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Selective approach to *N*-substituted tertiary 2-pyridones

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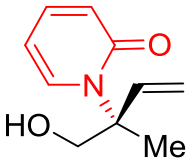
General experimental details

Analytical thin-layer chromatography (TLC) was carried out using 0.2 mm commercial silica gel plates (Yantai Jiangyou Silica Gel Development Co., Ltd., silica gel HSGF 254). Preparative column chromatography employing silica gel (Qingdao Shenghai Fine Silica Gel Chemical Co., Ltd., 200-300 mesh) was performed according to the method of Still. Solvents for the chromatography are listed as volume/volume ratios. High-resolution mass spectra (HRMS) were performed at Instrumental Analysis Center of Xi'an Jiao Tong University using ESI method. Proton nuclear magnetic resonance (^{1}H NMR) spectra were recorded with a Varian Mercuryplus 400 (400 MHz) spectrometer. Chemical shifts are reported in delta (δ) units, parts per million (ppm) downfield from tetramethylsilane or ppm relative to the center of the singlet at 7.26 ppm for deuteriochloroform. Coupling constants are reported in Hertz (Hz). Carbon-13 nuclear magnetic resonance (^{13}C NMR) spectra were recorded with a Varian Gemini 400 (100 MHz) spectrometer. Chemical shifts are reported in delta (δ) units, ppm relative to the center of the triplet at 77.0 ppm for deuteriochloroform. ^{13}C NMR spectra were routinely run with broadband decoupling. High performance liquid chromatography (HPLC) was performed with FuLi (instruments) spectrometers using chiral column as noted for each compound. Optical rotations were measured on SGW®-1 polarimeter. $Pd_2(dba)_3$•$CHCl_3$, Ligands and 2-hydroxypyridine compounds were purchased from Energy Chemicals and Aladin/Sigma-Aldrich companies and used as received. Substituted vinyl cyclic carbonates were synthesized according to the previously reported procedure.[1,2] All other chemicals were used as received from commercial resources.

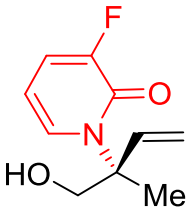
General procedure for the allylic amination of vinyl cyclic carbonate 1 with 2-hydroxypyridine

To an oven dried screw-cap reaction tube equipped with a magnetic stir bar, $Pd_2(dba)_3{\cdot}CHCl_3$ (5.2 mg, 2.5 mol%), Trost's ligand (*R*,*R*)-**L6** (7.8 mg, 5 mol%), vinyl cyclic carbonate **1a** (25.6 mg, 0.2 mmol), and 2-hydroxypyridine (28.53 mg, 0.3 mmol) were added. The reaction tube was sealed with rubber-septum, then evacuated and backfilled with nitrogen. Anhydrous CH_2Cl_2 (0.2 M, 1 mL) were added via syringe. The resulting mixture was stirred at 0 ˚C for 24 hours. The reaction mixture was warm to room temperature and the residue was purified by flash column chromatography on silica gel to afford the pure *N*-substituted 2-pyridone **3aa**. The enantiomeric excesses of the products were determined by HPLC analysis using chiral stationary phases as indicated for each case.



3aa

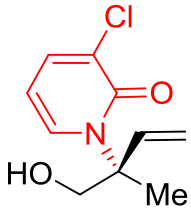
(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)pyridin-2(1H)-one (3aa) was prepared according to the general procedure from **1a** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 72% yield (25.8 mg). $[\alpha]^{25}_D$ = 32.8 (*c* = 0.14, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (dd, *J* = 1.2, 7.2 Hz, 1H), 7.34–7.30 (m, 1H), 6.58 (dd, *J* = 1.2, 7.2 Hz, 1H),, 6.22–6.19 (m, 1H), 6.10 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.38 (d, *J* = 10.8 Hz, 1H), 5.33 (d, *J* = 17.6 Hz, 1H), 5.31 (brt, 1H), 4.06 (dd, *J* = 5.2, 12.5 Hz, 1H), 3.85 (dd, *J* = 5.2, 12.5 Hz, 1H), 1.60 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.2, 140.0, 139.1, 136.1, 122.5, 115.7, 106.9, 70.5, 68.4, 21.0; HRMS (ESI-MS): Calcd. for $C_{10}H_{13}NO_2$ (M + Na): 202.0839, Found: 202.0830; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/19, t_{minor} = 83.51 min, t_{major} = 88.53 min; 99% ee.



3ab

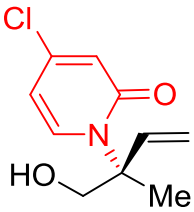
(*S*)-3-fluoro-1-(1-hydroxy-2-methylbut-3-en-2-yl)pyridin-2(1H)-one (3ab) was prepared according to the general procedure from **1a** and **2b**. The crude product was purified by flash

column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 76% yield (30.1 mg). $[\alpha]^{25}_{D}$ = 72.4 (*c* = 0.10, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.34–7.31 (m, 1H), 7.12–7.08 (m, 1H), 6.16–6.12 (m, 1H), 6.11 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.40 (d, *J* = 10.8 Hz, 1H), 5.33 (d, *J* = 17.6 Hz, 1H), 4.66 (brs, 1H), 4.09 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.94 (dd, *J* = 7.4, 12.2 Hz, 1H), 1.64 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7, 157.6, 153.8, 152.2, 139.6, 131.2, 119.7, 119.6, 116.1, 104.4, 71.2, 68.2, 20.9; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}FNO_2$ (M + Na): 220.0744, Found: 220.0738; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/9, t_{major} = 46.74 min, t_{minor} = 54.67 min; 97% ee.



3ac

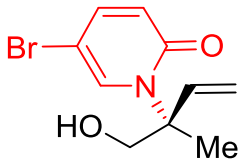
(*S*)-3-chloro-1-(1-hydroxy-2-methylbut-3-en-2-yl)pyridin-2(1H)-one (3ac) was prepared according to the general procedure from **1a** and **2c**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 80% yield (34.2 mg). $[\alpha]^{25}_{D}$ = 71.5 (*c* = 0.056, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56–7.50 (m, 2H), 6.18 (t, *J* = 7.2 Hz, 1H), 6.13 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.39 (d, *J* = 10.8 Hz, 1H), 5.33 (d, *J* = 17.6 Hz, 1H), 4.49 (brt, 1H), 4.08 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.97 (dd, *J* = 7.4, 12.2 Hz, 1H), 1.65 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.1, 139.6, 137.4, 134.9, 127.5, 116.0, 105.8, 71.2, 67.9, 20.8; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}ClNO_2$ (M + Na): 236.0449, Found: 236.0443; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 16.86 min, t_{minor} = 21.20 min; 97% ee.



3ad

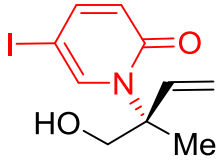
(*S*)-4-chloro-1-(1-hydroxy-2-methylbut-3-en-2-yl)pyridin-2(1H)-one (3ad) was prepared according to the general procedure from **1a** and **2d**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 79% yield (33.7 mg). $[\alpha]^{25}_{D}$ = 44.2 (*c* = 0.032, CH_2Cl_2); ^{1}H NMR

(400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 7.8 Hz, 1H), 6.58 (d, *J* = 2.2 Hz, 1H), 6.24–6.21 (m, 1H), 6.09 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.39 (d, *J* = 10.8 Hz, 1H), 5.32 (d, *J* = 17.6 Hz, 1H), 4.73 (brt, 1H), 4.04 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.90 (dd, *J* = 7.4, 12.2 Hz, 1H), 1.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.2, 146.5, 139.6, 136.5, 120.6, 116.0, 108.3, 70.2, 67.7, 20.9; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}ClNO_2$ (M + Na): 236.0449, Found: 236.0442; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 10.96 min, t_{minor} = 11.94 min; 90% ee.



3ae

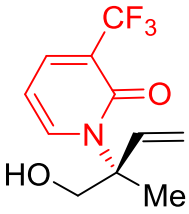
(*S*)-5-bromo-1-(1-hydroxy-2-methylbut-3-en-2-yl)pyridin-2(1H)-one (3ae) was prepared according to the general procedure from **1a** and **2e**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a white solid in 76% yield (39.2 mg). $[\alpha]^{25}_D$ = 33.8 (*c* = 0.16, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 2.6 Hz, 1H), 7.34 (dd, *J* = 2.6, 9.5 Hz, 1H), 6.47 (d, *J* = 9.5 Hz, 1H), 6.10 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.34 (d, *J* = 17.6 Hz, 1H), 4.83 (brt, 1H), 4.04 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.91 (dd, *J* = 7.4, 12.2 Hz, 1H), 1.62 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6, 142.1, 139.3, 136.1, 123.6, 116.4, 98.9, 70.8, 67.8, 20.8; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}BrNO_2$ (M + Na): 279.9944, Found: 279.9937; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{minor} = 11.91 min, t_{major} = 13.19 min; 98% ee.



3af

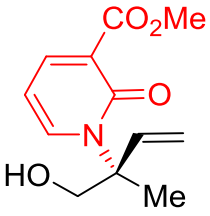
(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-5-iodopyridin-2(1H)-one (3af) was prepared according to the general procedure from **1a** and **2f**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 75% yield (45.8 mg). $[\alpha]^{25}_D$ = 21.2 (*c* = 0.13, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 2.6 Hz, 1H), 7.41 (dd, *J* = 2.6, 9.5 Hz, 1H), 6.37 (d, *J* = 9.5 Hz, 1H), 6.09 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.34 (d, *J* = 17.6 Hz, 1H), 4.82 (brt, 1H), 4.03 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.90 (dd, *J* = 7.4, 12.2 Hz, 1H), 1.62 (s, 3H); ^{13}C NMR

(100 MHz, $CDCl_3$) δ 162.6, 146.5, 141.1, 139.4, 124.2, 116.3, 70.7, 67.8, 65.6, 20.8; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}INO_2$ (M + Na): 327.9805, Found: 327.9804; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{minor} = 13.58 min, t_{major} = 15.02 min; 90% ee.



3ag

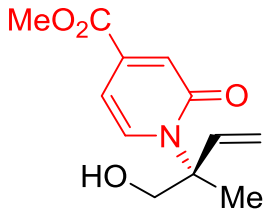
(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-3-(trifluoromethyl)pyridin-2(1H)-one (3ag) was prepared according to the general procedure from **1a** and **2g**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 81% yield (40.1 mg). $[\alpha]^{25}_D$ = 29.4 (*c* = 0.06, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, *J* = 7.0 Hz, 2H), 6.26 (t, *J* = 7.2 Hz, 1H), 6.14 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.35 (d, *J* = 17.6 Hz, 1H), 4.10-3.99 (m, 3H), 1.66 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.1, 140.4, 139.5, 138.7, 138.6, 116.3, 104.6, 71.0, 67.8, 20.9; HRMS (ESI-MS): Calcd. for $C_{11}H_{12}F_3NO_2$ (M + Na): 270.0712, Found: 270.0707; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 18.3 min, t_{minor} = 19.88 min; 98% ee.



3ah

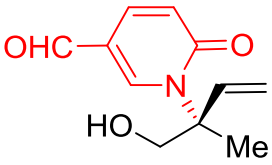
methyl (S)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-2-oxo-1,2-dihydropyridine-3-carboxylate (3ah) was prepared according to the general procedure from **1a** and **2h**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 83% yield (39.4 mg). $[\alpha]^{25}_D$ = 21.7 (*c* = 0.08, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (dd, *J* = 2.1, 7.0 Hz, 1H), 7.79 (dd, *J* = 2.1, 7.0 Hz, 1H), 6.26 (t, *J* = 7.2 Hz, 1H), 6.16 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.38 (d, *J* = 10.8 Hz, 1H), 5.32 (d, *J* = 17.6 Hz, 1H), 4.19 (brs, 1H), 4.09 (d, *J* = 12.2 Hz, 1H), 4.02 (d, *J* = 12.2 Hz, 1H), 3.89 (s, 3H), 1.66 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 161.0, 144.3, 141.1, 139.9, 122.0, 115.8, 105.1, 70.7, 67.7, 52.4, 21.1; HRMS (ESI-MS): Calcd. for $C_{12}H_{15}NO_4$ (M + Na):

260.0893, Found: 260.0883; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 39.63 min, t_{minor} = 52.89 min; 93% ee.



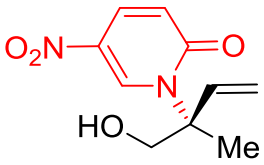
3ai

methyl (S)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-2-oxo-1,2-dihydropyridine-4-carboxylate (3ai) was prepared according to the general procedure from **1a** and **2i**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 80% yield (37.9 mg). $[\alpha]^{25}_{D}$ = 47.1 (*c* = 0.02, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 7.0 Hz, 1H), 7.18 (d, *J* = 2.1 Hz, 1H), 6.67 (dd, *J* = 2.1, 7.2 Hz, 1H), 6.11 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.33 (d, *J* = 17.6 Hz, 1H), 4.74 (brq, 1H), 4.06 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.92 (dd, *J* = 5.2, 12.2 Hz, 1H), 3.91 (s, 3H), 1.63 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.8, 163.9, 140.0, 139.6, 136.7, 124.2, 116.0, 105.0, 70.6, 67.9, 52.8, 20.9; HRMS (ESI-MS): Calcd. for $C_{12}H_{15}NO_4$ (M + Na): 260.0893, Found: 260.0886; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 35.95 min, t_{minor} = 52.89 min; 99% ee.



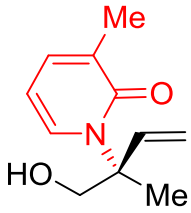
3aj

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-6-oxo-1,6-dihydropyridine-3-carbaldehyde (3aj) was prepared according to the general procedure from **1a** and **2j**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 84% yield (34.8 mg). $[\alpha]^{25}_{D}$ = 19.1 (*c* = 0.08, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.6 (s, 1H), 8.17 (d, *J* = 2.1 Hz, 1H), 7.79 (dd, *J* = 2.1, 9.2 Hz, 1H), 6.58 (d, *J* = 9.2 Hz, 1H), 6.18 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.46 (d, *J* = 10.8 Hz, 1H), 5.37 (d, *J* = 17.6 Hz, 1H), 4.10 (d, *J* = 12.2 Hz, 1H), 4.06 (d, *J* = 12.2 Hz, 1H), 3.81 (brs, 1H), 1.71 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.5, 164.1, 146.0, 138.8, 135.2, 122.6, 118.6, 116.8, 70.4, 67.3, 21.0; HRMS (ESI-MS): Calcd. for $C_{11}H_{13}NO_3$ (M + Na): 230.0788, Found: 230.0785; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{minor} = 35.15 min, t_{minor} = 38.29 min; 98% ee.



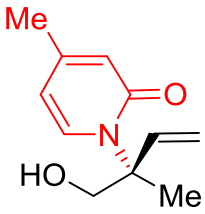
3ak

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-5-nitropyridin-2(1H)-one (3ak) was prepared according to the general procedure from **1a** and **2k**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a white solid in 78% yield (35.1 mg). $[\alpha]^{25}_{D}$ = 10.5 (*c* = 0.24, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.90 (d, *J* = 2.8 Hz, 1H), 8.07 (dd, *J* = 2.8, 9.8 Hz, 1H), 6.58 (d, *J* = 9.2 Hz, 1H), 6.17 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.48 (d, *J* = 10.8 Hz, 1H), 5.38 (d, *J* = 17.6 Hz, 1H), 4.11 (d, *J* = 6.8 Hz, 1H), 4.07 (d, *J* = 12.2 Hz, 1H), 3.43 (brt, 1H), 1.73 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.9, 138.6, 138.1, 132.7, 131.1, 121.1, 117.3, 70.8, 66.7, 21.0; HRMS (ESI-MS): Calcd. for $C_{10}H_{12}N_2O_2$ (M + Na): 247.0689, Found: 247.0682; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{minor} = 11.89 min, t_{major} = 12.68 min; 90% ee.



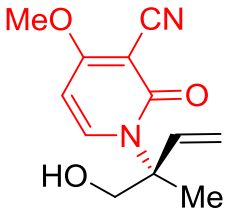
3al

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-3-methylpyridin-2(1H)-one (3al) was prepared according to the general procedure from **1a** and **2l**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 62% yield (24.1 mg). $[\alpha]^{25}_{D}$ = 49.5 (*c* = 0.09, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39–7.35 (m, 1H), 7.22–7.20 (m, 1H), 6.13 (t, *J* = 4.7 Hz, 1H), 6.11 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (brq, 1H), 5.35 (d, *J* = 10.8 Hz, 1H), 5.30 (d, *J* = 17.6 Hz, 1H), 4.06 (dd, *J* = 4.1, 12.4 Hz, 1H), 4.85 (d, *J* = 4.2, 12.6 Hz, 1H), 2.14 (s, 3H), 1.62 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.4, 140.4, 136.7, 133.5, 131.1, 115.3, 106.5, 70.4, 68.9, 21.1, 17.5; HRMS (ESI-MS): Calcd. for $C_{11}H_{15}NO_2$ (M + Na): 216.0995, Found: 216.0987; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 15.48 min, t_{minor} = 16.76 min; 99% ee.



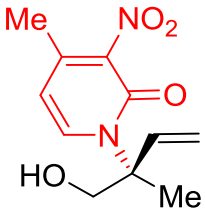
3am

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-4-methylpyridin-2(1H)-one (3am) was prepared according to the general procedure from **1a** and **2m**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 66% yield (25.5 mg). $[\alpha]^{25}_{D}$ = 137.4 (*c* = 0.012, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 (d, *J* = 7.4 Hz, 1H), 6.37 (s, 1H), 6.08 (dd, *J* = 10.8, 17.6 Hz, 1H), 6.04 (dd, *J* = 2.8, 6.4 Hz, 1H), 5.53 (brq, 1H), 5.36 (d, *J* = 10.8 Hz, 1H), 5.31 (d, *J* = 17.6 Hz, 1H), 4.03 (dd, *J* = 4.1, 12.4 Hz, 1H), 4.82 (d, *J* = 4.2, 12.6 Hz, 1H), 2.17 (s, 3H), 1.60 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.2, 150.9, 140.2, 135.1, 120.9, 115.6, 109.5, 70.2, 68.7, 21.0, 20.6; HRMS (ESI-MS): Calcd. for $C_{11}H_{15}NO_2$ (M + Na): 216.0995, Found: 216.0987; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 31.51 min, t_{minor} = 33.92 min; 96% ee.



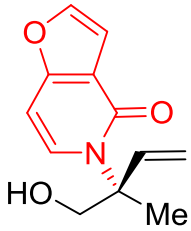
3an

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-4-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (3an) was prepared according to the general procedure from **1a** and **2n**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 77% yield (36.1 mg). $[\alpha]^{25}_{D}$ = 4.6 (*c* = 0.052, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (d, *J* = 8.2 Hz, 1H), 6.11 (dd, *J* = 10.8, 17.6 Hz, 1H), 6.10 (d, *J* = 8.2 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.34 (d, *J* = 17.6 Hz, 1H), 4.08–3.98 (m, 6H), 1.63 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.8, 162.7, 142.2, 139.1, 116.7, 113.7, 94.2, 89.9, 70.7, 67.5, 57.1, 20.9; HRMS (ESI-MS): Calcd. for $C_{12}H_{14}N_2O_3$ (M + Na): 257.0897, Found: 257.0888; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 24.00 min, t_{minor} = 32.54 min; 97% ee.



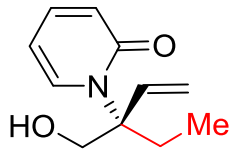
3ao

(*S*)-1-(1-hydroxy-2-methylbut-3-en-2-yl)-4-methyl-3-nitropyridin-2(1H)-one (3ao) was prepared according to the general procedure from **1a** and **2o**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 84% yield (40.1 mg). $[\alpha]^{25}_{D}$ = 36.4 (*c* = 0.25, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.2 Hz, 1H), 6.13 (d, *J* = 8.2 Hz, 1H), 6.12 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.36 (d, *J* = 17.6 Hz, 1H), 4.08 (dd, *J* = 4.1, 12.4 Hz, 1H), 4.02 (d, *J* = 4.2, 12.6 Hz, 1H), 3.92 (brq, 1H), 2.24 (s, 3H), 1.65 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.0, 143.3, 143.1, 139.0, 137.0, 116.8, 71.3, 67.4, 20.9, 17.3; HRMS (ESI-MS): Calcd. for $C_{11}H_{14}N_2O_4$ (M + Na): 261.0846, Found: 261.0837; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 22.20 min, t_{minor} = 27.50 min; 98% ee.



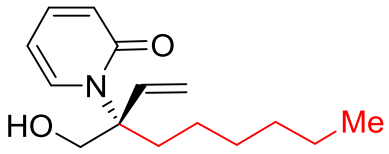
3ap

(*S*)-5-(1-hydroxy-2-methylbut-3-en-2-yl)furo[3,2-c]pyridin-4(5H)-one (3ap) was prepared according to the general procedure from **1a** and **2p**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 78% yield (34.2 mg). $[\alpha]^{25}_{D}$ = 19.6 (*c* = 0.04, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (m, 2H), 6.96 (d, *J* = 8.2 Hz, 1H), 6.56 (d, *J* = 8.2 Hz, 1H), 6.16 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.38 (d, *J* = 10.8 Hz, 1H), 5.32 (d, *J* = 17.6 Hz, 1H), 5.03 (brq, 1H), 4.13 (dd, *J* = 4.1, 12.4 Hz, 1H), 3.95 (d, *J* = 4.2, 12.6 Hz, 1H), 1.66 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.0, 158.9, 143.7, 140.8, 132.9, 117.5, 115.4, 107.6, 96.5, 70.3, 68.8, 21.5; HRMS (ESI-MS): Calcd. for $C_{12}H_{13}NO_3$ (M + Na): 242.0788, Found: 242.0779; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 3/7, t_{major} = 10.87 min, t_{minor} = 11.72 min; 90% ee.



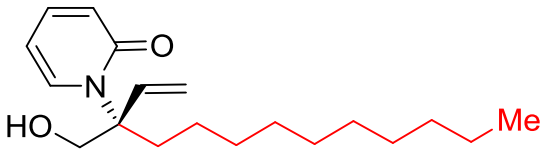
3ba

(*S*)-1-(3-(hydroxymethyl)pent-1-en-3-yl)pyridin-2(1H)-one (3ba) was prepared according to the general procedure from **1b** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 62% yield (23.9 mg). $[\alpha]^{25}_{D}$ = -22.6 (*c* = 0.052, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.34–7.31 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.18 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.26 (d, *J* = 17.6 Hz, 1H), 5.06 (brq, 1H), 4.15 (dd, *J* = 4.1, 12.4 Hz, 1H), 3.95 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.20–2.08 (m, 2H), 0.88 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.8, 139.1, 139.1, 137.0, 122.6, 116.4, 106.4, 73.5, 67.7, 25.3, 8.2; HRMS (ESI-MS): Calcd. for $C_{11}H_{15}NO_2$ (M + Na): 216.0995, Found: 216.0985; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{minor} = 18.52 min, t_{major} = 21.01 min; 91% ee.



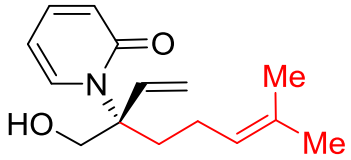
3ca

(*S*)-1-(3-(hydroxymethyl)non-1-en-3-yl)pyridin-2(1H)-one (3ca) was prepared according to the general procedure from **1c** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 82% yield (40.9 mg). $[\alpha]^{25}_{D}$ = 9.10 (*c* = 0.052, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.34–7.29 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.17 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.24 (d, *J* = 17.6 Hz, 1H), 5.07 (brq, 1H), 4.15 (dd, *J* = 4.1, 12.4 Hz, 1H), 3.93 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.14–1.97 (m, 2H), 1.33–1.20 (m, 8H), 0.85 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.8, 139.5, 139.1, 137.0, 122.6, 116.2, 106.4, 73.2, 67.9, 33.6, 31.6, 29.5, 23.5, 22.6, 14.0; HRMS (ESI-MS): Calcd. for $C_{15}H_{23}NO_2$ (M + Na): 272.1621, Found: 272.1614; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 14.48 min, t_{minor} = 15.92 min; 97% ee.



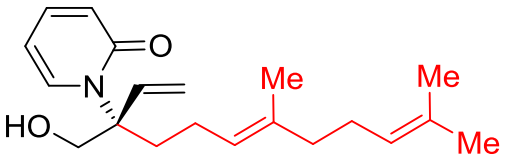
3da

(*S*)-1-(3-(hydroxymethyl)tridec-1-en-3-yl)pyridin-2(1H)-one (3da) was prepared according to the general procedure from **1d** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 79% yield (48.3 mg). $[\alpha]^{25}_{D}$ = -10.8 (*c* = 0.24, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.34–7.29 (m, 1H), 6.57 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.17 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.40 (d, *J* = 10.8 Hz, 1H), 5.23 (d, *J* = 17.6 Hz, 1H), 5.07 (brq, 1H), 4.15 (dd, *J* = 4.1, 12.4 Hz, 1H), 3.93 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.14–1.97 (m, 2H), 1.33–1.15 (m, 16H), 0.87 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.5, 139.1, 137.0, 122.6, 116.2, 106.4, 73.2, 67.9, 33.6, 31.8, 29.9, 29.5, 29.4, 29.3, 23.5, 22.6, 14.1; HRMS (ESI-MS): Calcd. for $C_{19}H_{31}NO_2$ (M + Na): 328.2247, Found: 328.2240; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 12.11 min, t_{minor} = 13.72 min; 91% ee.



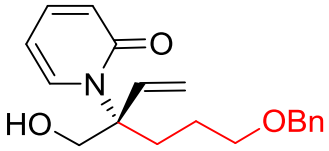
3ea

(*S*)-1-(3-(hydroxymethyl)-7-methylocta-1,6-dien-3-yl)pyridin-2(1H)-one (3ea) was prepared according to the general procedure from **1e** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 80% yield (39.5 mg). $[\alpha]^{25}_{D}$ = -50.4 (*c* = 0.03, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.33–7.29 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.21–6.17 (m, 1H), 6.09 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.26 (d, *J* = 17.6 Hz, 1H), 5.07–5.02 (m, 2H), 4.18 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.94 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.12–1.91 (m, 4H), 1.64 (s, 3H), 1.53 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.8, 139.4, 139.1, 136.9, 132.5, 123.0, 122.7, 116.2, 106.5, 73.0, 67.8, 33.8, 29.7, 25.6, 22.3, 17.6; HRMS (ESI-MS): Calcd. for $C_{15}H_{21}NO_2$ (M + Na): 270.1465, Found: 270.1459; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 14.39 min, t_{minor} = 16.23 min; 92% ee.



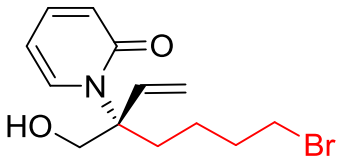
3fa

(*S*, *E*)-1-(3-(hydroxymethyl)-7,11-dimethyldodeca-1,6,10-trien-3-yl)pyridin-2(1H)-one (3fa) was prepared according to the general procedure from **1f** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 76% yield (47.9 mg). $[\alpha]^{25}_{D}$ = 16.4 (*c* = 0.11, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.33–7.30 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.21–6.17 (m, 1H), 6.09 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.27 (d, *J* = 17.6 Hz, 1H), 5.08–5.04 (m, 3H), 4.18 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.95 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.15–1.90 (m, 8H), 1.67 (s, 3H), 1.59 (s, 3H), 1.53 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.4, 139.1, 136.9, 136.1, 131.4, 124.2, 123.7, 122.8, 122.6, 116.2, 106.5, 73.0, 67.8, 39.6, 33.7, 26.6, 25.7, 22.2, 17.7, 16.0; HRMS (ESI-MS): Calcd. for $C_{20}H_{29}NO_2$ (M + Na): 338.2091, Found: 338.2083; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 9.13 min, t_{minor} = 9.87 min; 95% ee.



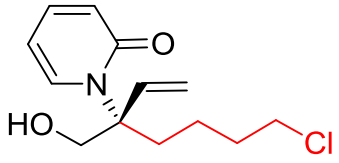
3ga

(*S*)-1-(6-(benzyloxy)-3-(hydroxymethyl)hex-1-en-3-yl)pyridin-2(1H)-one (3ga) was prepared according to the general procedure from **1g** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 80% yield (50.1 mg). $[\alpha]^{25}_{D}$ = 29.5 (*c* = 0.04, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.36–7.28 (m, 1H), 6.57 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.19–6.15 (m, 1H), 6.05 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.40 (d, *J* = 10.8 Hz, 1H), 5.29 (d, *J* = 17.6 Hz, 1H), 5.12 (brq, 1H), 4.47 (s, 2H), 4.11 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.96 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.47–3.44 (m, 2H), 2.26–2.16 (m, 2H), 1.63–1.53 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.6, 139.2, 136.9, 132.4, 130.9, 128.8, 128.4, 127.6, 122.5, 116.5, 106.6, 73.0, 72.8, 68.1, 67.8, 23.7, 23.0; HRMS (ESI-MS): Calcd. for $C_{19}H_{23}NO_2$ (M + Na): 336.1570, Found: 336.1566; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 24.46 min, t_{minor} = 29.47 min; 96% ee.



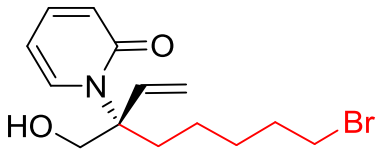
3ha

(*S*)-1-(7-bromo-3-(hydroxymethyl)hept-1-en-3-yl)pyridin-2(1H)-one (3ha) was prepared according to the general procedure from **1h** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 68% yield (40.8 mg). $[\alpha]^{25}_{D}$ = 33.4 (*c* = 0.06, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.36–7.32 (m, 1H), 6.59 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.22–6.19 (m, 1H), 6.04 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.46 (d, *J* = 10.8 Hz, 1H), 5.30 (d, *J* = 17.6 Hz, 1H), 5.11 (brs, 1H), 4.10 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.98 (d, *J* = 12.6 Hz, 1H), 3.41–3.35 (m, 2H), 2.20–2.05 (m, 2H), 1.88–1.75 (m, 2H), 1.53–1.45 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.2, 138.9, 136.9, 122.6, 116.8, 106.6, 73.0, 67.8, 32.7, 32.1, 25.3, 22.1; HRMS (ESI-MS): Calcd. for $C_{13}H_{18}BrNO_2$ (M + Na): 322.0413, Found: 322.0410; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 16.19 min, t_{minor} = 18.95 min; 95% ee.



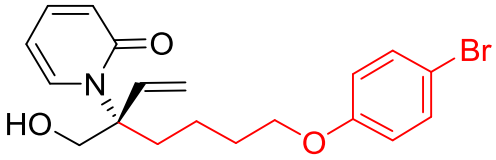
3ia

(*S*)-1-(7-chloro-3-(hydroxymethyl)hept-1-en-3-yl)pyridin-2(1H)-one (3ia) was prepared according to the general procedure from **1i** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 64% yield (32.7 mg). $[\alpha]^{25}_{D}$ = 29.4 (*c* = 0.05, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.35–7.32 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.22–6.19 (m, 1H), 6.04 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.45 (d, *J* = 10.8 Hz, 1H), 5.29 (d, *J* = 17.6 Hz, 1H), 5.12 (brs, 1H), 4.11 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.98 (d, *J* = 12.6 Hz, 1H), 3.54–3.48 (m, 2H), 2.20–2.05 (m, 2H), 1.80–1.75 (m, 2H), 1.52–1.44 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.3, 138.9, 136.9, 122.6, 116.8, 106.6, 73.0, 67.8, 44.5, 32.5, 32.2, 20.9; HRMS (ESI-MS): Calcd. for $C_{13}H_{18}ClNO_2$ (M + Na): 278.0918, Found: 278.0909; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 15.85 min, t_{minor} = 18.47 min; 90% ee.



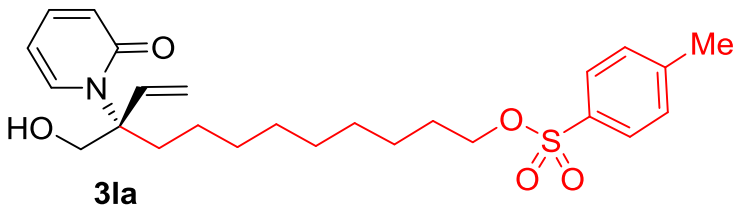
3ja

(*S*)-1-(8-bromo-3-(hydroxymethyl)oct-1-en-3-yl)pyridin-2(1H)-one (3ja) was prepared according to the general procedure from **1j** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 72% yield (45.2 mg). $[\alpha]^{25}_{D}$ = 11.9 (*c* = 0.02, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.35–7.30 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.22–6.18 (m, 1H), 6.05 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.43 (d, *J* = 10.8 Hz, 1H), 5.26 (d, *J* = 17.6 Hz, 1H), 5.09 (brq, 1H), 4.13 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.95 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.36 (t, *J* = 6.7 Hz, 2H), 2.18–2.02 (m, 2H), 1.86–1.74 (m, 3H), 1.50–1.40 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.2, 139.1, 136.9, 122.6, 116.5, 106.6, 73.0, 67.7, 33.6, 33.3, 32.4, 28.4, 22.8; HRMS (ESI-MS): Calcd. for $C_{14}H_{20}BrNO_2$ (M + Na): 336.0570, Found: 336.0561; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 20.11 min, t_{minor} = 22.04 min; 93% ee.



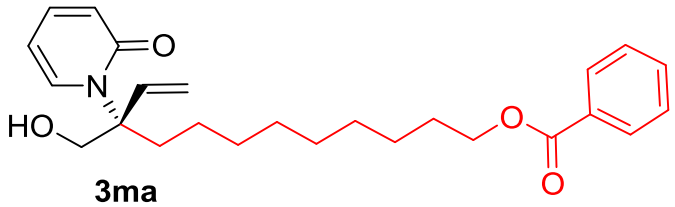
3ka

(*S*)-1-(7-(4-bromophenoxy)-3-(hydroxymethyl)hept-1-en-3-yl)pyridin-2(1H)-one (3ka) was prepared according to the general procedure from **1k** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 80% yield (62.7 mg). $[\alpha]^{25}_{D}$ = 11.91 (*c* = 0.36, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.36–7.34 (m, 2H), 7.33–7.30 (m, 1H), 6.75–6.71 (m, 2H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.17 (m, 1H), 6.04 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.43 (d, *J* = 10.8 Hz, 1H), 5.28 (d, *J* = 17.6 Hz, 1H), 5.13 (brq, 1H), 4.12 (dd, *J* = 4.2, 12.4 Hz, 1H), 3.97 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.91–3.86 (m, 2H), 2.23–2.09 (m, 2H), 1.79–1.71 (m, 2H), 1.51–1.38 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 158.0, 139.2, 139.0, 136.9, 132.2, 122.6, 73.0, 67.7, 67.5, 32.8, 29.2, 20.1; HRMS (ESI-MS): Calcd. for $C_{19}H_{22}BrNO_3$ (M + Na): 414.0675, Found: 414.0667; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 14.42 min, t_{minor} = 17.19 min; 87% ee.



3la

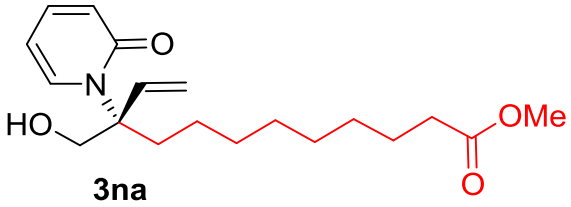
(*S*)-10-(hydroxymethyl)-10-(2-oxopyridin-1(2H)-yl)dodec-11-en-1-yl-4-methylbenzenesulfonate (3la) was prepared according to the general procedure from **1l** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 74% yield (68.3 mg). $[\alpha]^{25}_{D}$ = -10.82 (*c* = 0.15, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 5.4 Hz, 2H), 7.43 (dd, *J* = 1.7, 7.2 Hz, 1H), 7.35 (d, *J* = 5.4 Hz, 2H), 7.33–7.31 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.21–6.18 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.41 (d, *J* = 10.8 Hz, 1H), 5.24 (d, *J* = 17.6 Hz, 1H), 5.10 (brq, 1H), 4.13 (dd, *J* = 4.2, 12.4 Hz, 1H), 4.00 (t, *J* = 7.4 Hz, 2H), 3.93 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.45 (s, 3H), 2.12–1.98 (m, 2H), 1.64–1.59 (m, 4H), 1.28–1.16 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 144.6, 139.4, 139.1, 137.0, 133.2, 129.8, 127.9, 122.6, 116.3, 106.5, 73.2, 70.7, 67.9, 33.5, 29.8, 29.2, 29.1, 28.8, 28.7, 25.2, 23.5, 21.6; HRMS (ESI-MS): Calcd. for $C_{25}H_{35}NO_5S$ (M + Na): 484.2128, Found: 484.2122; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 5.86 min, t_{minor} = 7.93 min; 96% ee.



3ma

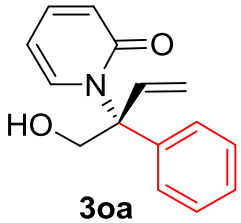
(*S*)-10-(hydroxymethyl)-10-(2-oxopyridin-1(2H)-yl)dodec-11-en-1-yl benzoate (3ma) was prepared according to the general procedure from **1m** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 72% yield (67.5 mg). $[\alpha]^{25}_{D}$ = -13.8 (*c* = 0.07, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05–8.03 (m, 2H), 7.57–7.54 (m, 1H), 7.45–7.42 (m, 3H), 7.33–7.30 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.17 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.40 (d, *J* = 10.8 Hz, 1H), 5.24 (d, *J* = 17.6 Hz, 1H), 5.09 (brq, 1H), 4.30 (t, *J* = 7.4 Hz, 2H), 4.14 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.93 (dd, *J* = 4.2, 12.6 Hz, 1H), 2.13–1.98 (m, 2H), 1.77–1.72 (m, 2H), 1.44–1.39 (m, 2H), 1.33-1.23 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 164.7, 139.4, 139.1, 137.0, 132.8, 130.5, 129.5, 128.3, 122.6, 116.2, 106.5, 73.2, 67.9, 65.1, 33.5, 29.8, 29.4, 29.3, 29.2, 28.7, 26.0, 23.5; HRMS (ESI-MS): Calcd. for $C_{25}H_{35}NO_4$ (M + Na): 434.2302,

Found: 434.2300; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/5, t_{major} = 53.57 min, t_{minor} = 61.15 min; 96% ee.



3na

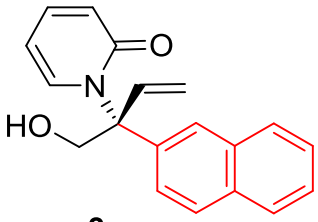
(*S*)-10-(hydroxymethyl)-10-(2-oxopyridin-1(2H)-yl)dodec-11-en-1-yl benzoate (3na) was prepared according to the general procedure from **1n** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 68% yield (45.6 mg). $[\alpha]^{25}_{D}$ = 22.7 (*c* = 0.09, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (dd, *J* = 1.2, 8.2 Hz, 1H), 7.33–7.30 (m, 1H), 6.58 (dd, *J* = 1.2, 8.2 Hz, 1H), 6.20–6.18 (m, 1H), 6.06 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.40 (d, *J* = 10.8 Hz, 1H), 5.24 (d, *J* = 17.6 Hz, 1H), 5.08 (brt, 1H), 4.14 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.93 (dd, *J* = 4.2, 12.6 Hz, 1H), 3.66 (s, 3H), 2.28 (t, *J* = 7.4 Hz, 2H), 2.13–1.98 (m, 2H), 1.61–1.56 (m, 2H), 1.29–1.21 (m, 10H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 164.7, 139.4, 139.1, 137.0, 132.8, 130.5, 129.5, 128.3, 122.6, 116.2, 106.5, 73.2, 67.9, 65.1, 33.5, 29.8, 29.4, 29.3, 29.2, 28.7, 26.0, 23.5; HRMS (ESI-MS): Calcd. for $C_{19}H_{29}NO_4$ (M + Na): 358.1989, Found: 358.1984; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/4, t_{major} = 31.16 min, t_{minor} = 36.75 min; 94% ee.



3oa

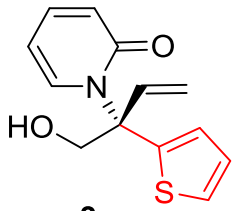
(*R*)-1-(12-hydroxy-3-(hydroxymethyl)dodec-1-en-3-yl)pyridin-2(1H)-one (3oa) was prepared according to the general procedure from **1o** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 42% yield (20.3 mg). $[\alpha]^{25}_{D}$ = 51.6 (*c* = 0.02, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39–7.32 (m, 4H), 7.19–7.19 (m, 2H), 7.16 (dd, *J* = 1.6, 9.2 Hz, 1H), 6.42 (dd, *J* = 10.8, 17.6 Hz, 1H), 6.15–6.12 (m, 1H), 5.52 (brq, 1H), 5.49 (d, *J* = 10.8 Hz, 1H), 4.80 (d, *J* = 17.6 Hz, 1H), 4.50 (dd, *J* = 5.6, 12.8 Hz, 1H), 4.03 (dd, *J* = 5.6, 12.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.6, 140.6, 139.4, 138.5, 137.8, 128.9, 128.0, 126.6, 122.8, 117.7, 106.3, 69.9, 68.9; HRMS (ESI-MS): Calcd. for $C_{15}H_{15}NO_2$ (M + Na): 264.0995, Found: 264.0987;

HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/5, t_{major} = 30.37 min, t_{minor} = 36.69 min; 89% ee.



3pa

(*R*)-1-(1-hydroxy-2-(4-methoxyphenyl)but-3-en-2-yl)pyridin-2(1H)-one (3pa) was prepared according to the general procedure from **1p** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 38% yield (22.1 mg). $[\alpha]^{25}_{D}$ = 79.7 (*c* = 0.01, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86–7.81 (m, 3H), 7.69 (d, *J* = 1.5 Hz, 1H), 7.54–7.50 (m, 2H), 7.40–7.35 (m, 2H), 7.17 (dd, *J* = 1.8, 7.2 Hz, 1H), 6.69 (dd, *J* = 1.8, 7.2 Hz, 1H), 6.42 (dd, *J* = 10.8, 17.6 Hz, 1H), 6.13–6.10 (m, 1H), 5.68 (brq, 1H), 5.55 (d, *J* = 10.8 Hz, 1H), 4.84 (d, *J* = 17.6 Hz, 1H), 4.63 (dd, *J* = 5.4, 12.8 Hz, 1H), 4.10 (dd, *J* = 5.4, 12.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 139.5, 138.5, 137.6, 133.1, 132.7, 129.0, 128.3, 127.6, 126.7, 126.6, 125.8, 124.4, 122.8, 117.8, 115.0, 106.3, 73.1, 68.9; HRMS (ESI-MS): Calcd. for $C_{19}H_{17}NO_2$ (M + Na): 314.1152, Found: 314.1147; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/5, t_{minor} = 10.83 min, t_{major} = 12.00 min; 82% ee.

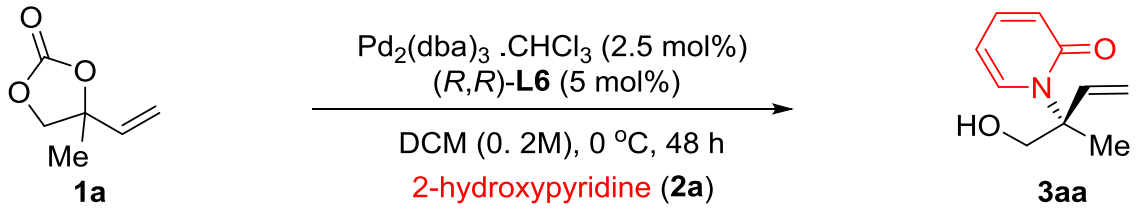


3qa

(*S*)-1-(1-hydroxy-2-(thiophen-2-yl)but-3-en-2-yl)pyridin-2(1H)-one (3qa) was prepared according to the general procedure from **1q** and **2a**. The crude product was purified by flash column chromatography (Petroleum ether/EtOAc = 2:1) on silica gel to provide the title compound as a colorless oil in 44% yield (21.8 mg). $[\alpha]^{25}_{D}$ = 72.7 (*c* = 0.07, CH_2Cl_2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36–7.33 (m, 2H), 7.13 (dd, *J* = 1.8, 7.4 Hz, 1H), 7.03 (dd, *J* = 3.6, 7.4 Hz, 1H), 7.00 (dd, *J* = 1.8, 7.4 Hz, 1H), 6.63 (dd, *J* = 1.6, 7.4 Hz, 1H), 6.40 (dd, *J* = 10.8, 17.6 Hz, 1H), 6.14–6.12 (m, 1H), 5.57 (brq, 1H), 5.48 (d, *J* = 10.8 Hz, 1H), 4.87 (d, *J* = 17.6 Hz, 1H), 4.48 (dd, *J* = 5.6, 12.8 Hz, 1H), 4.23 (dd, *J* = 5.6, 12.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.3, 144.2, 139.5, 137.8, 137.2, 126.9, 126.7, 126.5, 122.7, 117.3, 106.4, 74.9, 69.5; HRMS

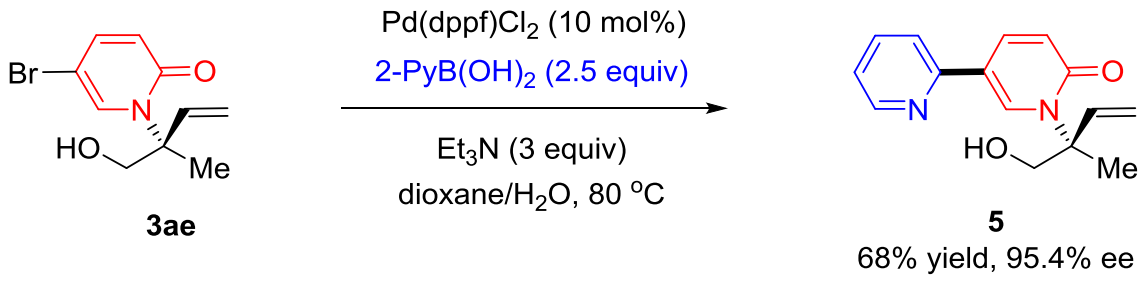
(ESI-MS): Calcd. for $C_{13}H_{13}NO_2S$ (M + Na): 270.0559, Found: 270.0552; HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/5, t_{major} = 16.94 min, t_{minor} = 24.92 min; 80% ee.

