [g] 0.5 equiv of additive was added.



A1 **A2** **A3** **A4**

Table S7. Further evaluation of the effects of solvents in the Ni-Catalyzed DKR of **1a**[a]



1a **2a**

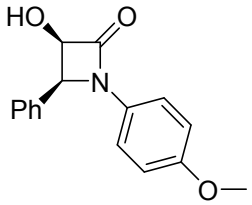
entry	solvent	conv. (%)[b]	dr[c]	ee(%)[d]
1	DCM	92	>20:1	86
2	THF	>95	>20:1	90.5
3	toluene	95	>20:1	92
***4*[e]**	***toluene***	***>95***	>20:1	***91***
5	$CHCl_3$	92	>20:1	86
6	hexane	80	>20:1	39
7	MTBE	>95	>20:1	90

[a] All reactions were carried out with a $Ni(OAc)_2$/(*S*)-Binapine/substrate ratio of 1:1.1:20 on 0.1 mmol scale. The additive was 1.0 equiv. of the substrate. The catalyst was pre-complexed in DCM (0.1 mL for each reaction vial), 0.9 mL other solvent for each. [b] Conversions were determined by ^{1}H NMR spectroscopy. [c] Diastereomeric ratios (dr) were determined by ^{1}H NMR spectroscopy [d] Enantiomeric excesses (ee) were determined by HPLC analysis using a chiral stationary phase. [e] The reaction time was 36 h.

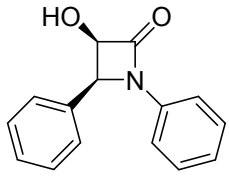
4. General Procedure for the Asymmetric Hydrogenation via DKR.

A stock solution was prepared by mixing $Ni(OAc)_2$ (9.0 mg, 0.05 mmol) with (*S*)-Binapine (40 mg, 0.055 mmol) in a 1:1.1 molar ratio in DCM (1 mL at room temperature for 30 min in an argon-filled glovebox. An aliquot of the catalyst solution (0.1 mL, 0.005 mmol) was transferred by syringe into the vials charged with different substrates (0.1 mmol for each) and additive **A4** (0.1 mmol for each) in anhydrous toluene (0.9 mL). The vials were subsequently transferred into an autoclave into which hydrogen gas was charged. The reaction was then stirred under H_2 (60 bar) at 80 °C for 36 h. The hydrogen gas was released slowly and carefully after cooled the autoclave to room temperature. The reaction solution was concentrated and the residue was passed through a short column of silica gel (eluent: EA:PE = 5:1 to 2:1) to remove the metal complex and the additive. The ee values of compounds **2** were determined by HPLC analysis on a chiral stationary phase. The physical data were identical in all respect to those previously reported.

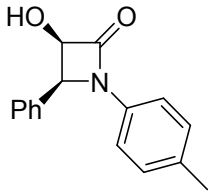
Characterization Data of 3-hydroxy-*β*-Lactams



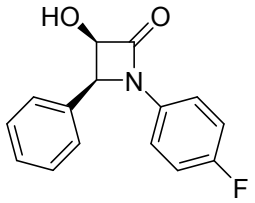
(3*R*,4*S*)-3-hydroxy-1-(4-methoxyphenyl)-4-phenylazetidin-2-one (2a): This is a known compound. [3] White solid; 23 mg, 87%; 91% ee; $[\alpha]^{20}_D$ = +81.1 (c 1.0, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 12.1 min (major), 19.3 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.27 (m, 7H), 6.80 (d, *J* = 9.0 Hz, 2H), 5.26 (d, *J* = 5.2 Hz, 1H), 5.18 (dd, *J* = 8.7, 5.2 Hz, 1H), 3.75 (s, 3H), 2.61 (d, *J* = 8.4 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 156.5, 133.2, 130.5, 129.1, 128.9, 127.5, 118.9, 114.4, 77.2, 62.3, 55.5. HRMS (ESI^+), m/z 270.1120 ($[M+H]^+$), calcd for $C_{16}H_{16}NO_3^+$: 270.1125.



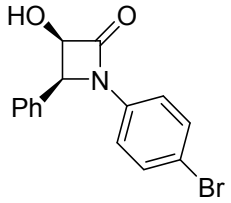
(3*R*,4*S*)-3-hydroxy-1,4-diphenylazetidin-2-one (2b): This is a known compound. [11] White solid, 22 mg, 90% yield, 89% ee, $[\alpha]^{20}_{D}$ = +92.8 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 11.9 min (major), 12.8 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.37 (m, 3H), 7.34 (dd, *J* = 7.3, 1.5 Hz, 4H), 7.30 – 7.24 (m, 2H), 7.12 – 7.05 (m, 1H), 5.30 (d, *J* = 5.3 Hz, 1H), 5.19 (dd, *J* = 8.3, 5.3 Hz, 1H), 2.89 (d, *J* = 8.4 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.2, 137.0, 133.0, 129.2, 129.2, 129.0, 127.5, 124.6, 117.6, 77.1, 62.2. HRMS (ESI^+), m/z 240.1016 ($[M+H]^+$), calcd for $C_{15}H_{14}NO_2^+$: 240.1019.



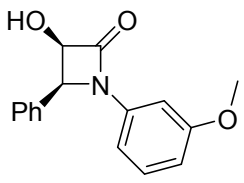
(3*R*,4*S*)-3-hydroxy-4-phenyl-1-(*p*-tolyl)azetidin-2-one (2c): This is a known compound. [11] White solid, 22 mg, 87% yield, 92% ee, $[\alpha]^{20}_{D}$ = +58.6 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 8.8 min (major), 15.3 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.29 (m, 5H), 7.25 – 7.19 (m, 2H), 7.06 (d, *J* = 8.3 Hz, 2H), 5.27 (d, *J* = 5.3 Hz, 1H), 5.18 (s, 1H), 2.95 (s, 1H), 2.27 (s, 3H).^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.2, 134.5, 134.3, 133.2, 129.7, 129.1, 128.9, 127.5, 117.5, 77.1, 62.2, 20.9. HRMS (ESI^+), m/z 254.1171 ($[M+H]^+$), calcd for $C_{16}H_{16}NO_2^+$: 254.1176.



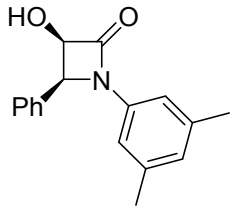
(3*R*,4*S*)-1-(4-fluorophenyl)-3-hydroxy-4-phenylazetidin-2-one (2d): This is a known compound. [1a] White solid, 23 mg, 90% yield, 87% ee, $[\alpha]^{20}_{D}$ = +108.4 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 8.1 min (major), 10.0 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.47 – 7.27 (m, 7H), 7.01 – 6.88 (m, 2H), 5.30 – 5.15 (m, 2H), 3.53 (d, *J* = 7.8 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.3, 160.6, 158.2（d, *J* = 245.4 Hz), 133.2（d, *J* = 3.0 Hz), 132.8, 129.1, 129.0, 127.6, 119.1, 119.0（d, *J* = 8.1 Hz), 116.2, 115.9（d, *J* = 22.2 Hz), 77.2, 62.6. HRMS (ESI$^+$), m/z 258.0922 ([M+H]$^+$), calcd for $C_{15}H_{13}FNO_2^+$: 258.0925.



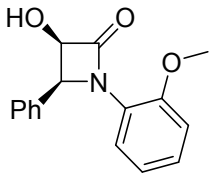
(3*R*,4*S*)-1-(4-bromophenyl)-3-hydroxy-4-phenylazetidin-2-one (2e): This is a new compound. White solid, 27 mg, 85% yield, 84% ee, $[\alpha]^{20}_{D}$ = +112.4 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 9.5 min (major), 15.2 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.34 (m, 5H), 7.33 – 7.27 (m, 2H), 7.24 – 7.16 (m, 2H), 5.27 (d, *J* = 5.3 Hz, 1H), 5.20 (dd, *J* = 7.6, 5.2 Hz, 1H), 3.06 (d, *J* = 8.3 Hz, 1H).^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.3, 135.9, 132.5, 132.2, 129.2, 129.1, 127.5, 119.1, 117.3, 77.3, 62.4. HRMS (ESI$^+$), m/z 318.0122 ([M+H]$^+$), calcd for $C_{15}H_{13}BrNO_2^+$: 318.0124.



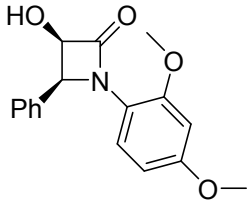
(3*R*,4*S*)-3-hydroxy-1-(3-methoxyphenyl)-4-phenylazetidin-2-one (2f): This is a known compound. [11] White solid, 22 mg, 82% yield, 84% ee, $[\alpha]^{20}_{D}$ = +60.0 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 12.2 min (minor), 14.8 min (major). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.45 – 7.36 (m, 3H), 7.36 – 7.31 (m, 2H), 7.15 (t, *J* = 8.2 Hz, 1H), 7.05 (t, *J* = 2.3 Hz, 1H), 6.80 (dd, *J* = 8.1, 2.0 Hz, 1H), 6.64 (dd, *J* = 8.3, 2.5 Hz, 1H), 5.29 (d, *J* = 5.4 Hz, 1H), 5.18 (d, *J* = 5.4 Hz, 1H), 3.75 (s, 3H), 2.56 (s, 1H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.1, 160.2, 138.1, 132.9, 130.0, 129.2, 129.0, 127.4, 110.4, 109.8, 103.6, 77.1, 62.3, 55.3. HRMS (ESI$^+$), m/z 270.1120 ([M+H]$^+$), calcd for $C_{16}H_{16}NO_3^+$: 270.1125.



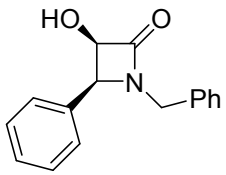
(3*R*,4*S*)-1-(3,5-dimethylphenyl)-3-hydroxy-4-phenylazetidin-2-one (2g): This is a new compound. White solid, 22 mg, 81% yield, 90% ee, $[\alpha]^{20}_{D}$ = +86.6 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 8.2 min (minor), 9.6 min (major). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.36 (m, 3H), 7.33 (dd, *J* = 7.9, 1.7 Hz, 2H), 7.00 – 6.95 (m, 2H), 6.73 (s, 1H), 5.28 (d, *J* = 5.3 Hz, 1H), 5.15 (d, *J* = 5.4 Hz, 1H), 2.61 (s, 1H), 2.23 (s, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.2, 139.0, 136.9, 133.2, 129.1, 128.8, 127.3, 126.4, 115.2, 76.9，62.1, 21.3. HRMS (ESI$^+$), m/z 268.1328 ([M+H]$^+$), calcd for $C_{17}H_{18}NO_2^+$: 268.1332.



(3*R*,4*S*)-3-hydroxy-1-(2-methoxyphenyl)-4-phenylazetidin-2-one (2h): This is a new compound. White solid, 23 mg, 85% yield, 89% ee, $[\alpha]^{20}_D$ = +49.7 (c 0.3, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 14.5 min (major), 16.3 min (minor). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.02 – 7.94 (m, 1H), 7.38 – 7.33 (m, 2H), 7.33 – 7.27 (m, 3H), 7.12 – 7.06 (m, 1H), 6.98 – 6.93 (m, 1H), 6.80 (d, *J* = 8.2 Hz, 1H), 5.66 (d, *J* = 5.3 Hz, 1H), 5.21 (d, *J* = 5.3 Hz, 1H), 3.59 (s, 3H), 2.75 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 167.9, 150.5, 135.1, 128.8, 128.4, 127.3, 126.3, 125.3, 123.3, 121.1, 112.1, 78.1, 65.9, 55.5. HRMS (ESI^+), m/z 270.1120 ($[M+H]^+$), calcd for $C_{16}H_{16}NO_3^+$: 270.1125.

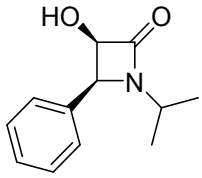


(3*R*,4*S*)-1-(2,4-dimethoxyphenyl)-3-hydroxy-4-phenylazetidin-2-one (2i): This is a new compound. White solid, 26 mg, 88% yield, 91% ee, $[\alpha]^{20}_D$ = +47.0 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 14.1 min (major), 19.8 min (minor). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.77 (dd, *J* = 8.7, 1.5 Hz, 1H), 7.36 (dd, *J* = 8.3, 6.4 Hz, 2H), 7.33 – 7.27 (m, 3H), 6.46 (dd, *J* = 8.8, 2.6 Hz, 1H), 6.37 (d, *J* = 2.6 Hz, 1H), 5.57 (d, *J* = 5.2 Hz, 1H), 5.20 (dd, *J* = 8.0, 5.1 Hz, 1H), 3.75 (s, 3H), 3.62 (s, 3H), 2.69 (d, *J* = 8.2 Hz, 1H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 167.8, 158.5, 152.4, 135.0, 128.8, 128.4, 127.5, 124.7, 118.4, 104.5, 99.8, 78.1, 65.6, 55.5. HRMS (ESI^+), m/z 300.1227 ($[M+H]^+$), calcd for $C_{17}H_{18}NO_4^+$: 300.1230.

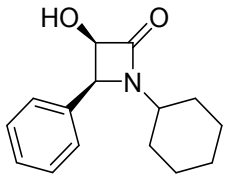


(3*R*,4*S*)-1-benzyl-3-hydroxy-4-phenylazetidin-2-one (2j): This is a known compound. [8] White solid, 18 mg, 70% yield, 88% ee, $[\alpha]^{20}_D$ = +94.0 (c 0.2, $CHCl_3$);

The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 10.0 min (major), 12.9 min (minor). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.41 – 7.33 (m, 3H), 7.32 – 7.23 (m, 5H), 7.12 (dd, *J* = 7.5, 2.0 Hz, 2H), 5.03 (d, *J* = 4.9 Hz, 1H), 4.82 (d, *J* = 14.8 Hz, 1H), 4.63 (d, *J* = 4.8 Hz, 1H), 3.86 (d, *J* = 14.8 Hz, 1H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 169.5, 134.8, 133.5, 128.9, 128.8, 128.6, 128.1, 127.9, 78.0, 62.0, 44.2. HRMS (ESI$^+$), m/z 254.1172 ([M+H]$^+$), calcd for $C_{16}H_{16}NO_2^+$: 254.1176.

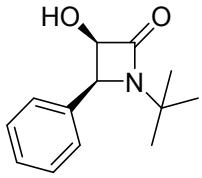


(3*R*,4*S*)-3-hydroxy-1-isopropyl-4-phenylazetidin-2-one (2k): This is a known compound. [1a] White solid, 16 mg, 77% yield, 91% ee, $[\alpha]^{20}_D$ = +35.7 (c 0.7, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 7.9 min (major), 9.6 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.50 – 7.32 (m, 5H), 4.97 (d, *J* = 5.0 Hz, 1H), 4.80 (d, *J* = 4.9 Hz, 1H), 3.96 (br, 1H), 3.85 – 3.45 (m, 1H), 1.27 (d, *J* = 6.8 Hz, 3H), 1.06 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.6, 135.2, 128.6, 128.5, 128.2, 76.6, 61.7, 45.0, 21.3, 20.2. HRMS (ESI$^+$), m/z 206.1174 ([M+H]$^+$), calcd for $C_{12}H_{16}NO_2^+$: 206.1176.

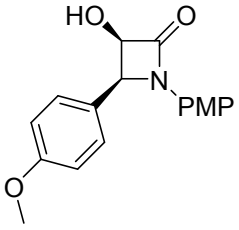


(3*R*,4*S*)-1-cyclohexyl-3-hydroxy-4-phenylazetidin-2-one (2l): This is a new compound. White solid, 18 mg, 72% yield, 94% ee, $[\alpha]^{20}_D$ = +55.2 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 95:5; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 17.7 min

(major), 19.2 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.58 – 7.31 (m, 5H), 4.96 (dd, *J* = 7.5, 4.9 Hz, 1H), 4.81 (d, *J* = 4.9 Hz, 1H), 3.92 – 3.77 (m, 1H), 3.52 – 3.33 (m, 1H), 2.09 – 1.86 (m, 1H), 1.88 – 1.68 (m, 2H), 1.68 – 1.48 (m, 3H), 1.35 – 1.21 (m, 1H), 1.21 – 1.11 (m, 2H), 1.11 – 0.98 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.6, 135.3, 128.6, 128.6, 128.2, 76.6, 61.8, 52.6, 31.5, 30.5, 25.2, 24.9, 24.9. HRMS (ESI$^+$), m/z 246.1485 ([M+H]$^+$), calcd for $C_{15}H_{20}NO_2^+$: 246.1489.

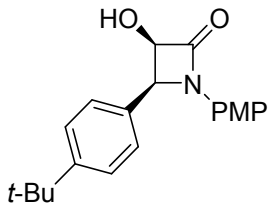


(3*R*,4*S*)-1-(tert-butyl)-3-hydroxy-4-phenylazetidin-2-one (2m): This is a new compound. White solid, 15 mg, 68% yield, 88% ee, $[\alpha]^{20}_D$ = -7.6 (c 0.7, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 7.0 min (major), 9.9 min (minor).^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.33 (m, 5H), 4.90 (dd, *J* = 7.8, 5.1 Hz, 1H), 4.86 (d, *J* = 5.1 Hz, 1H), 2.81 (d, *J* = 7.9 Hz, 1H), 1.29 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 168.8, 136.0, 128.7, 128.6, 128.0, 75.9, 61.9, 54.4, 28.2. HRMS (ESI$^+$), m/z 220.1330 ([M+H]$^+$), calcd for $C_{13}H_{18}NO_2^+$: 220.1332.

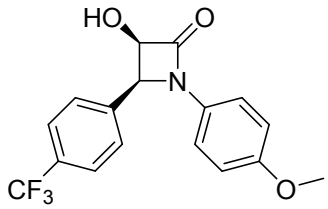


(3*R*,4*S*)-3-hydroxy-1,4-bis(4-methoxyphenyl)azetidin-2-one (2n): This is a known compound. [2] White solid, 27 mg, 91% yield, 92% ee, $[\alpha]^{20}_D$ = +115.4 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 18.3 min (major), 20.6 min (minor). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.31 – 7.21 (m, 5H),

6.94 (d, J = 8.3 Hz, 2H), 6.80 (d, J = 8.7 Hz, 2H), 5.22 (d, J = 5.2 Hz, 1H), 5.14 (s, 1H), 3.80 (s, 3H), 3.75 (s, 3H), 2.59 (s, 1H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 165.6, 160.1, 156.4, 130.6, 128.8, 124.8, 118.9, 114.6, 114.4, 77.1, 61.9, 55.5, 55.3. HRMS (ESI$^+$), m/z 300.1227 ([M+H]$^+$), calcd for $C_{17}H_{18}NO_4^+$: 300.1230.

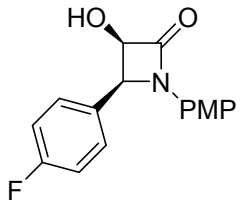


(3*R*,4*S*)-4-(4-(tert-butyl) phenyl)-3-hydroxy-1-(4-methoxyphenyl) azetidin-2-one (2o): This is a known compound. [6] White solid, 28 mg, 88% yield, 87% ee, $[\alpha]^{20}_D$ = +58.0 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 9.6 min (minor), 12.3 min (major). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.37 (d, J = 8.4 Hz, 2H), 7.25 – 7.18 (m, 4H), 6.88 (d, J = 9.0 Hz, 2H), 6.06 (d, J = 7.0 Hz, 1H), 5.26 (d, J = 5.1 Hz, 1H), 5.14 (dd, J = 6.9, 5.1 Hz, 1H), 3.68 (s, 3H), 1.26 (s, 9H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 166.8, 156.0, 150.5, 132.3, 131.2, 128.2, 125.4, 118.7, 114.9, 77.3, 62.0, 55.7, 34.7, 31.6. HRMS (ESI$^+$), m/z 326.1748 ([M+H]$^+$), calcd for $C_{20}H_{24}NO_3^+$: 326.1751.

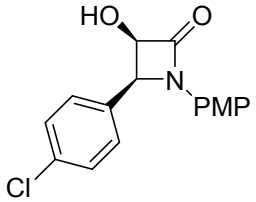


(3*R*,4*S*)-3-hydroxy-1-(4-methoxyphenyl)-4-(4-(trifluoromethyl) phenyl) azetidin-2-one (2p): This is a new compound. White solid, 28 mg, 82% yield, 90% ee, $[\alpha]^{20}_D$ = +112.0 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 10.5 min (minor), 14.0 min (major). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.74 (d, J = 8.1 Hz, 2H), 7.49 (d, J = 8.1 Hz, 2H), 7.22 (d, J = 9.0 Hz, 2H), 6.90 (d, J =

9.0 Hz, 2H), 6.24 (d, *J* = 7.1 Hz, 1H), 5.45 (d, *J* = 5.1 Hz, 1H), 5.24 (dd, *J* = 7.1, 5.1 Hz, 1H), 3.69 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 166.5, 156.2, 140.5, 131.0, 129.2,{ 129.3, 128.9, 128.6, 128.3 (q, *J* = 31.8 Hz)}{128.8, 126.1, 123.4, 120.7 (q, *J* = 273.2 Hz)}{125.6, 125.6, 125.5, 125.5 (q, *J* = 4.0 Hz)}118.6, 115.0, 77.5, 61.7, 55.7. HRMS (ESI$^+$), m/z 338.0993 ([M+H]$^+$), calcd for $C_{17}H_15F_3NO_3^+$: 338.0999.

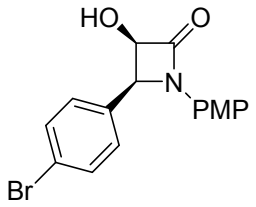


(3*R*,4*S*)-4-(4-fluorophenyl)-3-hydroxy-1-(4-methoxyphenyl)azetidin-2-one (2q): This is a known compound. [7] White solid, 24 mg, 85% yield, 94% ee, $[\alpha]^{20}_D$ = +102.2 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 18.8 min (major), 20.8 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.35 – 7.29 (m, 2H), 7.27 – 7.22 (m, 2H), 7.13 – 7.03 (m, 2H), 6.86 – 6.75 (m, 2H), 5.23 (d, *J* = 5.1 Hz, 1H), 5.19 (d, *J* = 5.4 Hz, 1H), 3.75 (s, 3H), 3.63 (d, *J* = 7.0 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.2, 164.2, 161.7 (d, *J* = 249.5 Hz), 156.6, 130.3, 129.5, 129.4 (d, *J* = 8.1 Hz), 129.1, 129.1 (d, *J* = 3.0 Hz), 118.9, 116.1, 115.9 (d, *J* = 22.2 Hz), 114.5, 76.9, 61.9, 55.5. HRMS (ESI$^+$), m/z 288.1026 ([M+H]$^+$), calcd for $C_{16}H_{15}FNO_3^+$: 288.1030.

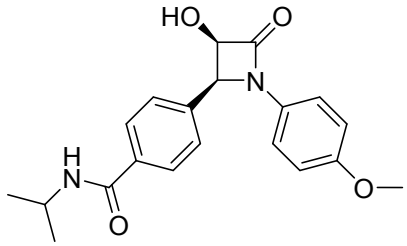


(3*R*,4*S*)-4-(4-chlorophenyl)-3-hydroxy-1-(4-methoxyphenyl)azetidin-2-one (2r): This is a new compound. White solid, 24 mg, 81% yield, 94% ee, $[\alpha]^{20}_D$ = +126.8 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 19.6 min (major), 22.2 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.36 (d,

J = 8.5 Hz, 2H), 7.30 – 7.20 (m, 4H), 6.86 – 6.75 (m, 2H), 5.20 (d, *J* = 6.9 Hz, 2H), 3.75 (s, 3H), 3.71 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.0, 156.6, 134.7, 131.9, 130.2, 129.2, 129.1, 118.9, 114.5, 61.9, 55.5. HRMS (ESI$^+$), m/z 304.0733 ([M+H]$^+$), calcd for $C_{16}H_{15}ClNO_3^+$: 304.0735.

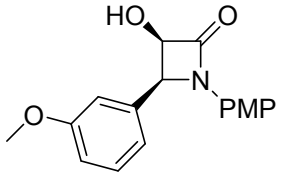


(3*R*,4*S*)-4-(4-bromophenyl)-3-hydroxy-1-(4-methoxyphenyl)azetidin-2-one (2s): This is a new compound. White solid, 30 mg, 86% yield, 90% ee, $[\alpha]^{20}_D$ = +112.4 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 13.1 min (minor), 15.7 min (major). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.57 – 7.43 (m, 2H), 7.30 – 7.17 (m, 4H), 6.86 – 6.75 (m, 2H), 5.19 (s, 2H), 3.75 (s, 3H), 3.64 (s, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.9, 156.6, 132.5, 132.1, 130.2, 129.4, 122.9, 118.9, 114.5, 62.0, 55.5. HRMS (ESI$^+$), m/z 348.0226 ([M+H]$^+$), calcd for $C_{16}H_{15}BrNO_3^+$: 348.0230.

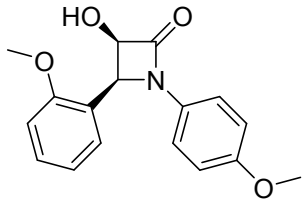


4-((2*S*,3*R*)-3-hydroxy-1-(4-methoxyphenyl)-4-oxoazetidin-2-yl)-N-isopropylbenzamide (2t): This is a new compound. White solid, 15 mg, 45% yield, 78% ee, $[\alpha]^{20}_D$ = +62.0 (c 0.3, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 19.5 min (minor), 23.6 min (major). ^{1}H NMR (600 MHz, DMSO-d_6) δ 8.2 (d, *J* = 7.7 Hz, 1H), 7.8 (d, *J* = 8.1 Hz, 2H), 7.3 (d, *J* = 8.1 Hz, 2H), 7.2 (d, *J* = 8.9 Hz, 2H), 6.9 (d, *J* = 8.9 Hz, 2H), 6.2 (s, 1H), 5.4 (d, *J* = 5.0 Hz, 1H), 5.2 (d, *J* = 5.0 Hz, 1H), 4.1 (dq, *J* = 13.5, 6.6 Hz, 1H), 3.7 (s, 3H), 1.1 (dd, *J* = 6.5, 2.7 Hz,

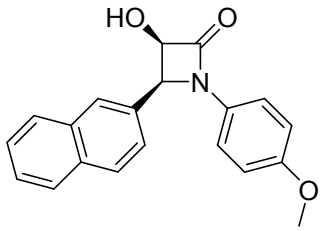
7H). ^{13}C NMR (151 MHz, DMSO-d_6) δ 166.7, 165.7, 156.1, 138.4, 135.0, 131.1, 128.2, 127.6, 118.7, 114.9, 77.5, 62.1, 55.7, 41.4, 22.8. HRMS (ESI$^+$), m/z 355.1648 ([M+H]$^+$), calcd for $C_{20}H_{23}N_2O_4^+$: 355.1652.



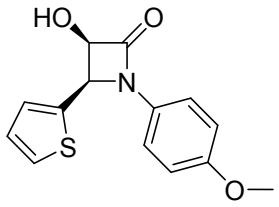
(3*R*,4*S*)-3-hydroxy-4-(3-methoxyphenyl)-1-(4-methoxyphenyl)azetidin-2-one (2u): This is a new compound. White solid, 26 mg, 85% yield, 87% ee, $[\alpha]^{20}_D$ = +96.8 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 14.5 min (major), 21.5 min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 – 7.20 (m, 3H), 6.97 – 6.81 (m, 3H), 6.83 – 6.72 (m, 2H), 5.25 – 5.10 (m, 2H), 3.75 (d, *J* = 10.3 Hz, 6H), 3.35 (d, *J* = 8.5 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.0, 160.1, 156.5, 135.0, 130.5, 130.2, 119.7, 118.9, 114.4, 114.2, 113.3, 77.1, 62.4, 55.5, 55.3. HRMS (ESI$^+$), m/z 300.1227 ([M+H]$^+$), calcd for $C_{17}H_{18}NO_4^+$: 300.1230.



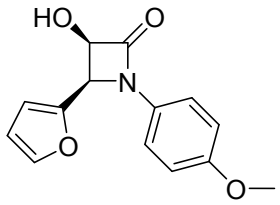
(3*R*,4*S*)-3-hydroxy-4-(2-methoxyphenyl)-1-(4-methoxyphenyl)azetidin-2-one (2v): This is a new compound. White solid, 24 mg, 80% yield, 82% ee, $[\alpha]^{20}_D$ = +44.8 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 12.5 min (major), 23.2min (minor). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.36 – 7.26 (m, 3H), 7.18 (dd, *J* = 7.5, 1.7 Hz, 1H), 7.00 – 6.90 (m, , 2H), 6.84 – 6.75 (m, 2H), 5.49 (d, *J* = 5.2 Hz, 1H), 5.18 (dd, *J* = 9.4, 5.2 Hz, 1H), 3.87 (s, 3H), 3.74 (s, 3H), 3.08 (d, *J* = 9.4 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.1, 157.7, 156.3, 130.9, 129.9, 128.8, 121.6, 121.1, 118.7, 114.4, 111.3, 77.4, 59.2, 55.9, 55.5. HRMS (ESI$^+$), m/z 300.1227 ([M+H]$^+$), calcd for $C_{17}H_{18}NO_4^+$: 300.1230.



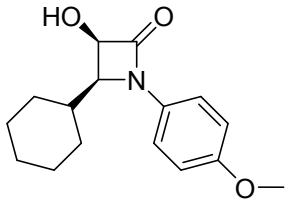
(3*R*,4*S*)-3-hydroxy-1-(4-methoxyphenyl)-4-(naphthalen-2-yl)azetidin-2-one (2w): This is a new compound. White solid, 28 mg, 92% yield, 88% ee, $[\alpha]^{20}_{D}$ = +110.0 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 16.5 min (major), 24.1 min (minor). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.94 – 7.80 (m, 4H), 7.51 (dt, *J* = 6.3, 3.4 Hz, 2H), 7.41 (dd, *J* = 8.6, 1.8 Hz, 1H), 7.30 – 7.19 (m, 2H), 6.92 – 6.82 (m, 2H), 6.15 (d, *J* = 7.1 Hz, 1H), 5.47 (d, *J* = 5.1 Hz, 1H), 5.24 (dd, *J* = 7.1, 5.1 Hz, 1H), 3.66 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 166.8, 156.1, 133.3, 133.2, 131.3, 128.2, 128.1, 128.0, 127.5, 126.7, 126.5, 126.2, 118.7, 114.9, 77.6, 62.5, 55.7. HRMS (ESI$^+$), m/z 338.0993 ([M+H]$^+$), calcd for $C_{20}H_{18}NO_3^+$: 320.1281.



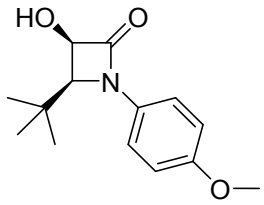
(3*R*,4*R*)-3-hydroxy-1-(4-methoxyphenyl)-4-(thiophen-2-yl) azetidin-2-one (2x): This is a known compound. [3] White solid, 24 mg, 88% yield, 87% ee, $[\alpha]^{20}_{D}$ = +60.4 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 19.2 min (minor), 20.5 min (major). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.51 (dd, *J* = 5.0, 1.3 Hz, 1H), 7.30 – 7.23 (m, 2H), 7.18 (dd, *J* = 3.6, 1.3 Hz, 1H), 7.03 (dd, *J* = 5.1, 3.5 Hz, 1H), 6.94 – 6.83 (m, 2H), 6.33 (s, 1H), 5.62 (d, *J* = 4.9 Hz, 1H), 5.18 (d, *J* = 4.5 Hz, 1H), 3.69 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 166.5, 156.2, 138.7, 131.0, 130.1, 128.2, 127.2, 118.8, 114.9, 77.3, 58.7, 55.7. HRMS (ESI$^+$), m/z 276.0685 ([M+H]$^+$), calcd for $C_{14}H_{14}NO_3S^+$: 276.0689.



(3*R*,4*R*)-4-(furan-2-yl)-3-hydroxy-1-(4-methoxyphenyl)azetidin-2-one (2y): This is a known compound.[12] White solid, 22 mg, 85% yield, 82% ee, $[\alpha]^{20}_{D}$ = +115.5 (c 0.8, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak IA column, hexane: isopropanol = 85:15; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 11.9 min (major), 18.9 min (minor). ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.7 (dd, J = 1.7, 0.7 Hz, 1H), 7.3 – 7.2 (m, 2H), 6.9 – 6.9 (m, 2H), 6.5 – 6.4 (m, 2H), 6.3 (d, J = 7.3 Hz, 1H), 5.4 (d, J = 5.0 Hz, 1H), 5.2 (dd, J = 7.3, 5.0 Hz, 1H), 3.7 (s, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 166.6, 156.1, 149.3, 143.9, 131.3, 118.4, 114.9, 111.1, 110.6, 77.3, 56.5, 55.7.



(3*R*,4*S*)-4-cyclohexyl-3-hydroxy-1-(4-methoxyphenyl) azetidin-2-one (2z): This is a new compound. White solid, 25 mg, 91% yield, 90% ee, $[\alpha]^{20}_{D}$ = +28.2 (c 0.5, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 6.6 min (minor), 8.5 min (major). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.42 – 7.28 (m, 2H), 6.92 – 6.80 (m, 2H), 5.07 (t, J = 5.1 Hz, 1H), 4.73 (d, J = 6.1 Hz, 1H), 4.05 (dd, J = 7.3, 5.2 Hz, 1H), 3.79 (s, 3H), 1.90 – 1.81 (m, 1H), 1.76 – 1.59 (m, 4H), 1.35 – 1.07 (m, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 168.5, 156.6, 131.2, 119.9, 114.2, 75.0, 63.4, 55.5, 38.5, 30.2, 29.6, 26.3, 26.2, 26.0. HRMS (ESI$^+$), m/z 276.1591 ([M+H]$^+$), calcd for $C_{16}H_{22}NO_3^+$: 276.1594.



(3*R*,4*S*)-4-(tert-butyl)-3-hydroxy-1-(4-methoxyphenyl)azetidin-2-one (2aa): This is a known compound.[13] White solid, 17.5 mg, 70% yield, 85% ee, $[\alpha]^{20}_{D}$ = +20.0 (c 0.3, $CHCl_3$); The enantiomeric excess was determined by HPLC on Chiralpak OD-3 column, hexane: isopropanol = 90:10; flow rate = 1.0 mL/min; UV detection at 254 nm; t_R = 7.9 min (minor), 10.9 min (major). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.3 – 7.3 (m, 2H), 6.9 – 6.8 (m, 2H), 5.1 (t, *J* = 5.7 Hz, 1H), 4.4 (d, *J* = 6.0 Hz, 1H), 4.1 (d, *J* = 5.3 Hz, 1H), 3.8 (s, 3H), 1.1 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.1, 157.0, 130.3, 122.0, 114.2, 75.6, 67.9, 55.5, 34.9, 27.2.

5. Deuterium-labelling Experiments.

Deuterium-labelling experiments in the presence of phenylphosphinic acid (A4): **1a** (0.05 mmol, 1.0 equiv), **A4** (phenylphosphinic acid, 0.05 mmol, 1.0 equiv), CD_3COOD (50 μL, 0.87 mmol, 17.5 equiv) and d^8-toluene (0.5 mL) were added into 5 NMR tubes, and the mixture was stirred at 80 ℃ for 0 h, 1 h, 5 h, 17 h and 24 h respectively. The deuteration ratios were determined by ^{1}H-NMR spectroscopy (Figure S1).

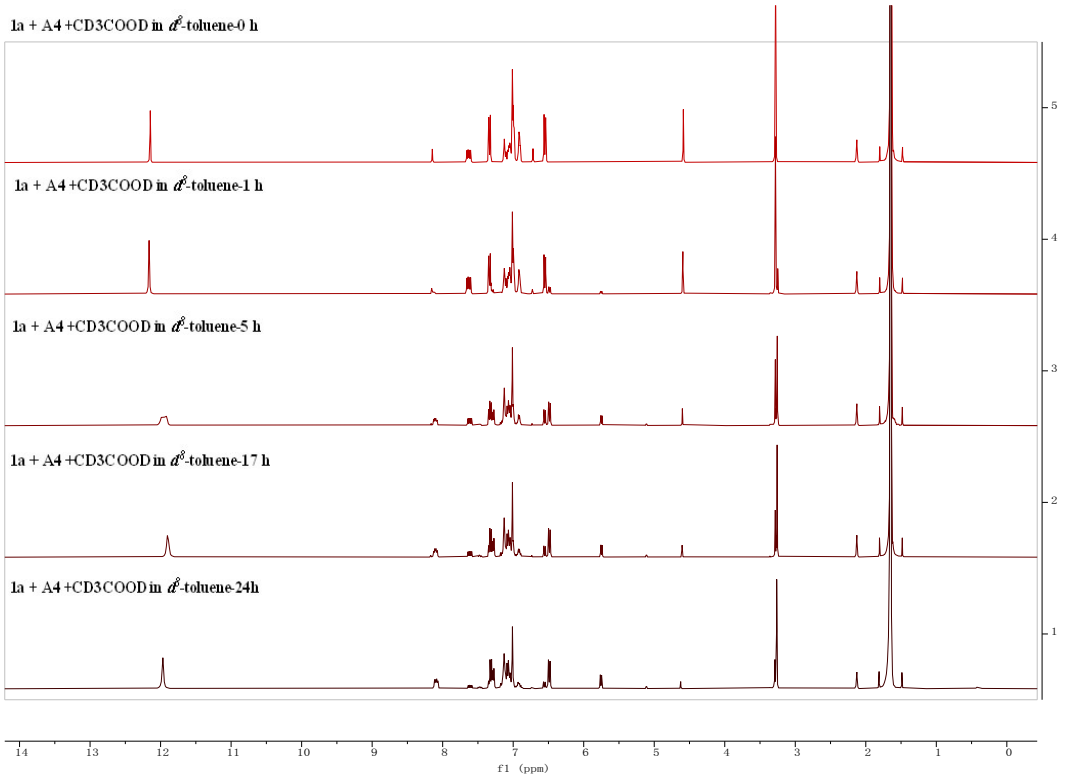


Figure S1. ^{1}H-NMR spectra of the deuteration experiments in the presence of phenylphosphinic acid (**A4**)

Deuterium-labelling experiments in the absence of phenylphosphinic acid (A4):

1a (0.05 mmol, 1.0 equiv), CD_3COOD (50 μL, 0.87 mmol, 17.5 equiv) and d^8-toluene (0.5 mL) were added into **NMR tube 1**, and the mixture was stirred at 80℃ for 24 h.

1a (0.05 mmol, 1.0 equiv) and d^8-toluene (0.5 mL) were added into **NMR tube 1**.

The deuteration ratio was determined by ^{1}H-NMR spectroscopy (Figure S2).

The ^{1}H-NMR spectroscopy showed both integral ratio of the H and O-CH_3 in was 1:3.

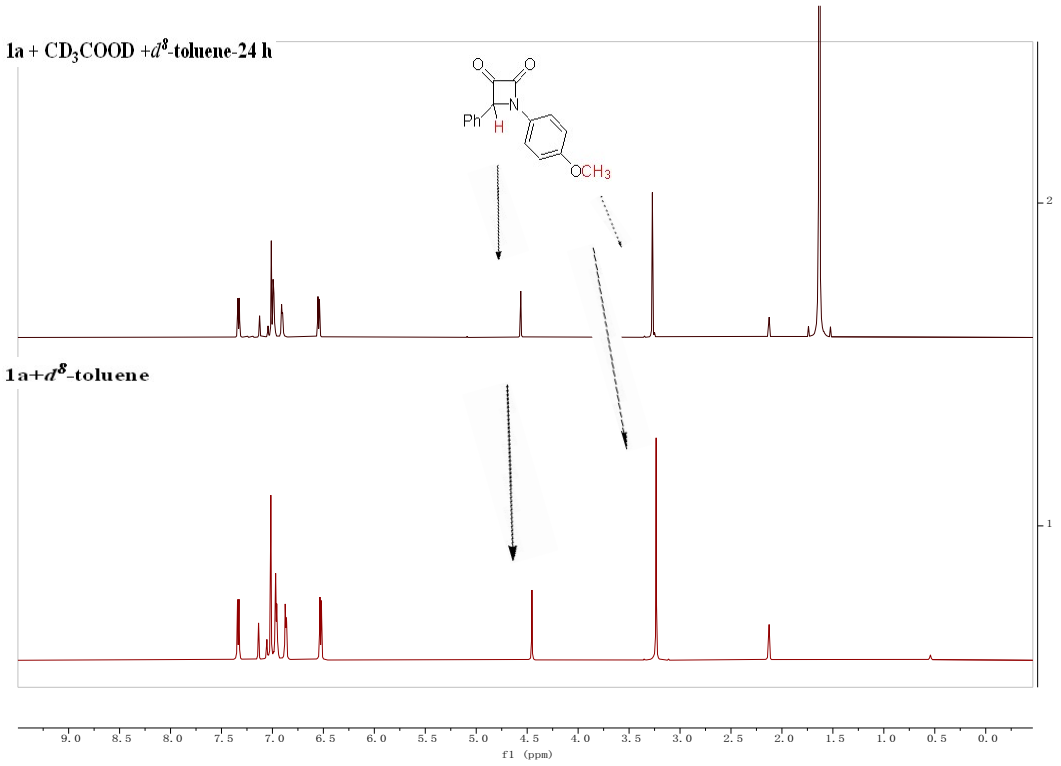


Figure S2. ^{1}H-NMR spectra of the deuteration experiment in the absence of phenylphosphinic acid (**A4**).

6. Rationale for the Origin of Diastereoselectivity and Enantioselectivity.

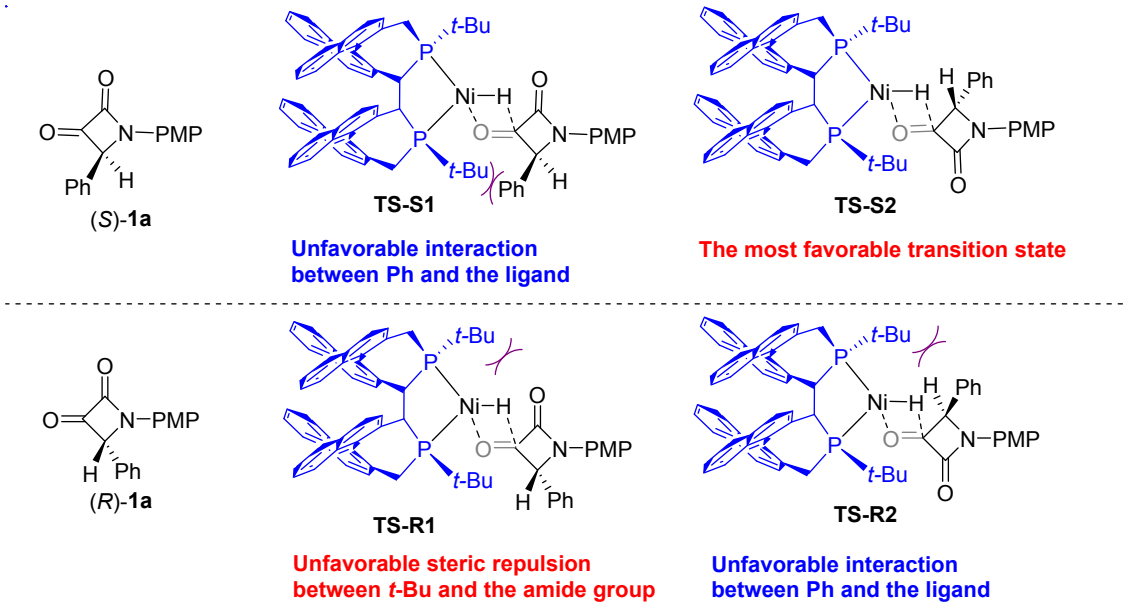
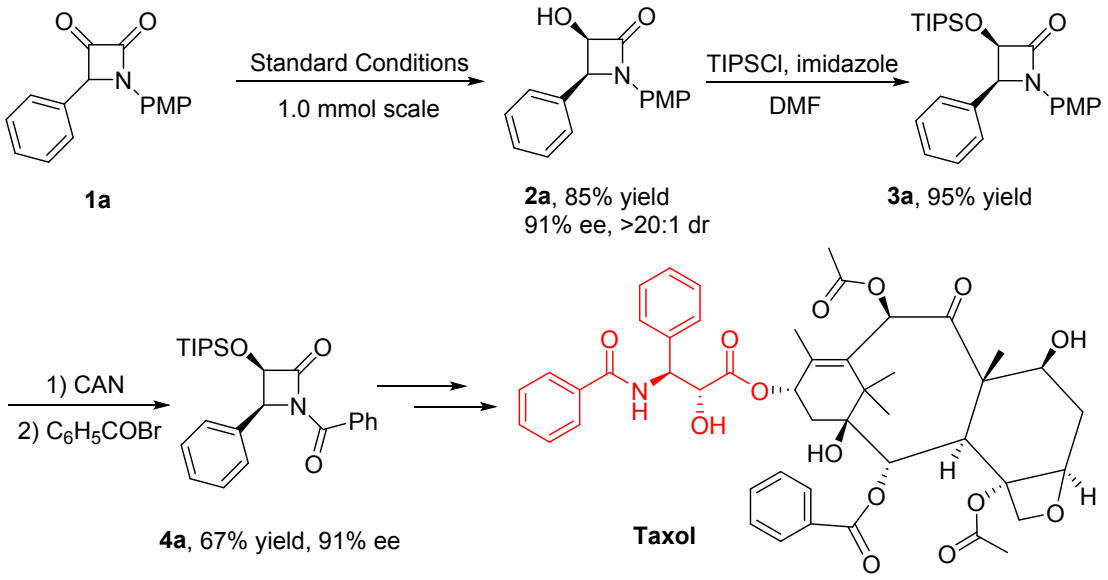


Figure S3. Rationale for the origin of diastereoselectivity and enantioselectivity.

According to the previous mechanistic investigations on nickel-catalyzed asymmetric hydrogenation of our group and Wanbin Zhang's group (see: (a) Y. Liu, Z. Yi, X. Yang, H. Wang, C. Yin, M. Wang, X.-Q. Dong, X. Zhang, *ACS Catal.* **2020**, *10*, 11153-11161; (b) Y. Hu, J. Chen, B. Li, Z. Zhang, I. D. Gridnev, W. Zhang, *Angew. Chem., Int. Ed.* **2020**, *59*, 5371-5375. (c) B. Li, J. Chen, Z. Zhang, I. D. Gridnev, W. Zhang, *Angew. Chem., Int. Ed.* **2019**, *58*, 7329-7334.), nickel hydride was identified as the key catalytic species in the current reaction.

As can be seen from Figure S3 above, the origin of diastereoselectivity was the energy difference between **TS-S1** and **TS-S2**, and **TS-R1** and **TS-R2**, the nickel hydride species attacks the carbonyl group from the opposite side of the α-phenyl group due the steric repulsion between the phenyl group and the ligand. The origin of enantioselectivity (rate difference observed in the reduction of the (*S*)- vs. the (*R*)- enantiomer of **1a**) was caused by the unfavorable steric interactions between the *t*-Bu group and the amide group of (*R*)-**1a** in **TS-R1**, and **TS-S2** is the most favorable transition state ((*S*)-**1a** matches better with the catalyst than (*R*)-**1a**).

7. Synthetic Applications.

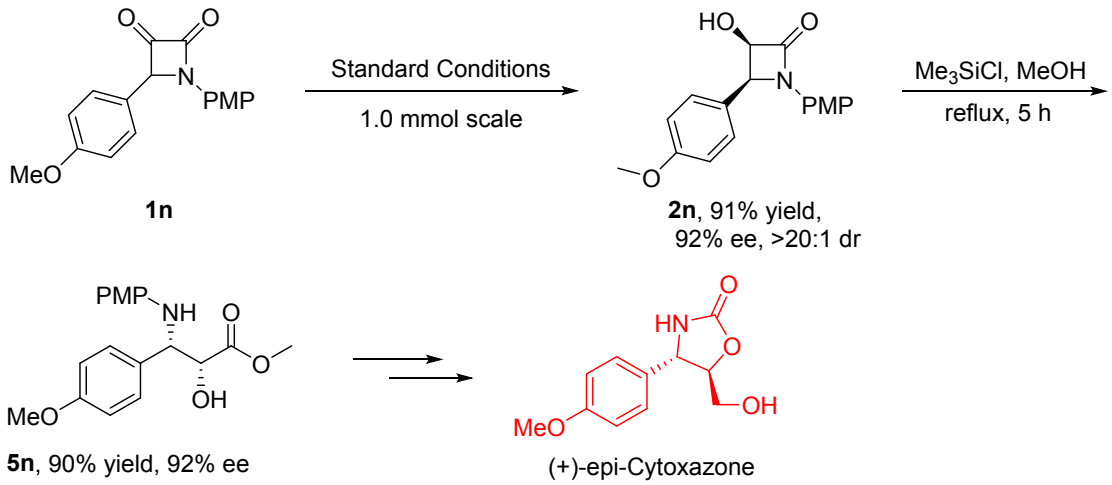


Compound 2a: A stock solution was made by mixing $Ni(OAc)_2$ (9.0 mg, 0.05 mmol) with (*S*)-Binapine (40 mg, 0.055 mmol) in a 1:1.1 molar ratio in DCM (1.0 mL) at room temperature for 30 min in an argon-filled glovebox. The catalyst solution (1.0 mL, 0.005 mmol) was transferred by syringe into the vials charged with substrate **1a** (267 mg, 1.0 mmol) in anhydrous toluene (9.0 mL). The vials were subsequently transferred into an autoclave into which hydrogen gas was charged. The reaction was then stirred under H_2 (50 atm) at 80 °C for 36 h. The hydrogen gas was released slowly and carefully. The reaction solution was concentrated and the residue was purified by column chromatography on silica gel (eluent: PE: EA = 5:1 to 2:1). The ee value of compound **2a** was determined by HPLC analysis on a chiral stationary phase. Pure compound **2a** (215 mg, 85% yield, 91% ee) was afforded after column chromatography.

Compound 3a [10]: To a solution of **2a** (0.85 mmol, 215 mg, 1.0 equiv.) in anhydrous DMF (1.0 mL) was cooled to 0 ℃, imidazole was added (cat. 0.01 equiv.) into the mixture and TIPSCl (1.5 mmol, 340 μL, 1.5 equiv.) was added slowly by syringe. TLC indicated that **2a** was consumed completely. The mixture was cooled to room temperature and quenched by 1 mL H_2O, the mixture was extracted by DCM (20 mL for 2 times), and the combined organic layer was washed by $NaHCO_3$, brine

successively. The obtained organic layer was dried over anhydrous Na_2SO_4, filtered and concentrated under vacuum. The residue was purified by chromatography (Si_2O, PE/EA from 20:1 to 5:1). Compound **3a** was obtained as a light yellow solid (340 mg, 95% yield).

Compound 4a [10]: (step 1) To a solution of **3a** (0.81 mmol, 340 mg, 1.0 equiv.) in CH_3CN (5 mL) was cooled to -5 °C, CAN (2.67 mmol, 1.01g, 3.3 equiv.) in 3 mL water was added dropwise. The reaction mixture was stirred for 45 min until TLC indicated the consumption of the starting material. Then the mixture was diluted with EtOAc (10 mL) and washed with saturated aqueous $NaHCO_3$ (2×10 mL), water (2×5 mL), saturated sodium metabisulfite (2×5 mL) and brine, and then the organic layer was dried over anhydrous Na_2SO_4. The crude product was chromatographed on silica gel with 40% EtOAc in hexanes to give the deprotected lactam. (step 2) To a solution of the deprotected lactam in anhydrous CH_2Cl_2 (1.0 mL) was cooled to 0 °C, triethylamine (285 μL, 1.62 mmol, 2 equiv.) and benzoyl chloride (137 μL, 0.89 mmol, 1.1 equiv.) were added. The mixture was then stirred at room temperature for 3 hours, diluted with EtOAc (10 mL), washed with saturated aqueous $NaHCO_3$ and brine, and dried over anhydrous Na_2SO_4. The crude product was purified by chromatography (15% EtOAc in hexane) to give the *β*-lactam **4a** (225 mg, 67% yield, 91% ee). ^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.09 – 7.98 (m, 2H), 7.63 – 7.54 (m, 1H), 7.51 – 7.44 (m, 2H), 7.43 – 7.28 (m, 5H), 5.43 (d, *J* = 6.1 Hz, 1H), 5.25 (d, *J* = 6.1 Hz, 1H), 1.04 – 0.94 (m, 3H), 0.94 – 0.83 (m, 18H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.3, 165.5, 133.8, 133.4 132.1, 129.9, 128.4, 128.2, 128.2, 76.6, 61.2, 17.5, 17.4, 11.7.



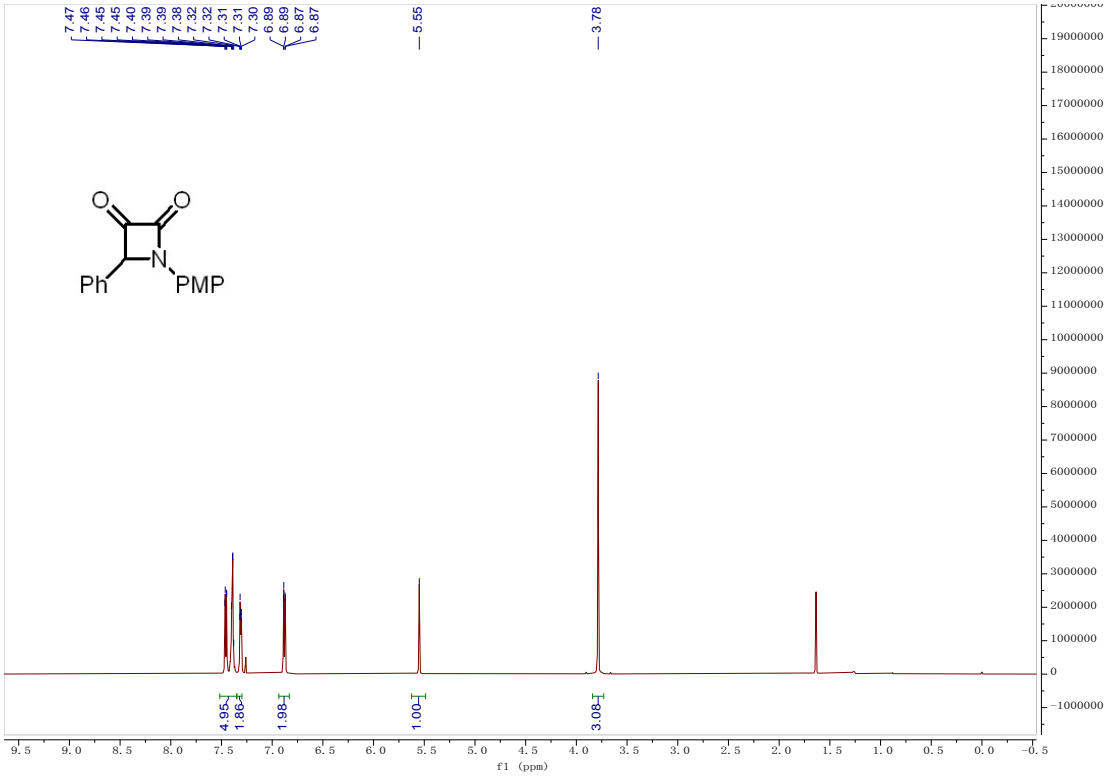
Compound 2n: A stock solution was made by mixing $Ni(OAc)_2$ (9.0 mg, 0.05 mmol) with (*S*)-Binapine (40 mg, 0.055 mmol) in a 1:1.1 molar ratio in DCM (1.0 mL) at room temperature for 30 min in an argon-filled glovebox. The catalyst solution (1.0 mL, 0.005 mmol) was transferred by syringe into the vial charged with substrate **1n** (297 mg, 1.0 mmol) in anhydrous toluene (9.0 mL). The vial was subsequently transferred into an autoclave into which hydrogen gas was charged. The reaction was then stirred under H_2 (50 atm) at 80 °C for 36 h. The hydrogen gas was released slowly and carefully. The reaction solution was concentrated and the residue was purified by column chromatography on silica gel (eluent: EA: PE = 5:1 to 2:1). The ee value of compound **2n** was determined by HPLC analysis on a chiral stationary phase. Pure compound **2n** (269 mg, 91% yield, 92% ee) was afforded after column chromatography.

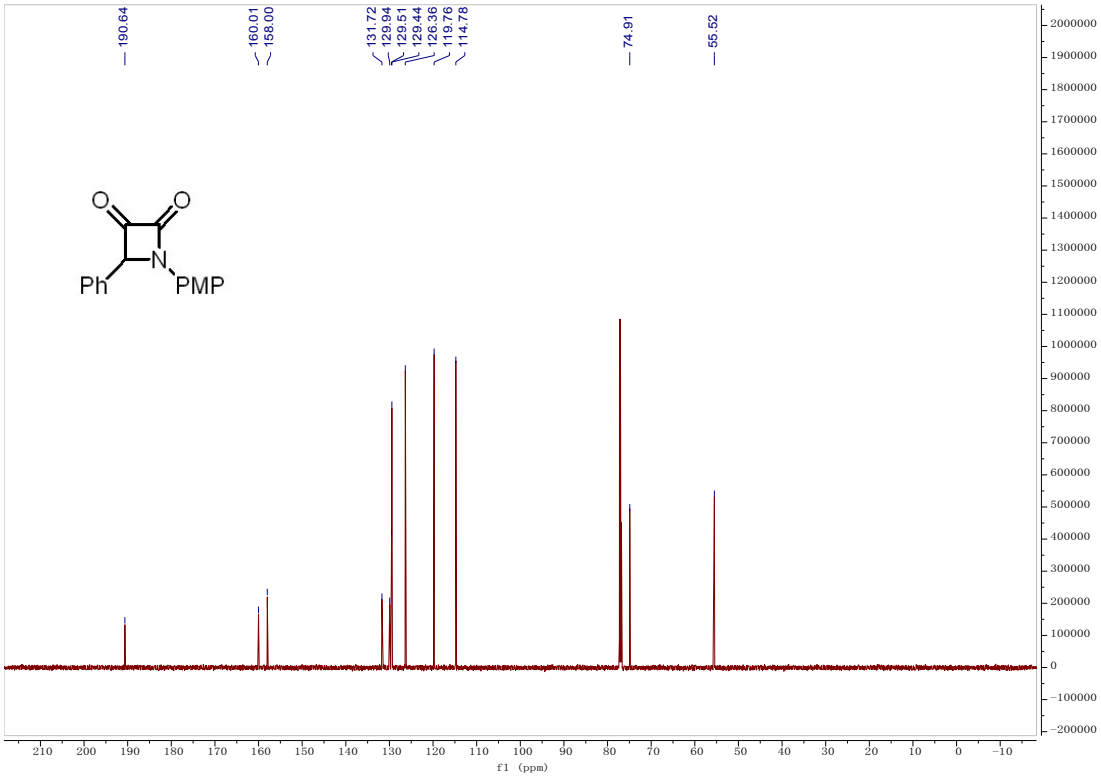
Compound 5n [9]: To a solution of **2n** (0.9 mmol, 269 mg, 1.0 equiv.) in anhydrous MeOH (2.0 mL) was cooled to 0℃, Me_3SiCl (2.7 mmol, 340 μL, 3.0 equiv.) was added slowly by syringe. TLC indicated that some **2n** was remained and Me_3SiCl (1.8 mmol, 227 μL, 2.0 equiv.) was added into the mixture. The mixture was warmed to room temperature and refluxed for 5 hours. After the starting materials was consumed completely the mixture was cooled to room temperature and quenched by 1 mL H_2O, the mixture was extracted by EtOAc (10 mL for 2 times), and the combined organic layer was washed by $NaHCO_3$, brine successively. The obtained organic layer was dried over anhydrous Na_2SO_4, filtered and concentrated under vacuum. The residue was purified by chromatography (Si_2O, PE/EA from 20:1 to 6:1). Compound **5n** was

obtained as a light yellow solid (265 mg, 90% yield, 92% ee). ^{1}H NMR (600 MHz, Chloroform-*d*) δ 7.33 – 7.22 (m, 2H), 6.90 – 6.82 (m, 2H), 6.73 – 6.65 (m, 2H), 6.56 – 6.46 (m, 2H), 4.79 (d, *J* = 2.9 Hz, 1H), 4.47 (s, 1H), 4.43 (d, *J* = 2.8 Hz, 1H), 3.75 (d, *J* = 2.9 Hz, 6H), 3.67 (s, 3H), 3.21 (s, 1H). ^{13}C NMR (151 MHz, Chloroform-*d*) δ 173.5, 159.0, 152.3, 140.5, 131.4, 128.1, 115.4, 114.7, 114.1, 74.8, 59.5, 55.7, 55.2, 52.9.