Gram-scale synthesis and further transformation for Figure 2



Scale-up Experiment: In a 100 mL round-bottom flask equipped with a magnetic stir bar, $Pd_2(dba)_3{\cdot}CHCl_3$ (65.0 mg, 1.25 mol%), Trost's ligand (*R*,*R*)-**L6** (98 mg, 2.5 mol%), vinyl cyclic carbonate **1a** (640.6 mg, 5.0 mmol), and 2-hydroxypyridine (1.23 g, 0.3 mmol) were added. The reaction tube was sealed with rubber-septum, then evacuated and backfilled with nitrogen. Anhydrous CH_2Cl_2 (0.2 M, 50 mL) were added via syringe. The resulting mixture was stirred at 0 ˚C for 48 hours. The reaction mixture was warm to room temperature and the solvent was removed *in vacuo* with the aid of a rotary evaporator. The obtained residue was purified by flash column chromatography on silica gel to afford the title compound **3aa** in 85% isolated yield without any lose in enantiomeric excess.

Procedure for the synthesis of 5:

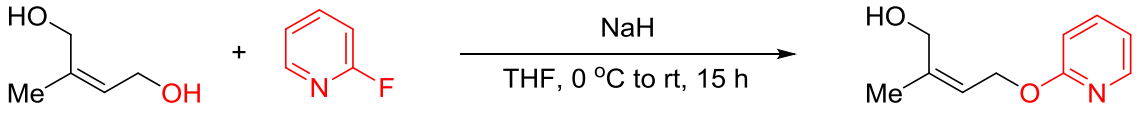


A flame-dried Schlenk tube was cooled to room temperature and filled with argon. To this flask were added **3ae** (51.6 mg, 0.2 mmol, 98% ee), $Pd(dppf)Cl_2$ (10 mol%), 2-$PyB(OH)_2$ (61.5 mg, 0.5 mmol), and Et_3N (83.2 μml, 0.6 mmol). The flask was evacuated and backfilled with nitrogen and placed under nitrogen atmosphere. To the flask was added freshly distilled dioxane (2.0 mL) and deionized water (0.2 mL). The reaction mixture was stirred at 80 °C for 24 h. The reac-

tion mixture was cooled and concentrated and the residue was purified by silica gel column chromatography (PE/EA = 5/1) to afford the desired product **5** as a yellow oil in 68% yield. HPLC conditions: Chiralcel IC column, 254 nm, flow rate: 1 ml/min, *i*-PrOH/hexanes = 1/5, t_{minor} = 67.07 min, t_{minor} = 79.31 min; 95.4% ee. $[\alpha]^{25}_{D}$ = 18.5 (*c* = 0.2, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.59–8.57 (m, 1H), 8.38 (d, *J* = 3.6 Hz, 1H), 7.75–7.70 (m, 1H), 7.47 (d, *J* = 12.0 Hz, 1H), 7.39–7.32 (m, 1H), 7.21–7.17 (m, 1H), 6.64 (d, *J* = 12.2 Hz, 1H), 6.22 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.42 (d, *J* = 10.8 Hz, 1H), 5.36 (d, *J* = 17.6 Hz, 1H), 5.18 (brs, 1H), 4.13 (d, *J* = 18.6 Hz, 1H), 3.96 (d, *J* = 18.6 Hz, 1H), 1.72 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.8, 153.5, 149.6, 139.7, 137.4, 137.0, 135.7, 121.9, 121.8, 119.1, 118.6, 115.8, 70.7, 68.1, 21.2; HRMS (ESI-MS): Calcd. for $C_{15}H_{16}N_2O_2$ (M + Na): 257.1285, Found: 257.1276.

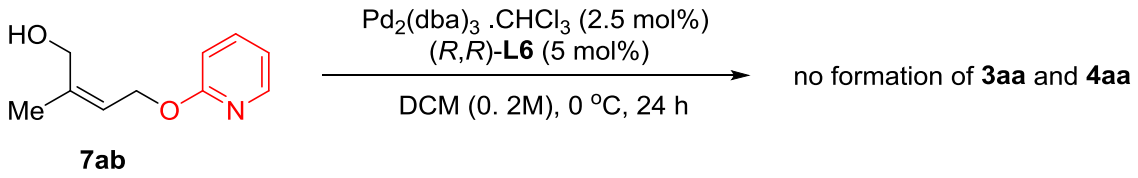
Mechanistic studies:

(1) Preparation and exclusion of the possible linear *O*-allyl intermediate



a **b** **7ab**, 15% yield

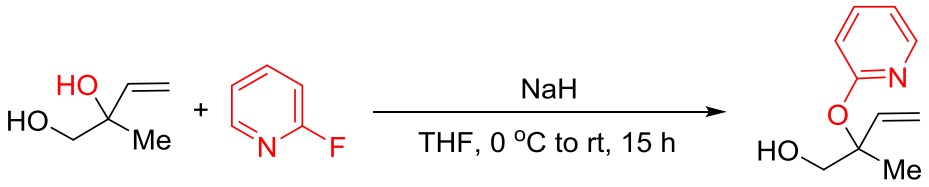
Compound **7ab** was prepared according to the reported literature.[3] (*Z*)-2-methylbut-2-ene-1,4-diol[4] (204.3 mg, 2 mmol, 1.0 equiv) was added dropwise to a stirred suspension of NaH (58 mg, 1.0 equiv) in THF (10 ml) at 0 °C. After stirring for 15 minutes, a solution of 2-fluoropyridine (194.0 mg, 2.4 mmol, 1.2 equiv) in 5 ml THF was added dropwise. The resulting mixture was stirred at room temperature for 15 hours. The reaction was quenched with saturated NH_4Cl solution and extracted with Et_2O. The combined organic layer was dried with Na_2SO_4 and the solvent was removed under reduced pressure and the crude product was purified with column chromatography (petroleum ether: ethyl acetate = 20: 1) to obtain a colorless oil (53.8 mg, 15 % yield). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (dd, *J* = 1.8, 5.0 Hz, 1H), 7.51–7.42 (m, 1H), 6.82 (dd, *J* = 5.0, 7.2 Hz, 1H), 6.76 (dd, *J* = 1.8, 7.2 Hz, 1H), 5.69 (t, *J* = 6.4 Hz, 1H), 4.60 (d, *J* = 6.5 Hz, 1H), 4.22 (s, 2H), 1.78 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.7, 143.8, 141.6, 138.4, 121.0, 114.8, 107.7, 64.0, 61.0, 18.6; HRMS (ESI-MS): Calcd. for $C_{10}H_{13}NO_2$ (M + Na): 202.0844, Found: 202.0836.



7ab

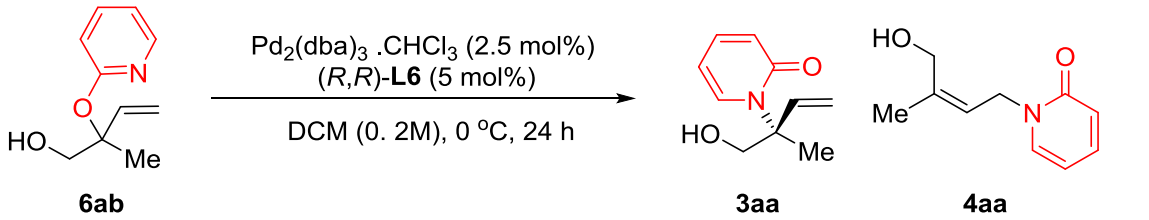
To an oven dried screw-cap reaction tube equipped with a magnetic stir bar, $Pd_2(dba)_3{\cdot}CHCl_3$ (5.2 mg, 2.5 mol%), Trost's ligand (*R*,*R*)-**L6** (7.8 mg, 5 mol%), compound **7ab** (35.84 mg, 0.2 mmol) were added. The reaction tube was sealed with rubber-septum, then evacuated and backfilled with nitrogen. Anhydrous CH_2Cl_2 (0.2 M, 1 mL) were added via syringe. The resulting mixture was stirred at 0 ˚C for 24 hours. The reaction mixture was warm to room temperature and the solvent was removed under reduced pressure. The ^{1}H NMR of the crude reaction mixture indicated no conversion of the starting material at all.

(2) Preparation and exclusion of the possible branched *O*-allyl intermediate



a **b** **6ab**

Compound **6ab** was prepared according to the reported literature.[3] 2-methylbut-3-ene-1,2-diol (510.7 mg, 5 mmol, 1.0 equiv) was added dropwise to a stirred suspension of NaH (144 mg, 1.2 equiv) in THF (10 ml) at 0 °C. After stirring for 15 minutes, a solution of 2-fluoropyridine (485.5 mg, 2 mmol, 1 equiv) in 10 ml THF was added dropwise. The resulting mixture was stirred at room temperature for 15 hours. The reaction was quenched with saturated NH_4Cl solution and extracted with Et_2O. The combined organic layer was dried with Na_2SO_4 and the solvent was removed under reduced pressure and the crude product was purified with column chromatography (petroleum ether: ethyl acetate = 20: 1) to obtain a colorless oil (89.6 mg, 10 % yield). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (d, *J* = 4.8 Hz, 1H), 7.51–7.58 (m, 1H), 6.83 (t, *J* = 6.2 Hz, 1H), 6.75 (d, *J* = 8.2 Hz, 1H), 6.03 (dd, *J* = 10.8, 17.6 Hz, 1H), 5.25 (d, *J* = 10.8 Hz, 1H), 5.20 (d, *J* = 17.6 Hz, 1H), 4.01 (d, *J* = 11.2 Hz, 1H), 1H), 3.78 (d, *J* = 11.2 Hz, 1H), 1H), 2.15 (brs, 1H), 1.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.7, 146.8, 140.4, 138.5, 116.8, 115.3, 111.7, 82.0, 70.0, 19.0; HRMS (ESI-MS): Calcd. for $C_{10}H_{13}NO_2$ (M + Na): 202.0844, Found: 202.0837.



10% conversion with 1:10 b/l regioselectivity

To an oven dried screw-cap reaction tube equipped with a magnetic stir bar, $Pd_2(dba)_3{\cdot}CHCl_3$ (5.2 mg, 2.5 mol%), Trost's ligand (*R*,*R*)-**L6** (7.8 mg, 5 mol%), compound **6ab** (35.84 mg, 0.2 mmol) were added. The reaction tube was sealed with rubber-septum, then evacuated and backfilled with nitrogen. Anhydrous CH_2Cl_2 (0.2 M, 1 mL) were added via syringe. The resulting mixture was stirred at 0 ˚C for 48 hours. The reaction mixture was warm to room temperature and the solvent was removed under reduced pressure. The ^{1}H NMR of the crude reaction mixture indicated only about 10% conversion of the starting material and 1/10 branched to linear ratio were determined by the ^{1}H NMR of the crude reaction mixture. In the meantime, **3aa** was not enough for further analysis.

X-ray crystallography of 3ak

A single-crystal of **3ak** was obtained from dichloromethane/hexane solvent system at room temperature. Diffraction data were collected on a Bruker SMART Apex-II CCD-based X-ray diffractometer with Cu-Kα radiation. The empirical absorption correction was applied by using the SADABS program. The structure was solved using direct method, and refined by full-matrix least-squares on F^2 (G.M. Sheldrick, SHELXTL2008, program of crystal structure refinement, University of Göttingen, Germany, 1997). H-atoms were refined isotopically, while all other atoms were refined anisotropically. The crystallographic data is summarized in Table F1 and the diagram is shown in Figure F1.

Table F1. Crystal data and structure refinement for **3ak**.

Identification code	A
Empirical formula	C10 H12 N2 O4
Formula weight	224.22
Temperature/K	173.00
Wavelength	0.71073 Å
Crystal system	monoclinic
space group	P2

Unit cell dimensions	a = 10.9511(8) Å alpha = 90 deg. b = 7.5328(6) Å beta = 99.332 deg. c = 12.7907(9) A gamma = 90 deg.
Volume	1041.17(13) Å^3
Z	4
Calculated density	1.430 mg/m^3
Absorption coefficient	0.112 mm^{-1}
F(000)	472.0
Crystal size	0.13 x 0.12 x 0.1mm^3
Theta range for data collection	4.548 to 61.052 deg.
Index range	-15≤h≤15, -10≤k≤8, -18≤l≤17
Reflections collected	12389
Independent reflections	5296 [R_{int} = 0.0318, R_{sigma} = 0.0452]
Completeness to theta	1.56/0.83
Theta (max)	30.526
Absorption correction	MULTI-SCAN
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	5296 / 1 / 305
Goodness-of-fit on F^2	1.042
Final R indices [I>2sigma(I)]	R_1 = 0.0489, wR2 = 0.1116
R indices (all data)	R1 = 0.0677, wR2 = 0.1234
Absolute structure parameter	-1.1 (9)
Largest diff. peak and hole	0.32/-0.22 e.Å^{-3}

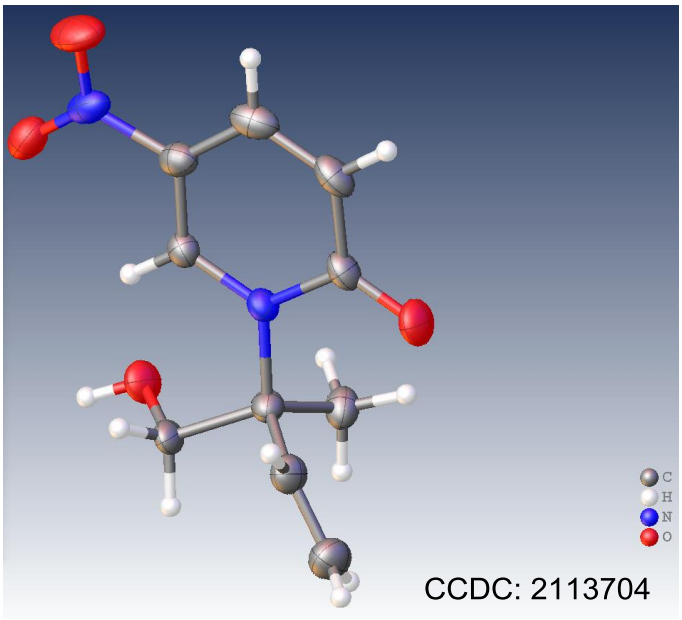
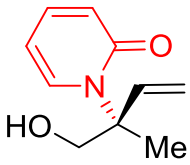


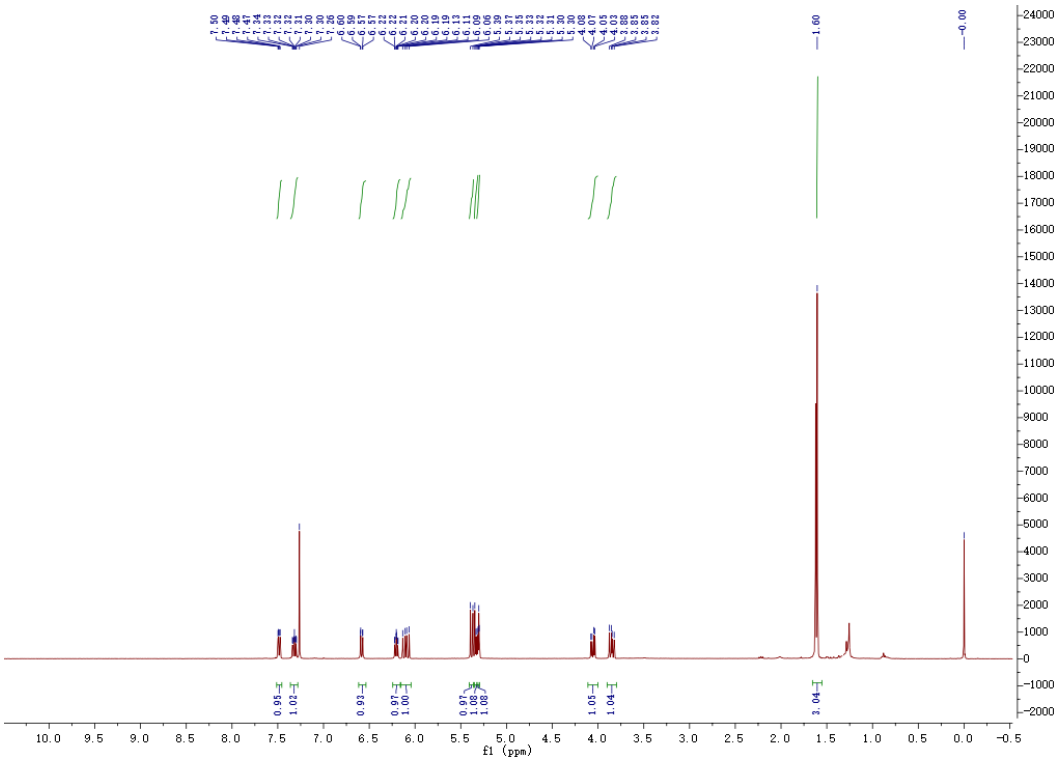
Figure F1. X-ray of **3ak**

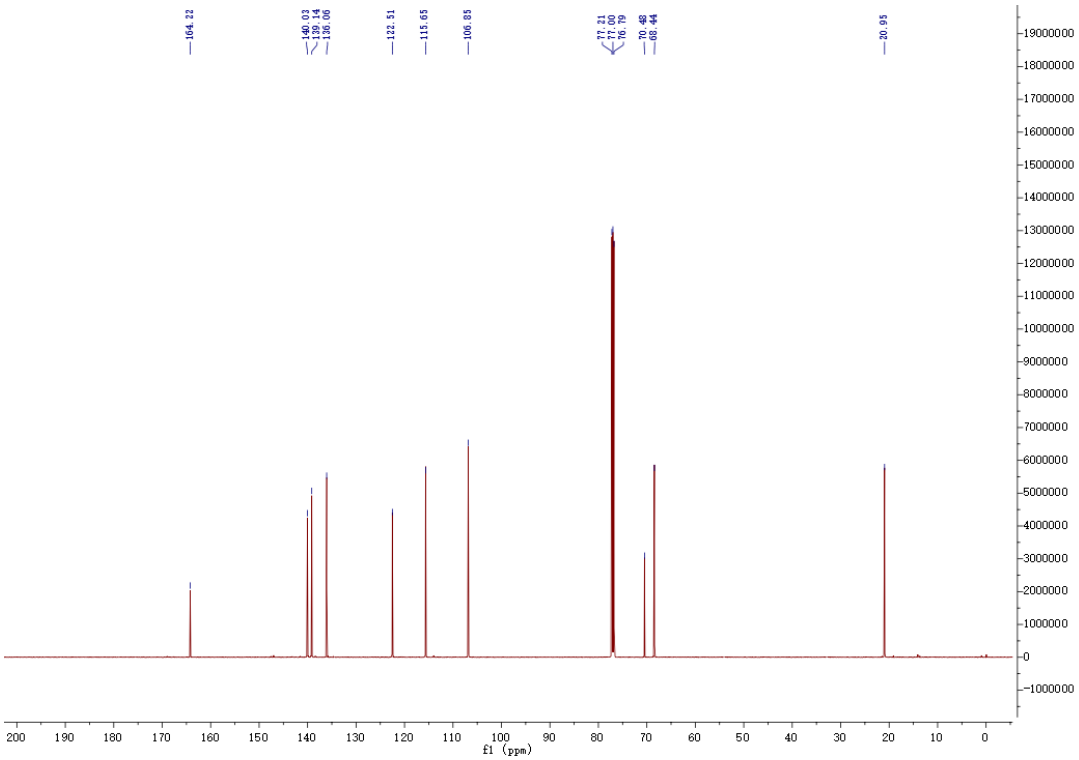
References:

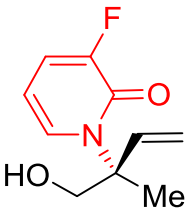
1. M. Salman, Y. Xu, S. Khan, J. Zhang and A. Khan, *Chem. Sci*., 2020, **11**, 5481.
2. (a) A. Khan, R. Zheng, Y. Kan, J. Ye, J. Xing and Y. J. Zhang, *Angew. Chem. Int. Ed*. 2014, **53**, 6439; (b) A. Khan, L. Yang, J. Xu, L. Y. Jin and Y. J. Zhang, *Angew. Chem. Int. Ed*. 2014, **53**, 11257.
3. (a) Rodrigues, E. E. Lee, R. A. Batey, *Org. Lett*. 2010, **12**, 260; (b) C. Li, M. Kähny, B. Breit, *Angew. Chem. Int. Ed*., 2014, **53**, 13780.
4. E. Jecs, E. J. Miller, R. J. Wilson, H. H. Nguyen, Y. A. Tahirovic, B. M. Katzman, V. M. Truax, M. B. Kim, K. M. Kuo, T. Wang, C. S. Sum, M. E. Cvijic, G. M. Schroeder, L. J. Wilson and D. C. Liotta, *ACS Med. Lett.* 2018, **9**, 89.



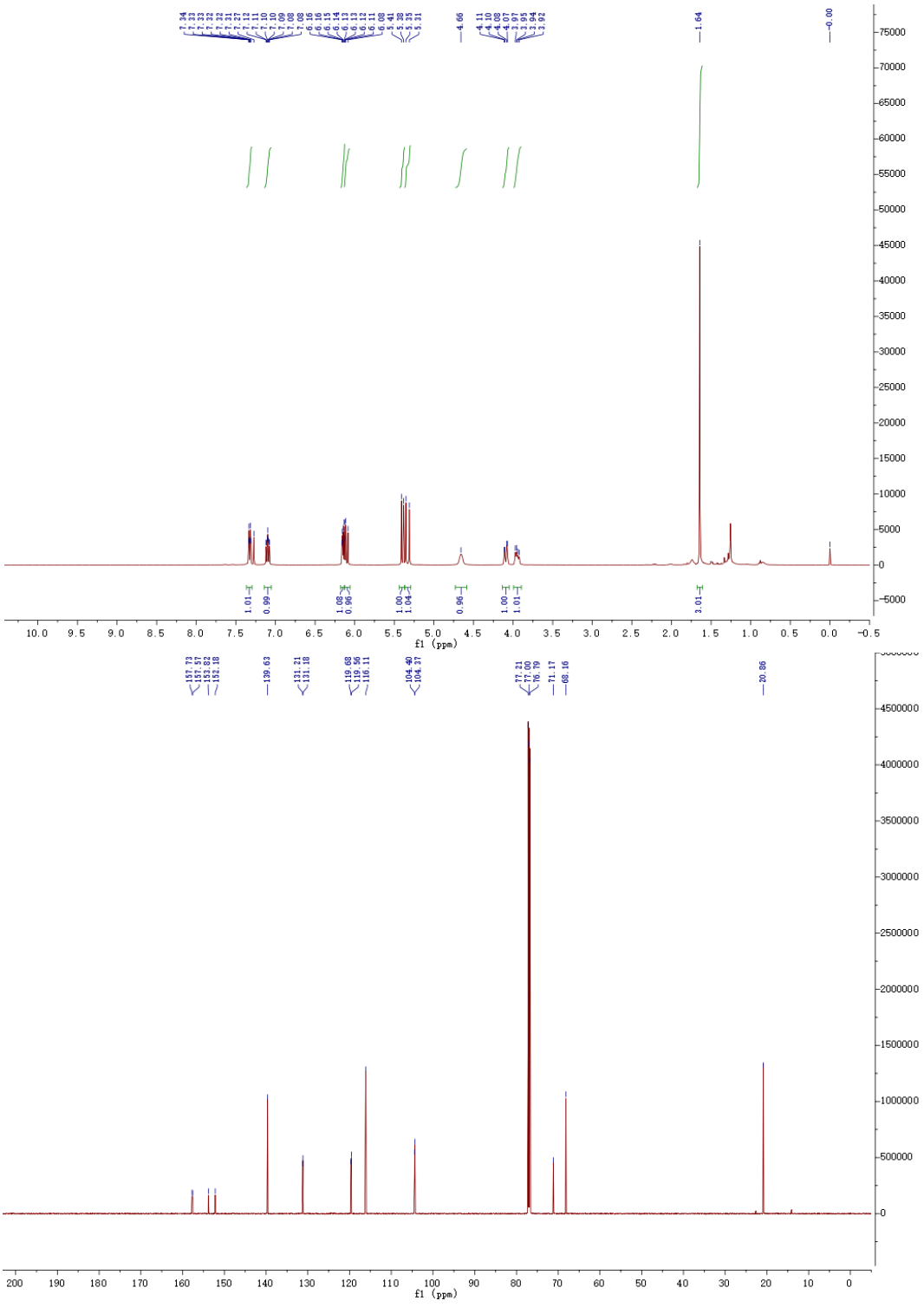
3aa

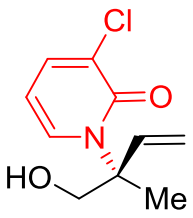




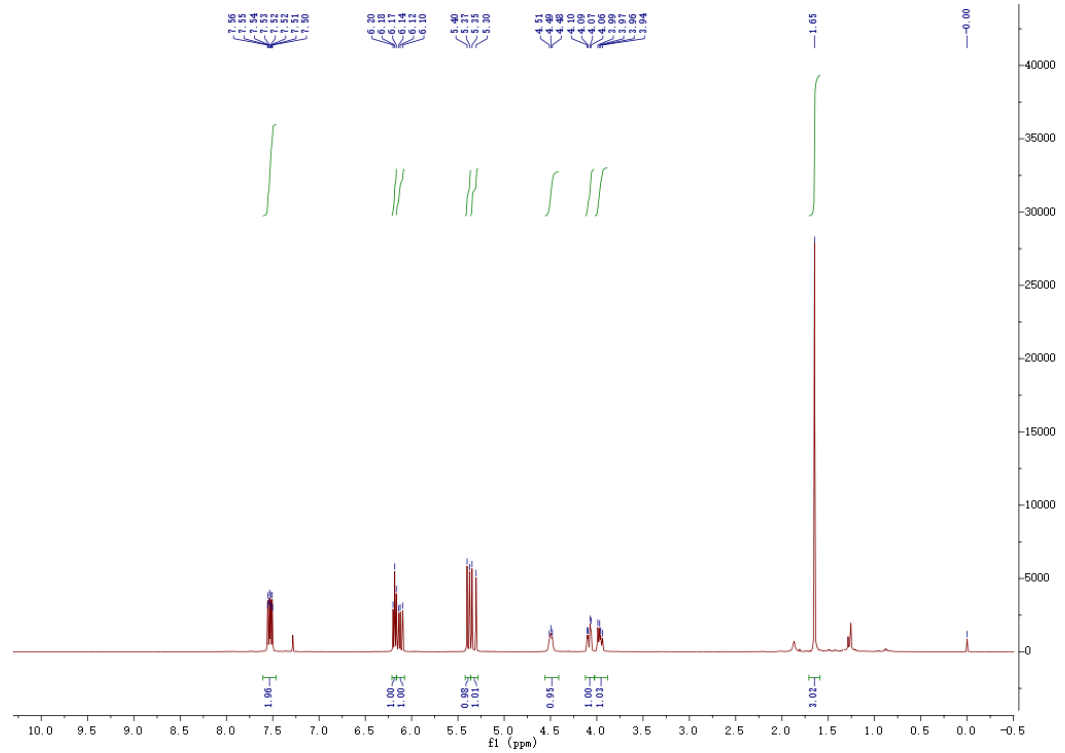


3ab




Cl
O
N
HO
Me

3ac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7.51
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6.17
6.14
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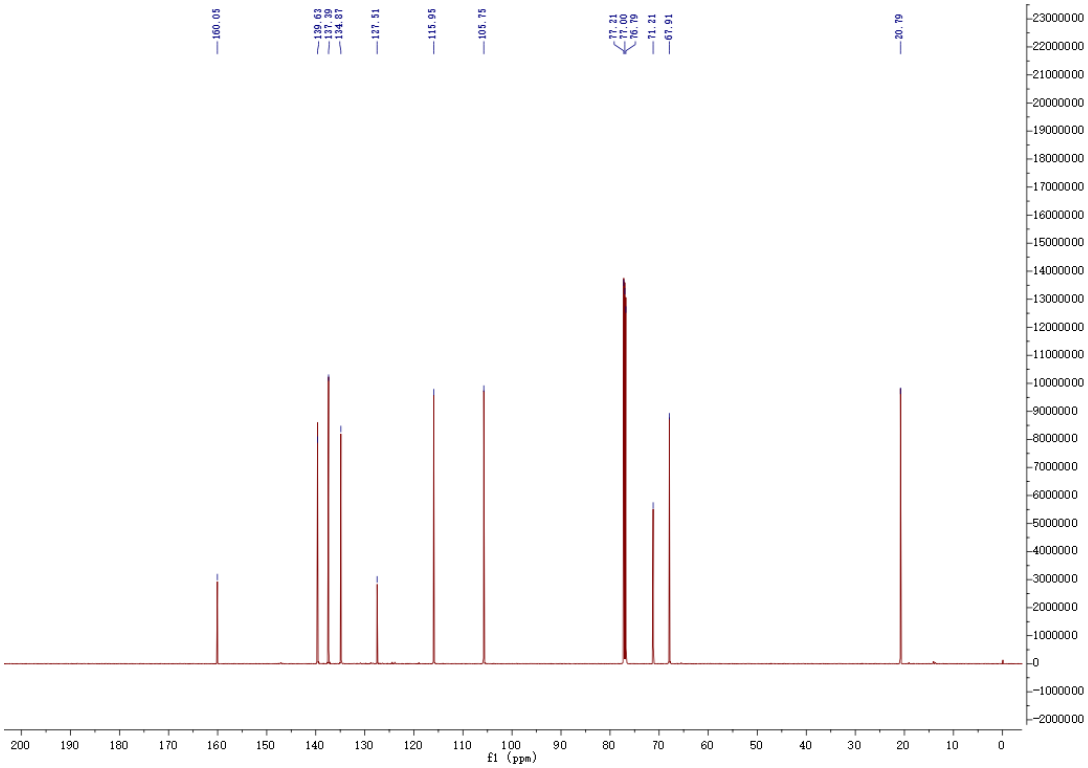
6.10
5.40
5.37
5.35
5.30
4.51
4.49
4.48
4.10
4.09
4.07
4.06
3.99
3.97
3.96
3.94
1.65
0.00
1.06
1.00
1.00
0.88
1.01
0.95
1.00
1.03
3.02
f1 (ppm)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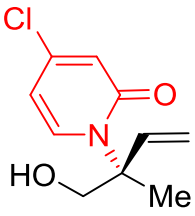
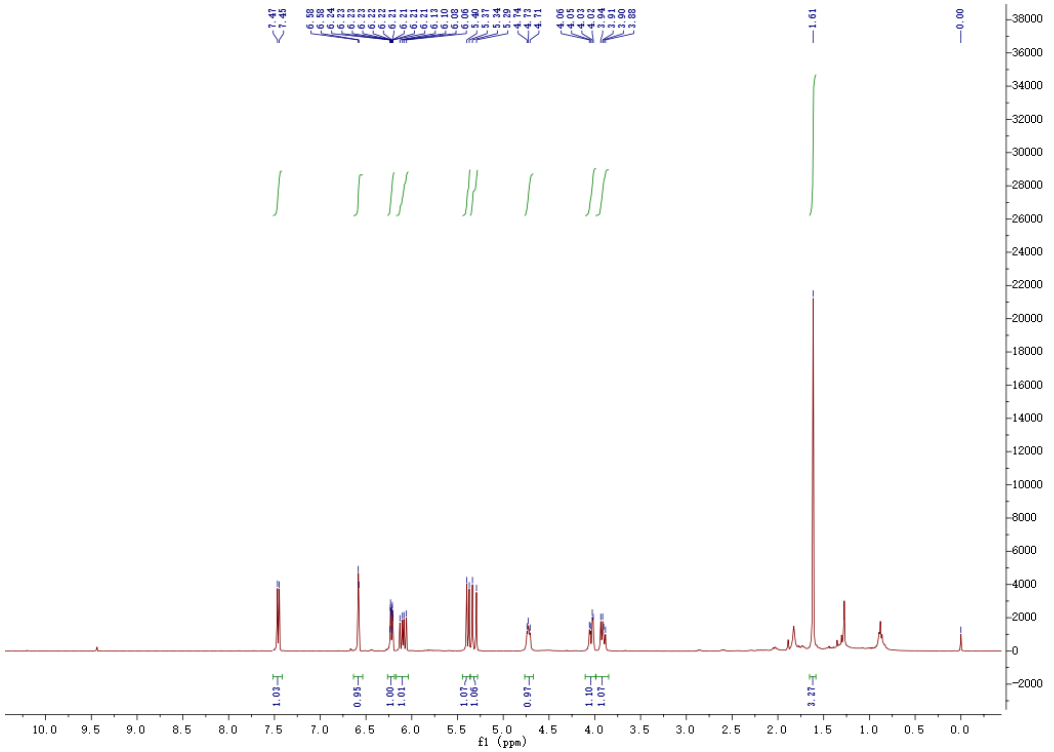
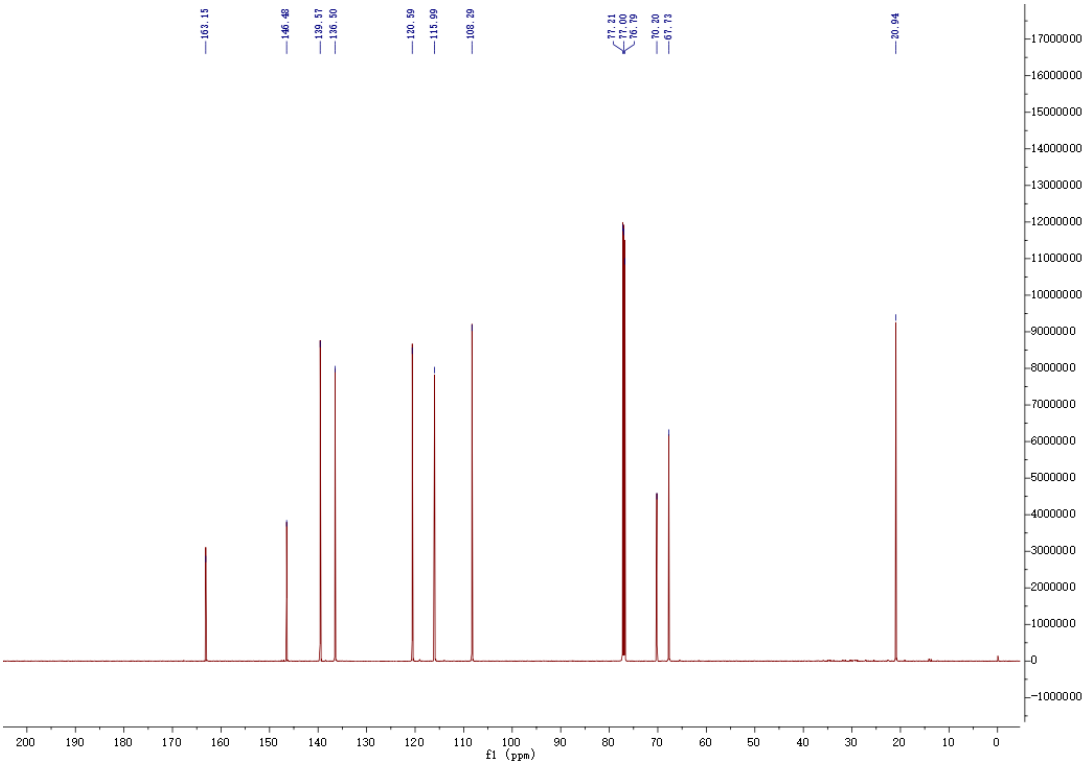
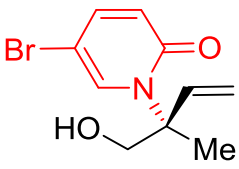
20.79
f1 (ppm)



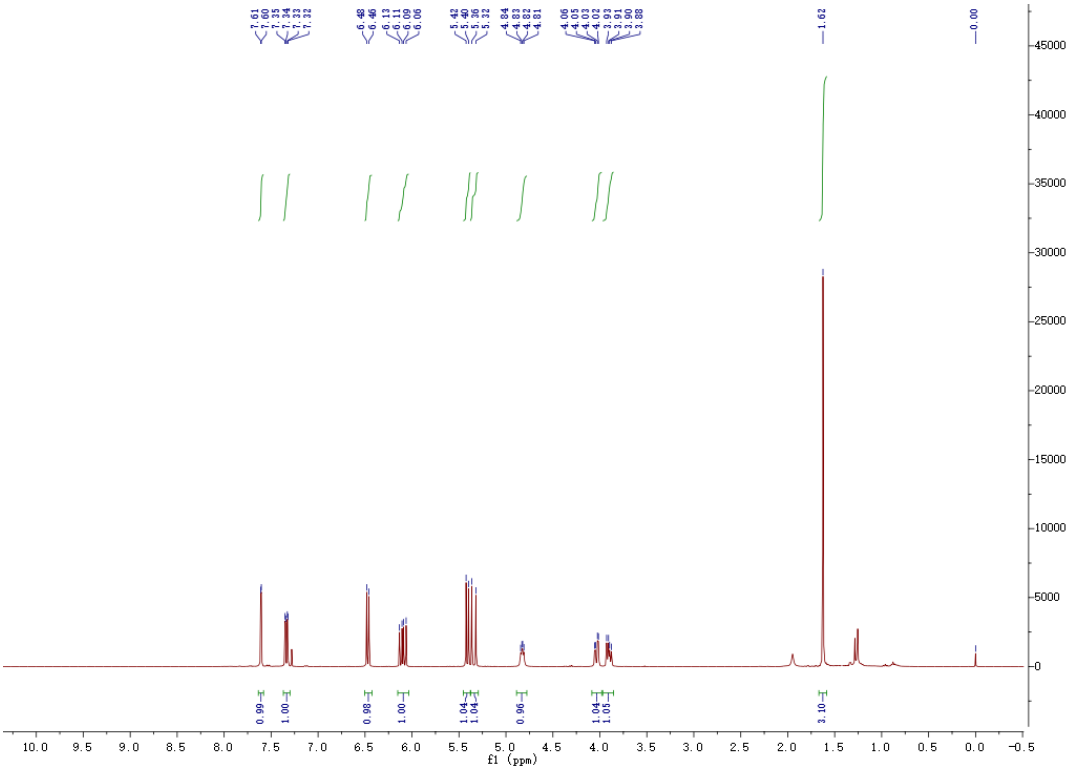
3ad






Br
O
N
HO
Me

3ae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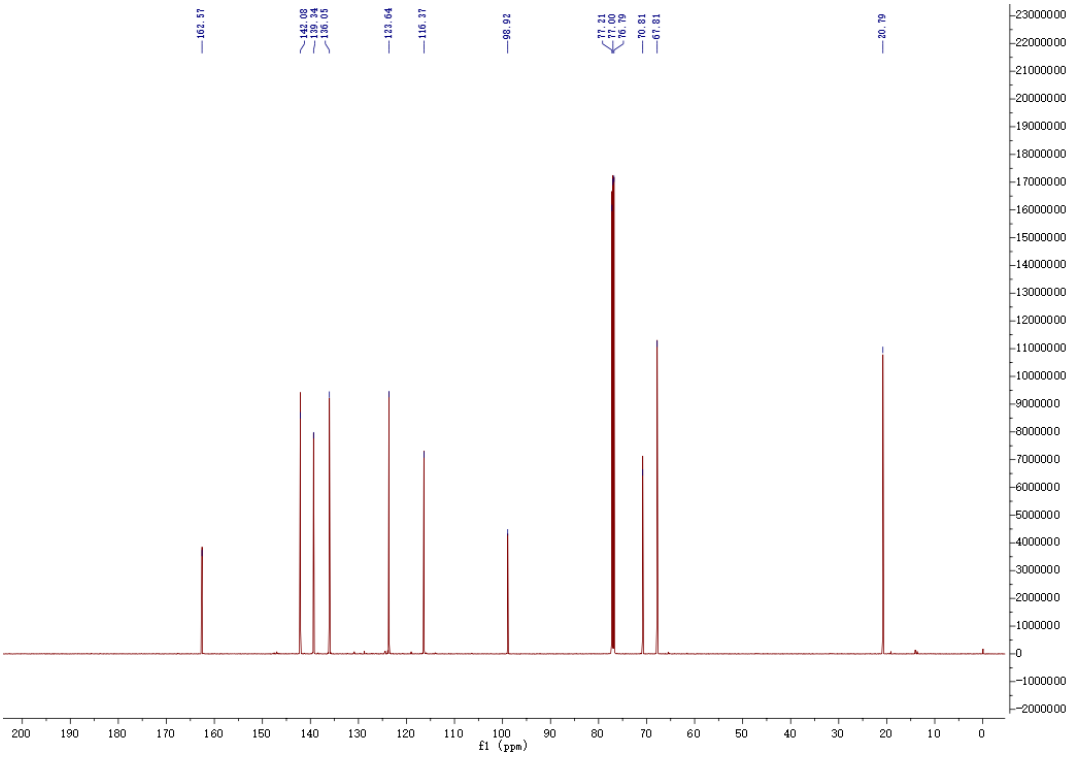
5.40
5.36
5.32
4.84
4.83
4.82
4.81
4.06
4.05
4.03
4.02
3.91
3.90
3.88
1.62
0.00
0.99
1.00
0.88
1.00
1.04
1.04
0.66
1.04
1.03
3.10
f1 (ppm)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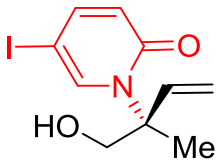
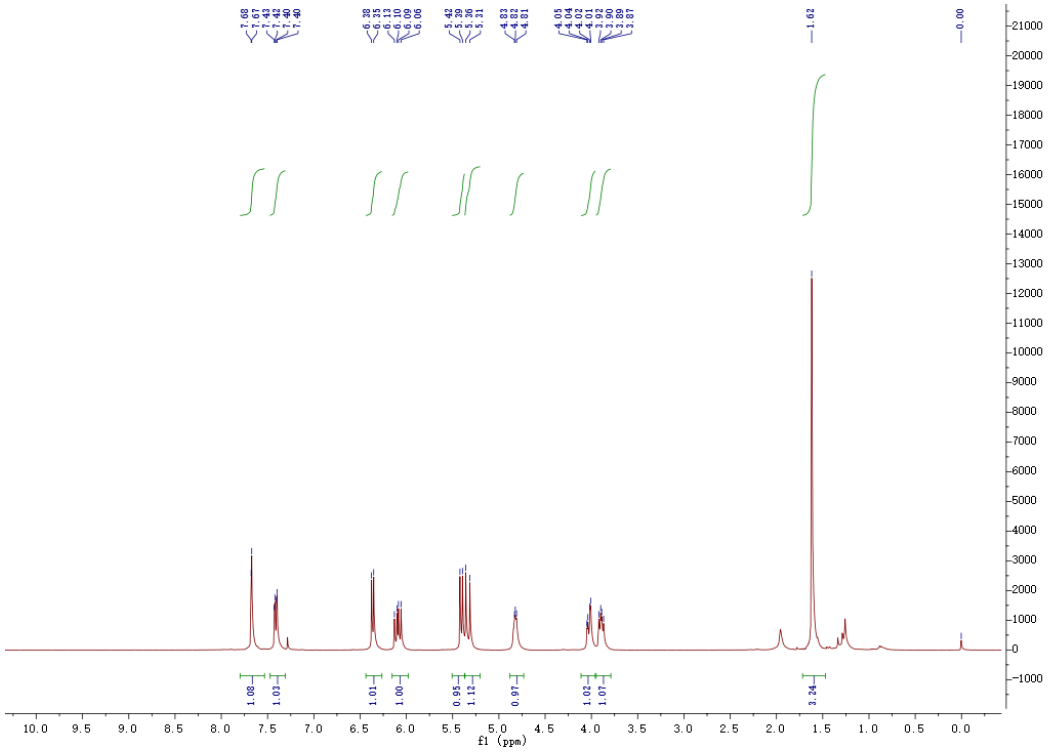
20.79
f1 (ppm)