8. NMR Spectroscopic Data.

^{1}H NMR and ^{13}C NMR of 1a





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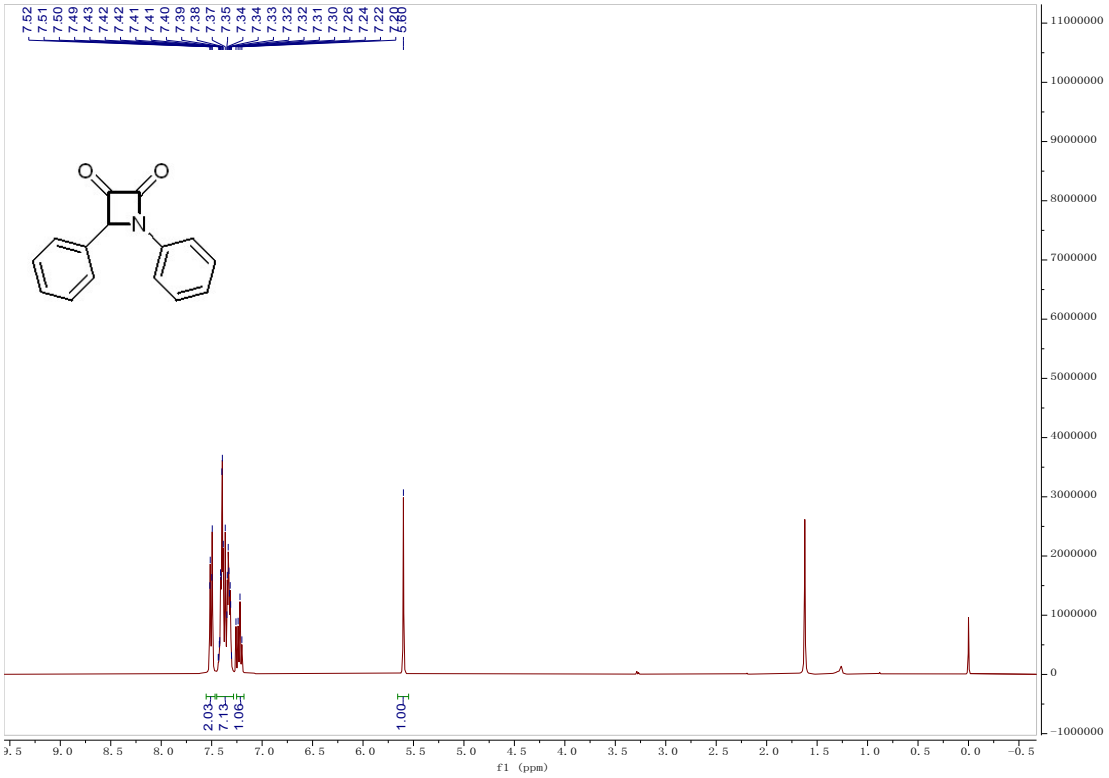
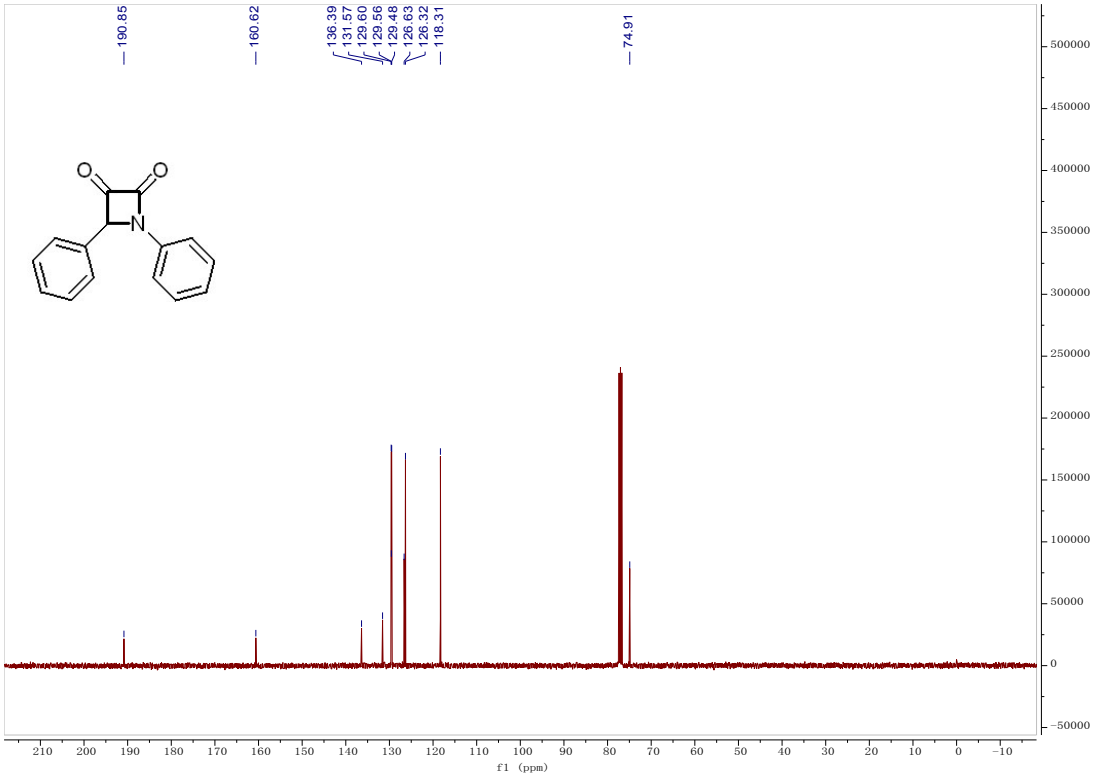
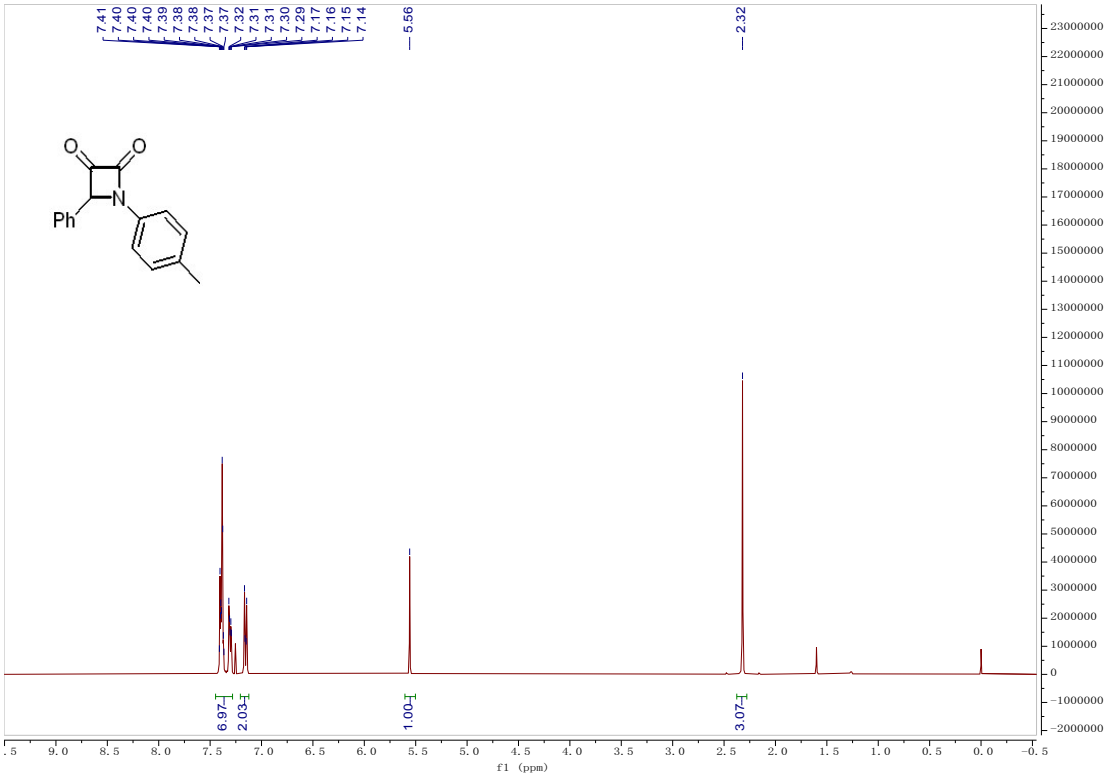
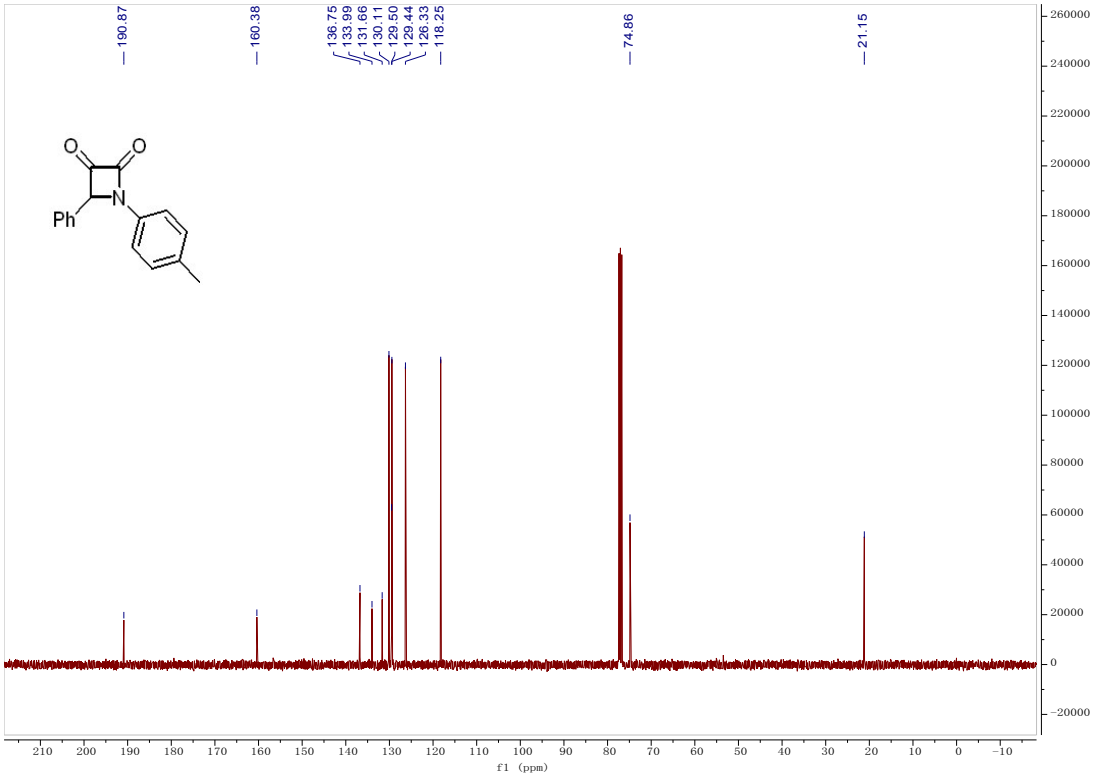


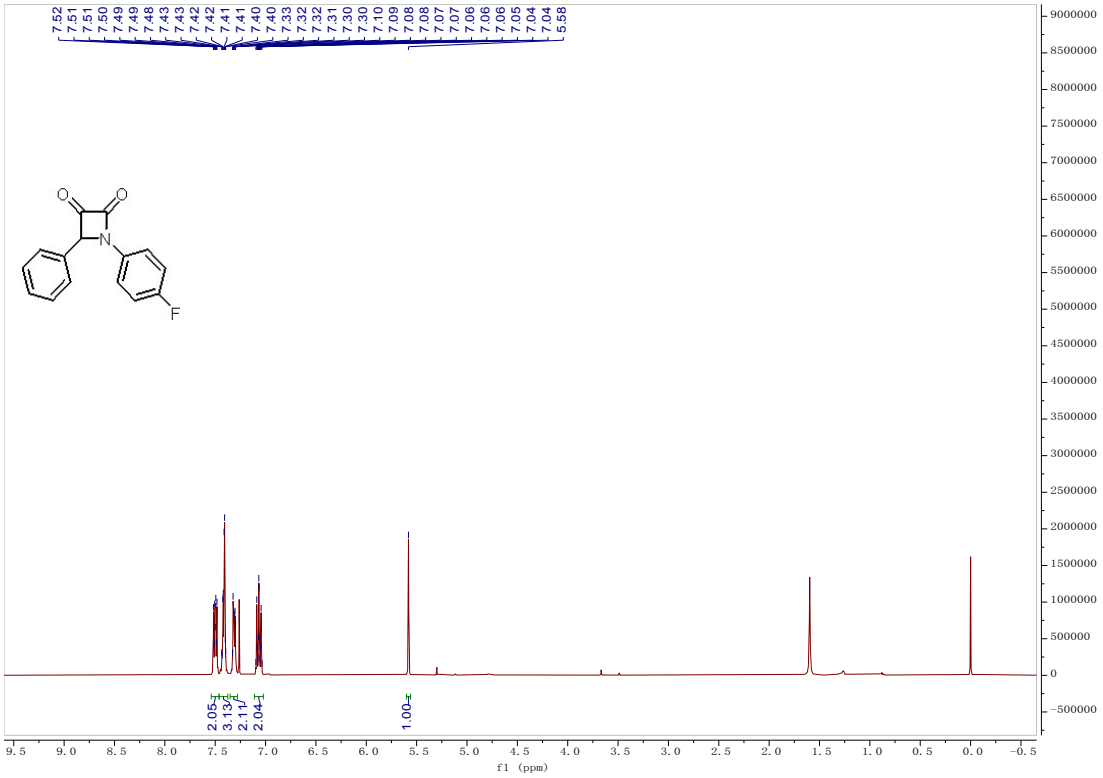


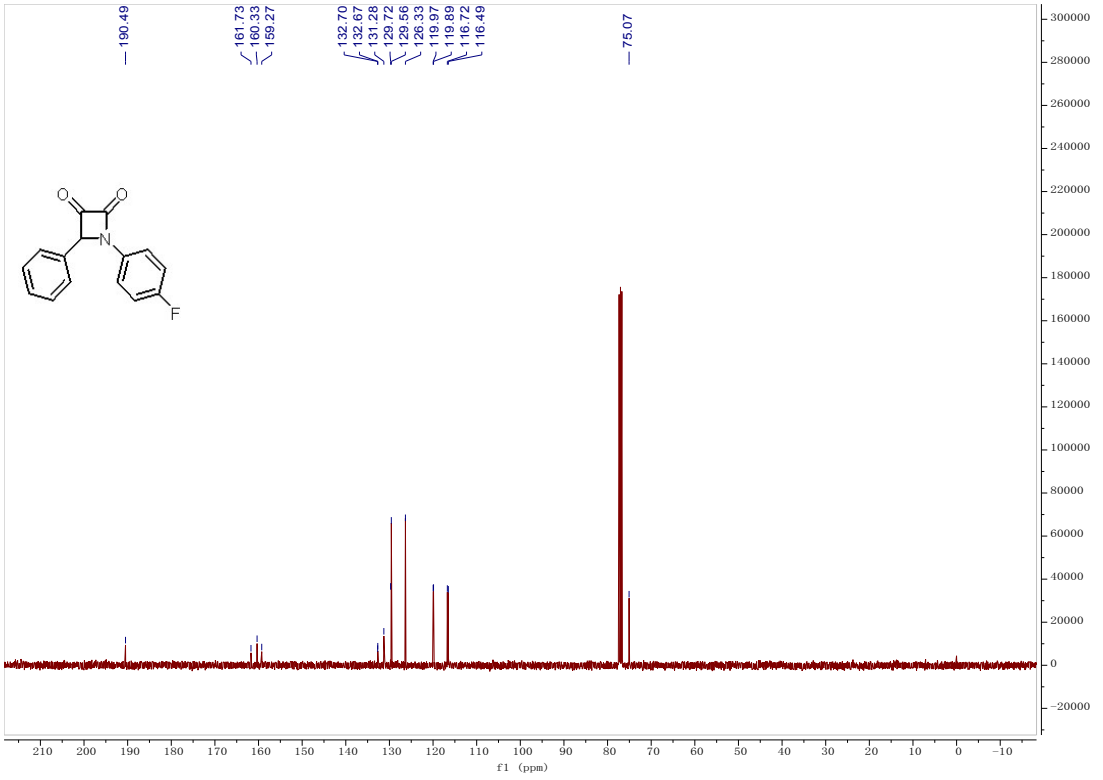
^{1}H NMR and ^{13}C NMR of 1c



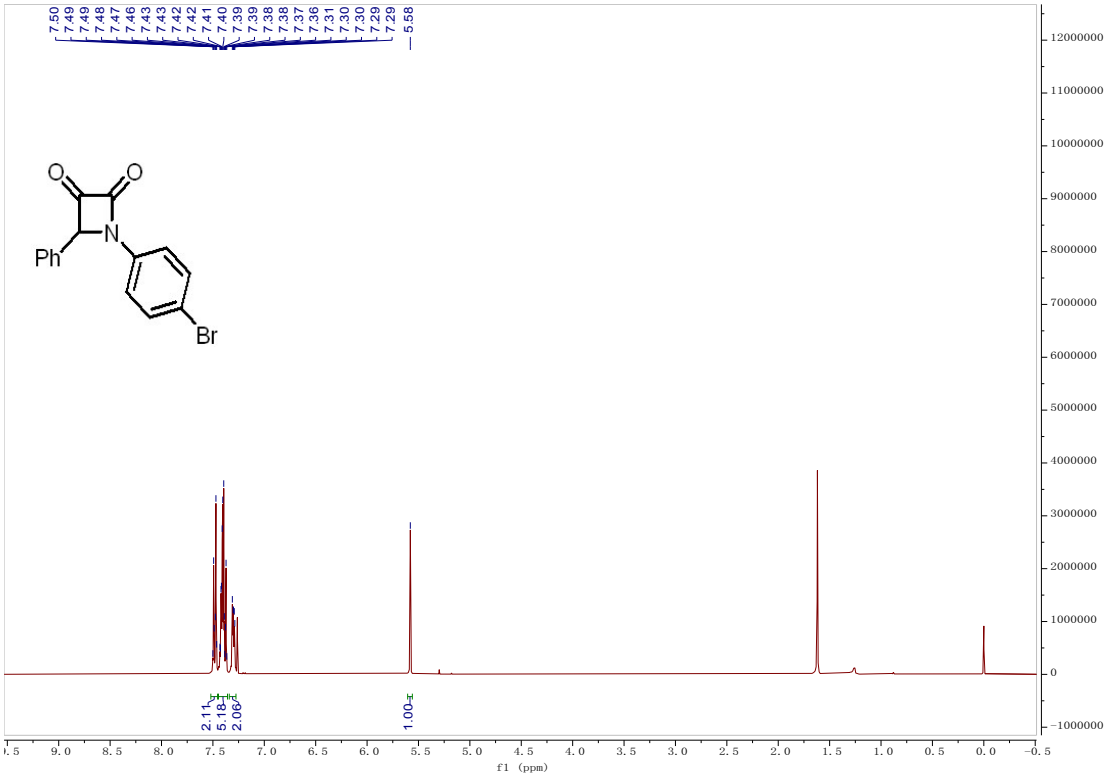


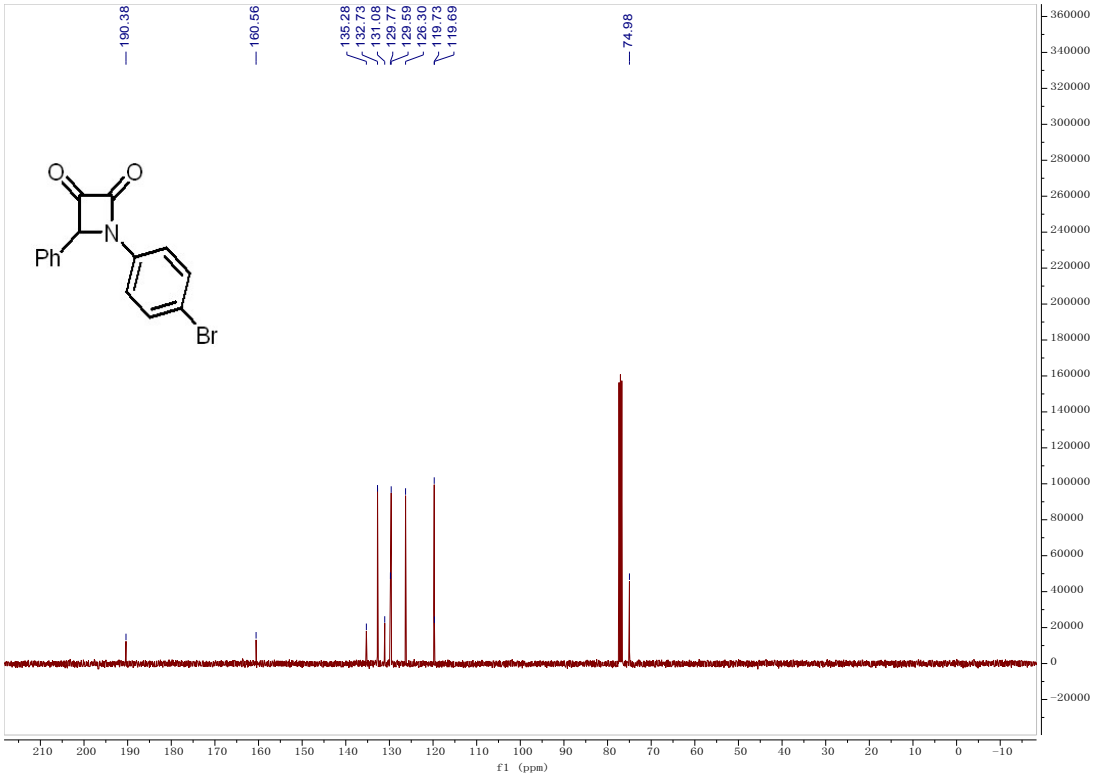
^{1}H NMR and ^{13}C NMR of 1d



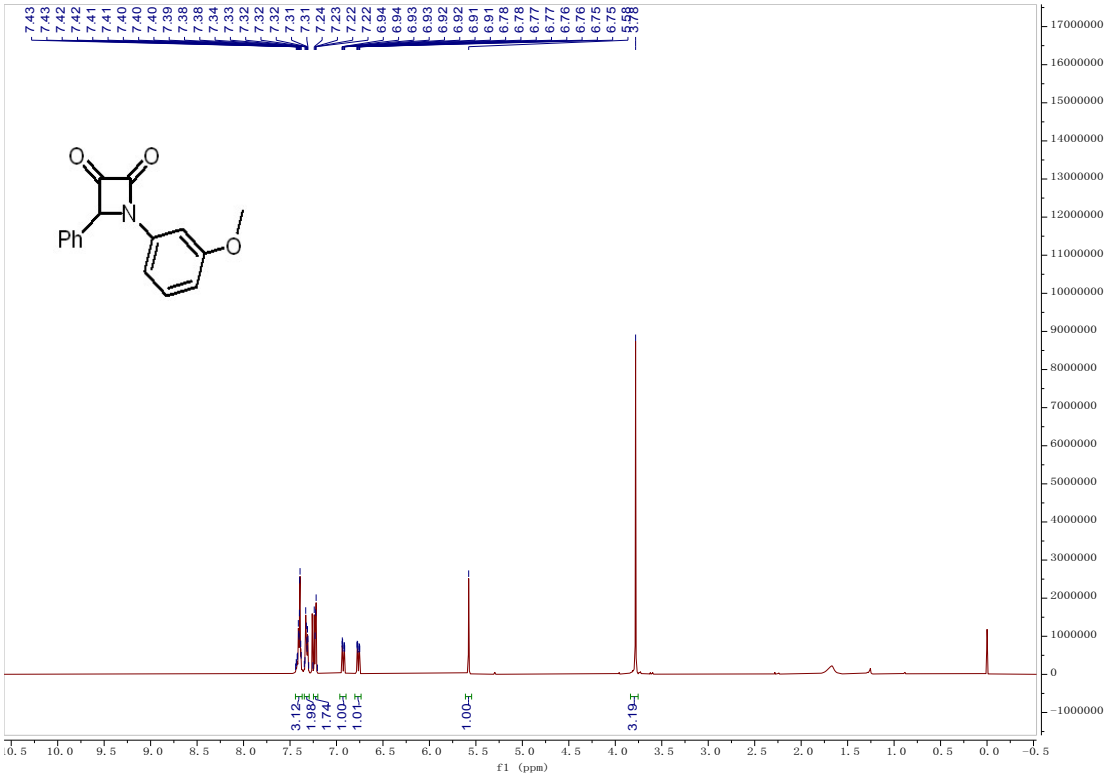


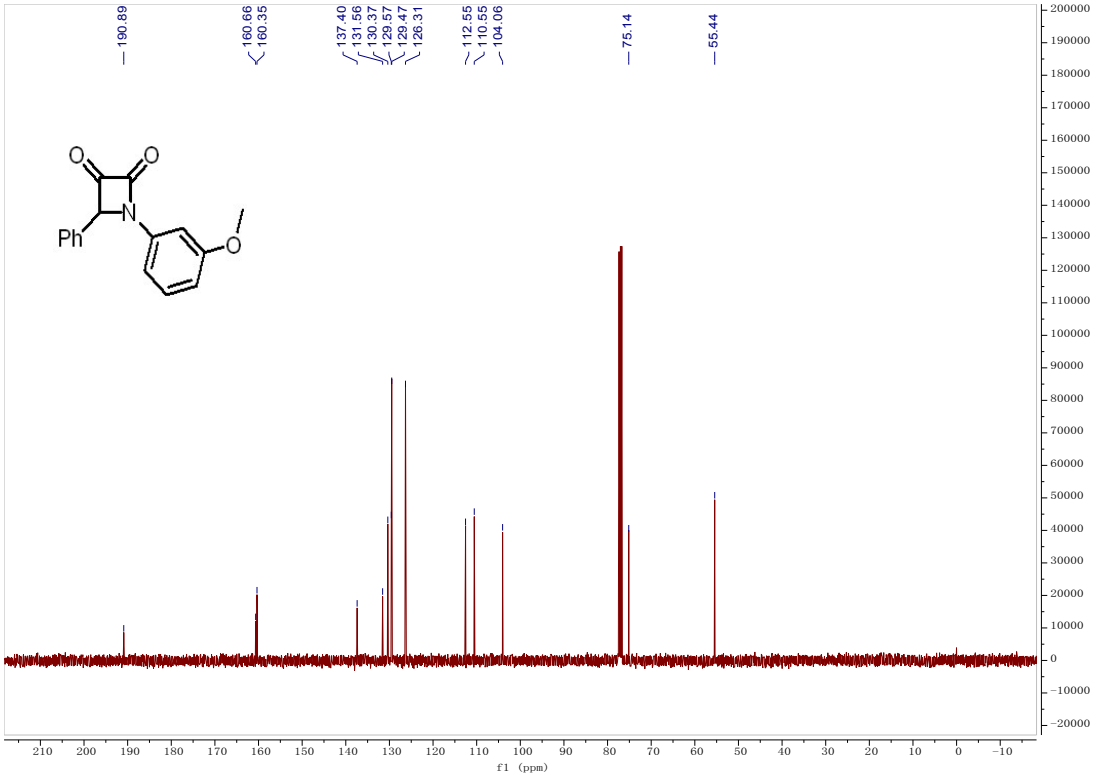
^{1}H NMR and ^{13}C NMR of 1e



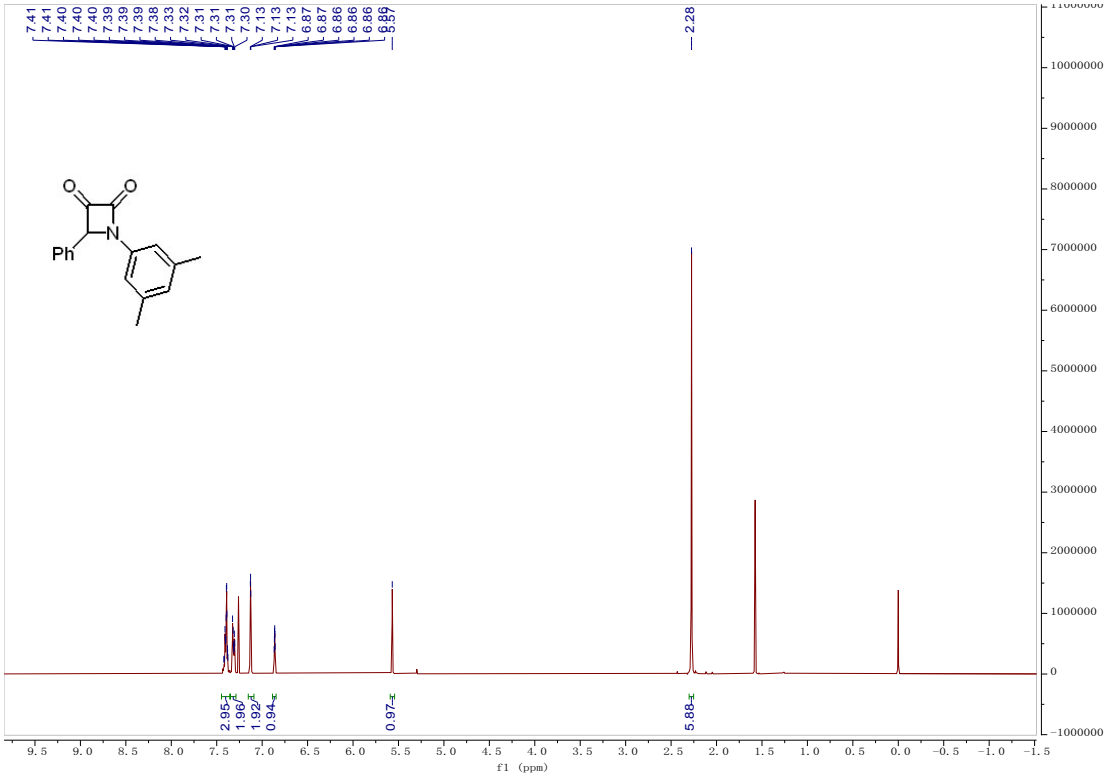


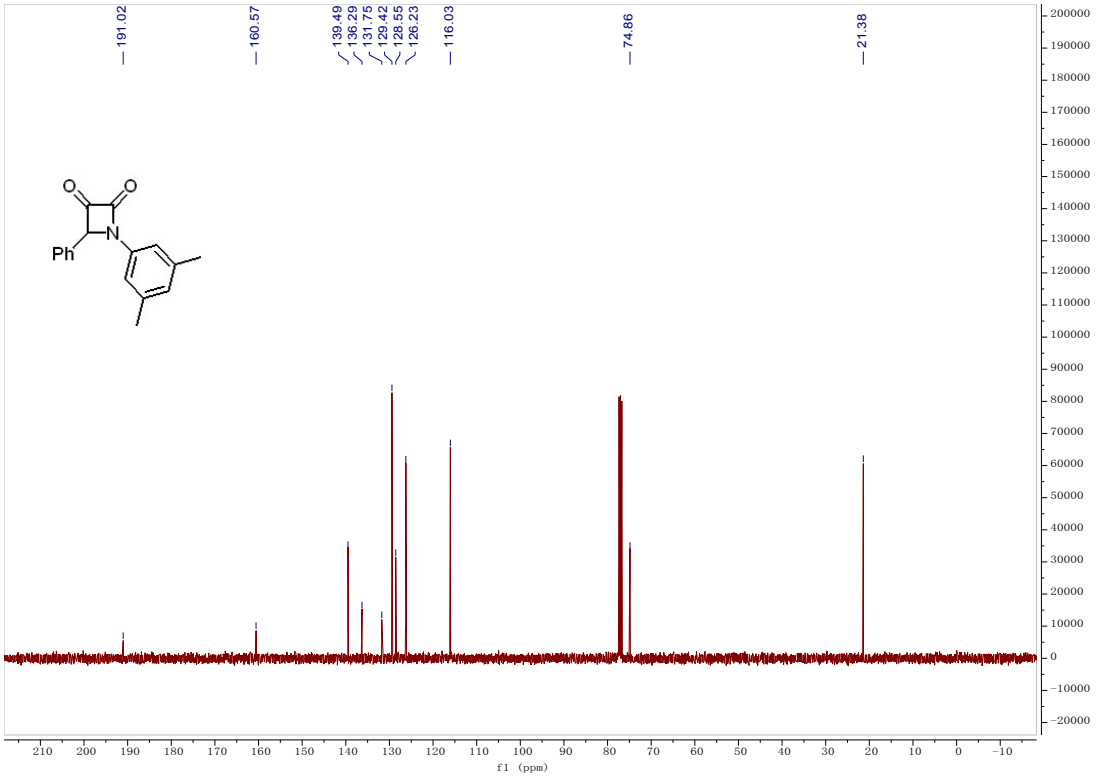
^{1}H NMR and ^{13}C NMR of 1f



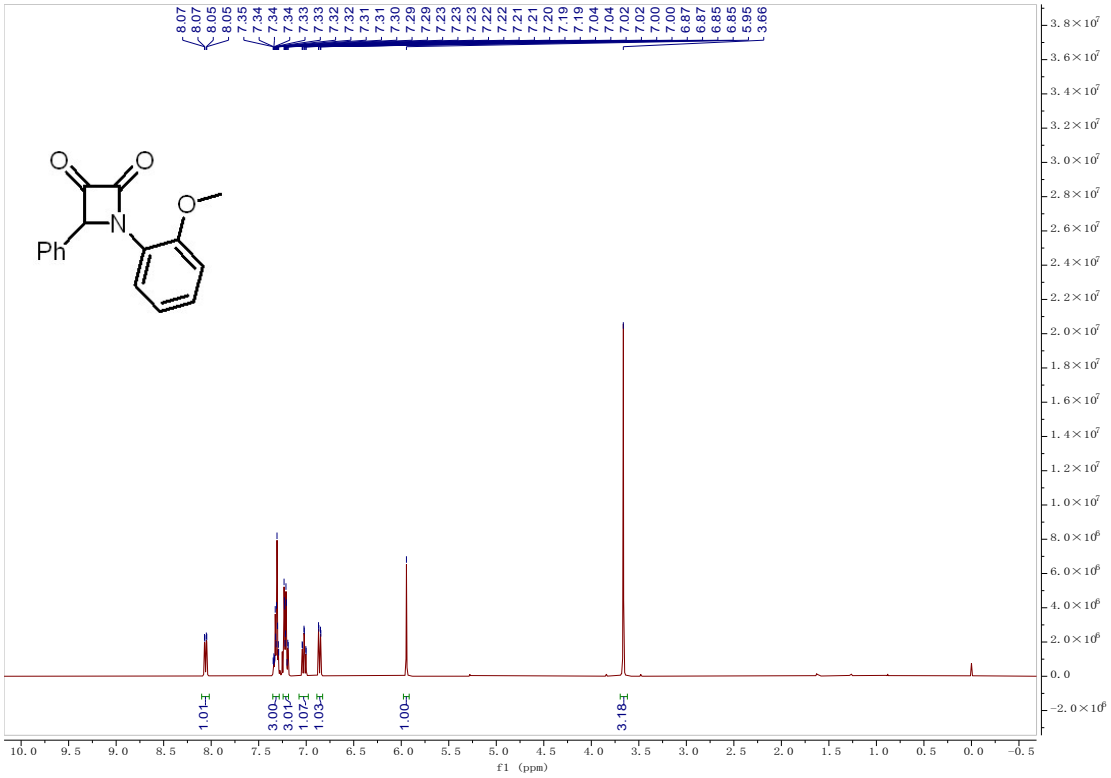


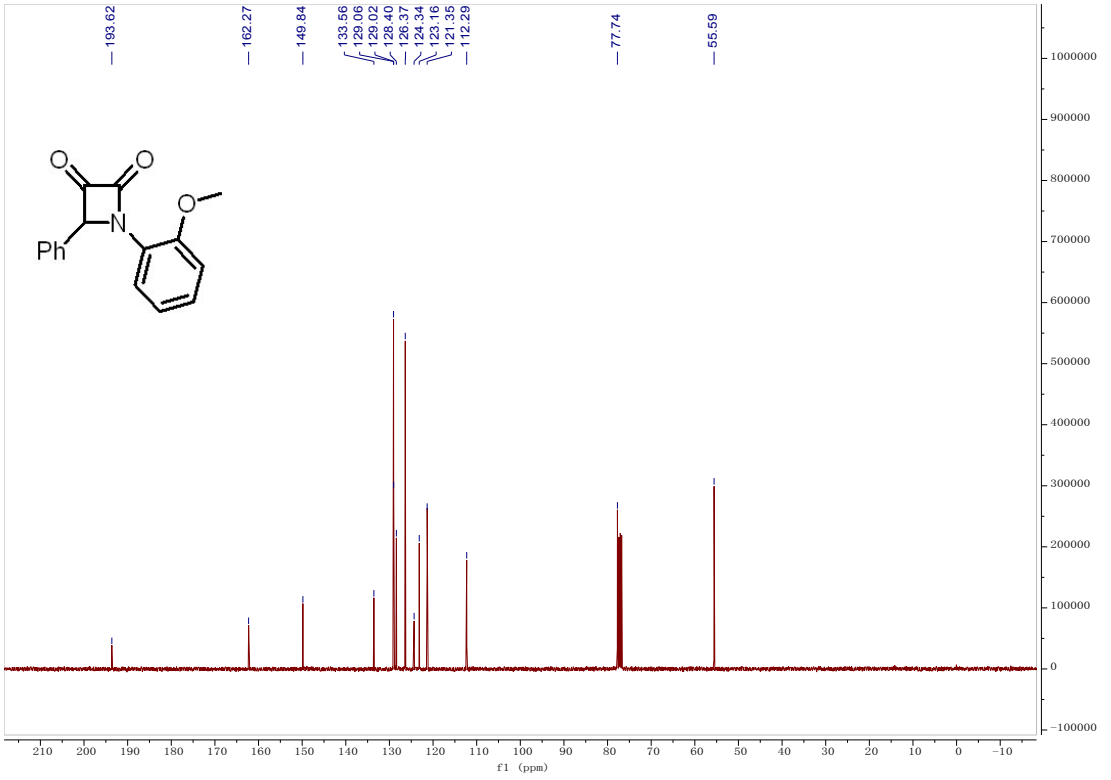
^{1}H NMR and ^{13}C NMR of 1g



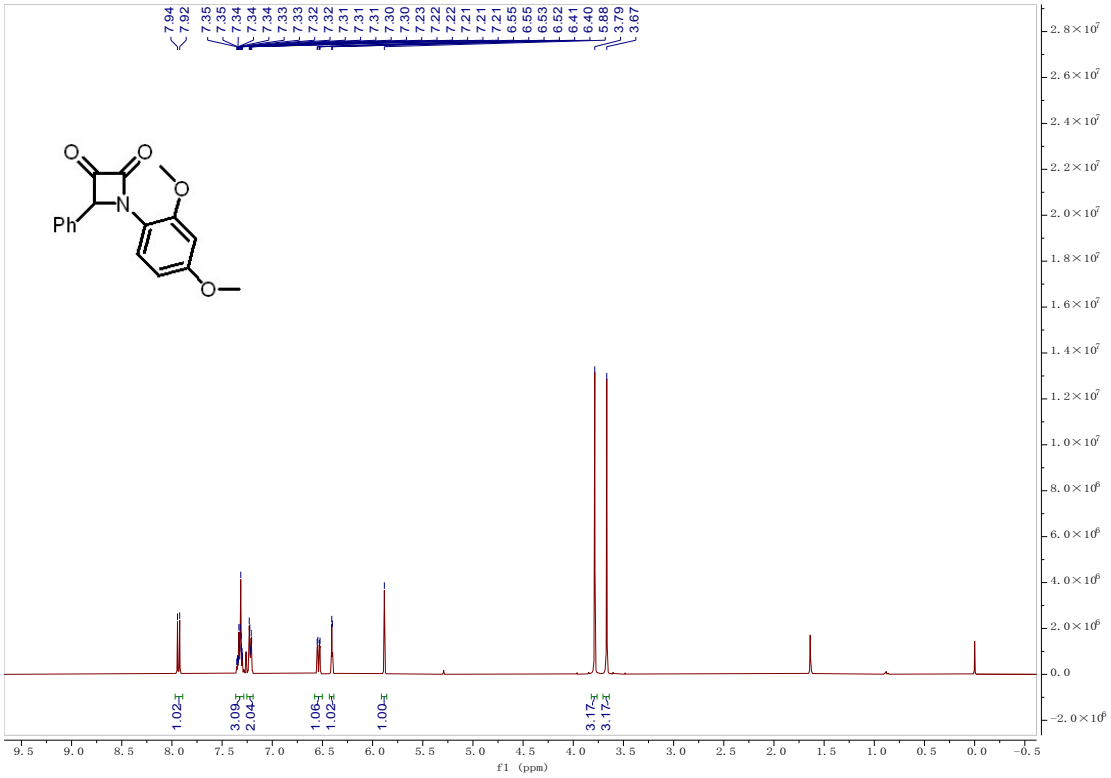


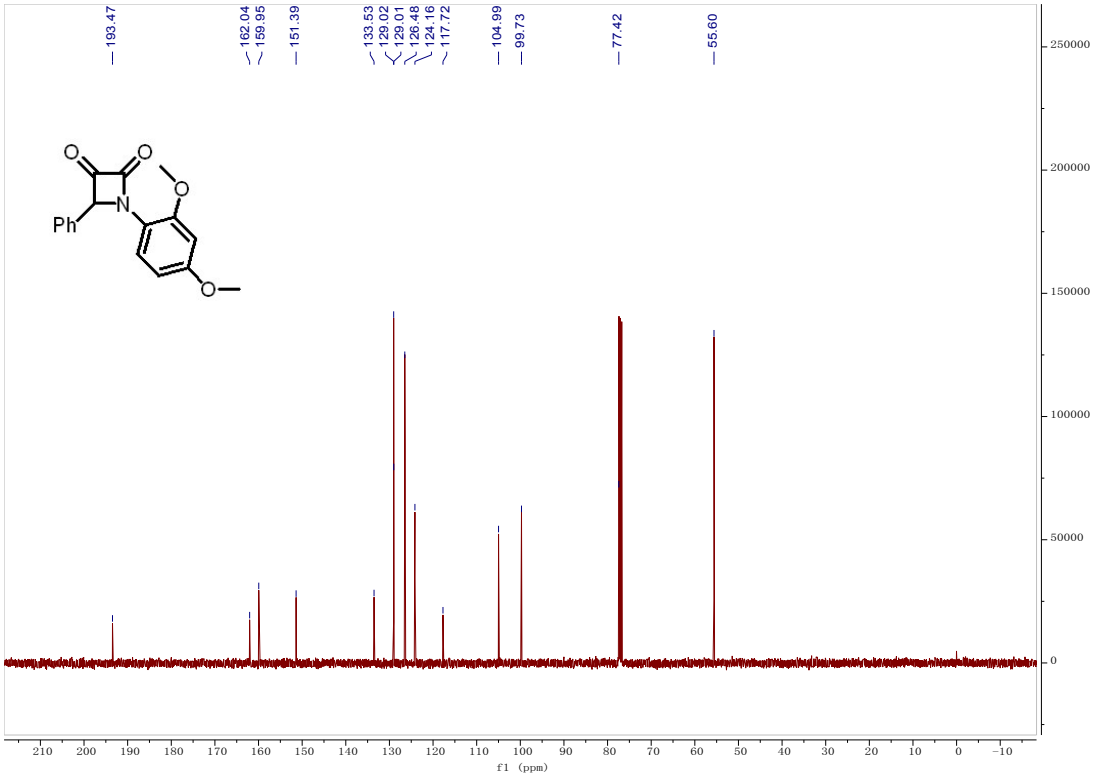
^{1}H NMR and ^{13}C NMR of 1h



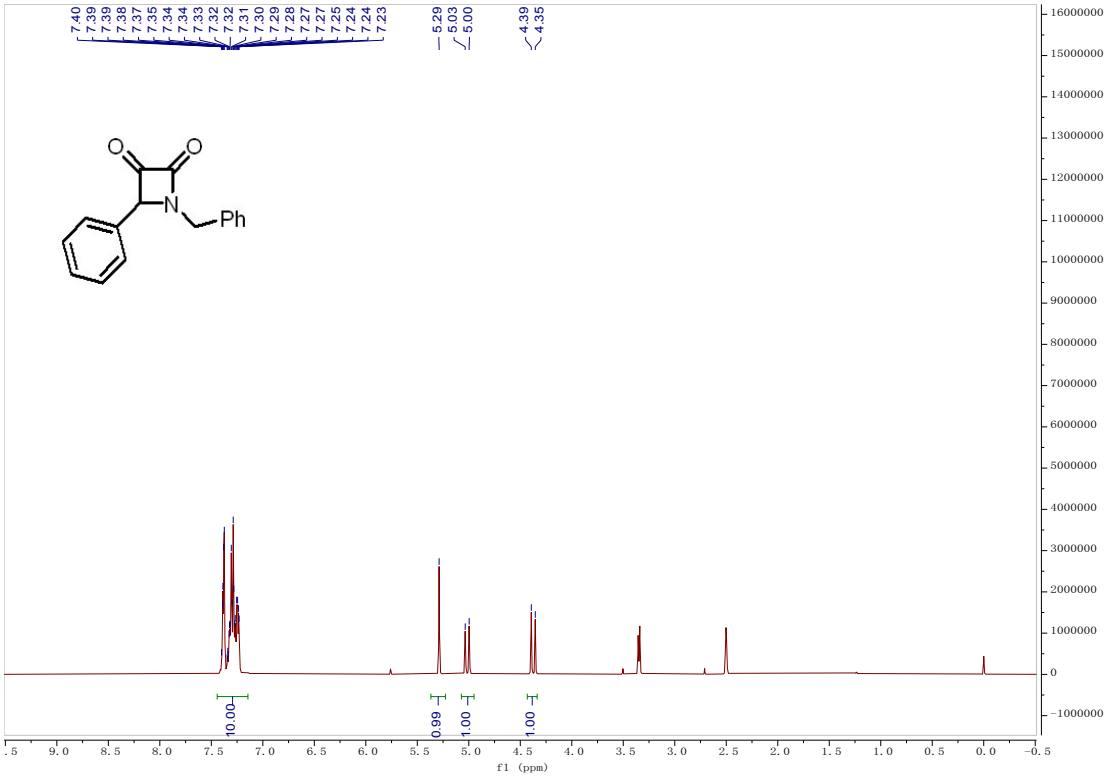


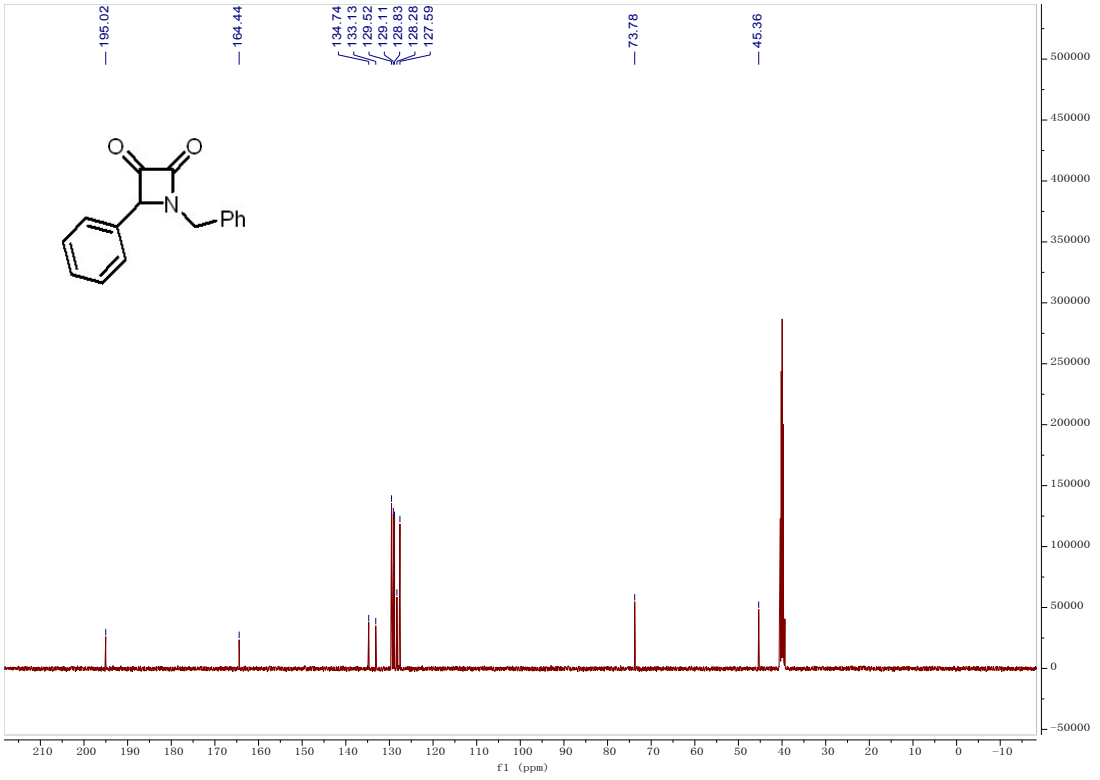
^{1}H NMR and ^{13}C NMR of 1i



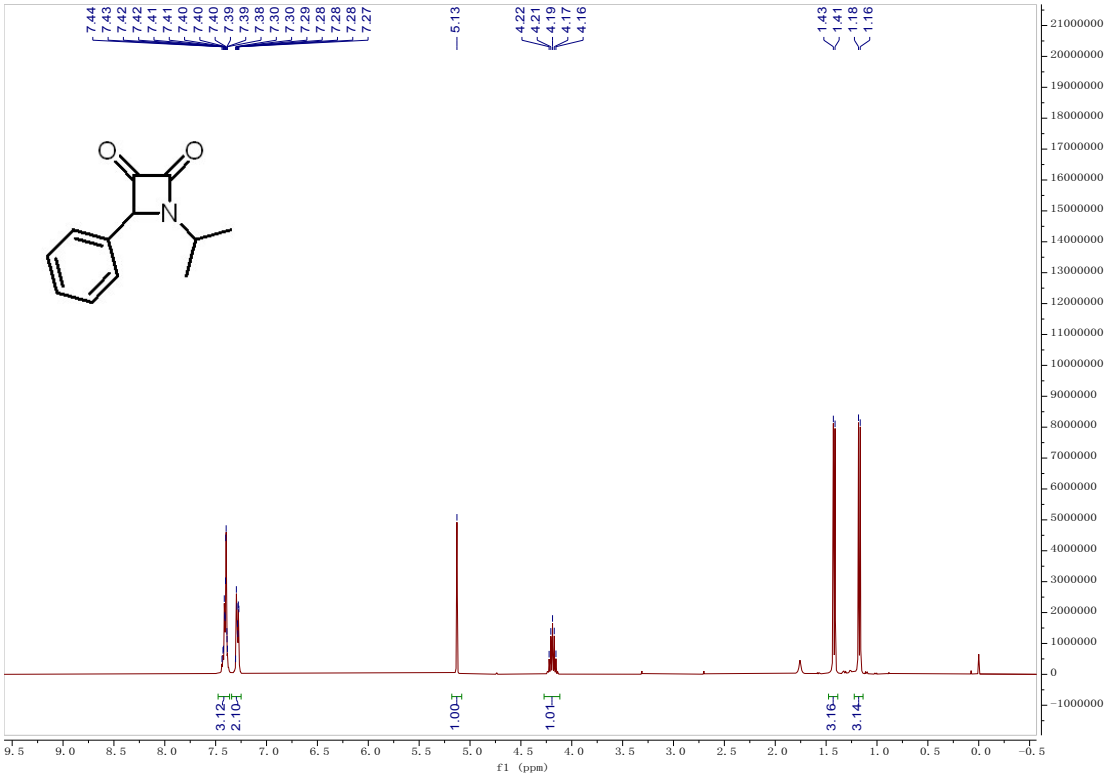


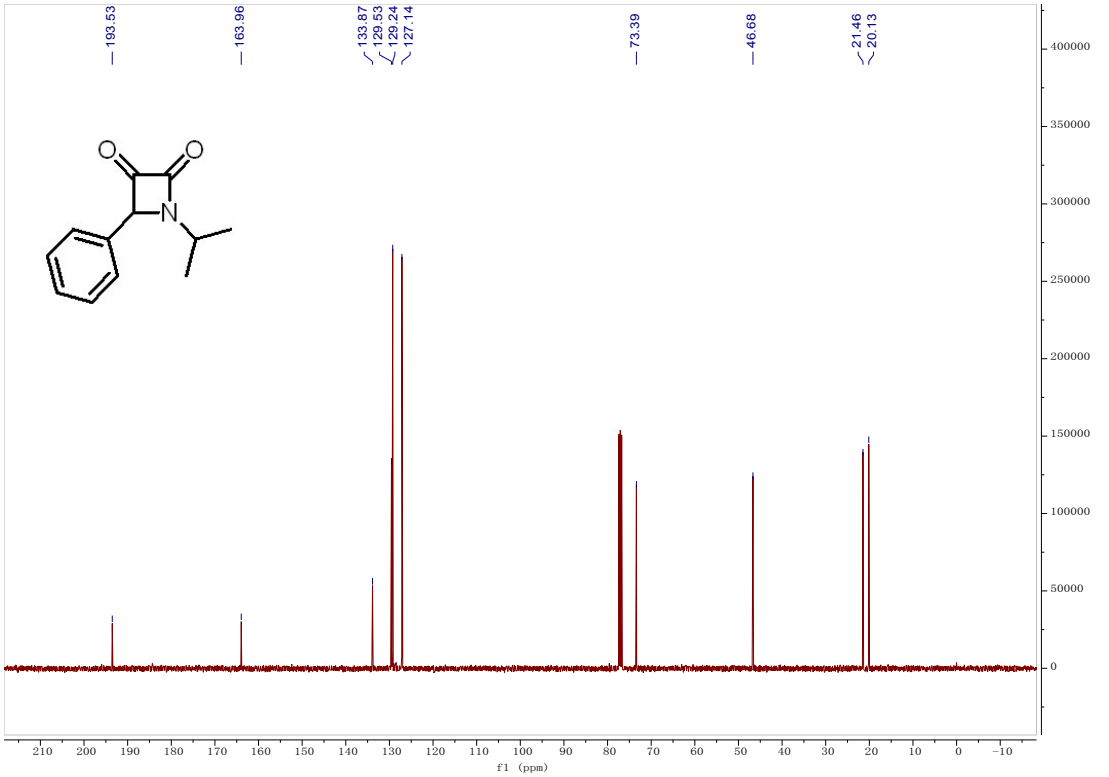
^{1}H NMR and ^{13}C NMR of 1j





^{1}H NMR and ^{13}C NMR of 1k





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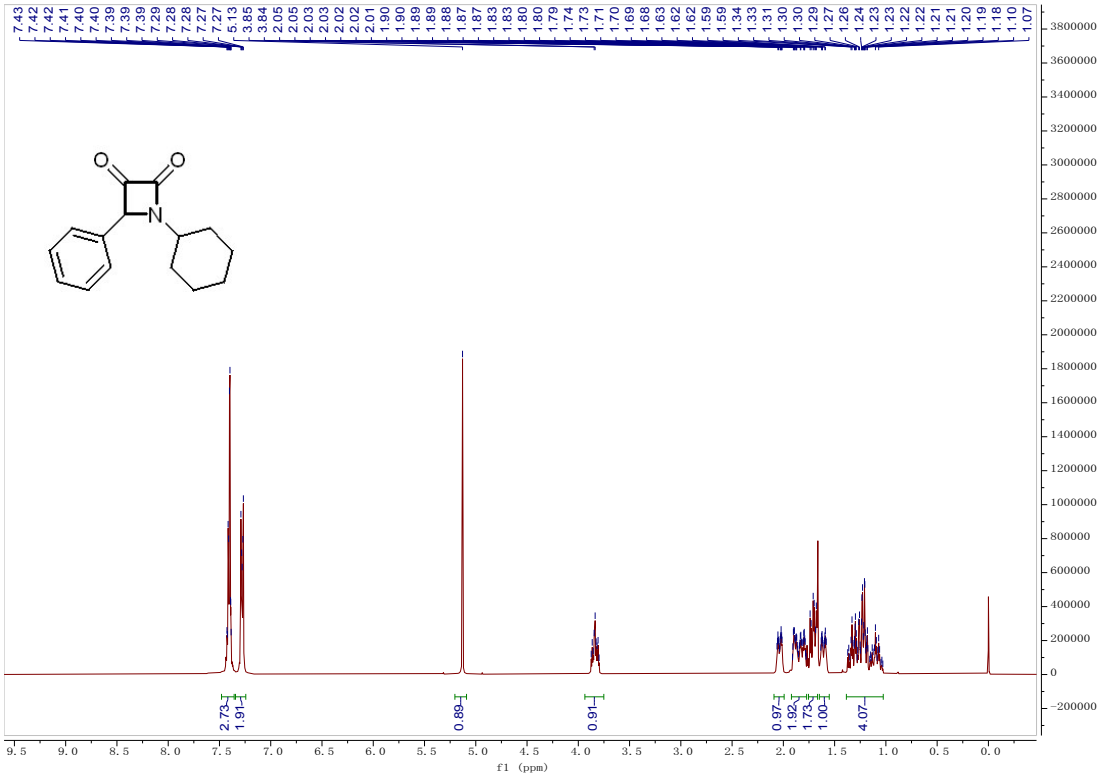
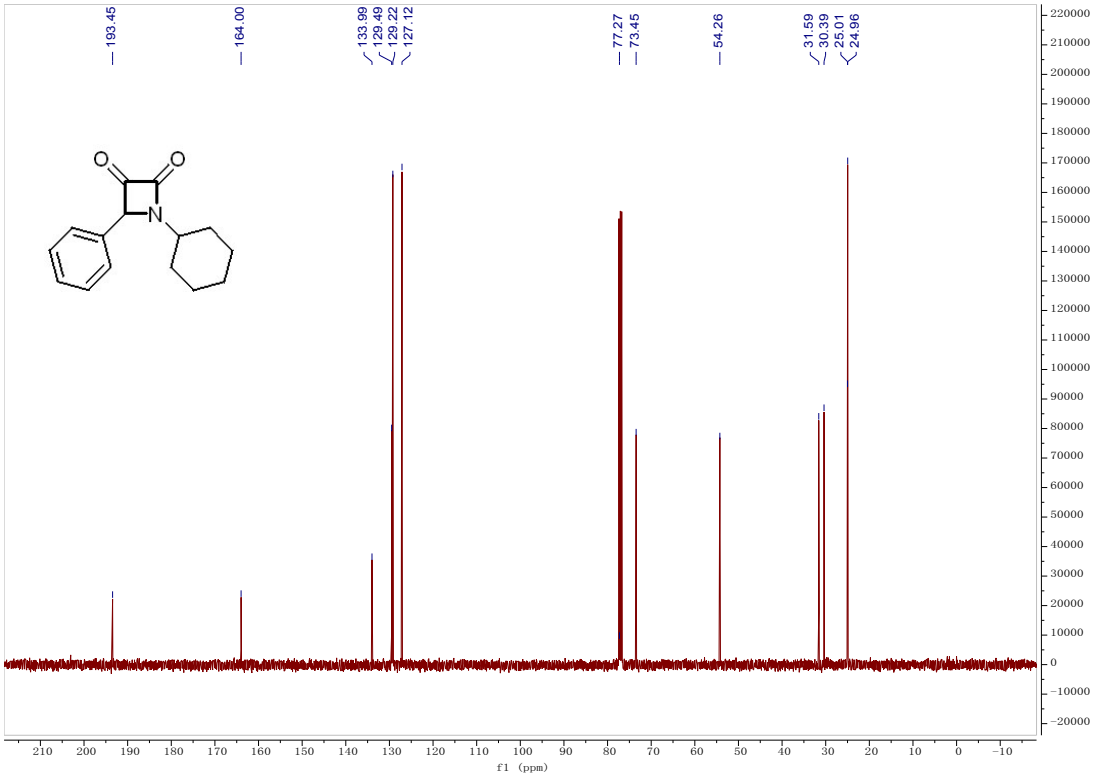
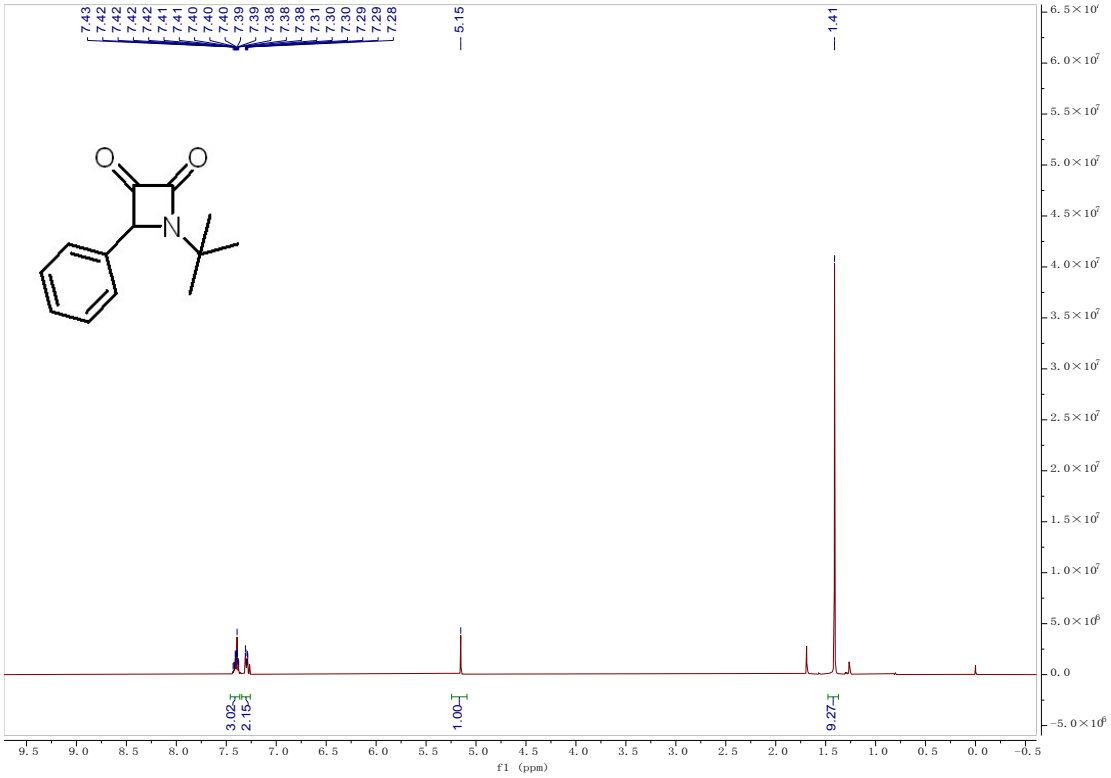
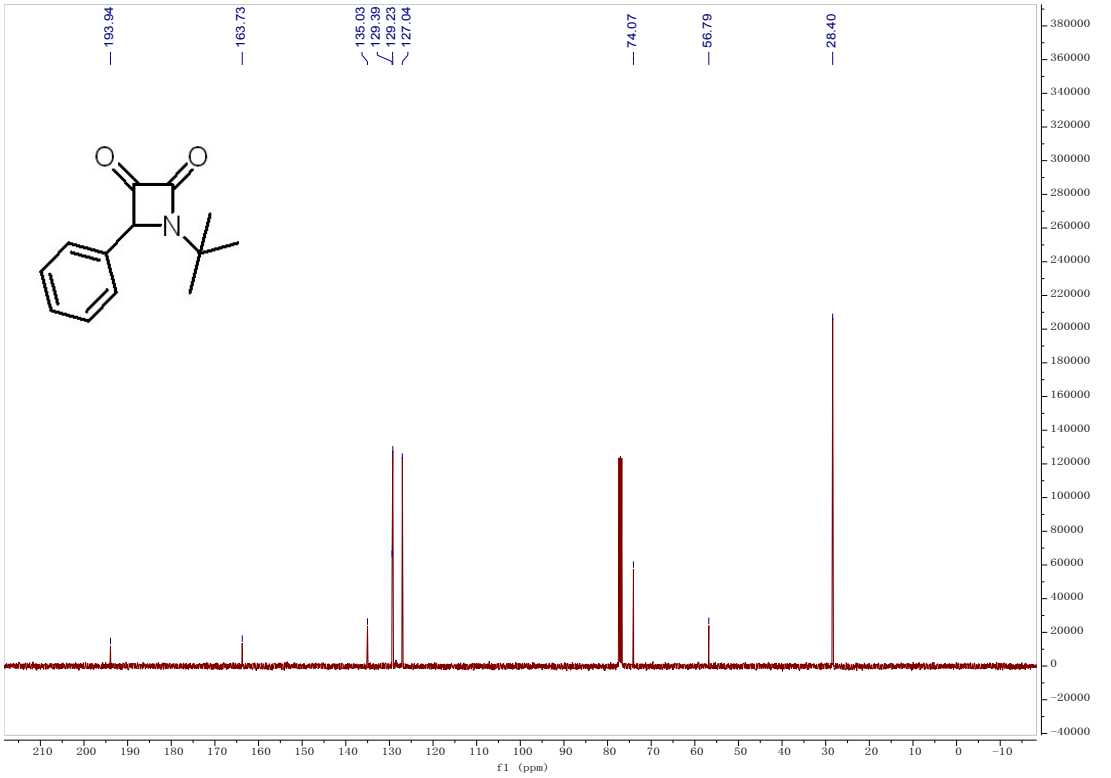




^{1}H NMR and ^{13}C NMR of 1m





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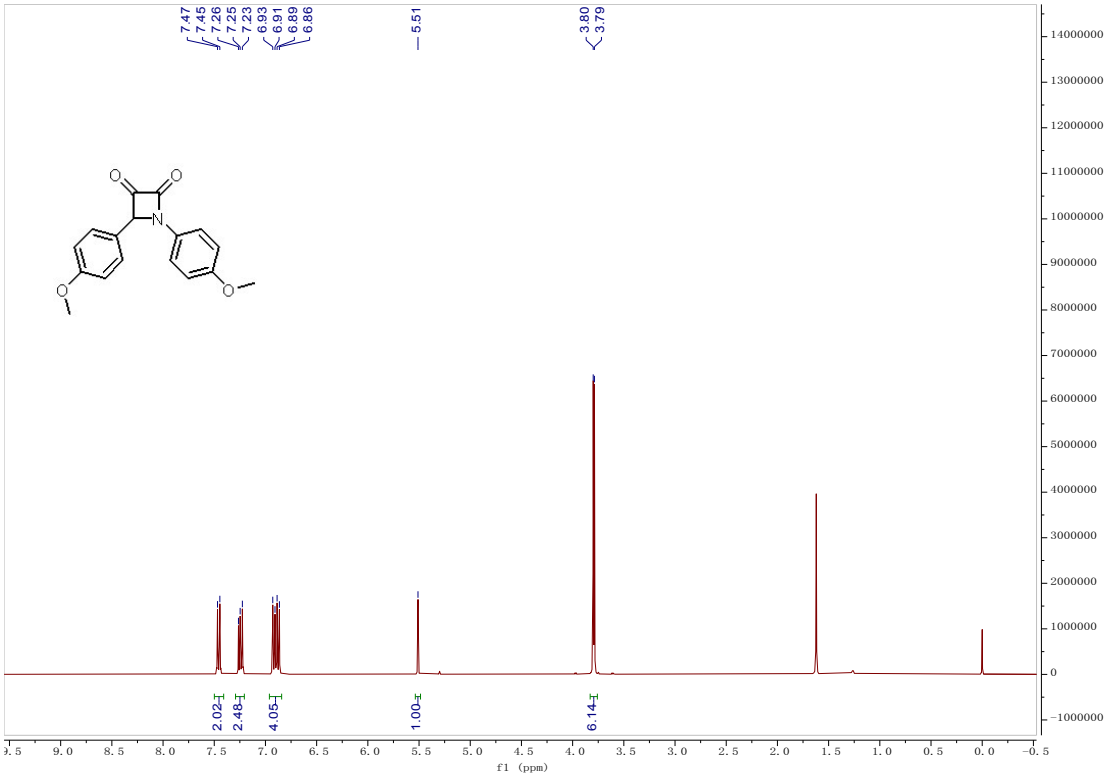