I
O
N
HO
Me

3af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5.31
4.83
4.82
4.81
4.05
4.04
4.02
4.01
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3.90
3.89
3.87
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1.00
0.95
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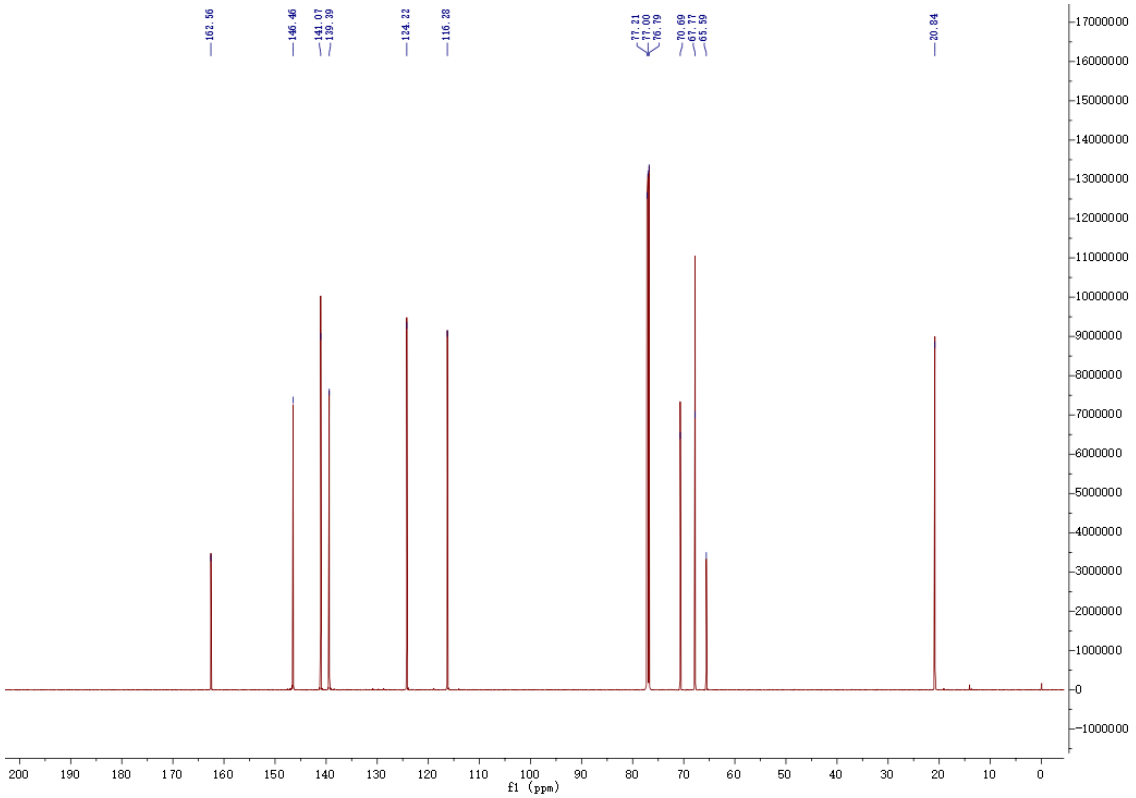
0.97
1.02
1.07
3.24
f1 (ppm)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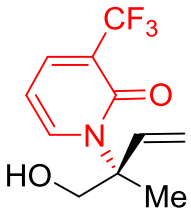
f1 (ppm)



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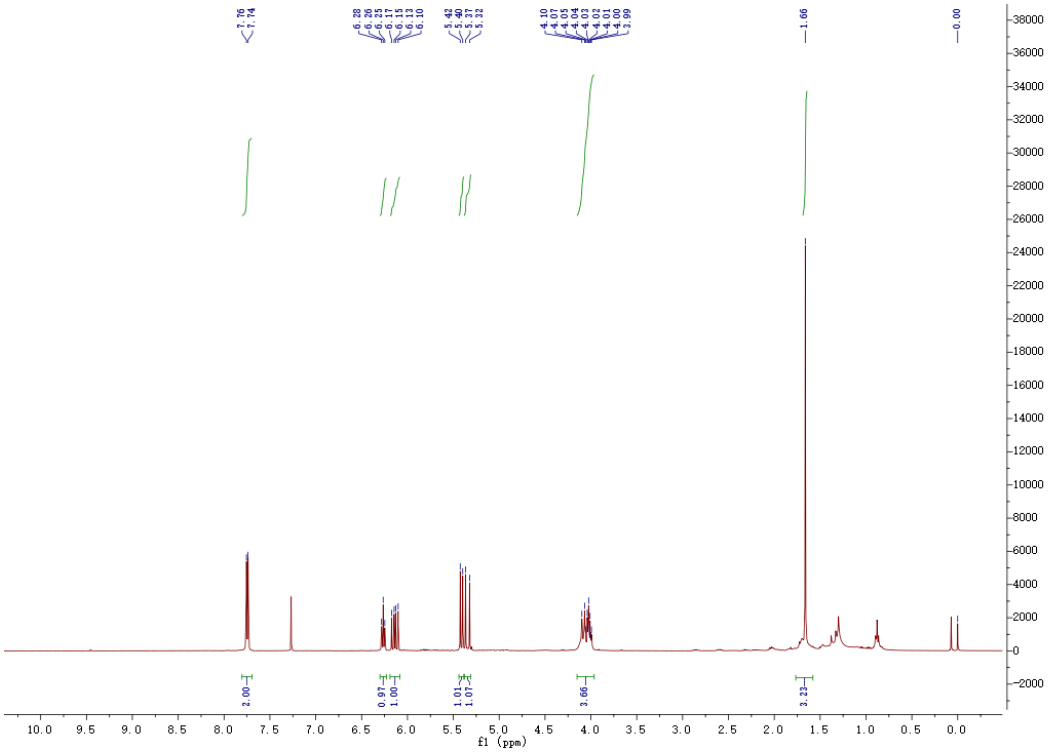

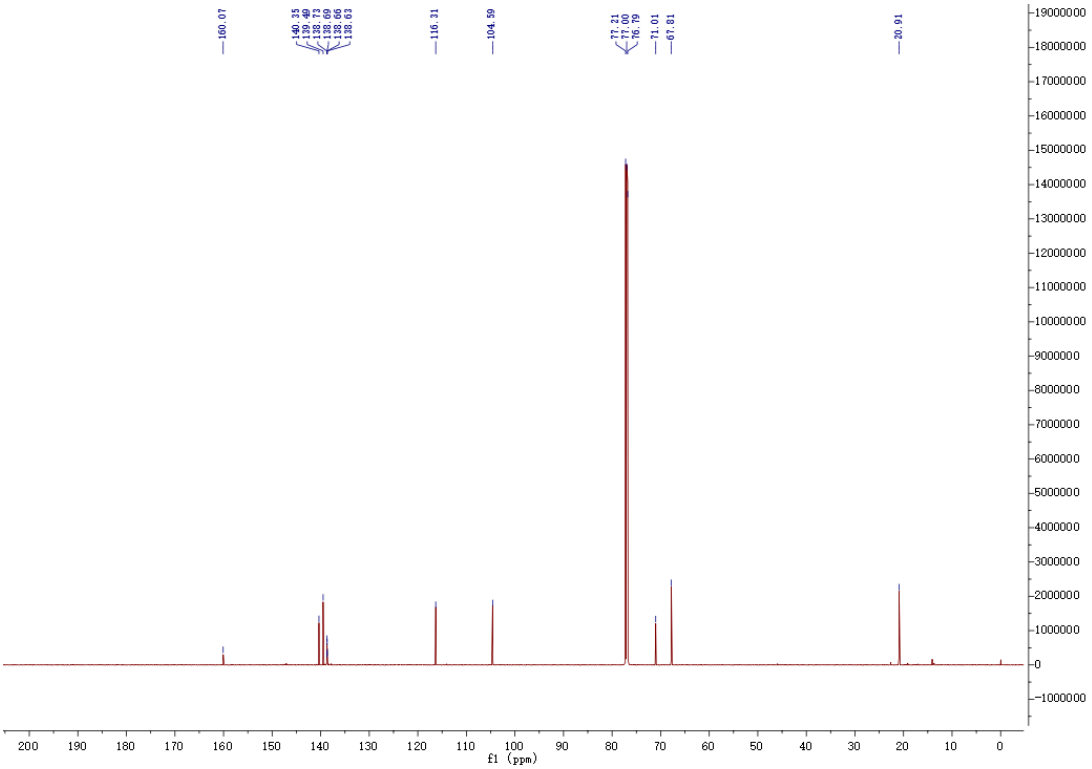

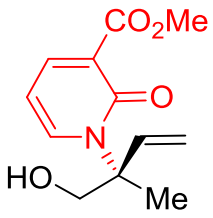

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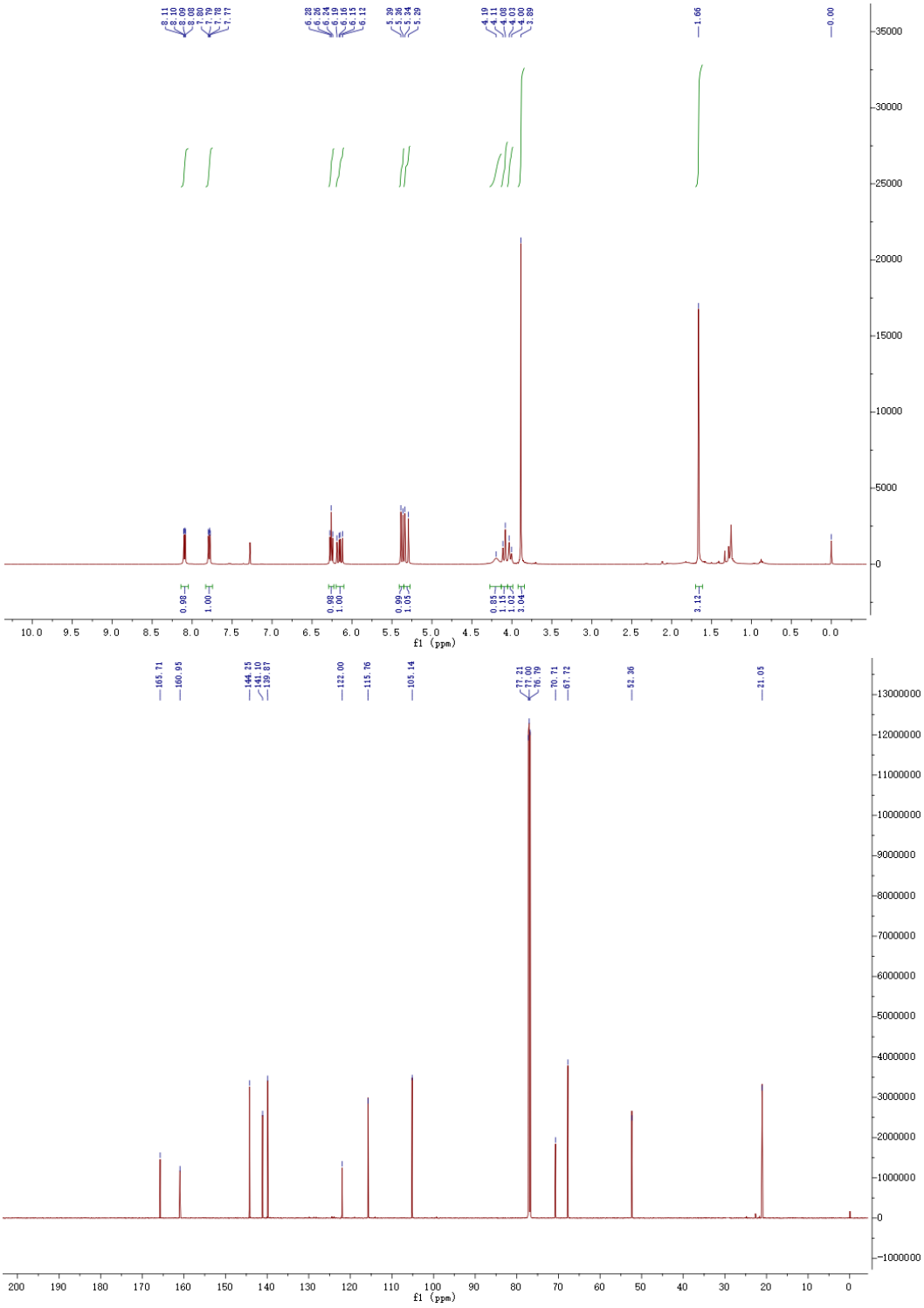

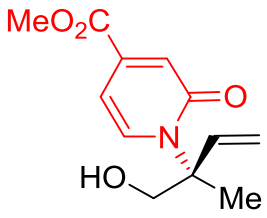

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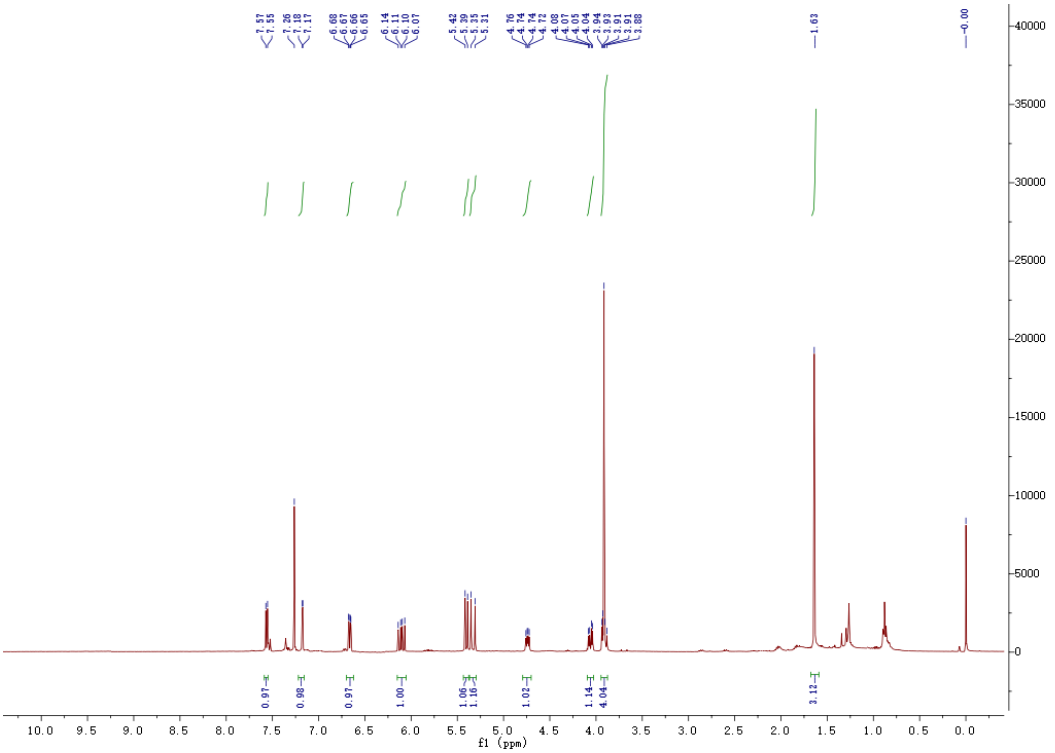

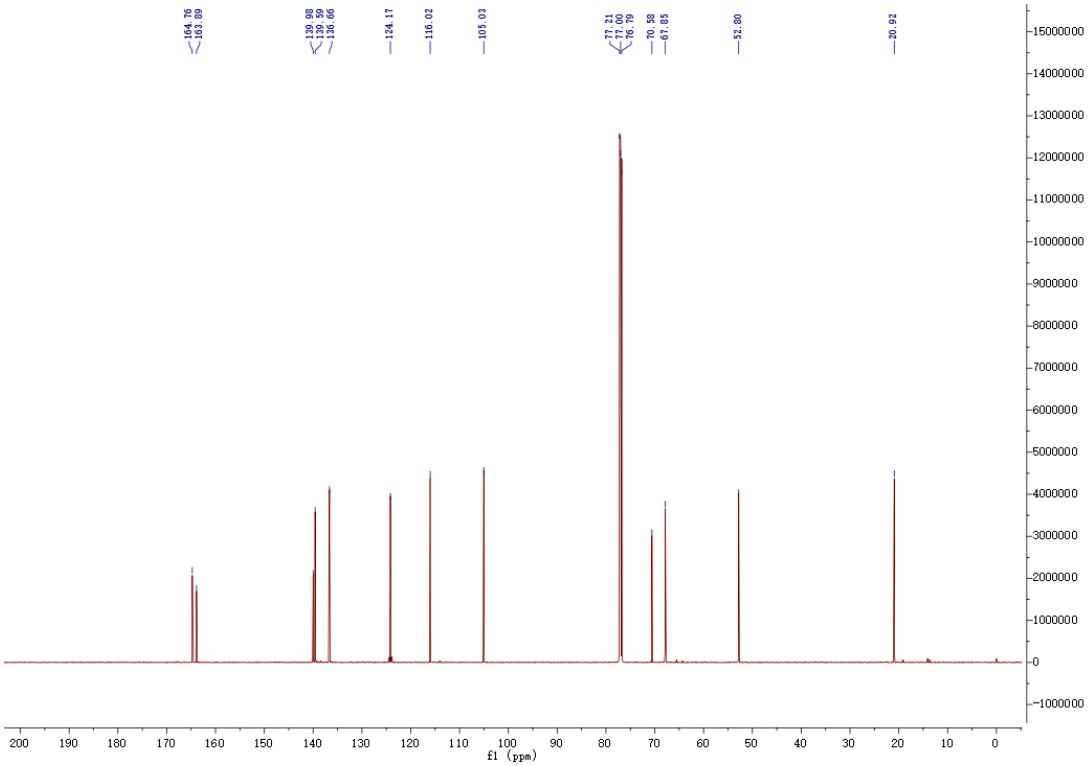

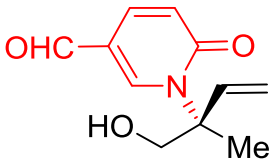
OHC
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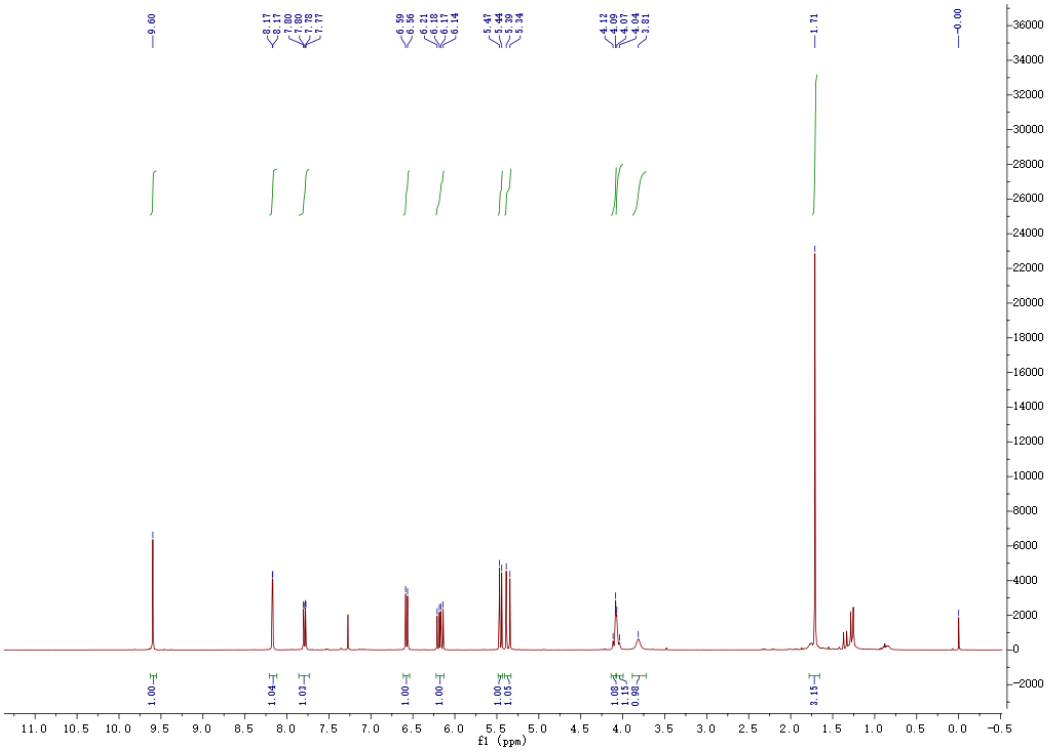
N
HO
Me

3aj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3.81
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0.00
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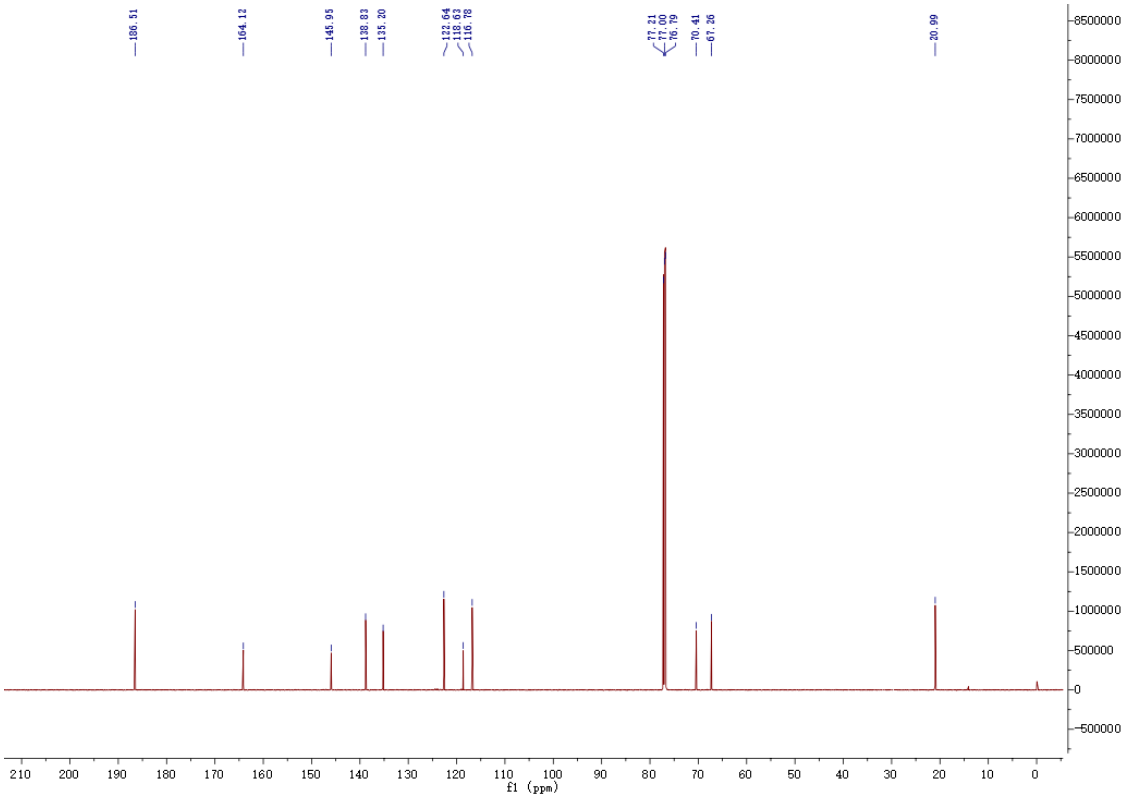
f1 (ppm)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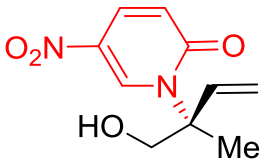
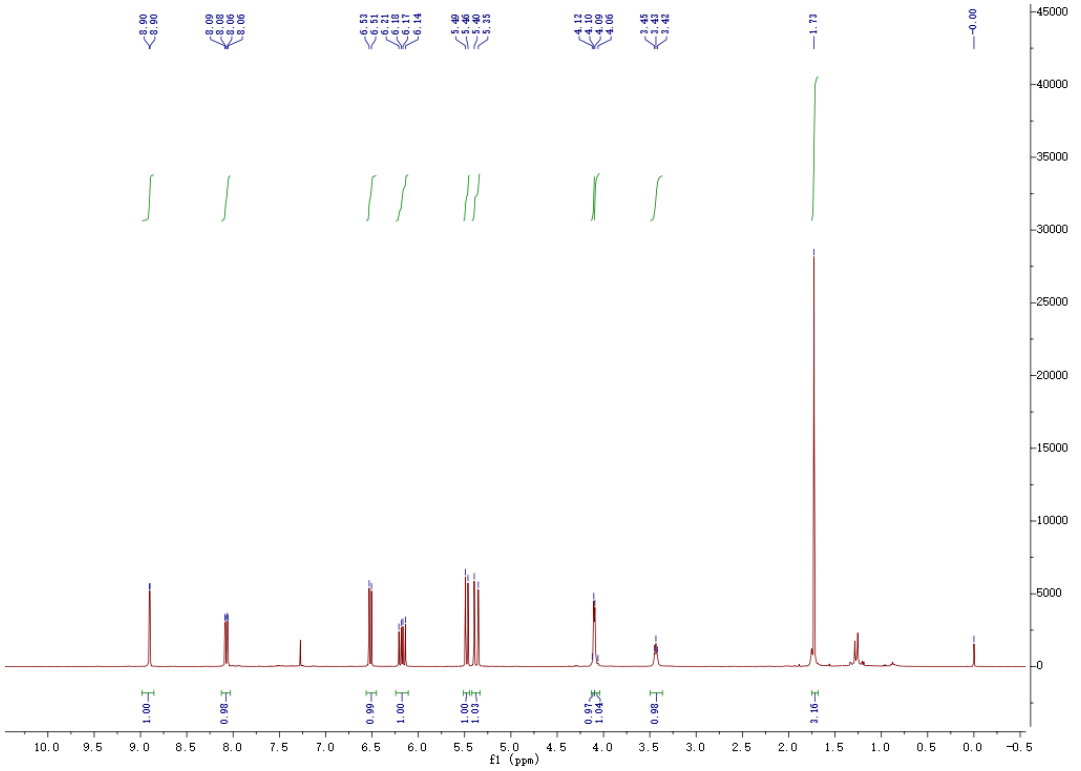
f1 (ppm)


O2N
O
N
HO
Me

3ak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5.35
4.12
4.10
4.09
4.06
3.45
3.43
3.42
1.73
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1.00
1.03
0.97
1.04
0.98
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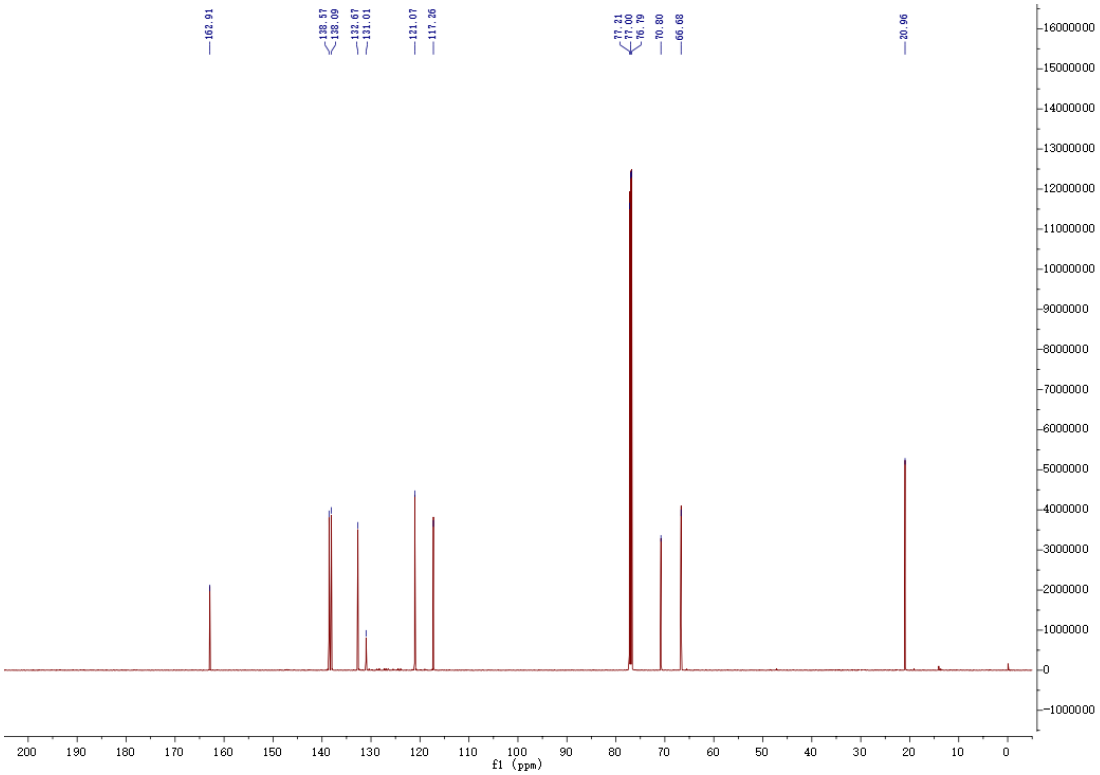
f1 (ppm)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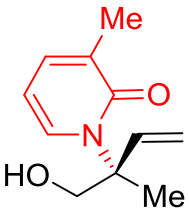

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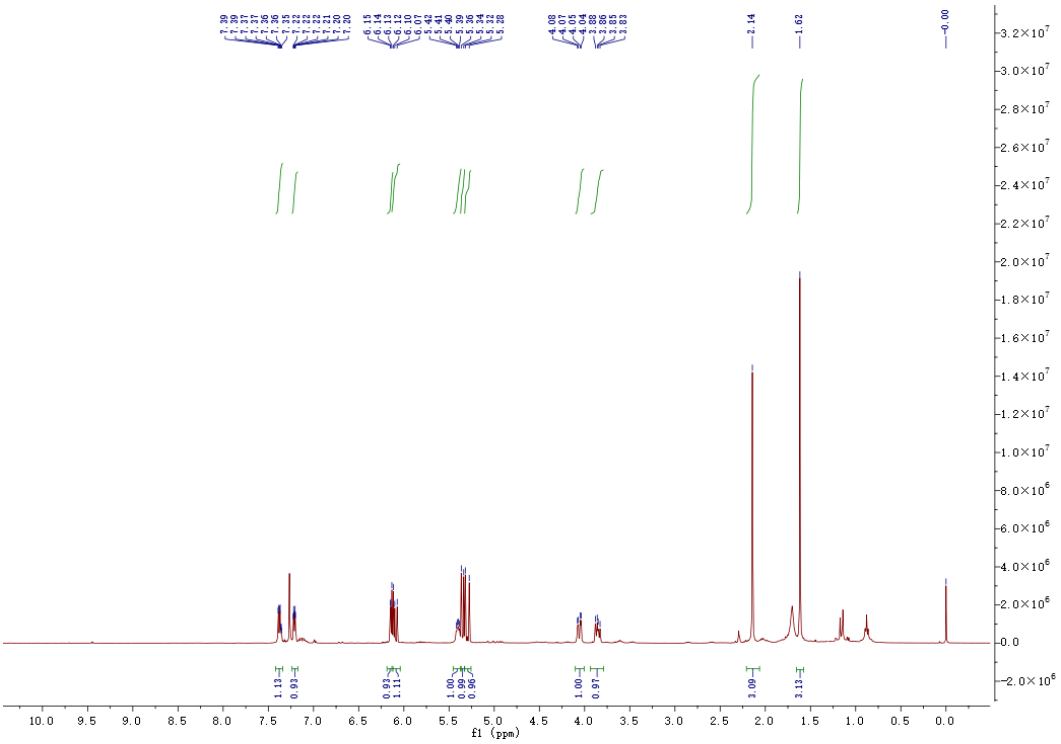

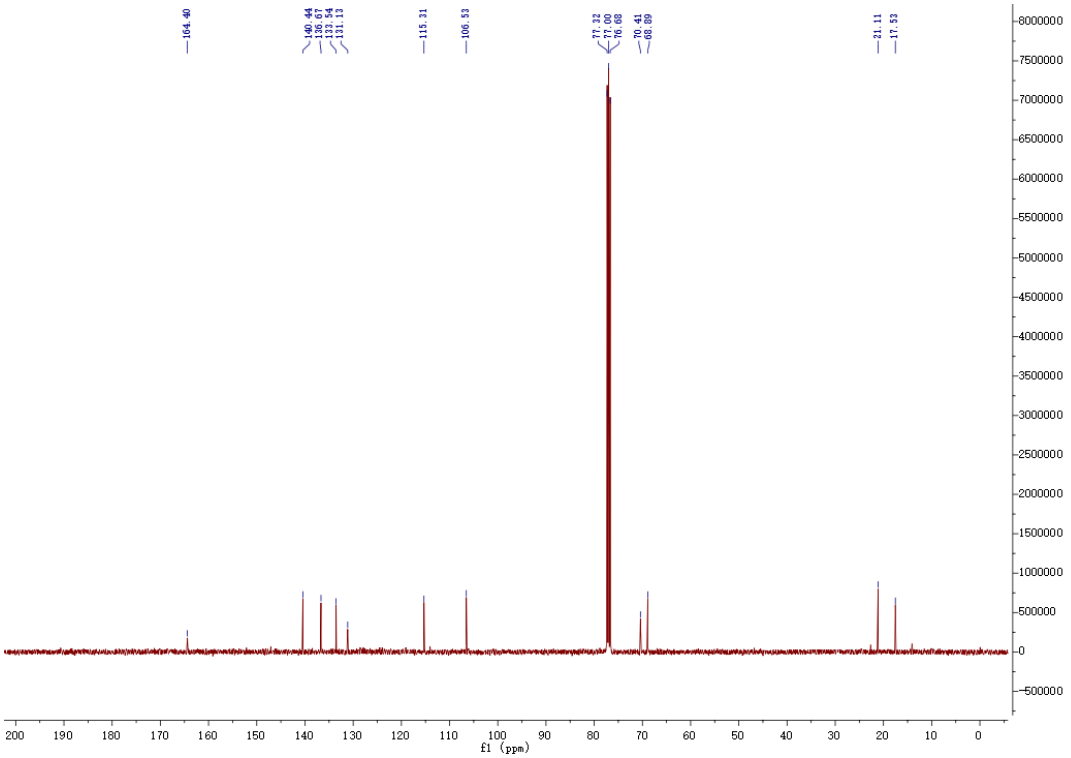

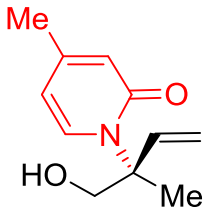

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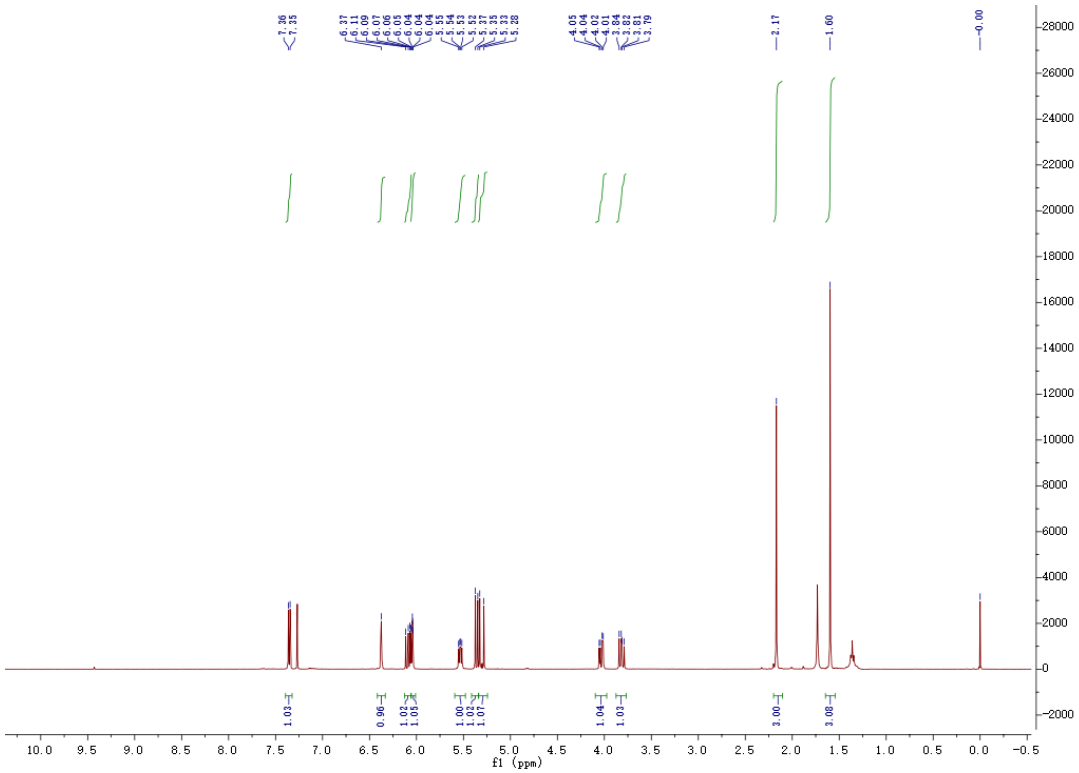

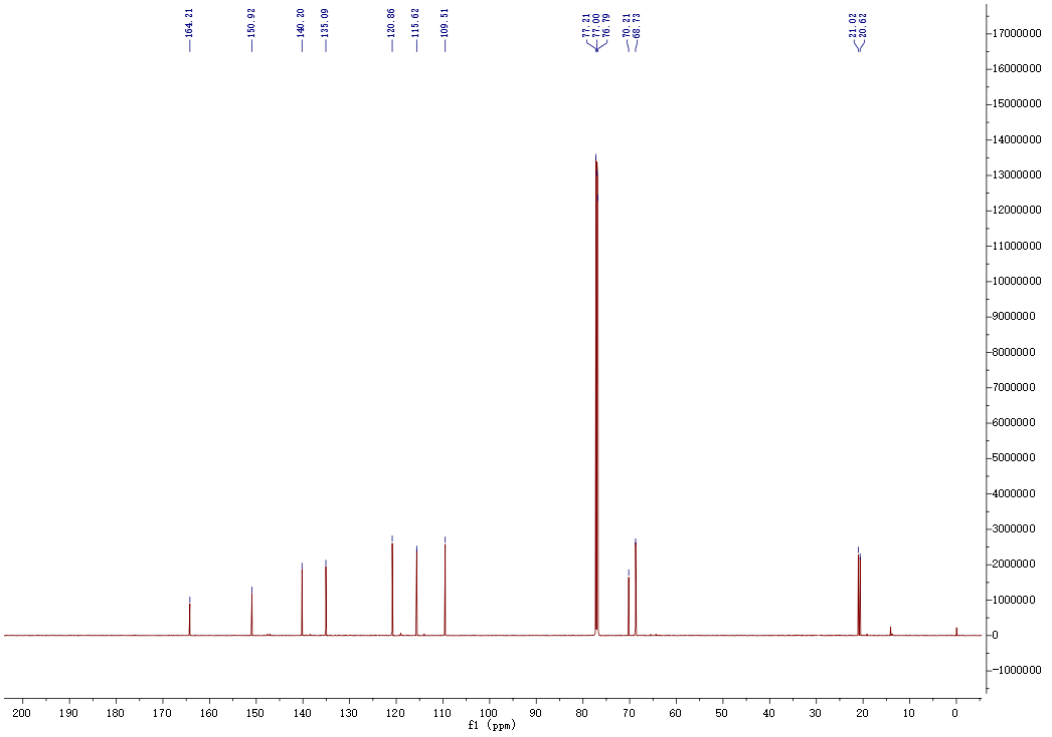

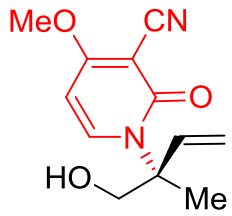

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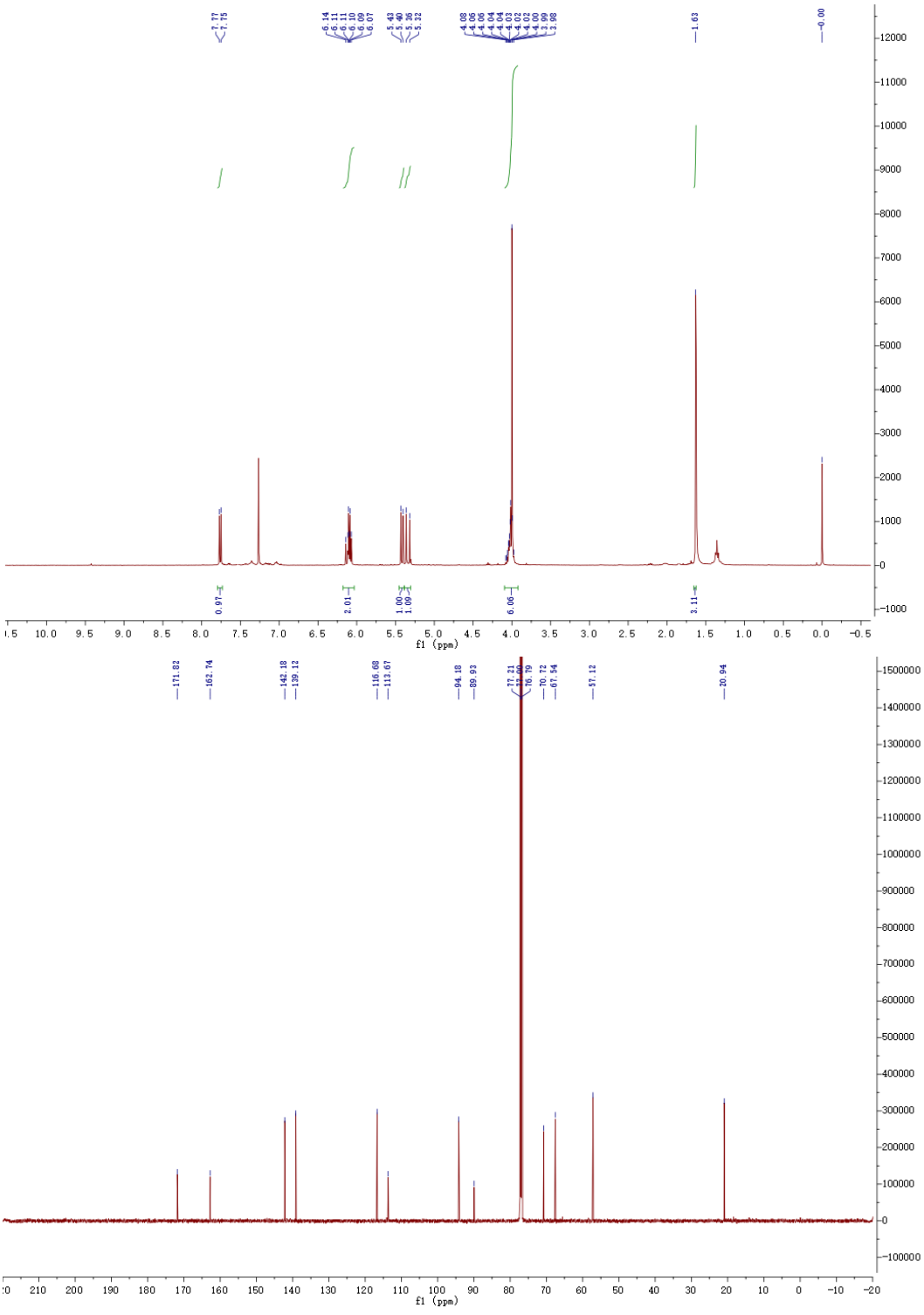

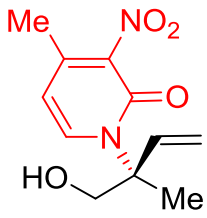

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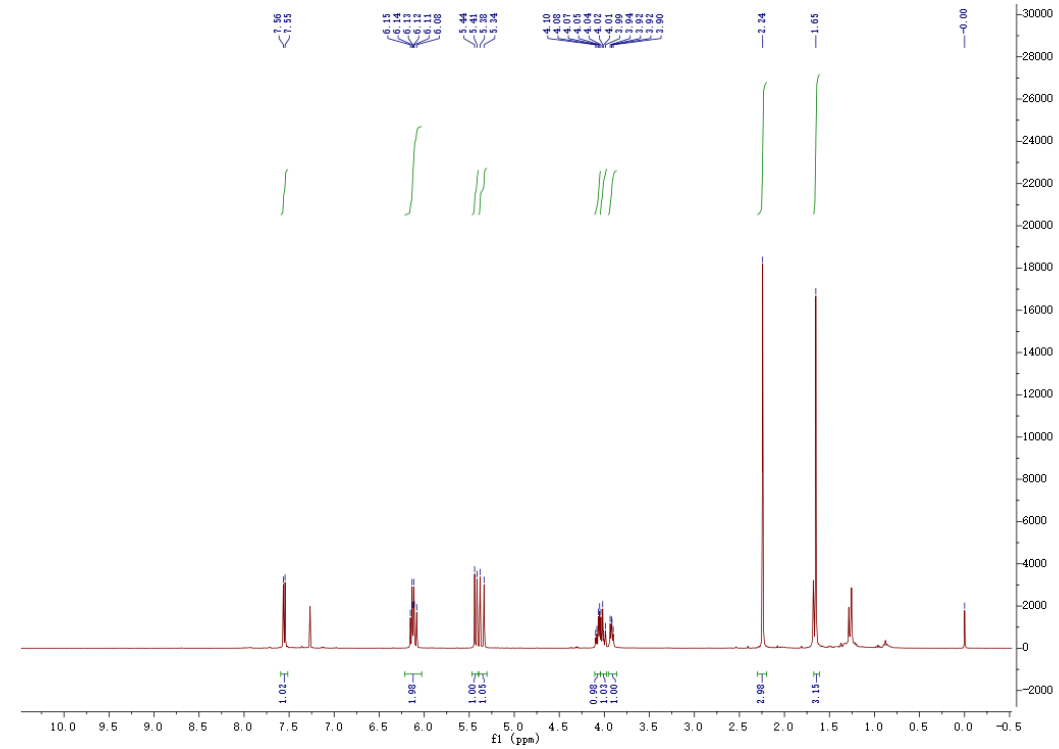

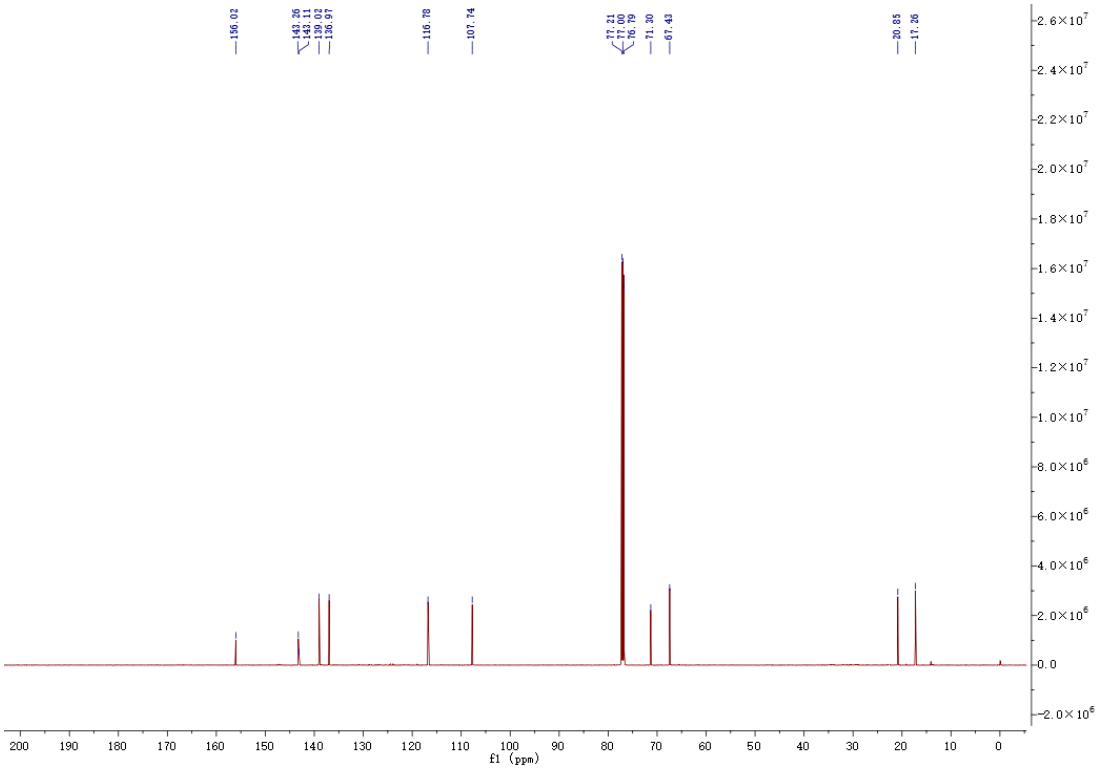

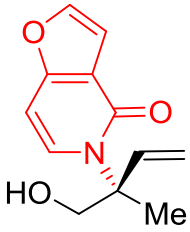
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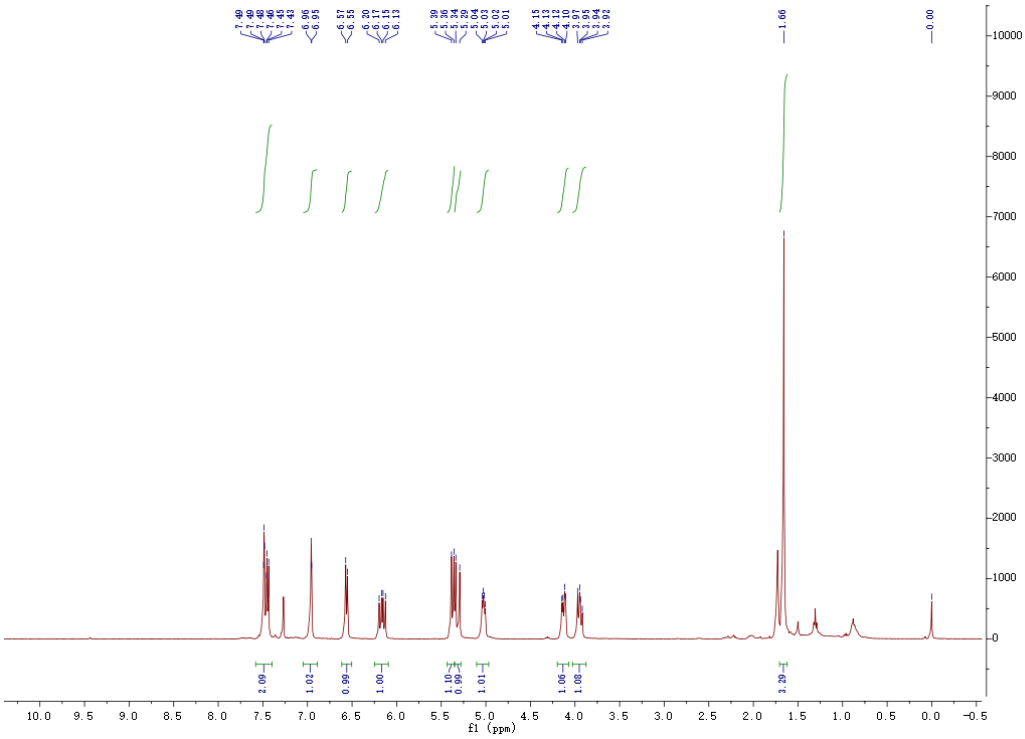
HO
Me

3ap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6.57
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6.13
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5.34
5.29
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5.03
5.02
5.01
4.15
4.13
4.12
4.10
3.97
3.95
3.94
3.92
1.66
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1.10
0.99
1.01
1.06
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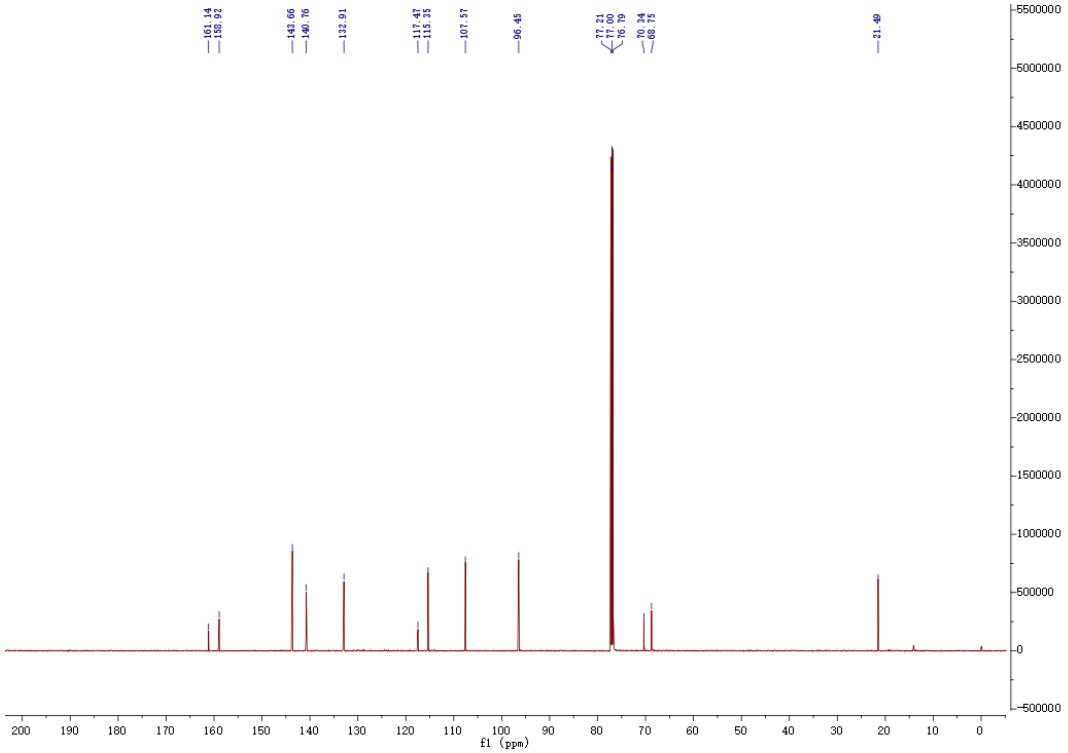
f1 (ppm)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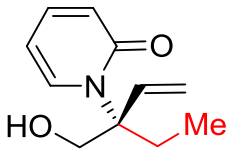
21.49
f1 (ppm)



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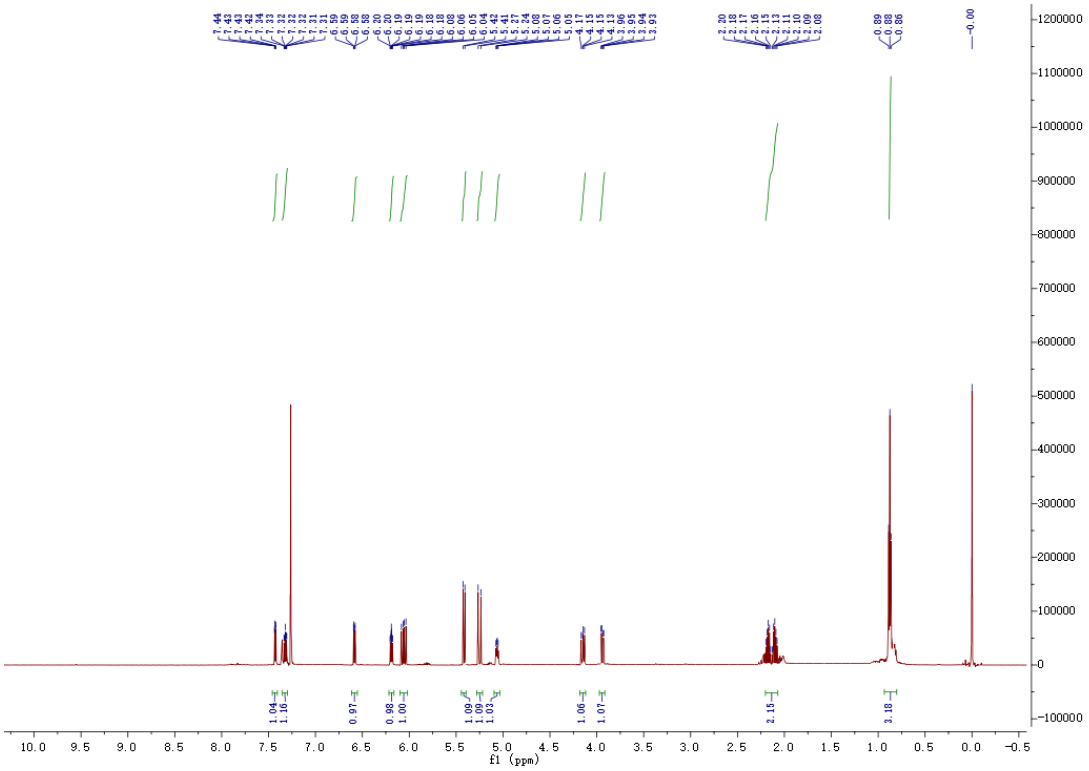

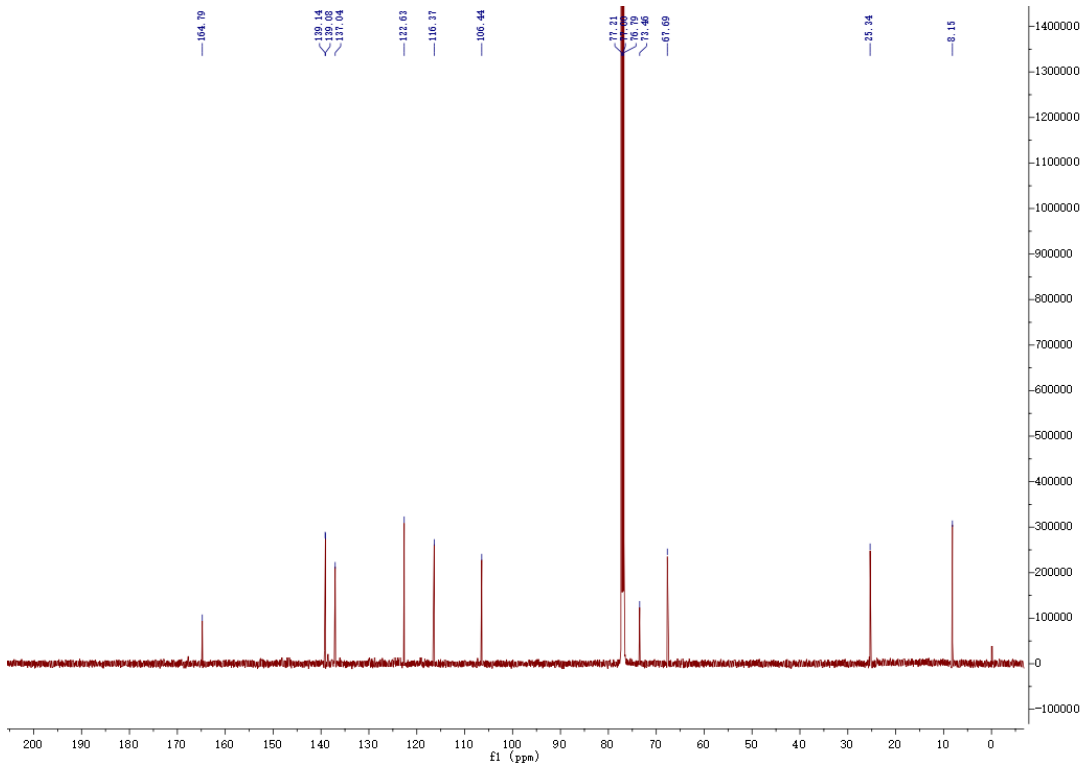

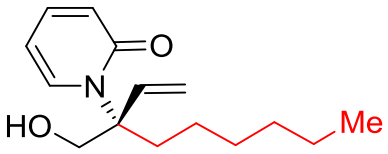

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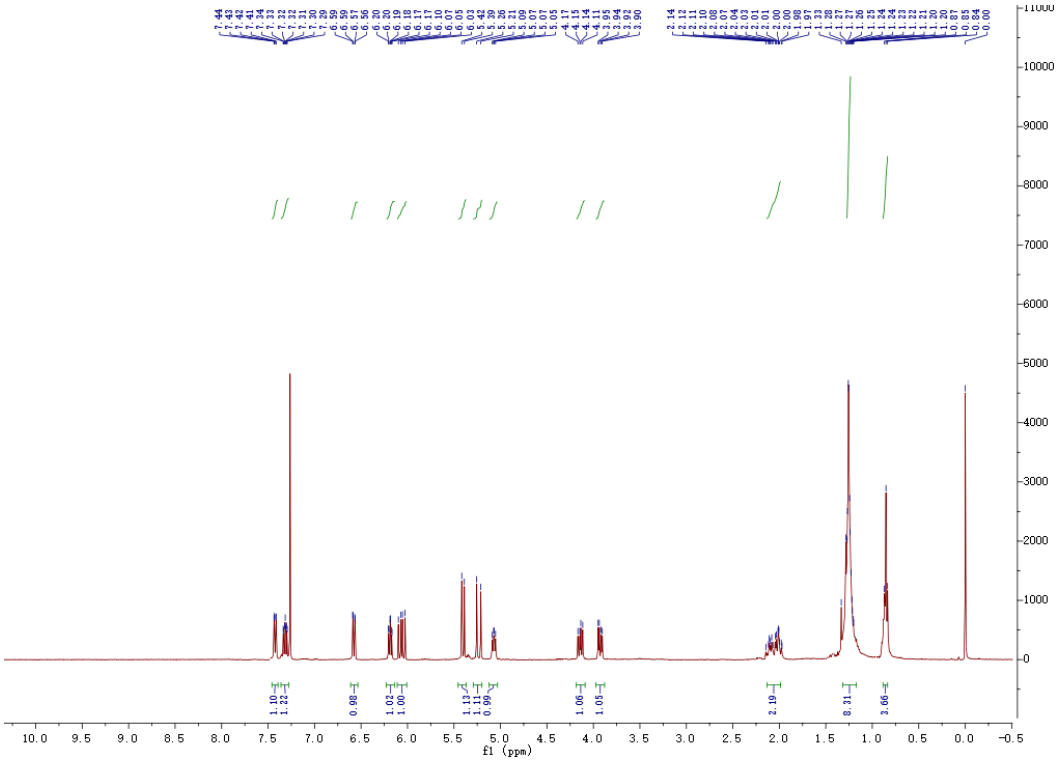

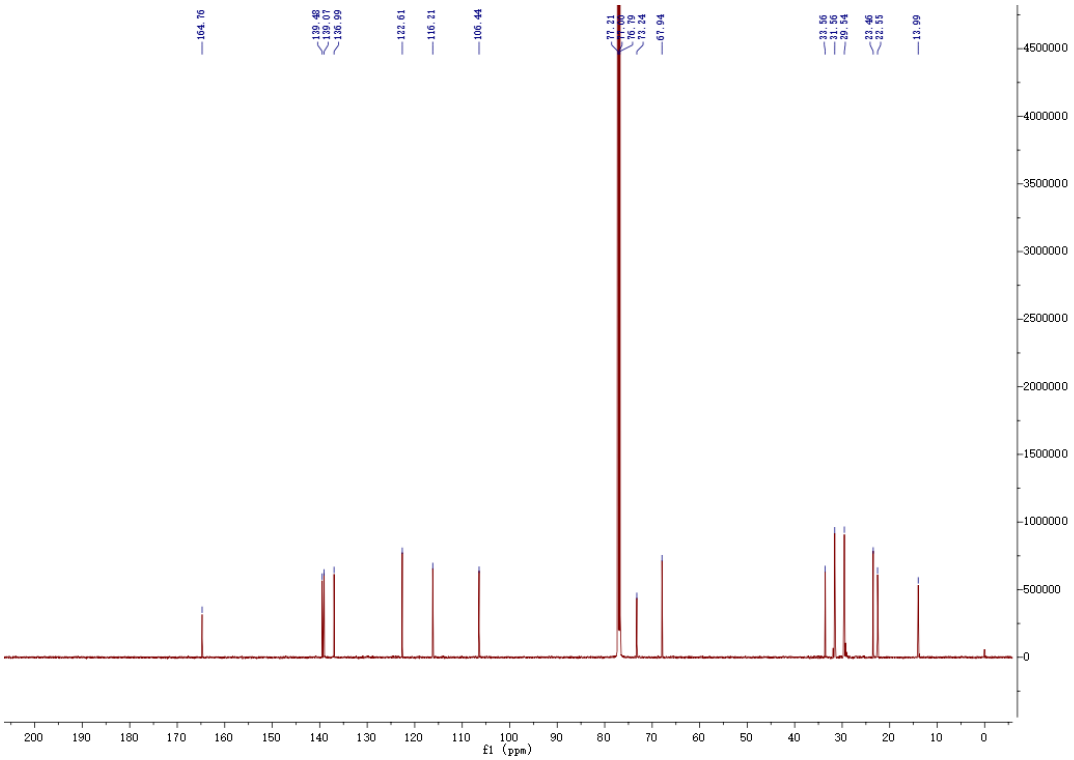

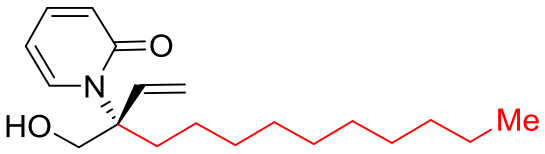

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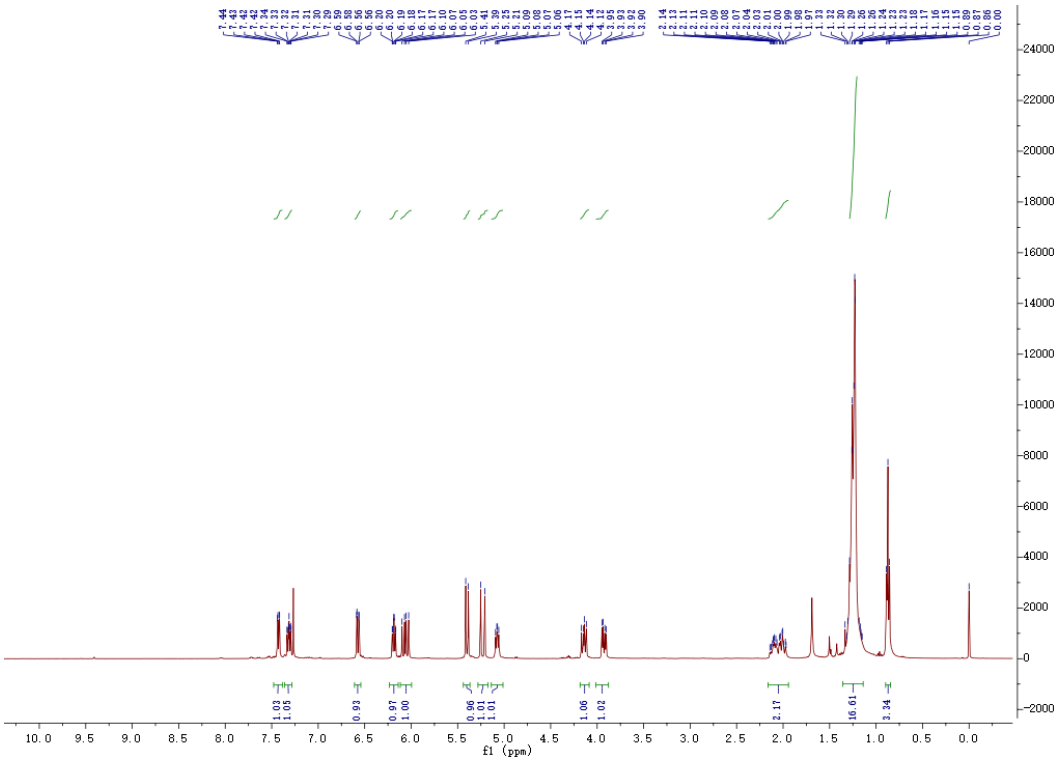

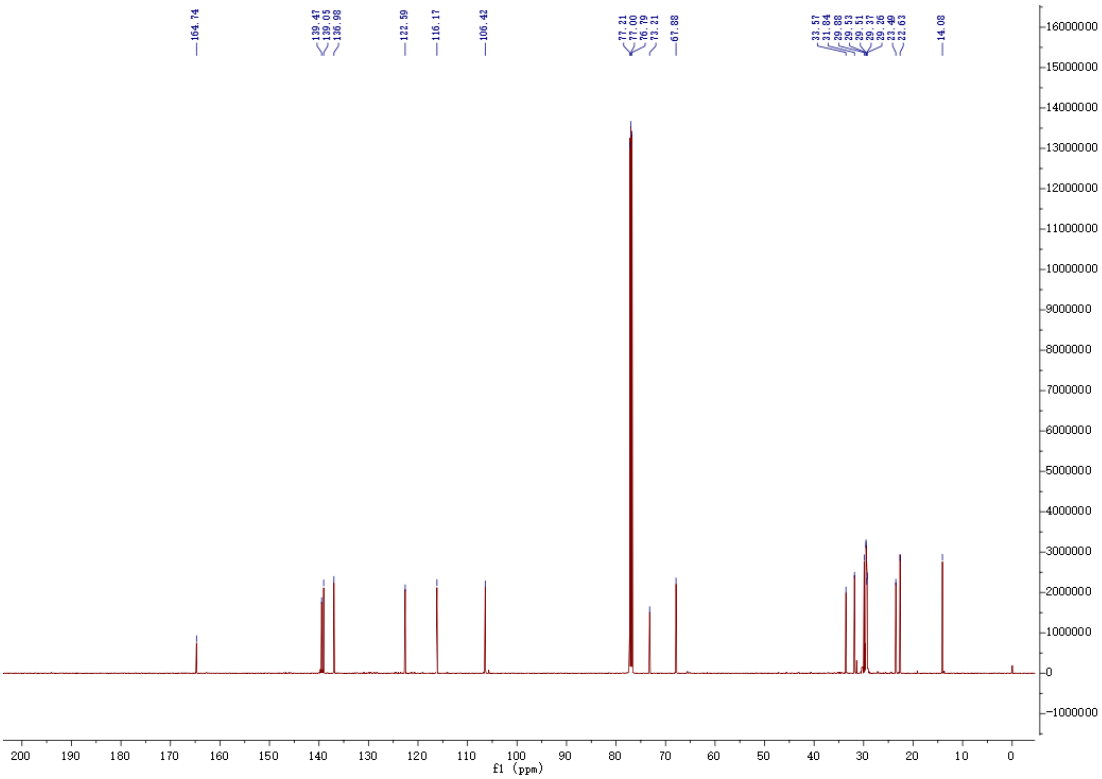

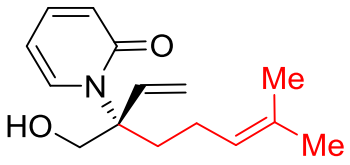

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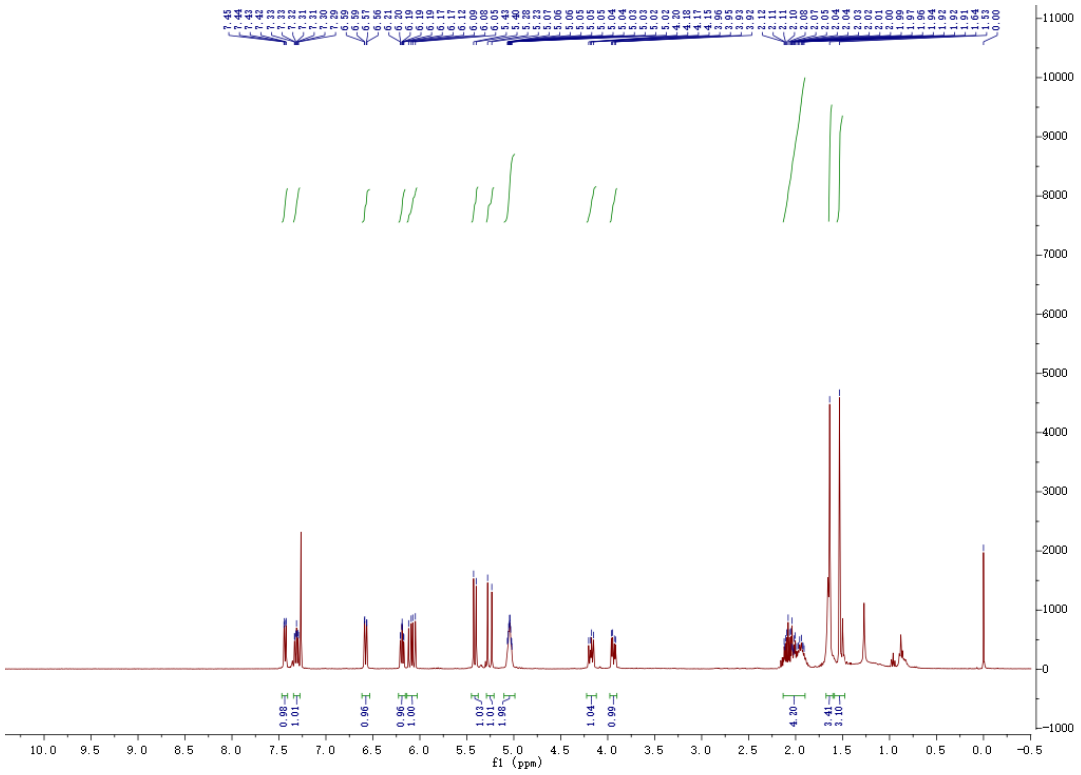

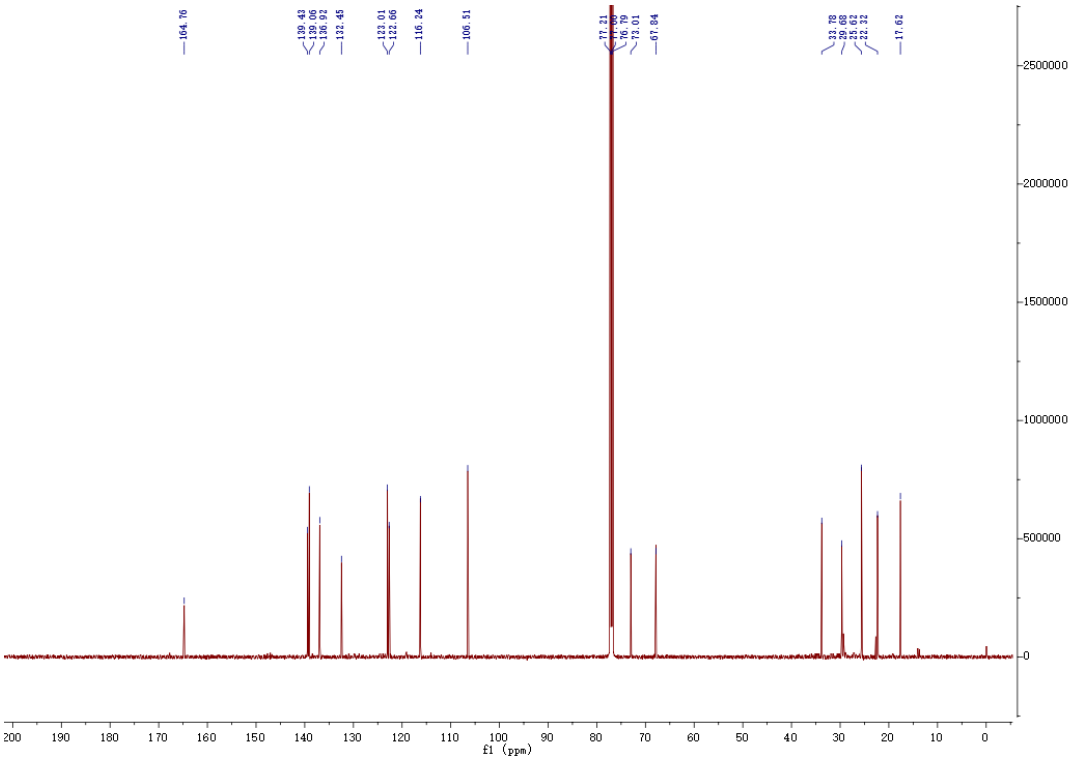

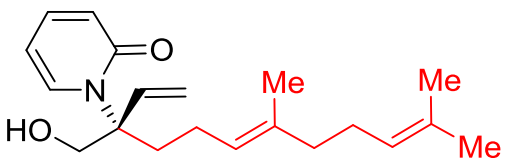

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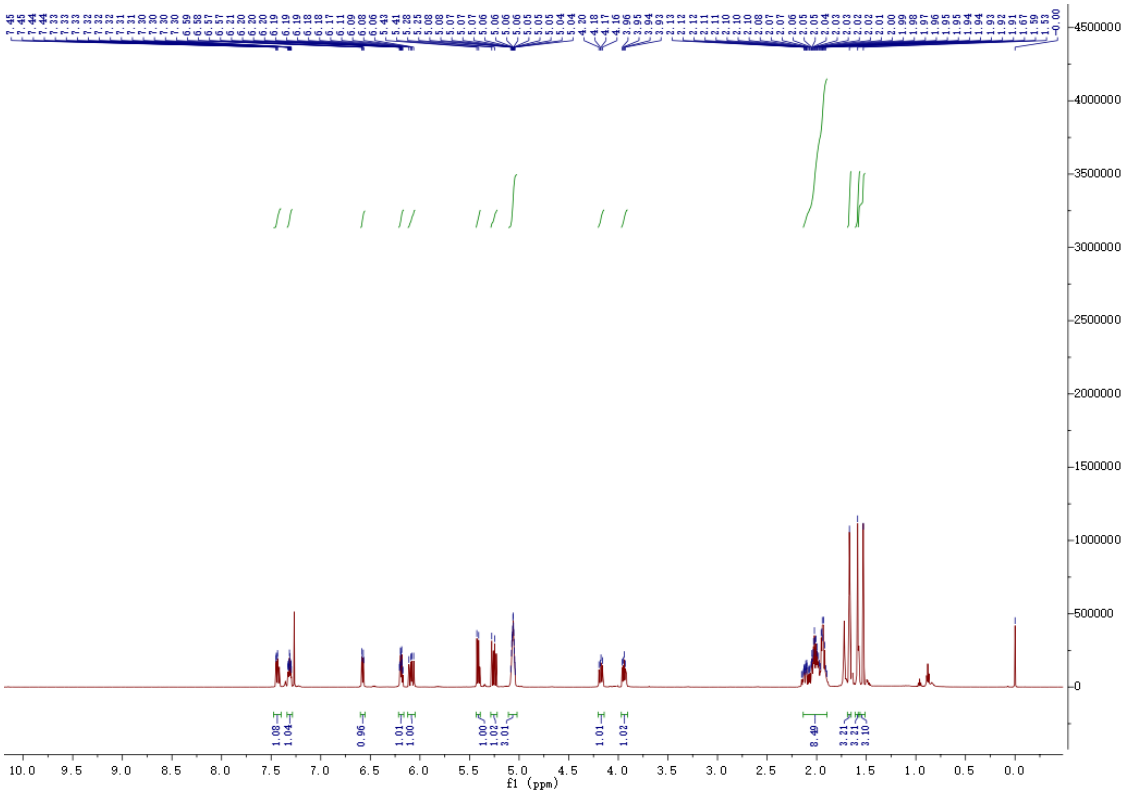

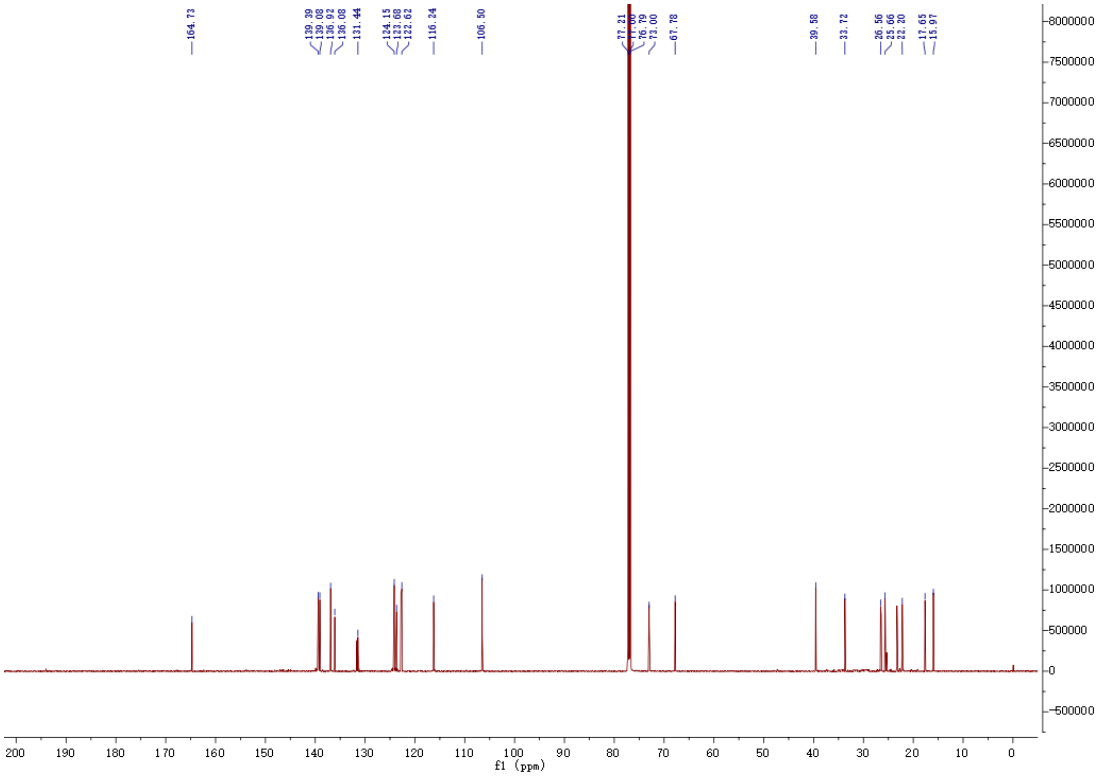

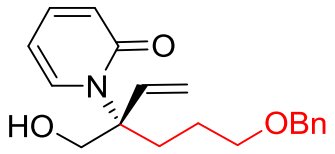

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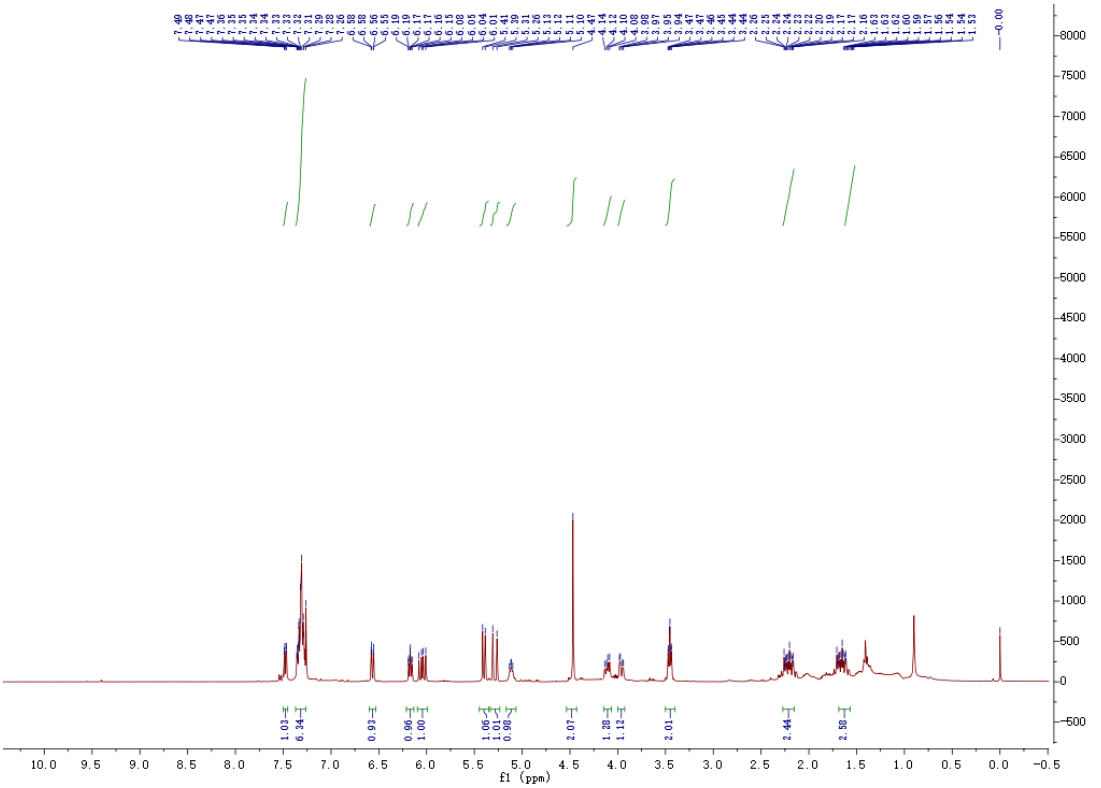

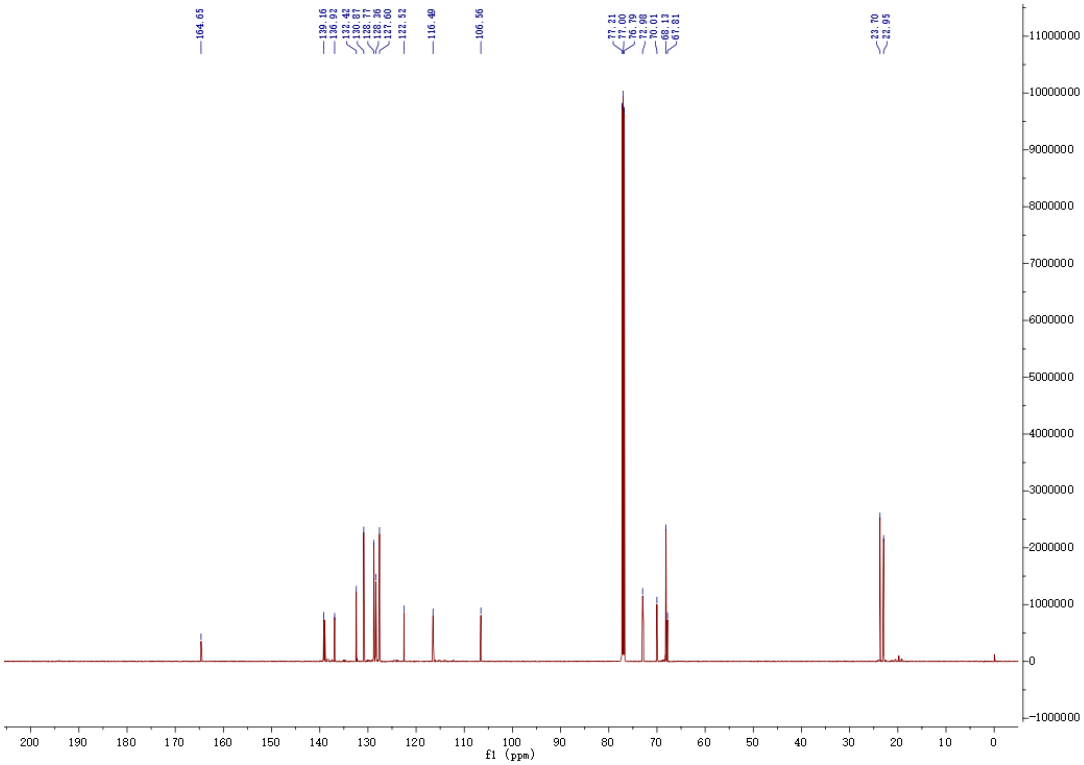

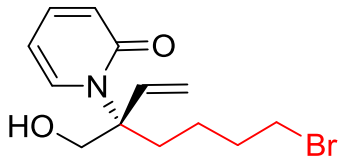

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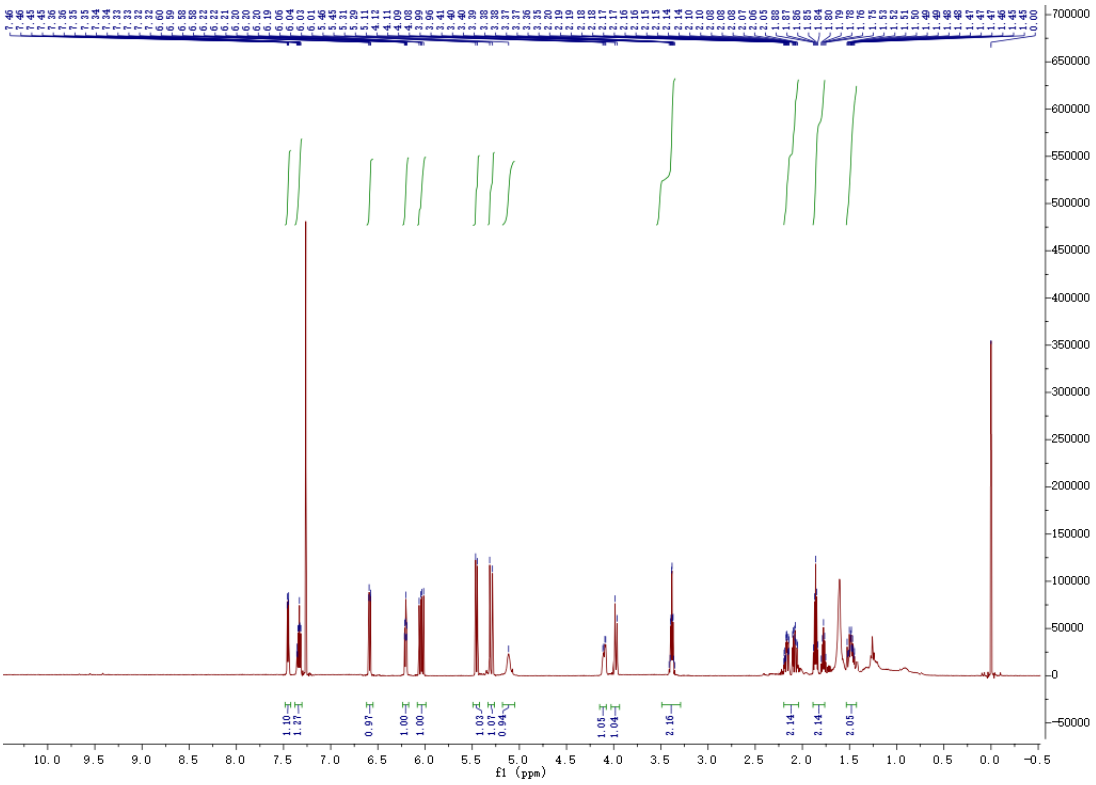