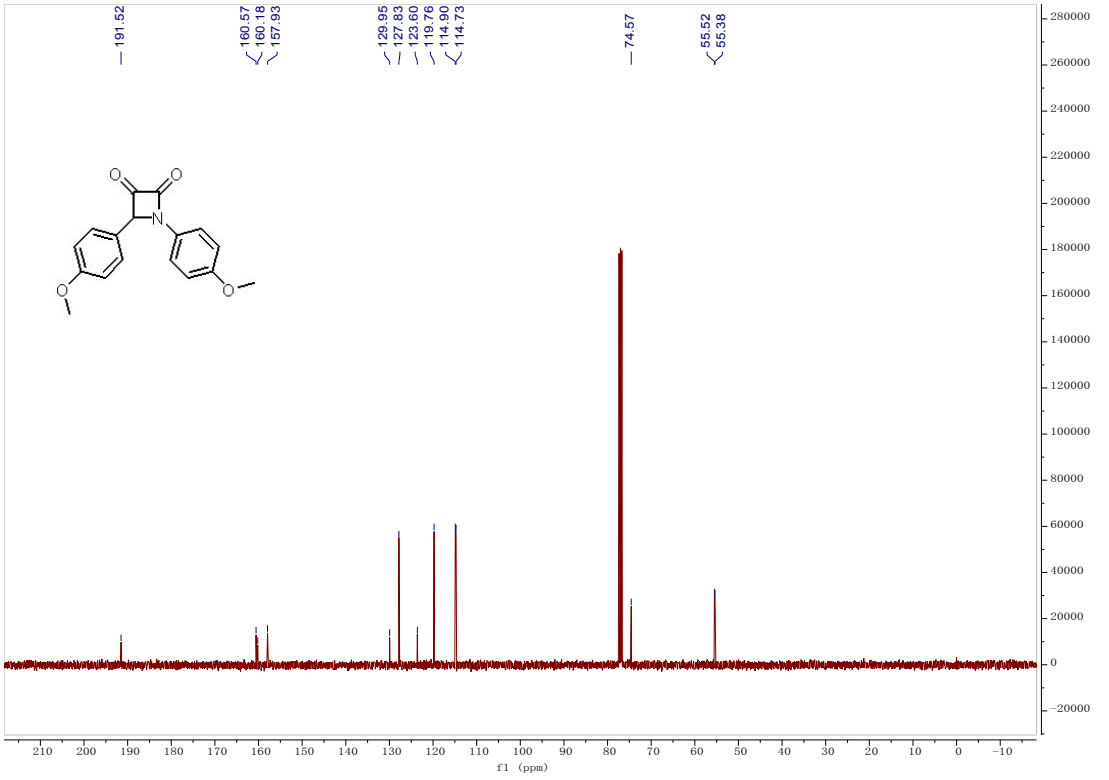

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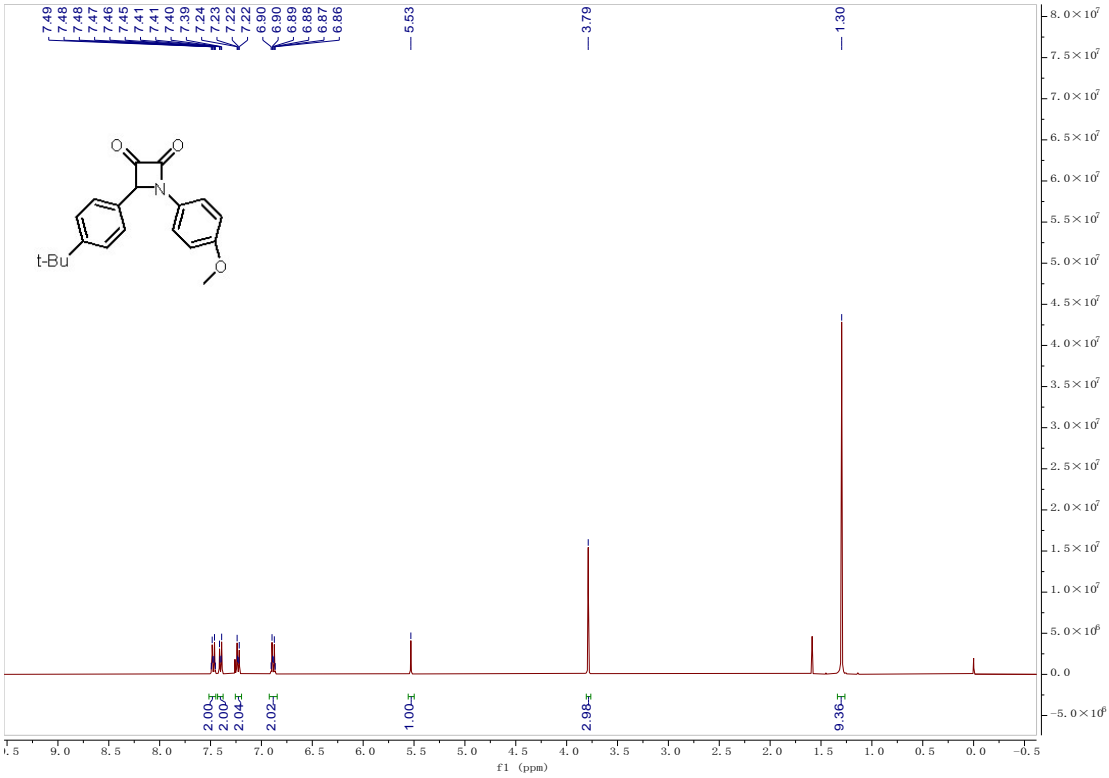
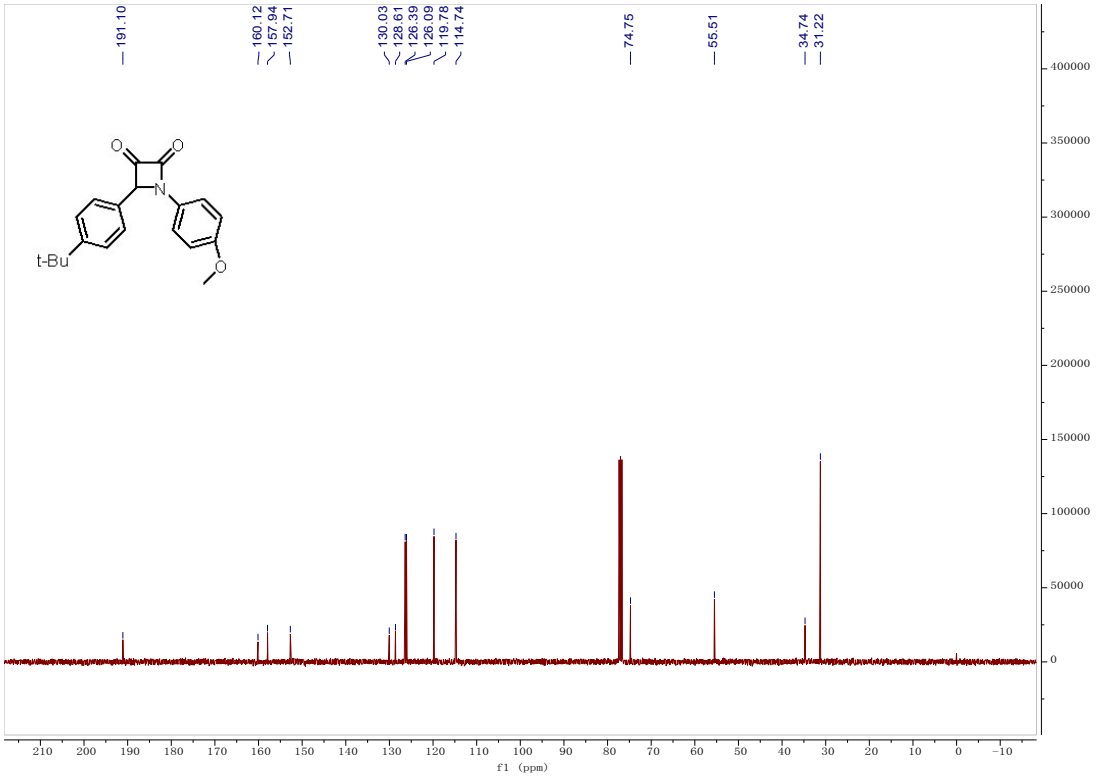
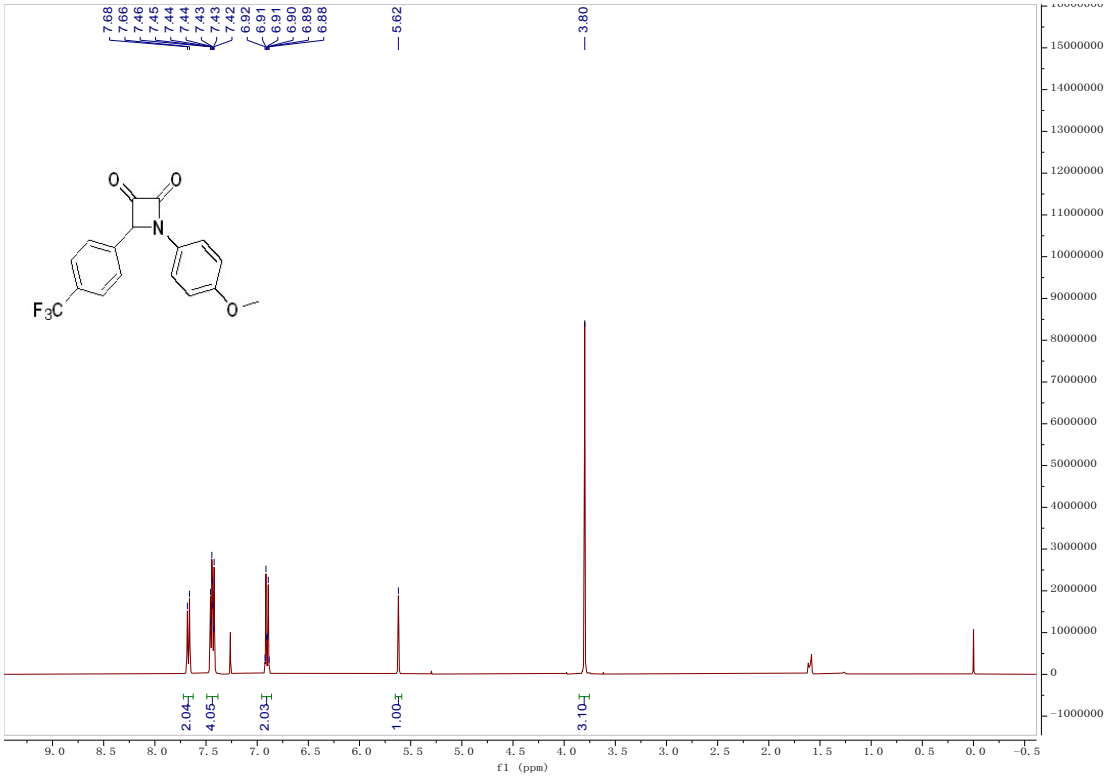
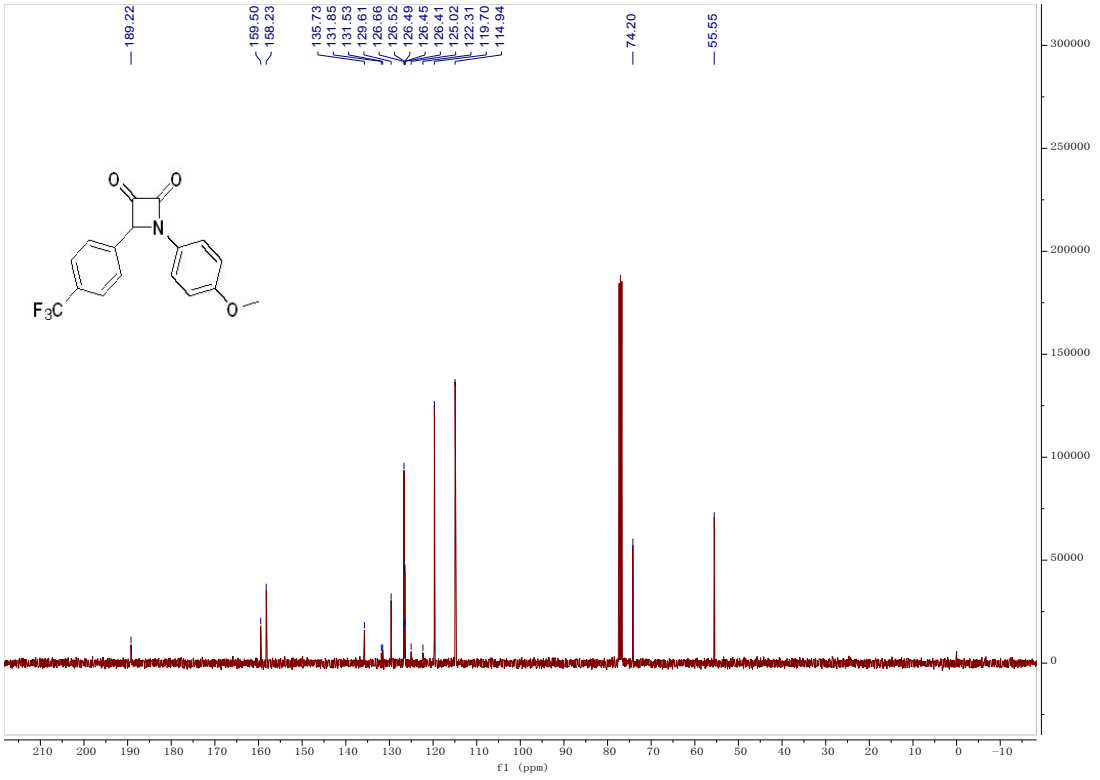