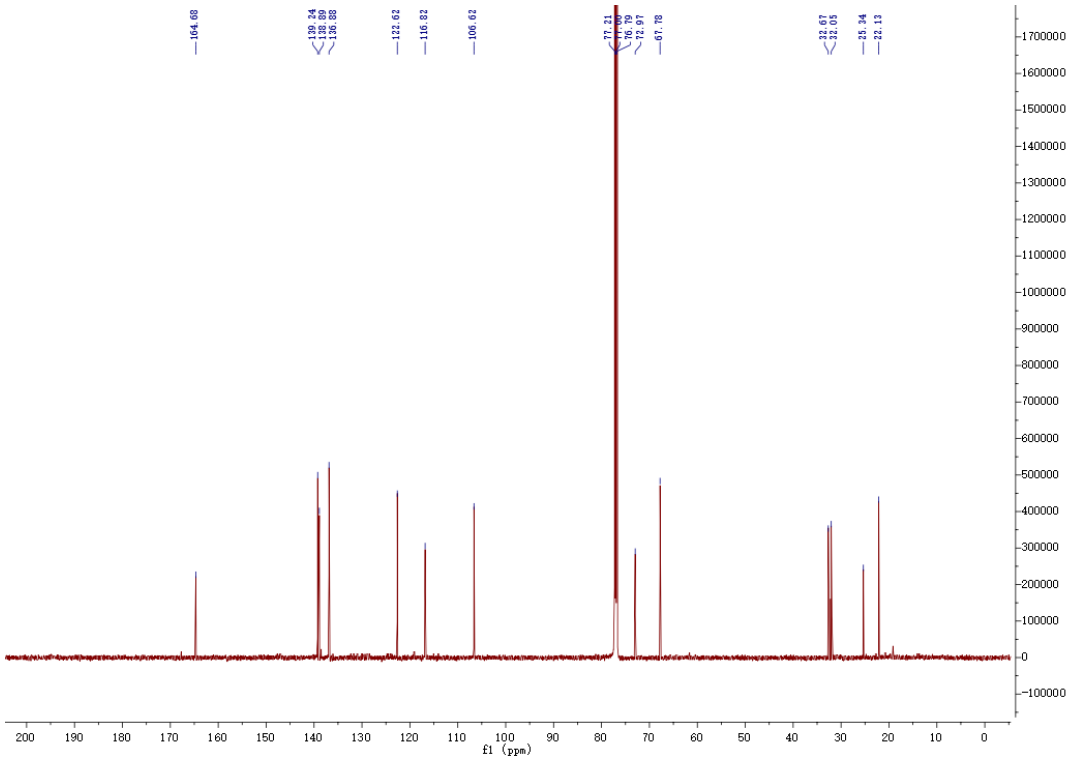

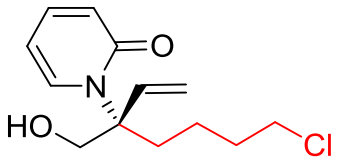
O
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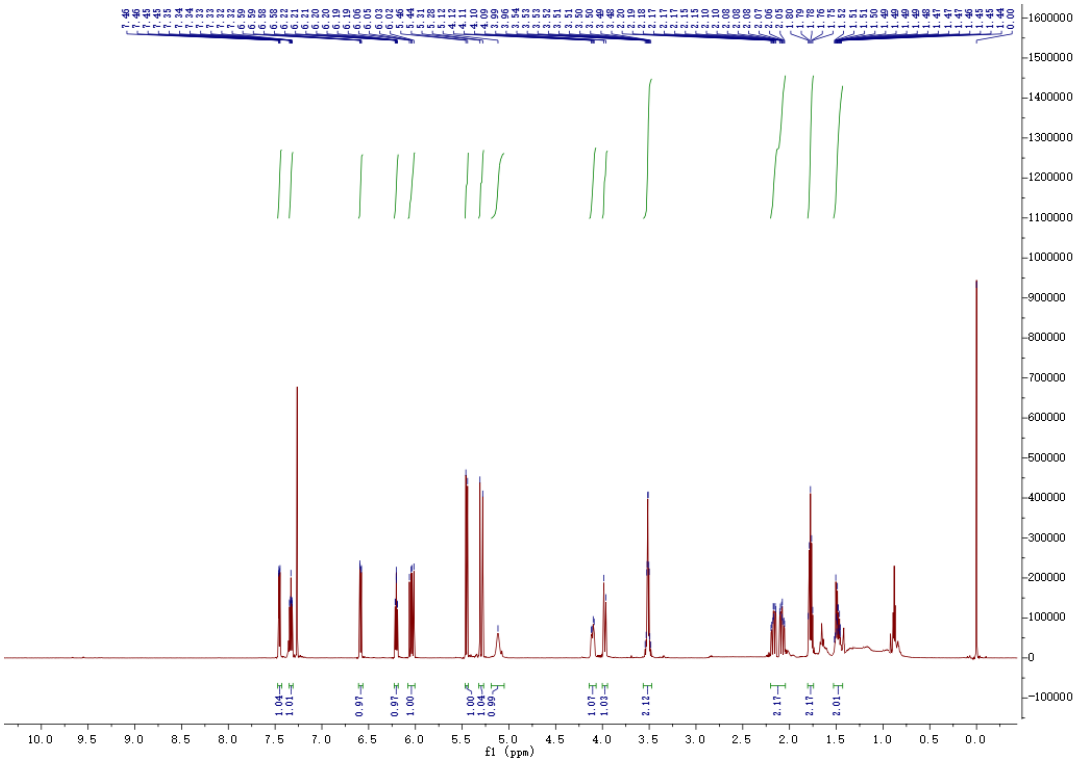
Cl

3ia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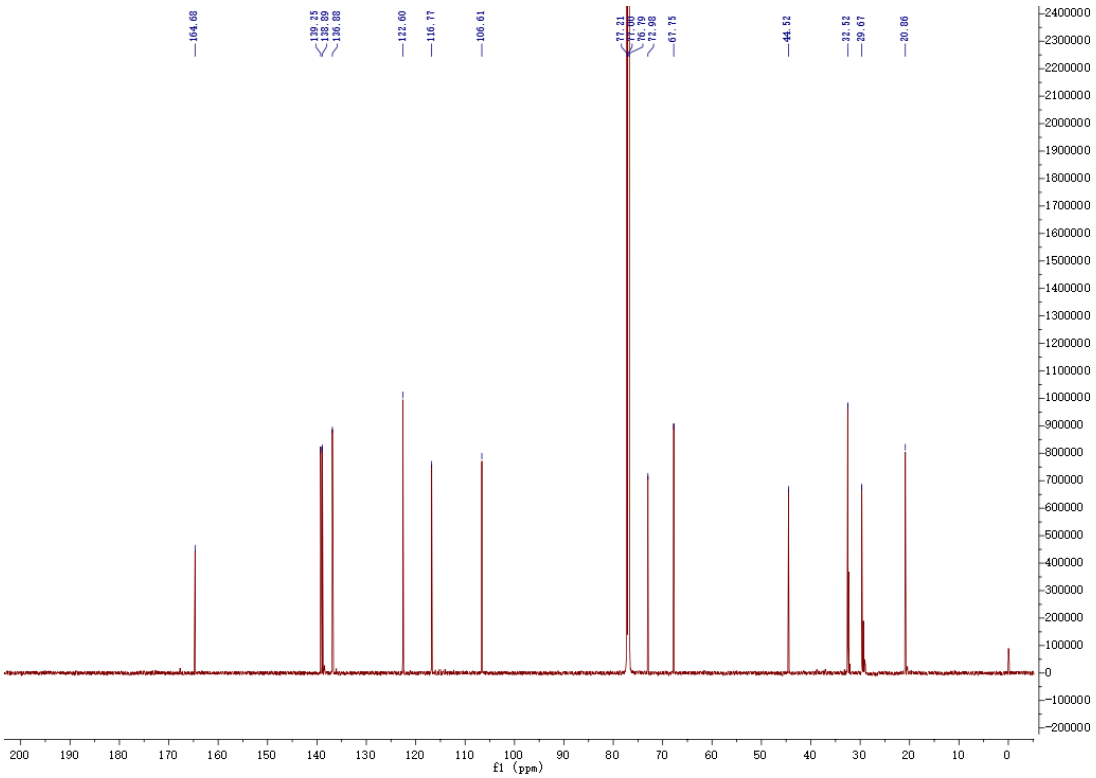
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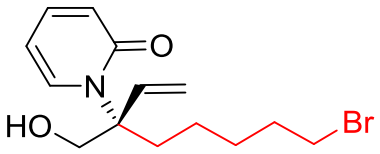

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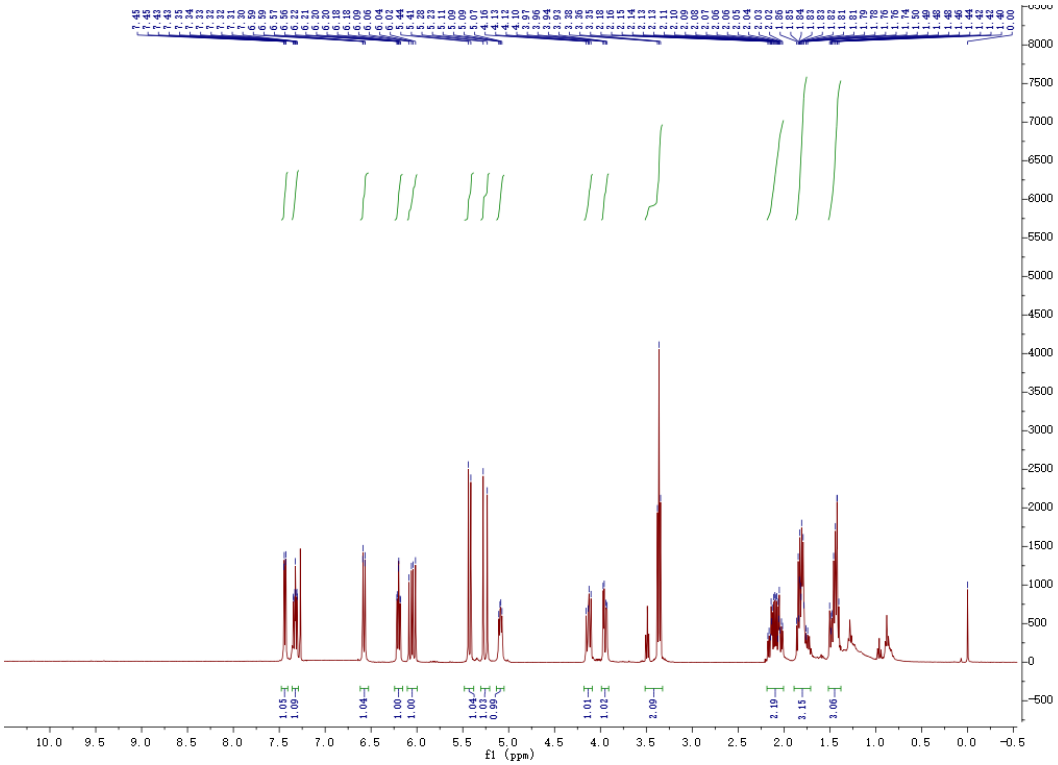

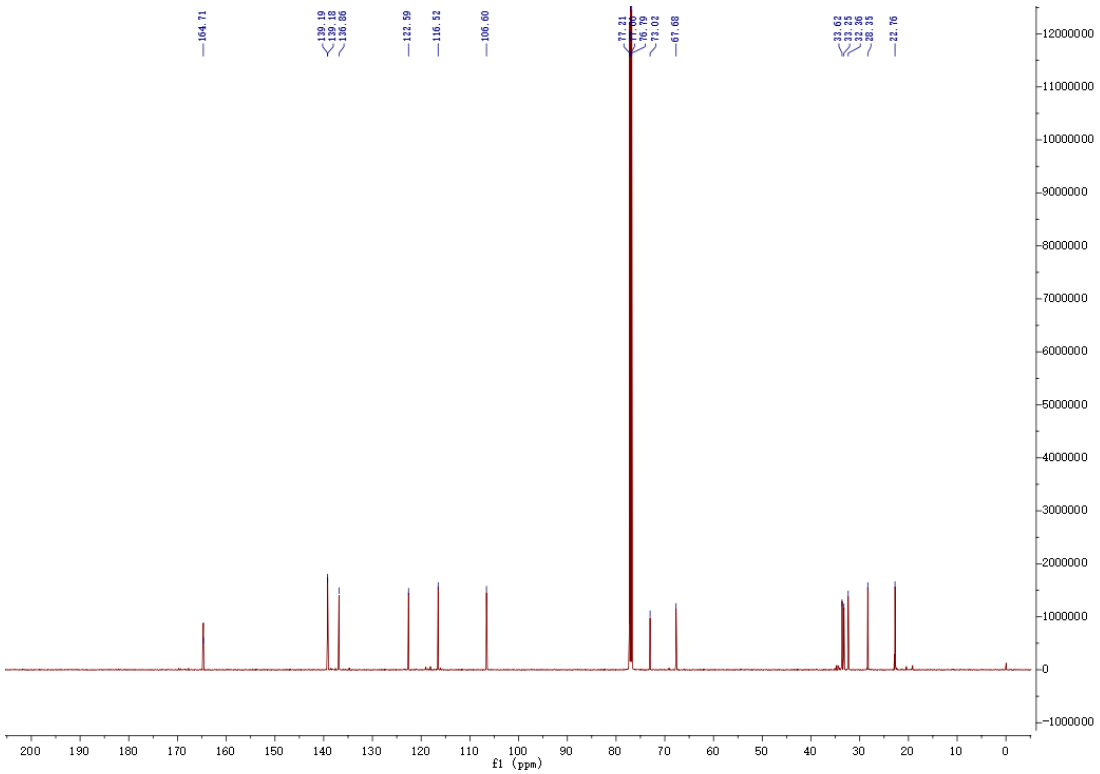

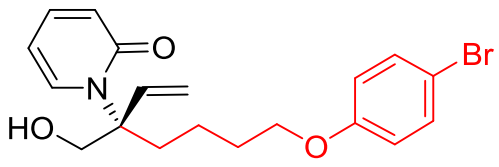
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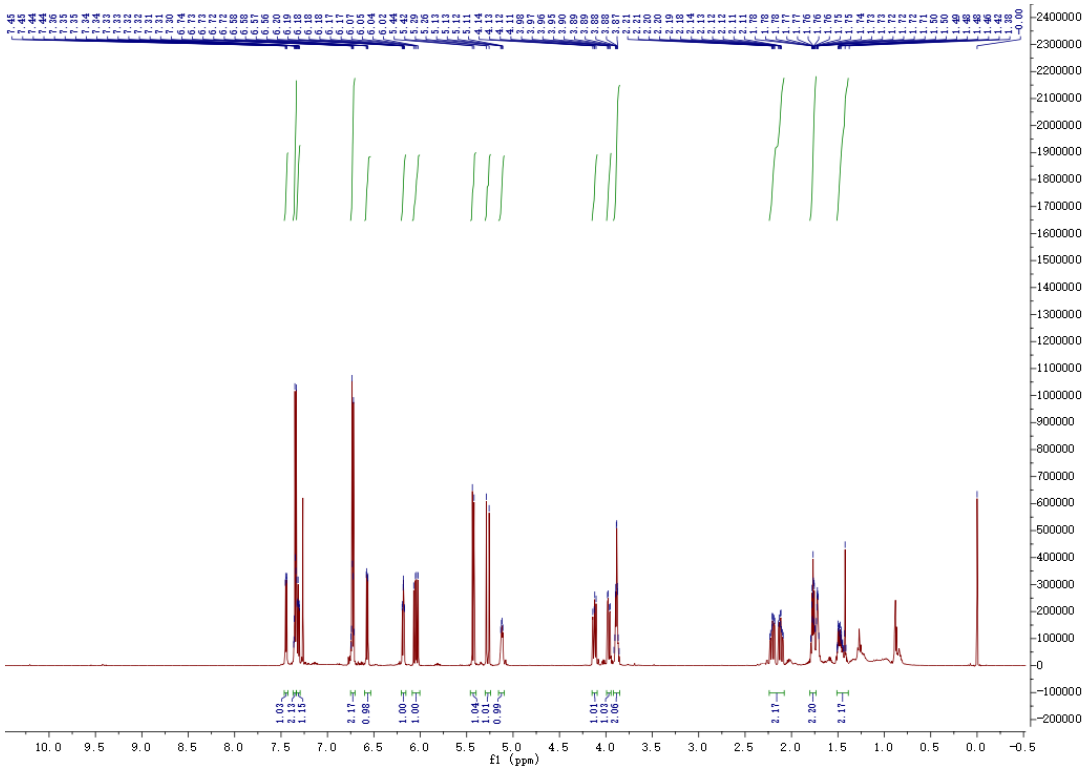
Br

3ka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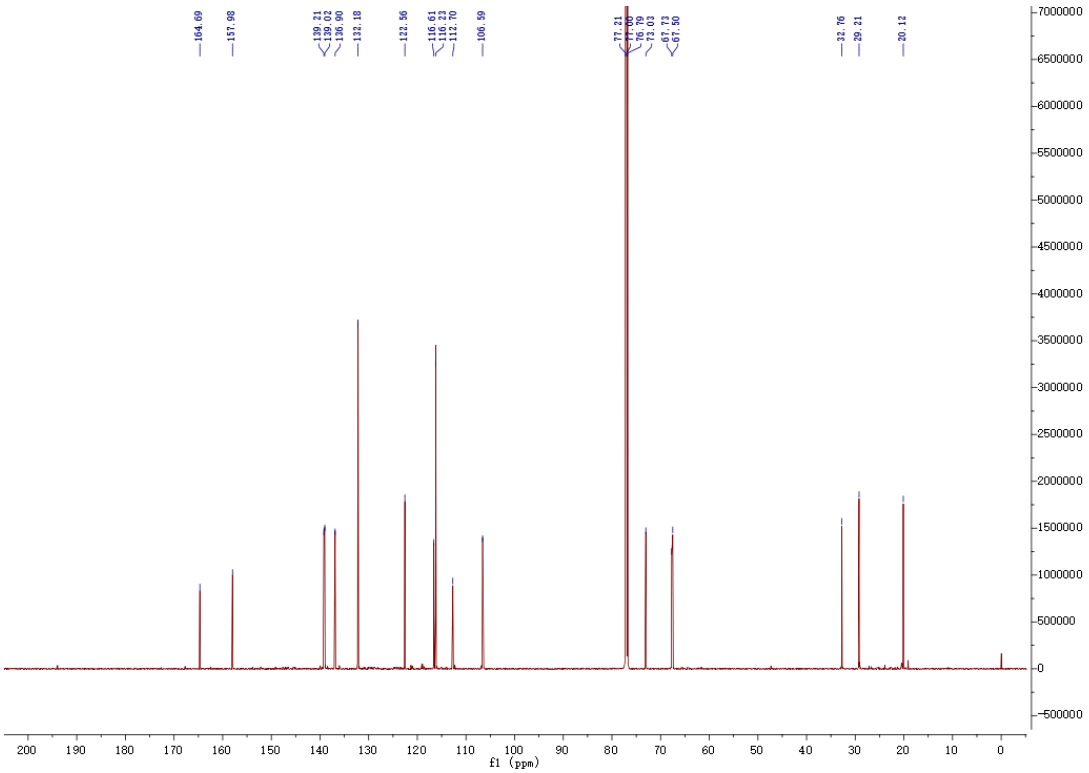
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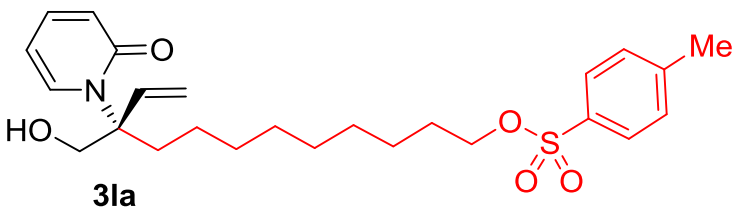
f1 (ppm)



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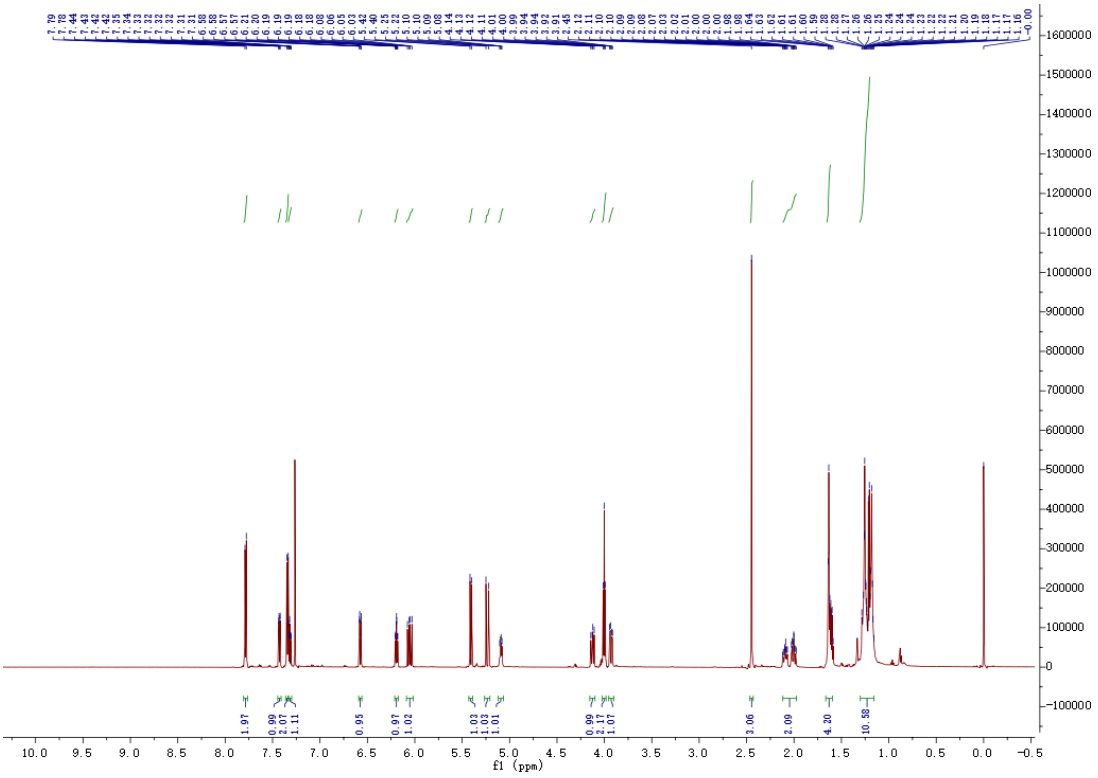

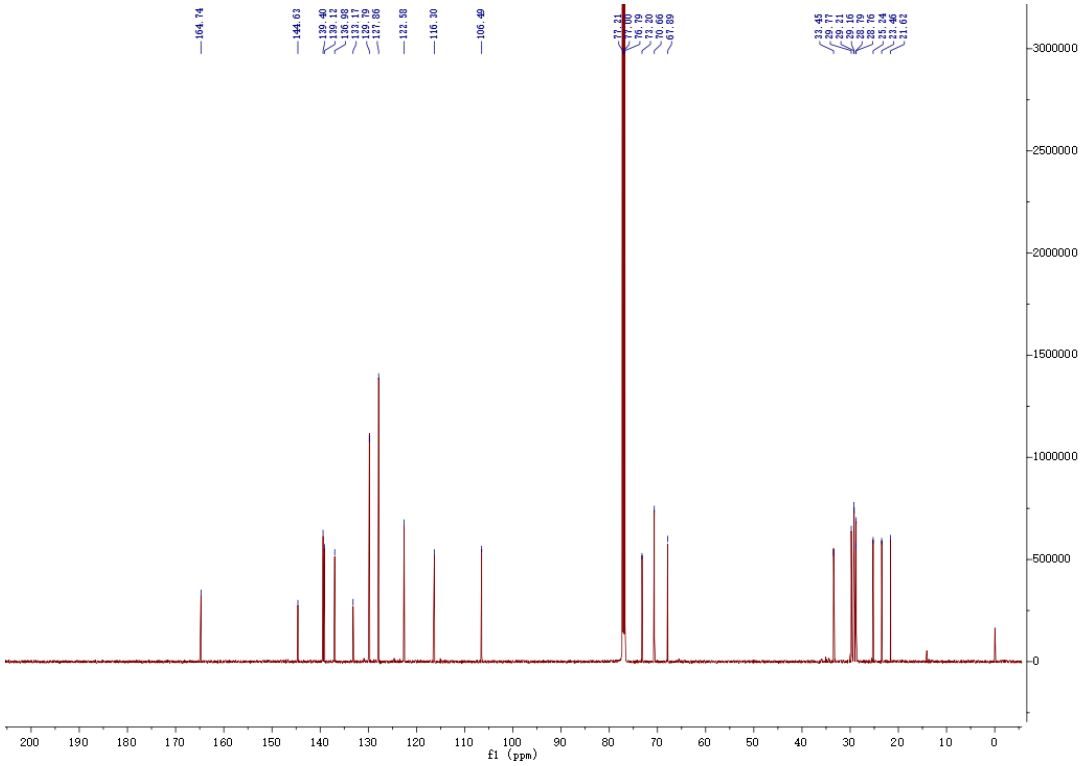

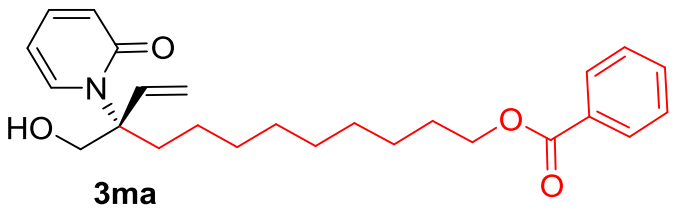

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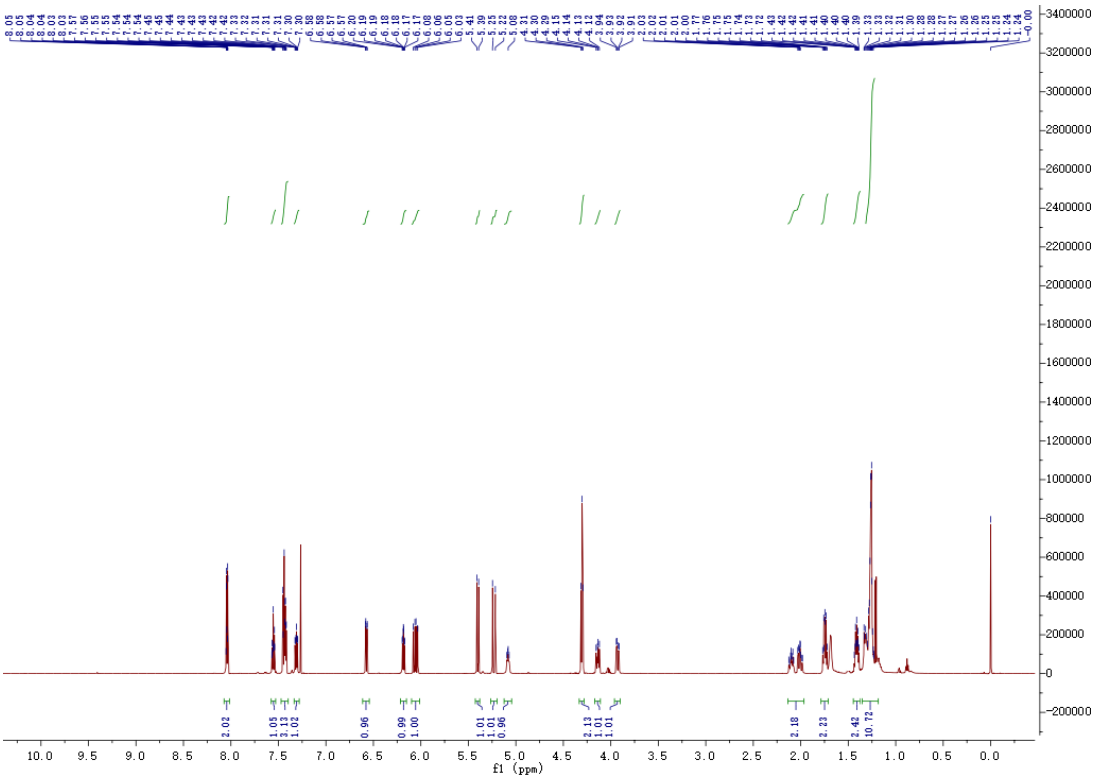

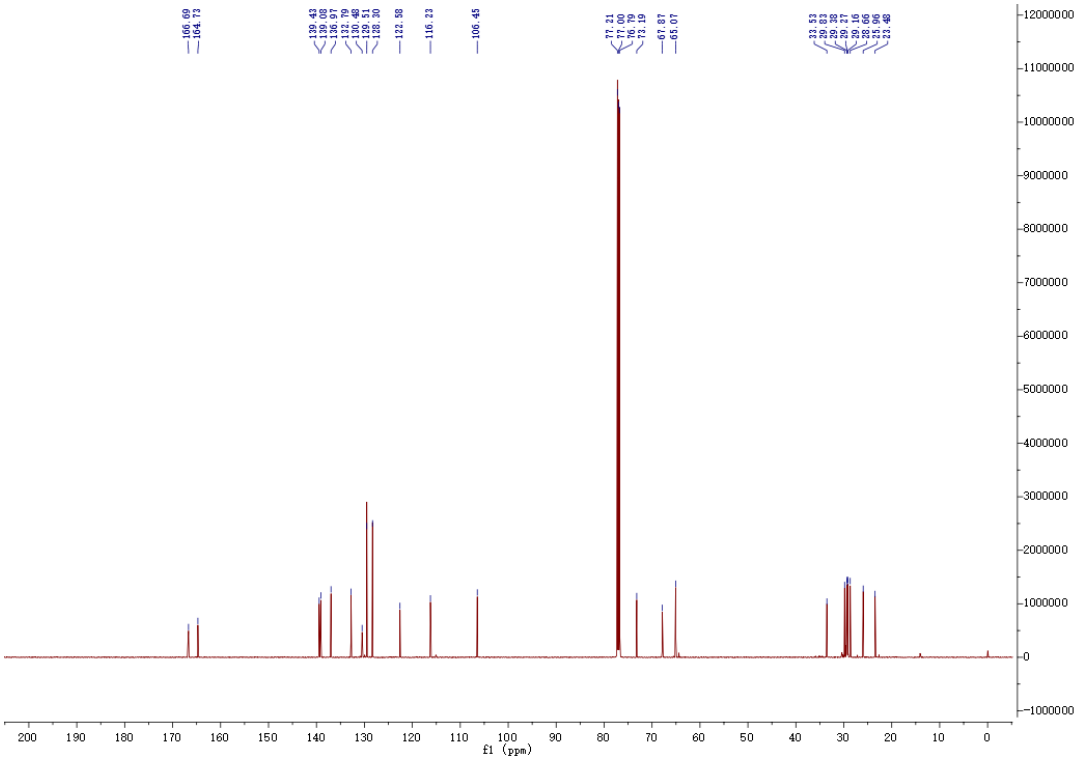

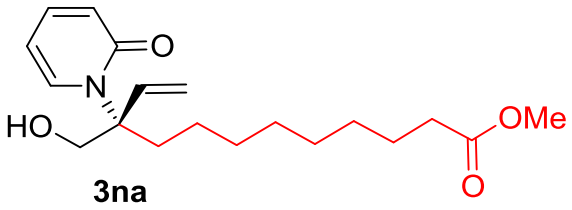

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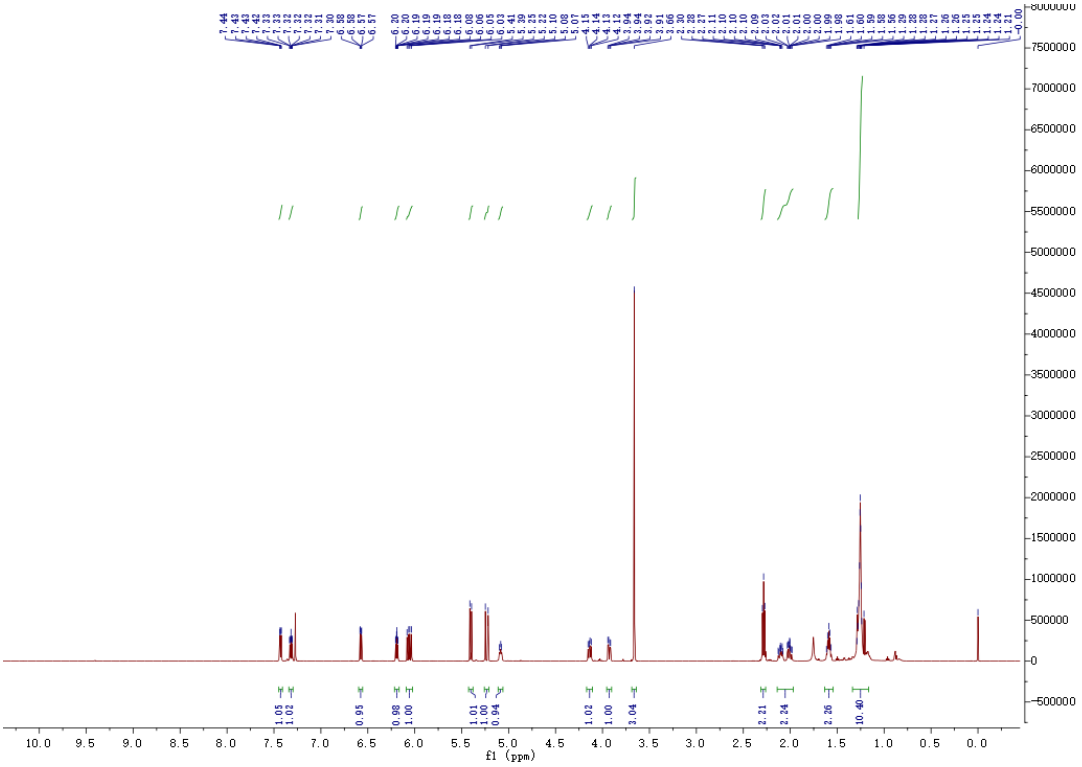

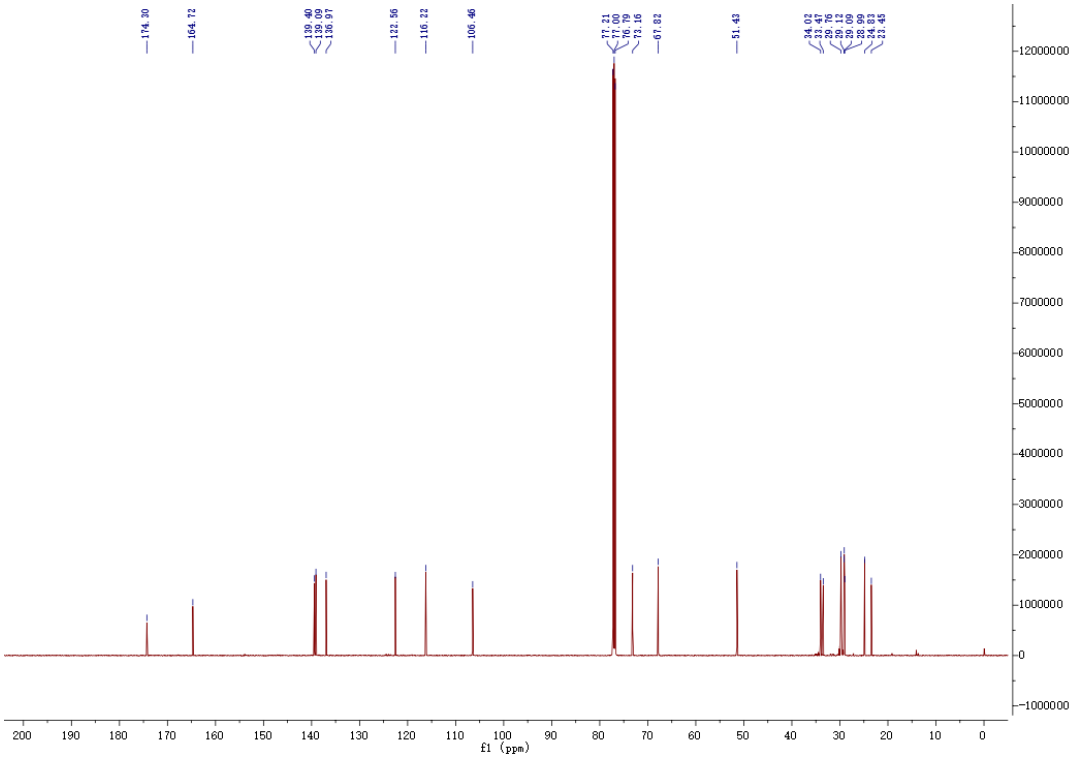

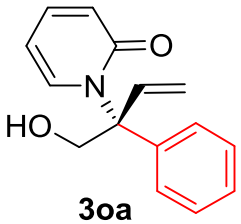

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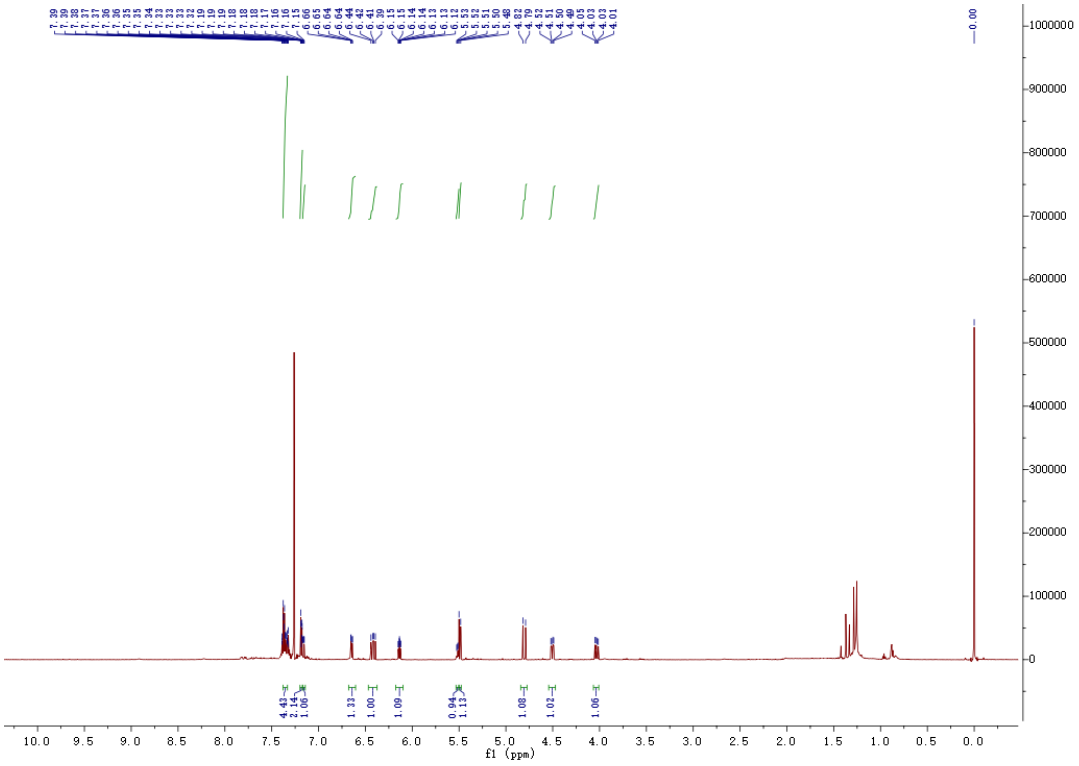
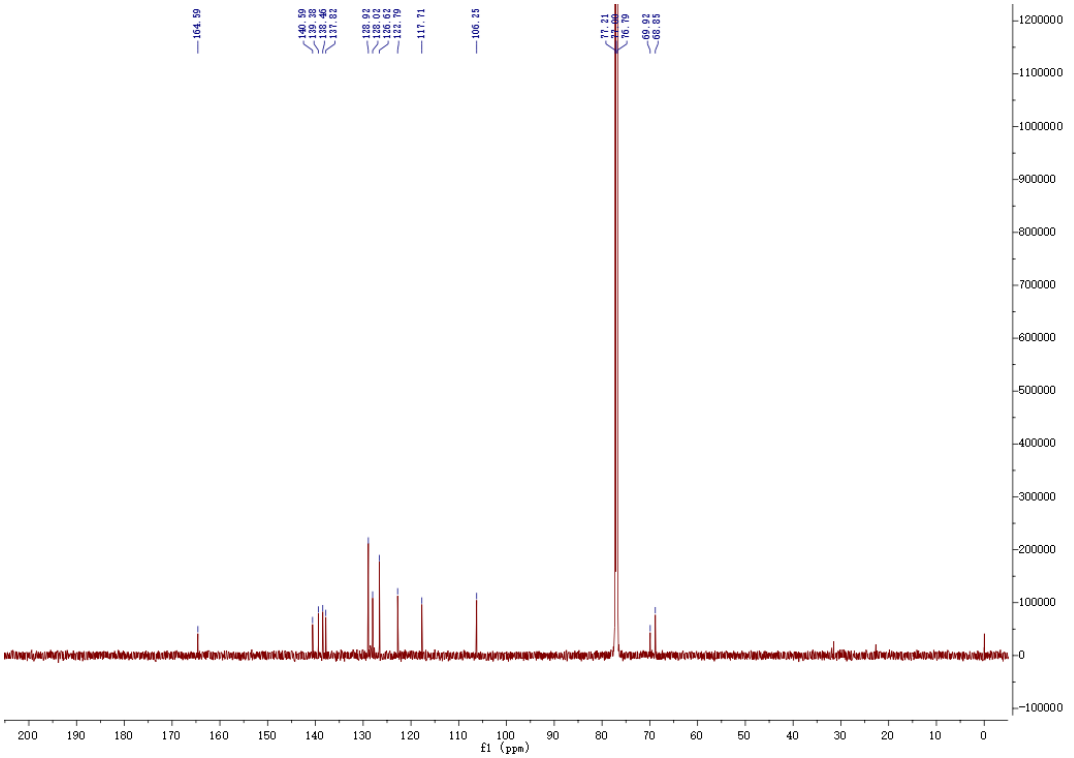
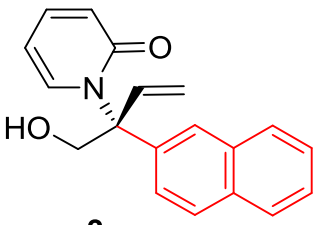
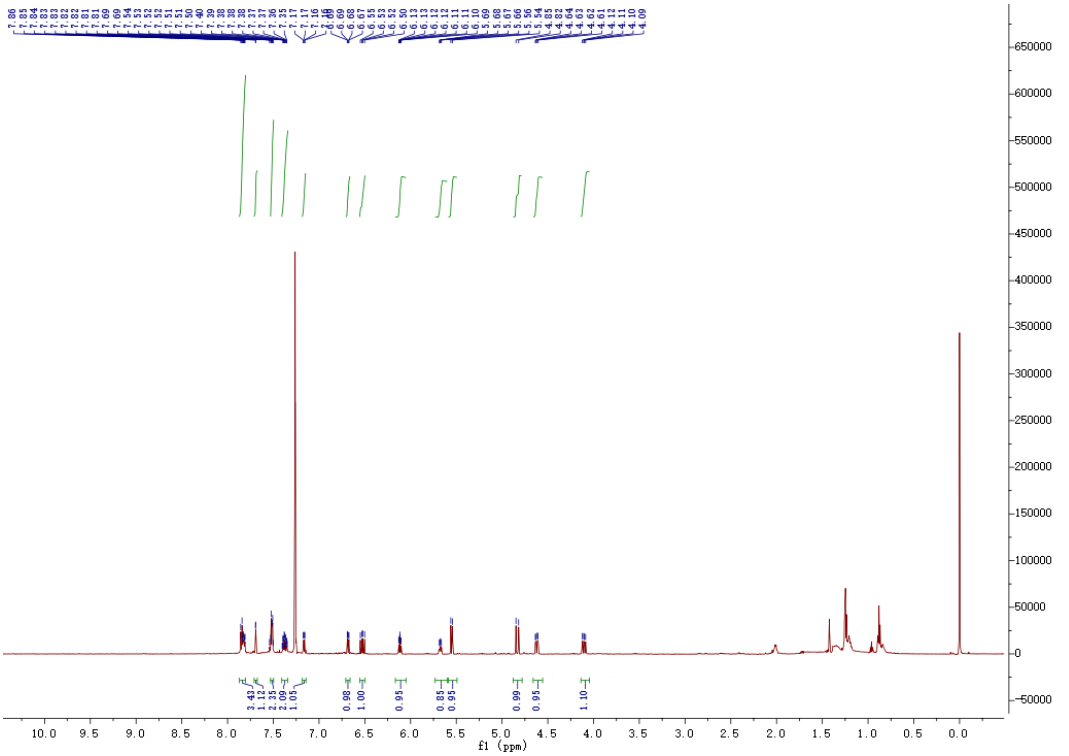
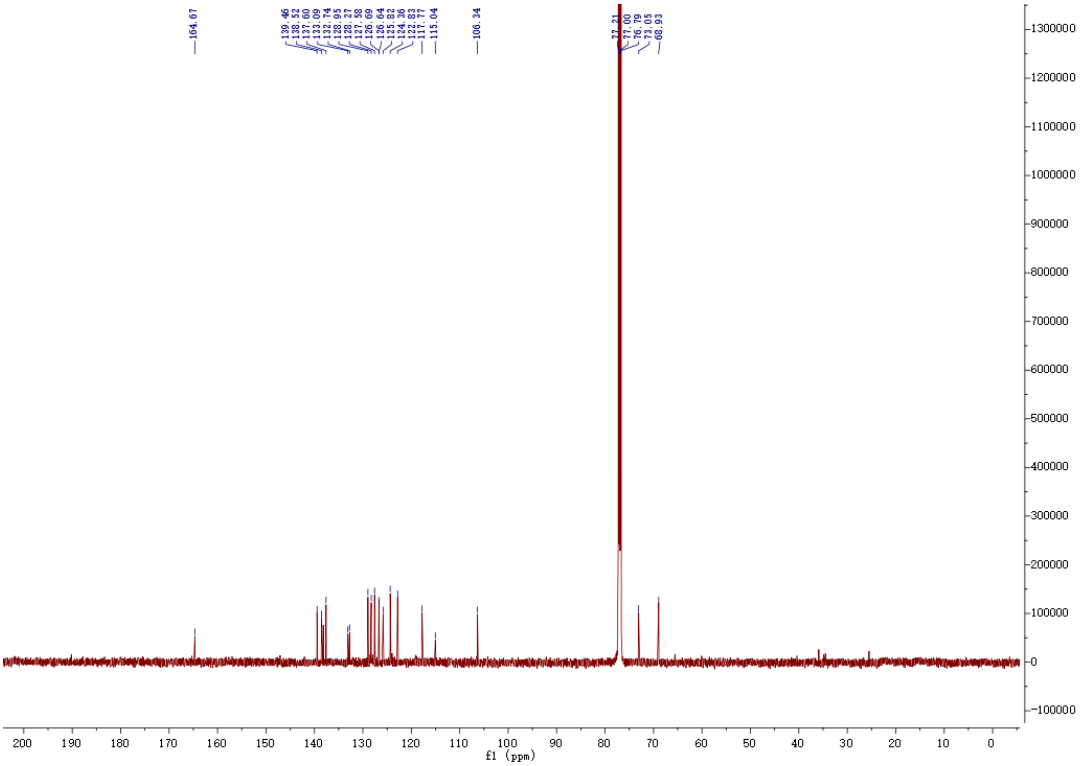