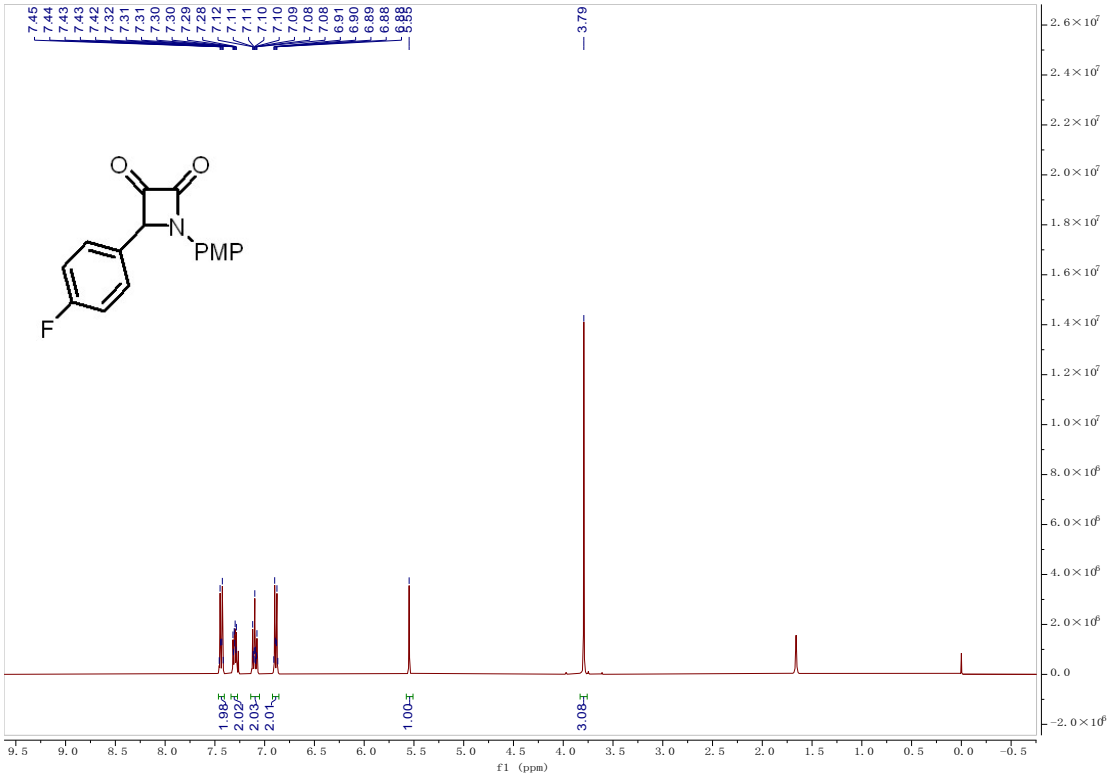


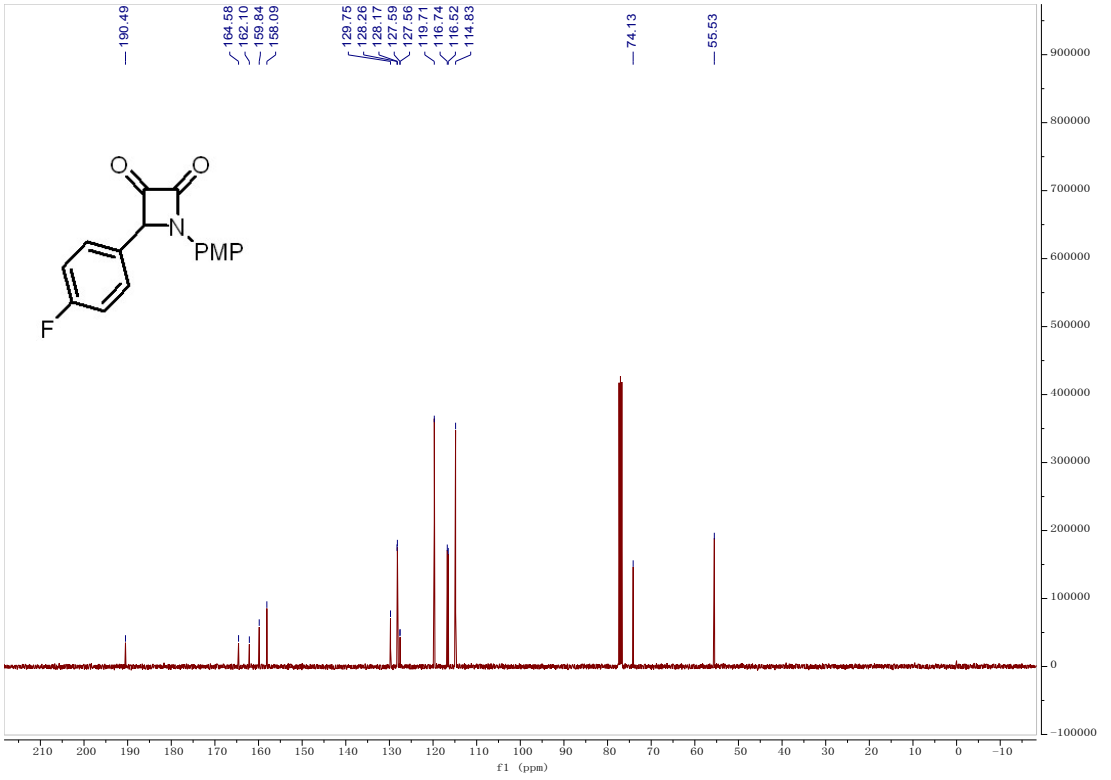
^{1}H NMR and ^{13}C NMR of 1p



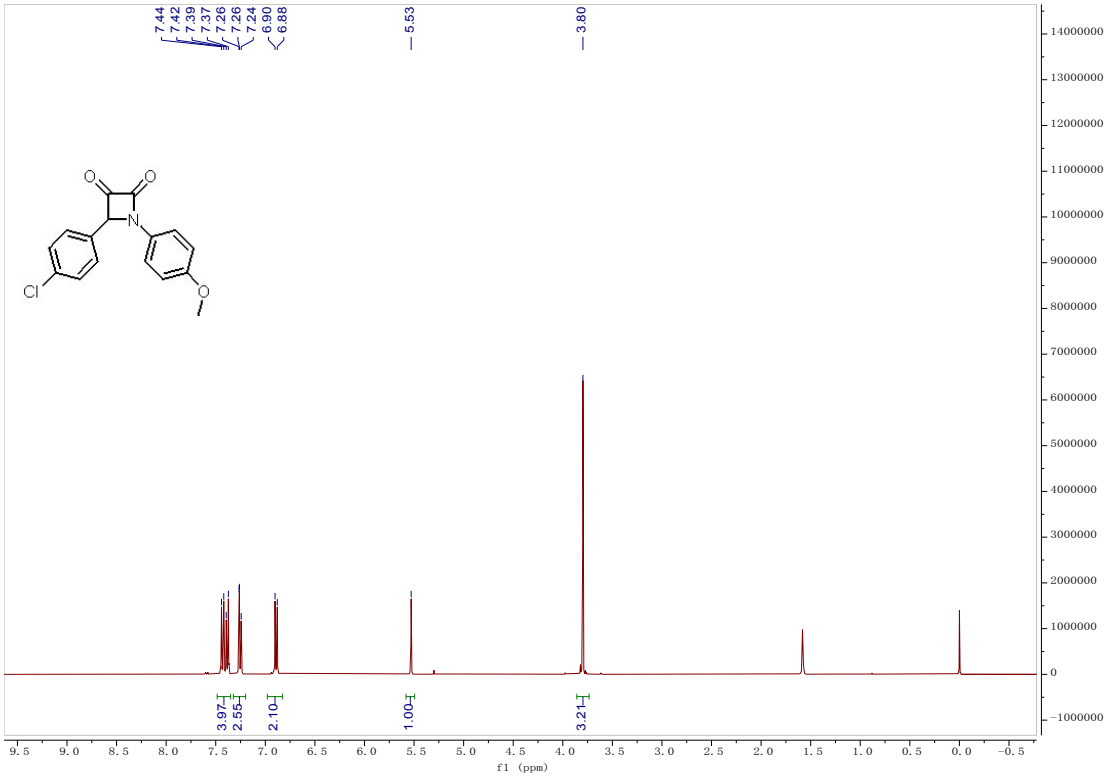


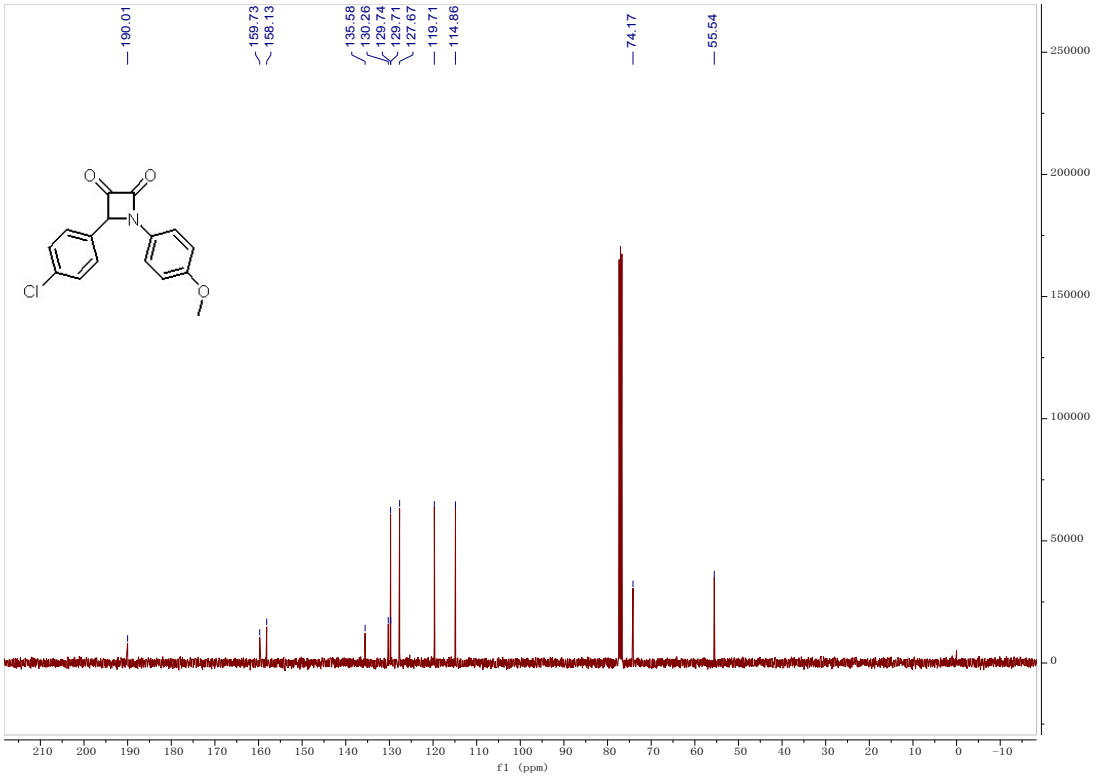
^{1}H NMR and ^{13}C NMR of 1q



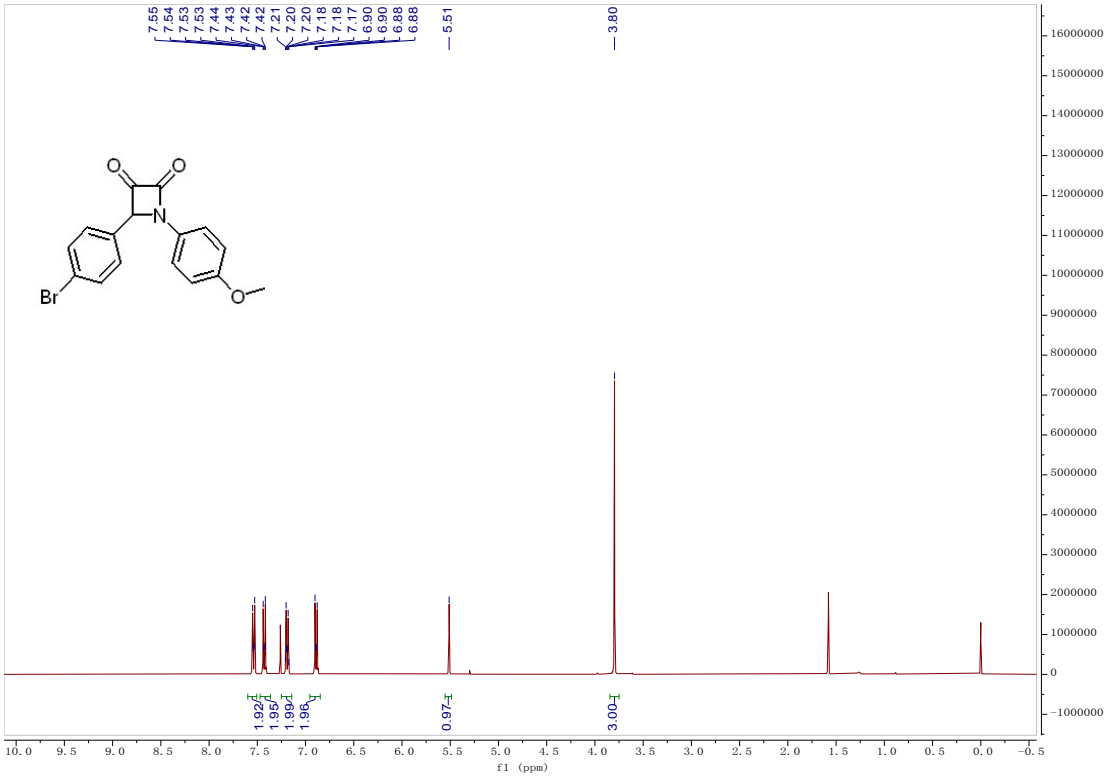


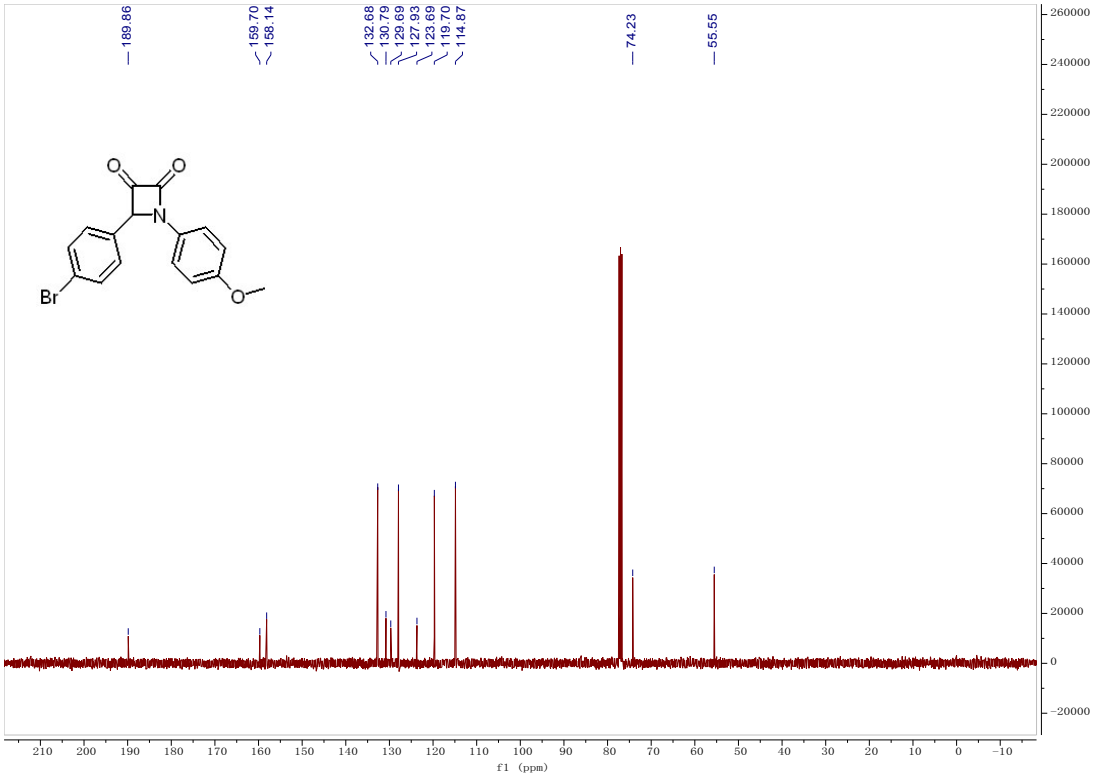
^{1}H NMR and ^{13}C NMR of 1r



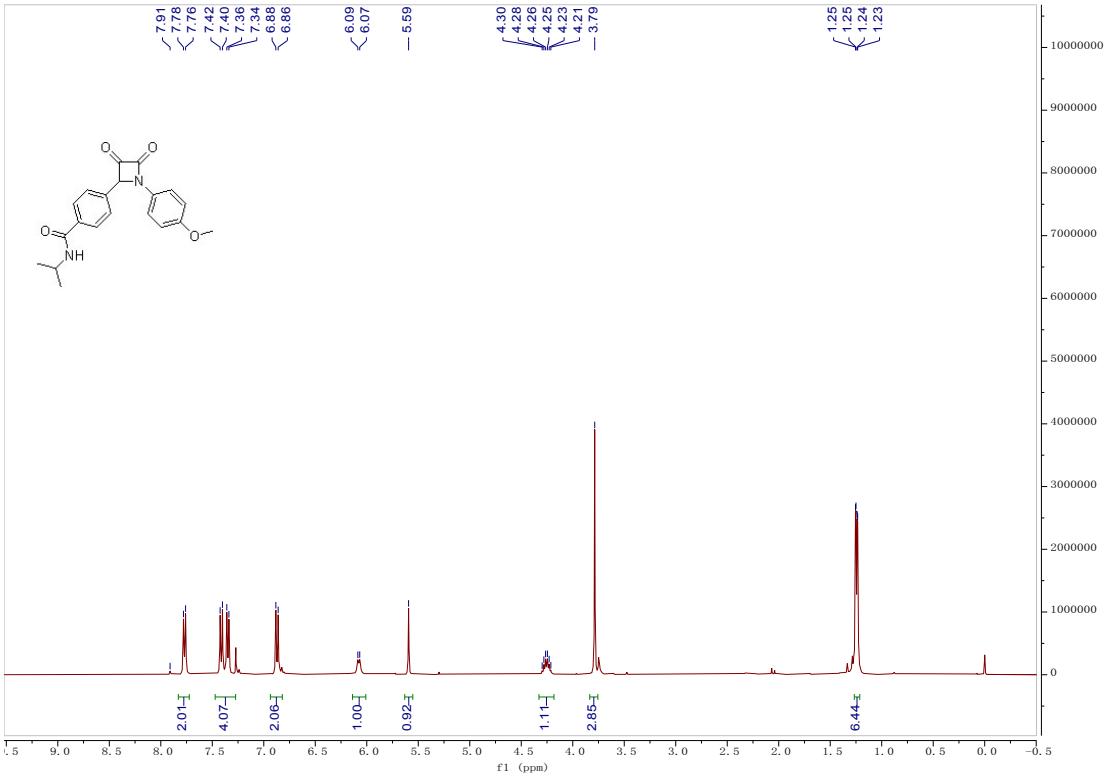


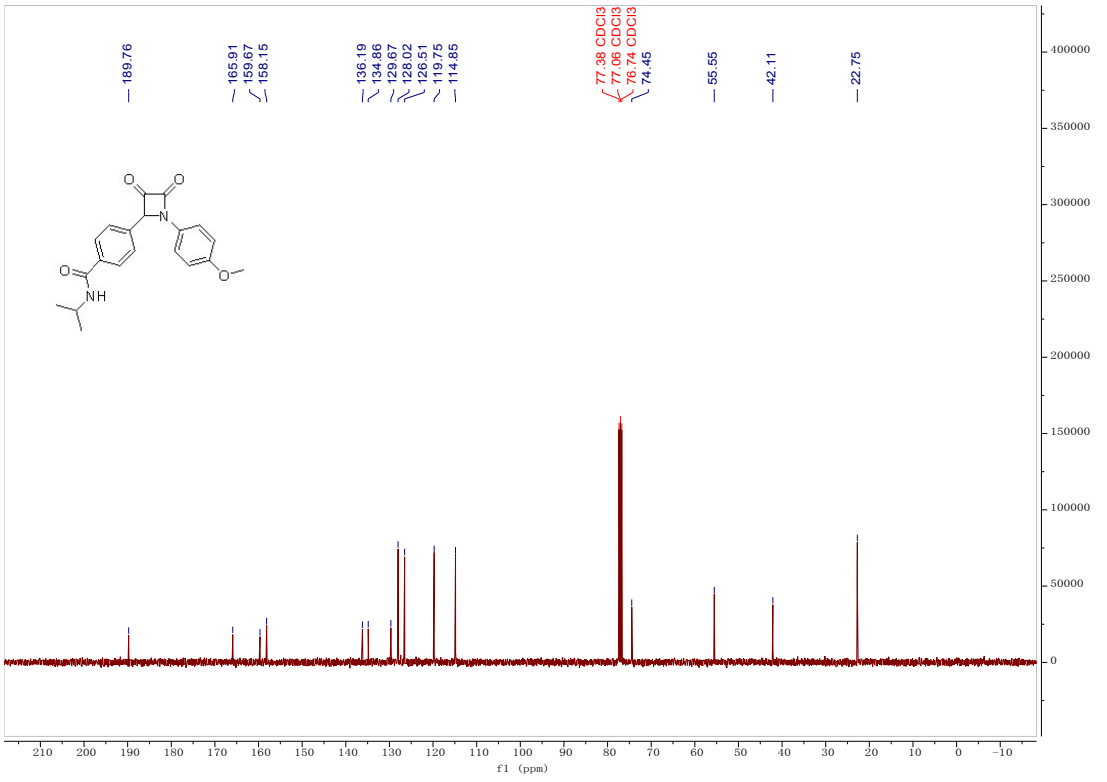
^{1}H NMR and ^{13}C NMR of 1s



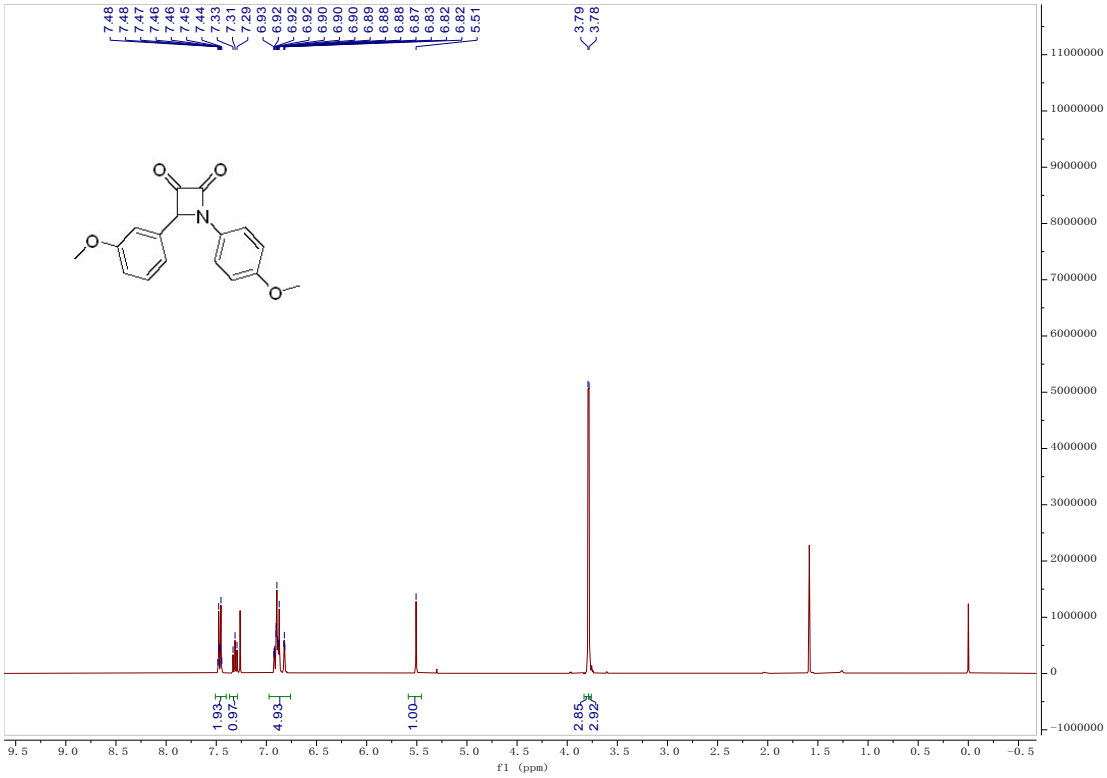


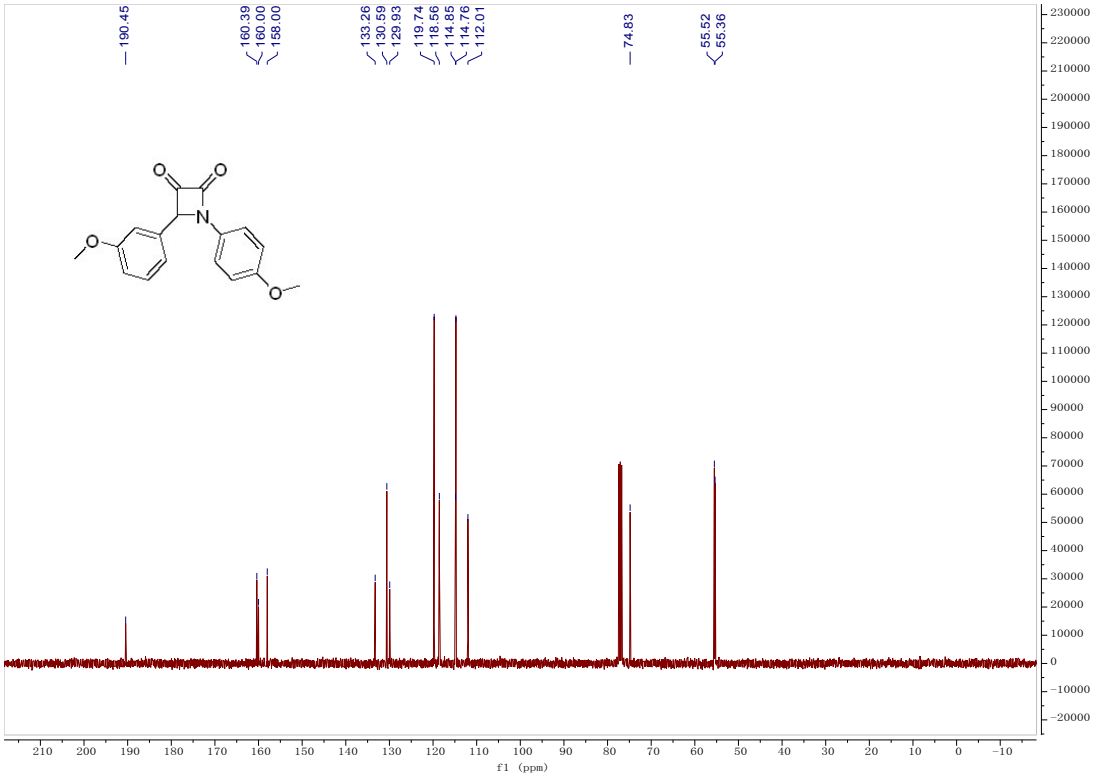
^{1}H NMR and ^{13}C NMR of 1t



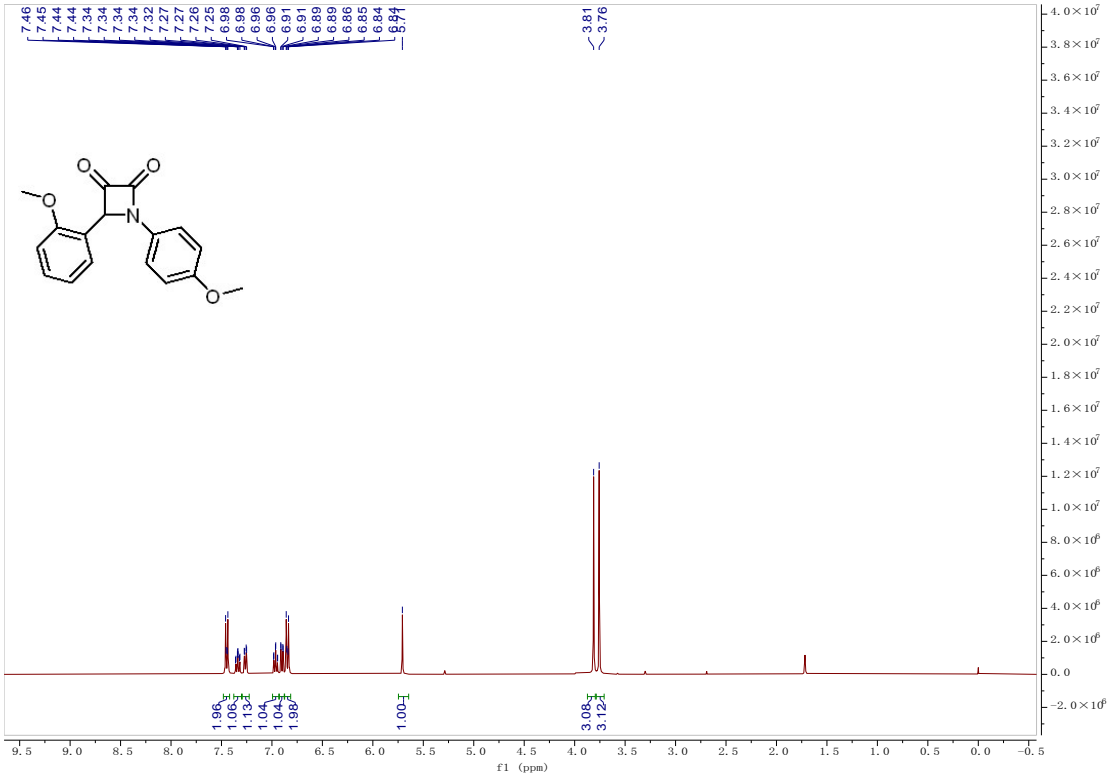


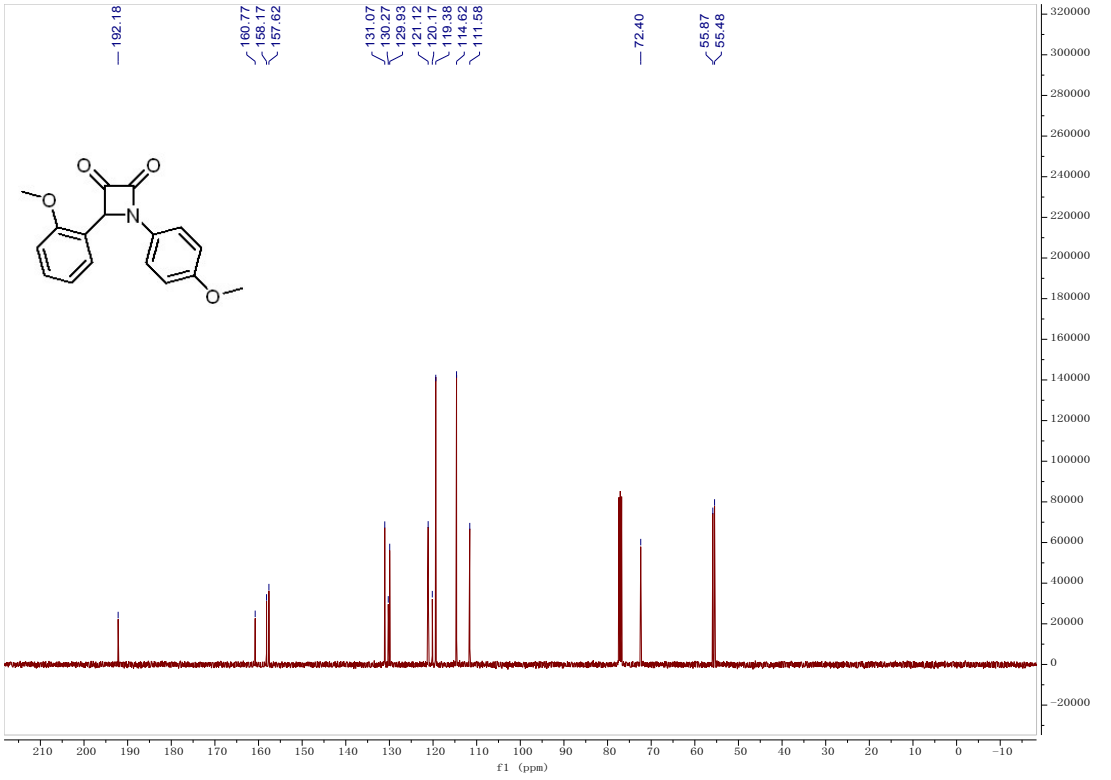
^{1}H NMR and ^{13}C NMR of 1u



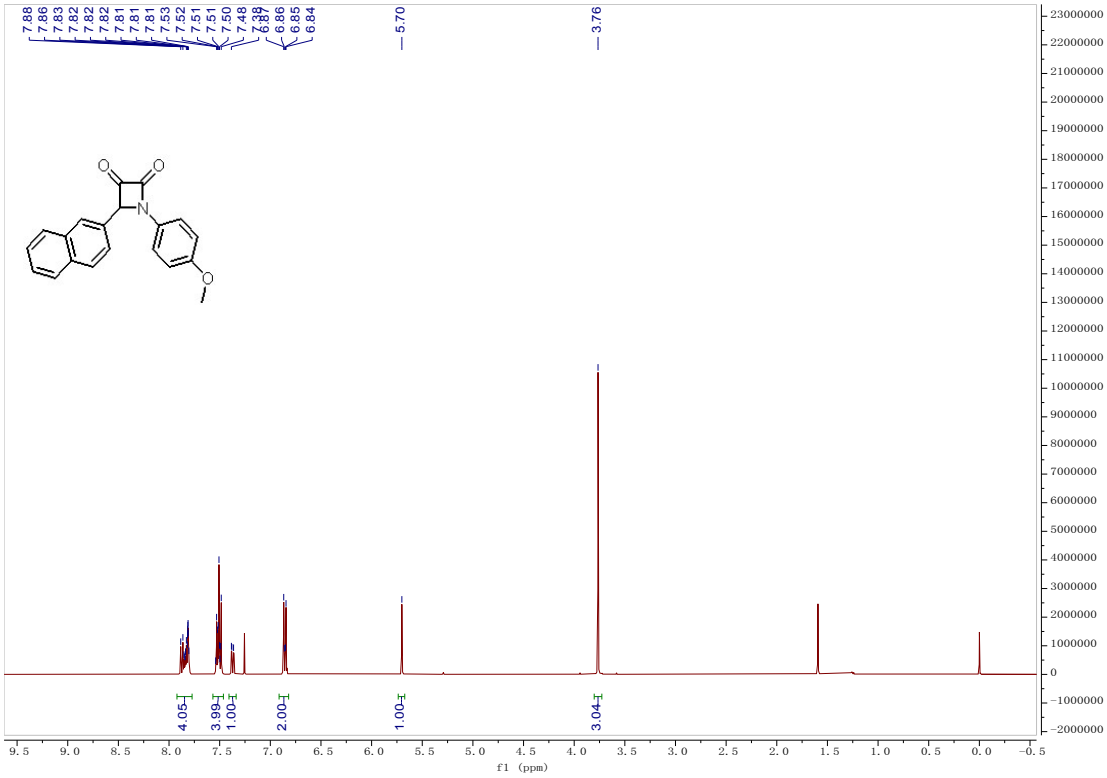


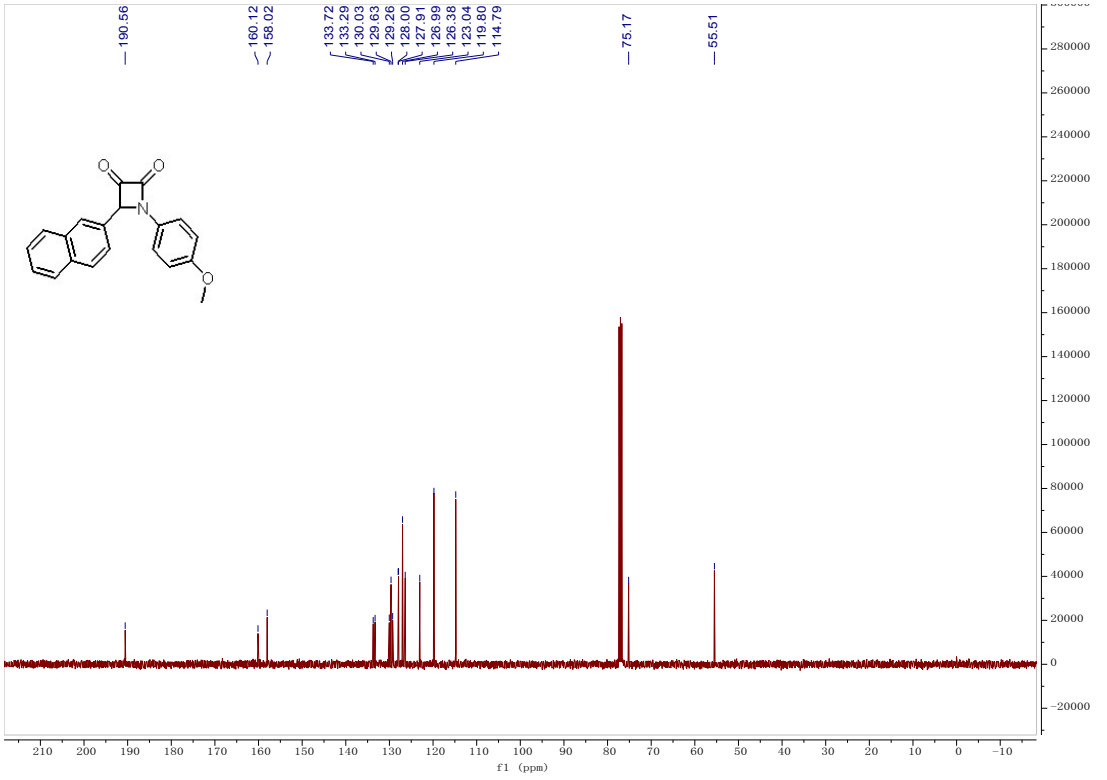
^{1}H NMR and ^{13}C NMR of 1v



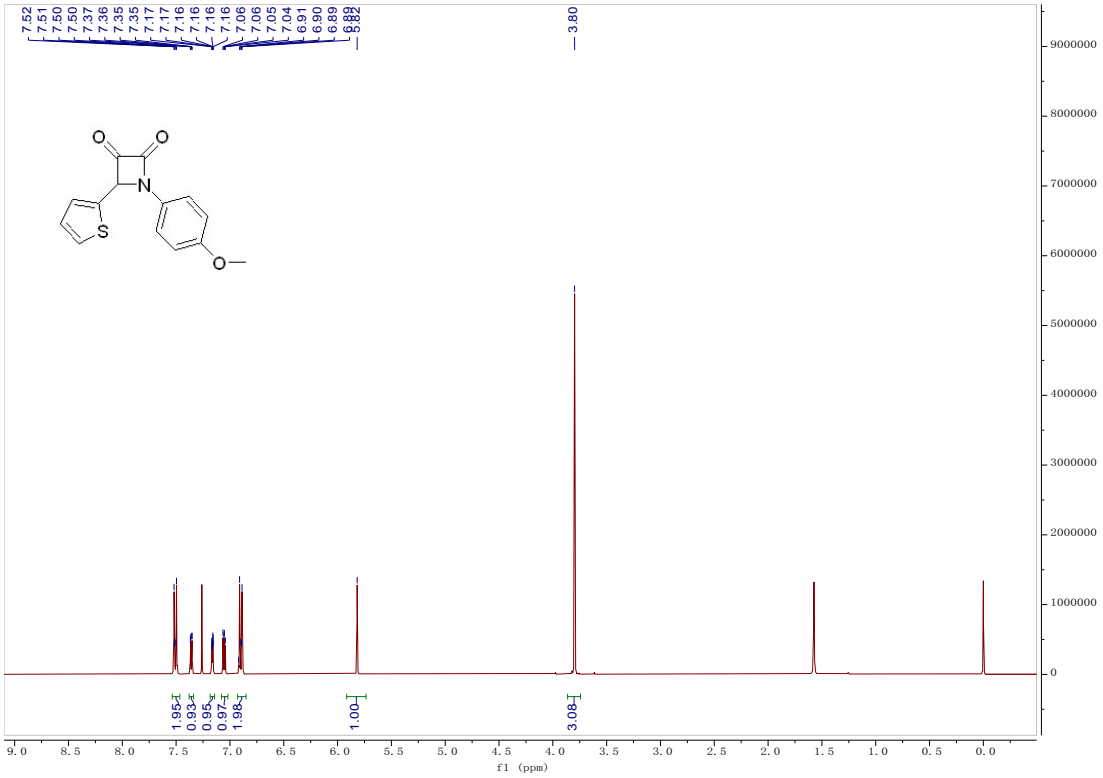


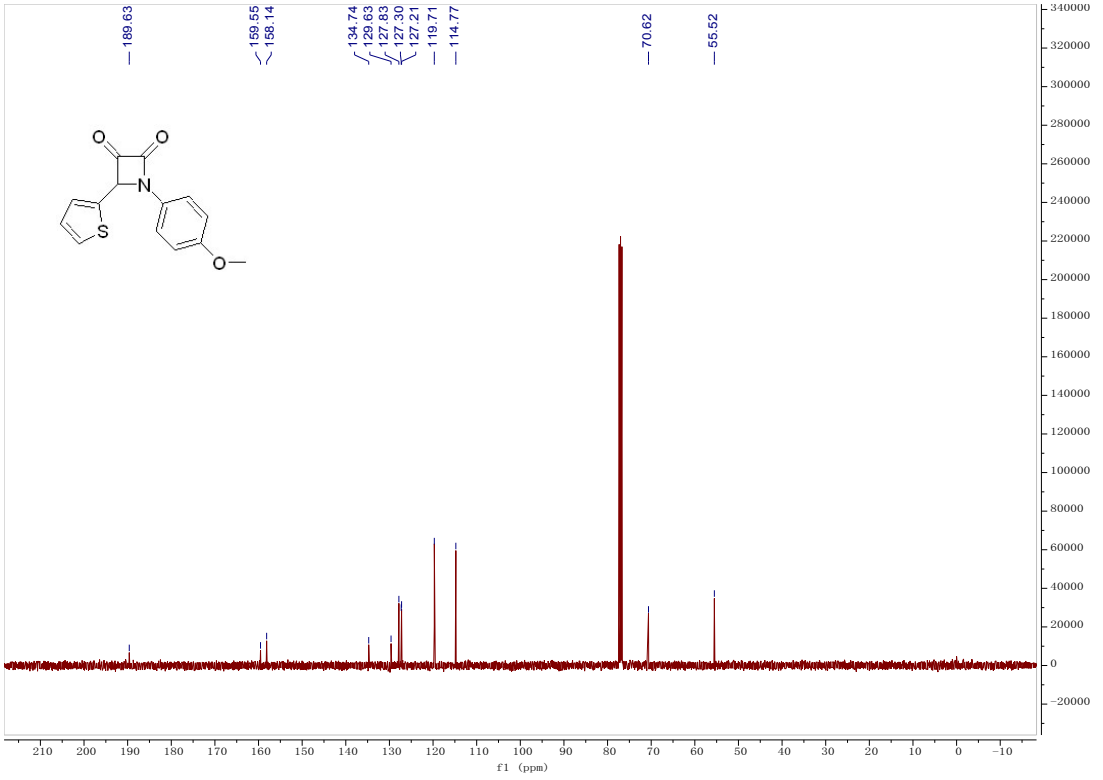
^{1}H NMR and ^{13}C NMR of 1w



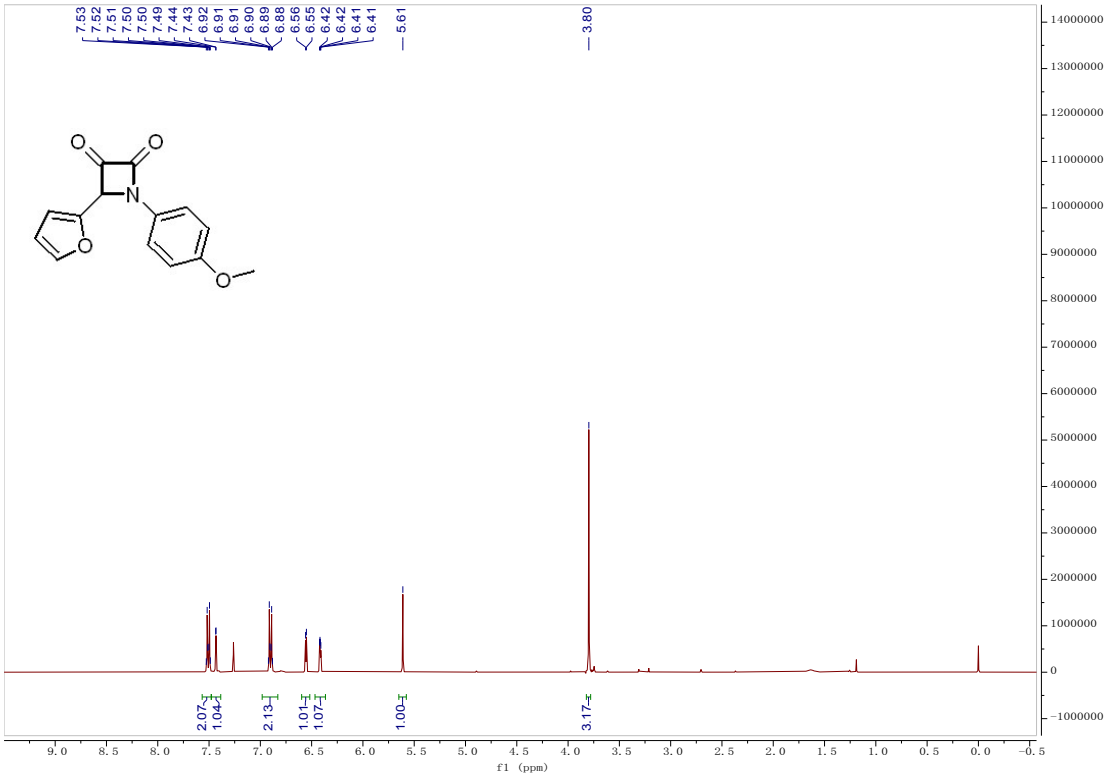


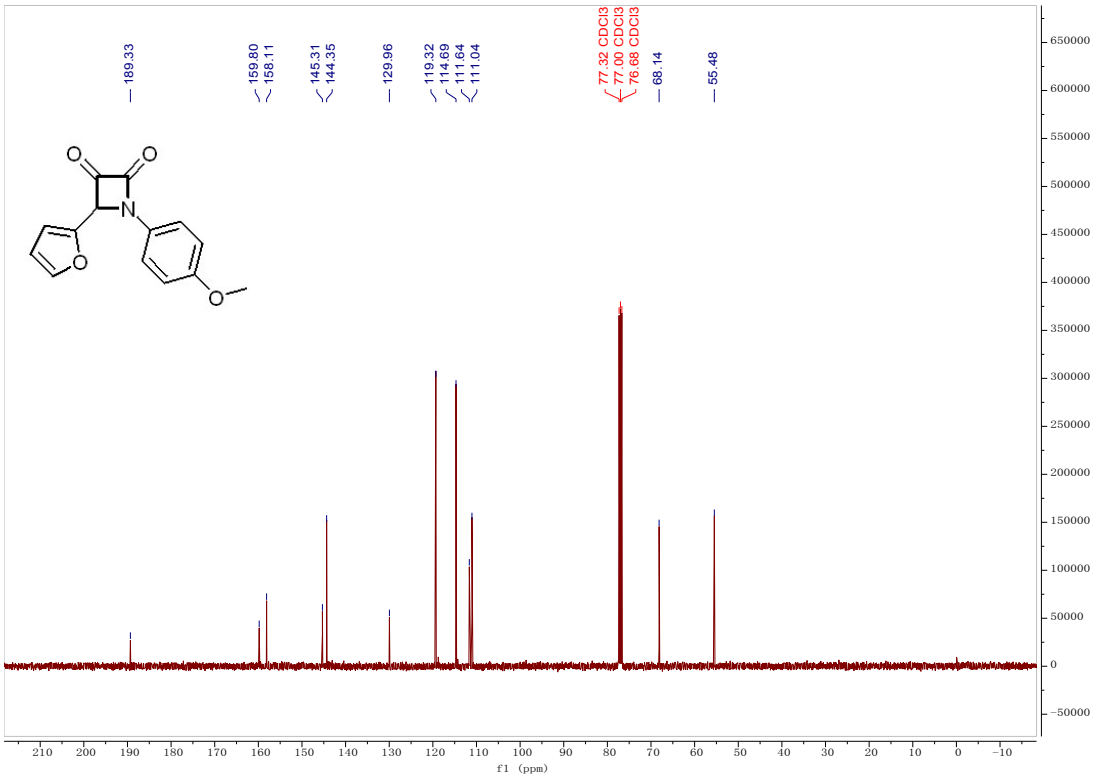
^{1}H NMR and ^{13}C NMR of 1x



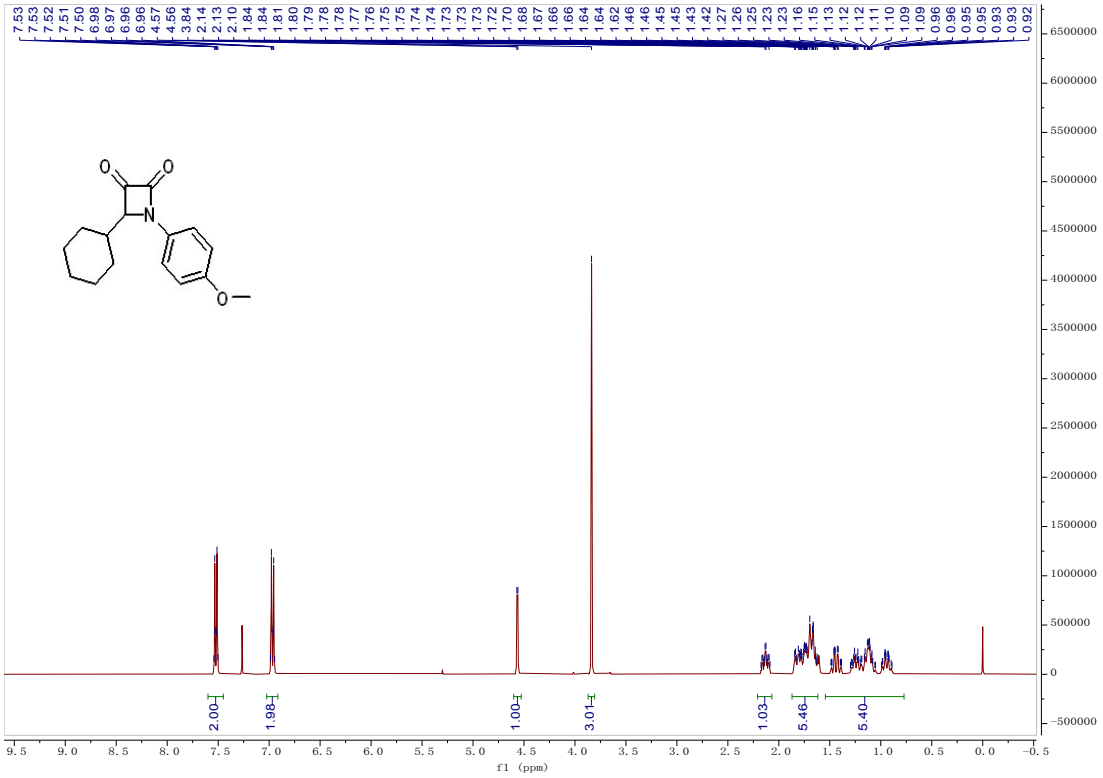


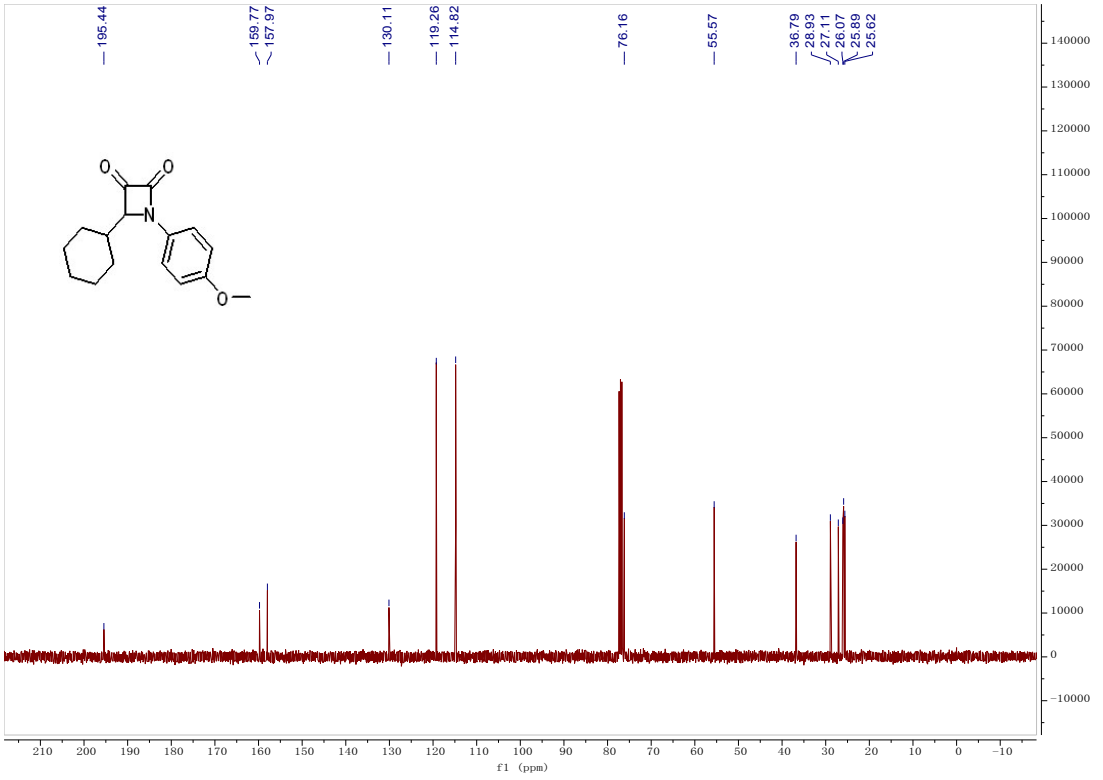
^{1}H NMR and ^{13}C NMR of 1y



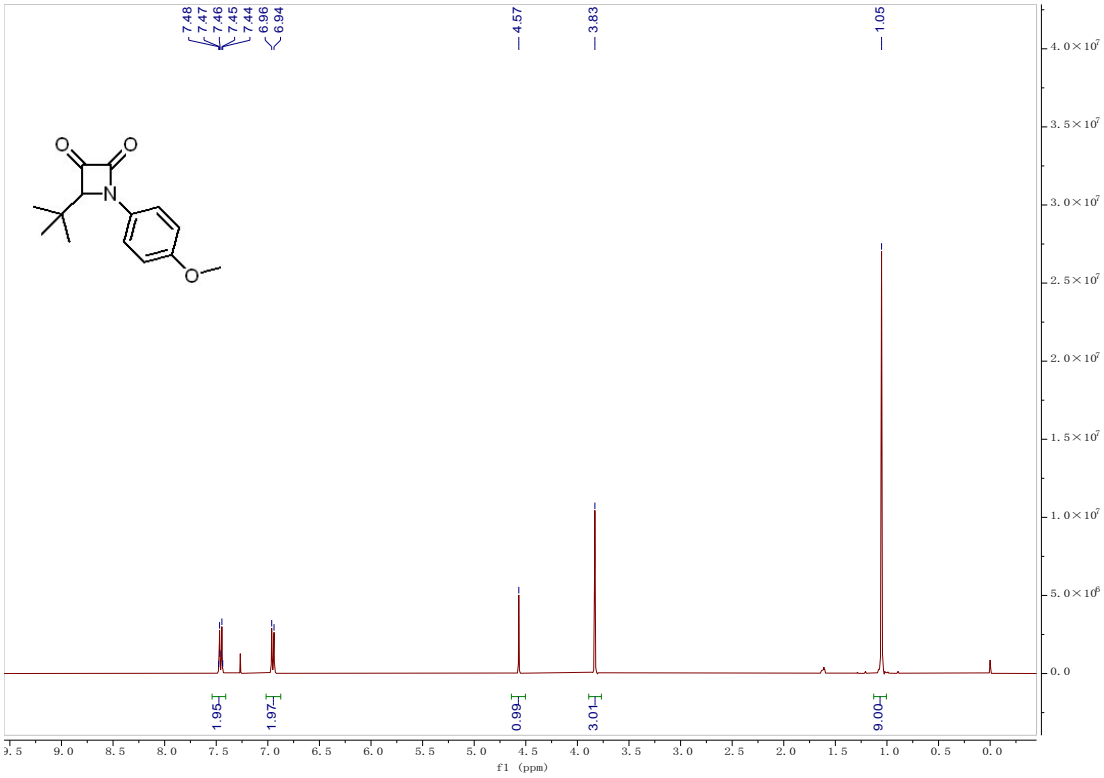


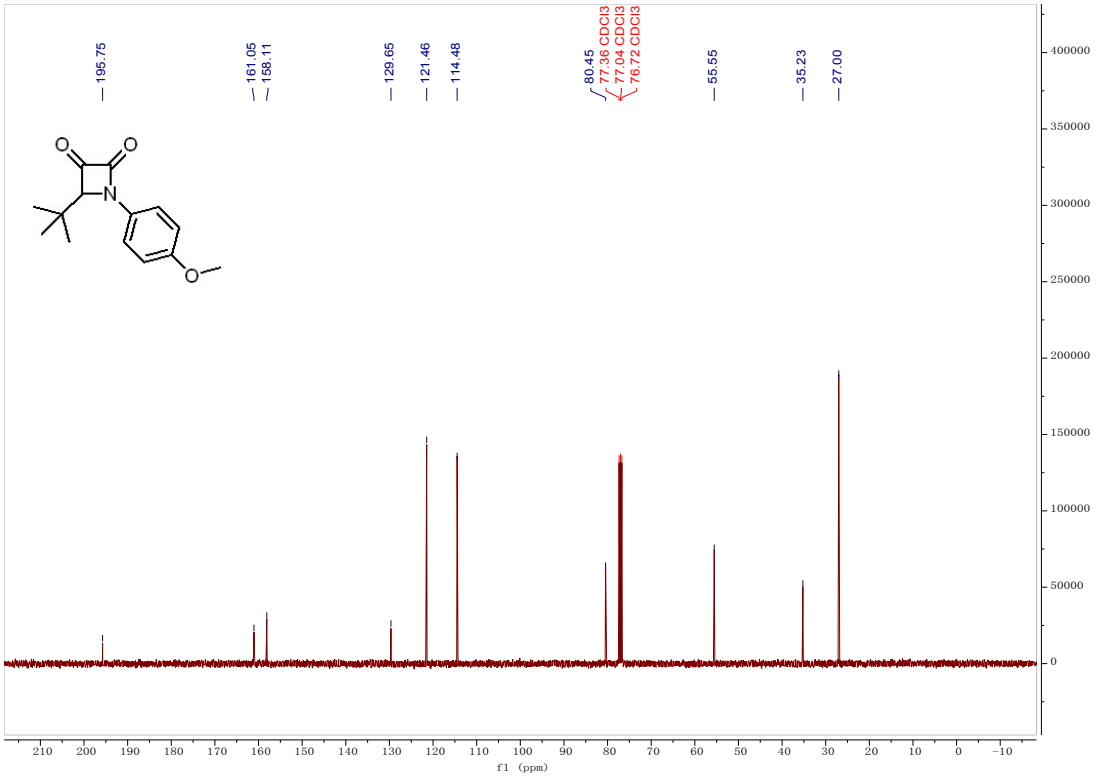
^{1}H NMR and ^{13}C NMR of 1z



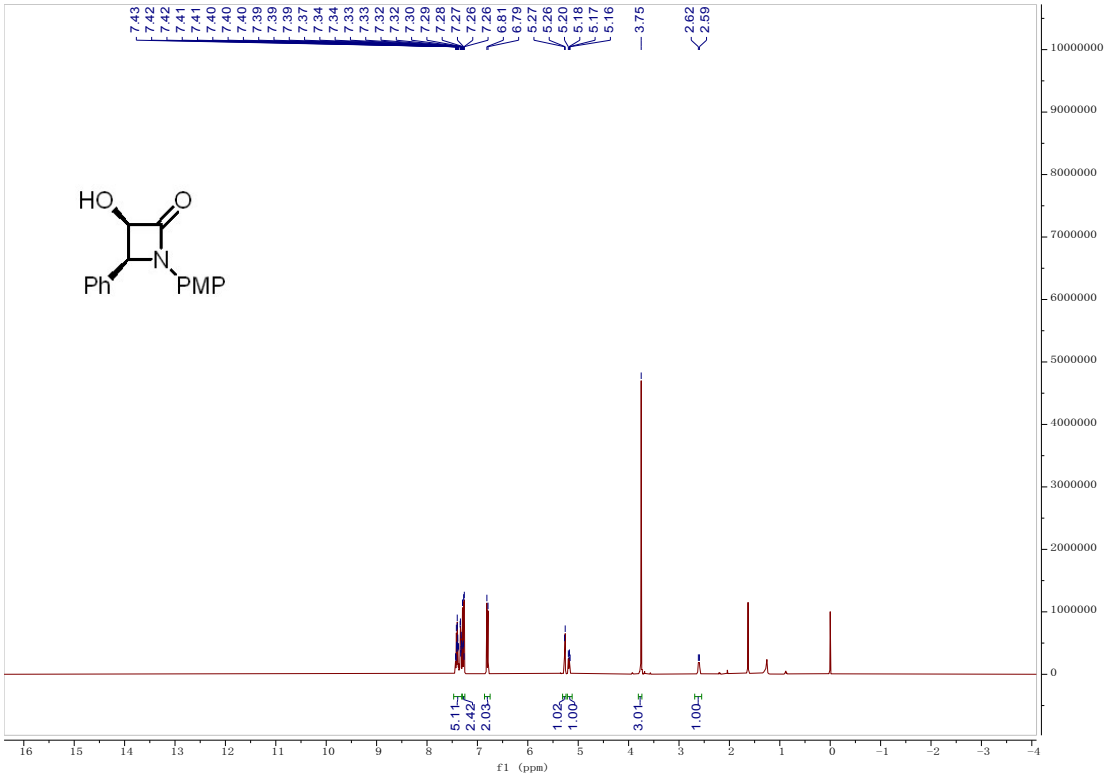


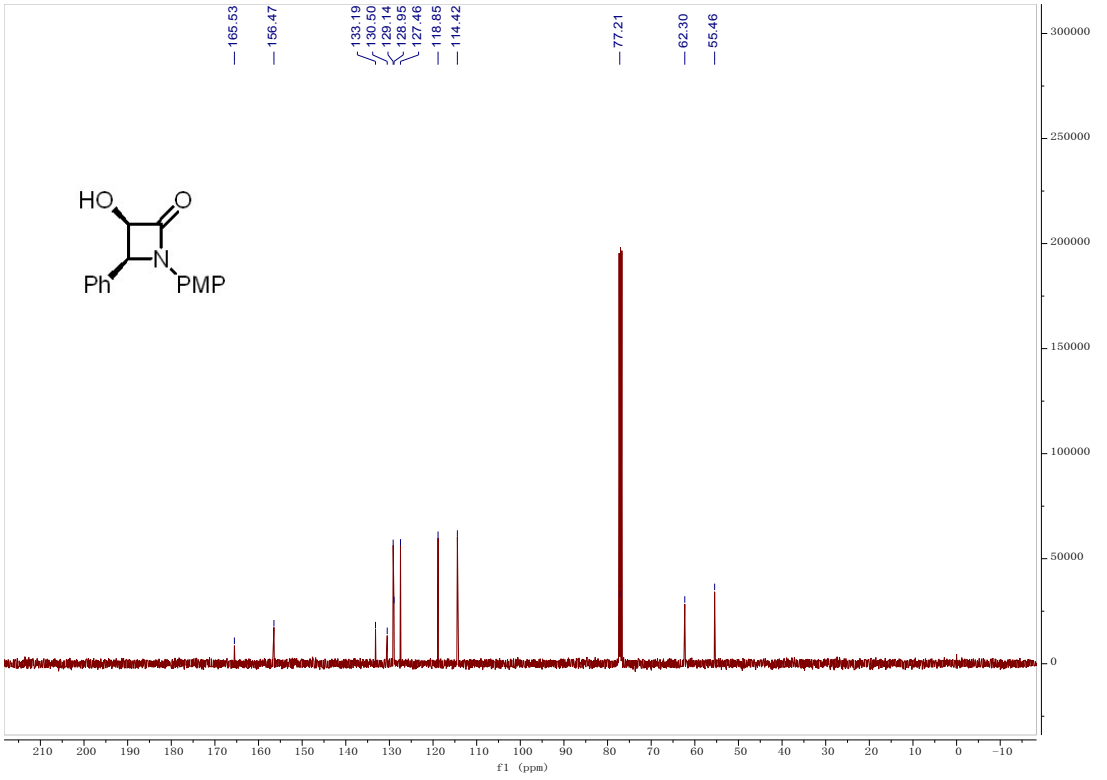
^{1}H NMR and ^{13}C NMR of 1aa



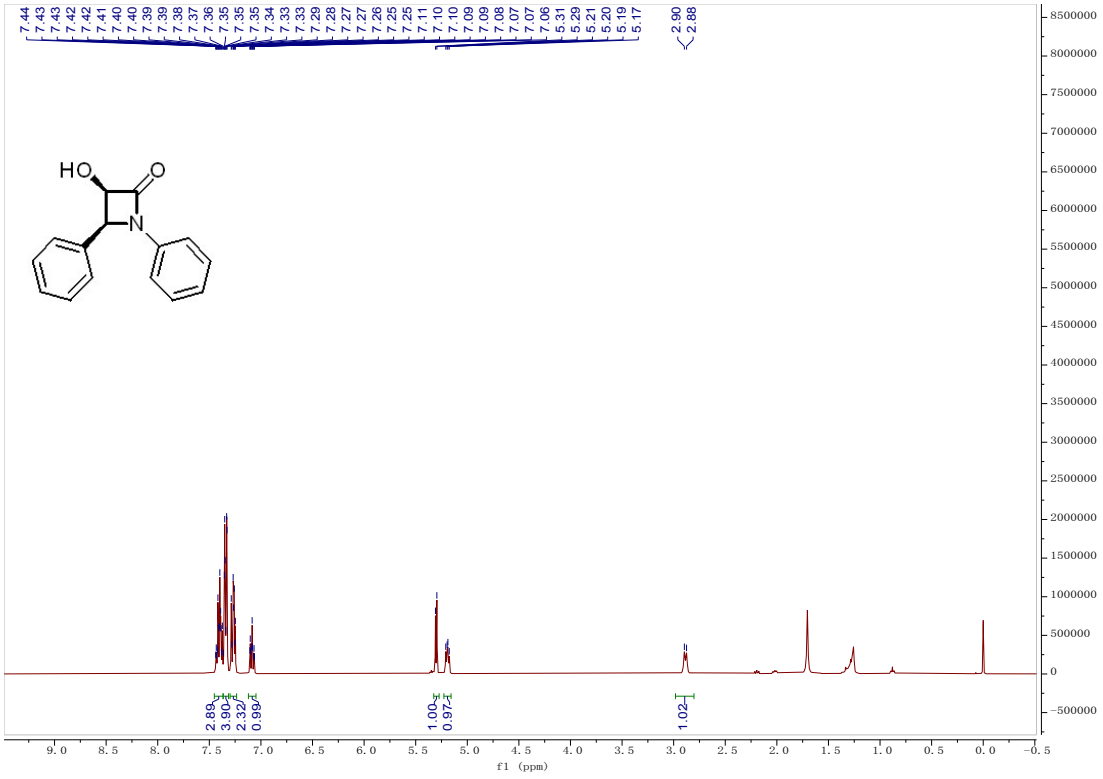


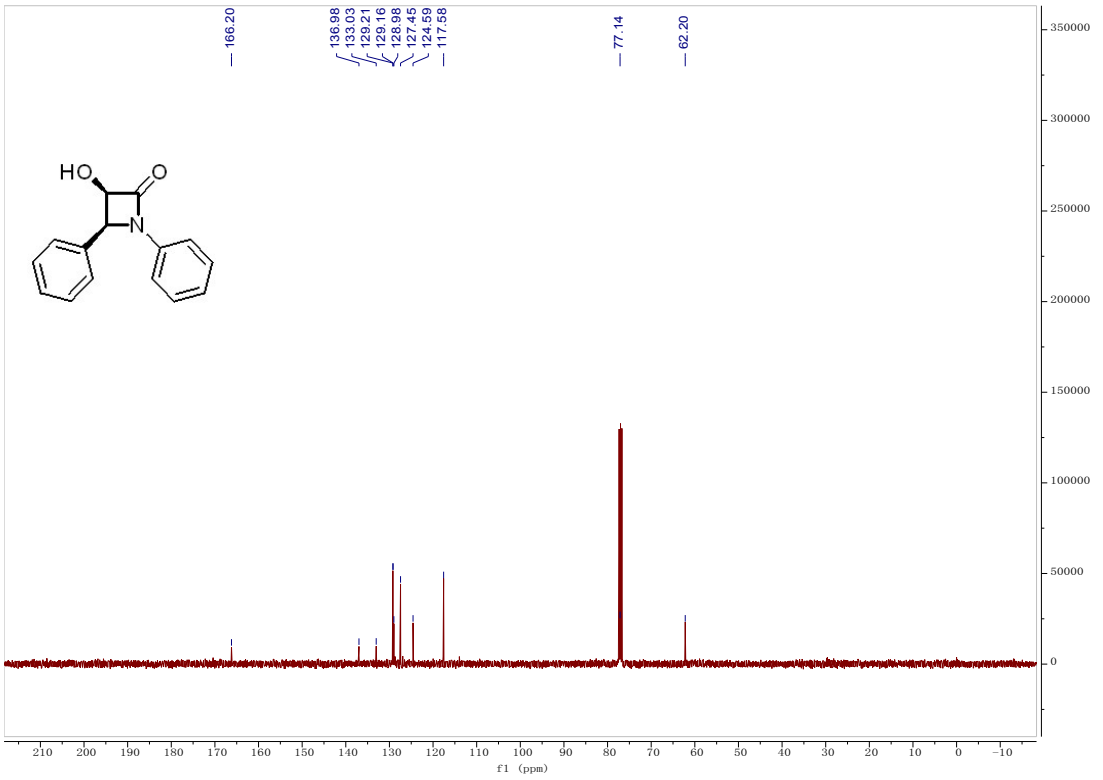
^{1}H NMR and ^{13}C NMR of 2a



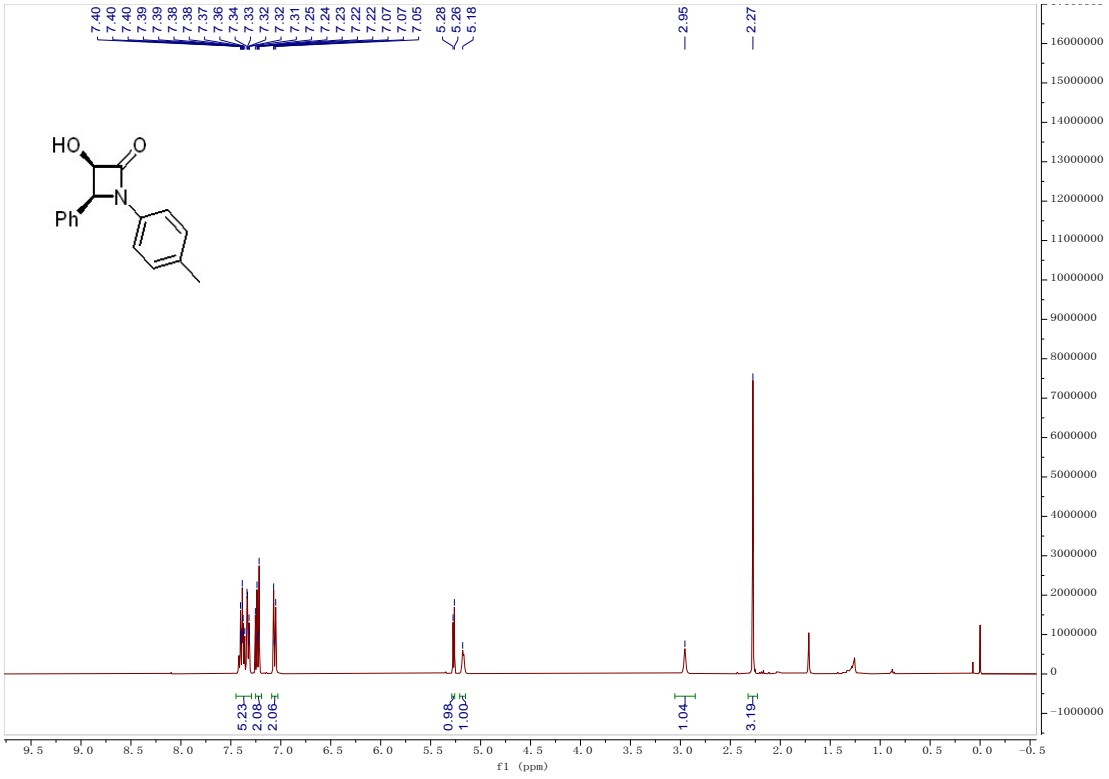


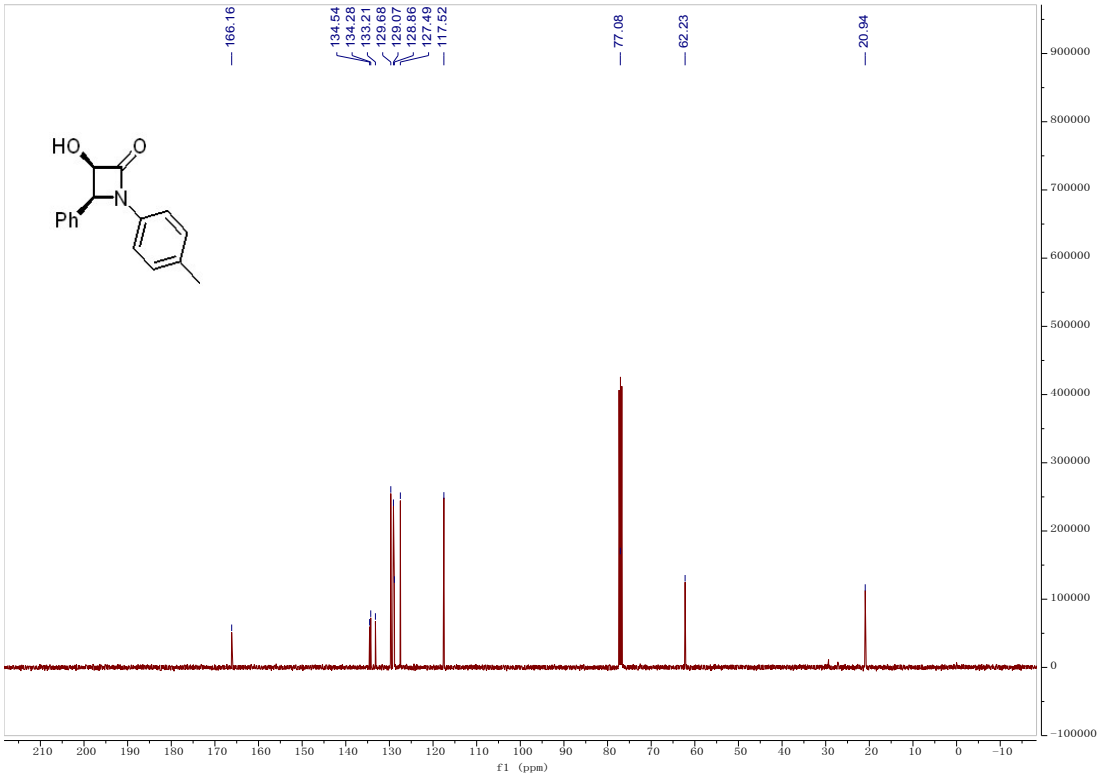
^{1}H NMR and ^{13}C NMR of 2b



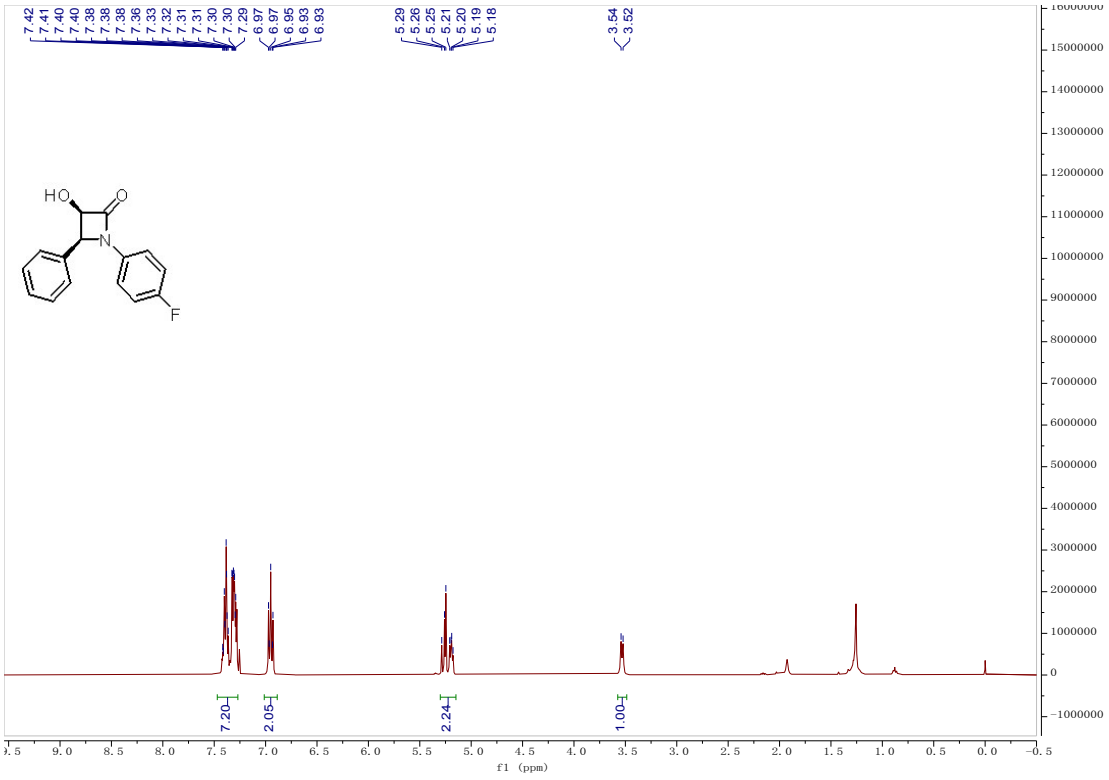


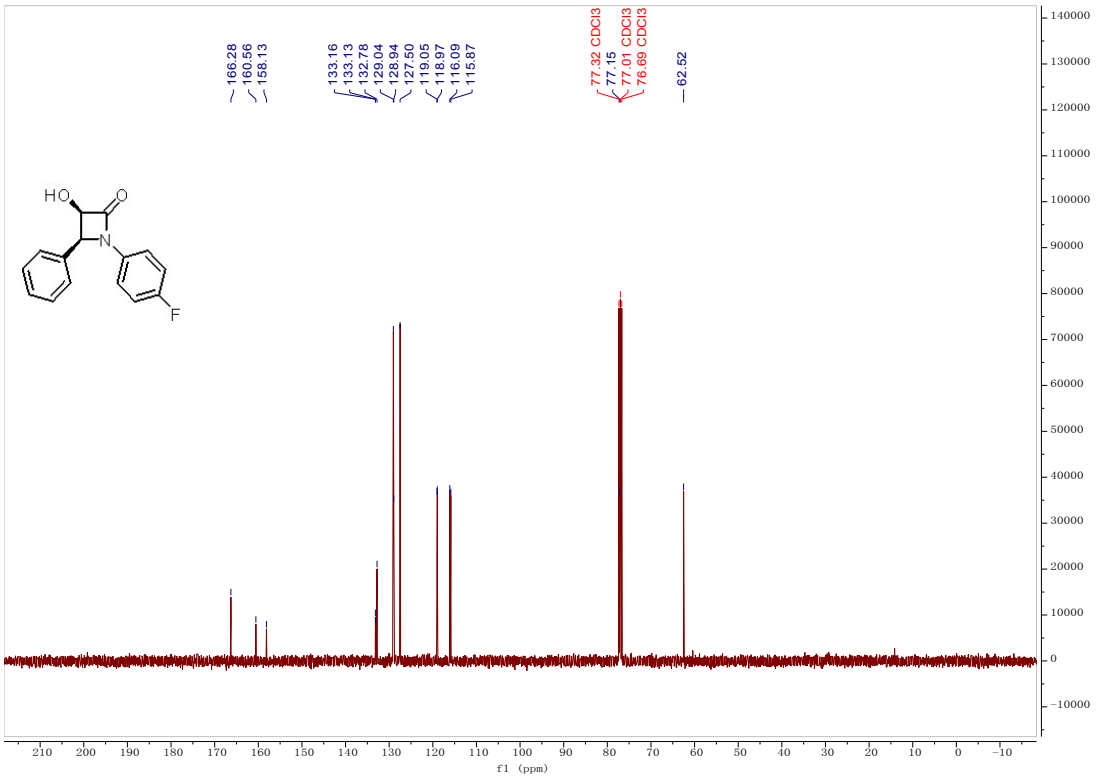
^{1}H NMR and ^{13}C NMR of 2c



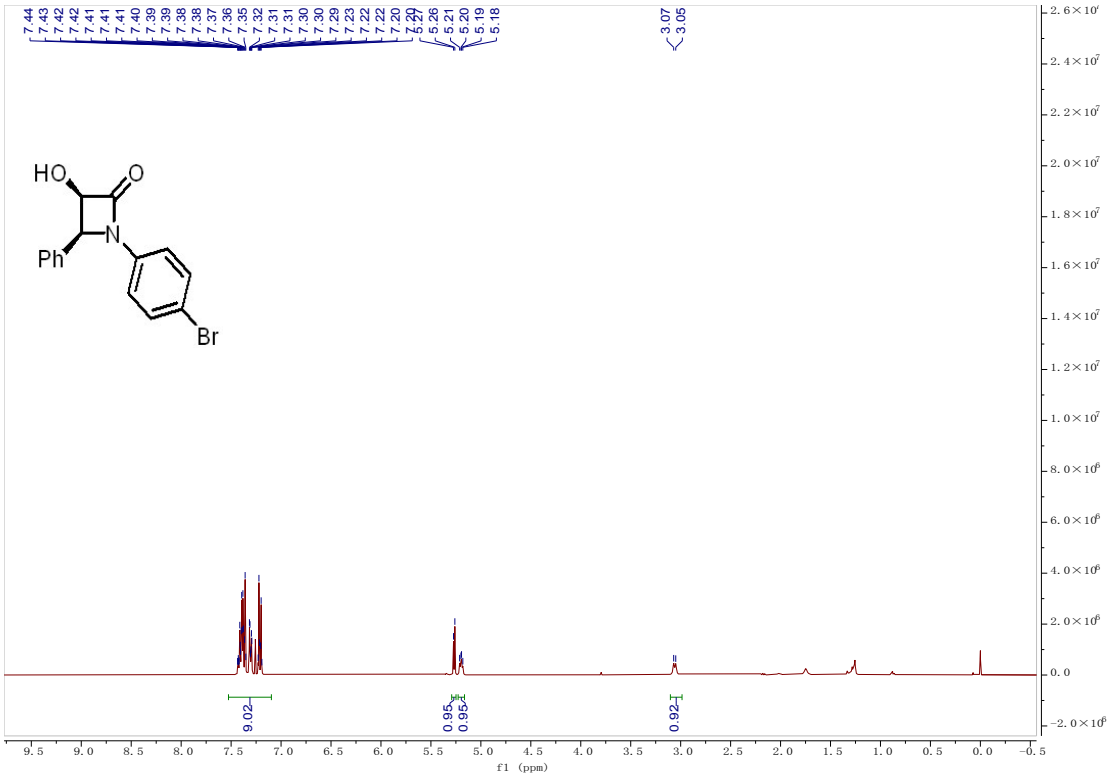


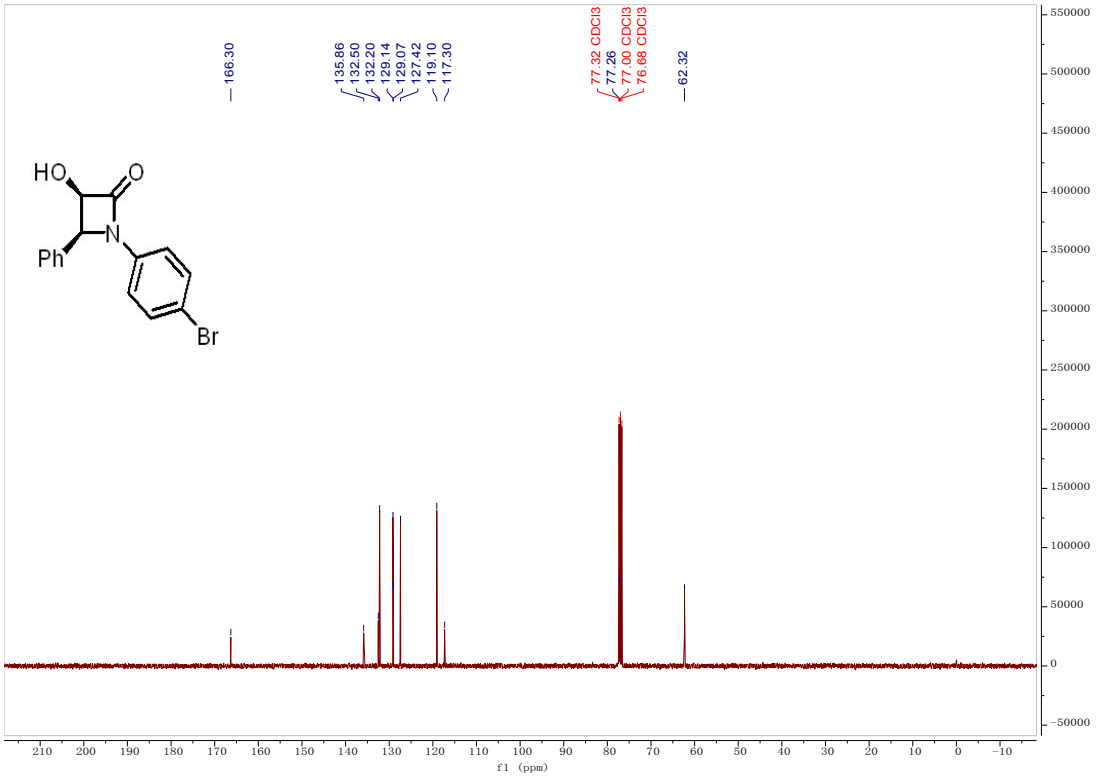
^{1}H NMR and ^{13}C NMR of 2d



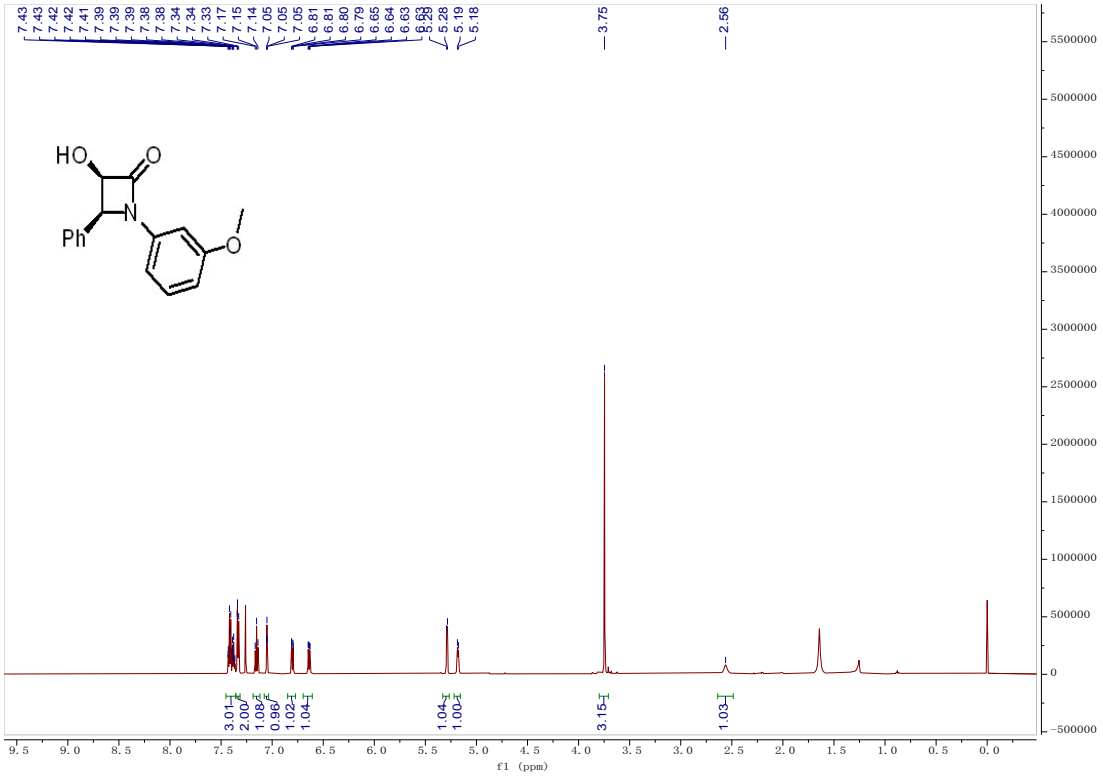


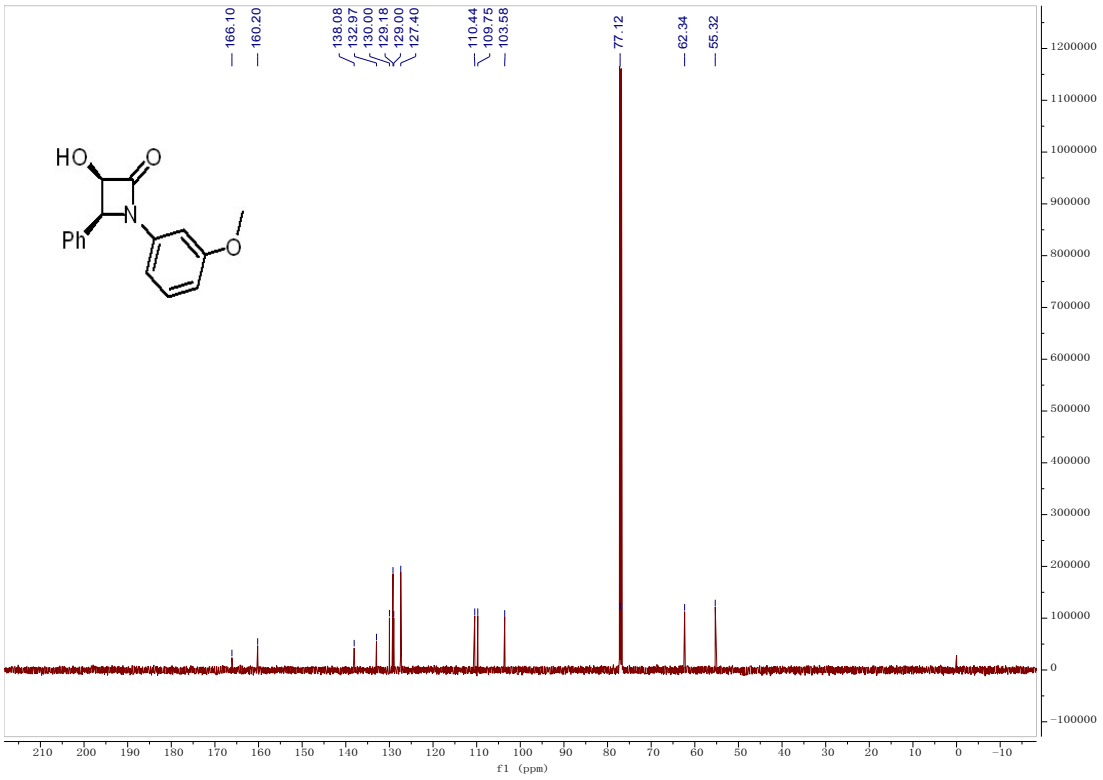
^{1}H NMR and ^{13}C NMR of 2e



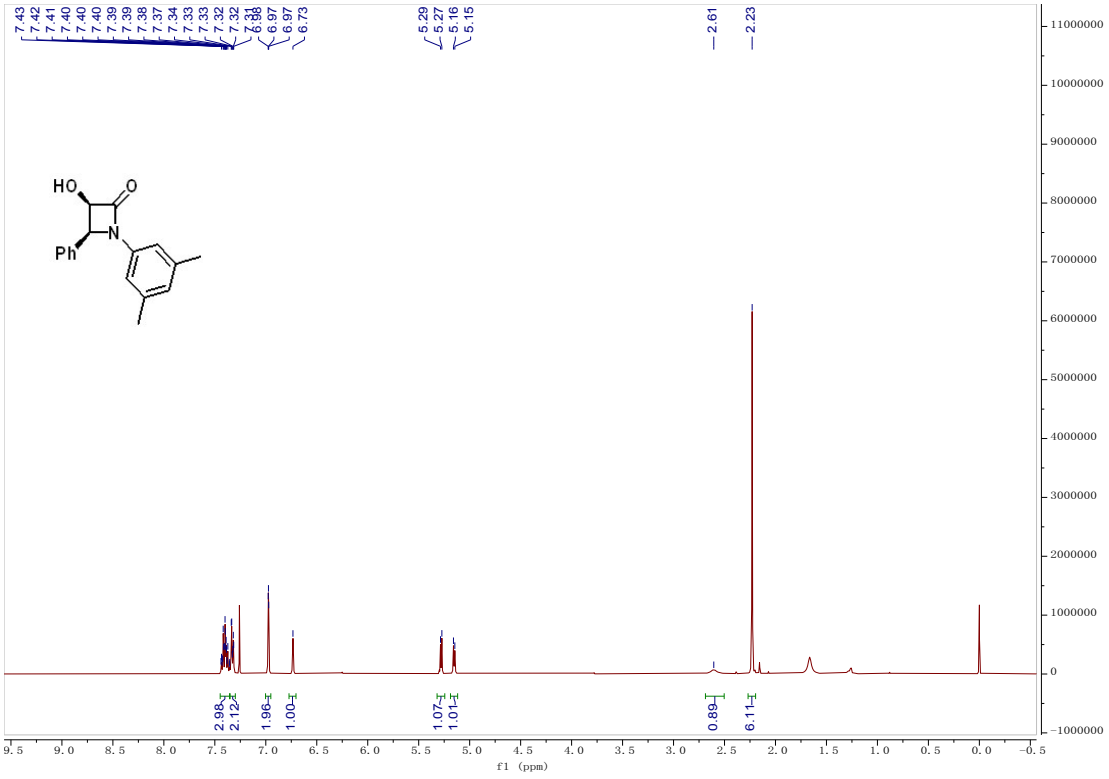


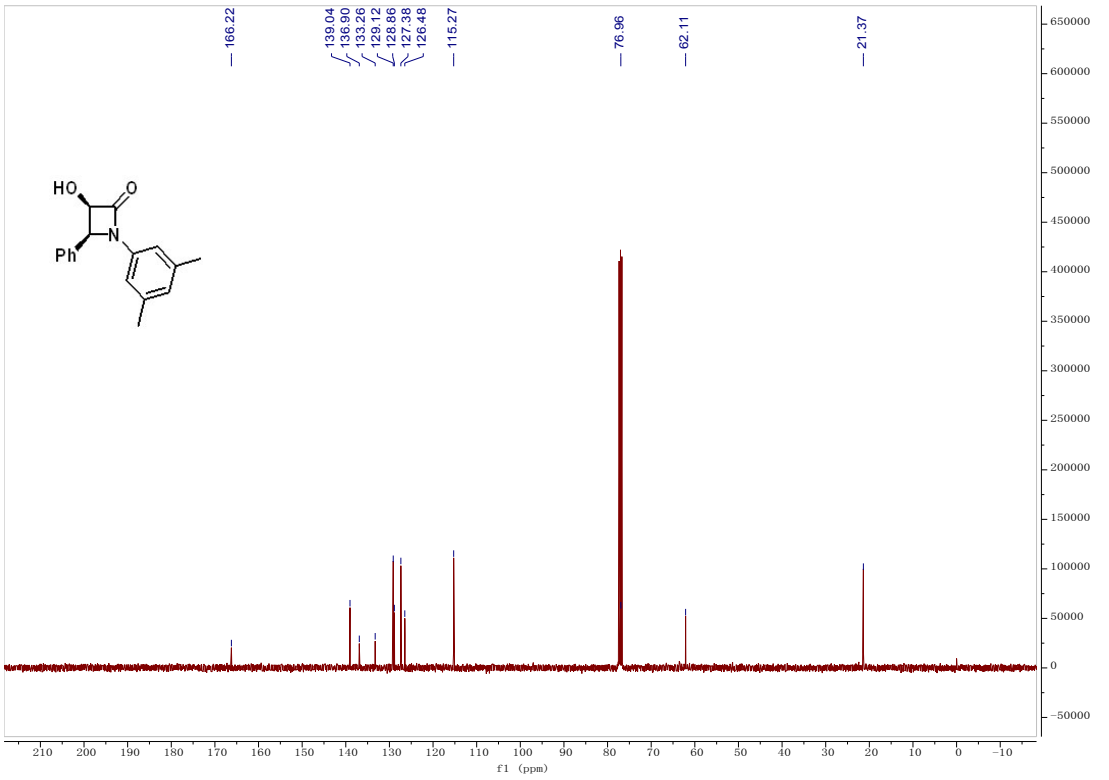
^{1}H NMR and ^{13}C NMR of 2f



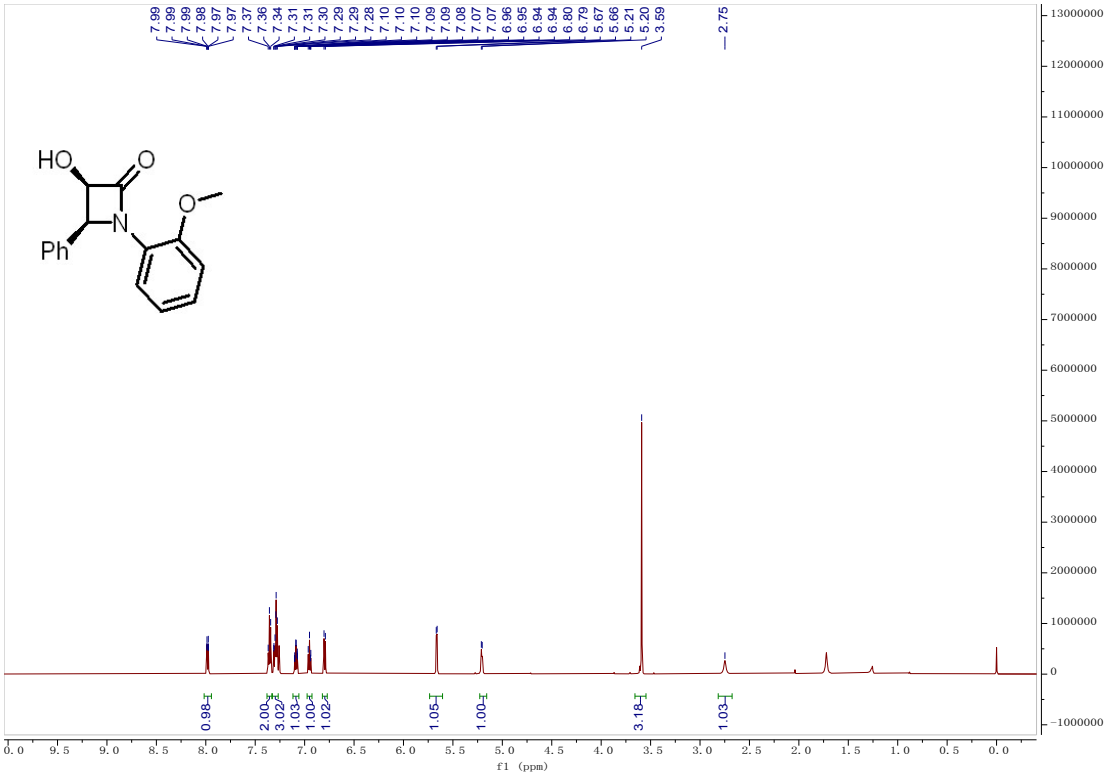


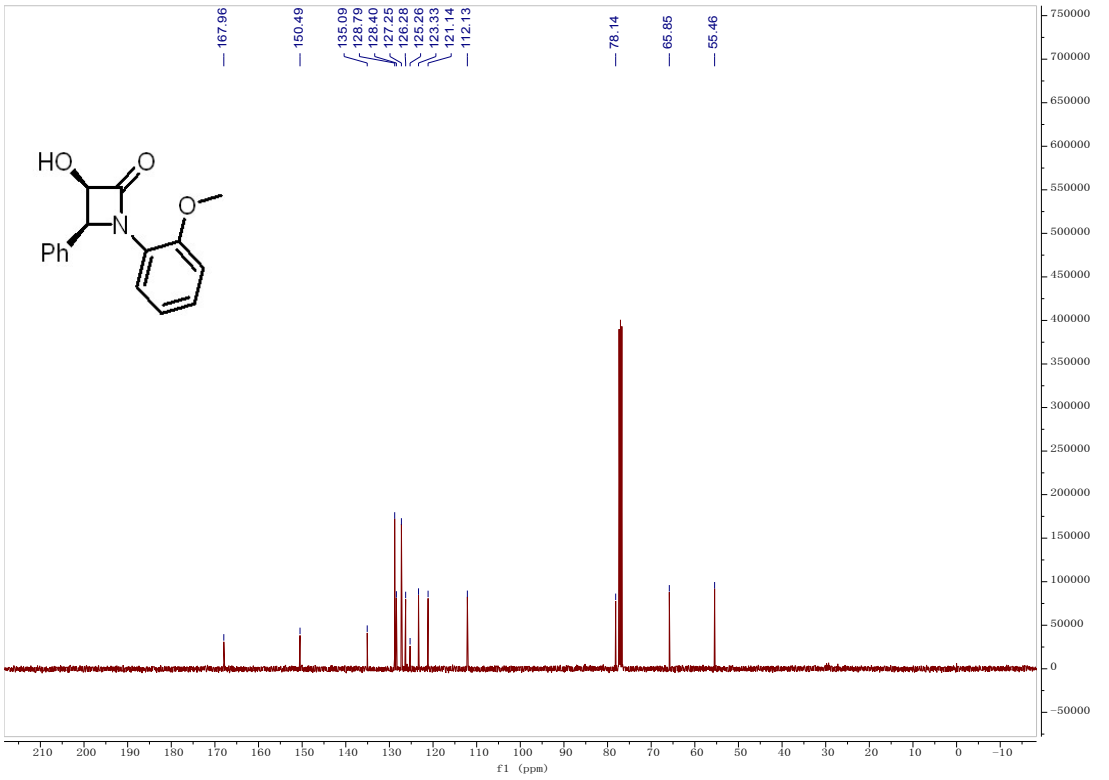
^{1}H NMR and ^{13}C NMR of 2g



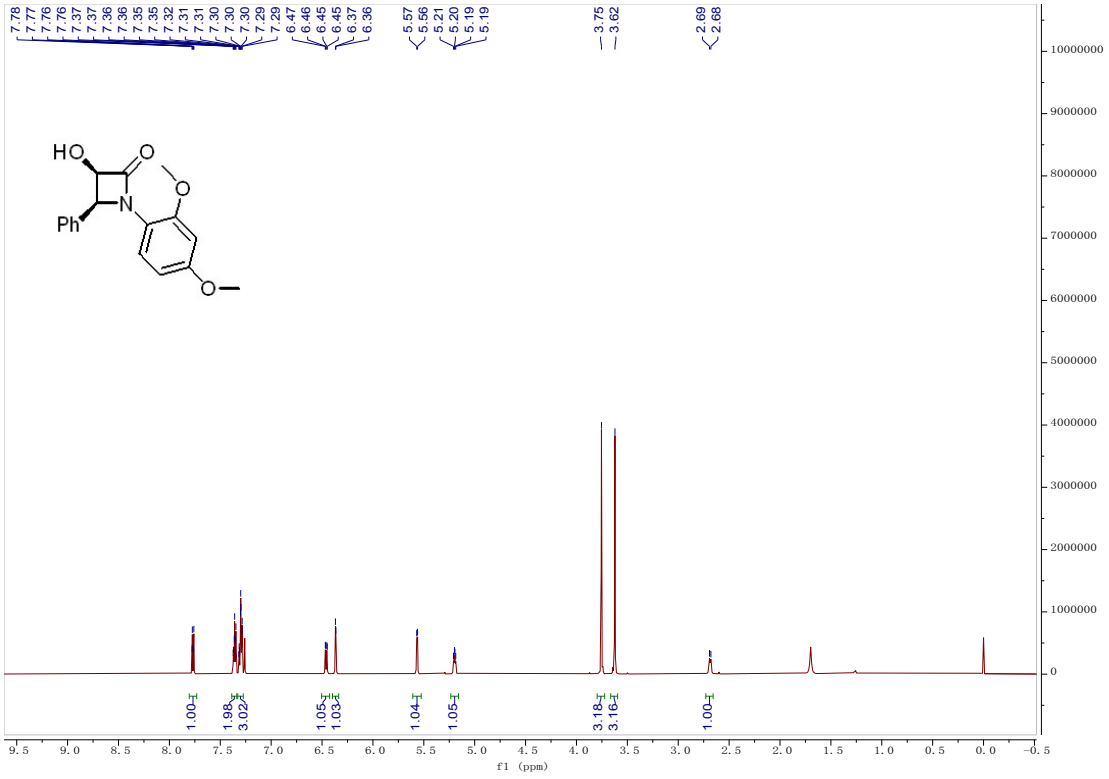


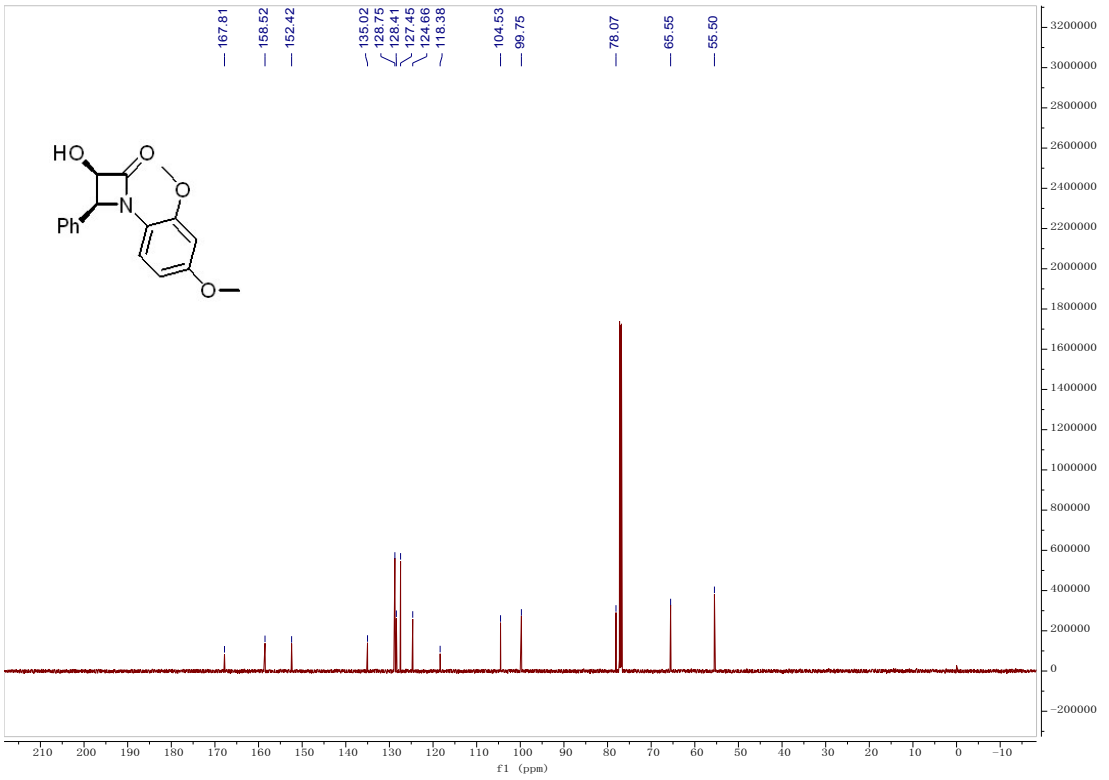
^{1}H NMR and ^{13}C NMR of 2h



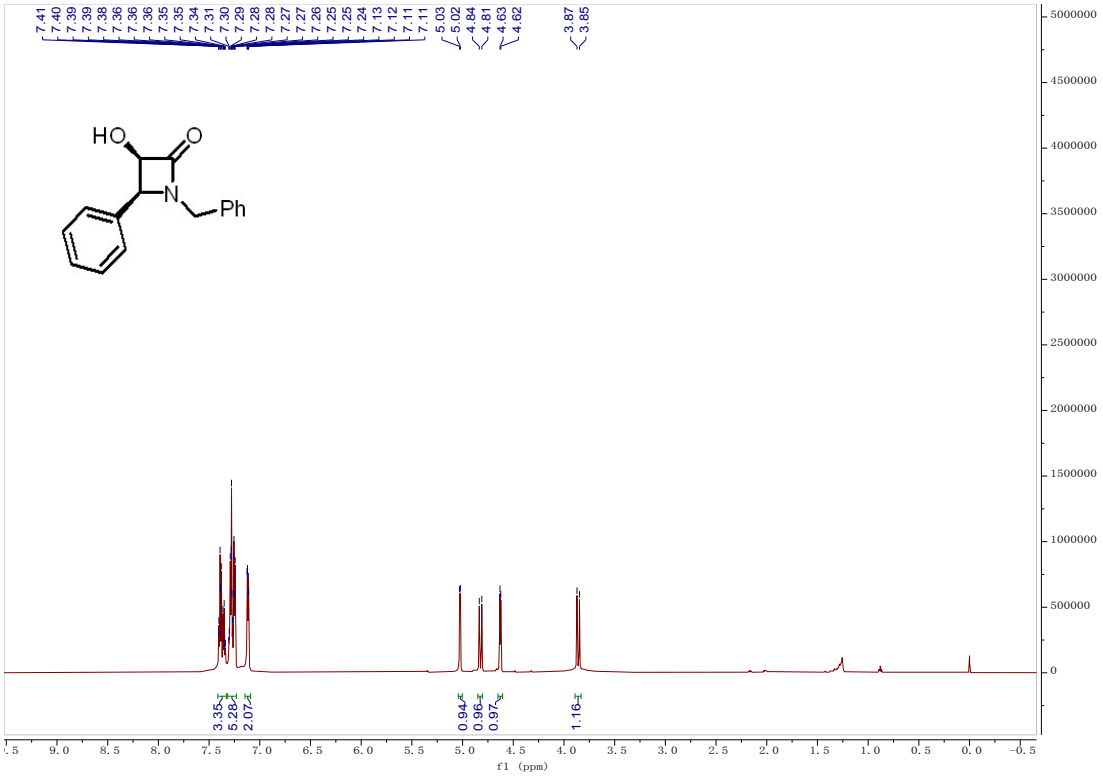


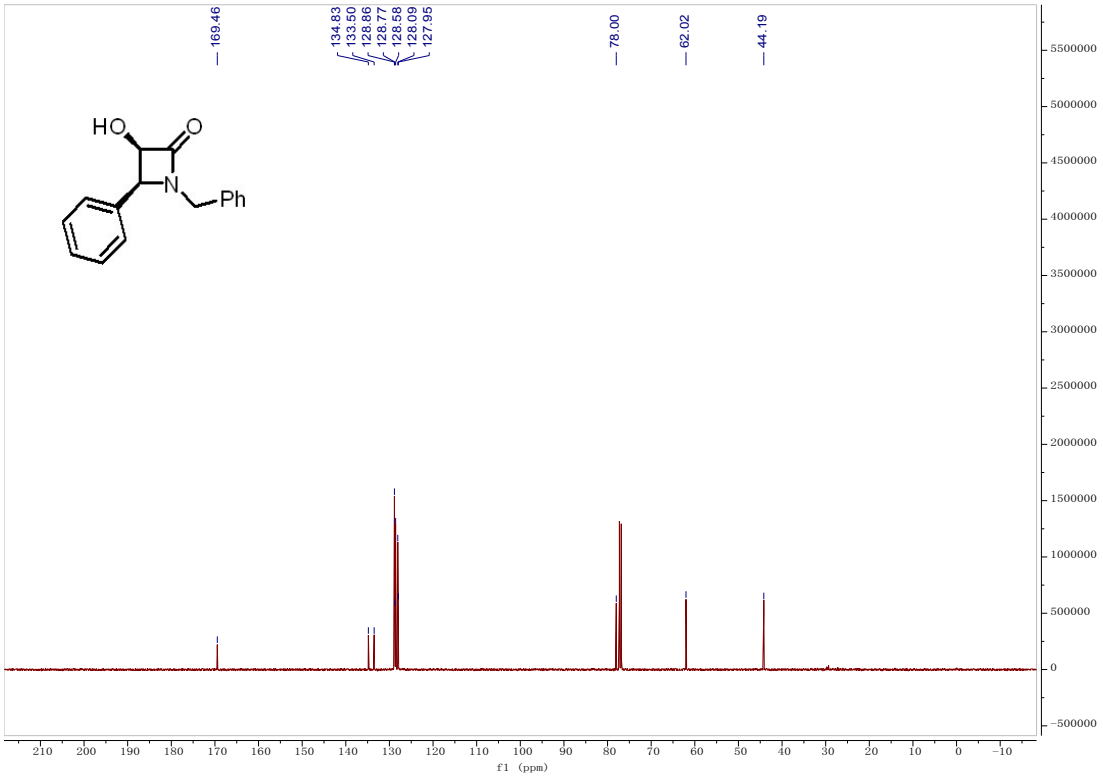
^{1}H NMR and ^{13}C NMR of 2i



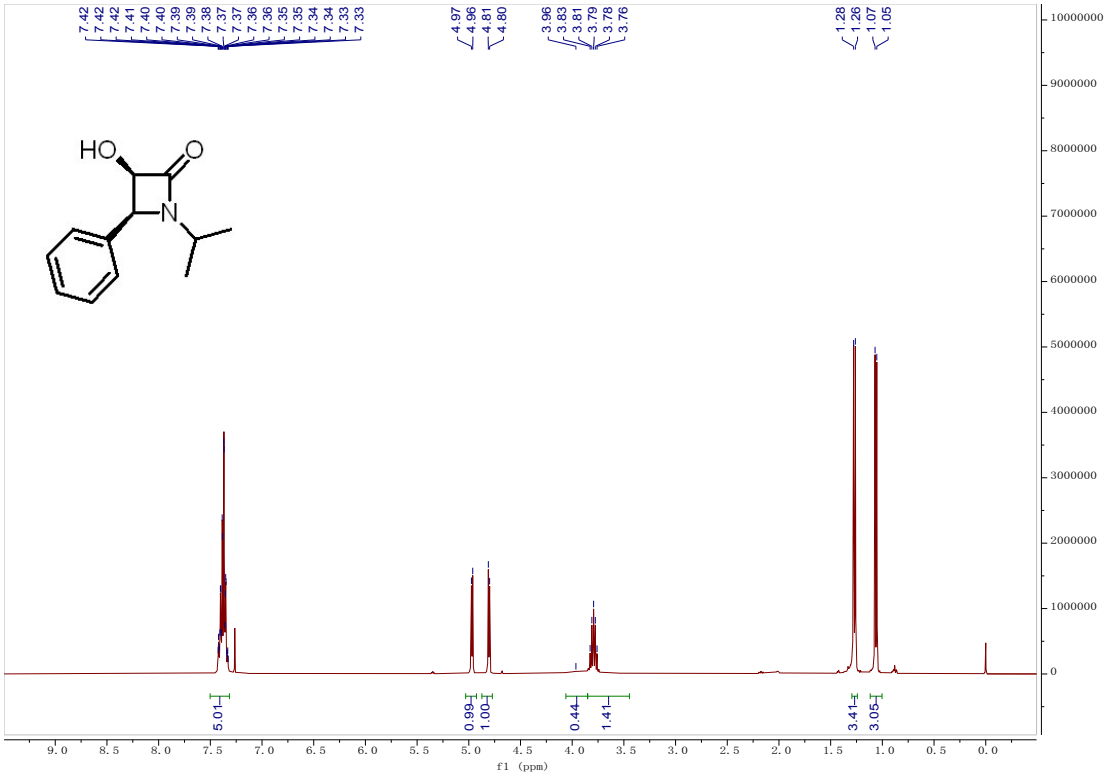


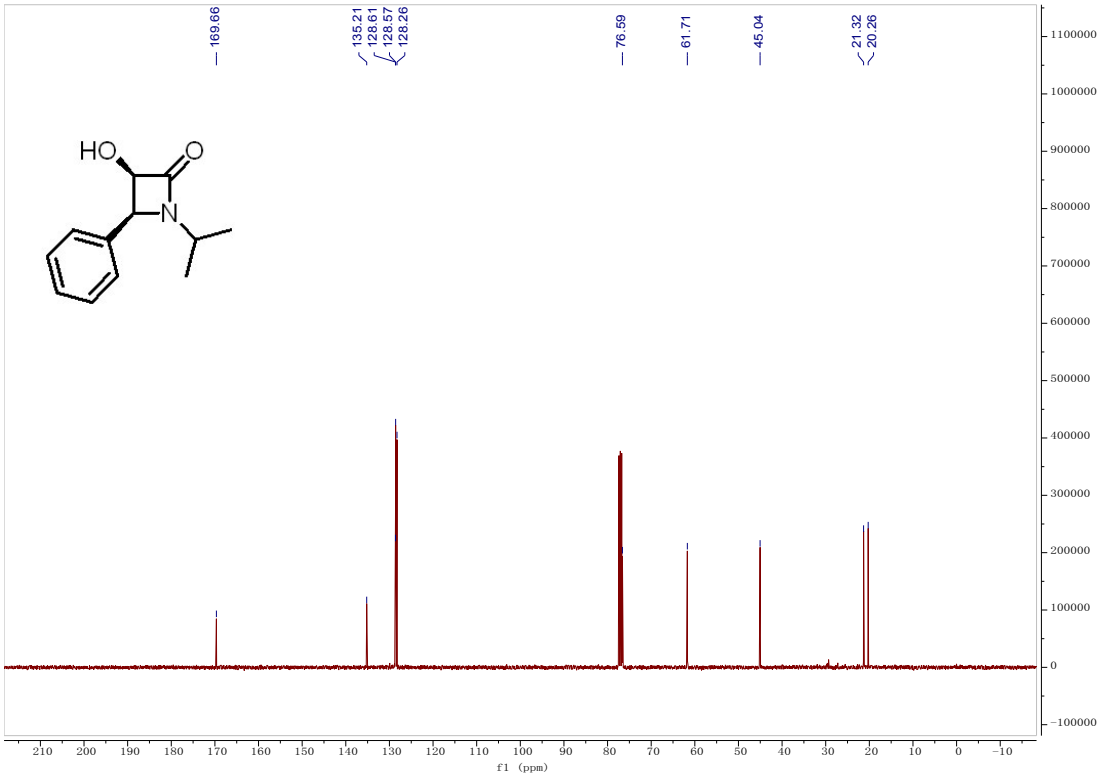
^{1}H NMR and ^{13}C NMR of 2j



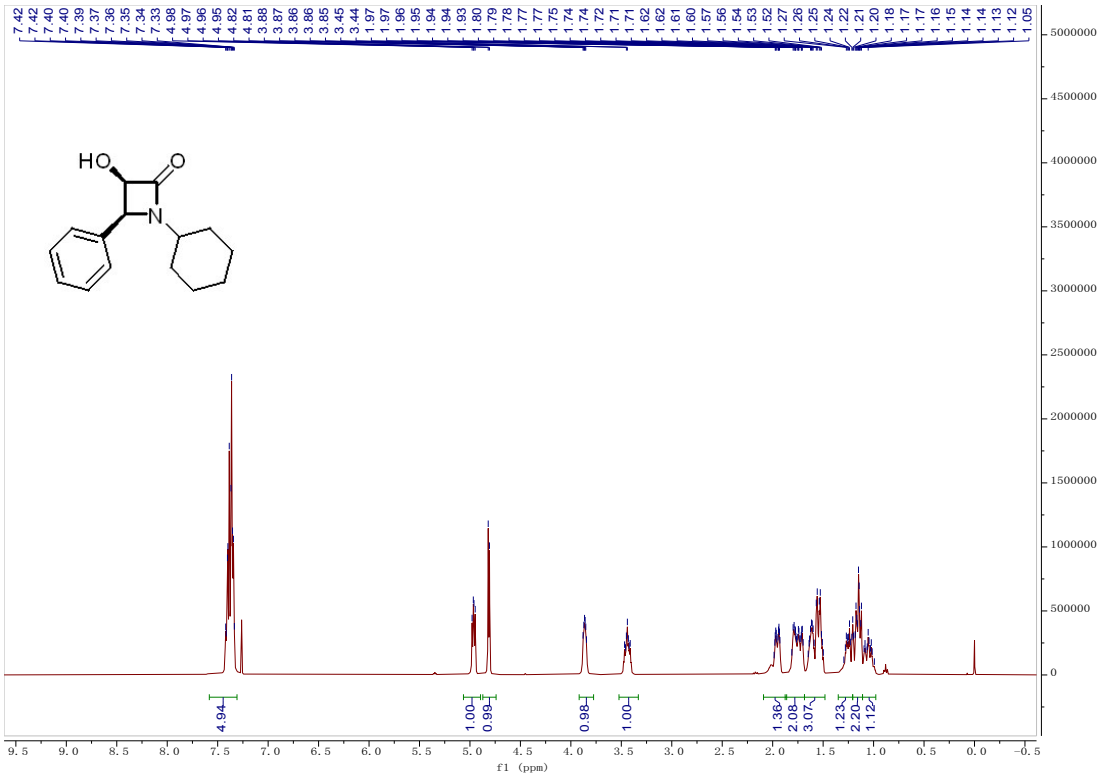


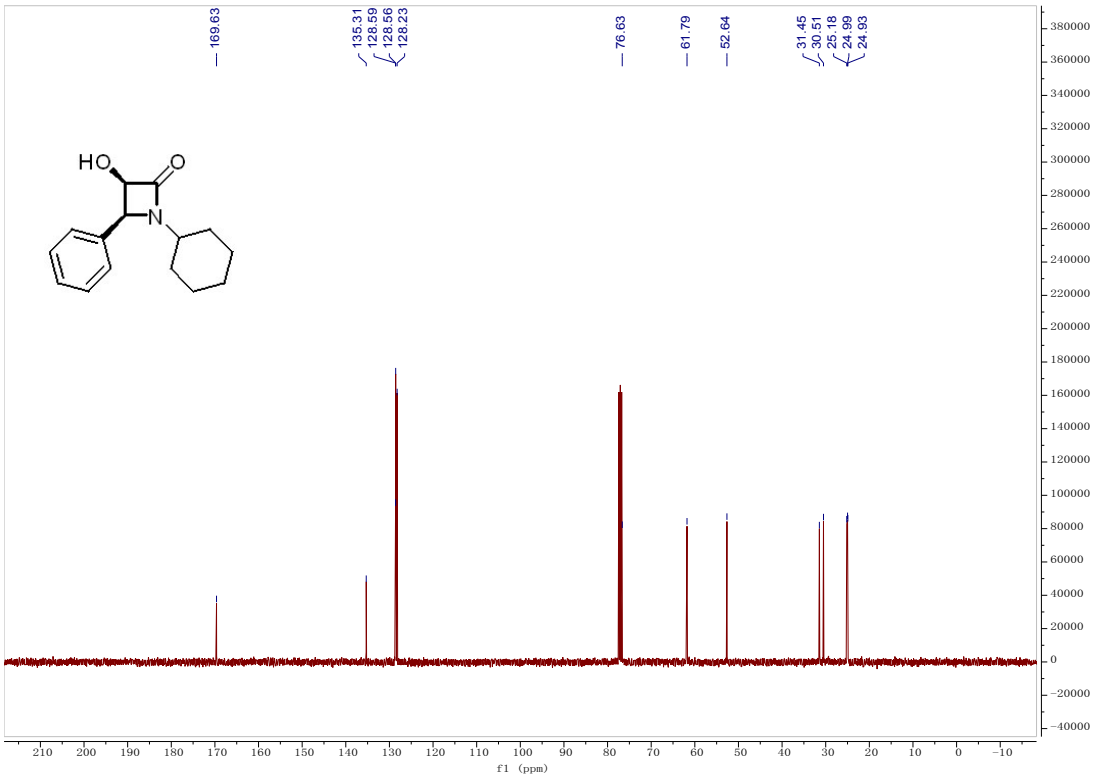
^{1}H NMR and ^{13}C NMR of 2k



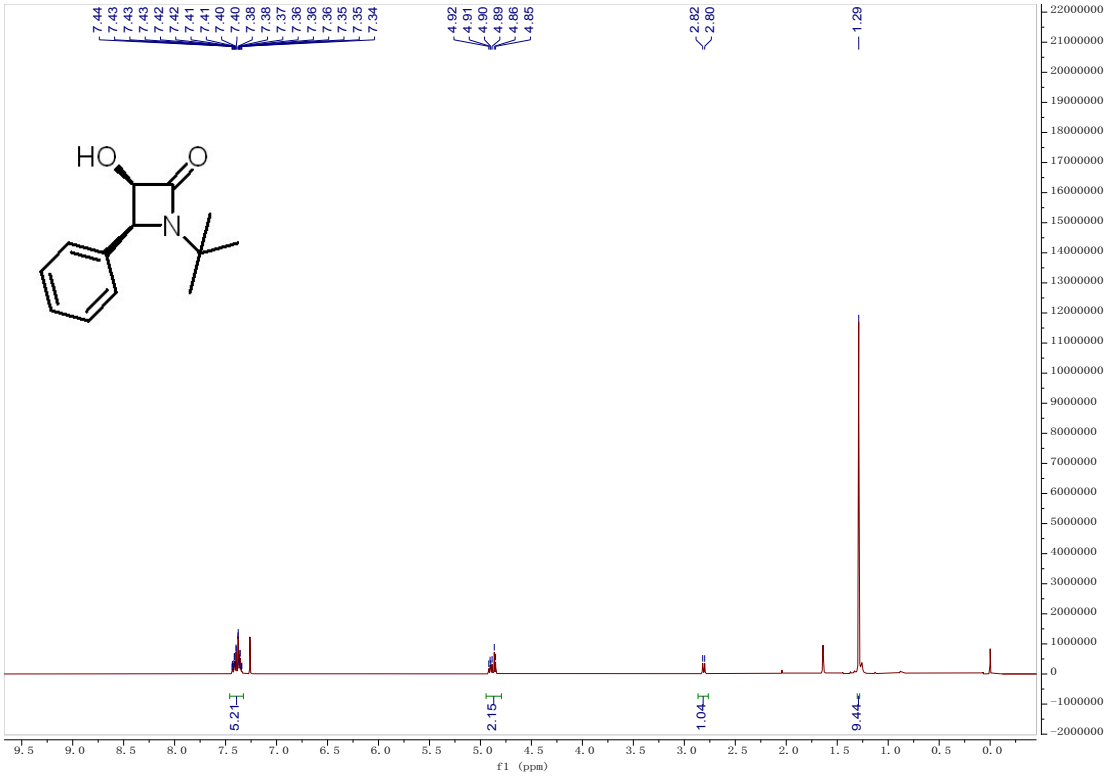


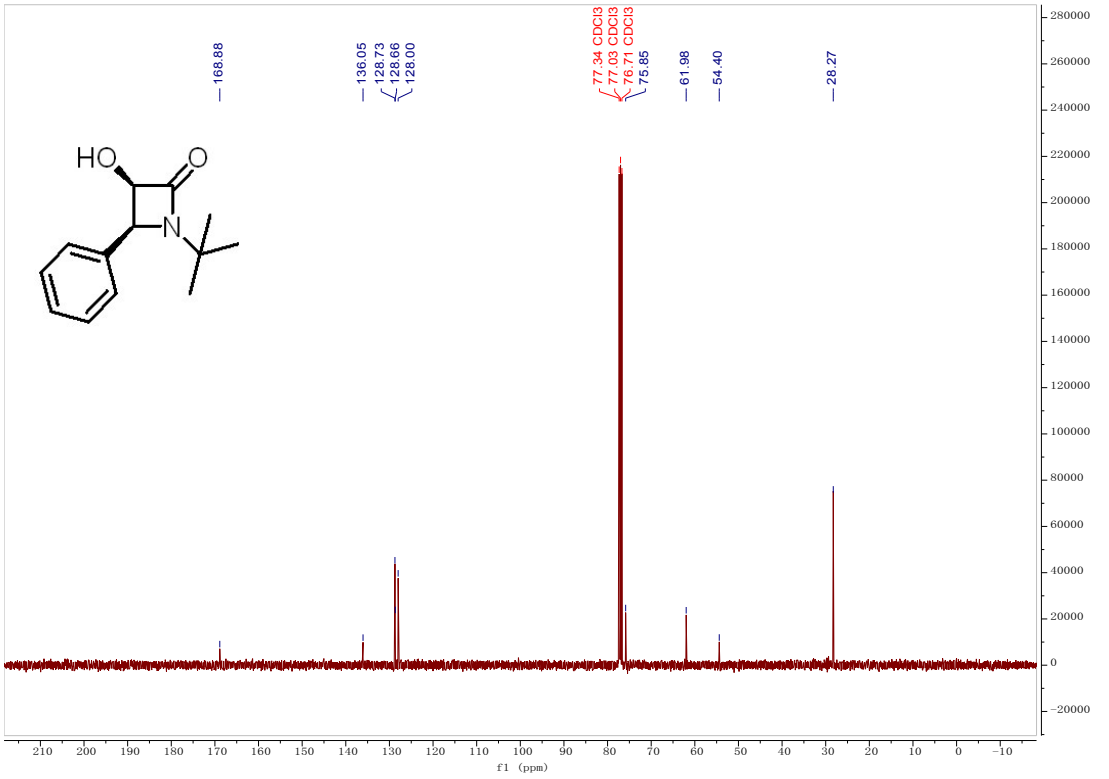
^{1}H NMR and ^{13}C NMR of 2l



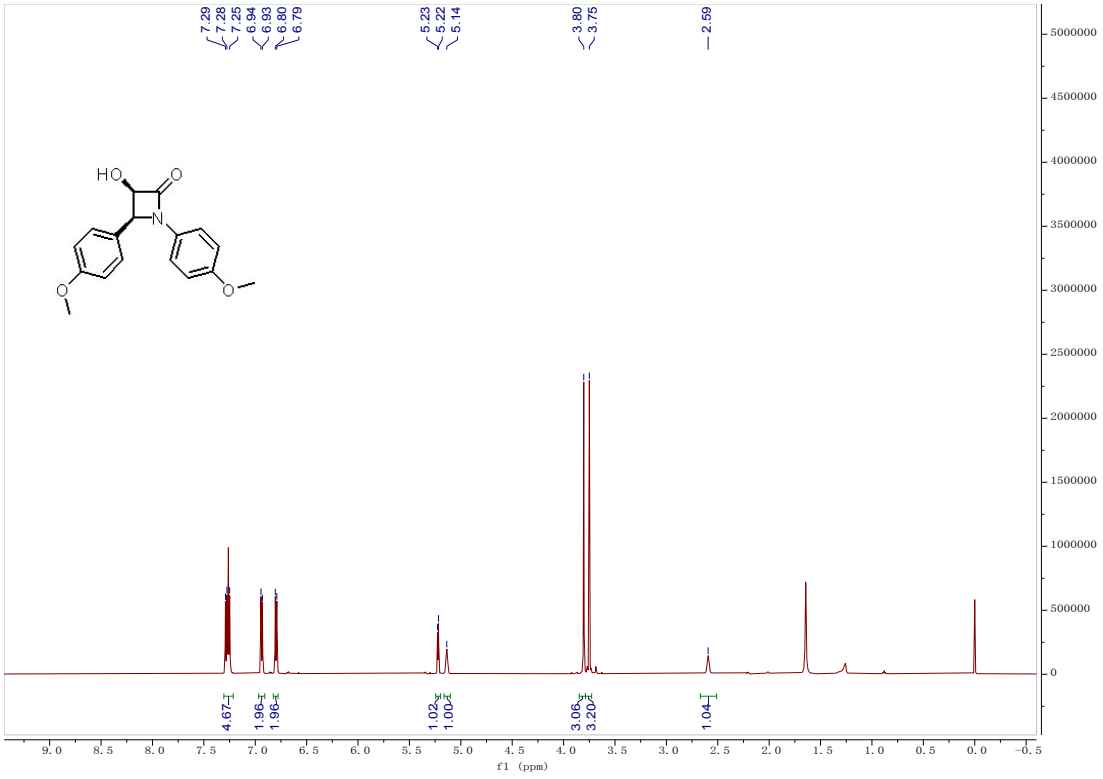


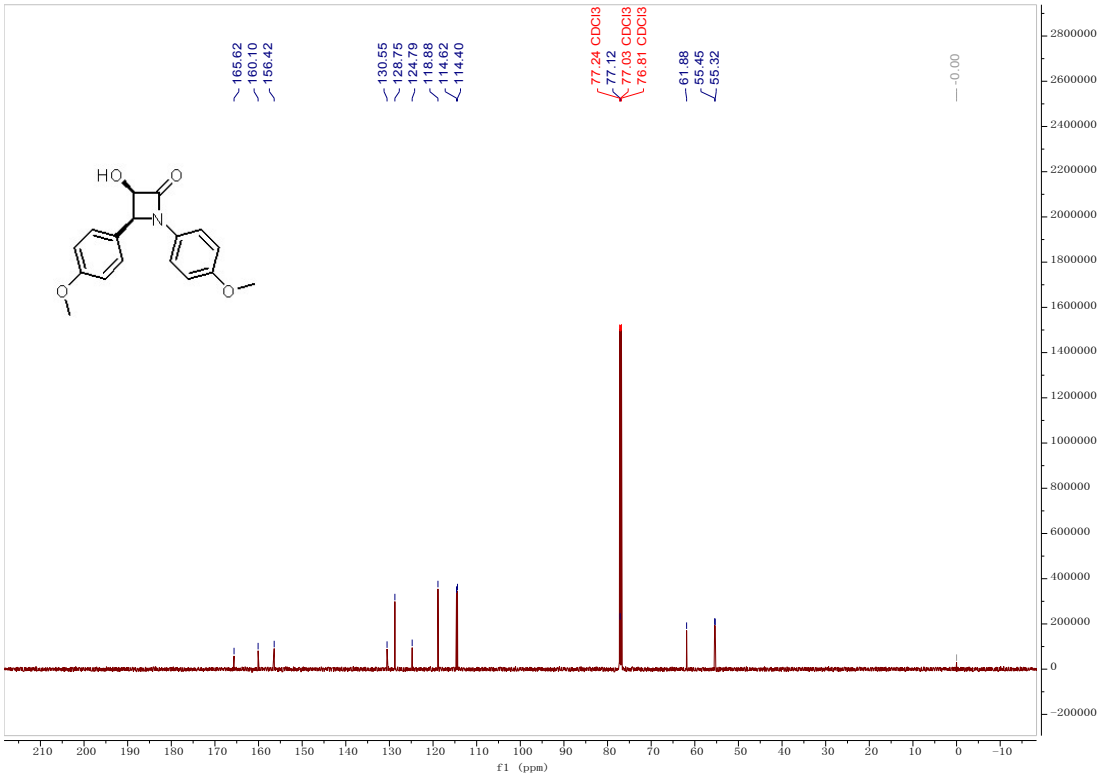
^{1}H NMR and ^{13}C NMR of 2m



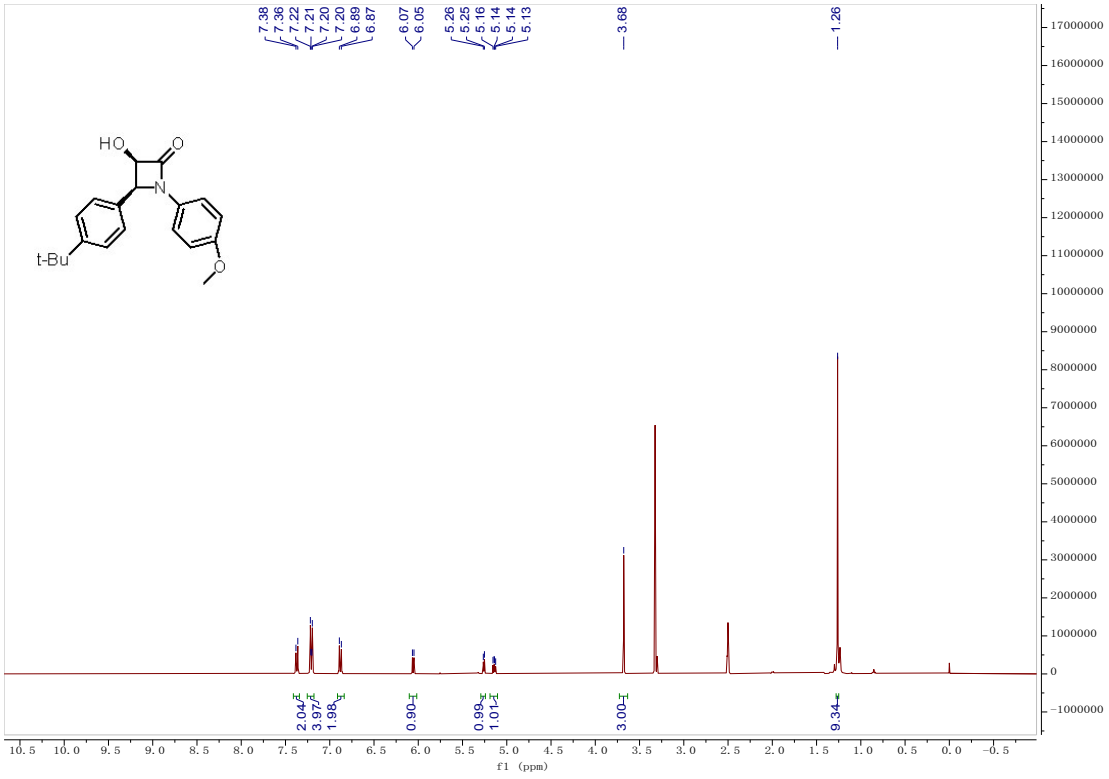


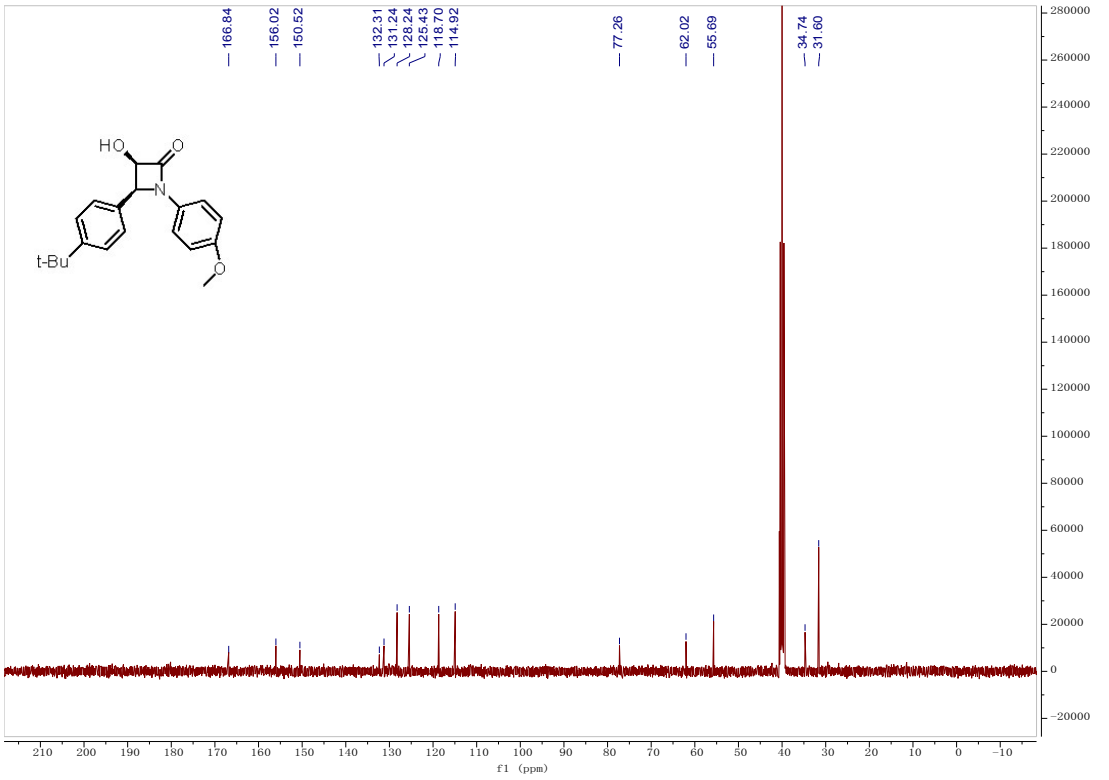
^{1}H NMR and ^{13}C NMR of 2n



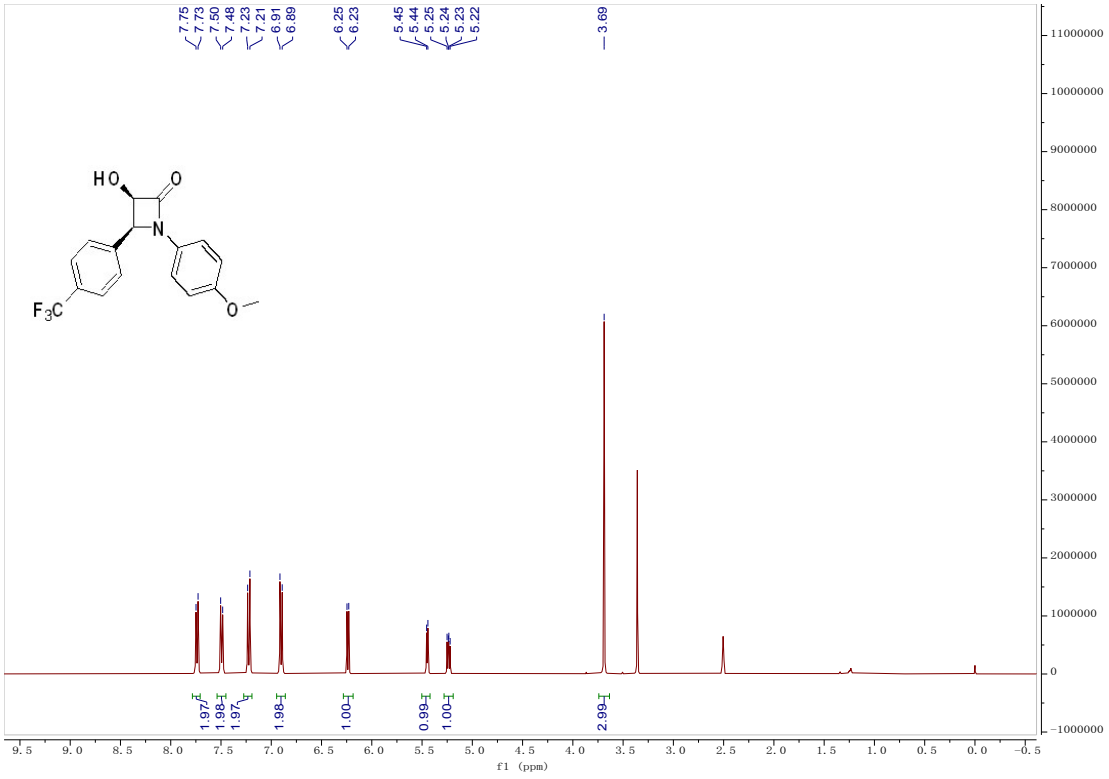


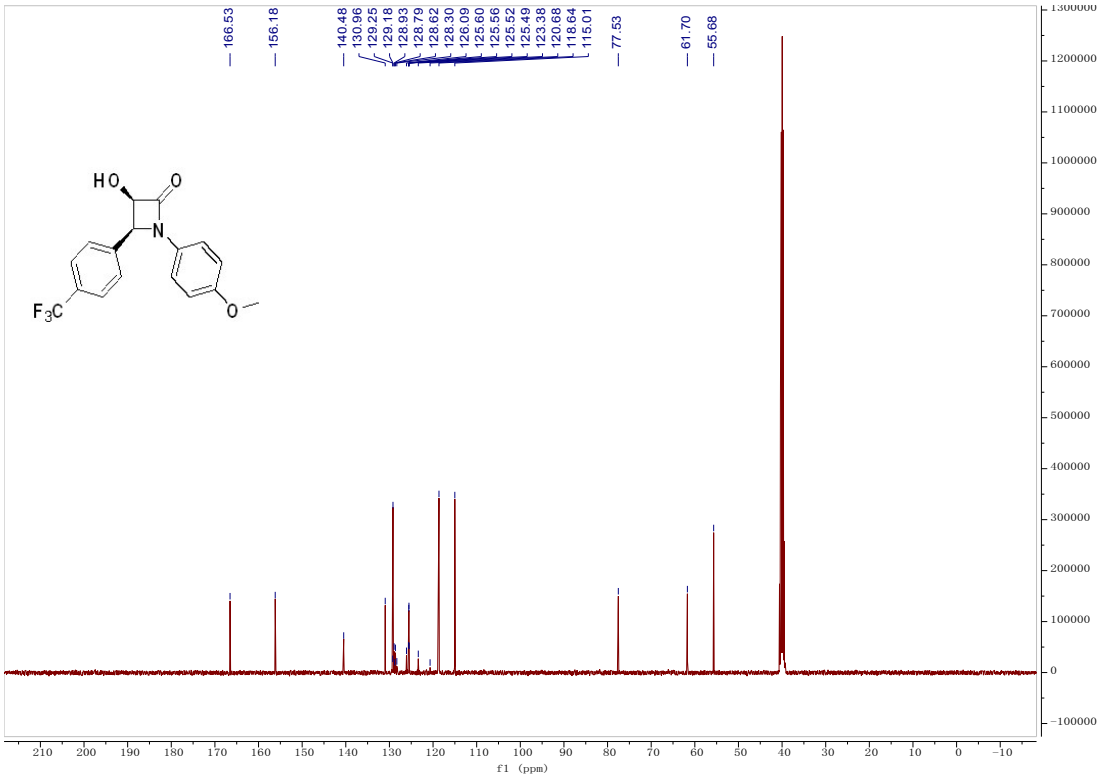
^{1}H NMR and ^{13}C NMR of 2o



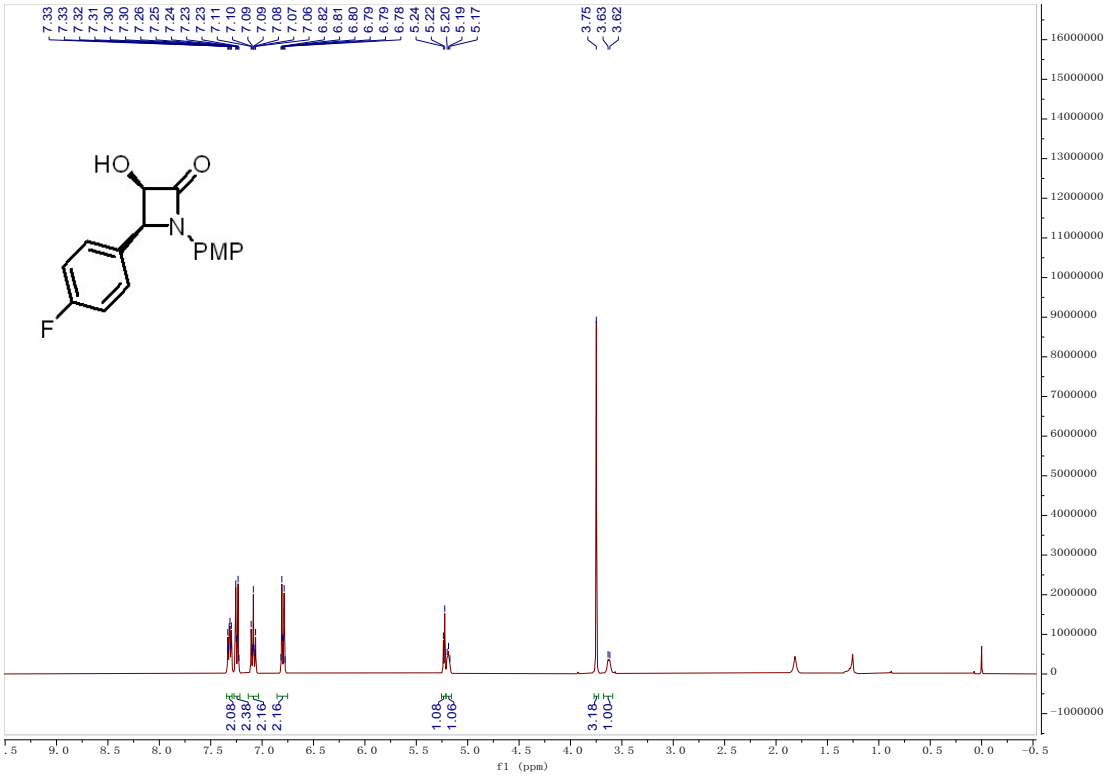


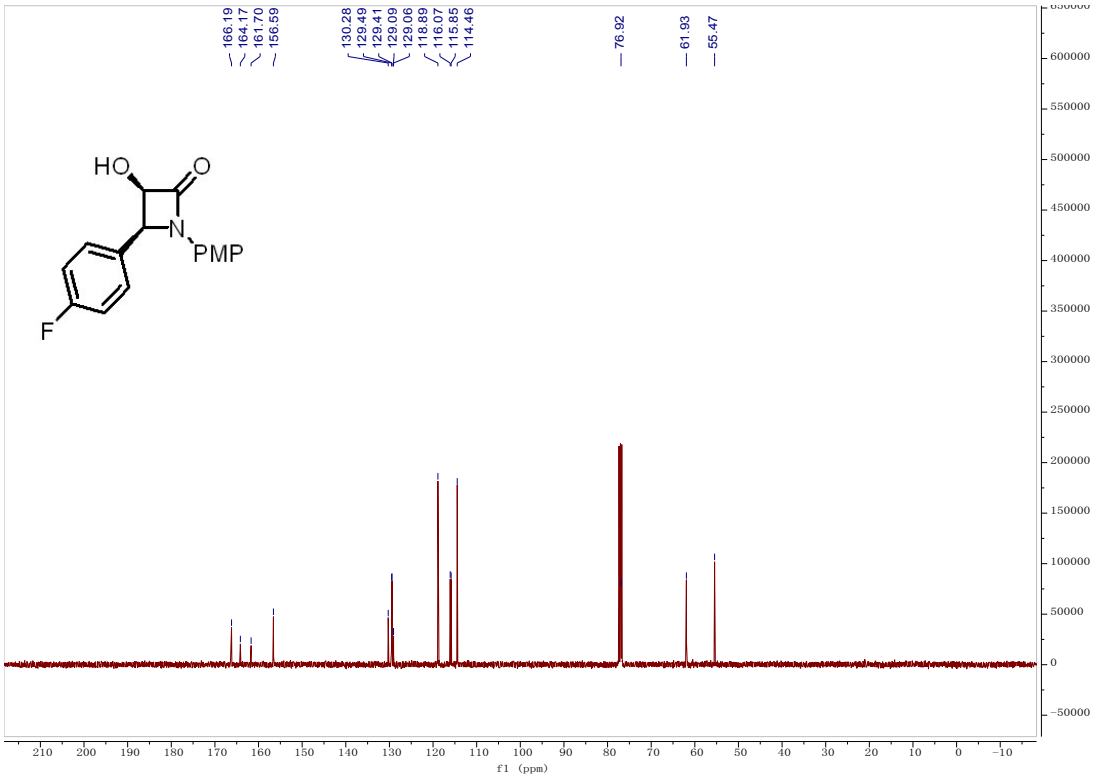
^{1}H NMR and ^{13}C NMR of 2p



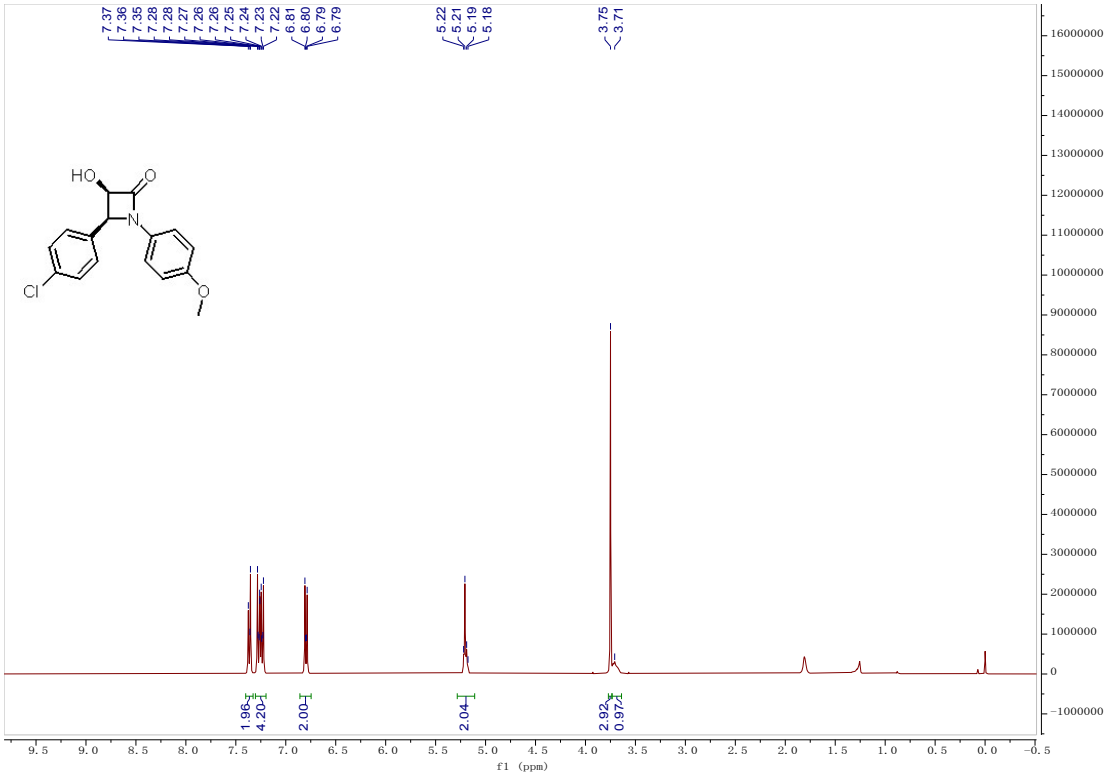


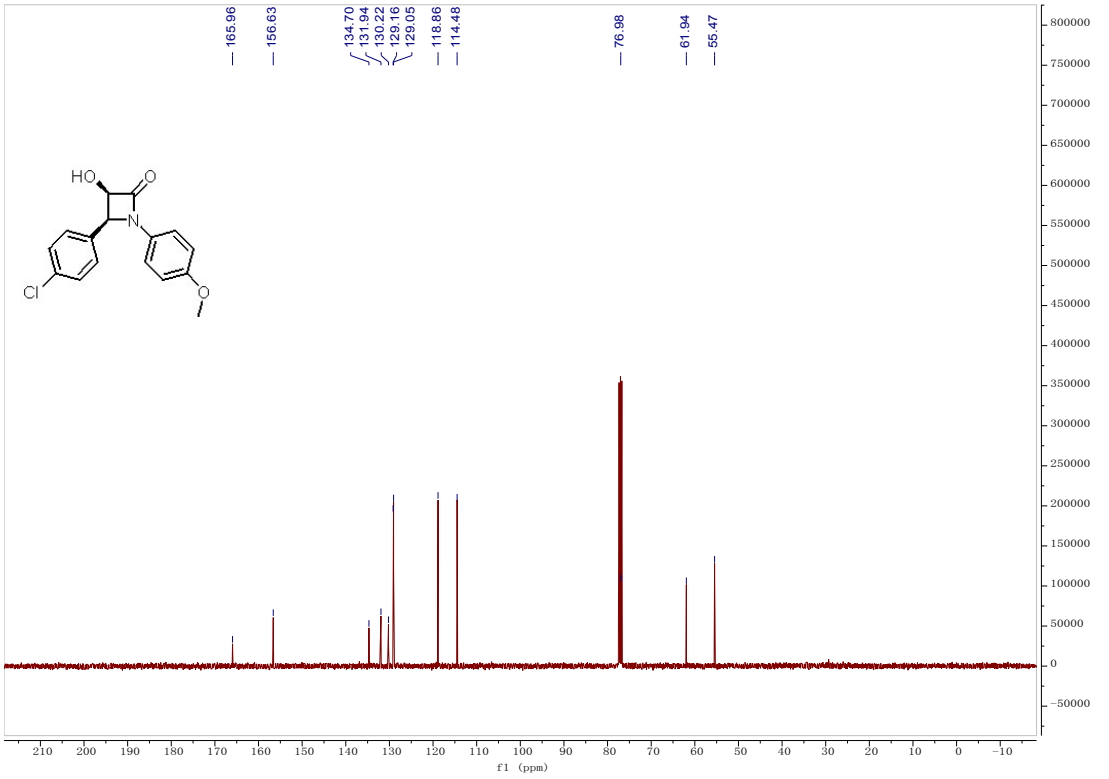
^{1}H NMR and ^{13}C NMR of 2q



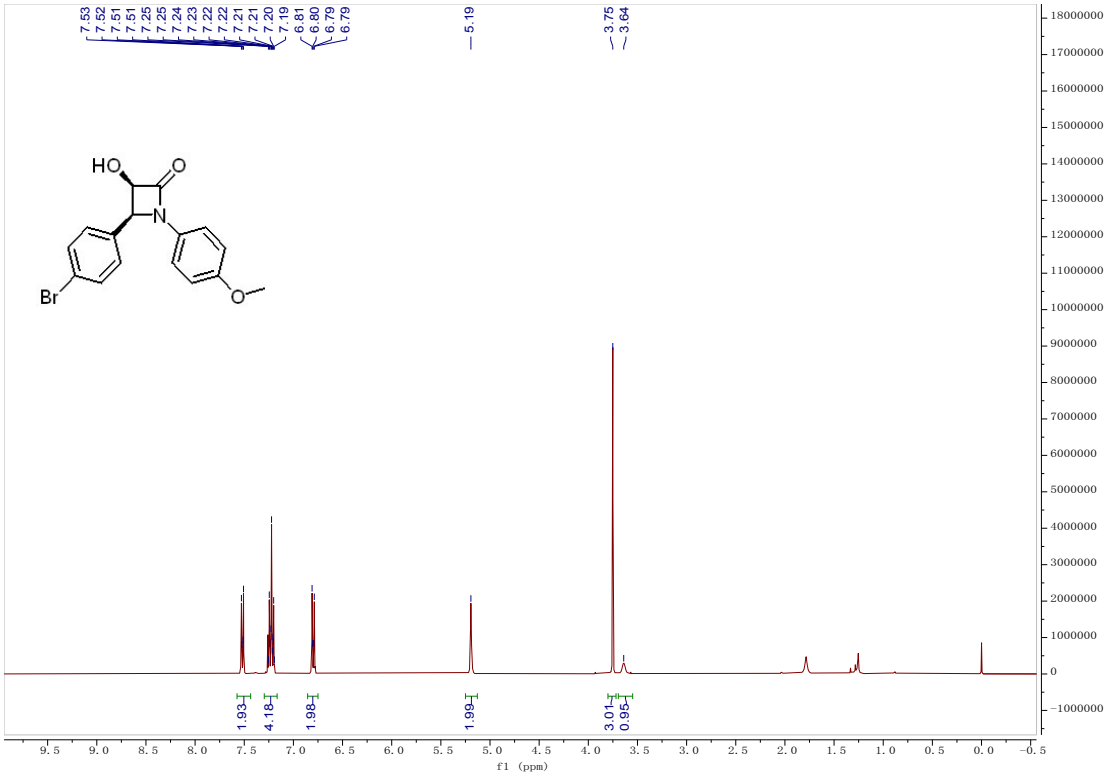


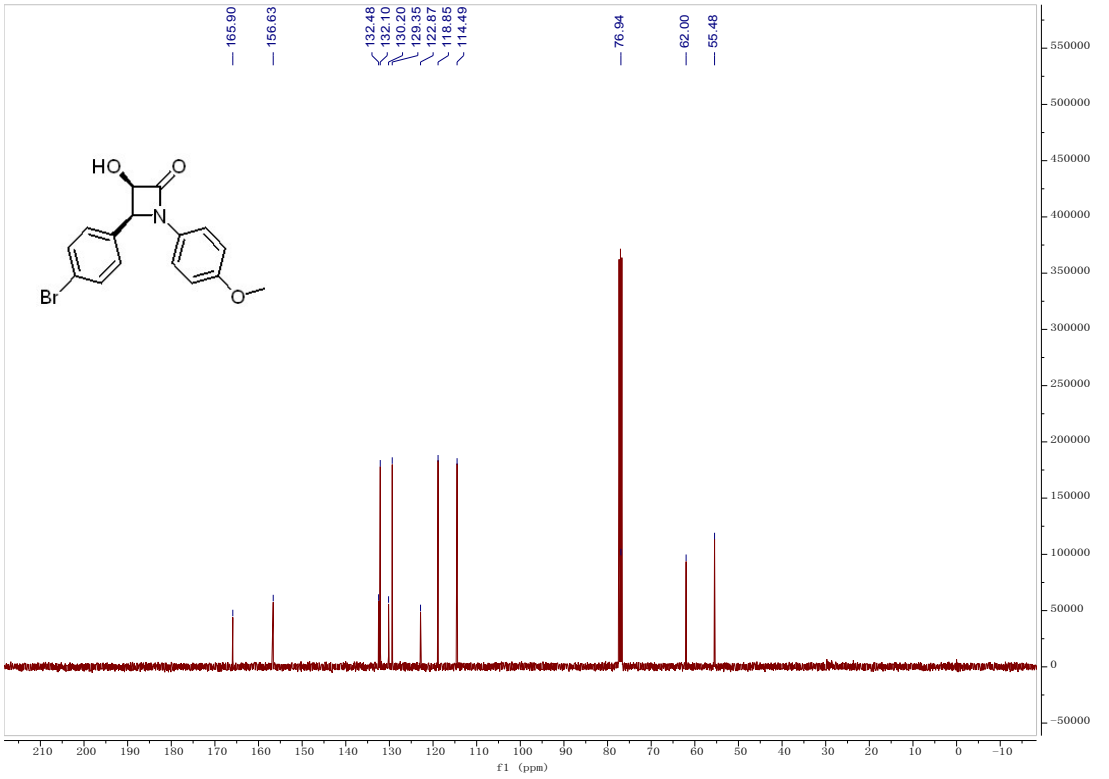
^{1}H NMR and ^{13}C NMR of 2r



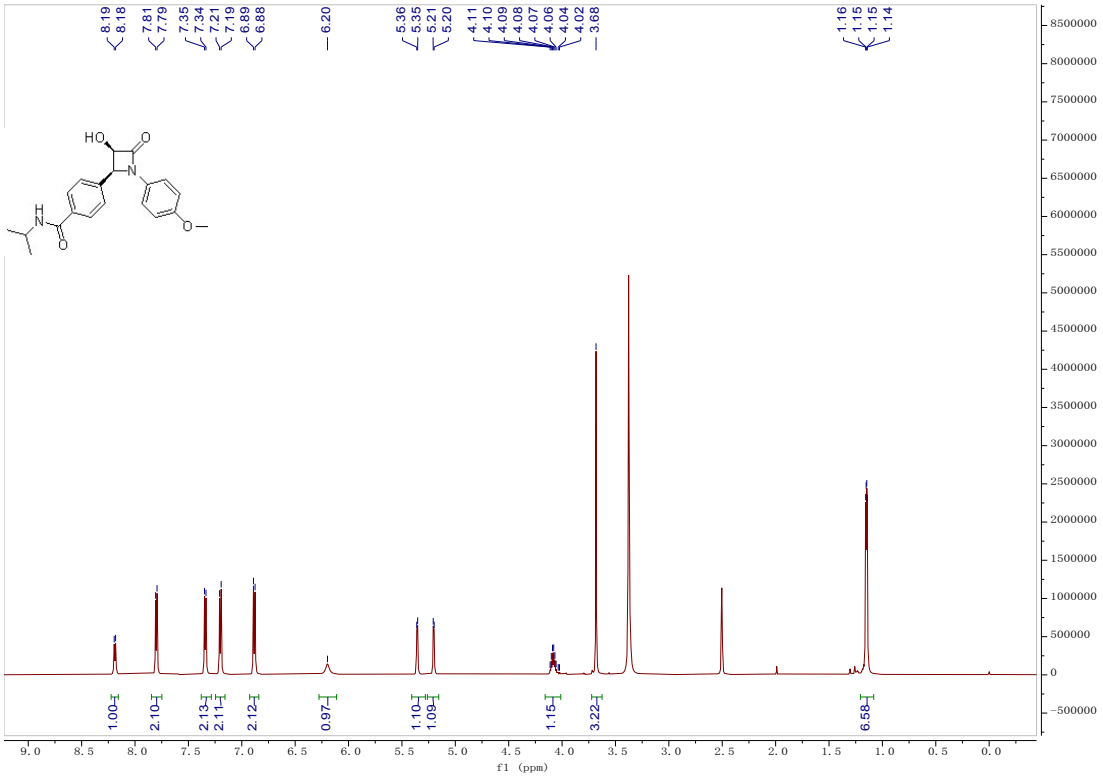


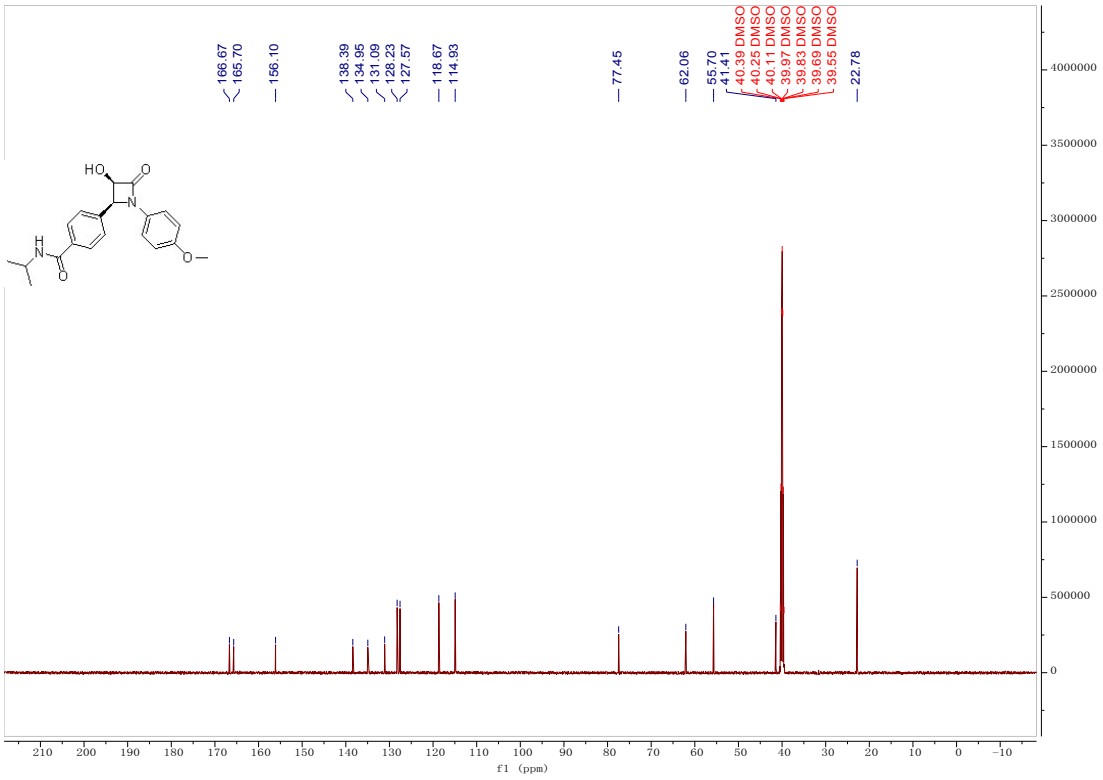
^{1}H NMR and ^{13}C NMR of 2s



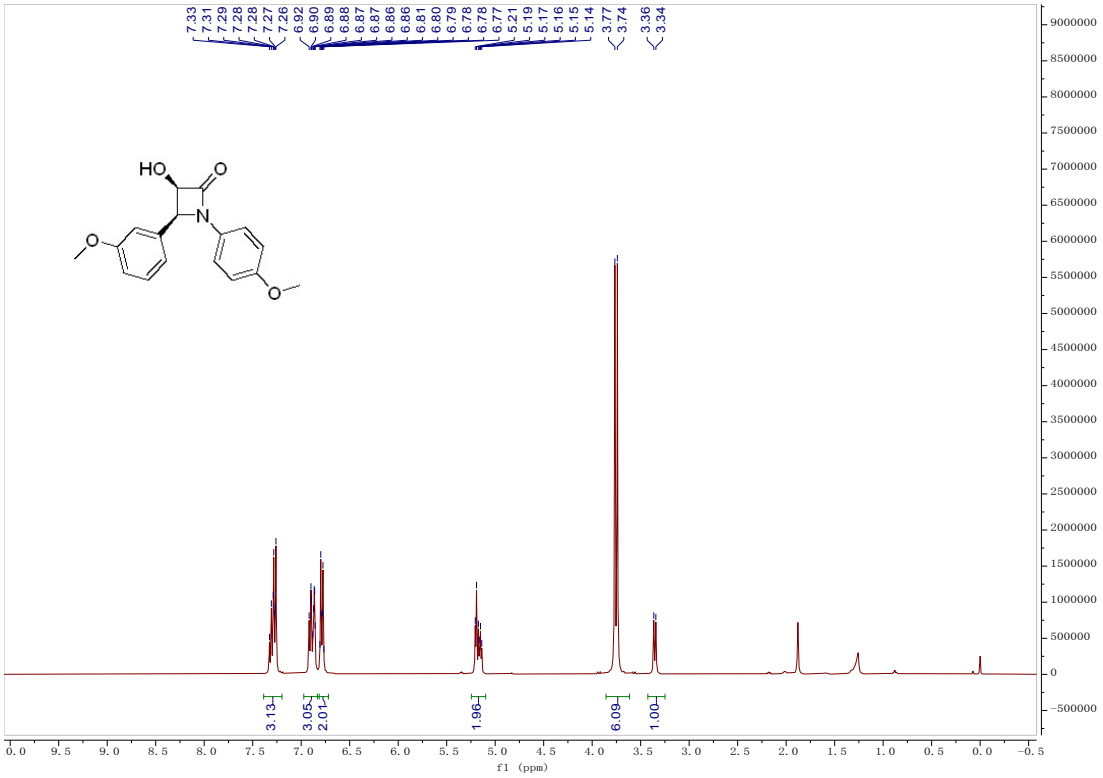


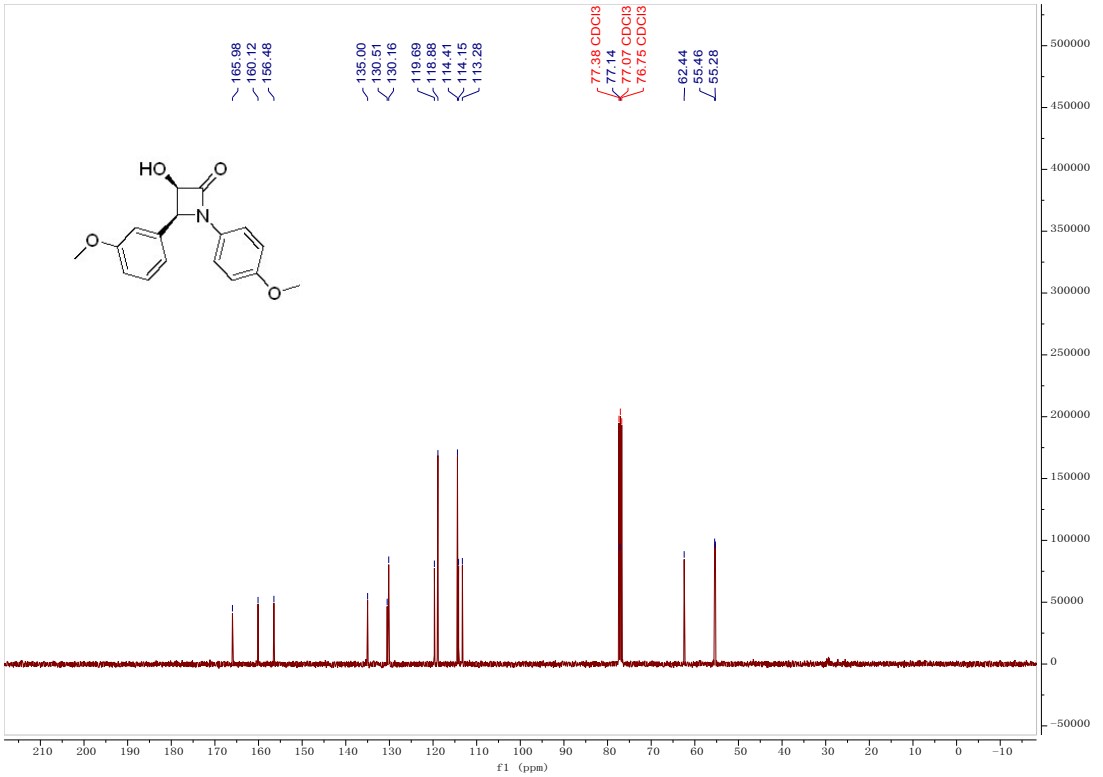
^{1}H NMR and ^{13}C NMR of 2t



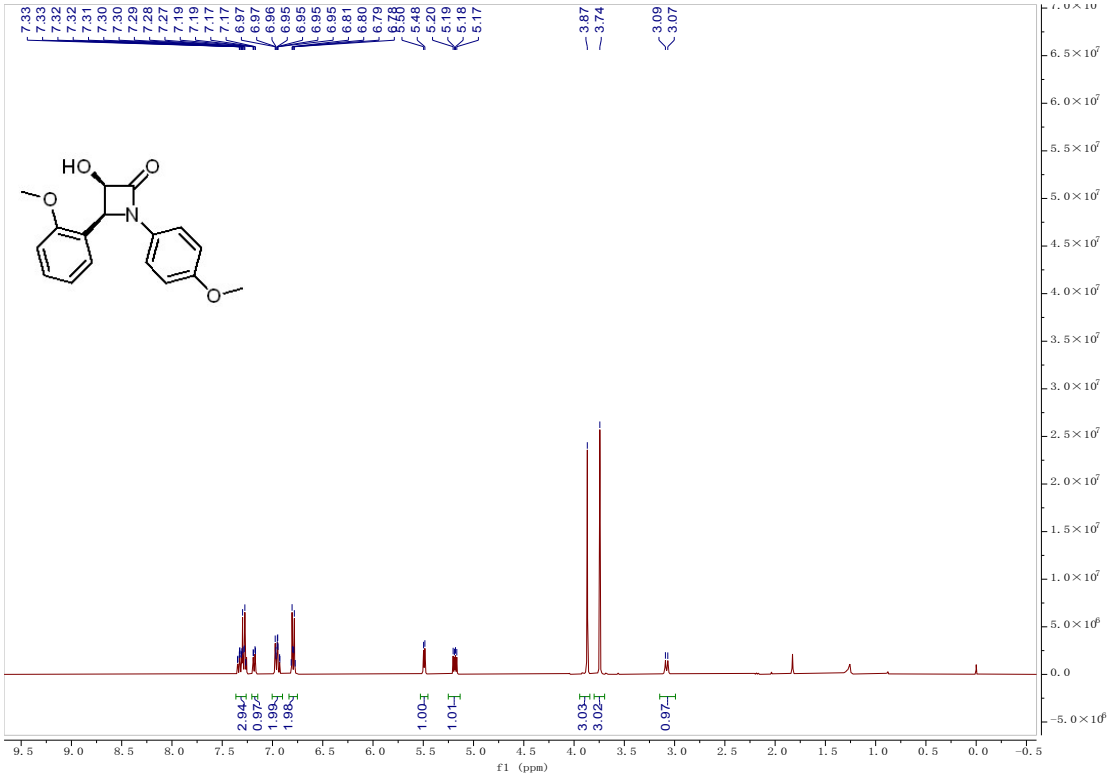


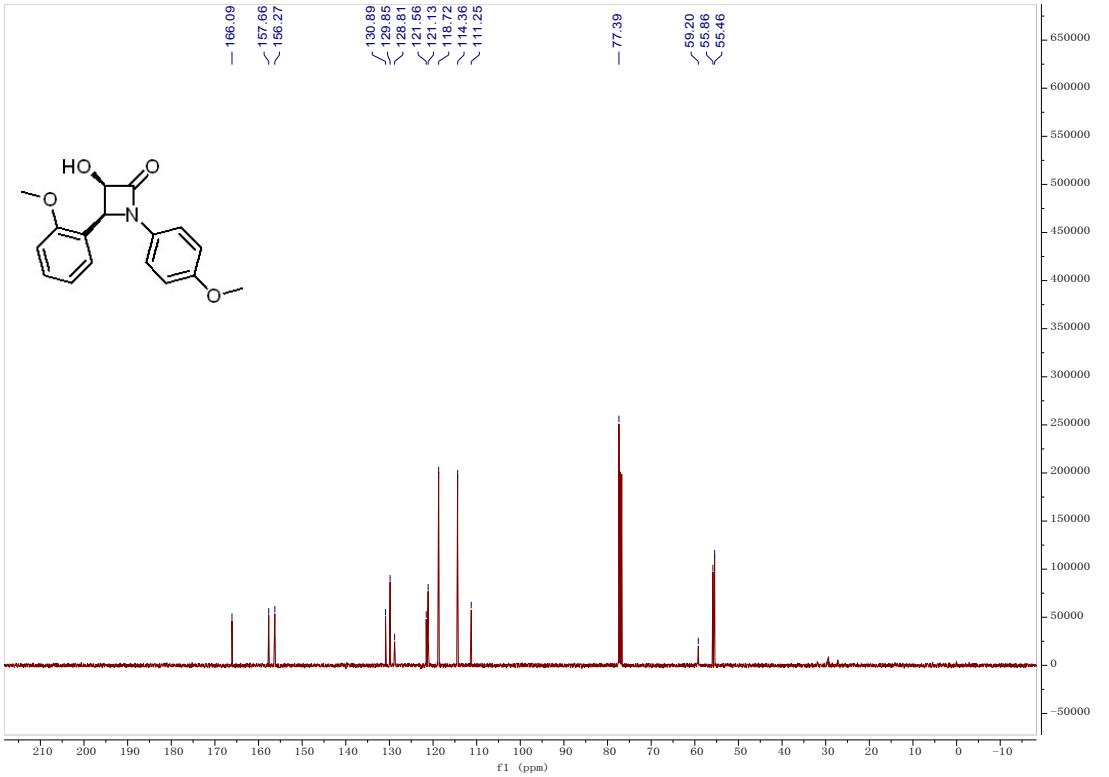
^{1}H NMR and ^{13}C NMR of 2u



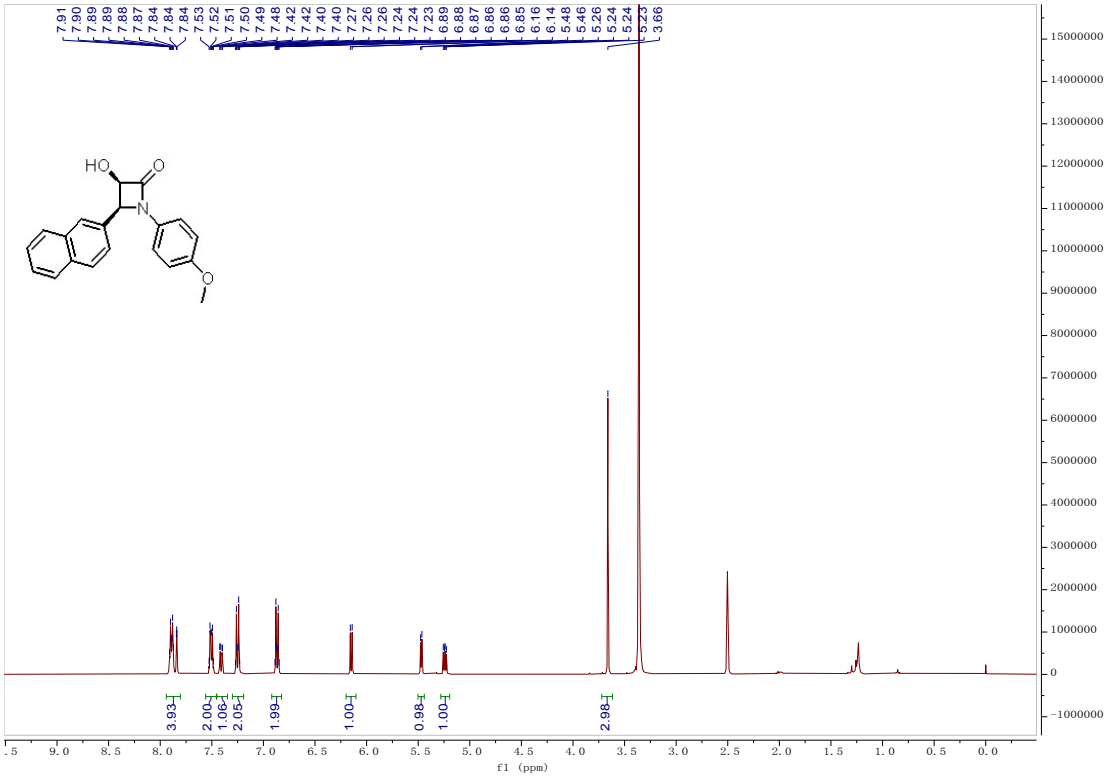


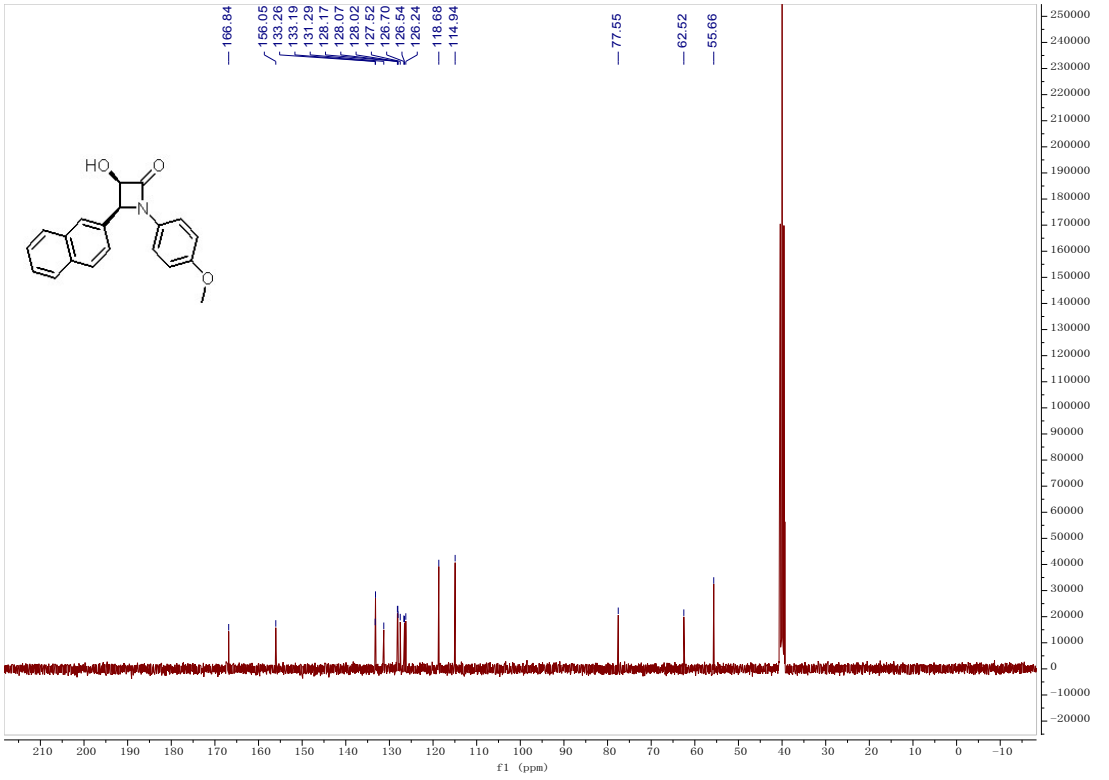
^{1}H NMR and ^{13}C NMR of 2v



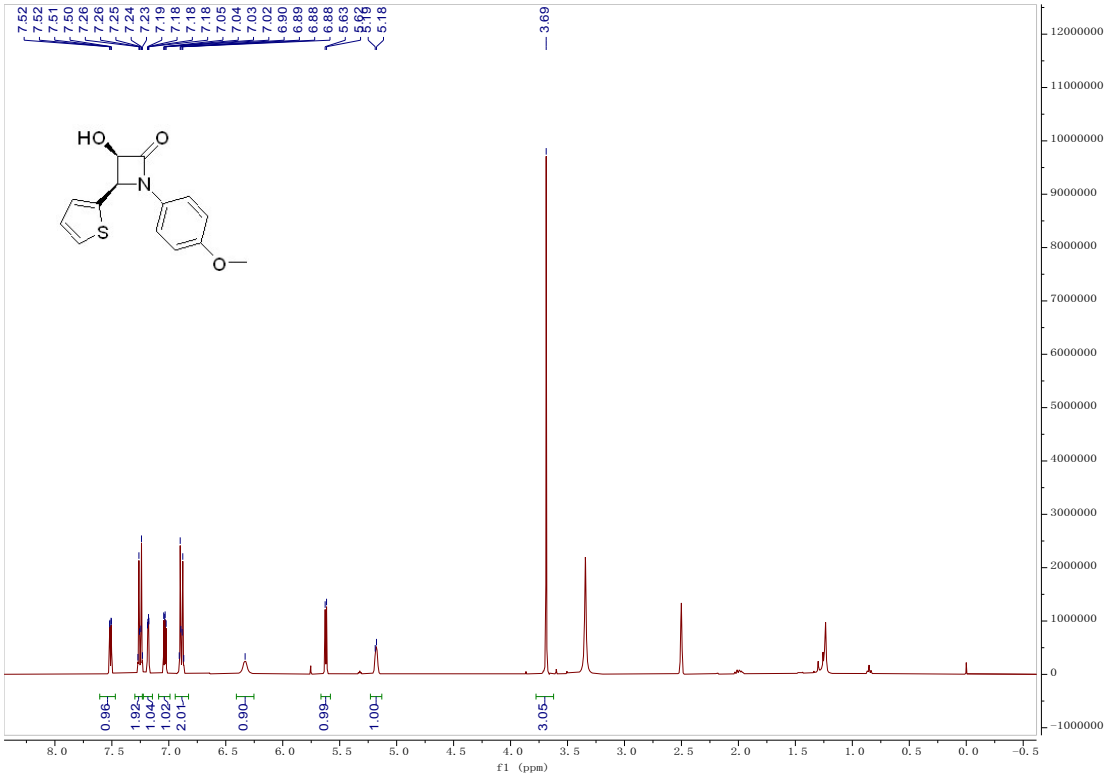


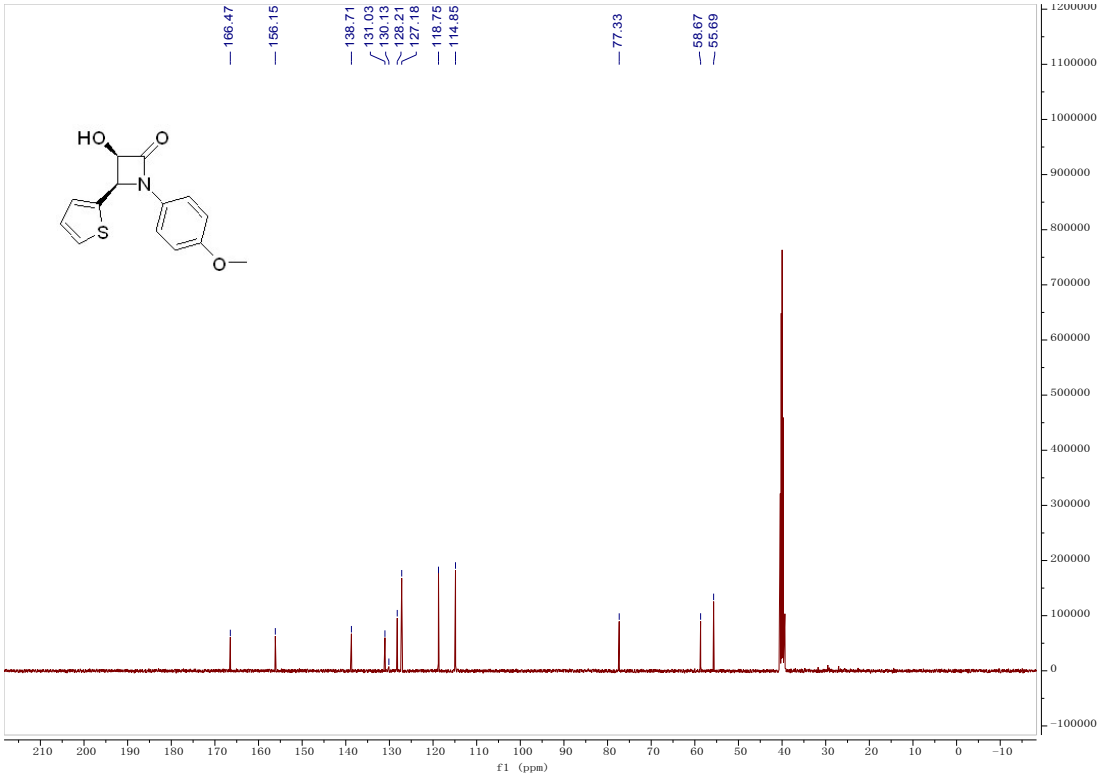
^{1}H NMR and ^{13}C NMR of 2w



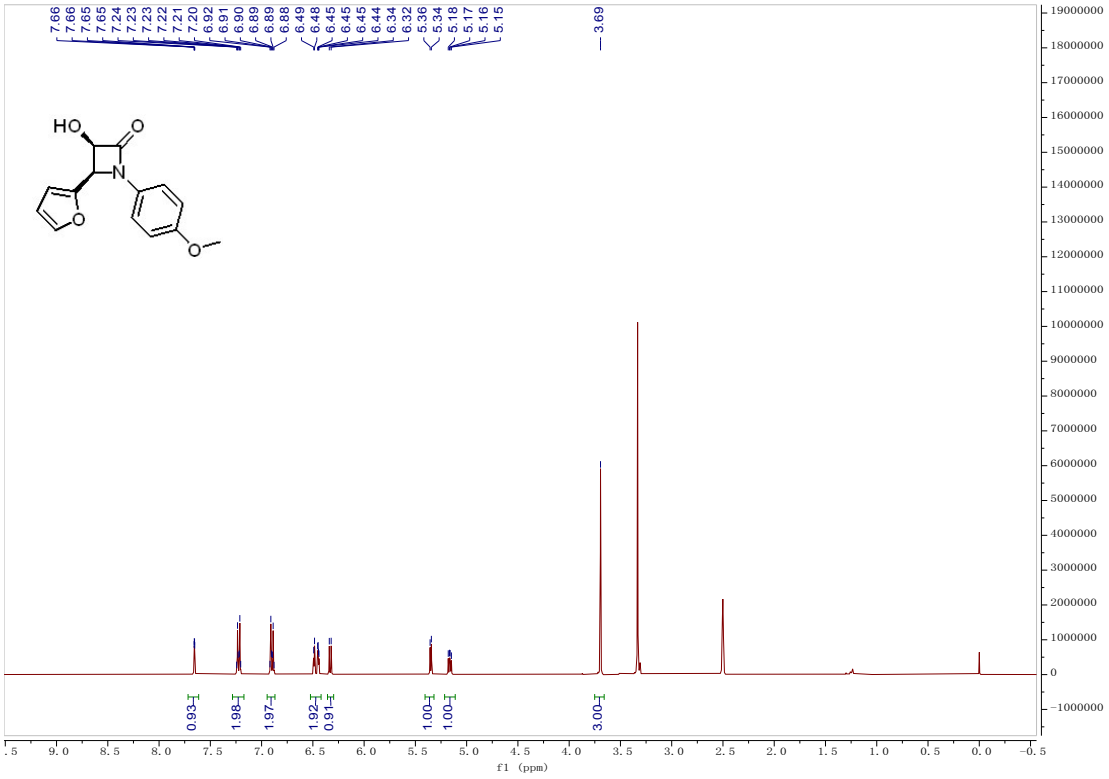