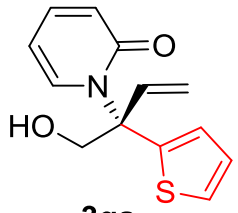




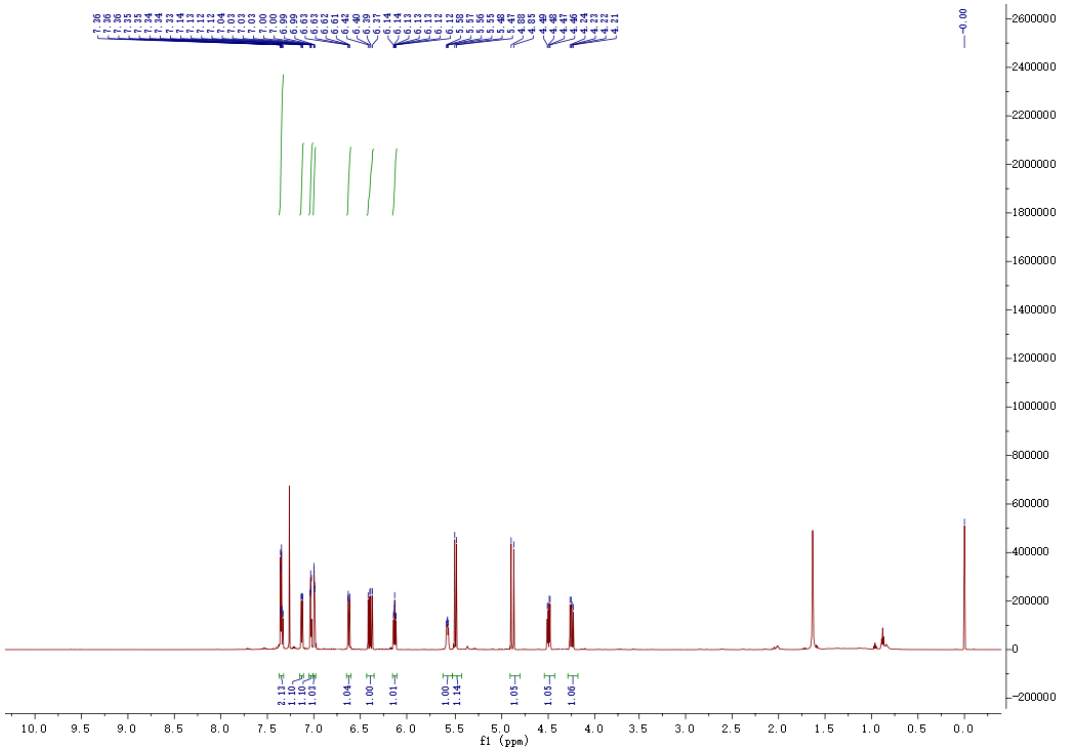
3pa

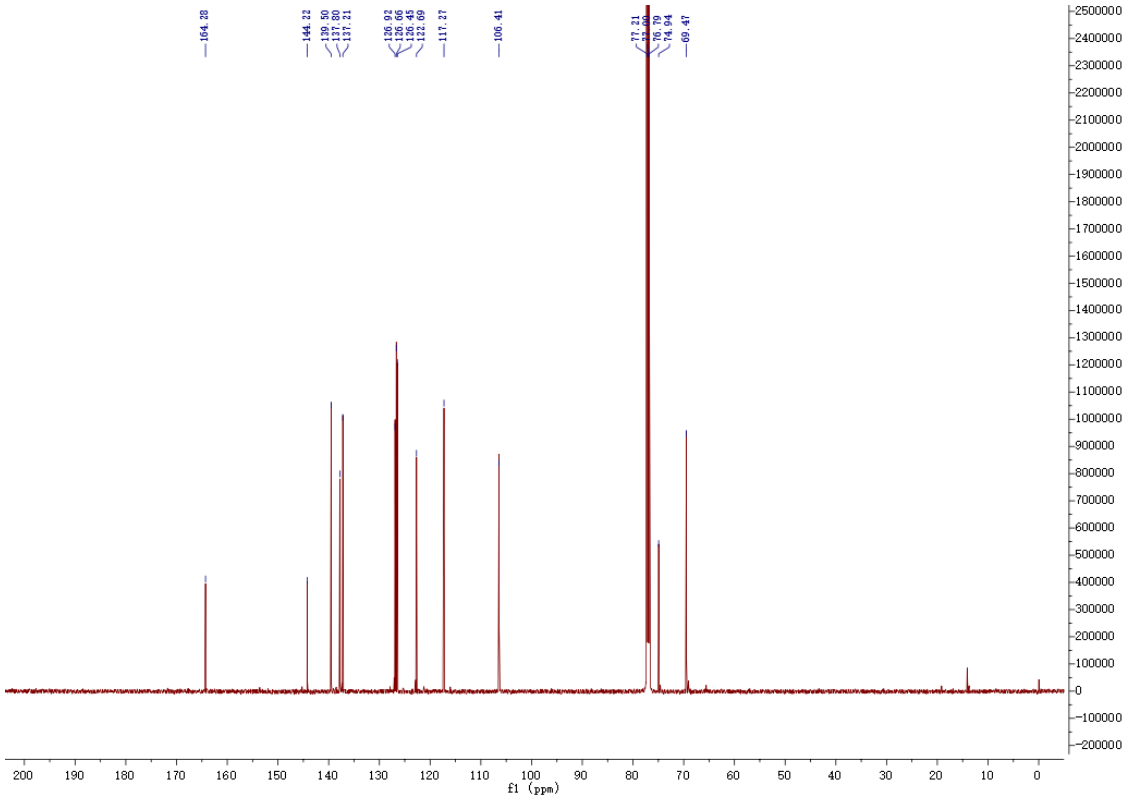


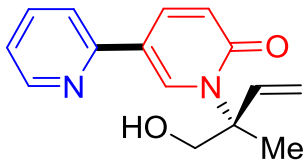




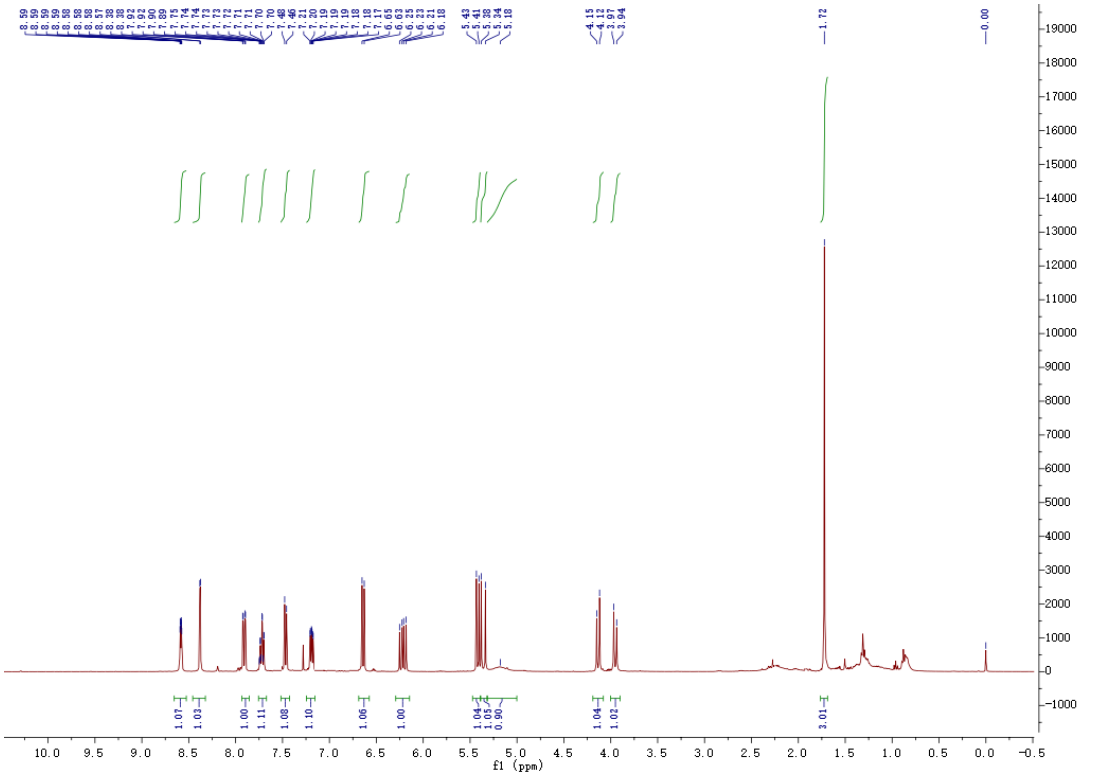
3qa

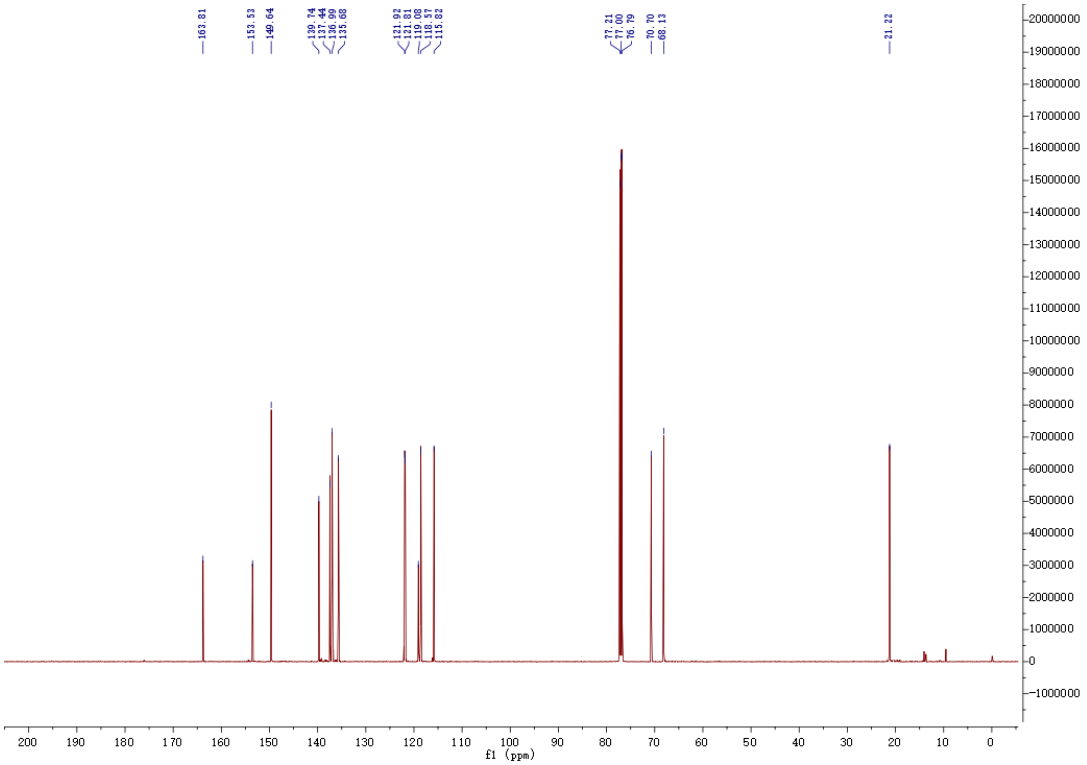


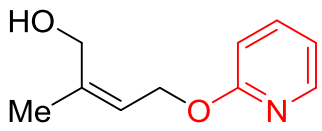




5






HO
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O
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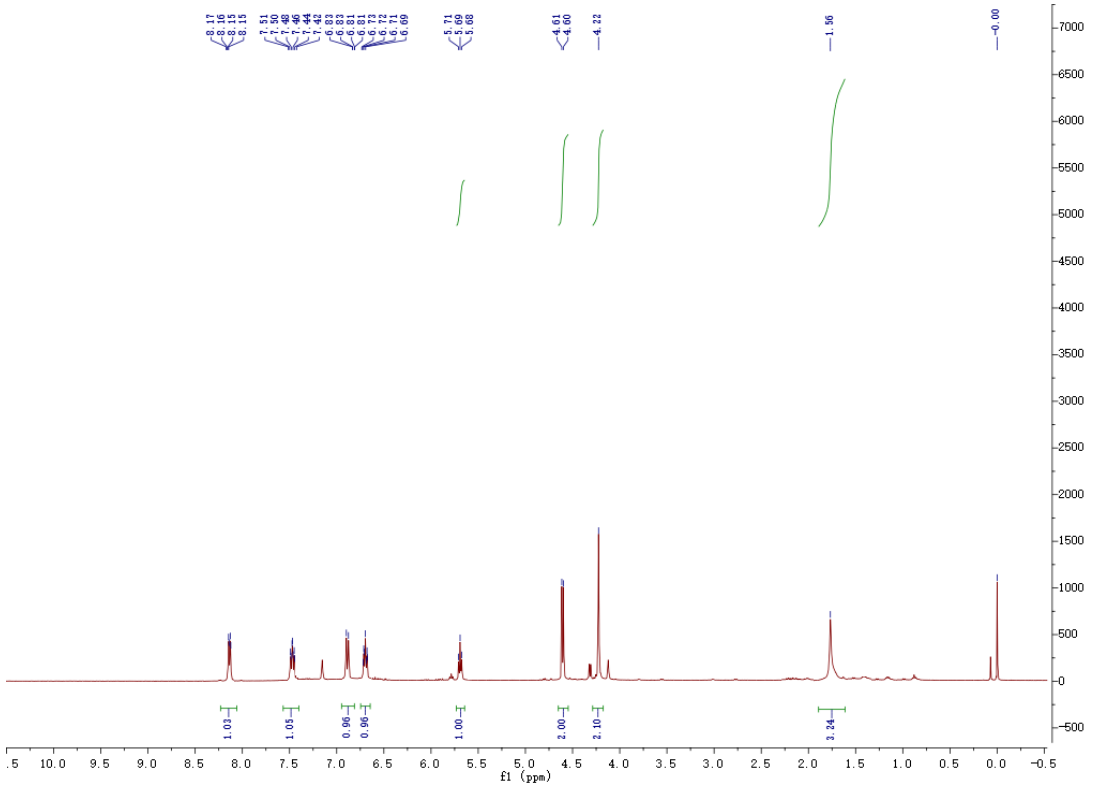
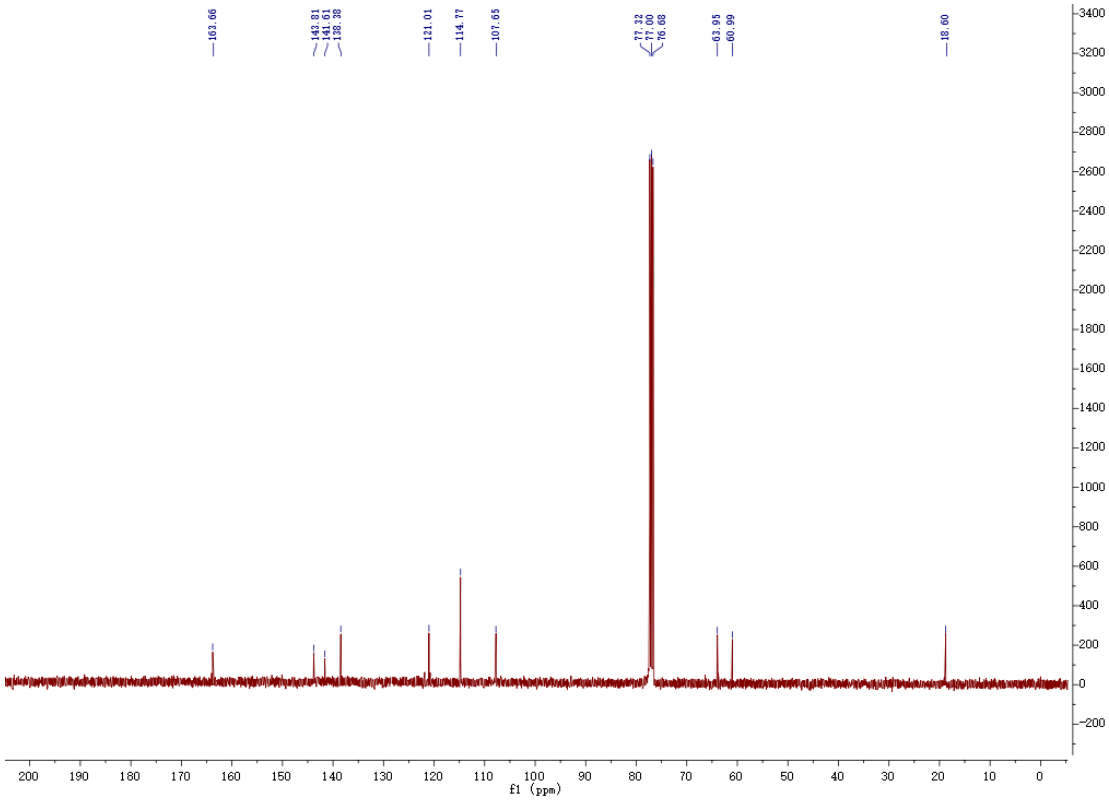
7ab


8.17
8.16
8.15
8.15
7.51
7.50
7.48
7.46
7.44
7.42
6.83
6.81
6.81
6.72
6.72
6.71
6.69
5.71
5.69
5.68
4.61
4.60
4.22
1.56
0.00
1.03
1.05
0.96
0.96
1.00
2.00
2.10
3.24
f1 (ppm)


163.66
147.81
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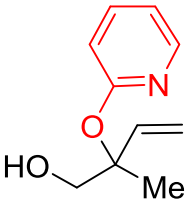
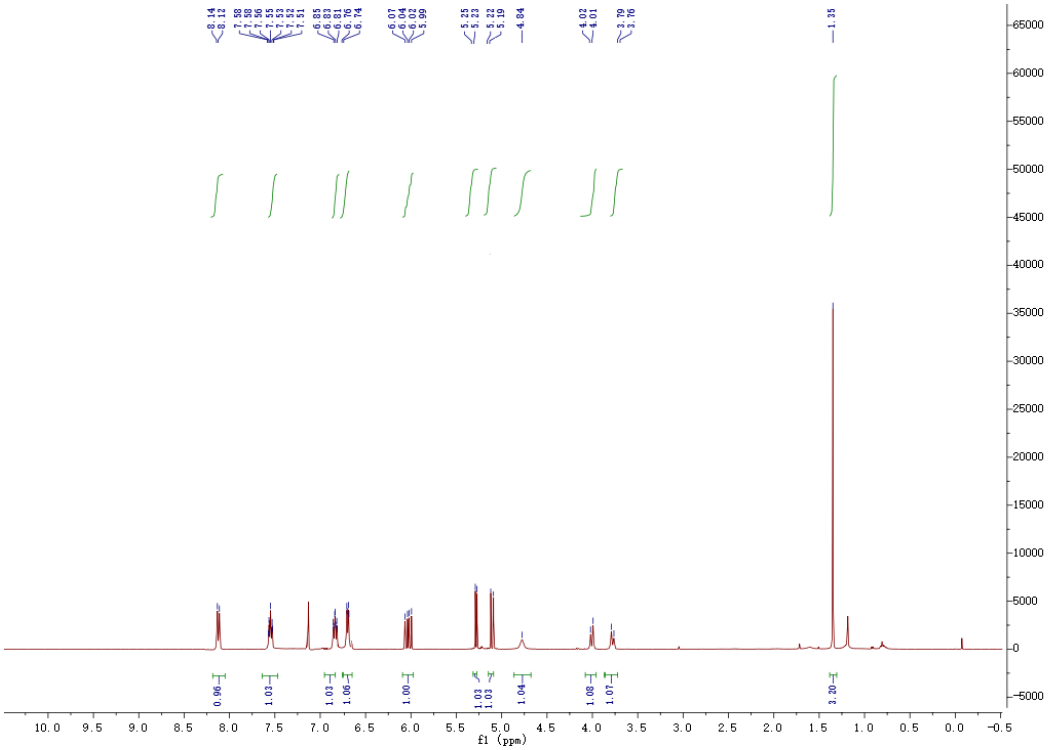
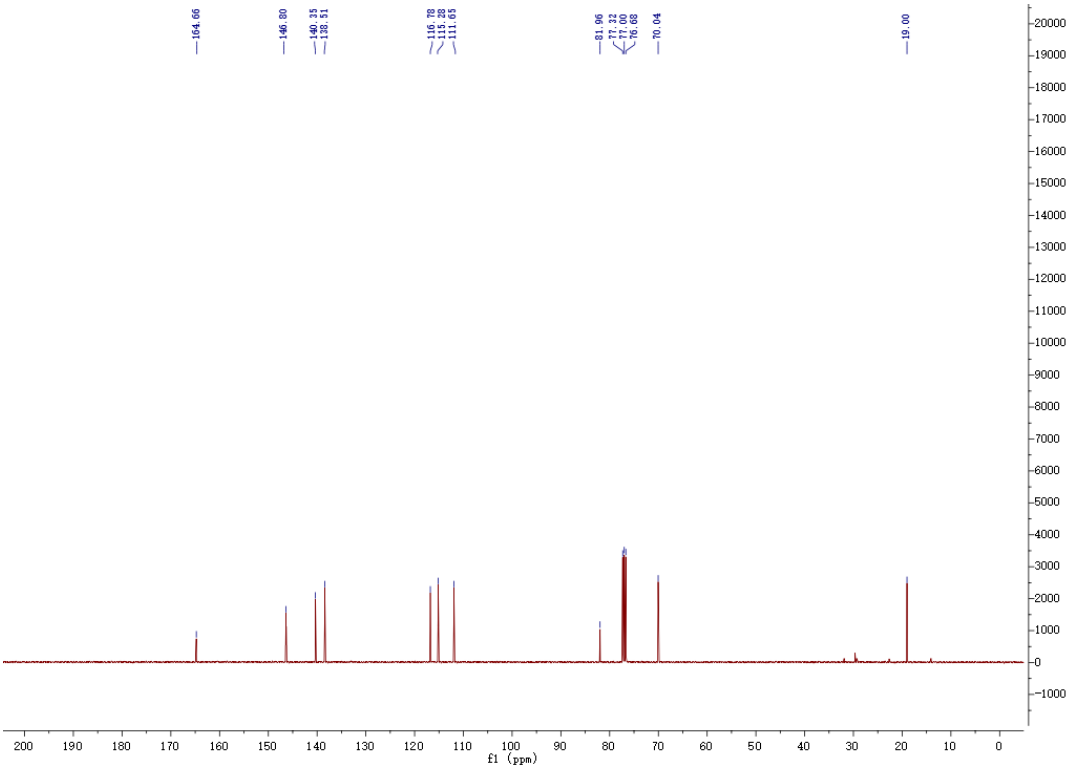
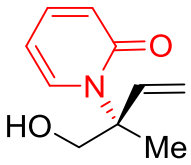
138.38
121.01
114.77
107.65
77.32
77.00
76.68
63.95
60.99
18.60
f1 (ppm)



6ab

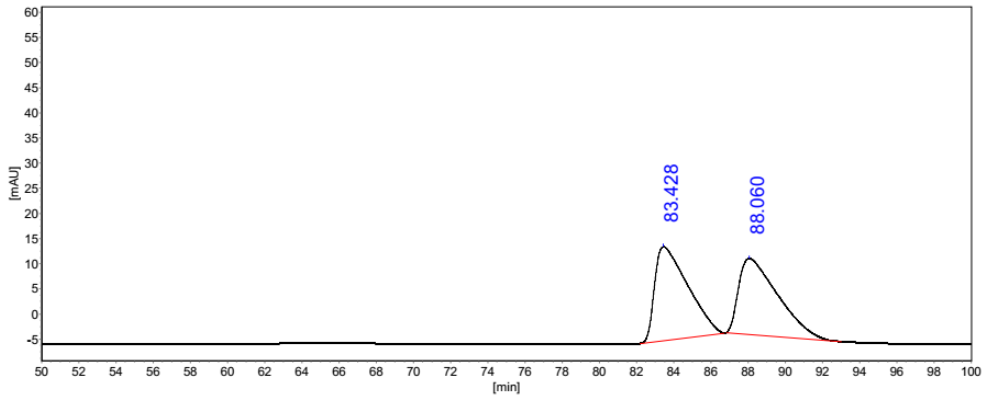






3aa

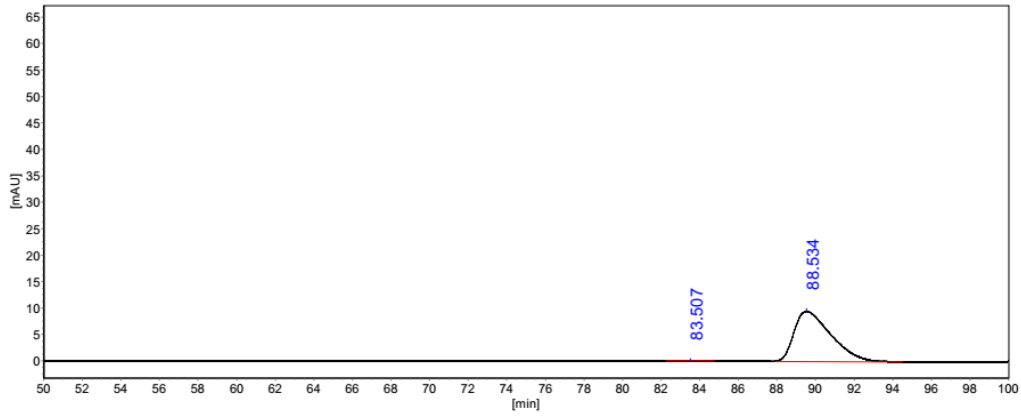
Inject Time: 2019-07-27 14:33:12 Stop Time: 2019-07-27 16:13:12
Comment：



Analysis Results

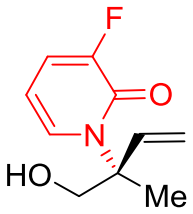
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		83.428	18671.3	2294775.3	50.7282	50.7282	+ BB
2		88.060	15139.8	2228891.5	49.2718	49.2718	+ BB
	Total:		**33811.1**	**4523666.9**	**100.0000**	**100.0000**	

Inject Time: 2019-07-27 16:14:05 Stop Time: 2019-07-27 17:54:05
Comment：



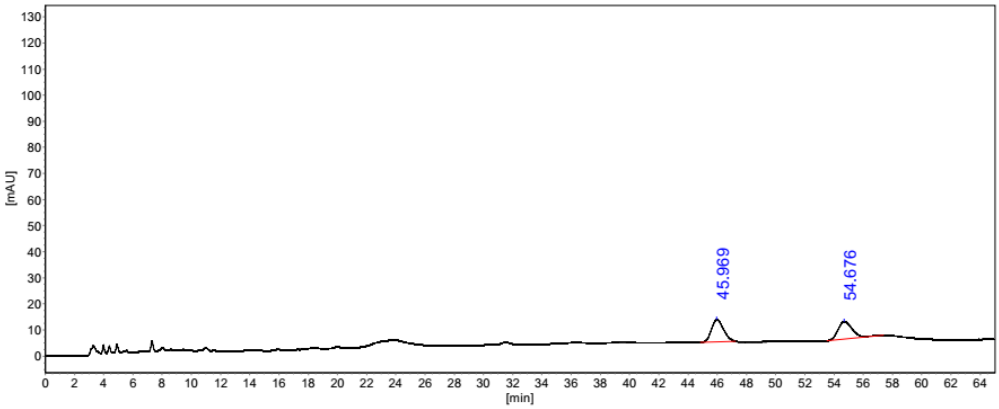
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		83.507	24.0	2152.1	0.1711	0.1711	+NBB
2		88.534	9476.5	1255874.9	99.8289	99.8289	+ BB
	Total:		**9500.5**	**1258027.0**	**100.0000**	**100.0000**	



3ab

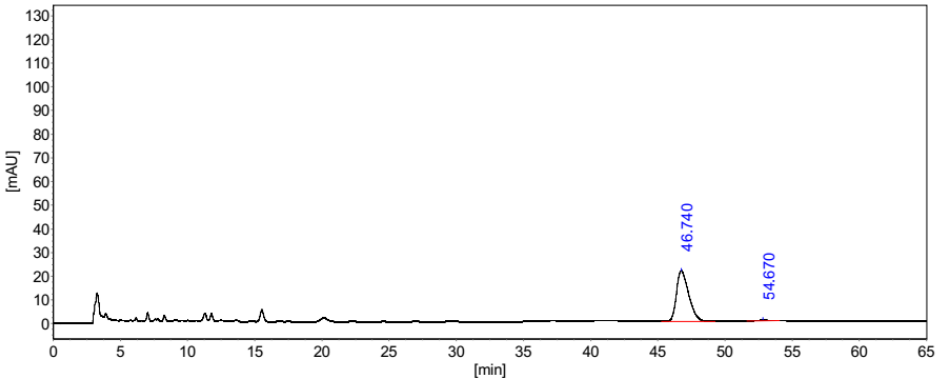
Inject Time: 2019-08-15 10:57:27 Stop Time: 2019-08-15 12:02:26
Comment：



Analysis Results

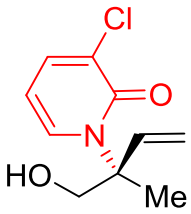
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		45.969	8530.8	489358.8	51.8443	51.8443	+ BB
2		54.676	6747.8	454541.4	48.1557	48.1557	+ BB
	Total:		**15278.6**	**943900.2**	**100.0000**	**100.0000**	

Inject Time: 2019-08-15 13:59:57 Stop Time: 2019-08-15 15:04:57
Comment：



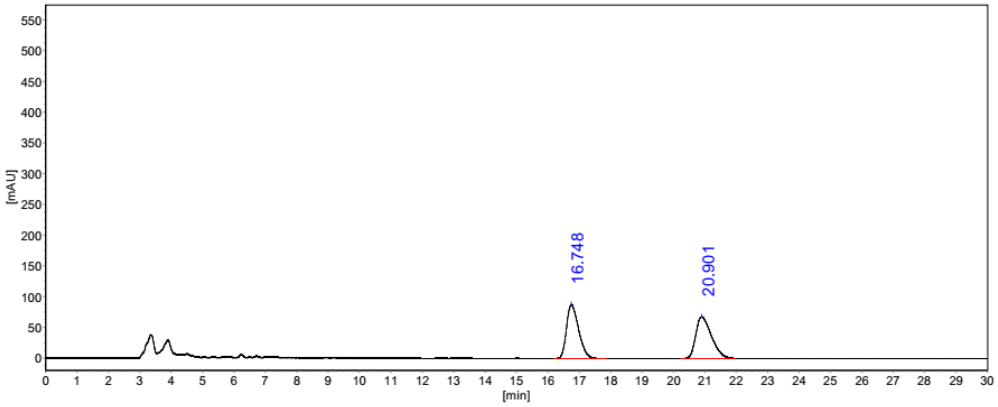
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		46.740	21368.7	1352182.1	98.3735	98.3735	+ BB
2		54.670	298.0	22356.5	1.6265	1.6265	+ BB
	Total:		**21666.7**	**1374538.7**	**100.0000**	**100.0000**	



3ac

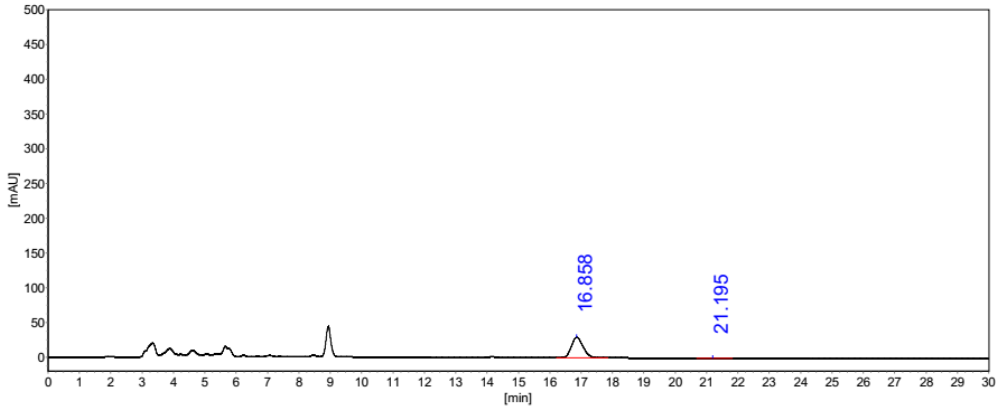
Inject Time: 2019-08-08 11:06:48 Stop Time: 2019-08-08 11:36:47
Comment:



Analysis Results

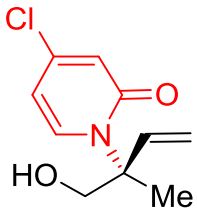
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.748	87453.2	2351149.2	50.0243	50.0243	BB
2		20.901	67763.7	2348867.6	49.9757	49.9757	BB
	Total:		**155216.9**	**4700016.8**	**100.0000**	**100.0000**	

Inject Time: 2019-08-08 09:45:08 Stop Time: 2019-08-08 10:25:08
Comment:



Analysis Results

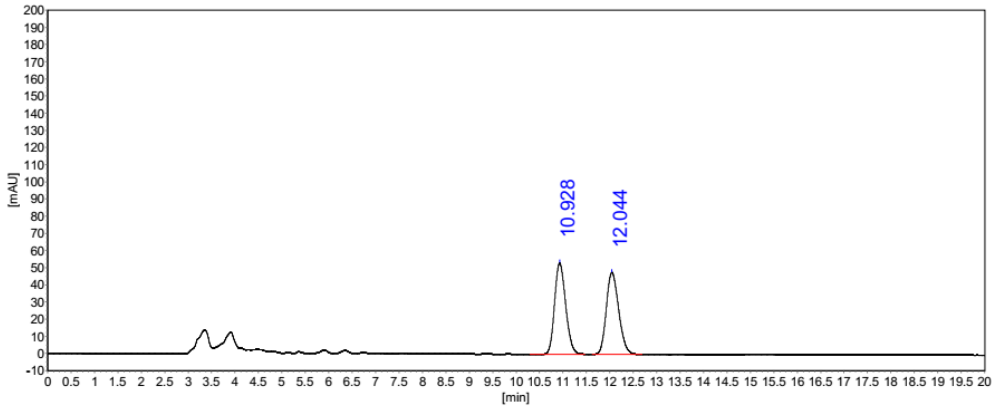
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.858	29462.2	780370.8	98.5417	98.5417	BB
2		21.195	334.6	11548.3	1.4583	1.4583	BB
	Total:		**29796.8**	**791919.1**	**100.0000**	**100.0000**	



3ad

Inject Time: 2019-08-22 09:21:22 Stop Time: 2019-08-22 10:11:22

Comment:

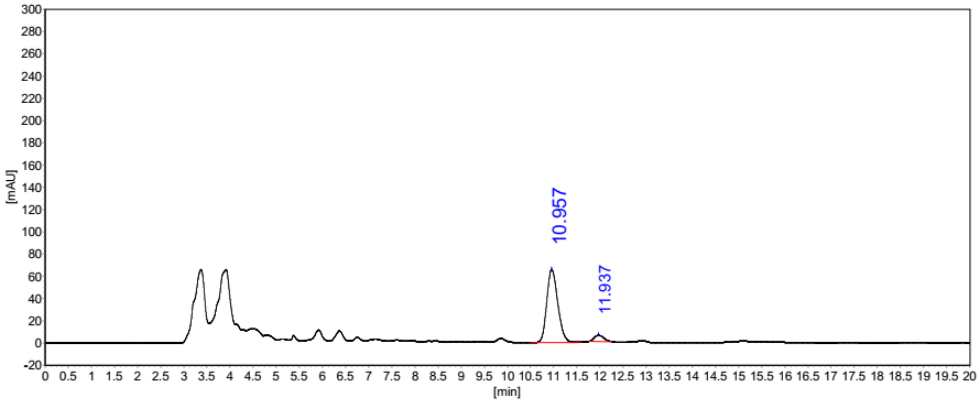


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		10.928	53266.0	875172.6	49.9358	49.9358	+ BB
2		12.044	47734.9	877423.9	50.0642	50.0642	+ BB
	Total:		**101000.9**	**1752596.4**	**100.0000**	**100.0000**	

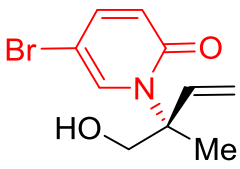
Inject Time: 2019-08-22 11:53:57 Stop Time: 2019-08-22 12:13:57

Comment:



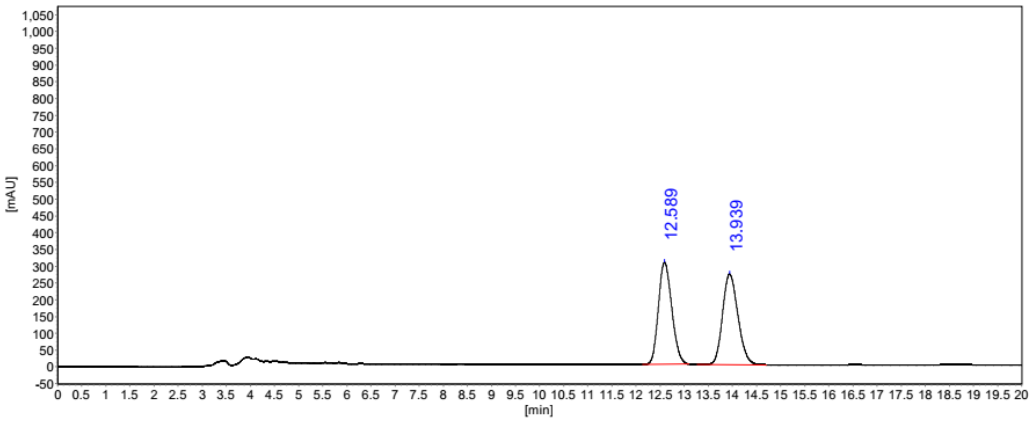
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		10.957	65705.0	1088319.1	95.1966	95.1966	+ BB
2		11.937	4649.6	54913.6	4.8034	4.8034	+ BB
	Total:		**70354.6**	**1143232.7**	**100.0000**	**100.0000**	



3ae

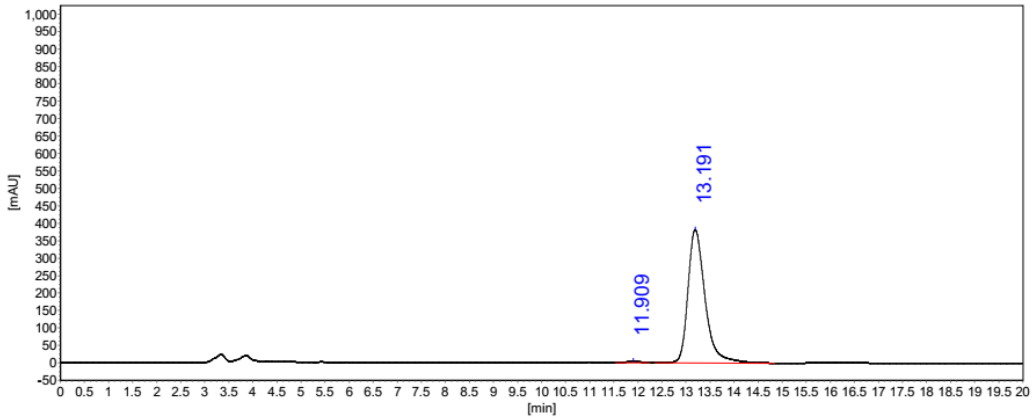
Inject Time: 2019-08-17 11:04:32 Stop Time: 2019-08-17 11:26:32
Comment：



Analysis Results

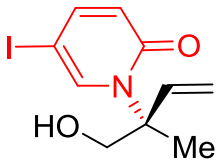
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		12.589	304187.2	5891089.7	49.5211	49.5211	+ BB
2		13.939	270385.7	6005036.4	50.4789	50.4789	+ BB
	Total:		**574572.9**	**11896126.1**	**100.0000**	**100.0000**	

Inject Time: 2019-08-17 11:27:23 Stop Time: 2019-08-17 11:47:23
Comment：



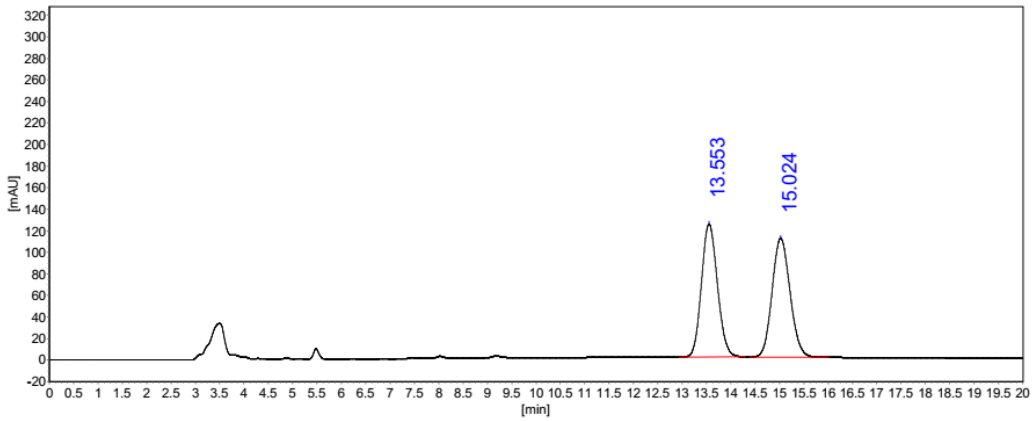
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		11.909	5699.7	103568.0	1.0811	1.0811	+ BB
2		13.191	382382.9	9476423.3	98.9189	98.9189	+ BB
	Total:		**388082.6**	**9579991.3**	**100.0000**	**100.0000**	



3af

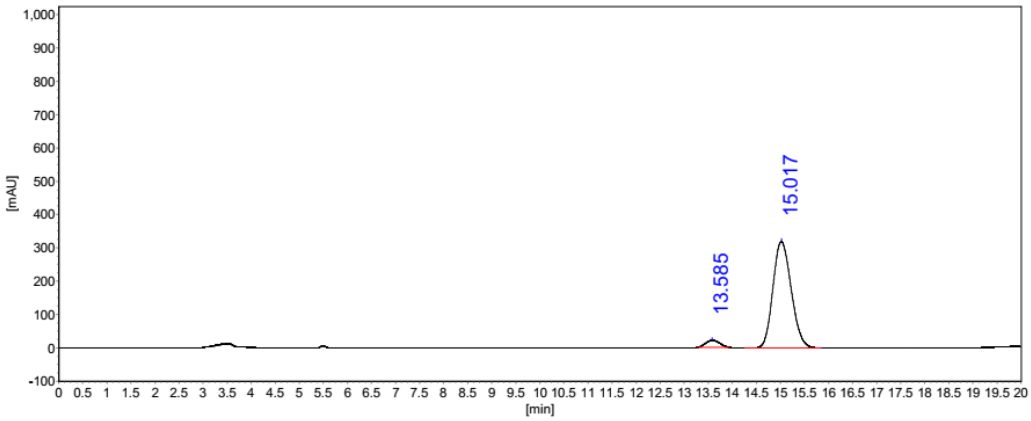
Inject Time: 2019-08-29 10:34:11 Stop Time: 2019-08-29 11:24:11
Comment:



Analysis Results

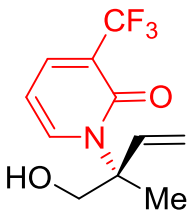
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		13.553	123499.2	2818614.4	49.9065	49.9065	+ BB
2		15.024	110324.6	2829174.0	50.0935	50.0935	+ BB
	Total:		**233823.8**	**5647788.4**	**100.0000**	**100.0000**	

Inject Time: 2019-08-29 11:28:50 Stop Time: 2019-08-29 11:48:49
Comment:



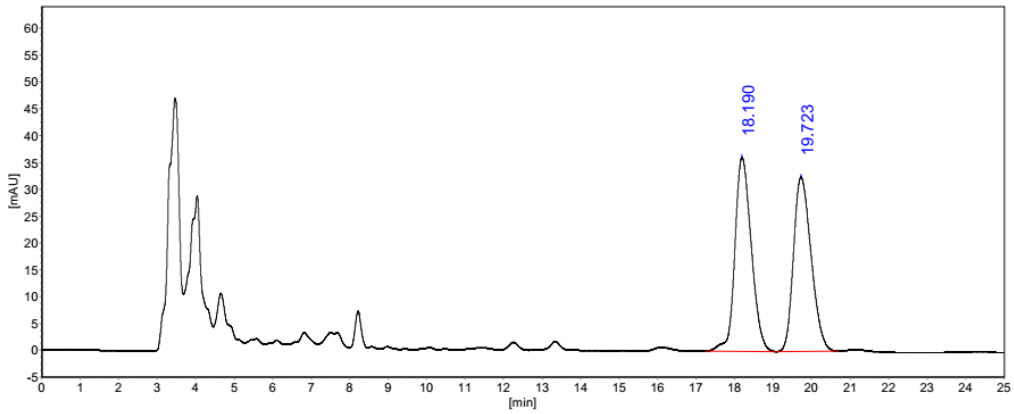
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		13.585	21780.7	443963.9	4.9859	4.9859	+ BB
2		15.017	319290.8	8460360.0	95.0141	95.0141	+ BB
	Total:		**341071.5**	**8904324.0**	**100.0000**	**100.0000**	



3ag

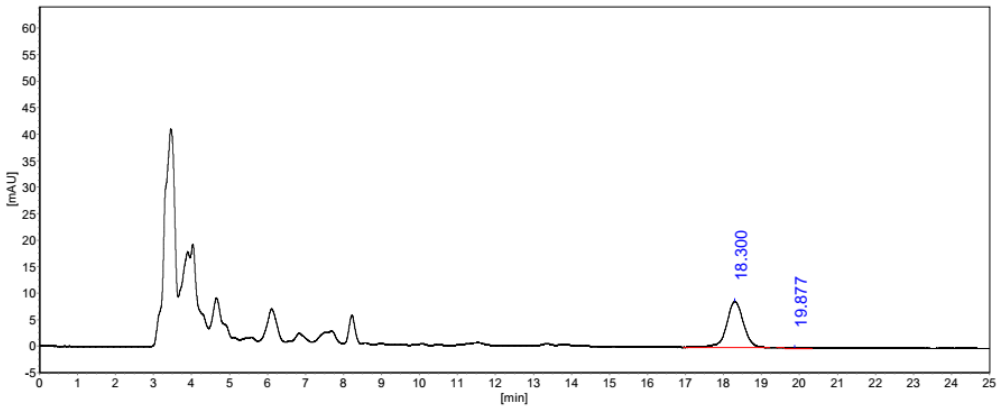
Inject Time: 2019-08-17 10:14:11 Stop Time: 2019-08-17 10:39:11
Comment：



Analysis Results

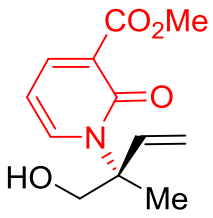
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		18.190	36146.3	1069852.7	50.8316	50.8316	+ BB
2		19.723	32498.1	1034845.8	49.1684	49.1684	+ BB
	Total:		**68644.4**	**2104698.5**	**100.0000**	**100.0000**	

Inject Time: 2019-08-17 09:48:18 Stop Time: 2019-08-17 10:13:18
Comment：



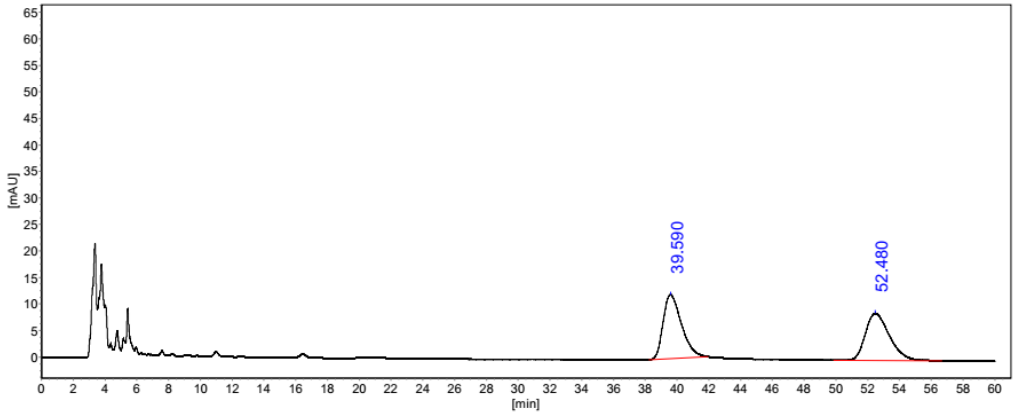
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		18.300	8663.3	263549.3	98.7801	98.7801	+ BB
2		19.877	130.3	3254.8	1.2199	1.2199	+ BB
	Total:		**8793.6**	**266804.0**	**100.0000**	**100.0000**	



3ah

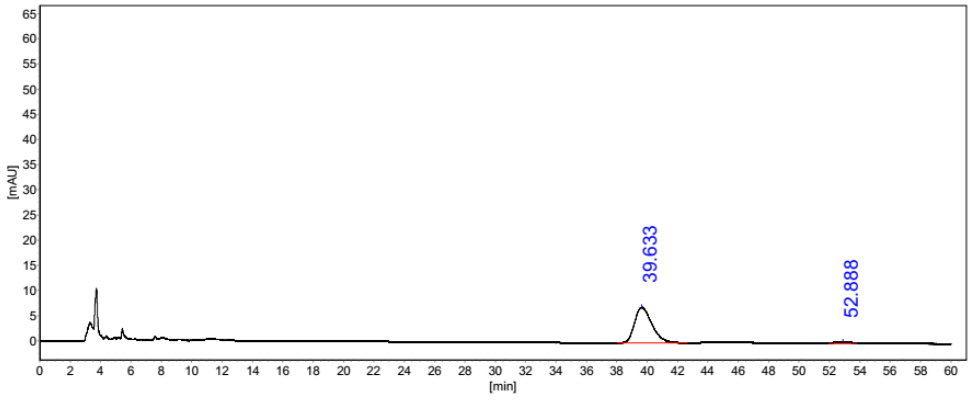
Inject Time: 2019-09-02 09:53:06 Stop Time: 2019-09-02 10:53:05
Comment:



Analysis Results

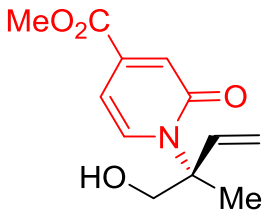
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		39.590	12043.1	973281.9	51.1114	51.1114	+ BB
2		52.480	8863.9	930956.0	48.8886	48.8886	+ BB
	Total:		**20907.0**	**1904237.9**	**100.0000**	**100.0000**	

Inject Time: 2019-09-02 10:53:58 Stop Time: 2019-09-02 11:53:58
Comment:



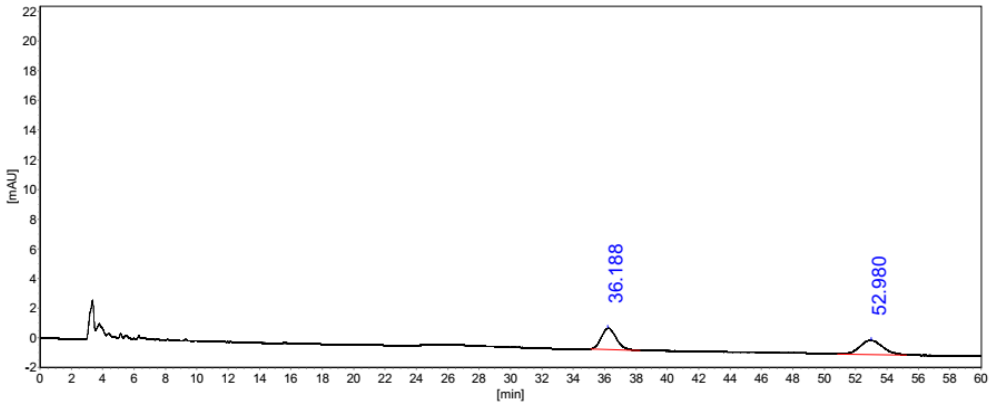
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		39.633	7038.5	558073.0	96.6524	96.6524	+ BB
2		52.888	286.7	19329.2	3.3476	3.3476	+ BB
	Total:		**7325.2**	**577402.2**	**100.0000**	**100.0000**	



3ai

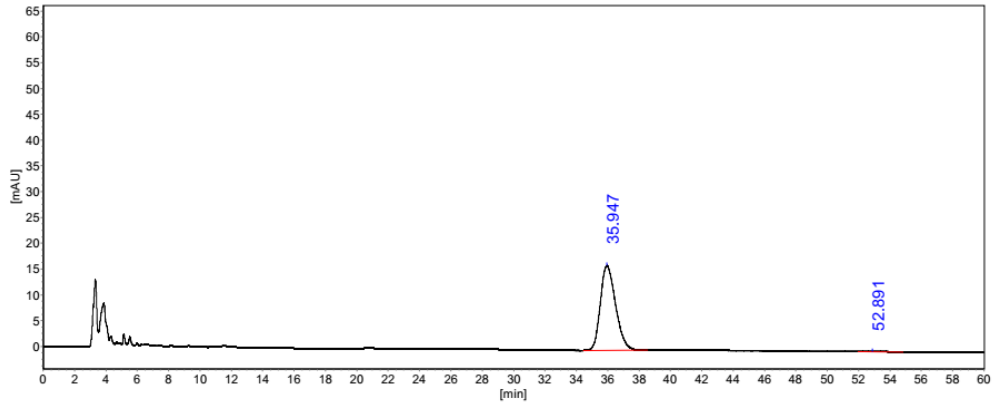
Inject Time: 2019-08-22 16:11:01 Stop Time: 2019-08-22 17:11:01
Comment:



Analysis Results

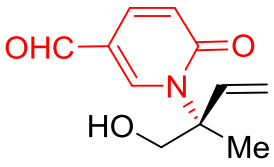
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		36.188	1434.8	95208.0	49.8162	49.8162	BB
2		52.980	960.7	95910.4	50.1838	50.1838	BB
	Total:		**2395.5**	**191118.4**	**100.0000**	**100.0000**	

Inject Time: 2019-08-22 15:10:10 Stop Time: 2019-08-22 16:10:09
Comment:



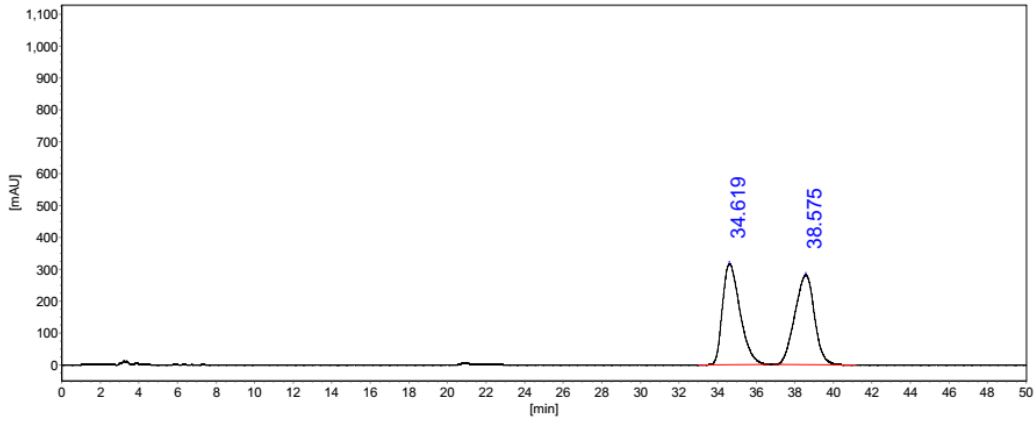
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		35.947	16396.0	1107434.5	99.3637	99.3637	+ BB
2		52.891	88.1	7092.3	0.6363	0.6363	BB
	Total:		**16484.1**	**1114526.7**	**100.0000**	**100.0000**	



3aj

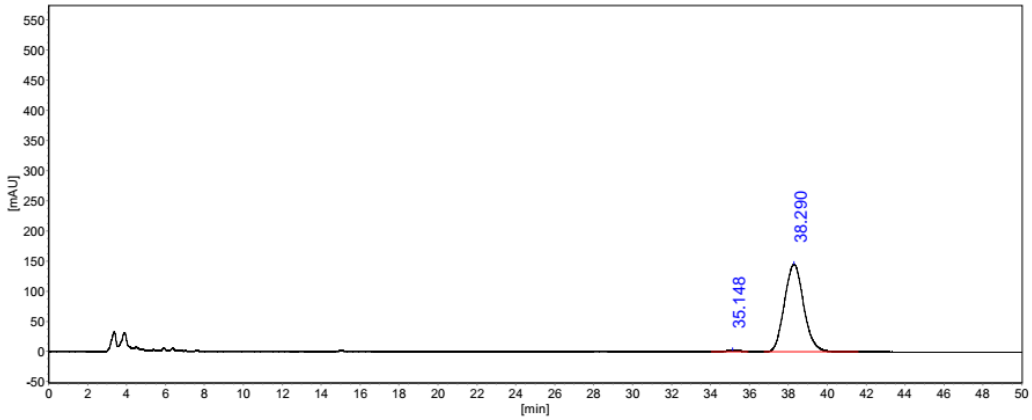
Inject Time: 2019-08-22 10:12:14 Stop Time: 2019-08-22 11:02:13
Comment：



Analysis Results

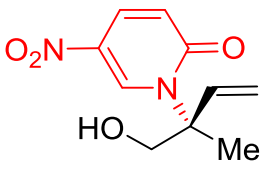
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		34.619	316005.2	19940044.7	49.9233	49.9233	+ BB
2		38.575	281919.7	20001274.9	50.0767	50.0767	+ BB
	Total:		**597924.9**	**39941319.6**	**100.0000**	**100.0000**	

Inject Time: 2019-08-22 12:14:46 Stop Time: 2019-08-22 13:04:46
Comment：



Analysis Results

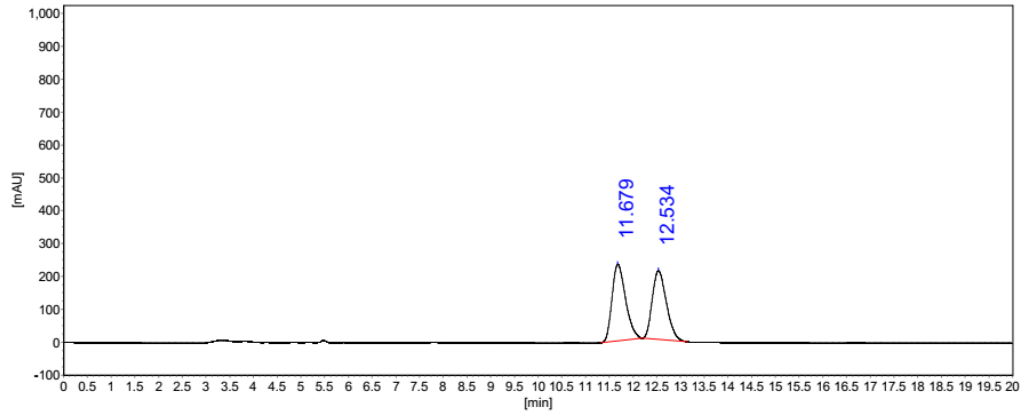
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		35.148	2087.3	108778.4	1.0771	1.0771	+ BB
2		38.290	144937.9	9990637.5	98.9229	98.9229	+ BB
	Total:		**147025.2**	**10099415.9**	**100.0000**	**100.0000**	



3ak

Inject Time: 2019-08-29 11:49:43 Stop Time: 2019-08-29 12:09:43

Comment:

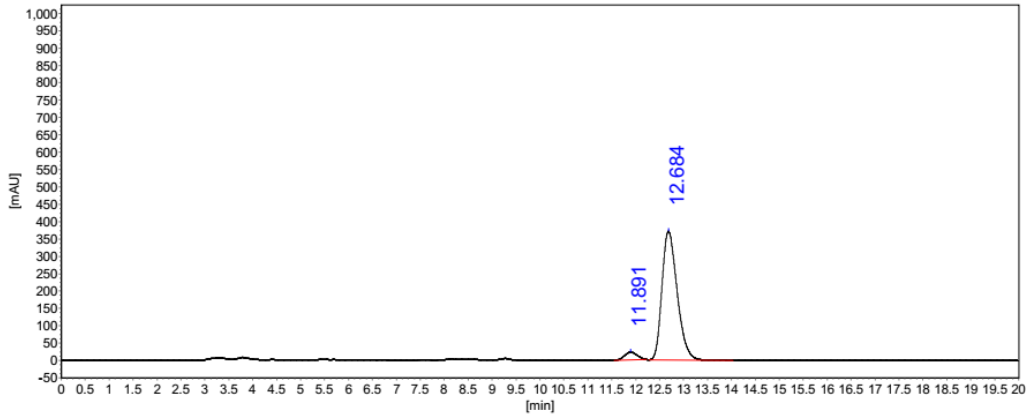


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		11.679	232876.6	4642570.4	51.6079	51.6079	+ BB
2		12.534	208859.8	4353288.3	48.3921	48.3921	+ BB
	Total:		**441736.4**	**8995858.7**	**100.0000**	**100.0000**	

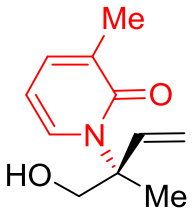
Inject Time: 2019-08-22 17:11:53 Stop Time: 2019-08-22 17:56:53

Comment:



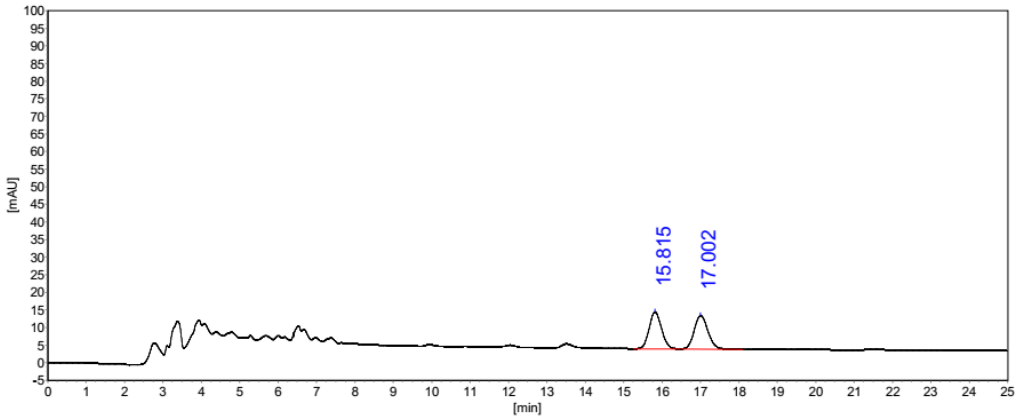
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		11.891	22374.0	413738.0	4.8201	4.8201	+ BB
2		12.684	370242.2	8169892.9	95.1799	95.1799	+ BB
	Total:		**392616.2**	**8583630.9**	**100.0000**	**100.0000**	



3al

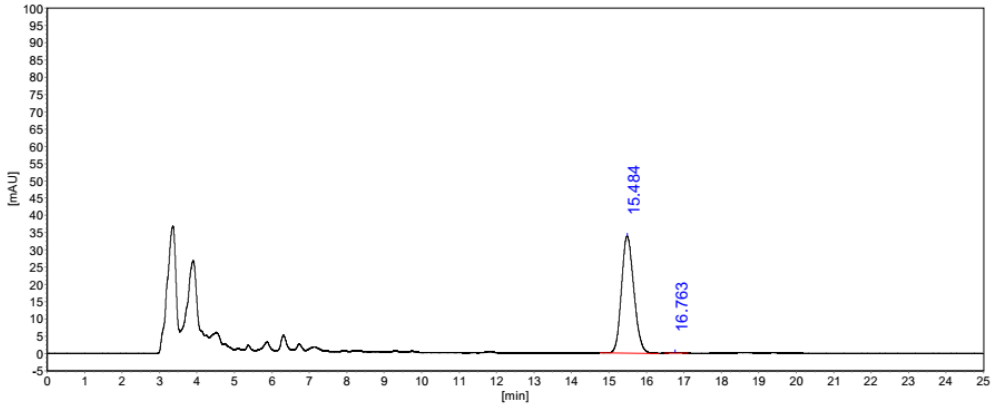
Inject Time: 2019-08-09 16:11:45 Stop Time: 2019-08-09 17:01:45
Comment:



Analysis Results

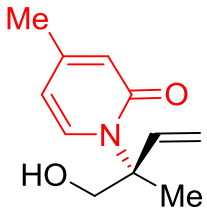
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		15.815	10455.2	236390.3	49.9974	49.9974	+ BB
2		17.002	9569.6	236415.0	50.0026	50.0026	+ BB
	Total:		**20024.8**	**472805.3**	**100.0000**	**100.0000**	

Inject Time: 2019-08-09 17:02:37 Stop Time: 2019-08-09 17:51:37
Comment:



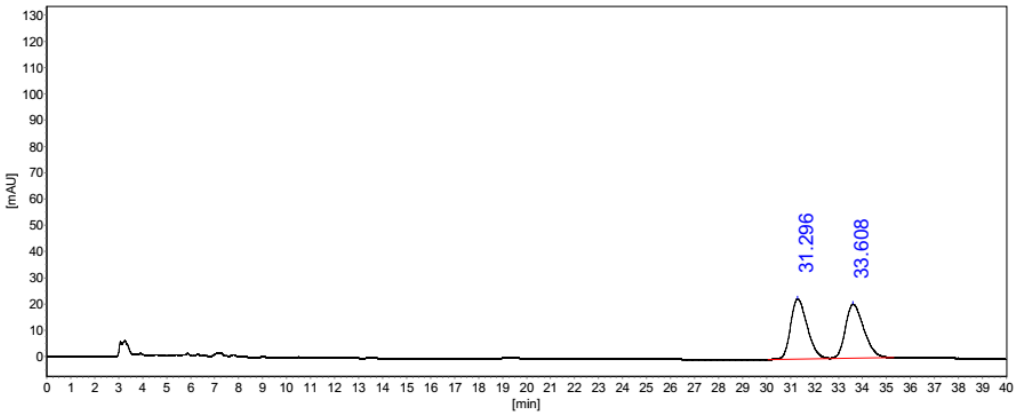
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		15.484	33844.3	783531.8	99.3219	99.3219	+ BB
2		16.763	249.4	5349.6	0.6781	0.6781	+ BB
	Total:		**34093.7**	**788881.4**	**100.0000**	**100.0000**	



3am

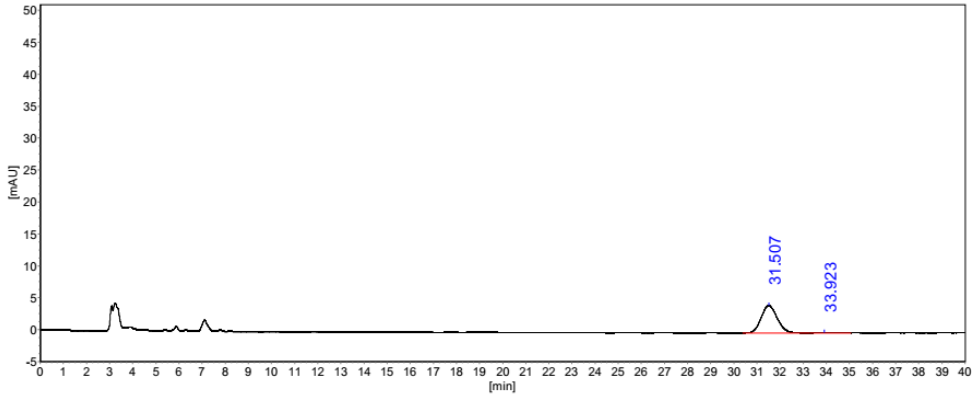
Inject Time: 2019-08-09 11:13:47 Stop Time: 2019-08-09 11:53:46
Comment：



Analysis Results

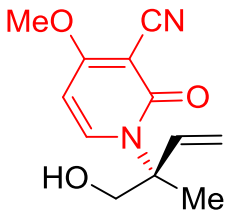
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		31.296	22886.3	1096193.5	49.9958	49.9958	BV
2		33.608	20537.2	1096378.6	50.0042	50.0042	VB
	Total:		**43423.5**	**2192572.1**	**100.0000**	**100.0000**	

Inject Time: 2019-08-09 11:54:37 Stop Time: 2019-08-09 12:34:36
Comment：



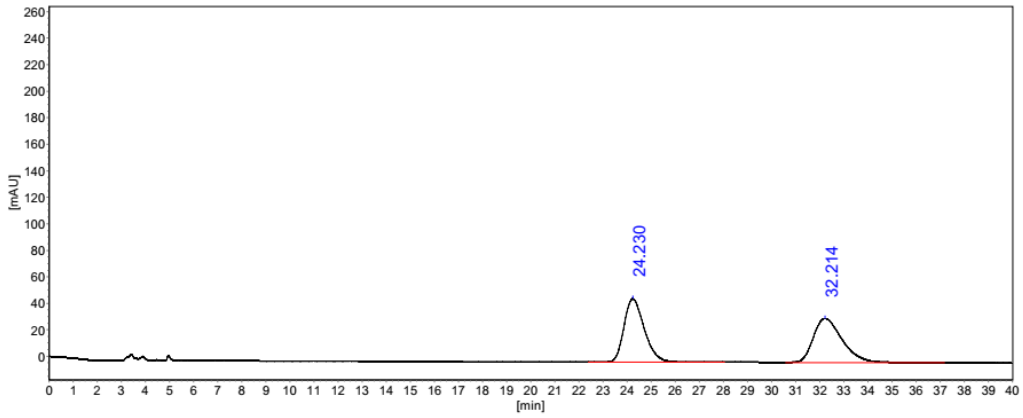
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		31.507	4283.5	206960.3	98.0372	98.0372	VV
2		33.923	79.8	4143.6	1.9628	1.9628	VV
	Total:		**4363.3**	**211103.8**	**100.0000**	**100.0000**	



3an

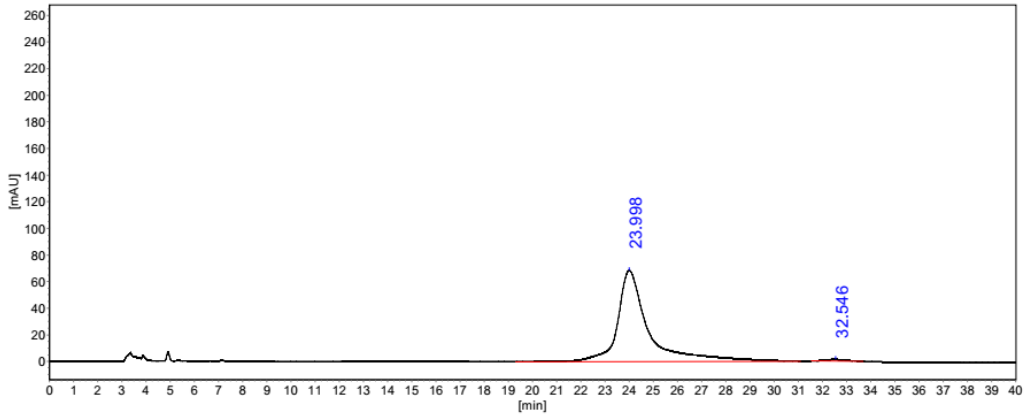
Inject Time: 2019-08-29 14:40:03 Stop Time: 2019-08-29 15:20:02
Comment:



Analysis Results

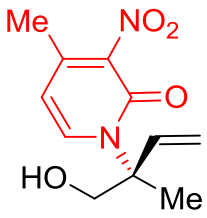
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		24.230	47771.9	2815780.0	50.3985	50.3985	BB
2		32.214	33261.2	2771251.6	49.6015	49.6015	BB
	Total:		**81033.1**	**5587031.6**	**100.0000**	**100.0000**	

Inject Time: 2019-08-29 13:06:58 Stop Time: 2019-08-29 13:46:58
Comment:



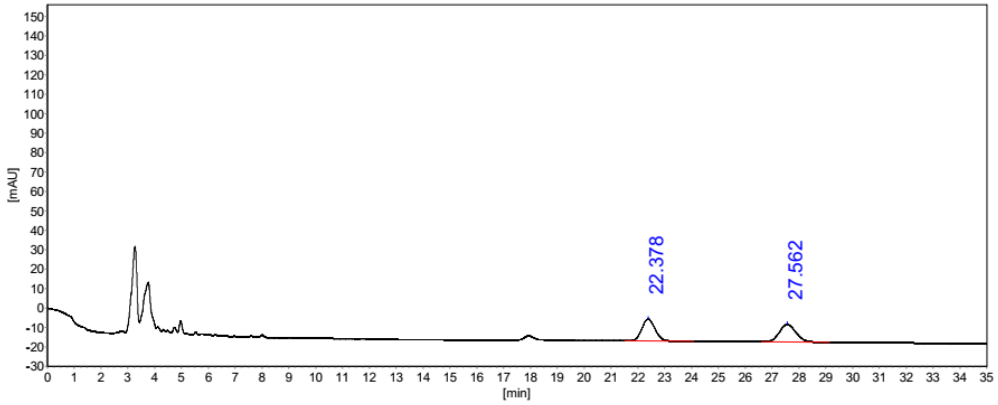
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		23.998	68244.8	5990921.4	98.3994	98.3994	+ BB
2		32.546	1401.0	97449.7	1.6006	1.6006	+ BB
	Total:		**69645.8**	**6088371.1**	**100.0000**	**100.0000**	



3ao

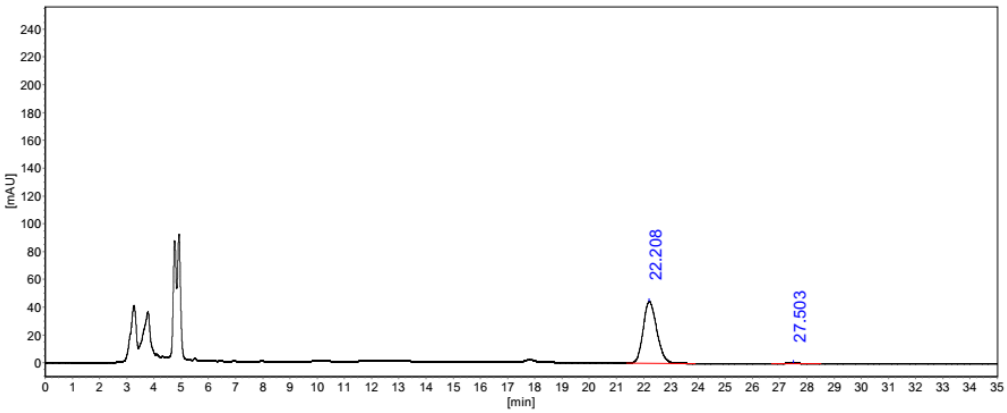
Inject Time: 2019-08-16 12:51:21 Stop Time: 2019-08-16 13:41:21
Comment:



Analysis Results

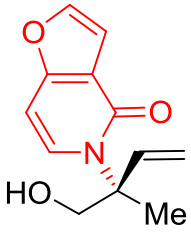
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		22.378	11306.9	390816.1	50.0480	50.0480	BB
2		27.562	9018.8	390067.1	49.9520	49.9520	BB
	Total:		**20325.7**	**780883.2**	**100.0000**	**100.0000**	

Inject Time: 2019-08-16 13:42:12 Stop Time: 2019-08-16 14:32:12
Comment:



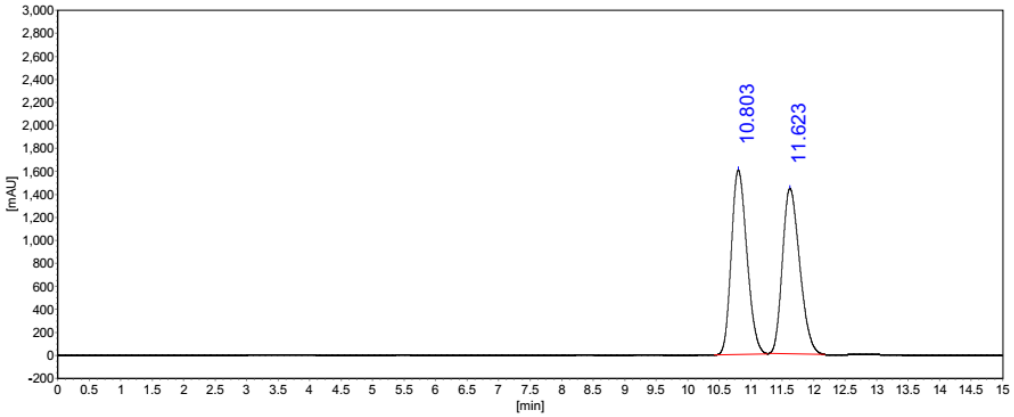
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		22.208	44326.4	1535622.4	98.9034	98.9034	+ BB
2		27.503	400.5	17027.0	1.0966	1.0966	+ BB
	Total:		**44726.9**	**1552649.4**	**100.0000**	**100.0000**	



3ap

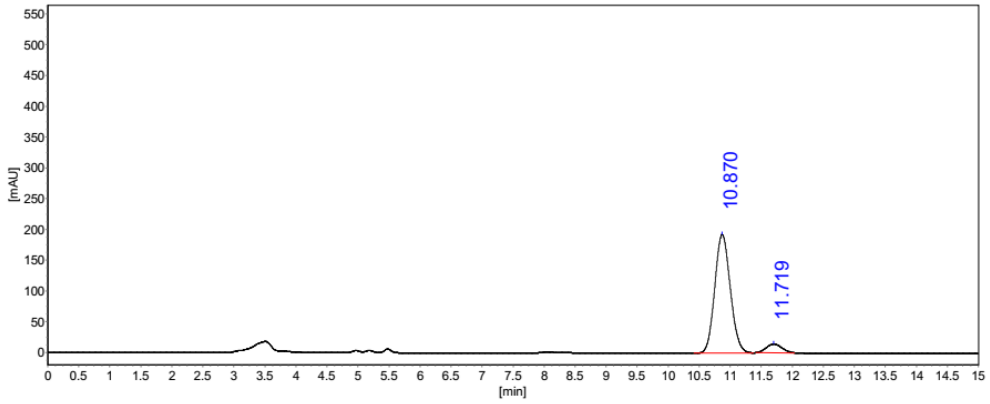
Inject Time: 2019-08-28 17:17:49 Stop Time: 2019-08-28 18:17:49
Comment：



Analysis Results

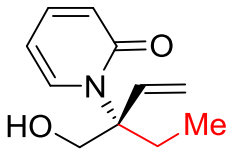
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		10.803	1605648.1	27623633.6	50.1729	50.1729	+ BB
2		11.623	1438798.2	27433274.8	49.8271	49.8271	+ BB
	Total:		**3044446.3**	**55056908.4**	**100.0000**	**100.0000**	

Inject Time: 2019-08-29 09:17:27 Stop Time: 2019-08-29 09:32:27
Comment：



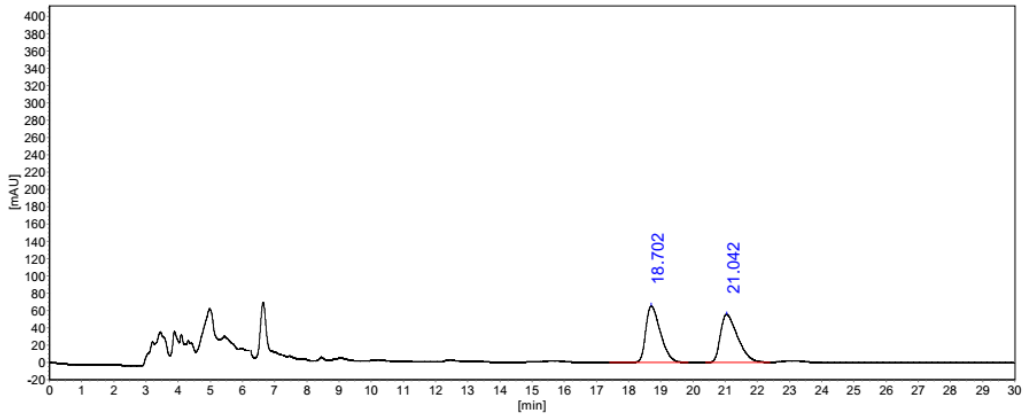
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		10.870	192886.5	3358015.3	95.1633	95.1633	+ BB
2		11.719	11570.9	170670.5	4.8367	4.8367	+ BB
	Total:		**204457.4**	**3528685.8**	**100.0000**	**100.0000**	



3ba

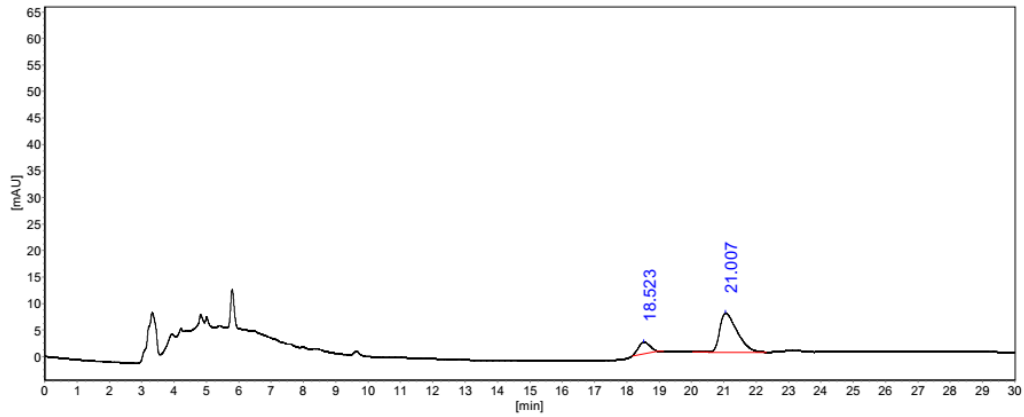
Inject Time: 2019-08-30 16:31:57 Stop Time: 2019-08-30 17:06:57
Comment:



Analysis Results

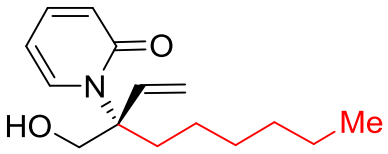
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		18.702	65535.2	2065017.5	49.9496	49.9496	+ BB
2		21.042	55417.1	2069186.8	50.0504	50.0504	+ BB
	Total:		**120952.3**	**4134204.4**	**100.0000**	**100.0000**	

Inject Time: 2019-08-31 13:53:50 Stop Time: 2019-08-31 14:43:50
Comment:



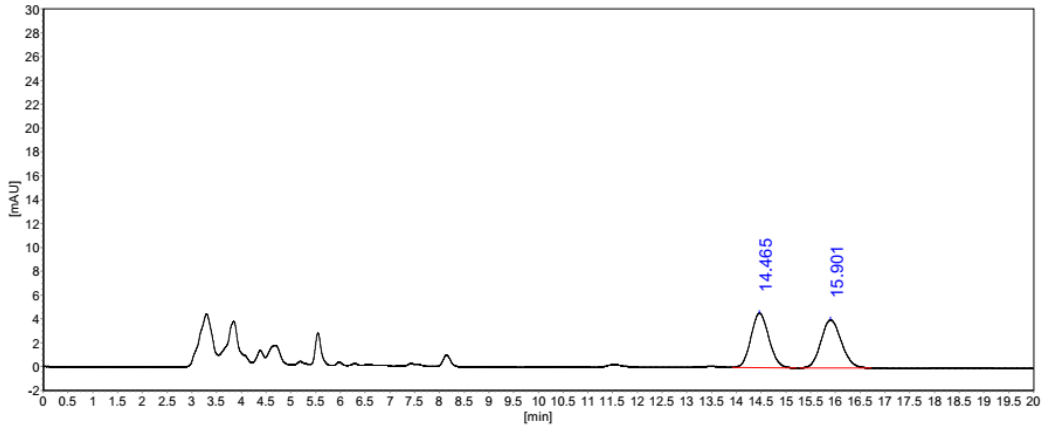
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		18.523	2174.8	55031.9	4.4389	4.4389	+ BB
2		21.007	6608.9	1184729.7	95.5611	95.5611	+ BB
	Total:		**8783.7**	**1239761.6**	**100.0000**	**100.0000**	



3ca

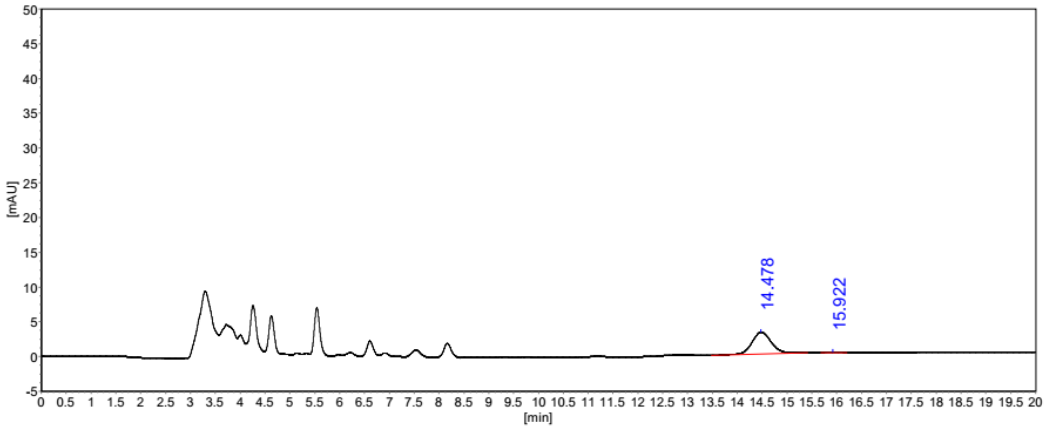
Inject Time: 2019-09-02 12:54:52 Stop Time: 2019-09-02 13:24:52
Comment:



Analysis Results

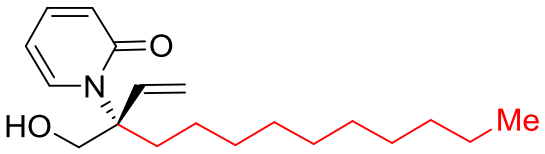
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.465	4558.8	114789.2	49.7967	49.7967	+ BB
2		15.901	4043.8	115726.3	50.2033	50.2033	+ BB
	Total:		**8602.6**	**230515.5**	**100.0000**	**100.0000**	

Inject Time: 2019-09-02 12:04:01 Stop Time: 2019-09-02 12:54:01
Comment:



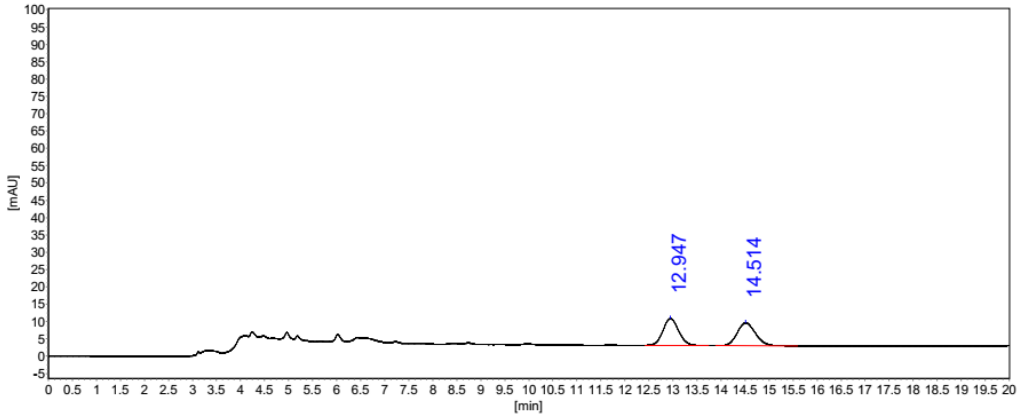
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.478	3164.1	86139.4	98.5322	98.5322	+ BB
2		15.922	65.3	1283.2	1.4678	1.4678	+ BB
	Total:		**3229.4**	**87422.5**	**100.0000**	**100.0000**	



3da

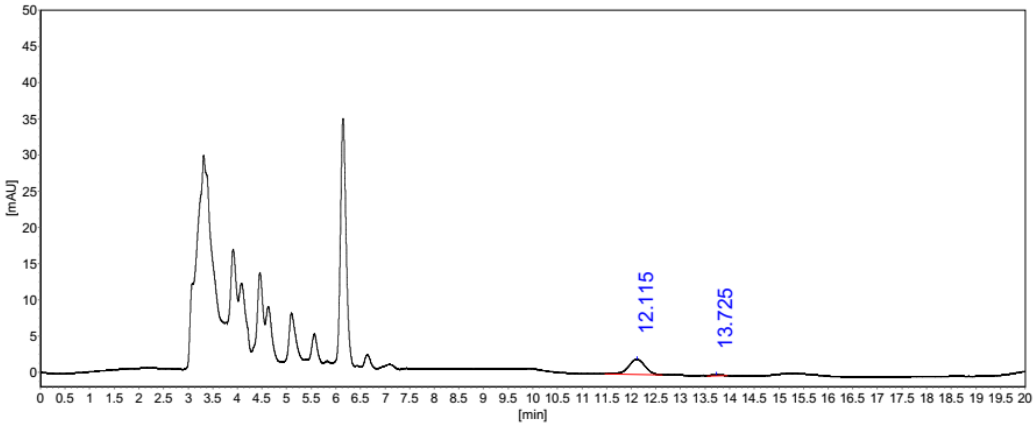
Inject Time: 2019-09-04 09:54:06 Stop Time: 2019-09-04 10:14:06
Comment：