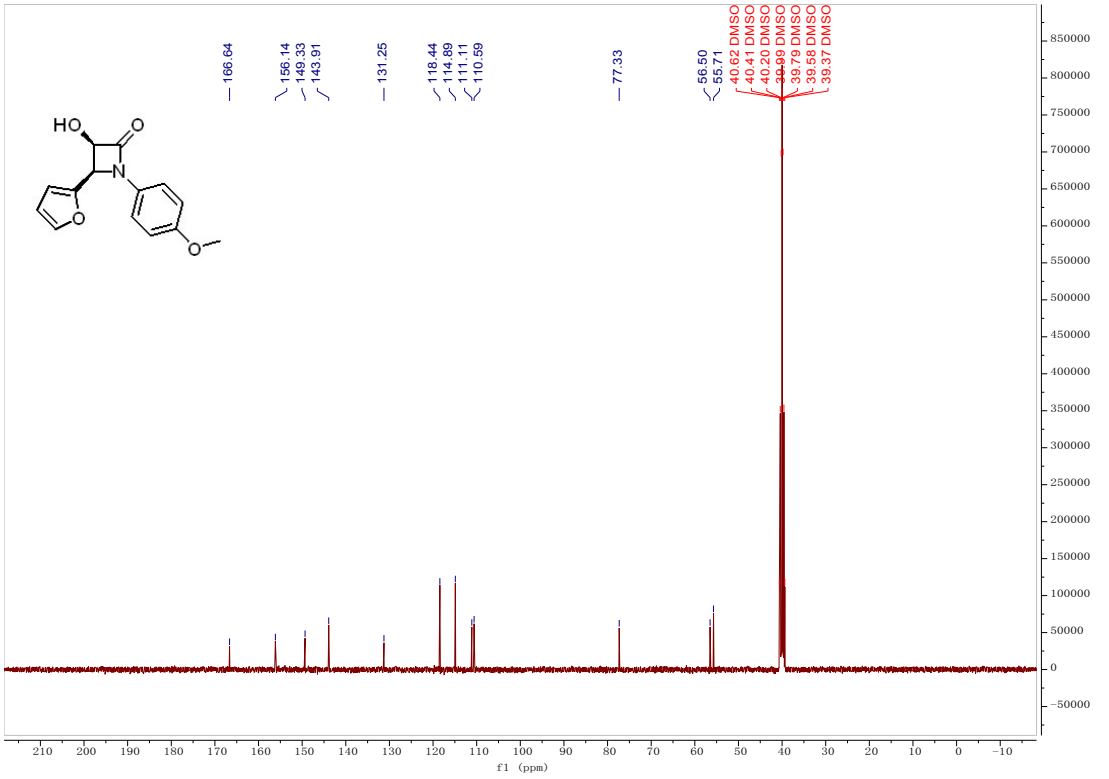
^{1}H NMR and ^{13}C NMR of 2x



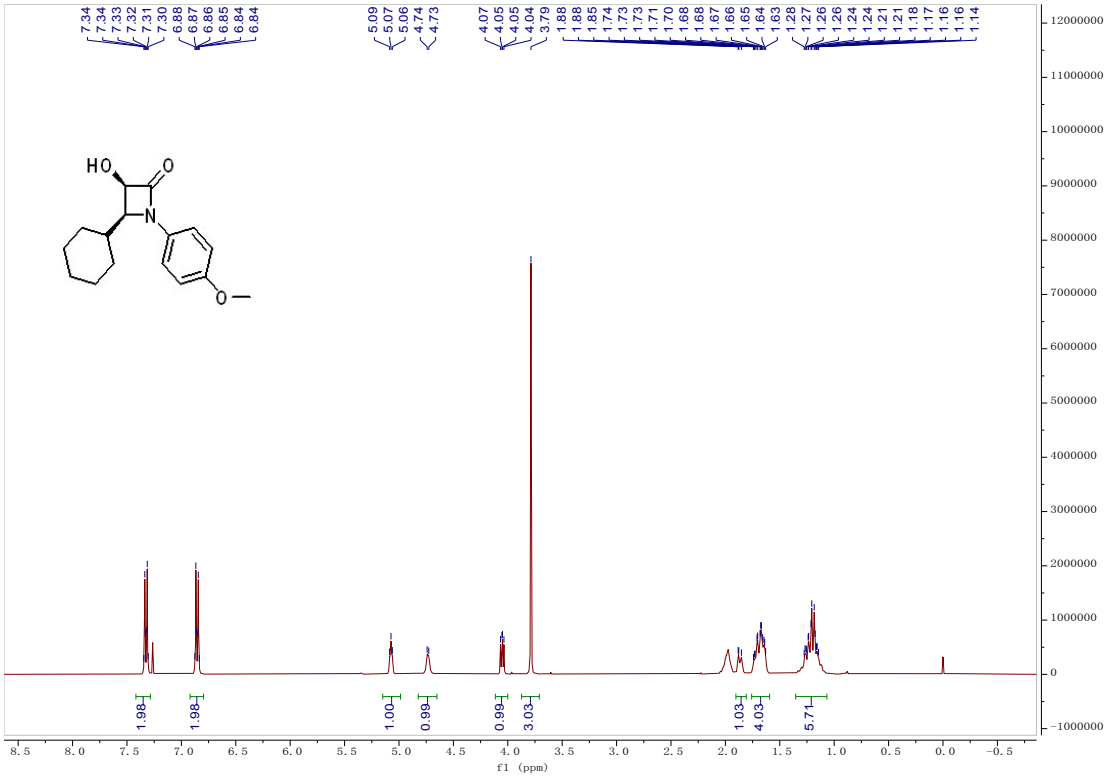


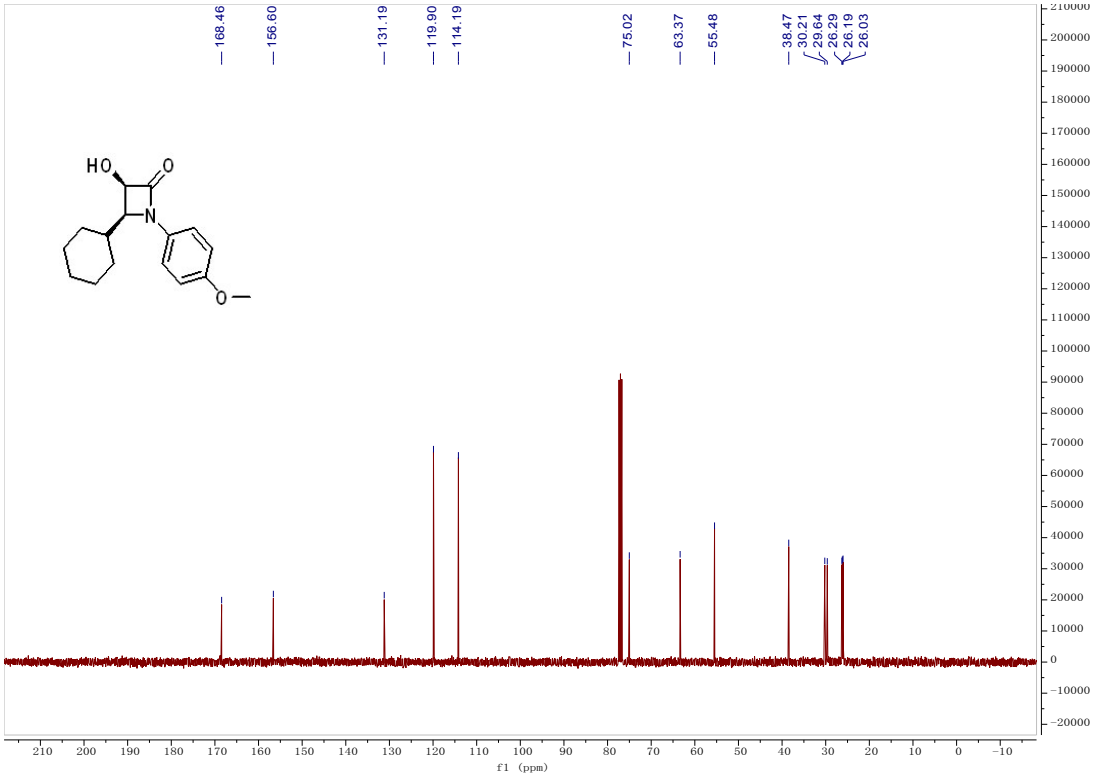
^{1}H NMR and ^{13}C NMR of 2y



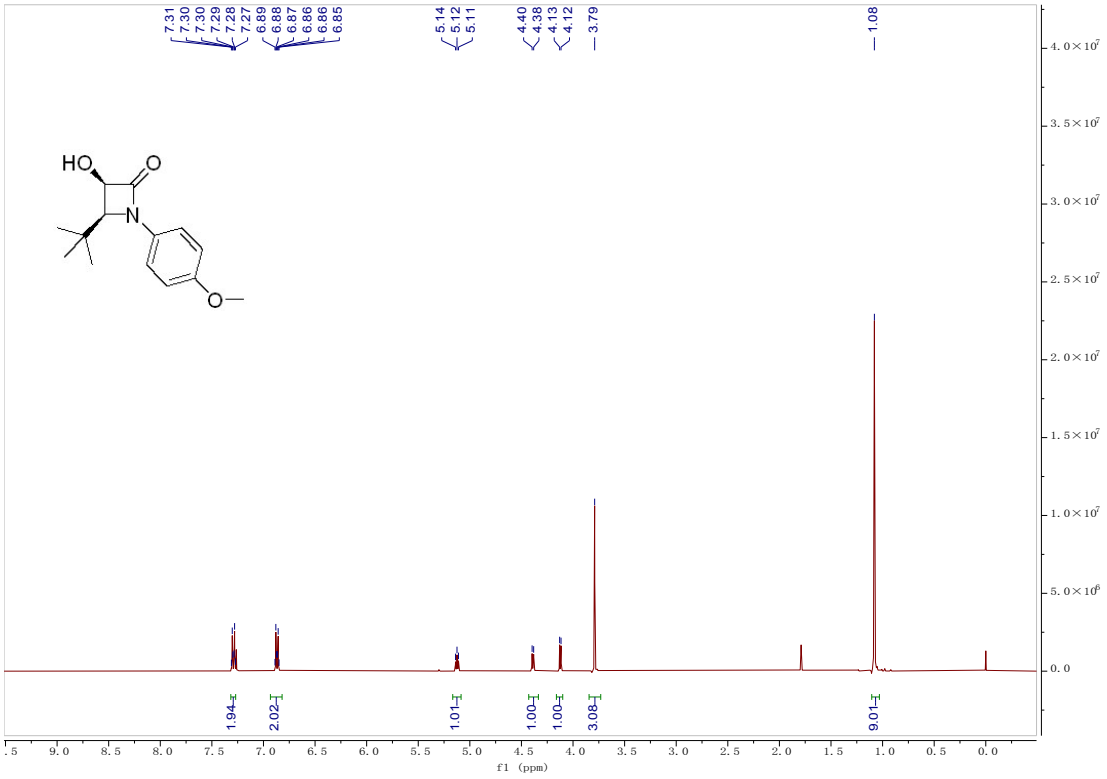


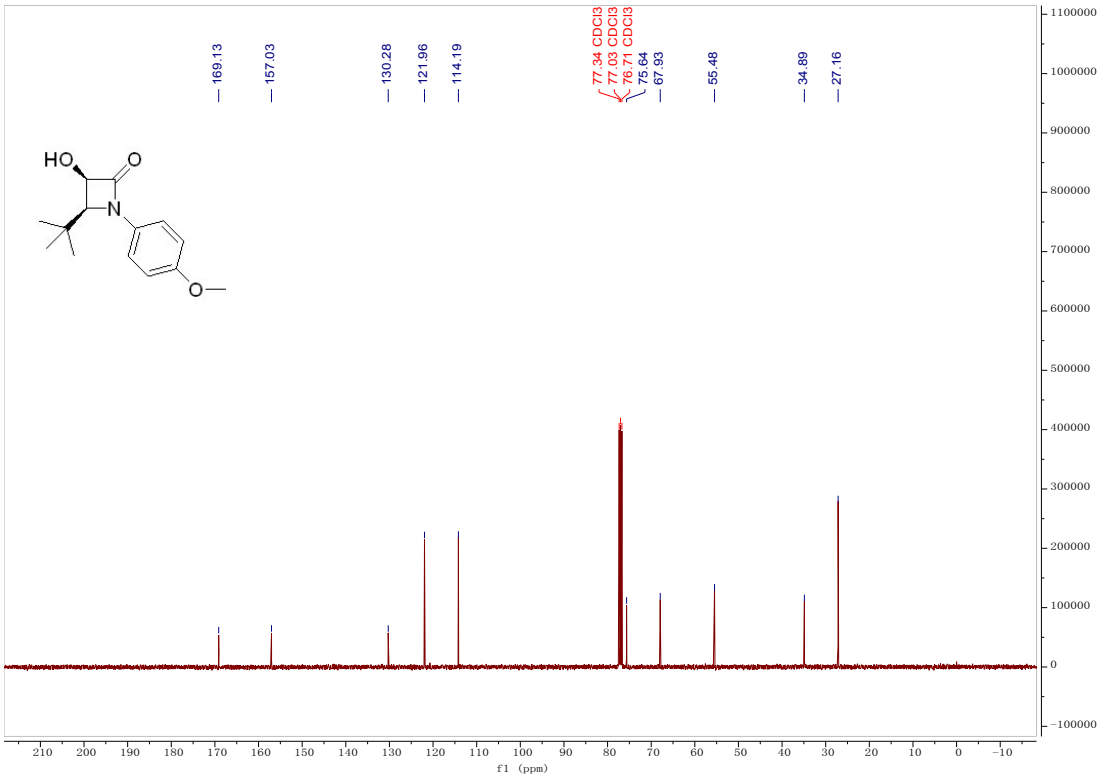
^{1}H NMR and ^{13}C NMR of 2z



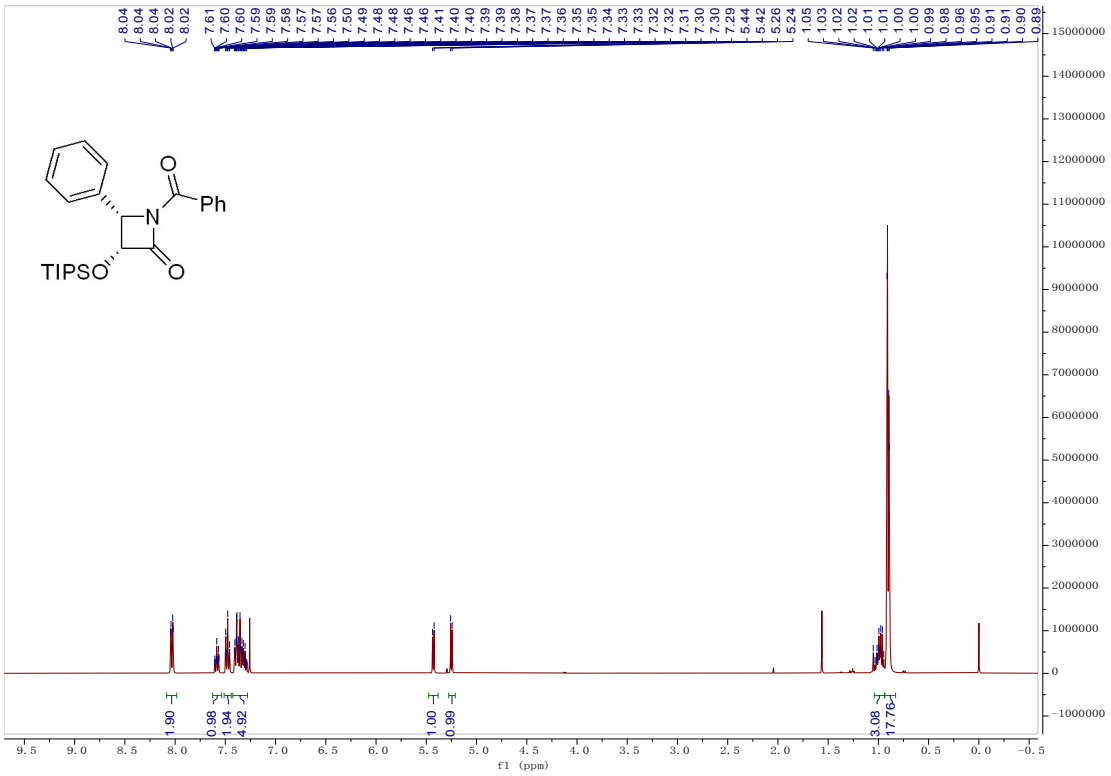


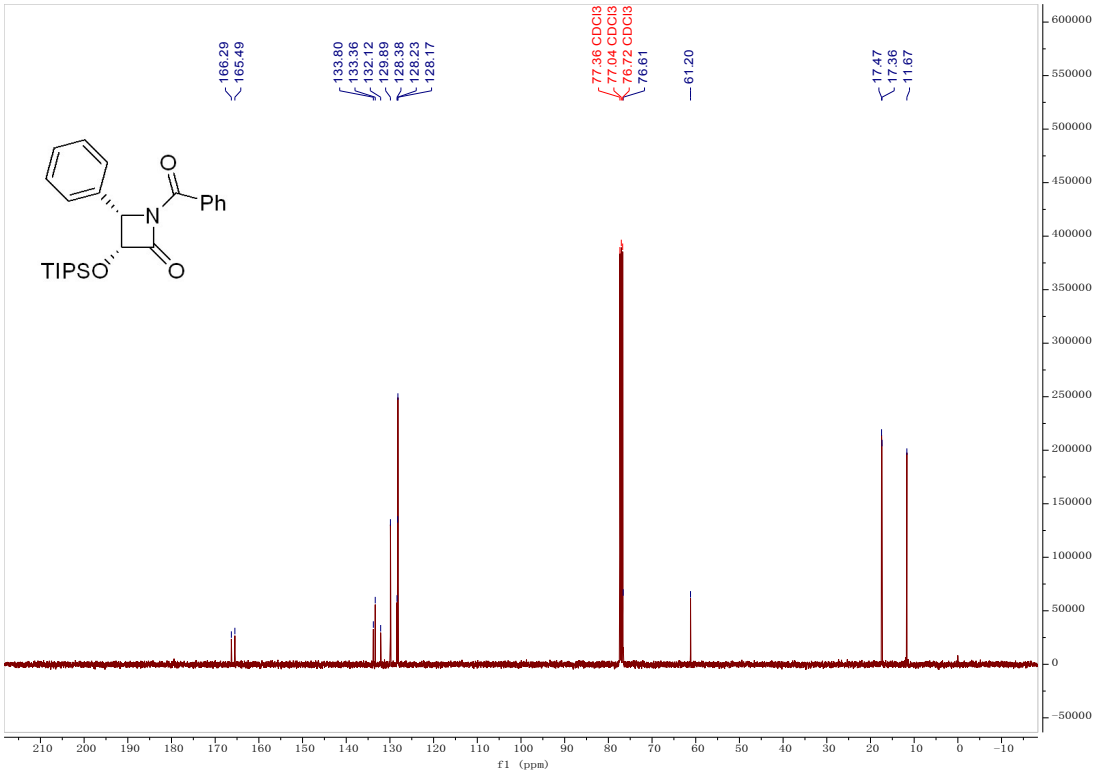
^{1}H NMR and ^{13}C NMR of 2aa



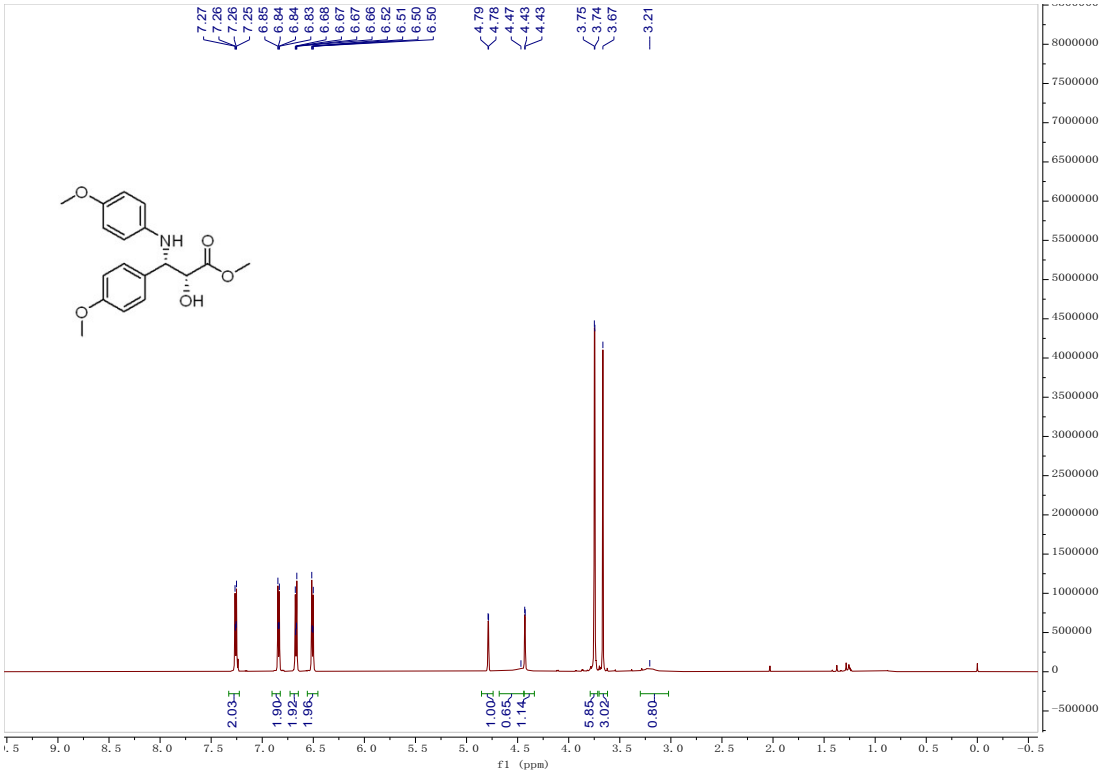


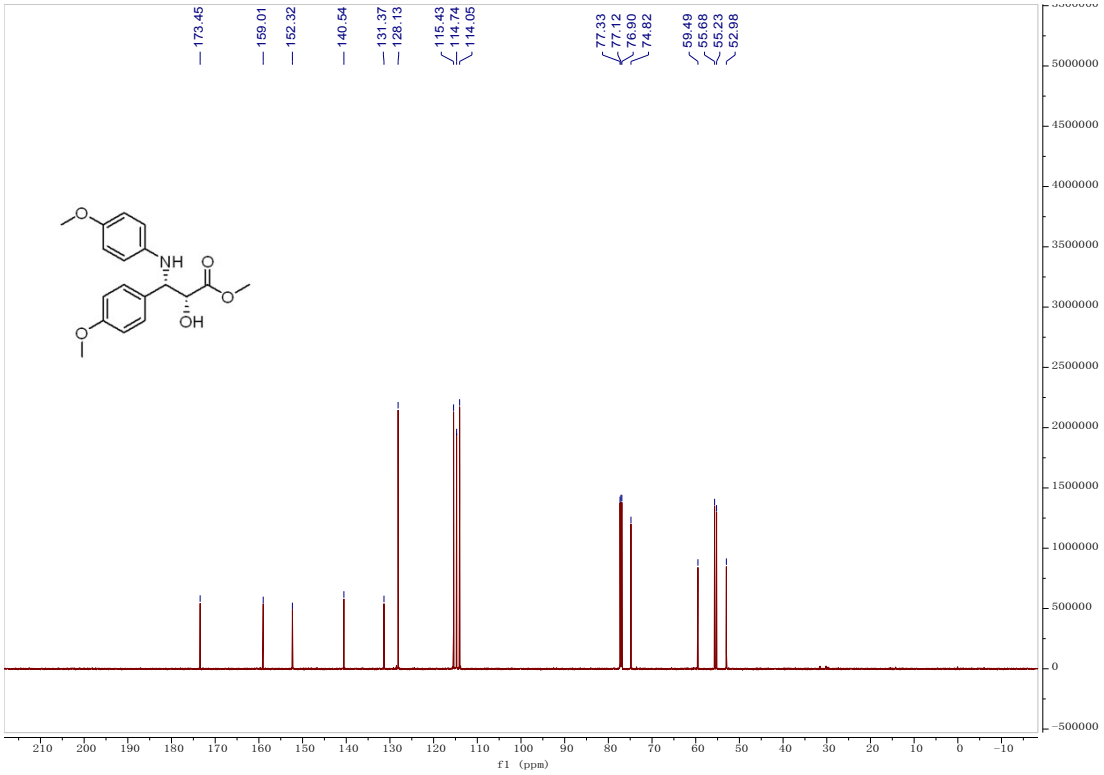
^{1}H NMR and ^{13}C NMR of 4a





^{1}H NMR and ^{13}C NMR of 5n

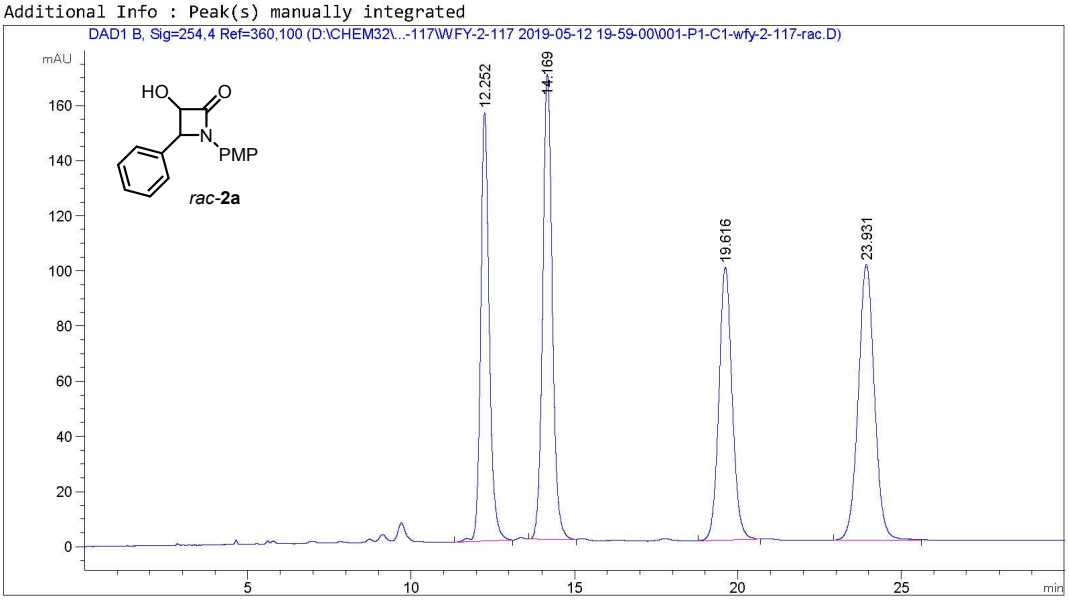




9. HPLC Spectra of the Products.

Data File D:\CHEM32\...Y\WFY-2-117\WFY-2-117 2019-05-12 19-59-00\001-P1-C1-wfy-2-117-rac.D
Sample Name: wfy-2-117-rac

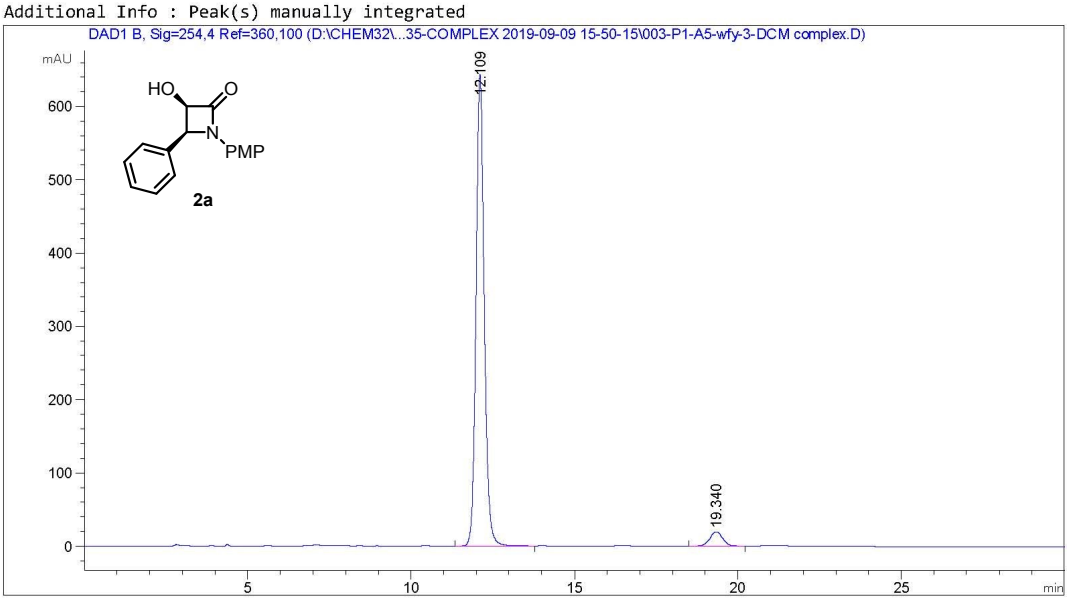
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   1
Acq. Instrument : 1260-DAD                      Location :   P1-C-01
Injection Date  : 5/12/2019 19:59:51                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-2-117\wfy-2-117 2019-05-12 19-59-00\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-2-117\wfy-2-117 2019-05-12 19-59-00\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 4/19/2020 22:41:24 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.252 VB R  0.2749 2826.83594  155.51921  22.6851
   2  14.169 BB    0.3112 3427.30908  168.54640  27.5039
   3  19.616 BB    0.4302 2783.29785   98.95164  22.3357
   4  23.931 BB    0.5299 3423.74170   99.87918  27.4753
```

Data File D:\CHEM32\...\WFY-3-35-COMPLEX 2019-09-09 15-50-15\003-P1-A5-wfy-3-DCM complex.D
Sample Name: wfy-3-DCM complex

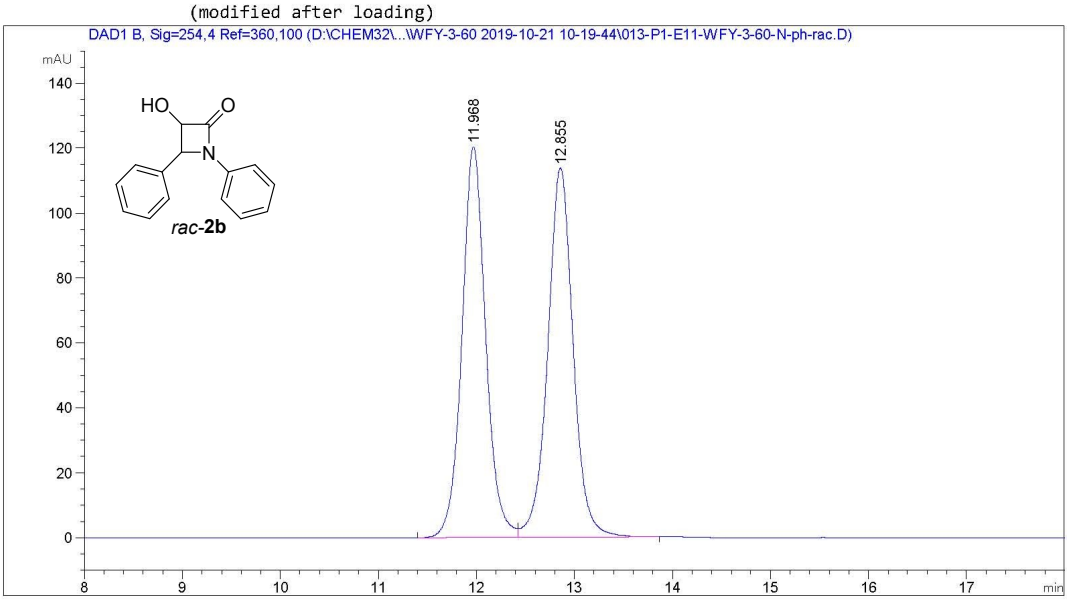
```
=====================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Acq. Instrument : 1260-DAD                     Location :   P1-A-05
Injection Date  : 9/9/2019 16:37:24                 Inj :   1
                                              Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-35\wfy-3-35-complex 2019-09-09 15-50-15\IA-85-15
                  -1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-35\wfy-3-35-complex 2019-09-09 15-50-15\IA-85-15
                  -1ml-30min.M (Sequence Method)
Last changed    : 4/19/2020 22:40:02 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.109 BB    0.2652 1.12109e4   643.78705  95.3865
   2  19.340 BB    0.4181  542.23633   19.76000   4.6135

Totals :                  1.17532e4   663.54705
```

Data File D:\CHEM32\...FY-3-60\WFY-3-60 2019-10-21 10-19-44\013-P1-E11-WFY-3-60-N-ph-rac.D
Sample Name: WFY-3-60-N-ph-rac

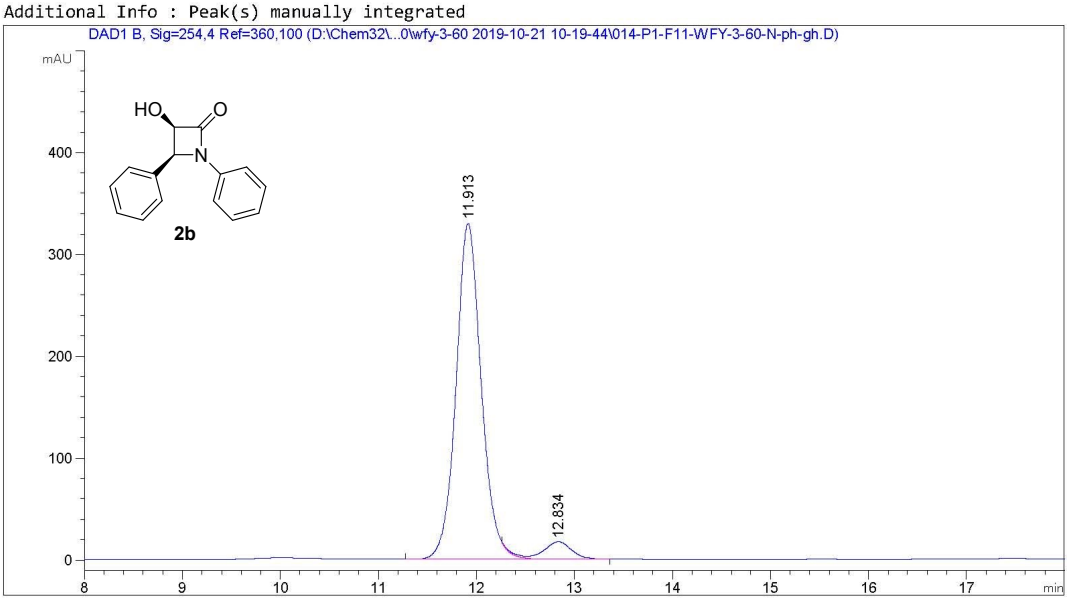
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  13
Acq. Instrument : 1260-DAD                     Location :   P1-E-11
Injection Date  : 10/21/2019 15:55:45               Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-90-10-1.0ml-
                  25min.M
Last changed    : 3/16/2019 16:37:28 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-90-10-1.0ml-
                  25min.M (Sequence Method)
Last changed    : 11/15/2019 16:31:39 by SYSTEM
                  (modified after loading)
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.968 BV    0.2536 2017.66260  120.31926  49.6550
   2  12.855 VB    0.2718 2045.69629  113.74475  50.3450

Totals :                  4063.35889  234.06401
```

Data File D:\Chem32\...WFY-3-60\wfy-3-60 2019-10-21 10-19-44\014-P1-F11-WFY-3-60-N-ph-gh.D
Sample Name: WFY-3-60-N-ph-gh

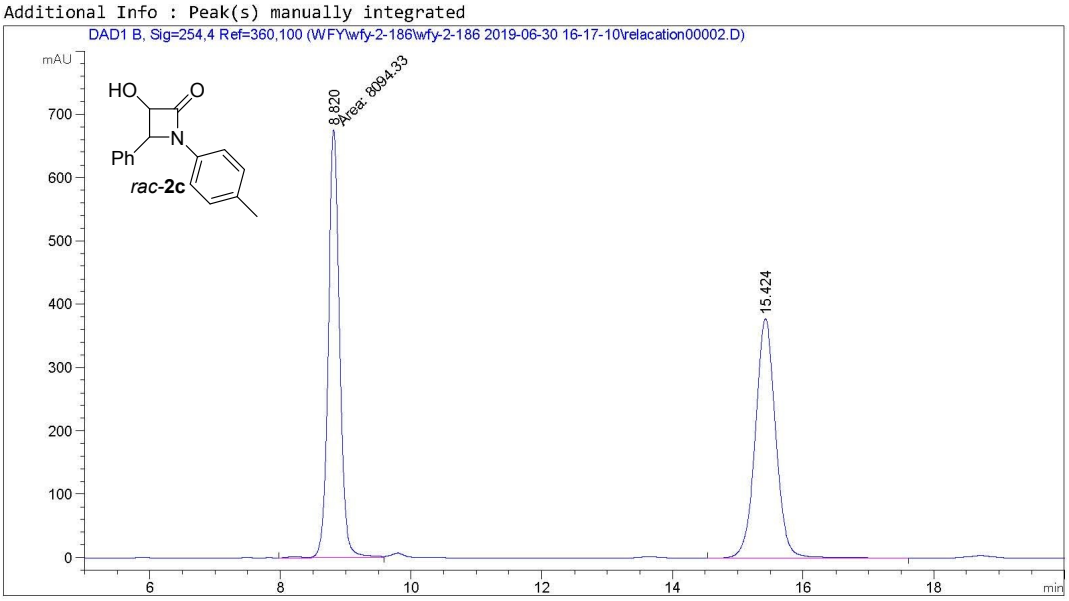
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  14
Acq. Instrument : 1260-DAD                      Location :   P1-F-11
Injection Date  : 10/21/2019 16:21:40                Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-90-10-1.0ml-
                  25min.M
Last changed    : 3/16/2019 16:37:28 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-90-10-1.0ml-
                  25min.M (Sequence Method)
Last changed    : 11/15/2019 16:32:19 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.913 BV R  0.2708 5905.14404  329.88065  94.5105
   2  12.834 VB E  0.3011  342.98813   17.01727   5.4895

Totals :                  6248.13217  346.89791
```

Data File D:\ChemSta...\Data\WFY\wfy-2-186\wfy-2-186 2019-06-30 16-17-10\relacation00002.D
Sample Name: N-p-Me-rac

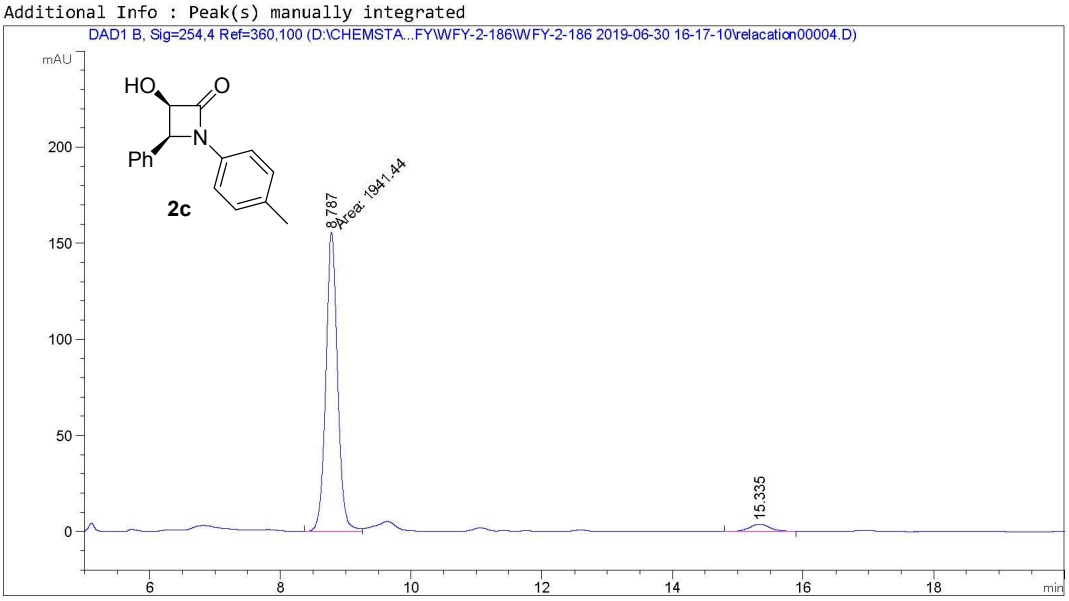
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P1-E-01
Injection Date  : 6/30/2019 4:28:26 PM              Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 3.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-2-186\wfy-2-186 2019-06-30 16-17-10\IA-85-15-
                  1ML-30 min.M
Last changed    : 6/26/2019 8:16:18 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-2-186\wfy-2-186 2019-06-30 16-17-10\IA-85-15-
                  1ML-30 min.M (Sequence Method)
Last changed    : 12/18/2019 8:25:53 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.820 MF    0.1995 8094.32568  676.24884  50.0021
   2  15.424 BB    0.3260 8093.64795  377.72263  49.9979
```

Data File D:\CHEMSTA...\DATA\WFY\WFY-2-186\WFY-2-186 2019-06-30 16-17-10\relacation00004.D
Sample Name: wfy-2-186-N-p-Me

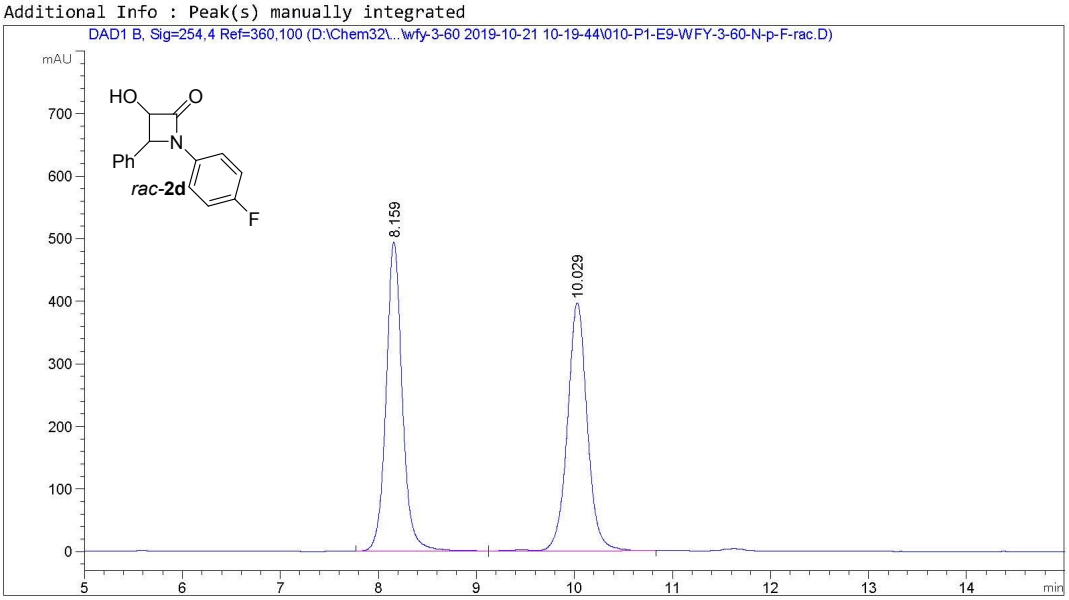
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   4
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-E-03
Injection Date  : 6/30/2019 5:30:16 PM               Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-2-186\wfy-2-186 2019-06-30 16-17-10\IA-85-15-
                  1ML-30 min.M
Last changed    : 6/26/2019 8:16:18 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-2-186\wfy-2-186 2019-06-30 16-17-10\IA-85-15-
                  1ML-30 min.M (Sequence Method)
Last changed    : 12/18/2019 8:24:30 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.787 MF    0.2081 1941.43738  155.46277  96.0785
   2  15.335 BB    0.3267   79.24133    3.68805   3.9215
```

Data File D:\Chem32\...FY-3-60\wfy-3-60 2019-10-21 10-19-44\010-P1-E9-WFY-3-60-N-p-F-rac.D
Sample Name: WFY-3-60-N-p-F-rac

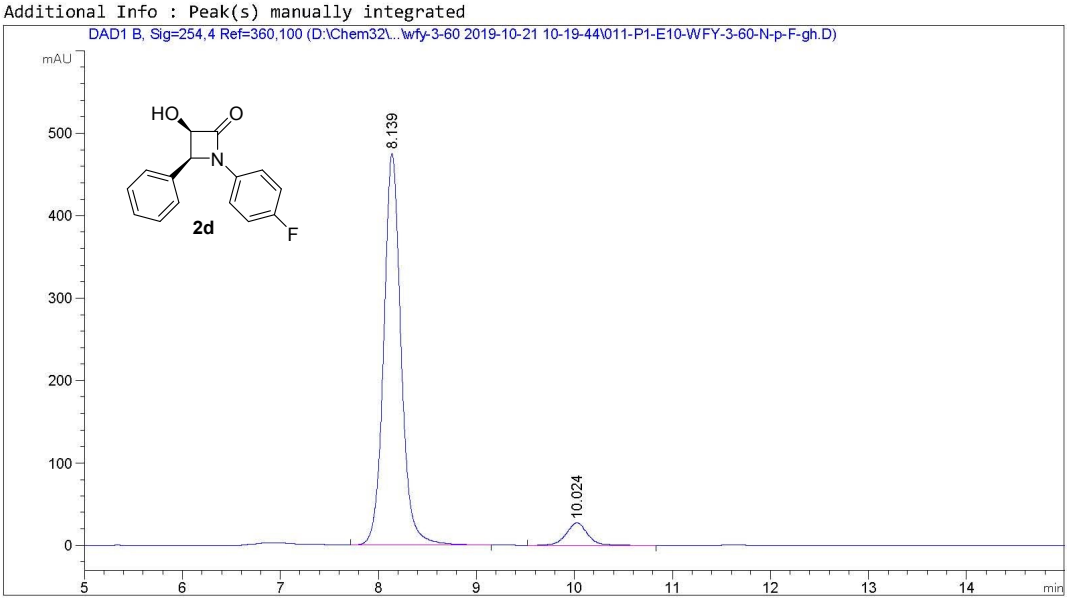
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  10
Acq. Instrument : 1260-DAD                     Location :   P1-E-09
Injection Date  : 10/21/2019 14:43:30              Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:28:56 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.159 BB    0.1718 5666.89551  494.20334  50.3851
   2  10.029 VB R  0.2113 5580.26221  396.64206  49.6149

Totals :                  1.12472e4   890.84540
```

Data File D:\Chem32\...FY-3-60\wfy-3-60 2019-10-21 10-19-44\011-P1-E10-WFY-3-60-N-p-F-gh.D
Sample Name: WFY-3-60-N-p-F-gh

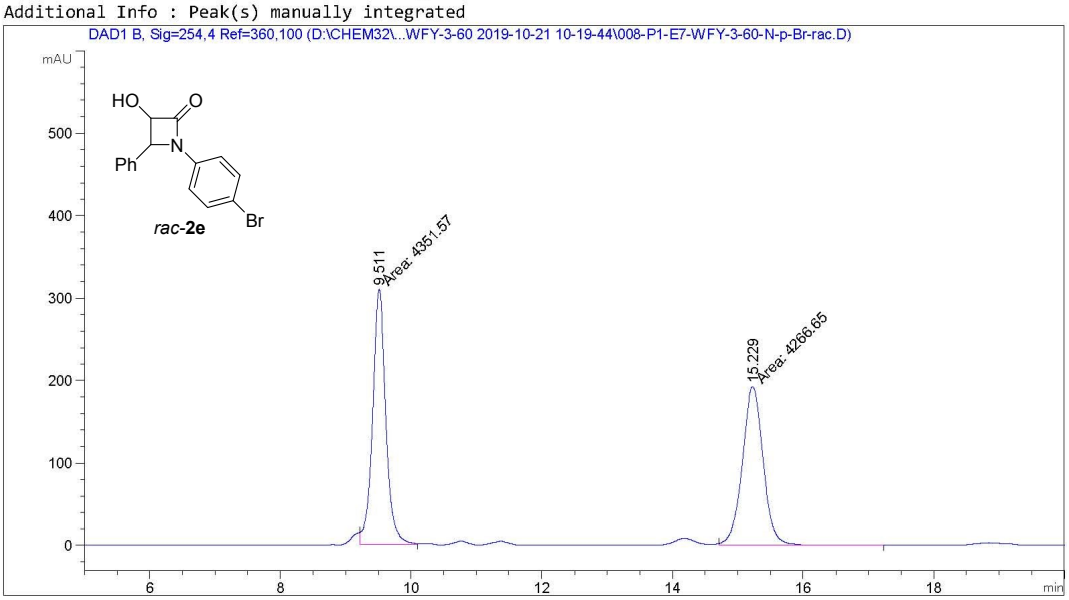
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  11
Acq. Instrument : 1260-DAD                      Location :   P1-E-10
Injection Date  : 10/21/2019 15:14:25                Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:29:33 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.139 BB    0.1850 5822.56787  475.07040  93.5051
   2  10.024 BB    0.2258  404.43726   27.14475   6.4949

Totals :                  6227.00513  502.21515
```

Data File D:\CHEM32\...Y-3-60\WFY-3-60 2019-10-21 10-19-44\008-P1-E7-WFY-3-60-N-p-Br-rac.D
Sample Name: WFY-3-60-N-p-Br-rac

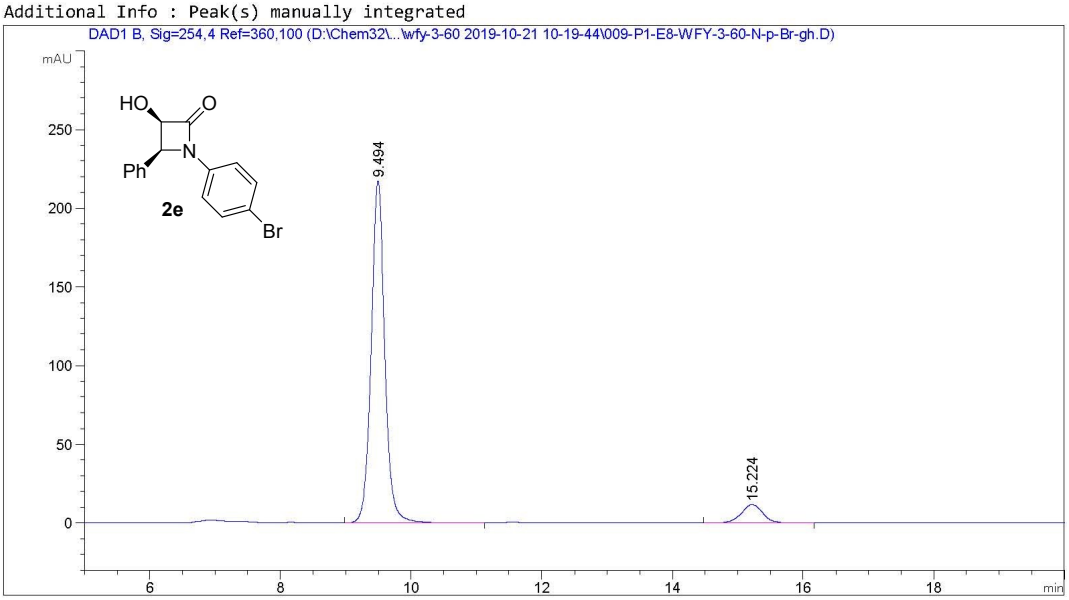
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   8
Acq. Instrument : 1260-DAD                     Location :   P1-E-07
Injection Date  : 10/21/2019 13:41:37              Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:26:42 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.511 FM    0.2340 4351.57227  309.97708  50.4927
   2  15.229 FM    0.3691 4266.65186  192.66867  49.5073

Totals :                  8618.22412  502.64575
```

Data File D:\Chem32\...FY-3-60\wfy-3-60 2019-10-21 10-19-44\009-P1-E8-WFY-3-60-N-p-Br-gh.D
Sample Name: WFY-3-60-N-p-Br-gh

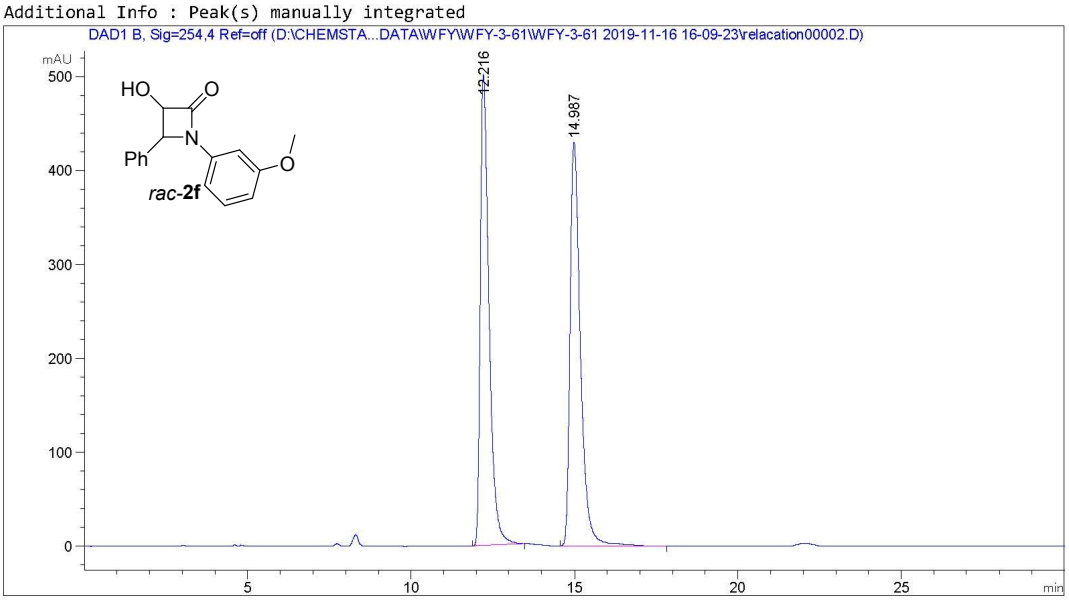
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   9
Acq. Instrument : 1260-DAD                          Location :   P1-E-08
Injection Date  : 10/21/2019 14:12:34                    Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:27:35 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.494 BB    0.2178 3124.87720  217.28073  92.1592
   2  15.224 BB    0.3466  265.86227   11.72096   7.8408

Totals :                  3390.73947  229.00169
```

Data File D:\CHEMSTA...\1\DATA\WFY\WFY-3-61\WFY-3-61 2019-11-16 16-09-23\relacation00002.D
Sample Name: wfy-3-61-N-MeO-rac

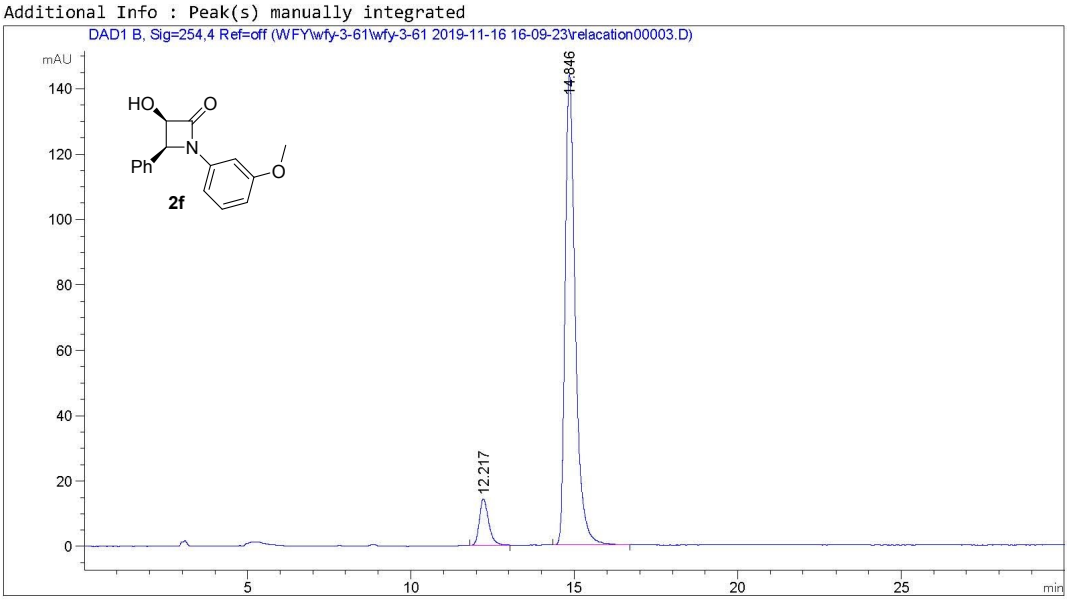
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P1-E-01
Injection Date  : 11/16/2019 4:20:40 PM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 16-09-23\OD-3-90-10-
                  1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 16-09-23\OD-3-90-10-
                  1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:43:05 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.216 BB    0.2782 9287.84180  501.23859  49.4806
   2  14.987 BB    0.3336 9482.82031  429.53882  50.5194
```

Data File D:\ChemSta...\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 16-09-23\relacation00003.D
Sample Name: wfy-3-61-N-MeO-rac

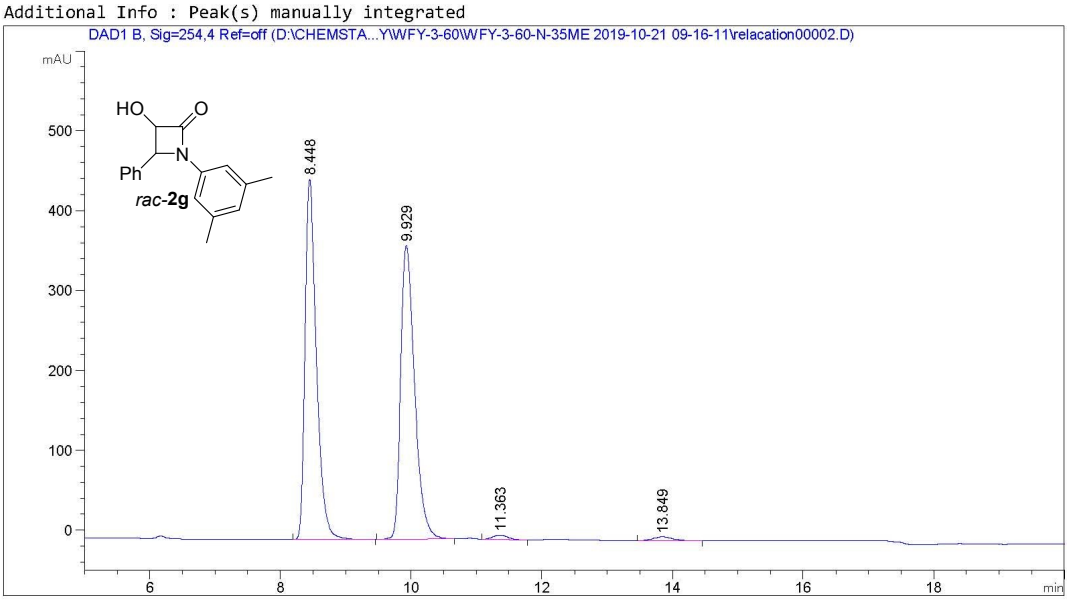
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-E-02
Injection Date  : 11/16/2019 4:51:35 PM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 16-09-23\OD-3-90-10-
                  1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 16-09-23\OD-3-90-10-
                  1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:43:05 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.217 BB    0.2950  279.56189   14.24502   8.2641
   2  14.846 BB    0.3296 3103.30420  143.90709  91.7359
```

Data File D:\CHEMSTA...\WFY\WFY-3-60\WFY-3-60-N-35ME 2019-10-21 09-16-11\relacation00002.D
Sample Name: WFY-3-60-35-Me-RAC

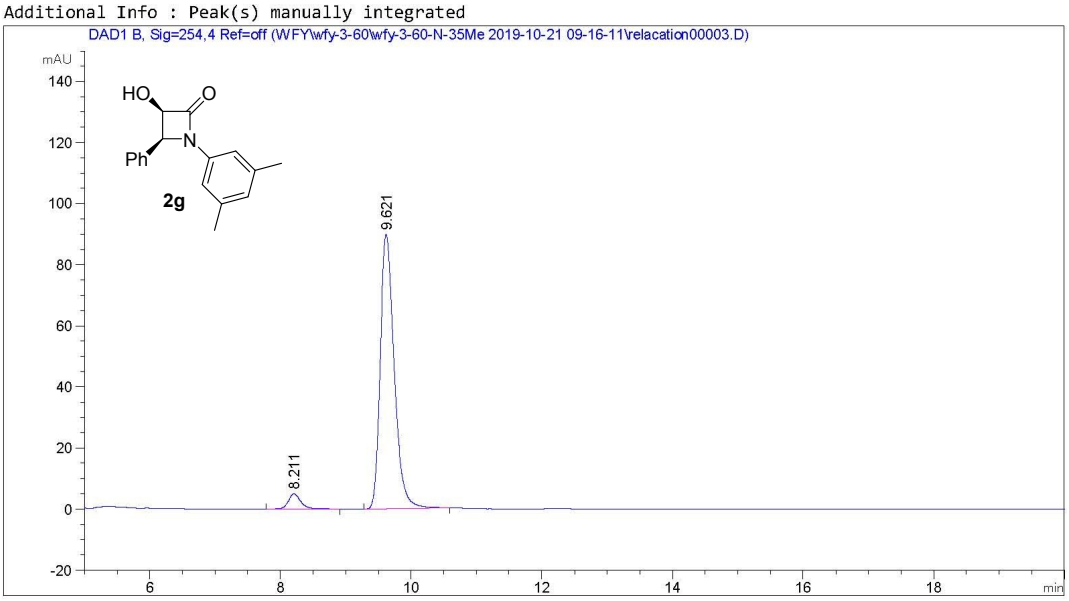
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P2-C-01
Injection Date  : 10/21/2019 9:27:25 AM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 3.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-60\wfy-3-60-N-35Me 2019-10-21 09-16-11\OD-3
                  -90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-60\wfy-3-60-N-35Me 2019-10-21 09-16-11\OD-3
                  -90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 6:37:36 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.448 BB    0.1855 5471.21289  451.12543  49.4161
   2   9.929 BB    0.2241 5422.83057  367.69009  48.9791
   3  11.363 BB    0.2457   88.44357    5.61560   0.7988
```

Data File D:\ChemSta...\WFY\wfy-3-60\wfy-3-60-N-35Me 2019-10-21 09-16-11\relacation00003.D
Sample Name: WFY-3-60-35-Me-gh

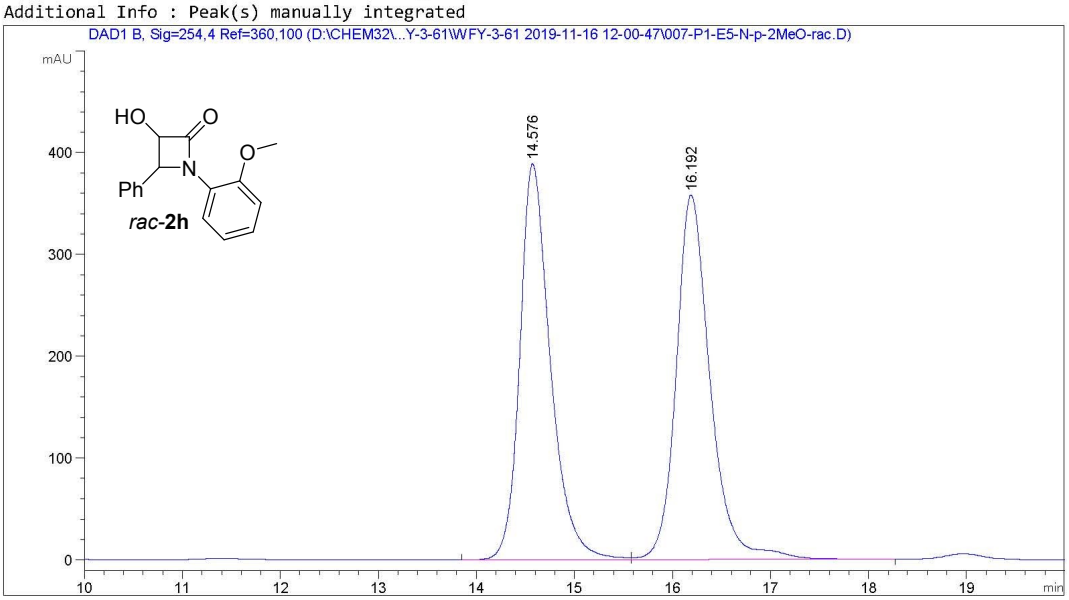
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P2-C-02
Injection Date  : 10/21/2019 9:58:16 AM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-60\wfy-3-60-N-35Me 2019-10-21 09-16-11\OD-3
                  -90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-60\wfy-3-60-N-35Me 2019-10-21 09-16-11\OD-3
                  -90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 6:39:01 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.211 BB    0.2059   68.27014    5.04445   4.8913
   2   9.621 BB    0.2264 1327.46912   89.83994  95.1087
```

Data File D:\CHEM32\...\WFY\WFY-3-61\WFY-3-61 2019-11-16 12-00-47\007-P1-E5-N-p-2MeO-rac.D
Sample Name: N-p-2MeO-rac

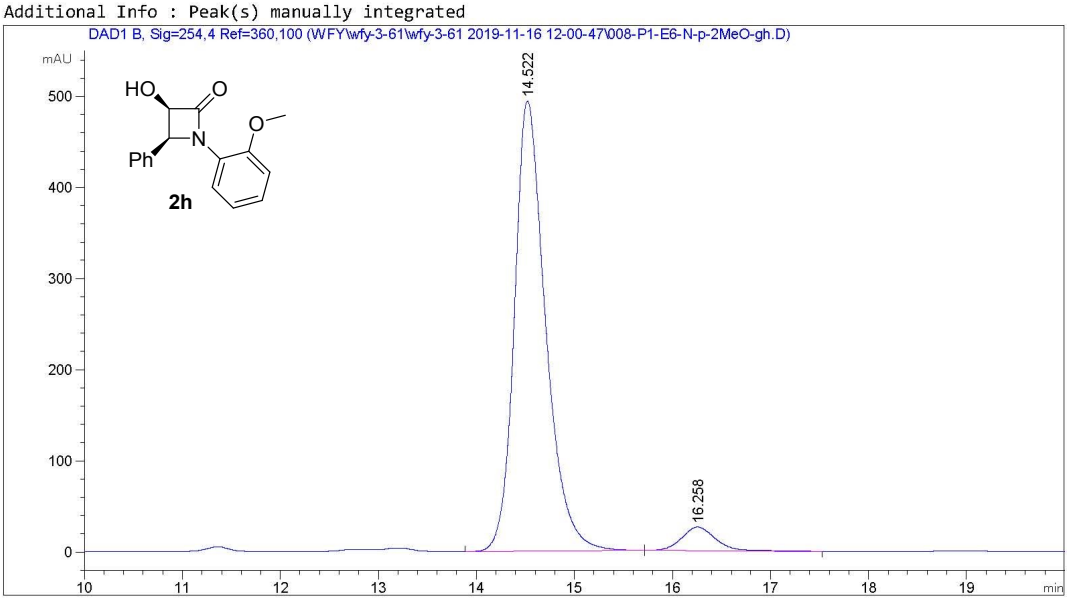
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   7
Acq. Instrument : 1260-DAD                      Location :   P1-E-05
Injection Date  : 11/16/2019 14:31:20               Inj :   1
                                               Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-90-10-1.0ml-
                  30min.M
Last changed    : 7/24/2019 08:50:24 by SYSTEM
Analysis Method : d:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-90-10-1.0ml-
                  30min.M (Sequence Method)
Last changed    : 11/19/2019 21:24:06 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.576 BV    0.3244 8407.05176  388.59735  49.4304
   2  16.192 VB    0.3582 8600.80469  358.14880  50.5696

Totals :                  1.70079e4   746.74615
```

Data File d:\Chem32\...a\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\008-P1-E6-N-p-2MeO-gh.D
Sample Name: N-p-2MeO-gh

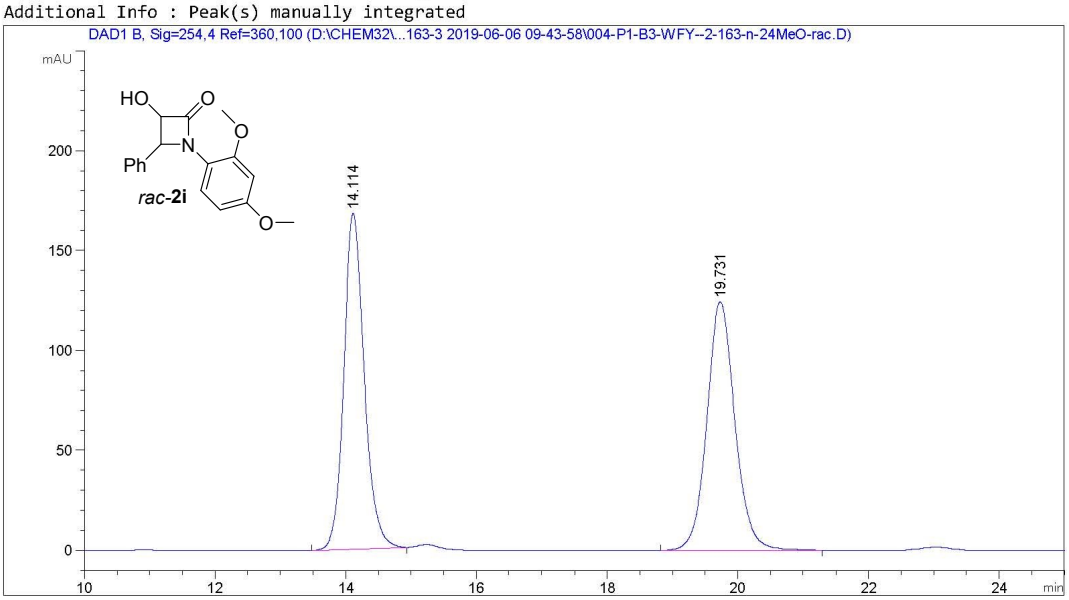
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   8
Acq. Instrument : 1260-DAD                      Location :   P1-E-06
Injection Date  : 11/16/2019 15:02:16               Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-90-10-1.0ml-
                  30min.M
Last changed    : 7/24/2019 08:50:24 by SYSTEM
Analysis Method : d:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-90-10-1.0ml-
                  30min.M (Sequence Method)
Last changed    : 11/19/2019 21:24:54 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.522 BB    0.3313 1.08979e4   494.12057  94.5239
   2  16.258 BB    0.3682  631.35242   25.92160   5.4761

Totals :                  1.15293e4   520.04217
```

Data File D:\CHEM32\...\WFY-2-163-3 2019-06-06 09-43-58\004-P1-B3-WFY--2-163-n-24MeO-rac.D
Sample Name: WFY--2-163-n-24MeO-rac

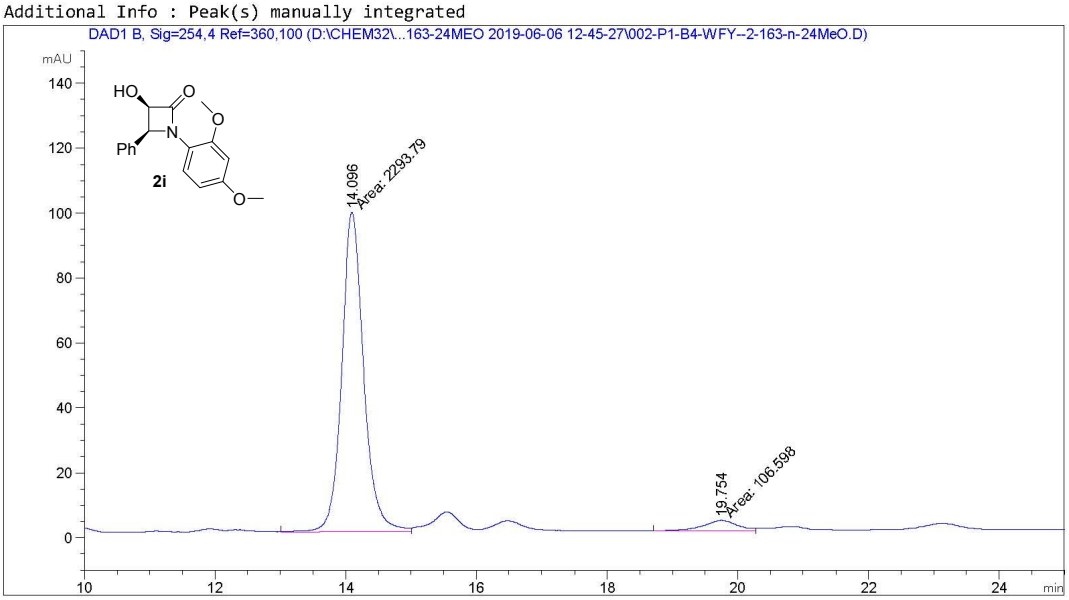
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   4
Acq. Instrument : 1260-DAD                     Location :   P1-B-03
Injection Date  : 6/6/2019 11:01:58                 Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-2-163\wfy-2-163-3 2019-06-06 09-43-58\IA-85-15-1ml
                  -30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-2-163\wfy-2-163-3 2019-06-06 09-43-58\IA-85-15-1ml
                  -30min.M (Sequence Method)
Last changed    : 12/18/2019 21:08:51 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.114 BB    0.3278 3626.81567  168.06200  49.5057
   2  19.731 BB    0.4550 3699.23828  124.36620  50.4943

Totals :                  7326.05396  292.42819
```

Data File D:\CHEM32\...\WFY-2-163-24MEO 2019-06-06 12-45-27\002-P1-B4-WFY--2-163-n-24MeO.D
Sample Name: WFY--2-163-n-24MeO

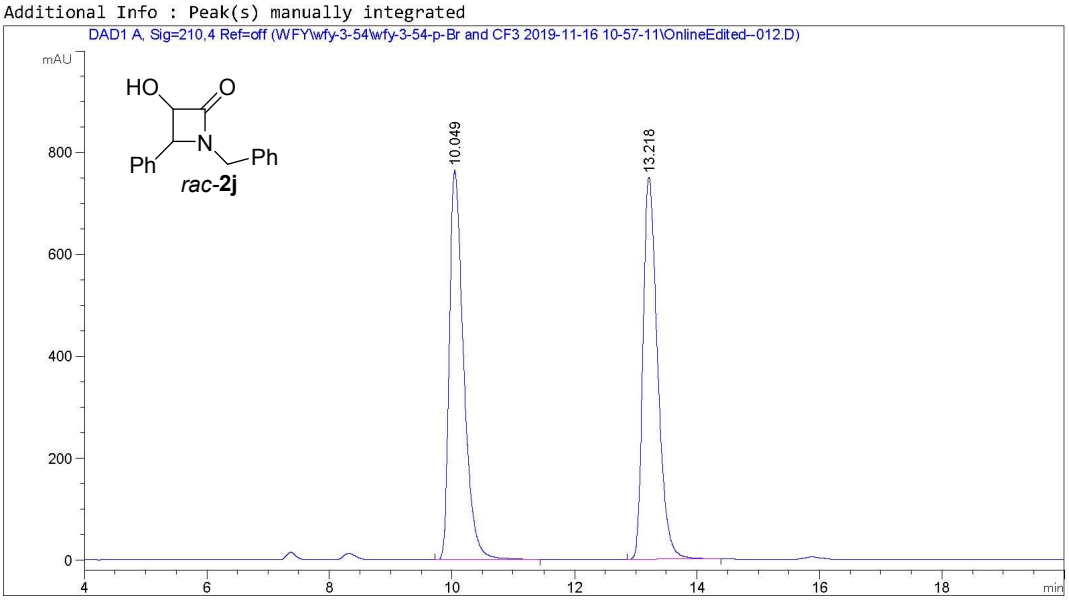
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   2
Acq. Instrument : 1260-DAD                      Location :   P1-B-04
Injection Date  : 6/6/2019 13:01:44                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-2-163\wfy-2-163-24MeO 2019-06-06 12-45-27\IA-85-15
                  -1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-2-163\wfy-2-163-24MeO 2019-06-06 12-45-27\IA-85-15
                  -1ml-30min.M (Sequence Method)
Last changed    : 12/18/2019 21:07:20 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.096 MF    0.3885 2293.79004   98.40395  95.5591
   2  19.754 MF    0.5817  106.59768    3.05441   4.4409

Totals :                  2400.38772  101.45835
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--012.D
Sample Name: wfy-3-61-N-Bn-rac

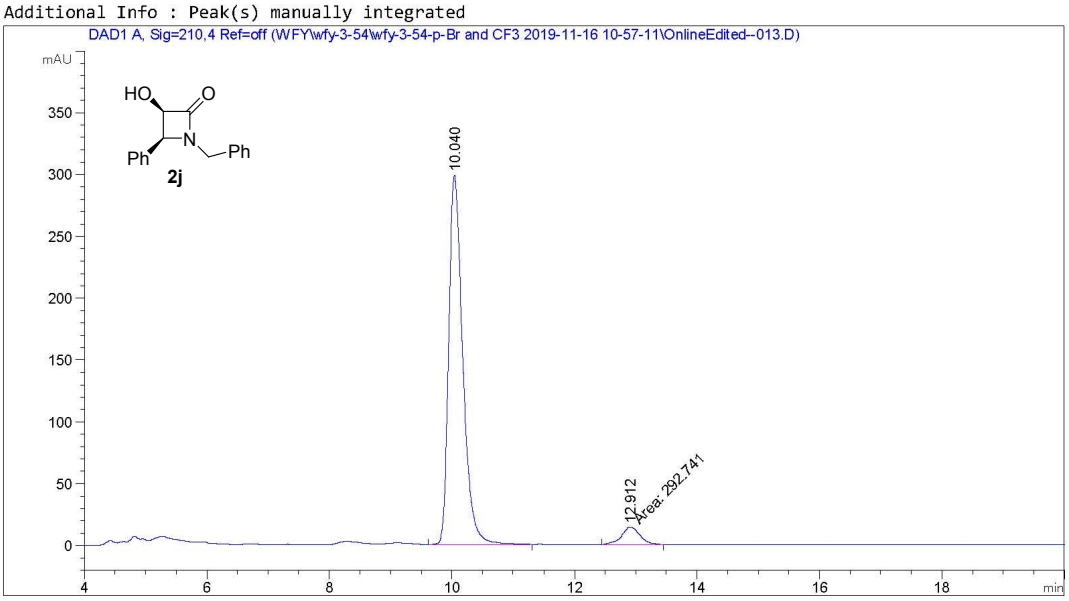
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  12
Sample Operator : SYSTEM
Acq. Instrument : LC                             Location :   P1-C-09
Injection Date  : 11/16/2019 2:57:28 PM               Inj :   1
                                                Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:29:29 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.049 BB    0.2460 1.23304e4   765.21844  49.8753
   2  13.218 BB    0.2546 1.23921e4   750.57318  50.1247
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--013.D
Sample Name: wfy-3-61-N-Bn-gh

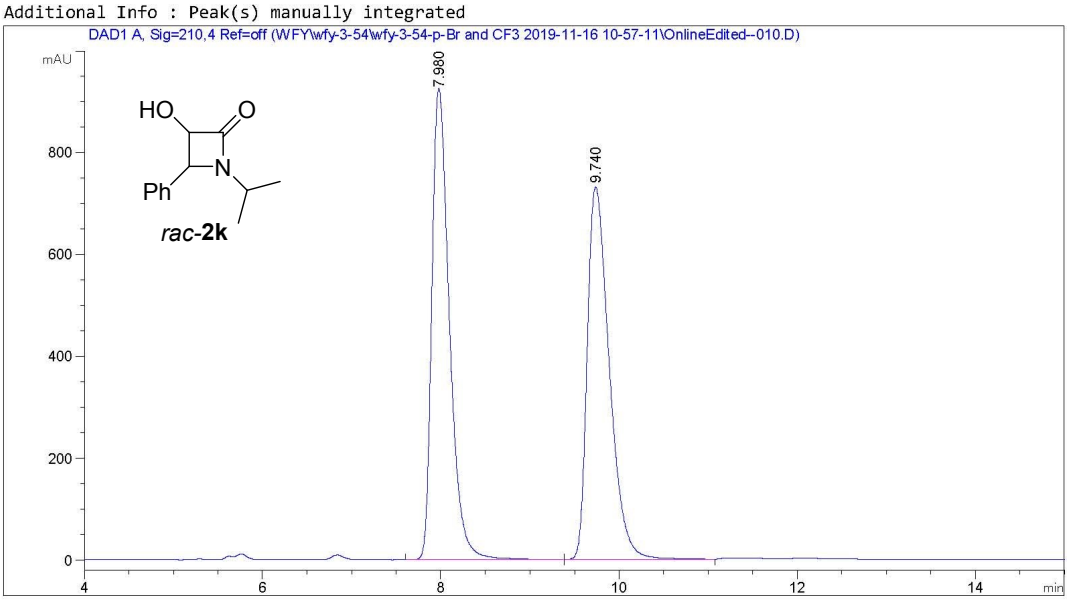
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  13
Sample Operator : SYSTEM
Acq. Instrument : LC                             Location :   P1-C-10
Injection Date  : 11/16/2019 3:18:21 PM               Inj :   1
                                                Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:31:36 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.040 BB    0.2410 4730.57617  298.38846  94.1724
   2  12.912 MM    0.3419  292.74106   14.26877   5.8276
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--010.D
Sample Name: wfy-3-61-N-t-ipr-rac

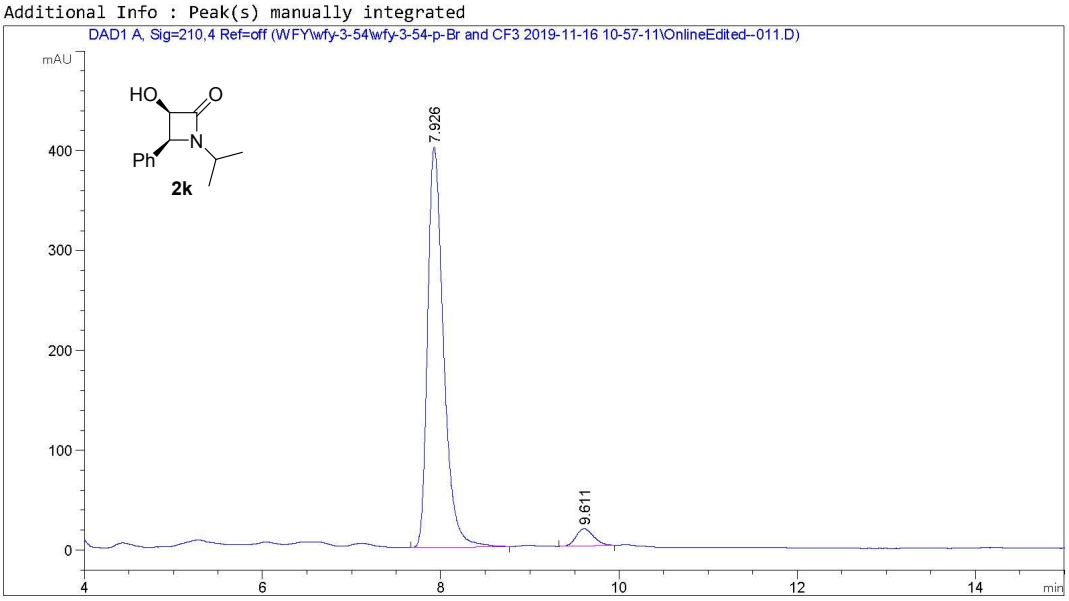
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  10
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-C-07
Injection Date  : 11/16/2019 2:15:39 PM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:27:35 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.980 BB    0.2087 1.25994e4   926.00726  50.2652
   2   9.740 BB    0.2628 1.24664e4   731.55688  49.7348
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--011.D
Sample Name: wfy-3-61-N-t-ipr-gh

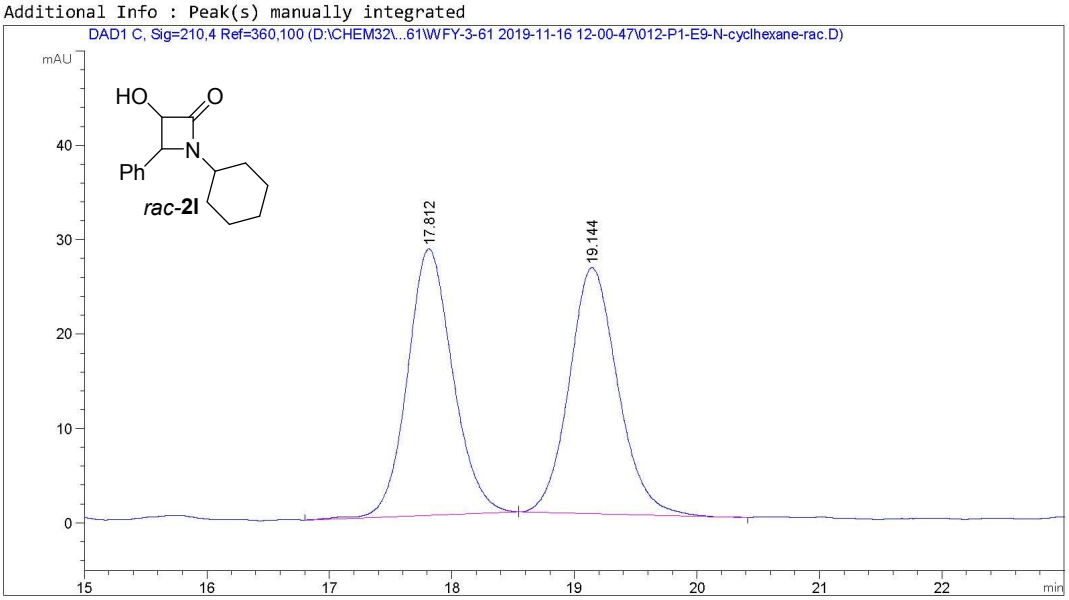
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  11
Sample Operator : SYSTEM
Acq. Instrument : LC                             Location :   P1-C-08
Injection Date  : 11/16/2019 2:36:33 PM               Inj :   1
                                                Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:28:29 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.926 BB    0.1880 4944.41602  400.47427  95.4395
   2   9.611 BB    0.2116  236.26707   17.26842   4.5605
```

Data File D:\CHEM32\...\WFY-3-61\WFY-3-61 2019-11-16 12-00-47\012-P1-E9-N-cyclhexane-rac.D
Sample Name: N-cyclhexane-rac

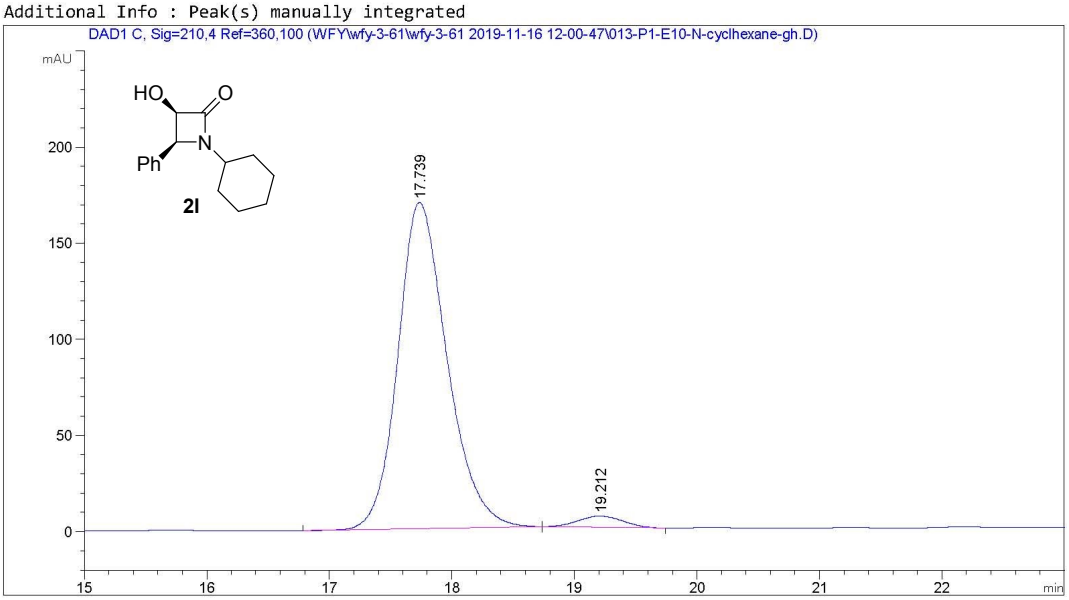
```
=====================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  12
Acq. Instrument : 1260-DAD                      Location :   P1-E-09
Injection Date  : 11/16/2019 16:35:32               Inj :   1
                                               Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-95-5-1.0ml-
                  40min.M
Last changed    : 7/23/2019 21:23:53 by SYSTEM
Analysis Method : d:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-95-5-1.0ml-
                  40min.M (Sequence Method)
Last changed    : 11/19/2019 21:19:28 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 C, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.812 BB    0.3935  724.02100   28.20666  50.2415
   2  19.144 BB    0.4192  717.06049   26.04605  49.7585

Totals :                  1441.08148   54.25271
```

Data File d:\Chem32\...\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\013-P1-E10-N-cyclhexane-gh.D
Sample Name: N-cyclhexane-gh

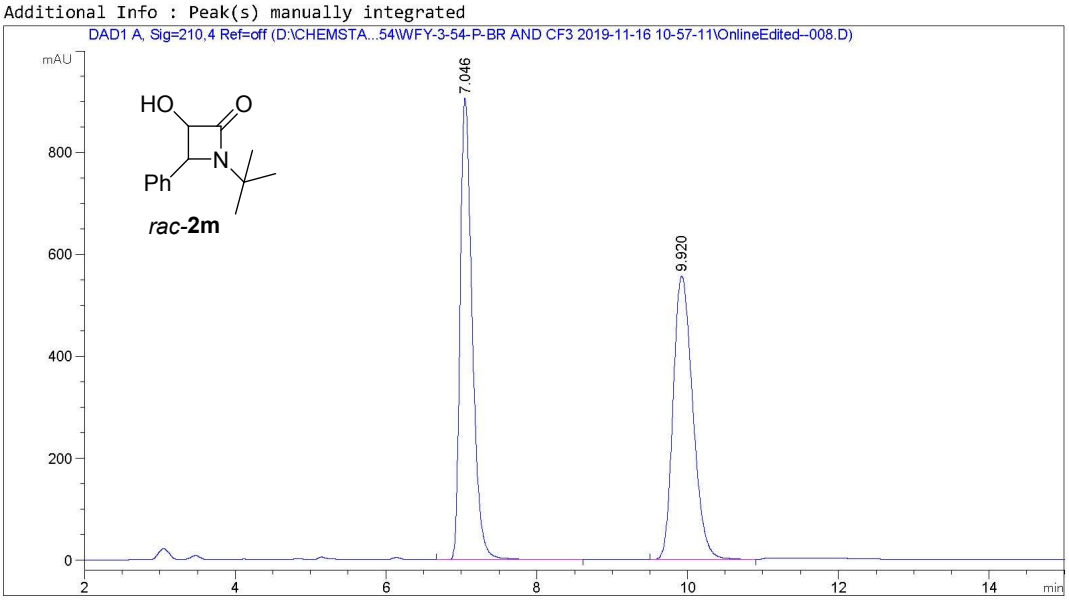
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  13
Acq. Instrument : 1260-DAD                       Location :   P1-E-10
Injection Date  : 11/16/2019 17:16:26                 Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-95-5-1.0ml-
                  40min.M
Last changed    : 7/23/2019 21:23:53 by SYSTEM
Analysis Method : d:\Chem32\1\Data\WFY\wfy-3-61\wfy-3-61 2019-11-16 12-00-47\IA-95-5-1.0ml-
                  40min.M (Sequence Method)
Last changed    : 11/19/2019 21:21:14 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 C, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.739 BB    0.4209 4723.84717  169.63908  97.0363
   2  19.212 BB    0.3950  144.27815    5.74461   2.9637

Totals :                  4868.12532  175.38370
```

Data File D:\CHEMSTA...-3-54\WFY-3-54-P-BR AND CF3 2019-11-16 10-57-11\OnlineEdited--008.D
Sample Name: wfy-3-61-N-t-Bu-rac

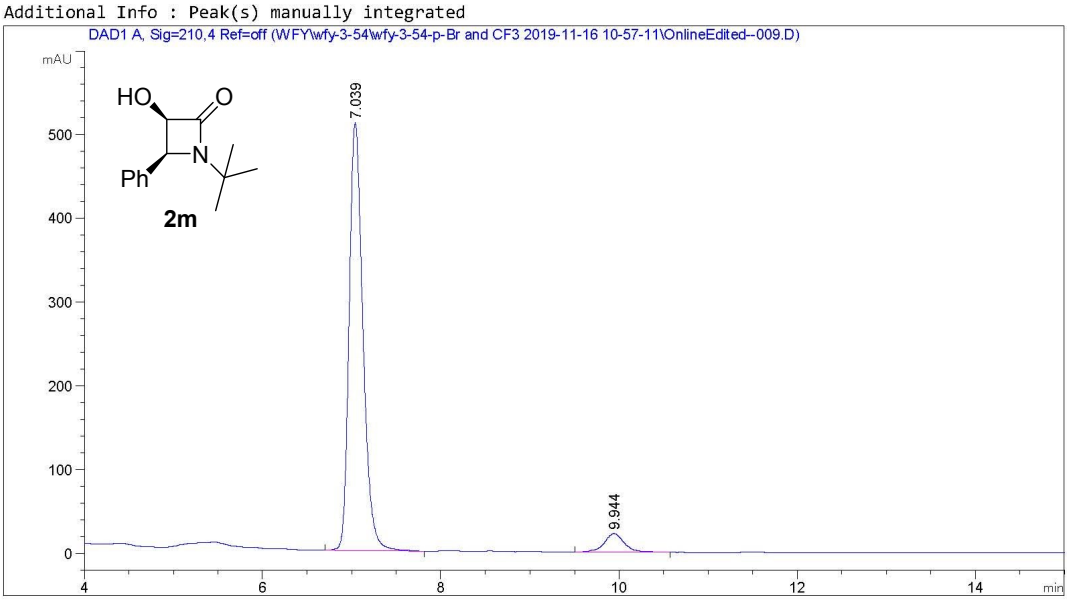
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   8
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-C-05
Injection Date  : 11/16/2019 1:33:48 PM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:24:45 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.046 BV R  0.1718 1.00922e4   906.98041  50.1066
   2   9.920 BB    0.2826 1.00492e4   556.80591  49.8934
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--009.D
Sample Name: wfy-3-61-N-t-Bu-gh

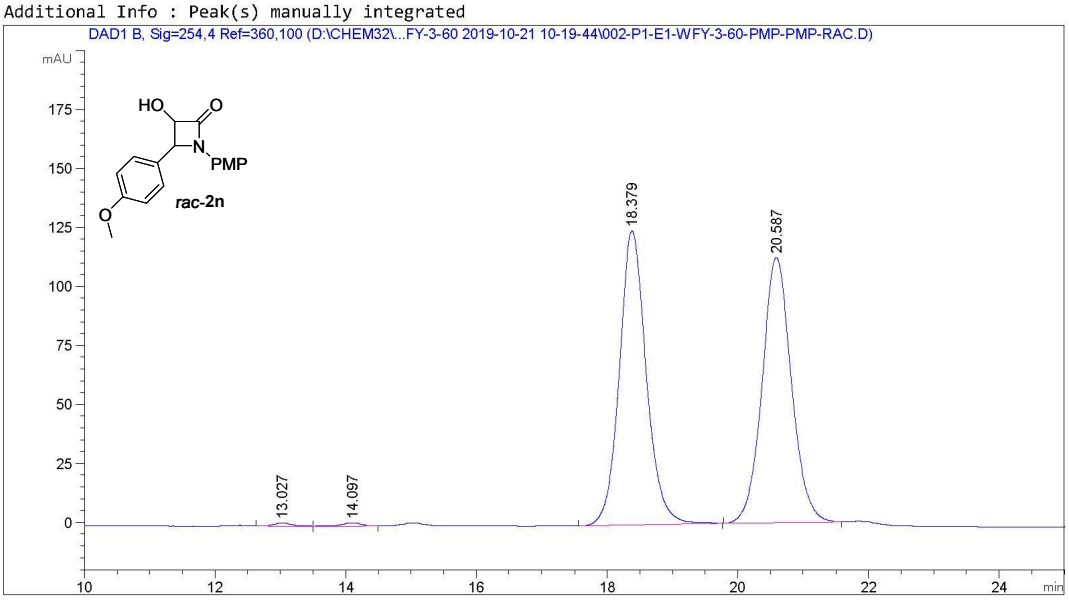
```
======================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   9
Sample Operator : SYSTEM
Acq. Instrument : LC                             Location :   P1-C-06
Injection Date  : 11/16/2019 1:54:43 PM               Inj :   1
                                                Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:25:42 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 A, Sig=210,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.039 BB    0.1678 5509.03564  510.88080  93.9404
   2   9.944 BB    0.2390  355.36087   22.41015   6.0596
```

Data File D:\CHEM32\...-3-60\WFY-3-60 2019-10-21 10-19-44\002-P1-E1-WFY-3-60-PMP-PMP-RAC.D
Sample Name: WFY-3-60-PMP-PMP-RAC

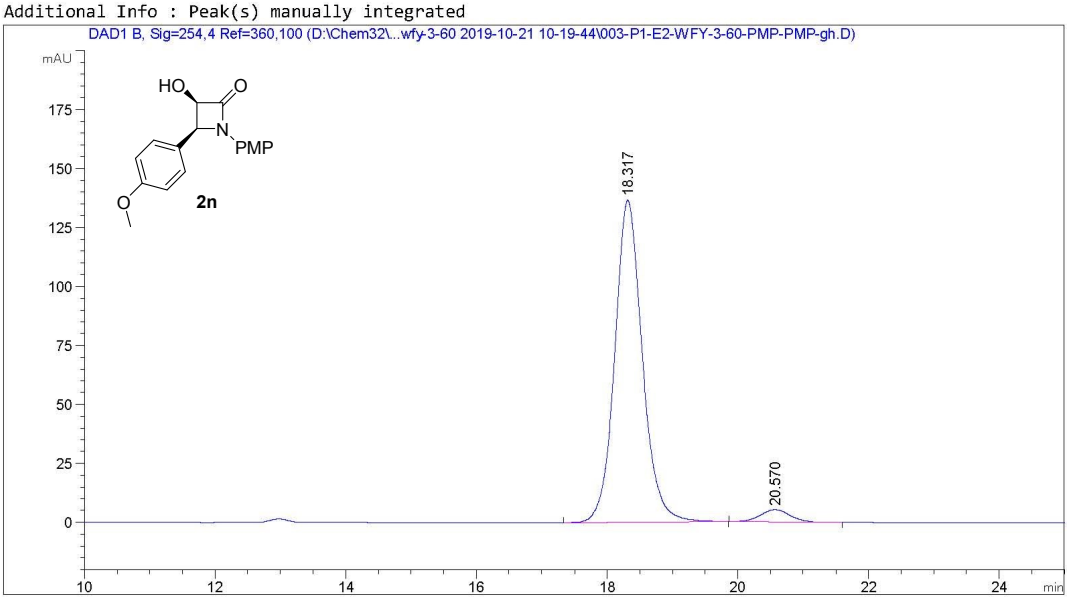
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Acq. Instrument : 1260-DAD                     Location :   P1-E-01
Injection Date  : 10/21/2019 10:35:59               Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:15:32 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.027 BB    0.2796   24.73135    1.32593   0.3481
   2  14.097 BB    0.2996   26.97620    1.31347   0.3797
   3  18.379 BB    0.4339 3568.28564  124.67841  50.2229
   4  20.587 BB    0.4738 3484.90698  112.36911  49.0493
```

Data File D:\Chem32\...Y-3-60\wfy-3-60 2019-10-21 10-19-44\003-P1-E2-WFY-3-60-PMP-PMP-gh.D
Sample Name: WFY-3-60-PMP-PMP-gh

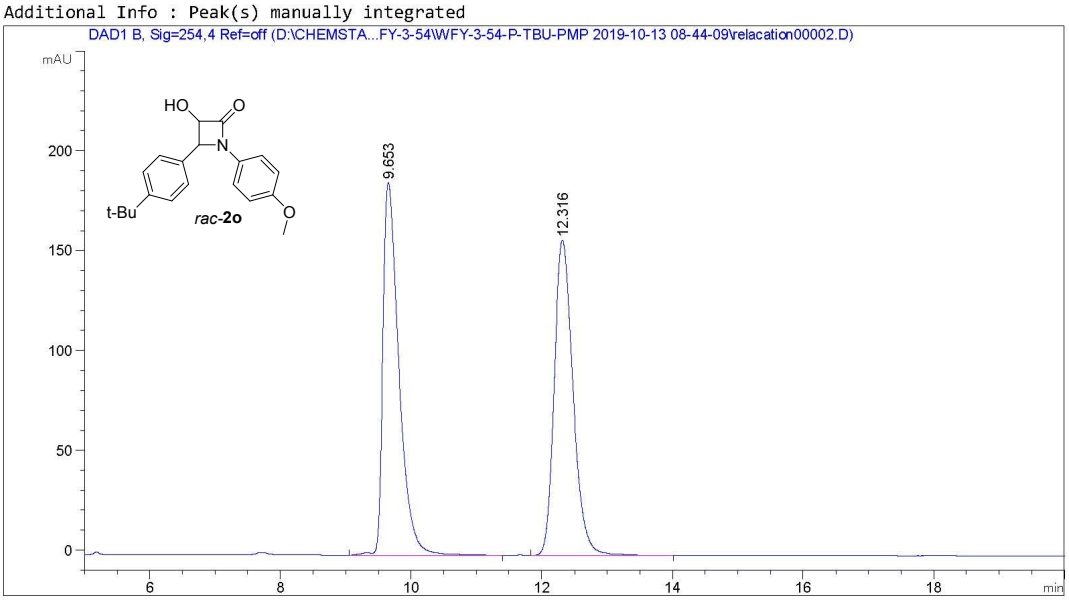
```
======================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   3
Acq. Instrument : 1260-DAD                          Location :   P1-E-02
Injection Date  : 10/21/2019 11:06:55                    Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:15:32 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.317 BB    0.4438 4002.24438  136.59238  95.9853
   2  20.570 BB    0.4814  167.40054    5.28678   4.0147

Totals :                  4169.64493  141.87916
```

Data File D:\CHEMSTA...Y\WFY-3-54\WFY-3-54-P-TBU-PMP 2019-10-13 08-44-09\relacation00002.D
Sample Name: p-tBu-pmp-rac

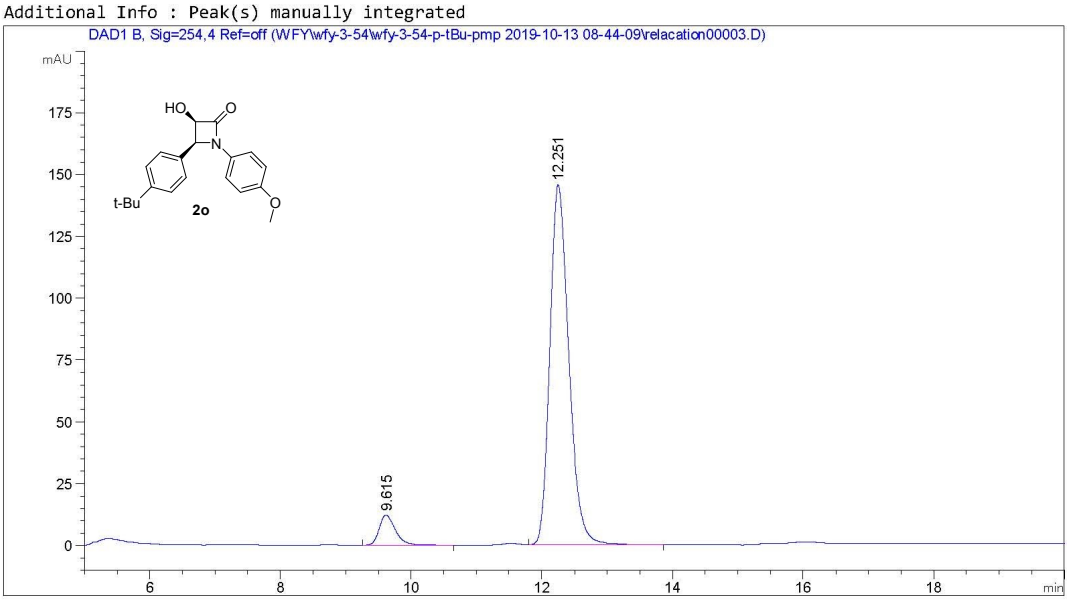
```
=====================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                          Location :   P2-C-01
Injection Date  : 10/13/2019 8:55:23 AM            Inj :   1
                                             Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-tBu-pmp 2019-10-13 08-44-09
                  \OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-tBu-pmp 2019-10-13 08-44-09
                  \OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:33:51 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.653 BB    0.2557 3157.07715  186.35049  50.1434
   2  12.316 BB    0.3063 3139.01489  157.63347  49.8566
```

Data File D:\ChemSta...Y\wfy-3-54\wfy-3-54-p-tBu-pmp 2019-10-13 08-44-09\relacation00003.D
Sample Name: wfy-3-54p-tBu-pmp-gh

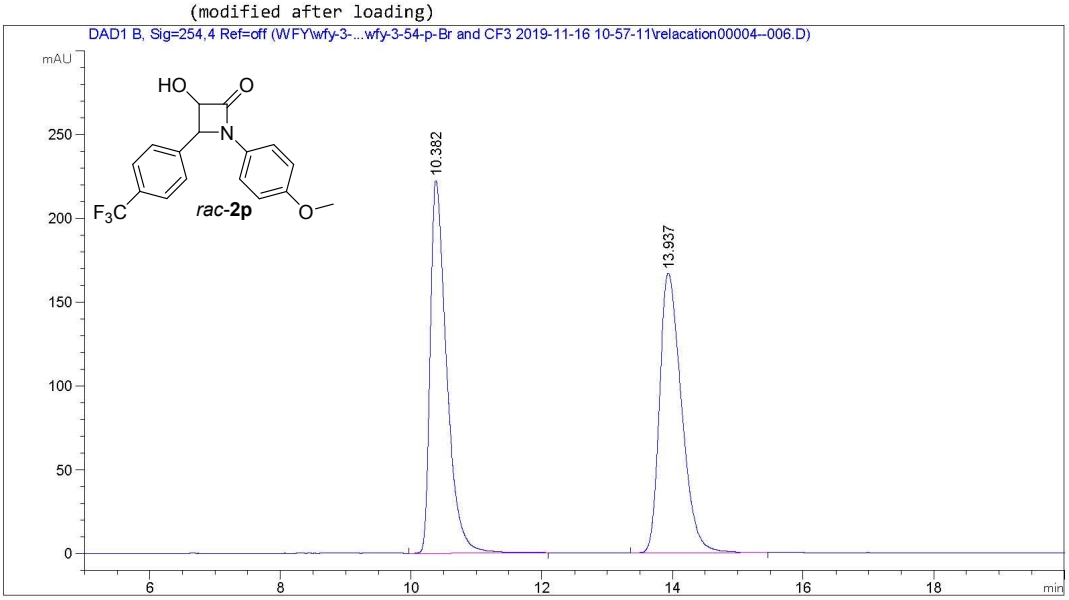
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P2-C-02
Injection Date  : 10/13/2019 9:26:15 AM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-tBu-pmp 2019-10-13 08-44-09
                  \OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-tBu-pmp 2019-10-13 08-44-09
                  \OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:35:29 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.615 BB    0.2639  211.06749   12.19588   6.7320
   2  12.251 BB    0.3085 2924.22314  145.48213  93.2680
```

Data File D:\ChemSta...54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\relacation00004--006.D
Sample Name: WFY-3-54-P-CF3-PMP-RAC

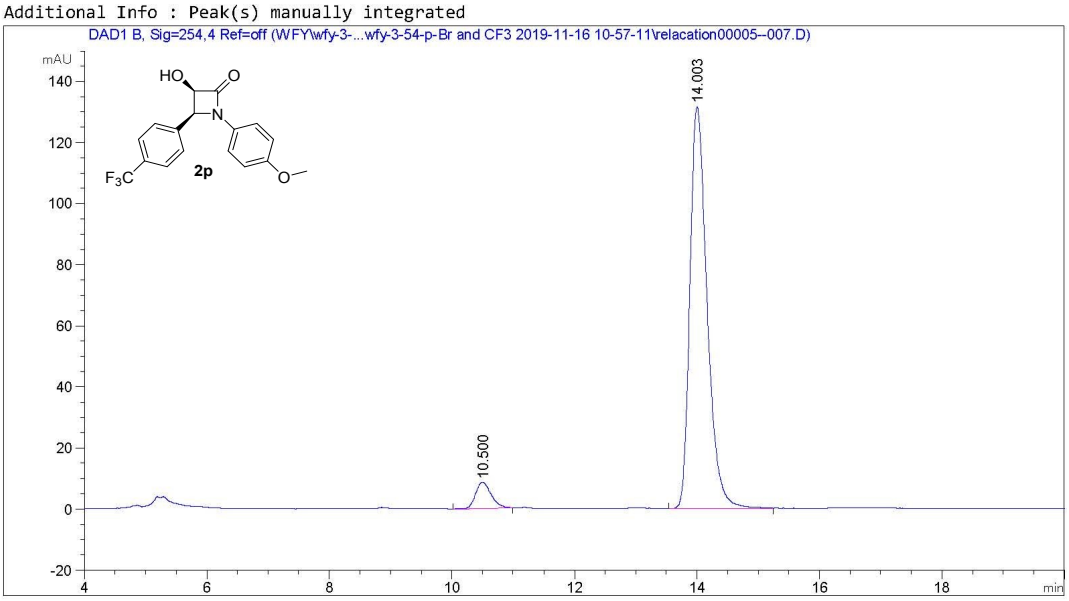
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   6
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P1-C-03
Injection Date  : 11/16/2019 12:52:00 PM            Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:07:39 PM by SYSTEM
                  (modified after loading)
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   3.044 BB    0.1174   10.27355    1.23083   0.1320
   2  10.382 BB    0.2637 3887.44653  222.60713  49.9403
   3  13.937 BB    0.3457 3886.46045  166.89842  49.9277
```

Data File D:\ChemSta...54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\relacation00005--007.D
Sample Name: WFY-3-54-P-CF3-PMP-gh

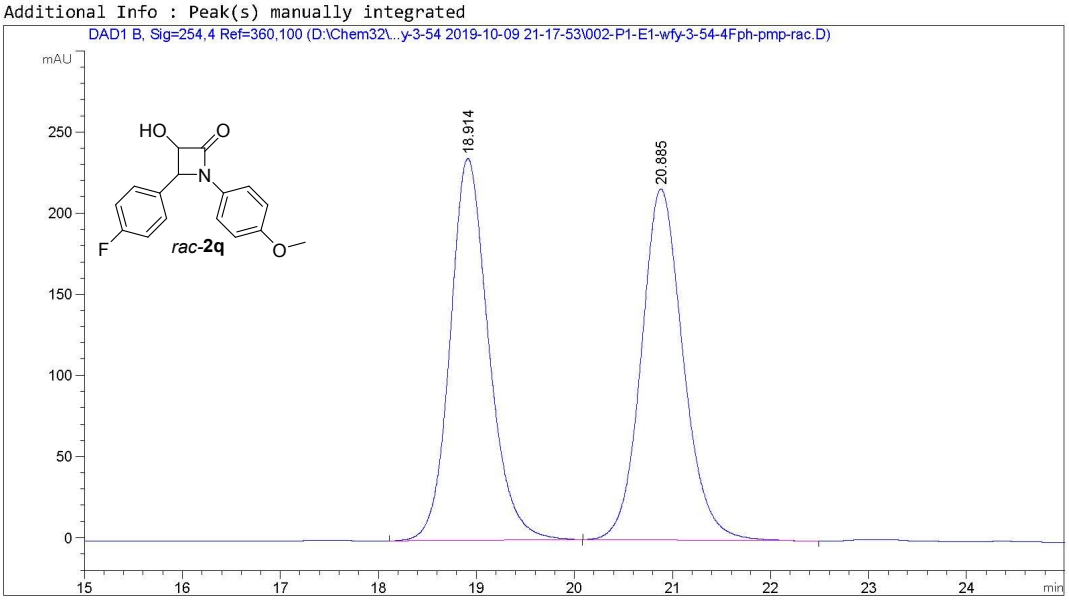
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   7
Sample Operator : SYSTEM
Acq. Instrument : LC                          Location :   P1-C-04
Injection Date  : 11/16/2019 1:12:54 PM            Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:33:25 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.500 BB    0.2656  149.71025    8.57843   5.5519
   2  14.003 BB    0.2980 2546.85449  131.45151  94.4481
```

Data File D:\Chem32\...3-54\wfy-3-54 2019-10-09 21-17-53\002-P1-E1-wfy-3-54-4Fph-pmp-rac.D
Sample Name: wfy-3-54-4Fph-pmp-rac

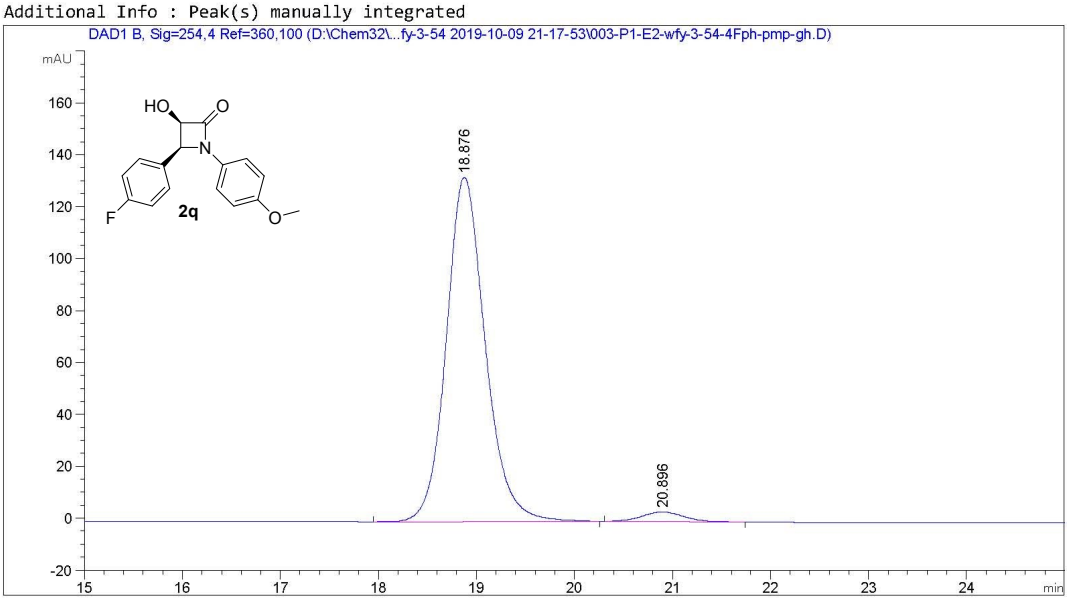
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Acq. Instrument : 1260-DAD                     Location :   P1-E-01
Injection Date  : 10/9/2019 21:29:09               Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M
Last changed    : 7/24/2019 08:50:24 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M (Sequence Method)
Last changed    : 11/14/2019 18:51:36 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.914 BB    0.4141 6413.76074  235.21341  49.9667
   2  20.885 BB    0.4524 6422.32031  216.30305  50.0333

Totals :                  1.28361e4   451.51646
```

Data File D:\Chem32\...-3-54\wfy-3-54 2019-10-09 21-17-53\003-P1-E2-wfy-3-54-4Fph-pmp-gh.D
Sample Name: wfy-3-54-4Fph-pmp-gh

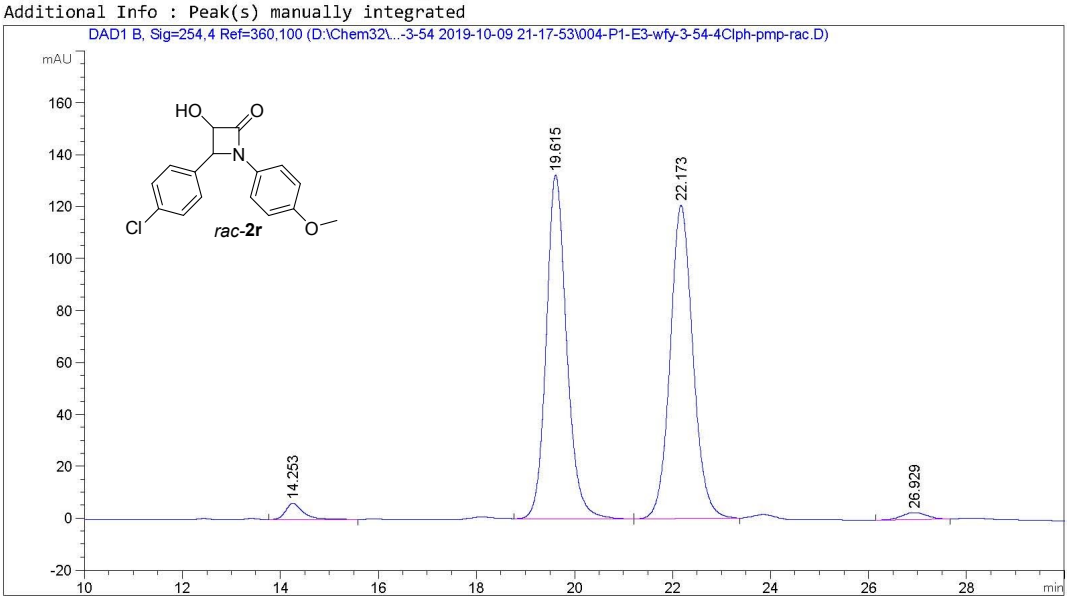
```
    ======================================================================
    Acq. Operator   : SYSTEM                        Seq. Line :   3
    Acq. Instrument : 1260-DAD                       Location :   P1-E-02
    Injection Date  : 10/9/2019 22:00:04                 Inj :   1
                                                   Inj Volume : 3.000 µl
    Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
    Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                      30min.M
    Last changed    : 7/24/2019 08:50:24 by SYSTEM
    Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                      30min.M (Sequence Method)
    Last changed    : 11/14/2019 18:52:03 by SYSTEM
                      (modified after loading)
    Additional Info : Peak(s) manually integrated
```




```
    ======================================================================
                            Area Percent Report
    ======================================================================

    Sorted By             :      Signal
    Multiplier            :      1.0000
    Dilution              :      1.0000
    Use Multiplier & Dilution Factor with ISTDs


    Signal 1: DAD1 B, Sig=254,4 Ref=360,100

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]   [mAU*s]     [mAU]       %
    ----|-------|----|-------|----------|----------|--------|
       1  18.876 BB    0.4200 3659.78003  132.60747  97.1604
       2  20.896 BB    0.4458  106.95877    3.67228   2.8396

    Totals :                  3766.73880  136.27974
```

Data File D:\Chem32\...-54\wfy-3-54 2019-10-09 21-17-53\004-P1-E3-wfy-3-54-4Clph-pmp-rac.D
Sample Name: wfy-3-54-4Clph-pmp-rac

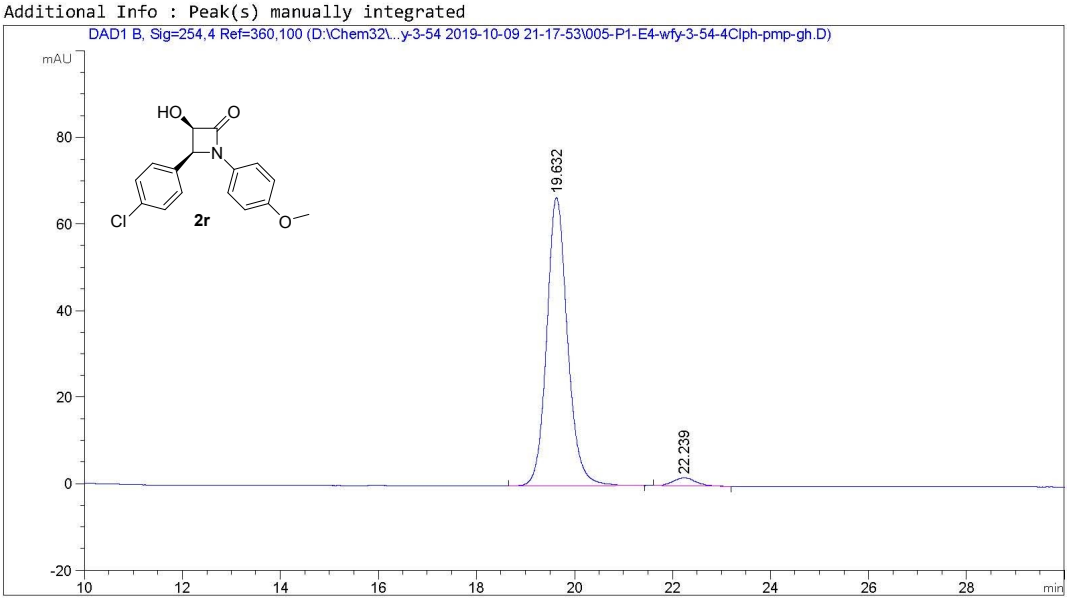
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   4
Acq. Instrument : 1260-DAD                     Location :   P1-E-03
Injection Date  : 10/9/2019 22:30:58               Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M
Last changed    : 7/24/2019 08:50:24 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M (Sequence Method)
Last changed    : 11/14/2019 18:53:01 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.253 BB    0.3633  151.60417    6.15692   1.9001
   2  19.615 BB    0.4403 3837.85669  132.36440  48.1020
   3  22.173 BB    0.4924 3893.10571  120.66217  48.7944
   4  26.929 BB    0.5075   96.01798    2.73532   1.2034
```

Data File D:\Chem32\...3-54\wfy-3-54 2019-10-09 21-17-53\005-P1-E4-wfy-3-54-4Clph-pmp-gh.D
Sample Name: wfy-3-54-4Clph-pmp-gh

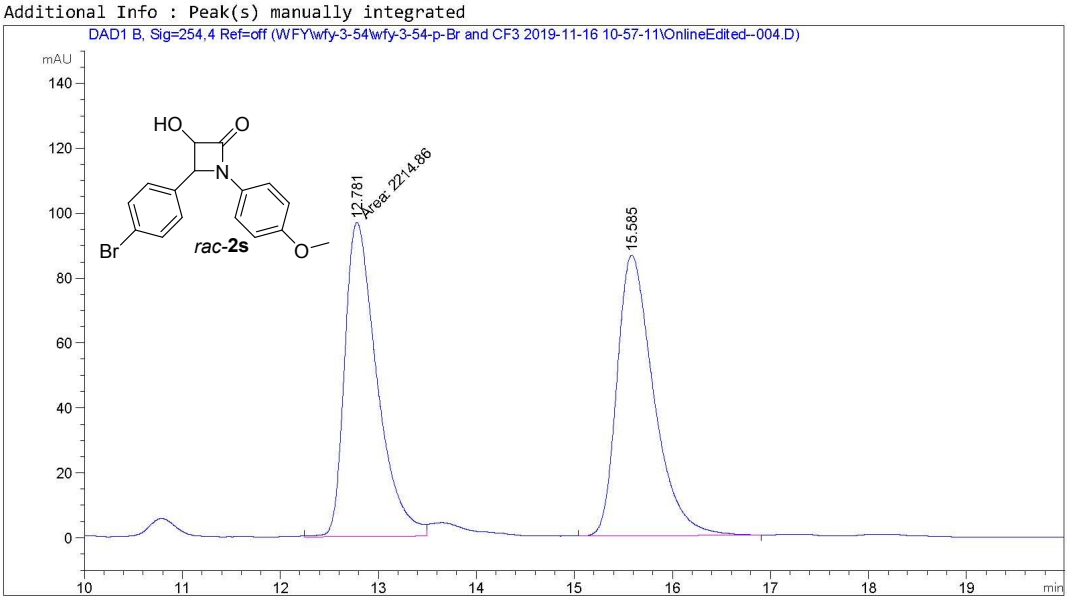
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   5
Acq. Instrument : 1260-DAD                      Location :   P1-E-04
Injection Date  : 10/9/2019 23:01:54                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M
Last changed    : 7/24/2019 08:50:24 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54 2019-10-09 21-17-53\IA-90-10-1.0ml-
                  30min.M (Sequence Method)
Last changed    : 11/14/2019 18:54:22 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  19.632 BB    0.4484 1965.79492   66.59377  97.0672
   2  22.239 BB    0.4506   59.39445    1.87994   2.9328

Totals :                  2025.18938   68.47372
```

Data File D:\ChemSta...-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-11\OnlineEdited--004.D
Sample Name: WFY-3-54-P-Br-PMP-RAC

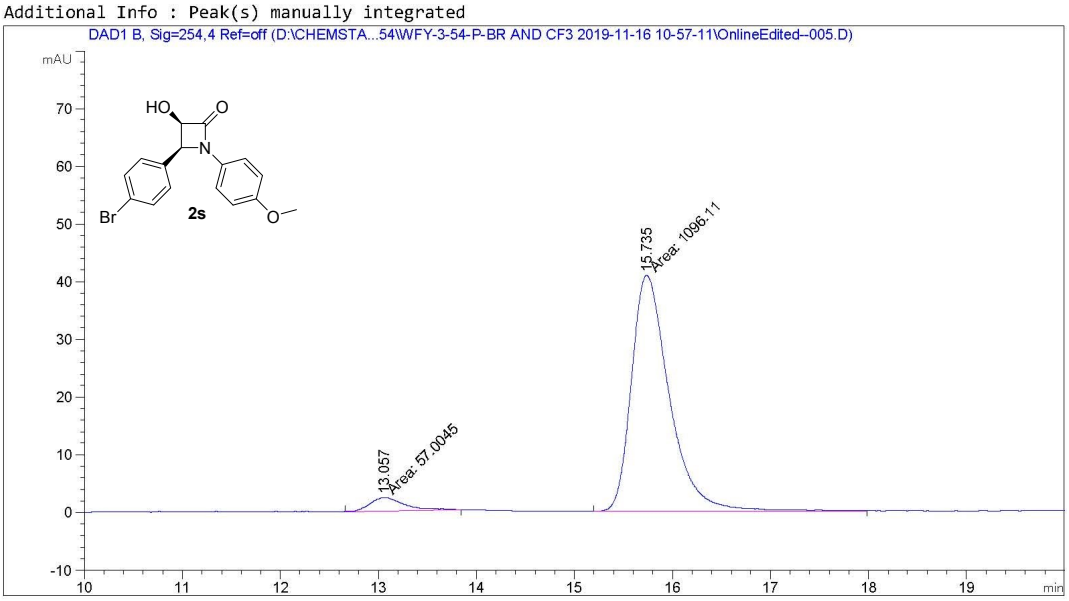
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   4
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-C-01
Injection Date  : 11/16/2019 12:10:12 PM             Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
                  (modified after loading)
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:05:48 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.781 MM    0.3814 2214.85864   96.79659  49.6119
   2  15.585 BB    0.3958 2249.51392   86.39938  50.3881
```

Data File D:\CHEMSTA...-3-54\WFY-3-54-P-BR AND CF3 2019-11-16 10-57-11\OnlineEdited--005.D
Sample Name: WFY-3-54-P-Br-PMP-gh

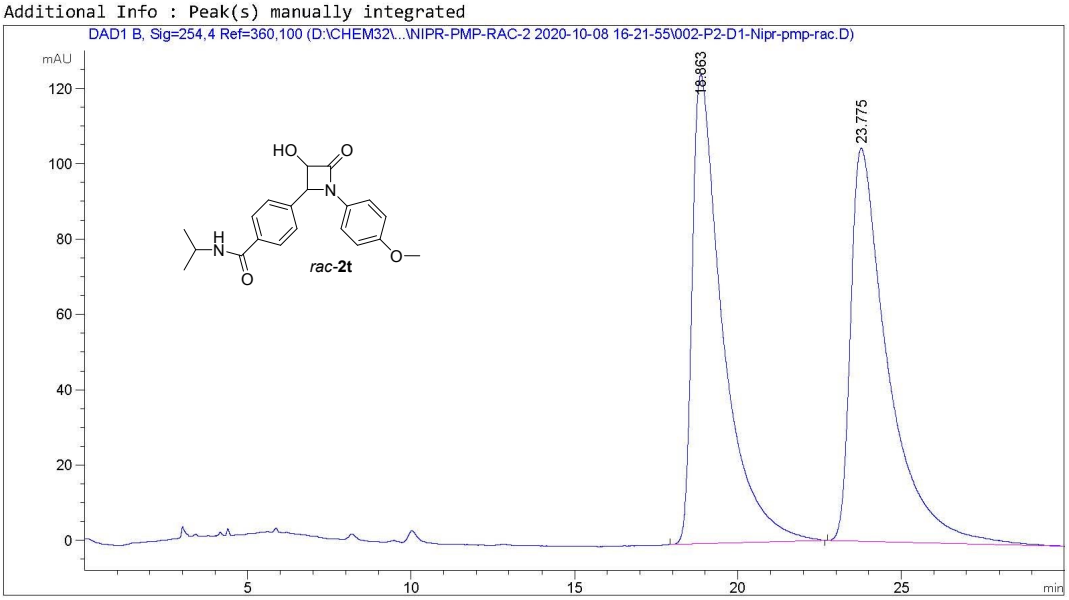
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   5
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-C-02
Injection Date  : 11/16/2019 12:31:06 PM             Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 3.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M
Last changed    : 11/16/2019 12:28:44 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-p-Br and CF3 2019-11-16 10-57-
                  11\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/19/2019 9:04:36 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.057 MM    0.4088   57.00448    2.32401   4.9435
   2  15.735 MM    0.4467 1096.11255   40.89233  95.0565
```

Data File D:\CHEM32\...-PAPER2\NIPR-PMP-RAC-2 2020-10-08 16-21-55\002-P2-D1-Nipr-pmp-rac.D
Sample Name: Nipr-pmp-rac

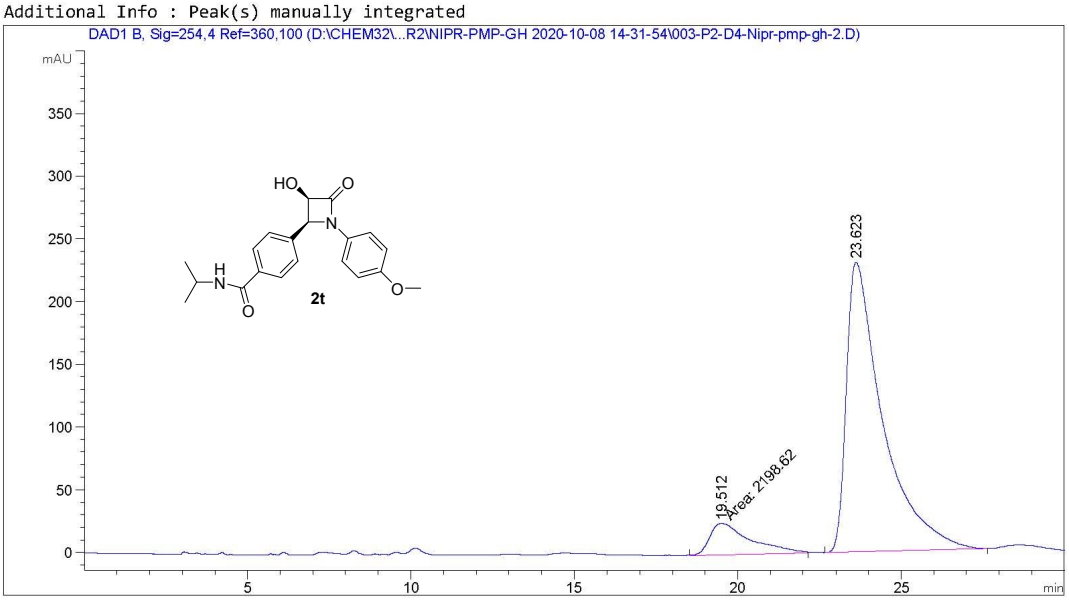
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   2
Acq. Instrument : 1260-DAD                       Location :   P2-D-01
Injection Date  : 10/8/2020 16:28:13                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-4-paper2\Nipr-pmp-rac-2 2020-10-08 16-21-55\IA-85-
                  15-1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : d:\Chem32\1\Data\WFY\wfy-4-paper2\Nipr-pmp-rac-2 2020-10-08 16-21-55\IA-85-
                  15-1ml-30min.M (Sequence Method)
Last changed    : 10/9/2020 08:54:53 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.863 BB    0.9134 8067.21631  124.59436  49.5297
   2  23.775 BBA   1.1272 8220.42383  104.33062  50.4703

Totals :                  1.62876e4   228.92498
```

Data File D:\CHEM32\...-4-PAPER2\NIPR-PMP-GH 2020-10-08 14-31-54\003-P2-D4-Nipr-pmp-gh-2.D
Sample Name: Nipr-pmp-gh-2

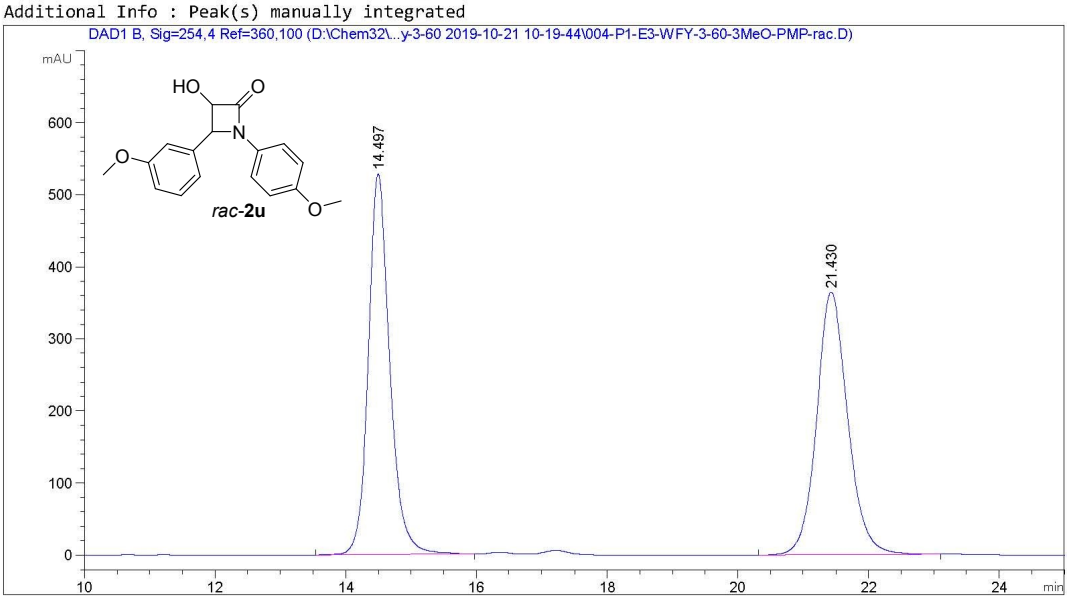
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   3
Acq. Instrument : 1260-DAD                      Location :   P2-D-04
Injection Date  : 10/8/2020 15:14:01                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-4-paper2\Nipr-pmp-gh 2020-10-08 14-31-54\IA-85-15-
                  1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-4-paper2\Nipr-pmp-gh 2020-10-08 14-31-54\IA-85-15-
                  1ml-30min.M (Sequence Method)
Last changed    : 10/8/2020 16:20:01 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  19.512 MM    1.4493 2198.61914   25.28300  10.9829
   2  23.623 BB    1.0702 1.78199e4   230.95465  89.0171

Totals :                  2.00185e4   256.23765
```

Data File D:\Chem32\...3-60\wfy-3-60 2019-10-21 10-19-44\004-P1-E3-WFY-3-60-3MeO-PMP-rac.D
Sample Name: WFY-3-60-3MeO-PMP-rac

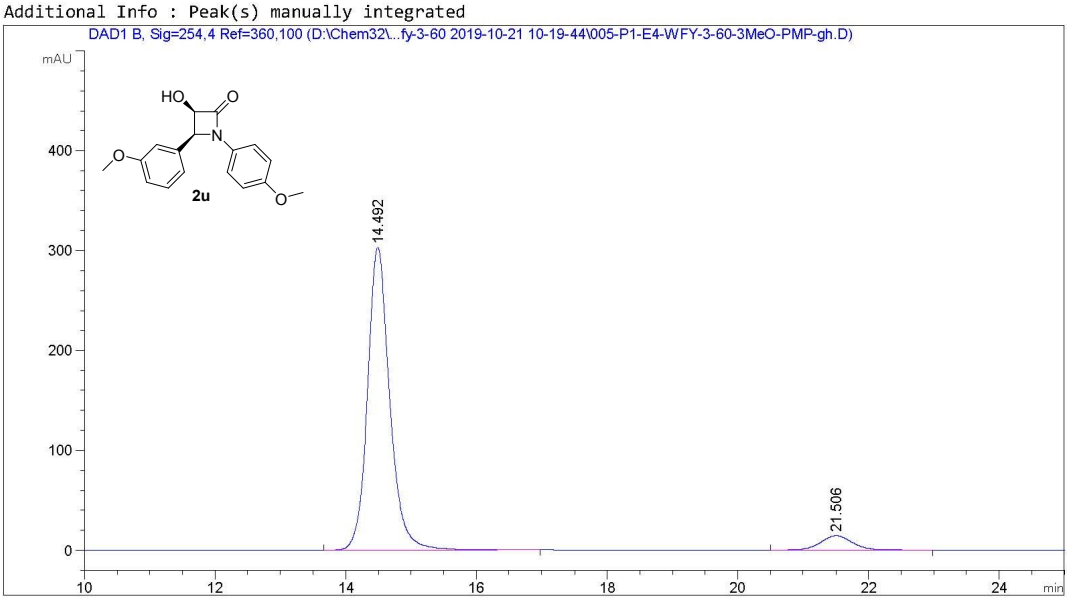
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   4
Acq. Instrument : 1260-DAD                        Location :   P1-E-03
Injection Date  : 10/21/2019 11:37:51                  Inj :   1
                                                 Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:17:57 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.497 BB    0.3409 1.19822e4   527.68707  49.9497
   2  21.430 BB    0.5007 1.20064e4   364.09576  50.0503

Totals :                  2.39886e4   891.78284
```

Data File D:\Chem32\...-3-60\wfy-3-60 2019-10-21 10-19-44\005-P1-E4-WFY-3-60-3MeO-PMP-gh.D
Sample Name: WFY-3-60-3MeO-PMP-gh

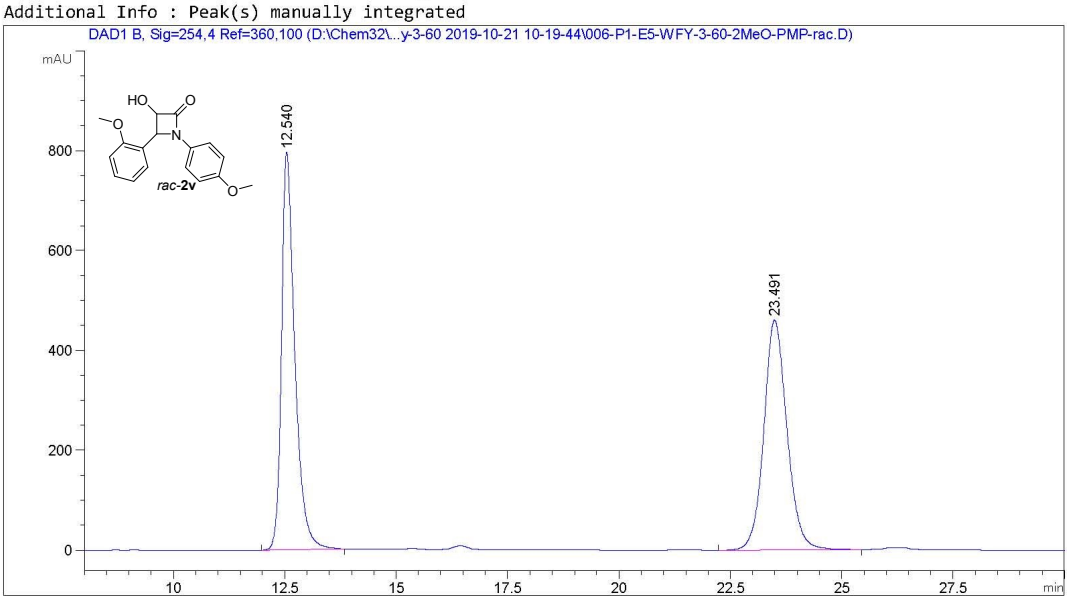
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   5
Acq. Instrument : 1260-DAD                        Location :   P1-E-04
Injection Date  : 10/21/2019 12:08:47                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:18:37 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.492 BB    0.3559 7166.12158  302.98111  93.4674
   2  21.506 BB    0.5172  500.85095   14.63854   6.5326

Totals :                  7666.97253  317.61965
```

Data File D:\Chem32\...3-60\wfy-3-60 2019-10-21 10-19-44\006-P1-E5-WFY-3-60-2MeO-PMP-rac.D
Sample Name: WFY-3-60-2MeO-PMP-rac

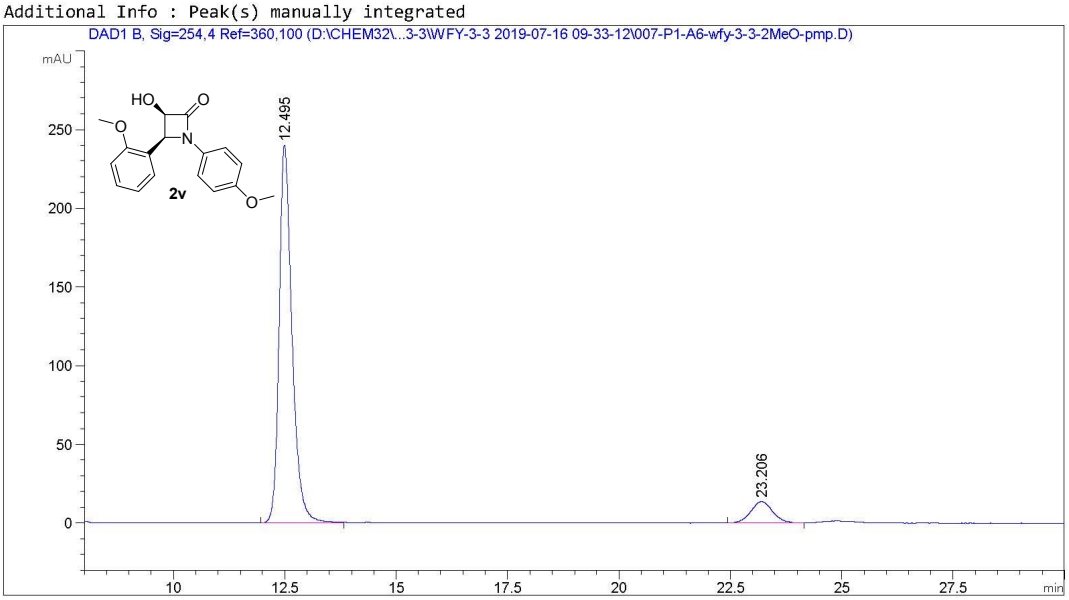
```
=====================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   6
Acq. Instrument : 1260-DAD                     Location :   P1-E-05
Injection Date  : 10/21/2019 12:39:44              Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\WFY-3-60\wfy-3-60 2019-10-21 10-19-44\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:20:12 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.540 BB    0.3067 1.64155e4   795.71454  49.7787
   2  23.491 BB    0.5459 1.65615e4   460.17523  50.2213

Totals :                 3.29771e4  1255.88977
```

Data File D:\CHEM32\...FY\WFY-3-3\WFY-3-3 2019-07-16 09-33-12\007-P1-A6-wfy-3-3-2MeO-pmp.D
Sample Name: wfy-3-3-2MeO-pmp

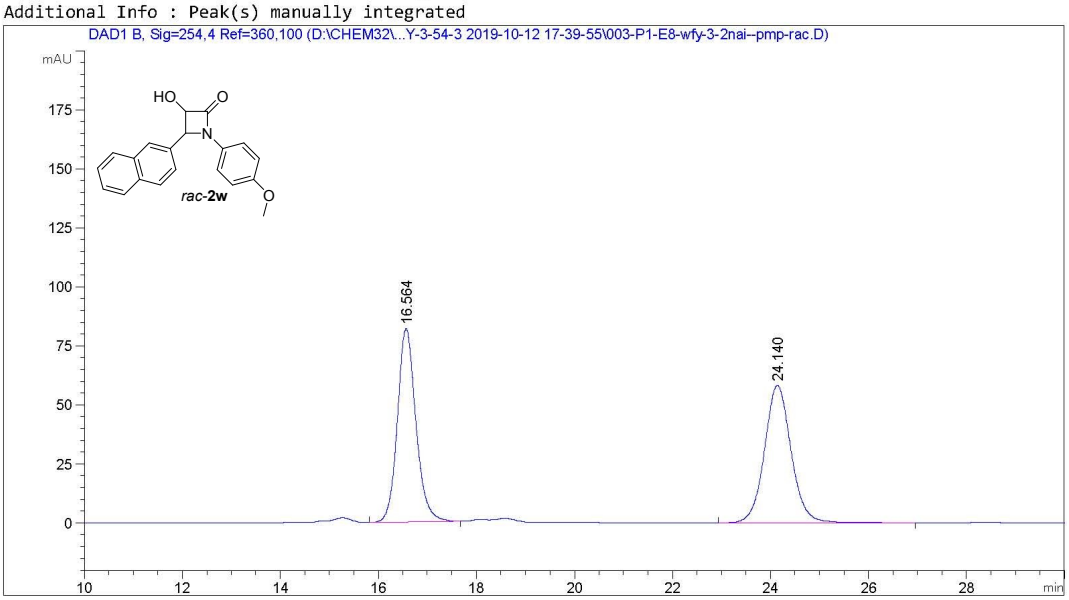
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   7
Acq. Instrument : 1260-DAD                      Location :   P1-A-06
Injection Date  : 7/16/2019 12:23:56                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-3\wfy-3-3 2019-07-16 09-33-12\IA-85-15-1ml-30min
                  .M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-3\wfy-3-3 2019-07-16 09-33-12\IA-85-15-1ml-30min
                  .M (Sequence Method)
Last changed    : 11/15/2019 16:23:24 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.495 BB    0.3006 4784.05176  239.99965  91.2069
   2  23.206 BB    0.5020  461.21979   13.51834   8.7931

Totals :                  5245.27155  253.51799
```

Data File D:\CHEM32\...3-54\WFY-3-54-3 2019-10-12 17-39-55\003-P1-E8-wfy-3-2nai--pmp-rac.D
Sample Name: wfy-3-2nai--pmp-rac

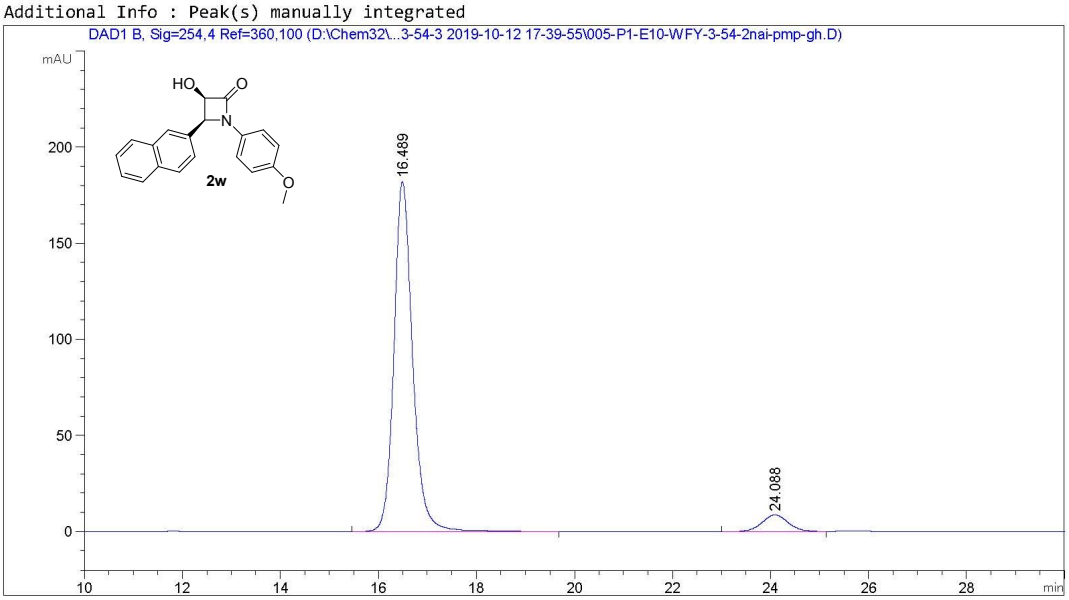
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   3
Acq. Instrument : 1260-DAD                      Location :   P1-E-08
Injection Date  : 10/12/2019 18:27:07               Inj :   1
                                               Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54-3 2019-10-12 17-39-55\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54-3 2019-10-12 17-39-55\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:10:21 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.564 BB    0.3980 2149.37061   81.94154  49.3583
   2  24.140 BB    0.5749 2205.25806   58.35309  50.6417

Totals :                  4354.62866  140.29463
```

Data File D:\Chem32\...54\wfy-3-54-3 2019-10-12 17-39-55\005-P1-E10-WFY-3-54-2nai-pmp-gh.D
Sample Name: WFY-3-54-2nai-pmp-gh

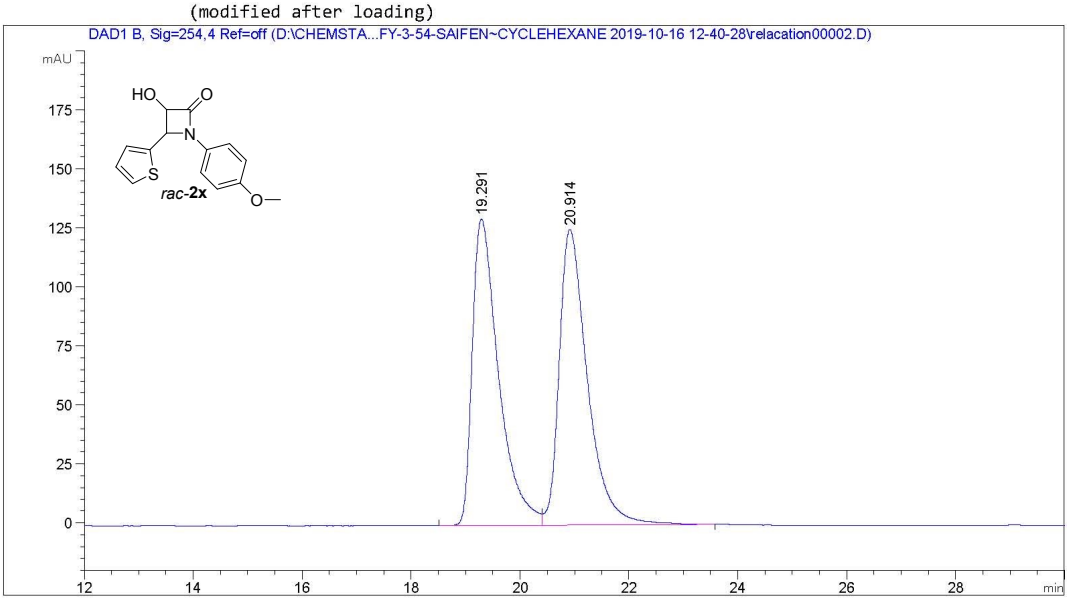
```
==========================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   5
Acq. Instrument : 1260-DAD                     Location :   P1-E-10
Injection Date  : 10/12/2019 19:28:54               Inj :   1
                                              Inj Volume : 3.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54-3 2019-10-12 17-39-55\IA-85-15-1ml-
                  30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-3-54\wfy-3-54-3 2019-10-12 17-39-55\IA-85-15-1ml-
                  30min.M (Sequence Method)
Last changed    : 11/15/2019 16:12:01 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.489 BB    0.3988 4815.67578  181.91084  93.7227
   2  24.088 BB    0.5637  322.54138    8.67614   6.2773

Totals :                  5138.21716  190.58698
```

Data File D:\CHEMSTA...4\WFY-3-54-SAIFEN~CYCLEHEXANE 2019-10-16 12-40-28\relacation00002.D
Sample Name: WFY-3-sifen-pmp-rac

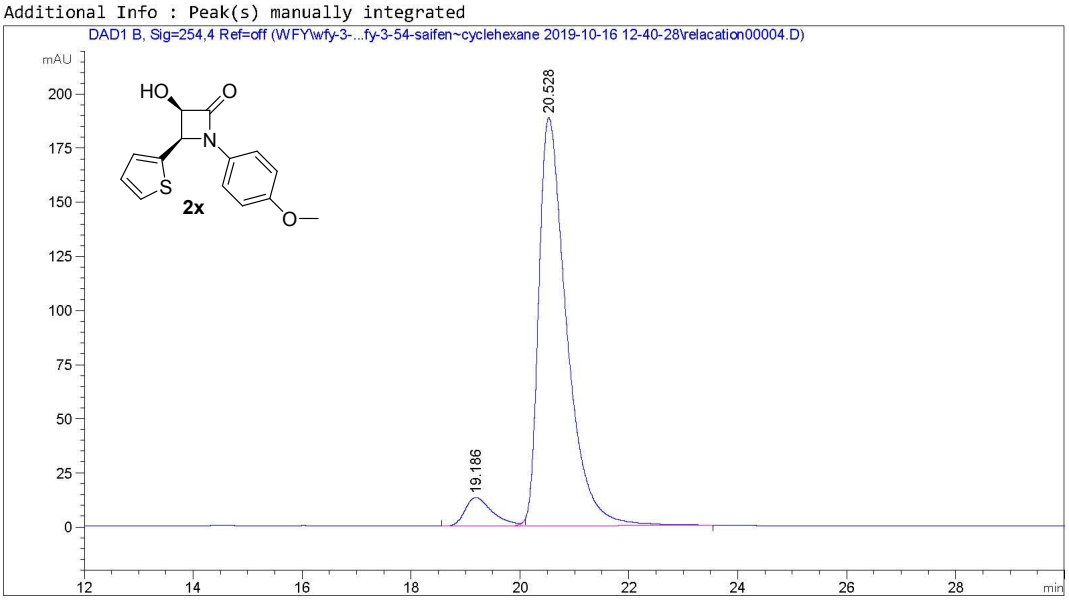
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                          Location :   P2-C-01
Injection Date  : 10/16/2019 12:51:44 PM           Inj :   1
                                             Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:39:00 PM by SYSTEM
                  (modified after loading)
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   3.012 BB    0.1269   21.23623    2.50547   0.1884
   2   8.027 BB    1.1947 2398.82886   25.42502  21.2834
   3  19.291 BV    0.4993 4352.98486  129.79451  38.6215
   4  20.914 VB    0.5373 4497.82764  125.15175  39.9066
```

Data File D:\ChemSta...4\wfy-3-54-saifen~cyclehexane 2019-10-16 12-40-28\relacation00004.D
Sample Name: WFY-3-54-sifen-pmp-gh

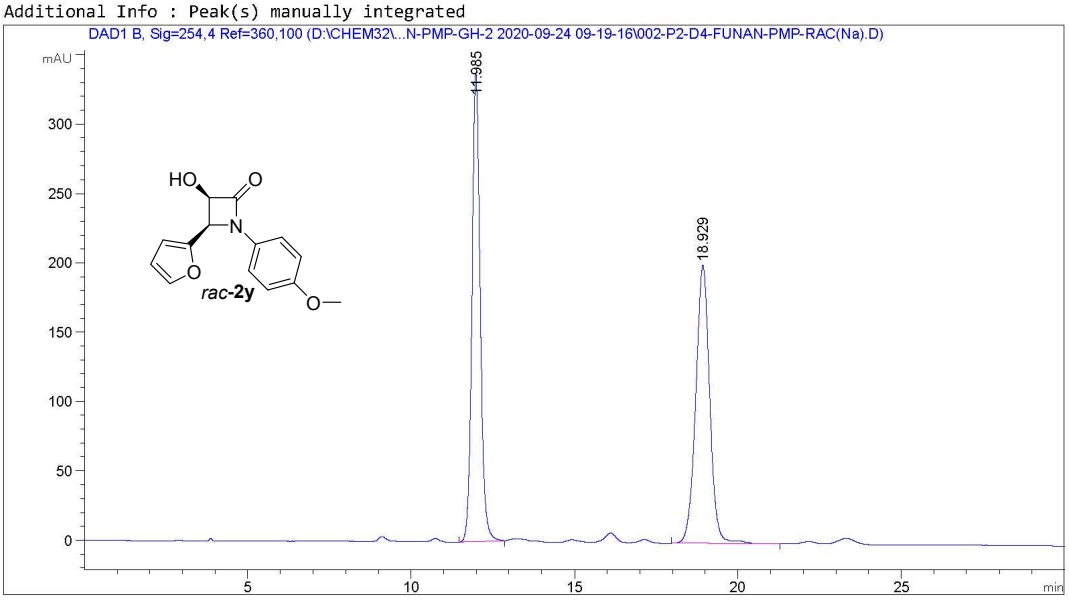
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   4
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P2-C-03
Injection Date  : 10/16/2019 1:53:26 PM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:39:57 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  19.186 BV E  0.5213  453.74026   13.12718   6.3606
   2  20.528 VB R  0.5354 6679.85205  188.52869  93.6394
```

Data File D:\CHEM32\...R2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\002-P2-D4-FUNAN-PMP-RAC(Na).D
Sample Name: FUNAN-PMP-RAC(Na)

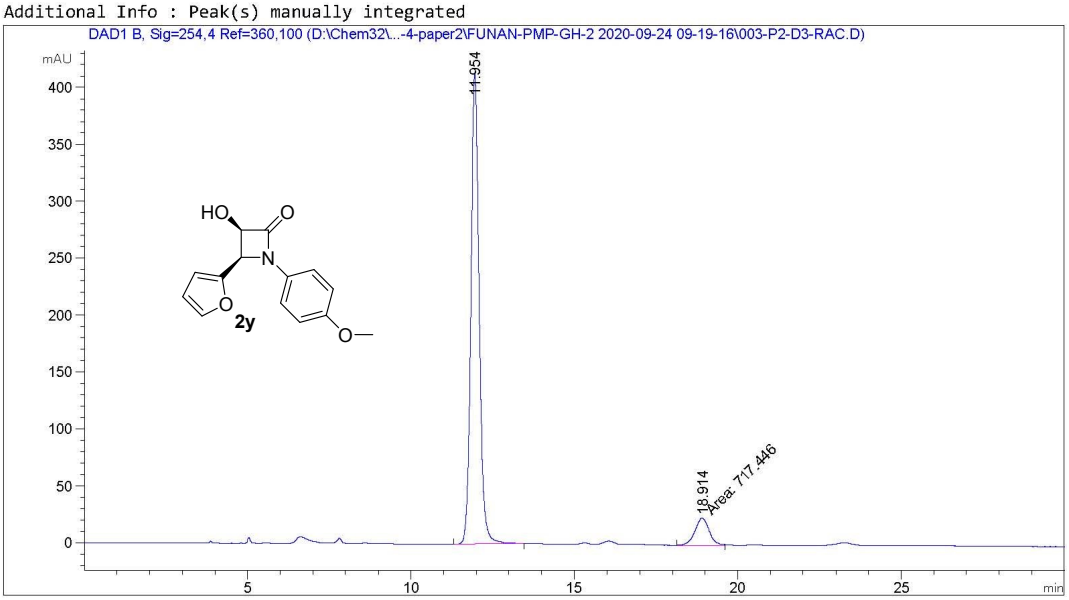
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   2
Acq. Instrument : 1260-DAD                        Location :   P2-D-04
Injection Date  : 9/24/2020 09:35:29                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-4-paper2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\IA-85-
                  15-1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-4-paper2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\IA-85-
                  15-1ml-30min.M (Sequence Method)
Last changed    : 10/8/2020 16:15:27 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.985 BB    0.2652 5874.34375  337.19861  49.5997
   2  18.929 BB    0.4510 5969.17188  200.68852  50.4003

Totals :                  1.18435e4   537.88713
```

Data File D:\Chem32\...WFY\wfy-4-paper2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\003-P2-D3-RAC.D
Sample Name: RAC

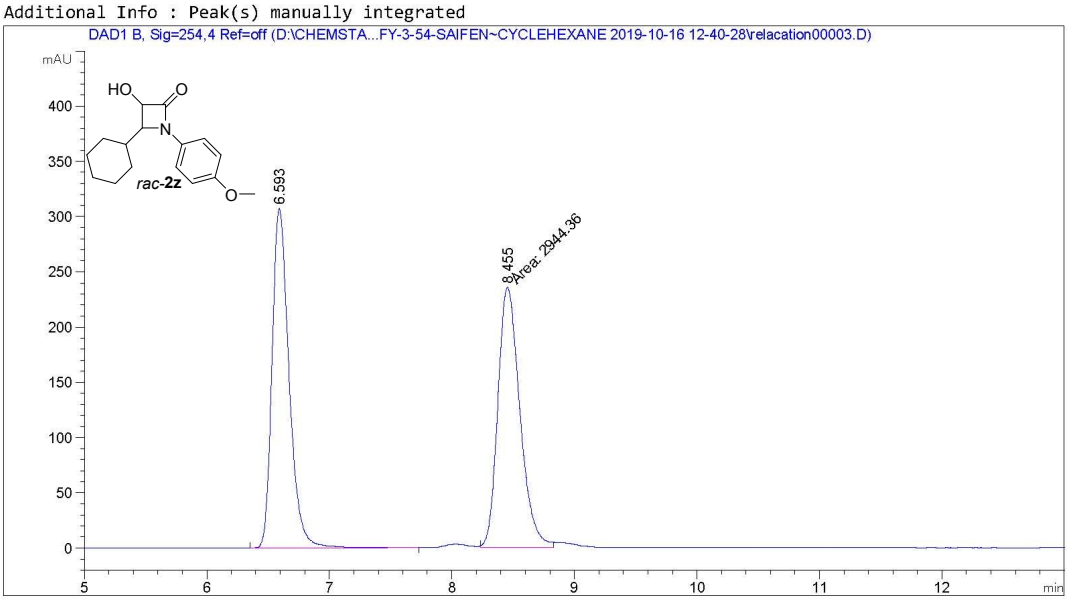
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   3
Acq. Instrument : 1260-DAD                      Location :   P2-D-03
Injection Date  : 9/24/2020 10:06:22                 Inj :   1
                                               Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\Chem32\1\Data\WFY\wfy-4-paper2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\IA-85-
                  15-1ml-30min.M
Last changed    : 1/7/2019 21:25:37 by SYSTEM
Analysis Method : D:\Chem32\1\Data\WFY\wfy-4-paper2\FUNAN-PMP-GH-2 2020-09-24 09-19-16\IA-85-
                  15-1ml-30min.M (Sequence Method)
Last changed    : 10/8/2020 16:15:27 by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.954 BB    0.2665 7231.65381  412.65378  90.9745
   2  18.914 MM    0.4986  717.44562   23.98012   9.0255

Totals :                  7949.09943  436.63390
```

Data File D:\CHEMSTA...4\WFY-3-54-SAIFEN~CYCLEHEXANE 2019-10-16 12-40-28\relacation00003.D
Sample Name: wfy-3-cyclhexane-rac

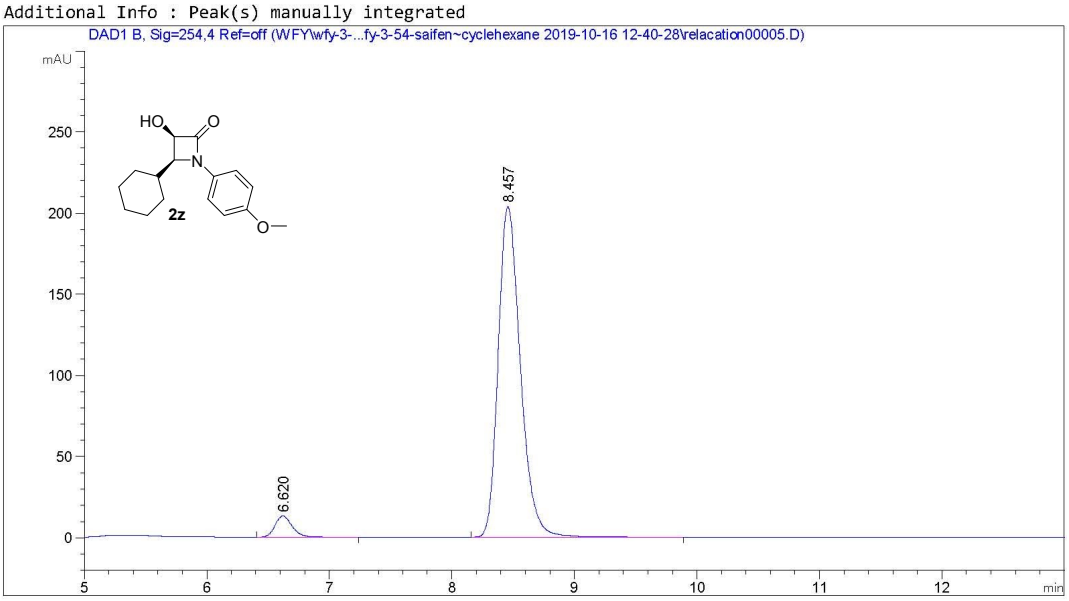
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P2-C-02
Injection Date  : 10/16/2019 1:22:35 PM              Inj :   1
                                               Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:42:46 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.593 BB    0.1465 2964.00635  307.38565  50.1662
   2   8.455 FM    0.2082 2944.36230  235.64851  49.8338
```

Data File D:\ChemSta...4\wfy-3-54-saifen~cyclehexane 2019-10-16 12-40-28\relacation00005.D
Sample Name: wfy-3-54-cyclhexane-gh

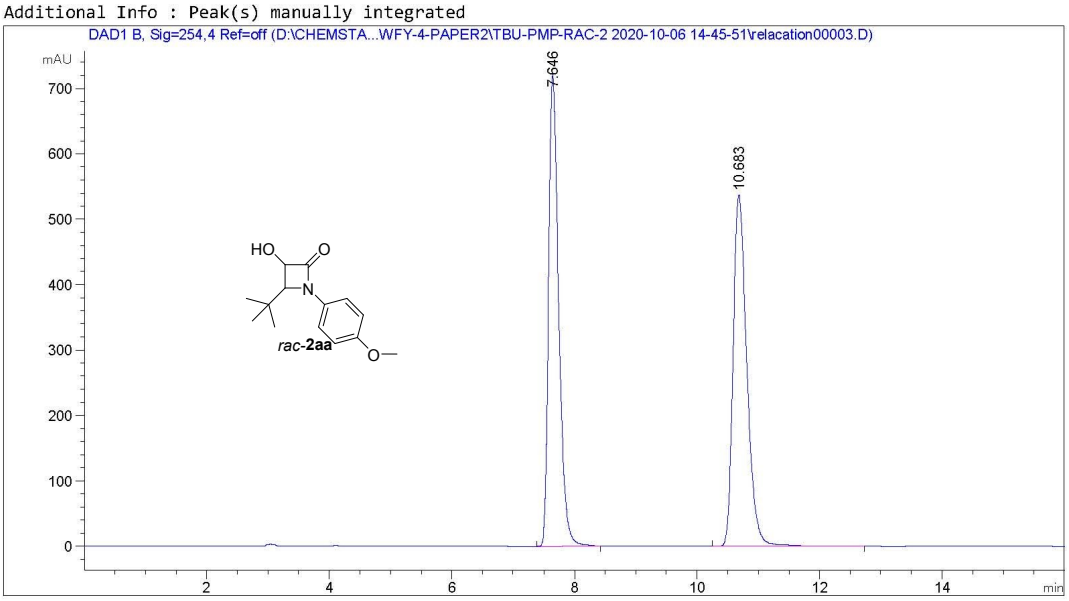
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   5
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P2-C-04
Injection Date  : 10/16/2019 2:24:17 PM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-54\wfy-3-54-saifen~cyclehexane 2019-10-16
                  12-40-28\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 11/14/2019 2:44:23 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.620 BB    0.1489  129.83894   13.18489   4.8267
   2   8.457 BB    0.1926 2560.18066  203.73653  95.1733
```

Data File D:\CHEMSTA...FY\WFY-4-PAPER2\TBU-PMP-RAC-2 2020-10-06 14-45-51\relacation00003.D
Sample Name: tBu-PMP-RAC-Na

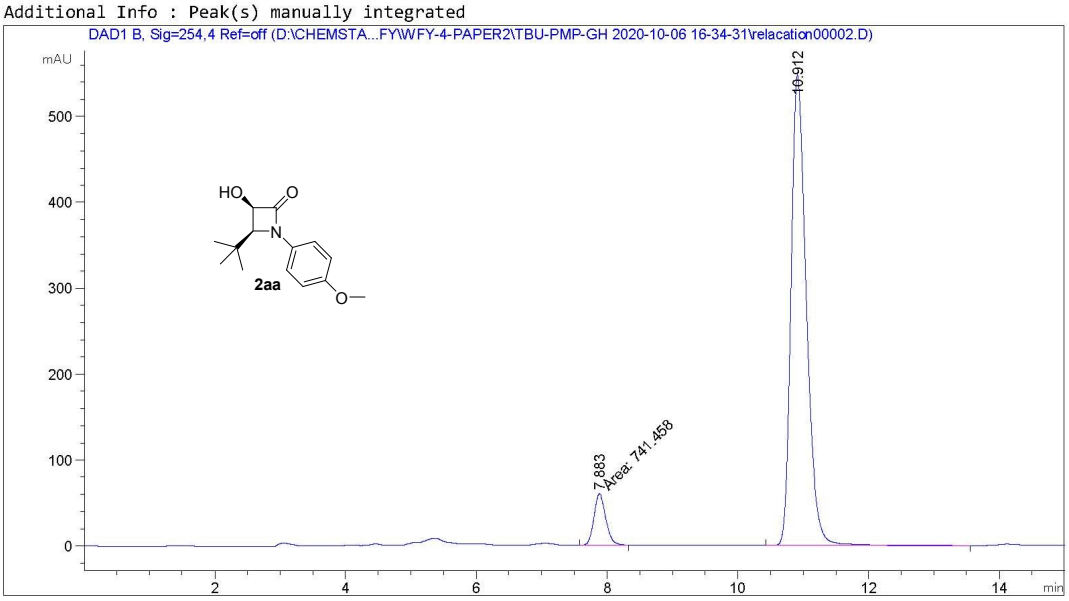
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   3
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P2-C-02
Injection Date  : 10/6/2020 3:20:43 PM              Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-4-paper2\tBu-PMP-RAC-2 2020-10-06 14-45-51\OD
                  -3-90-10-1ML-30min.M
Last changed    : 10/6/2020 3:19:52 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-4-paper2\tBu-PMP-RAC-2 2020-10-06 14-45-51\OD
                  -3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 10/8/2020 4:01:14 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.646 BB    0.1748 8218.07324  721.88336  49.6118
   2  10.683 BB    0.2371 8346.69824  537.61566  50.3882
```

Data File D:\CHEMSTA...A\WFY\WFY-4-PAPER2\TBU-PMP-GH 2020-10-06 16-34-31\relacation00002.D
Sample Name: tBu-PMP-RAC

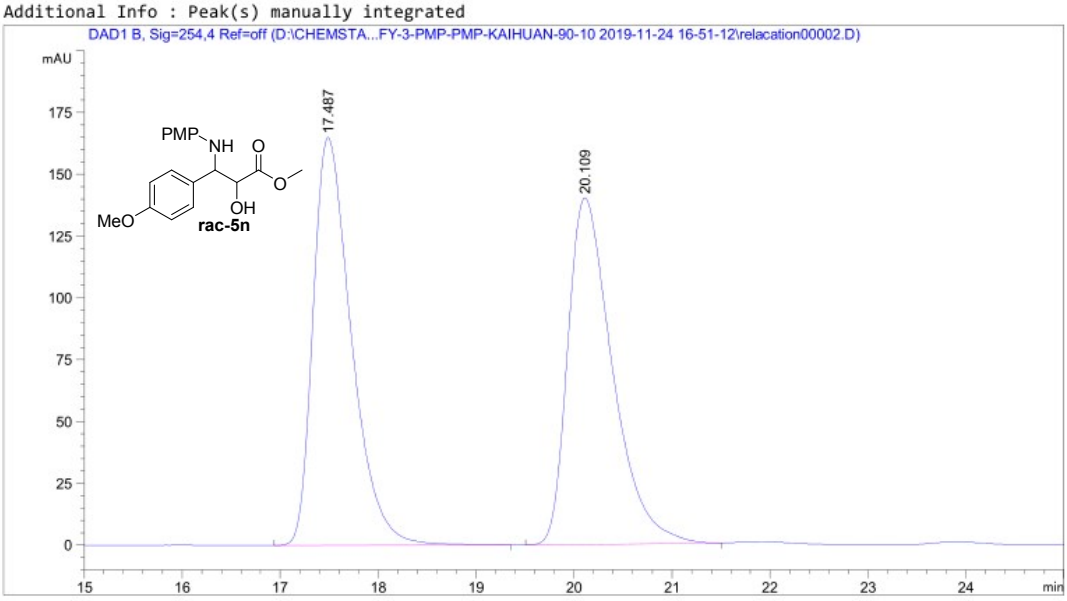
```
=====================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P2-C-03
Injection Date  : 10/6/2020 4:45:47 PM              Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 10.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-4-paper2\tBu-PMP-GH 2020-10-06 16-34-31\OD-3-
                  90-10-1ML-30min.M
Last changed    : 10/6/2020 4:48:30 PM by SYSTEM
                  (modified after loading)
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-4-paper2\tBu-PMP-GH 2020-10-06 16-34-31\OD-3-
                  90-10-1ML-30min.M (Sequence Method)
Last changed    : 10/8/2020 4:03:04 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.883 MM    0.2068  741.45837   59.75145   7.6633
   2  10.912 BB    0.2502 8933.97754  548.09882  92.3367
```

Data File D:\CHEMSTA...N\WFY-3-PMP-PMP-KAIHUAN-90-10 2019-11-24 16-51-12\relacation00002.D
Sample Name: PMP-PMP-KAIHUAN-RAC

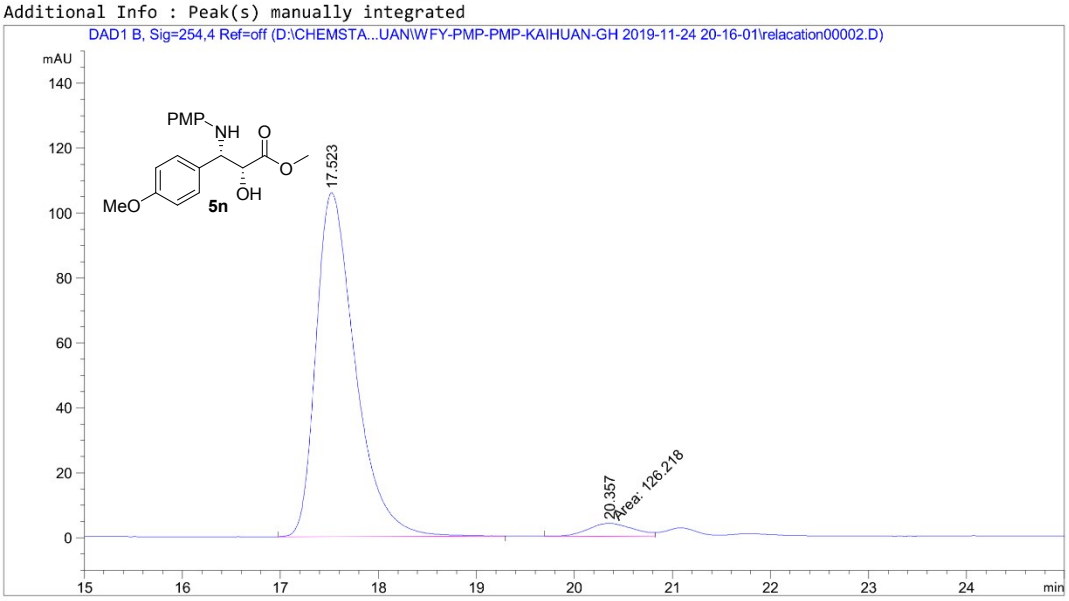
```
=====================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P1-C-08
Injection Date  : 11/24/2019 5:02:28 PM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\WFY-3-PMPPMP-KAIHUAN\WFY-3-PMP-PMP-KAIHUAN-90-10
                  2019-11-24 16-51-12\OD-3-90-10-1ML-45min.M
Last changed    : 6/27/2019 12:37:27 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\WFY-3-PMPPMP-KAIHUAN\WFY-3-PMP-PMP-KAIHUAN-90-10
                  2019-11-24 16-51-12\OD-3-90-10-1ML-45min.M (Sequence Method)
Last changed    : 12/18/2019 9:04:07 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.487 BB    0.4133 4488.58545  165.02647  50.2252
   2  20.109 BB    0.4842 4448.33887  140.20222  49.7748
```

Data File D:\CHEMSTA...AIHUAN\WFY-PMP-PMP-KAIHUAN-GH 2019-11-24 20-16-01\relacation00002.D
Sample Name: WFY-PMP-PMP-KH-GH

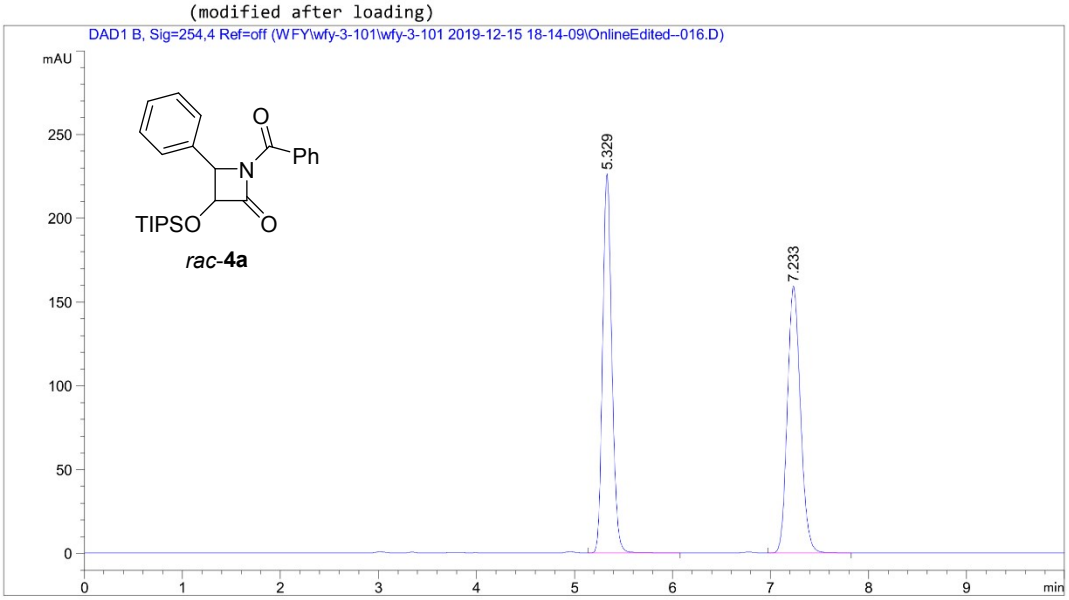
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :   2
Sample Operator : SYSTEM
Acq. Instrument : LC                           Location :   P1-C-09
Injection Date  : 11/24/2019 8:27:15 PM             Inj :   1
                                              Inj Volume : 1.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\WFY-3-PMPPMP-KAIHUAN\WFY-PMP-PMP-KAIHUAN-GH 2019-
                  11-24 20-16-01\OD-3-90-10-1ML-30min.M
Last changed    : 6/28/2019 8:29:21 AM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\WFY-3-PMPPMP-KAIHUAN\WFY-PMP-PMP-KAIHUAN-GH 2019-
                  11-24 20-16-01\OD-3-90-10-1ML-30min.M (Sequence Method)
Last changed    : 12/18/2019 9:06:26 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.523 BB    0.4197 2937.01978  105.86768  95.8796
   2  20.357 MF    0.5393  126.21805    3.90050   4.1204
```

Data File D:\ChemSta...ata\WFY\wfy-3-101\wfy-3-101 2019-12-15 18-14-09\OnlineEdited--016.D
Sample Name: wfy-3-ph-N-Bz-rac

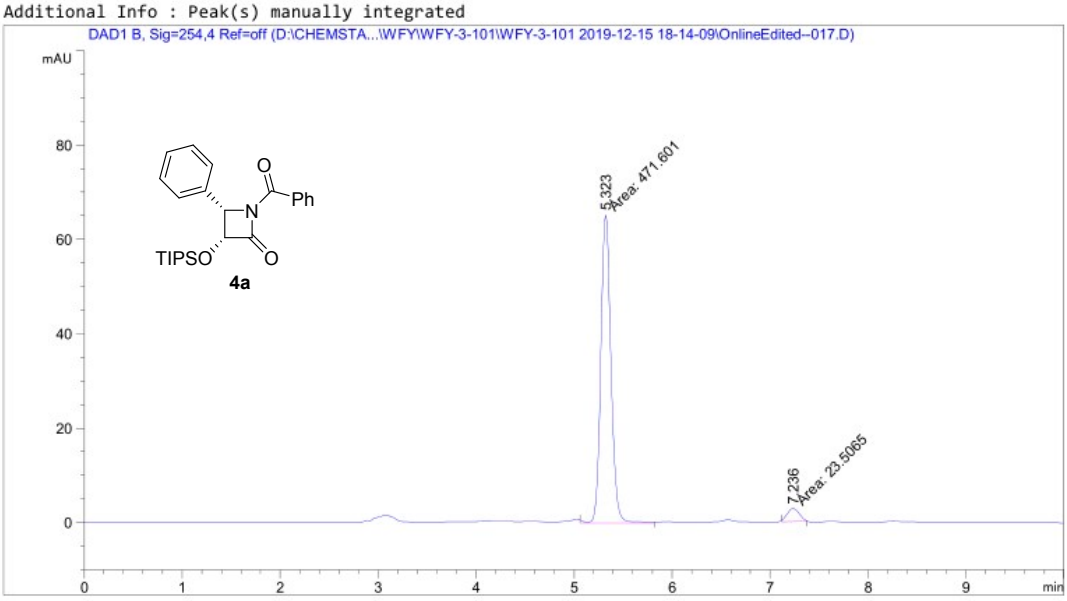
```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  16
Sample Operator : SYSTEM
Acq. Instrument : LC                            Location :   P1-A-06
Injection Date  : 12/16/2019 12:54:42 AM             Inj :   1
                                               Inj Volume : 2.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 3.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-101\wfy-3-101 2019-12-15 18-14-09\OD-3-90-
                  10-1ML-10min.M
Last changed    : 6/27/2019 12:37:27 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-101\wfy-3-101 2019-12-15 18-14-09\OD-3-90-
                  10-1ML-10min.M (Sequence Method)
Last changed    : 12/18/2019 9:14:31 PM by SYSTEM
                  (modified after loading)
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.329 BB    0.1002 1477.27869  226.32774  50.0182
   2   7.233 BB    0.1442 1476.20435  159.22878  49.9818

Totals :                  2953.48303  385.55652
```

Data File D:\CHEMSTA...ATA\WFY\WFY-3-101\WFY-3-101 2019-12-15 18-14-09\OnlineEdited--017.D
Sample Name: wfy-3-ph-N-Bz-gh

```
======================================================================
Acq. Operator   : SYSTEM                       Seq. Line :  17
Sample Operator : SYSTEM
Acq. Instrument : LC                          Location :   P1-A-07
Injection Date  : 12/16/2019 1:05:36 AM            Inj :   1
                                              Inj Volume : 2.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : D:\ChemStation\1\Data\WFY\wfy-3-101\wfy-3-101 2019-12-15 18-14-09\OD-3-90-
                  10-1ML-10min.M
Last changed    : 6/27/2019 12:37:27 PM by SYSTEM
Analysis Method : D:\ChemStation\1\Data\WFY\wfy-3-101\wfy-3-101 2019-12-15 18-14-09\OD-3-90-
                  10-1ML-10min.M (Sequence Method)
Last changed    : 12/18/2019 9:13:44 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.323 MM    0.1203  471.60080   65.35562  95.2522
   2   7.236 MM    0.1420   23.50647    2.75968   4.7478
```

10. References.

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