Analysis Results

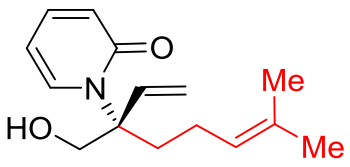
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		12.947	7742.5	176522.2	50.2439	50.2439	+ BB
2		14.514	6596.5	174808.2	49.7561	49.7561	+ BB
	Total:		**14339.0**	**351330.4**	**100.0000**	**100.0000**	

Inject Time: 2019-09-04 10:14:58 Stop Time: 2019-09-04 10:34:58
Comment：



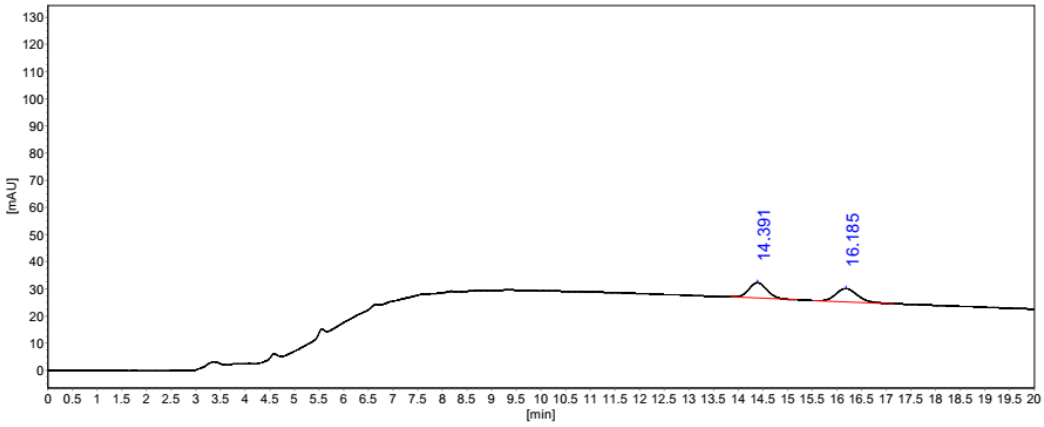
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		12.115	2101.7	49143.2	95.7011	95.7011	+ BB
2		13.725	137.3	2207.5	4.2989	4.2989	+ BB
	Total:		**2239.0**	**51350.7**	**100.0000**	**100.0000**	



3ea

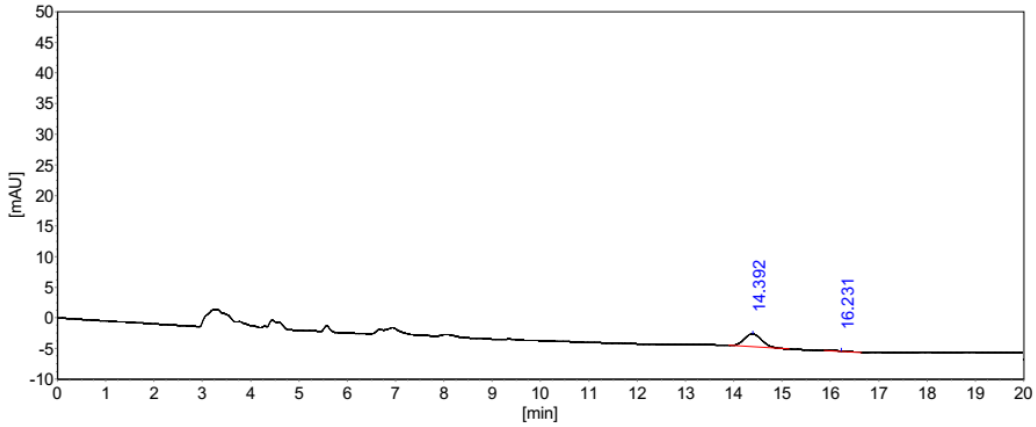
Inject Time: 2019-09-02 15:50:09 Stop Time: 2019-09-02 16:20:09
Comment：



Analysis Results

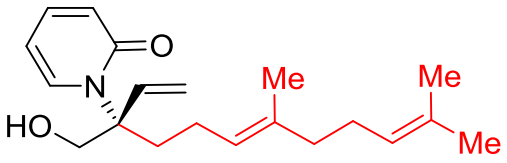
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.391	5645.6	145750.0	49.8727	49.8727	+ BB
2		16.185	4851.7	146493.8	50.1273	50.1273	+ BB
	Total:		**10497.3**	**292243.8**	**100.0000**	**100.0000**	

Inject Time: 2019-09-02 16:21:02 Stop Time: 2019-09-02 16:46:02
Comment：



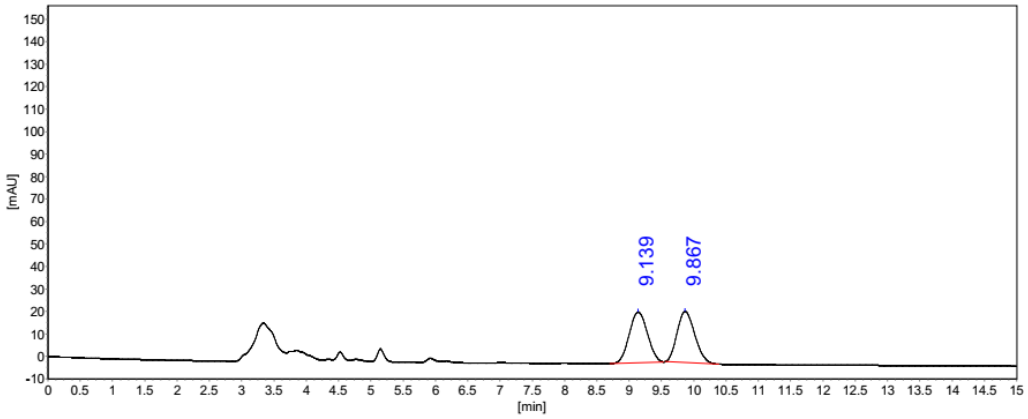
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.392	2122.4	54186.6	96.0403	96.0403	+ BB
2		16.231	93.4	2234.1	3.9597	3.9597	+ BB
	Total:		**2215.8**	**56420.7**	**100.0000**	**100.0000**	



3fa

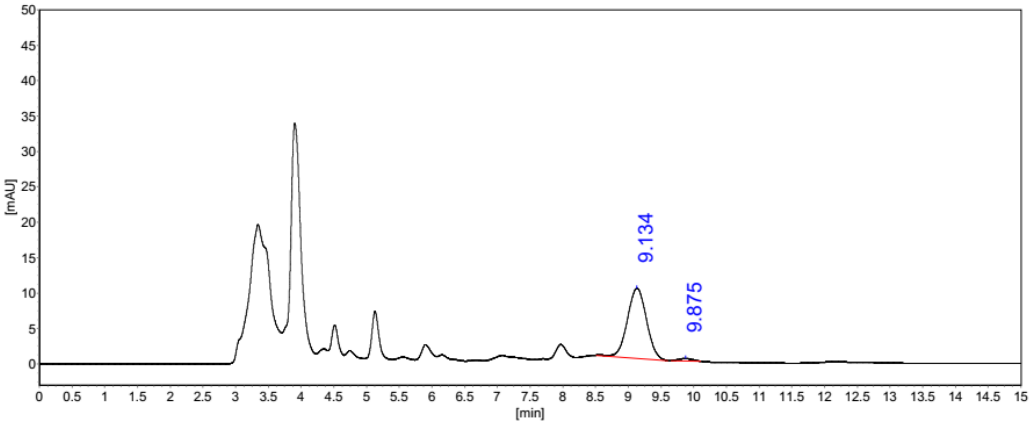
Inject Time: 2019-09-20 08:53:27 Stop Time: 2019-09-20 09:43:26
Comment:



Analysis Results

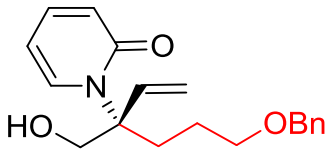
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		9.139	22550.8	442245.4	50.3259	50.3259	+ BB
2		9.867	22739.4	436517.9	49.6741	49.6741	+ BB
	Total:		**45290.2**	**878763.3**	**100.0000**	**100.0000**	

Inject Time: 2019-09-20 11:46:09 Stop Time: 2019-09-20 12:16:08
Comment:



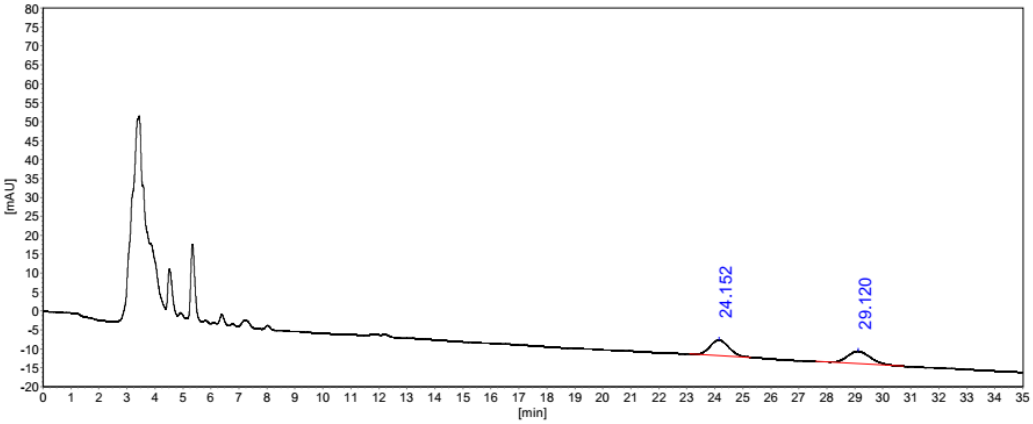
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		9.134	9871.8	200027.0	97.5830	97.5830	+ BB
2		9.875	329.6	4954.4	2.4170	2.4170	+ BB
	Total:		**10201.4**	**204981.5**	**100.0000**	**100.0000**	



3ga

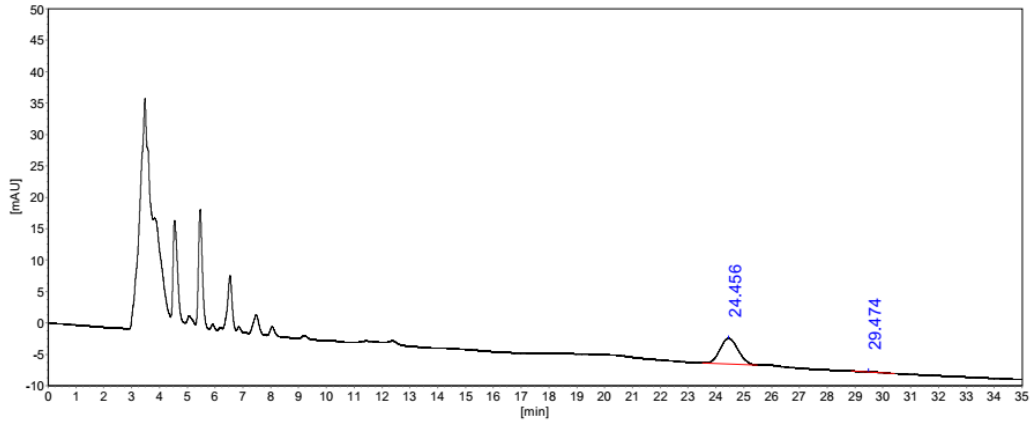
Inject Time: 2019-09-05 16:53:41 Stop Time: 2019-09-05 17:33:41
Comment：



Analysis Results

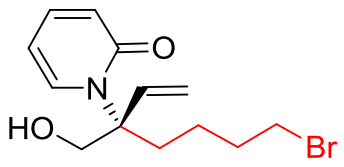
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		24.152	4097.3	193197.7	50.1858	50.1858	+ BB
2		29.120	3275.9	191767.5	49.8142	49.8142	+ BB
	Total:		**7373.2**	**384965.3**	**100.0000**	**100.0000**	

Inject Time: 2019-09-05 17:34:35 Stop Time: 2019-09-05 18:09:35
Comment：



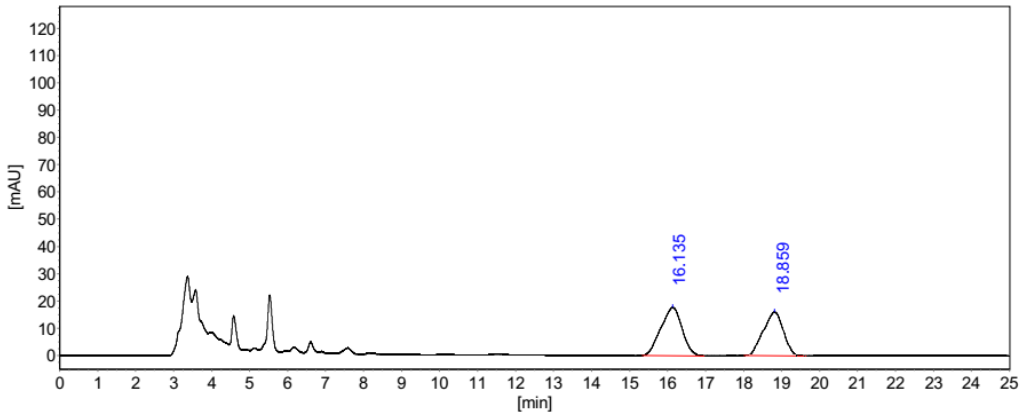
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		24.456	4093.6	184914.1	97.8676	97.8676	+ BB
2		29.474	84.6	4029.0	2.1324	2.1324	+ BB
	Total:		**4178.2**	**188943.1**	**100.0000**	**100.0000**	



3ha

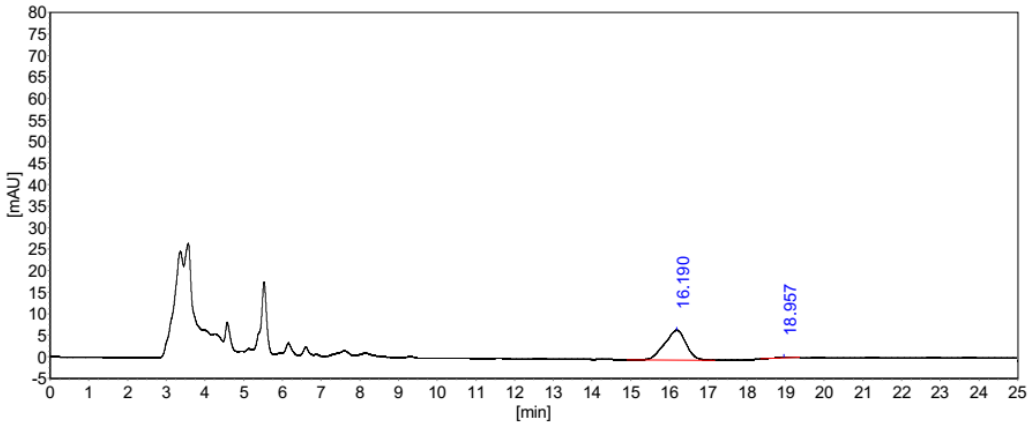
Inject Time: 2019-09-16 10:43:37 Stop Time: 2019-09-16 11:23:37
Comment:



Analysis Results

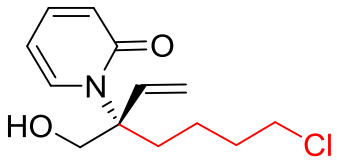
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.135	17662.5	689043.0	51.3357	51.3357	+ BB
2		18.859	12940.7	653186.2	48.6643	48.6643	+ BB
	Total:		**30603.2**	**1342229.2**	**100.0000**	**100.0000**	

Inject Time: 2019-09-17 09:09:59 Stop Time: 2019-09-17 09:39:58
Comment:



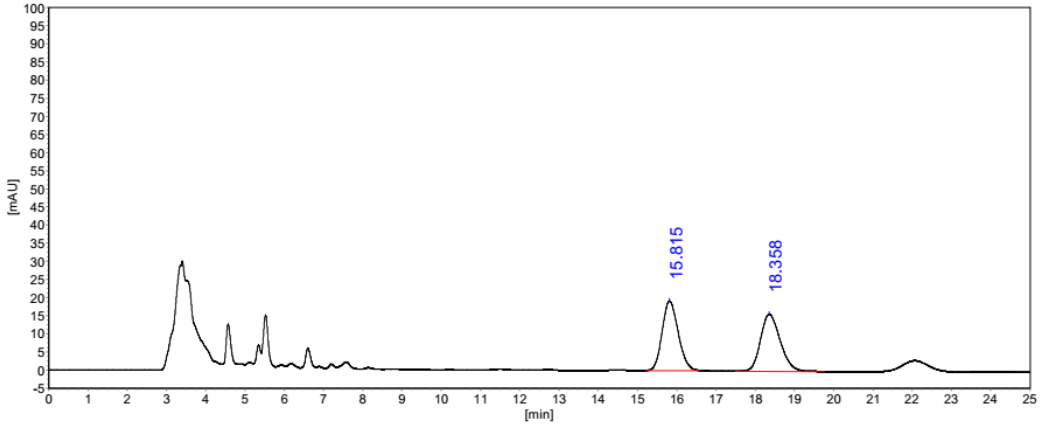
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.190	6926.6	266739.8	97.6892	97.6892	+ BB
2		18.957	225.3	6309.7	2.3108	2.3108	+ BB
	Total:		**7151.9**	**273049.6**	**100.0000**	**100.0000**	



3ia

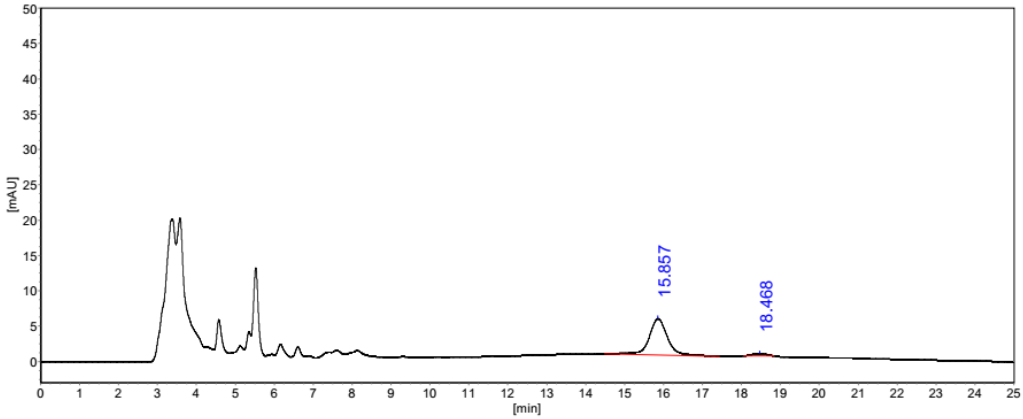
Inject Time: 2019-09-16 09:52:46 Stop Time: 2019-09-16 10:42:46
Comment:



Analysis Results

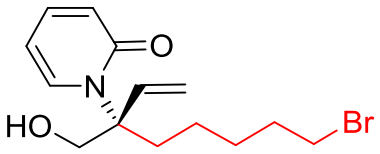
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		15.815	19132.4	547063.7	50.0956	50.0956	+ BB
2		18.358	15690.2	544975.6	49.9044	49.9044	+ BB
	Total:		**34822.6**	**1092039.2**	**100.0000**	**100.0000**	

Inject Time: 2019-09-17 09:40:52 Stop Time: 2019-09-17 10:07:51
Comment:



Analysis Results

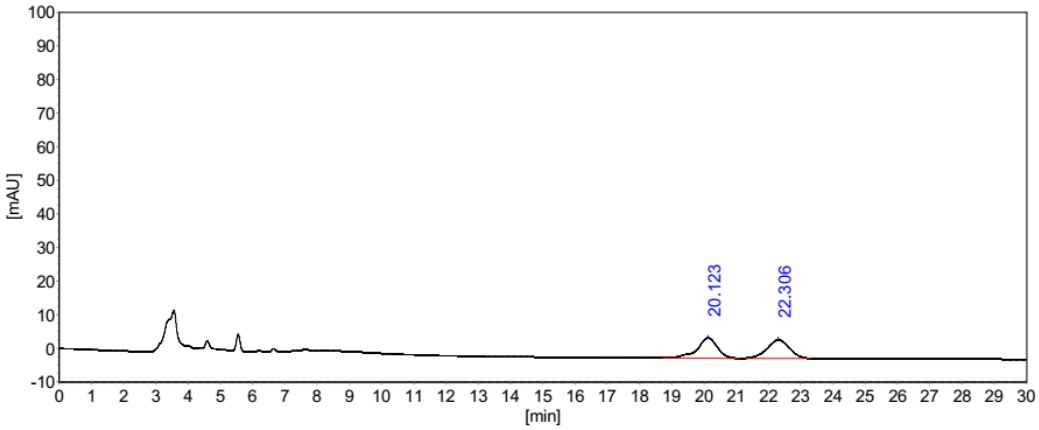
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		15.857	5123.0	168135.4	94.9894	94.9894	+ BB
2		18.468	327.6	8868.9	5.0106	5.0106	+ BB
	Total:		**5450.6**	**177004.3**	**100.0000**	**100.0000**	



3ja

Inject Time: 2019-09-16 08:45:58 Stop Time: 2019-09-16 09:20:59

Comment：

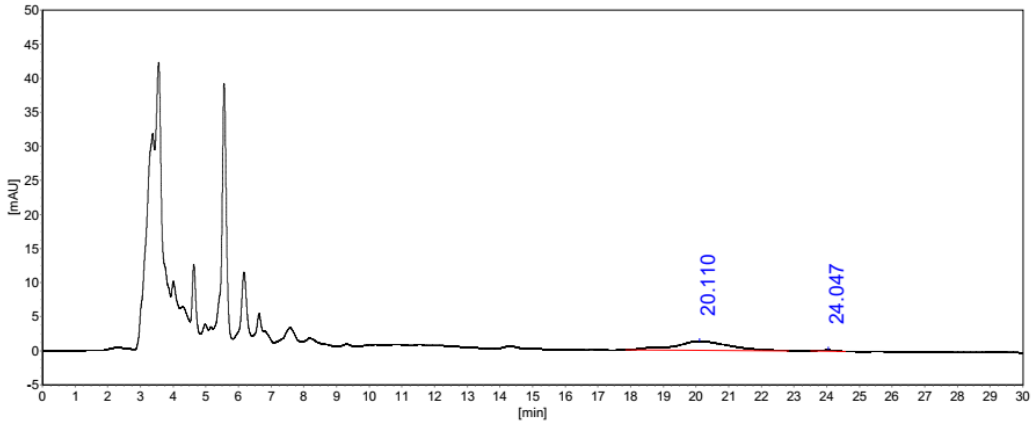


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		20.123	6038.6	263503.3	49.9550	49.9550	+ BB
2		22.306	5504.7	263978.0	50.0450	50.0450	+ BB
	Total:		**11543.3**	**527481.2**	**100.0000**	**100.0000**	

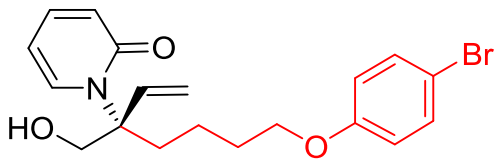
Inject Time: 2019-09-16 11:27:11 Stop Time: 2019-09-16 12:17:12

Comment：



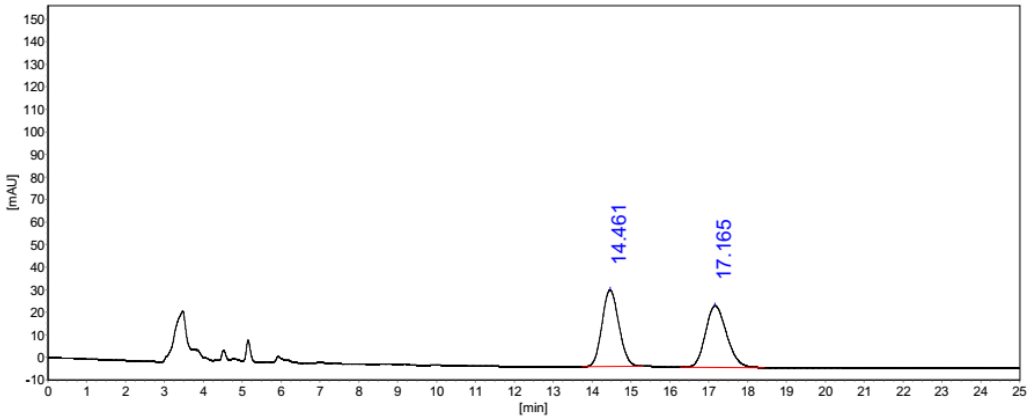
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		20.110	1331.3	152924.7	96.4882	96.4882	+ BB
2		24.047	166.8	5565.9	3.5118	3.5118	+ BB
	Total:		**1498.1**	**158490.5**	**100.0000**	**100.0000**	



3ka

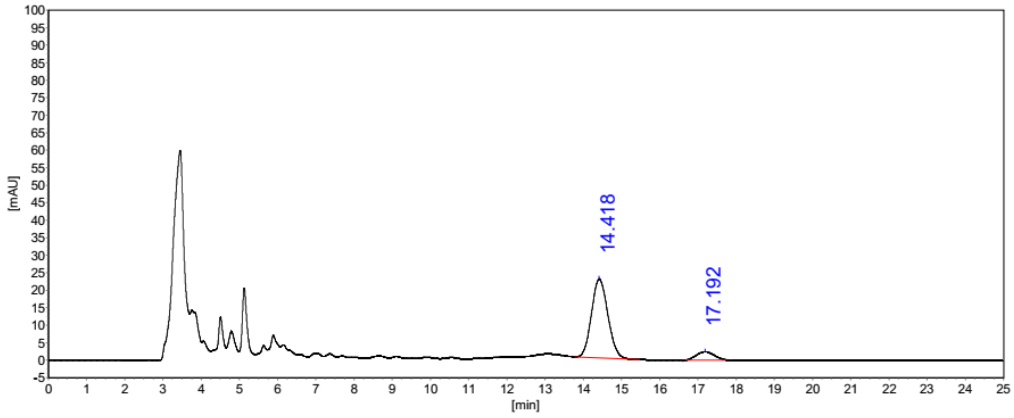
Inject Time: 2019-09-17 15:33:00 Stop Time: 2019-09-17 16:18:00
Comment:



Analysis Results

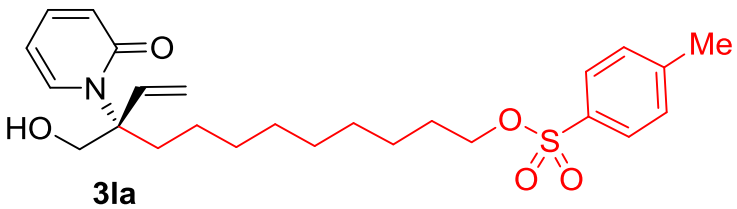
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.461	34072.3	1026635.7	49.7113	49.7113	+ BB
2		17.165	27375.2	1038558.3	50.2887	50.2887	+ BB
	Total:		**61447.5**	**2065194.0**	**100.0000**	**100.0000**	

Inject Time: 2019-09-17 16:18:54 Stop Time: 2019-09-17 16:43:54
Comment:



Analysis Results

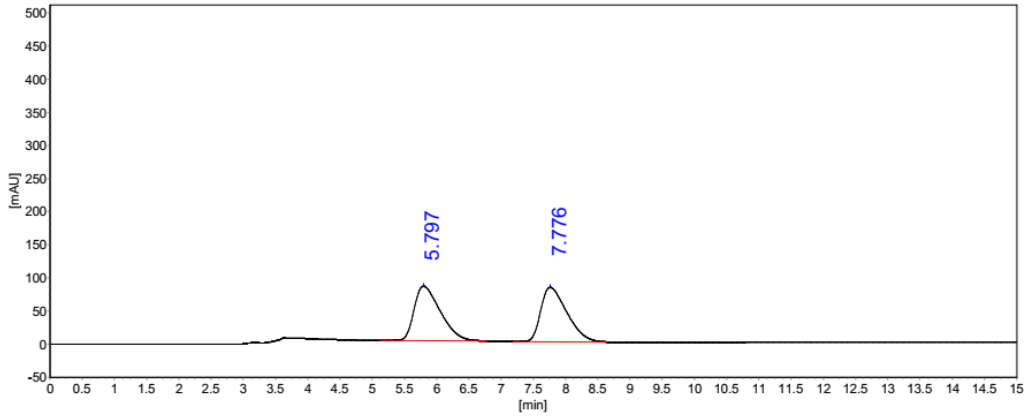
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		14.418	22515.9	673048.2	93.4947	93.4947	+ BB
2		17.192	1783.7	46830.4	6.5053	6.5053	+ BB
	Total:		**24299.6**	**719878.5**	**100.0000**	**100.0000**	



3la

Inject Time: 2019-10-08 13:36:34 Stop Time: 2019-10-08 14:26:34

Comment:

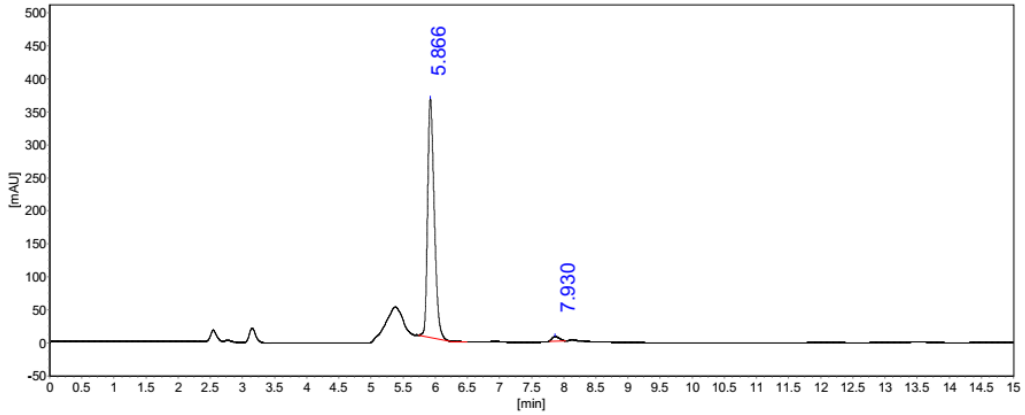


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		5.797	82307.7	2327487.9	48.0406	48.0406	+ BB
2		7.776	80235.9	2517347.5	51.9594	51.9594	+ BB
	Total:		**162543.6**	**4844835.4**	**100.0000**	**100.0000**	

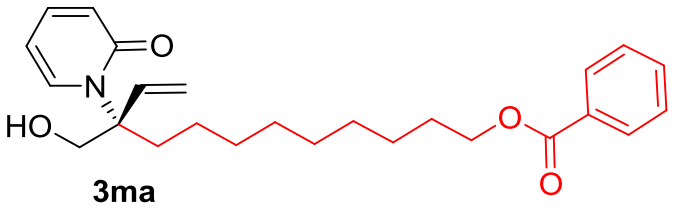
Inject Time: 2019-10-08 14:27:28 Stop Time: 2019-10-08 14:44:51

Comment:



Analysis Results

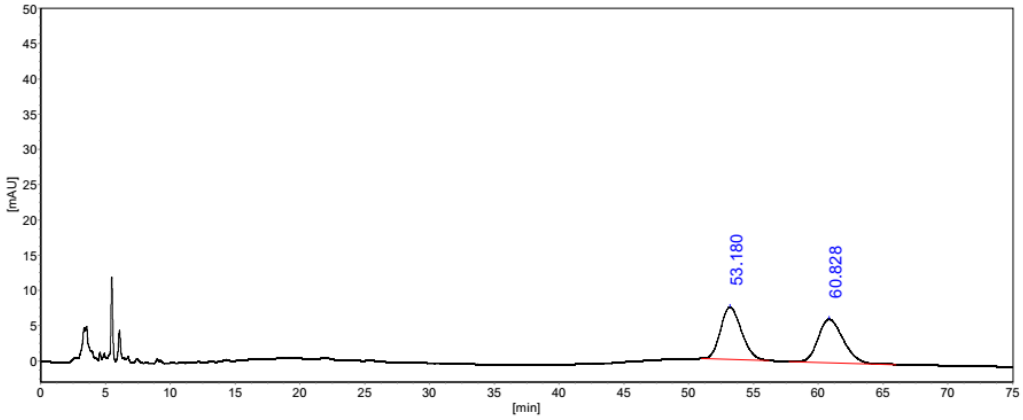
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		5.866	8174.5	123682.8	98.0304	98.0304	+ BB
2		7.930	283.1	2484.9	1.9696	1.9696	+ BB
	Total:		**8457.6**	**126167.7**	**100.0000**	**100.0000**	



3ma

Inject Time: 2019-09-17 10:15:08 Stop Time: 2019-09-17 11:30:08

Comment：

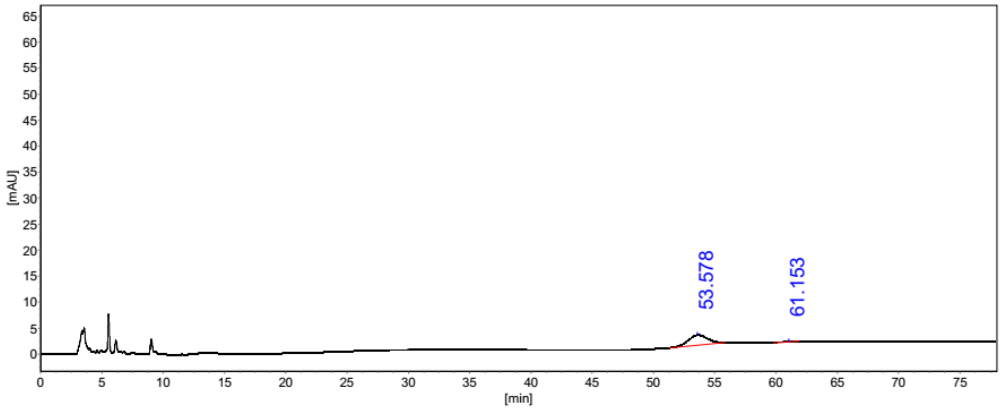


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		53.180	7411.5	835076.9	50.2650	50.2650	+ BB
2		60.828	6153.2	826270.3	49.7350	49.7350	+ BB
	Total:		**13564.7**	**1661347.2**	**100.0000**	**100.0000**	

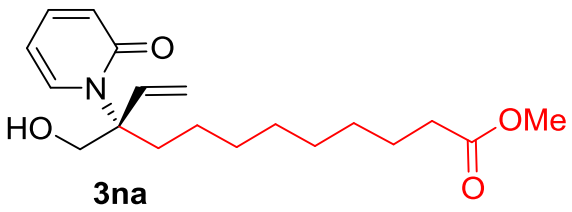
Inject Time: 2019-09-17 11:31:01 Stop Time: 2019-09-17 12:46:01

Comment：



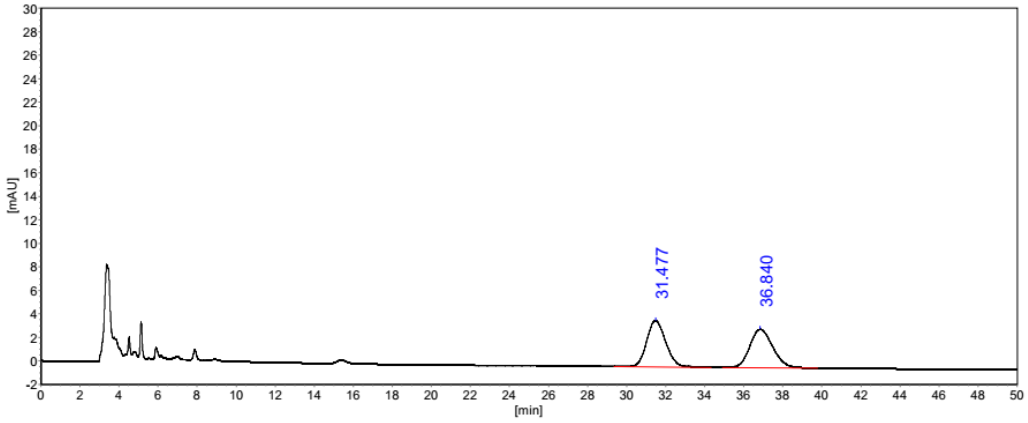
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		53.578	1946.0	215708.2	98.0308	98.0308	+ BB
2		61.153	52.8	4333.0	1.9692	1.9692	+ BB
	Total:		**1998.8**	**220041.2**	**100.0000**	**100.0000**	



3na

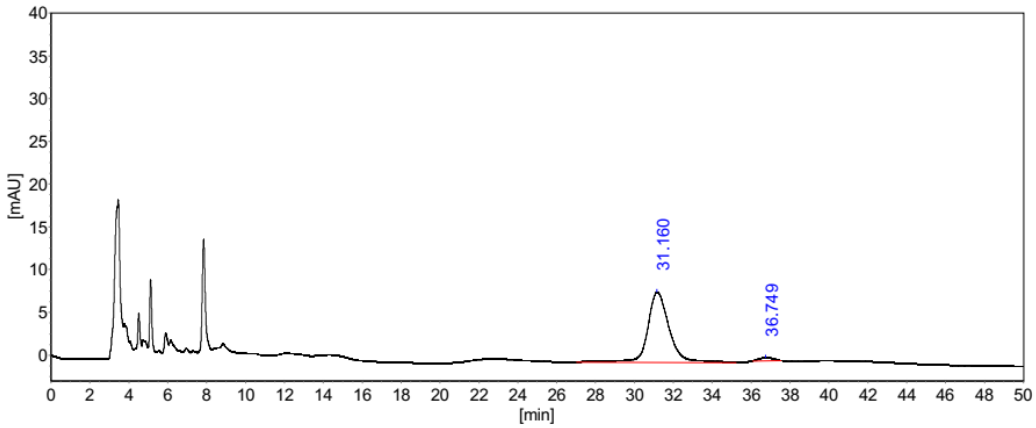
Inject Time: 2019-09-20 10:45:15 Stop Time: 2019-09-20 11:45:14
Comment:



Analysis Results

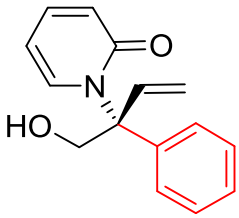
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		31.477	3921.8	265460.3	49.8293	49.8293	+ BB
2		36.840	3274.3	267278.7	50.1707	50.1707	+ BB
	Total:		**7196.1**	**532739.0**	**100.0000**	**100.0000**	

Inject Time: 2019-09-20 13:46:36 Stop Time: 2019-09-20 14:36:35
Comment:



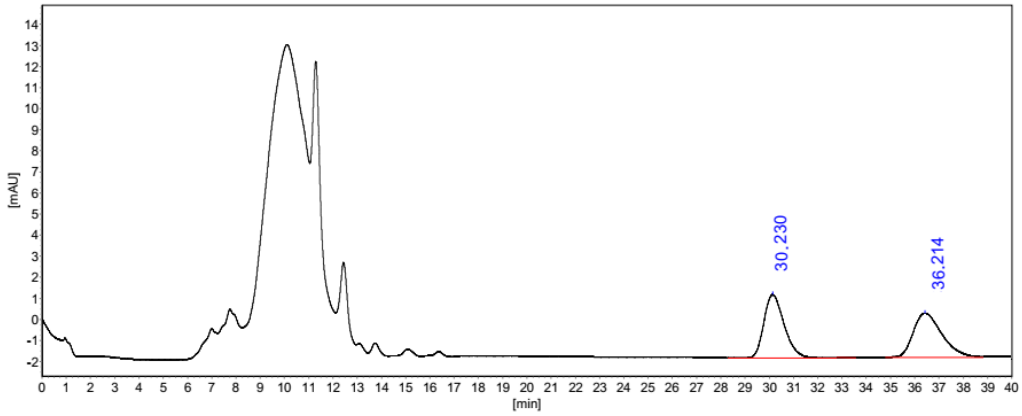
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		31.160	8203.1	630527.9	97.0155	97.0155	+ BB
2		36.749	362.6	19397.3	2.9845	2.9845	+ BB
	Total:		**8565.7**	**649925.2**	**100.0000**	**100.0000**	



3oa

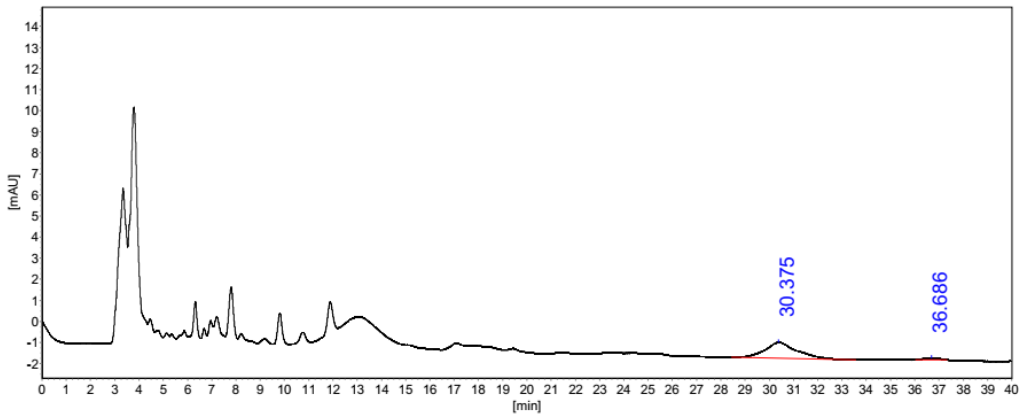
Comment:



Analysis Results

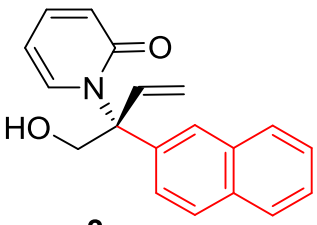
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		30.230	47771.9	2815780.0	50.3985	50.3985	BB
2		36.214	33261.2	2771251.6	49.6015	49.6015	BB
	Total:		**81033.1**	**5587031.6**	**100.0000**	**100.0000**	

Comment:



Analysis Results

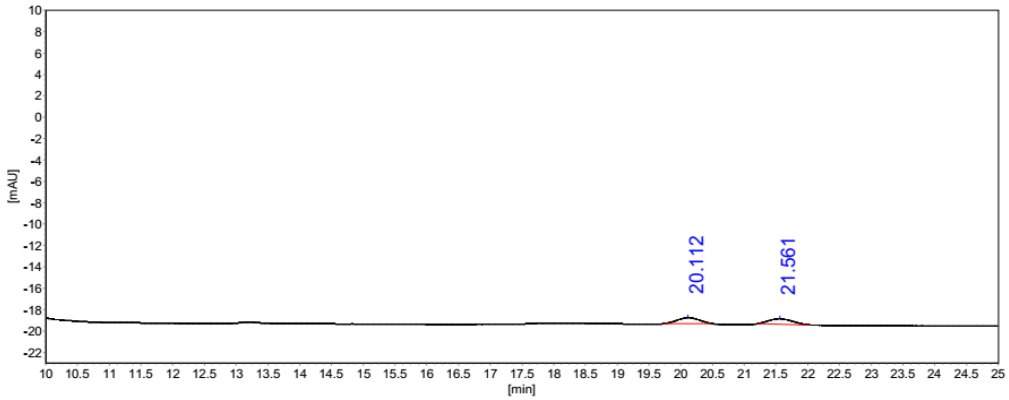
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		30.375	751.3	68967.7	94.5211	94.5211	BB
2		36.686	91.1	3997.7	5.4789	5.4789	+ BB
	Total:		**842.4**	**72965.4**	**100.0000**	**100.0000**	



3pa

Inject Time: 2019-08-16 16:09:08 Stop Time: 2019-08-16 16:59:09

Comment:

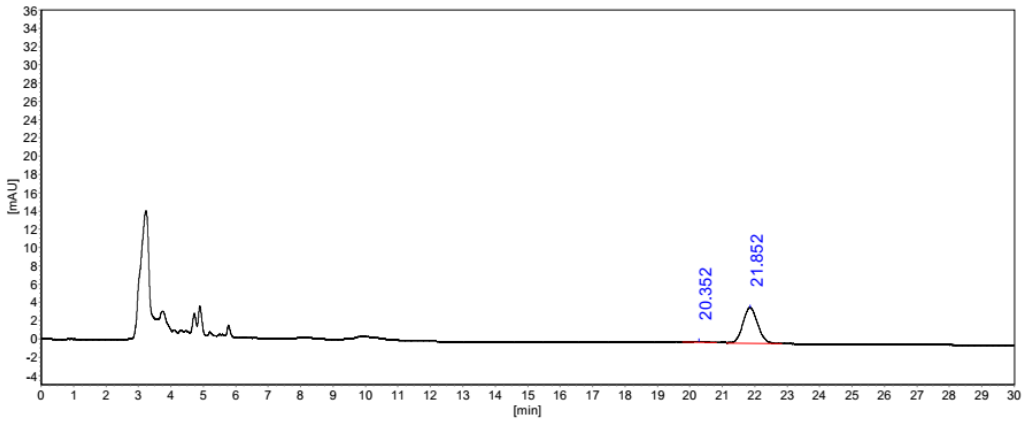


Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		20.112	544.3	12966.6	49.4911	49.4911	+ BB
2		21.561	503.8	13233.3	50.5089	50.5089	+ BB
	Total:		**1048.1**	**26199.8**	**100.0000**	**100.0000**	

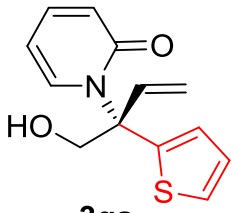
Inject Time: 2019-08-16 14:33:03 Stop Time: 2019-08-16 15:13:03

Comment:



Analysis Results

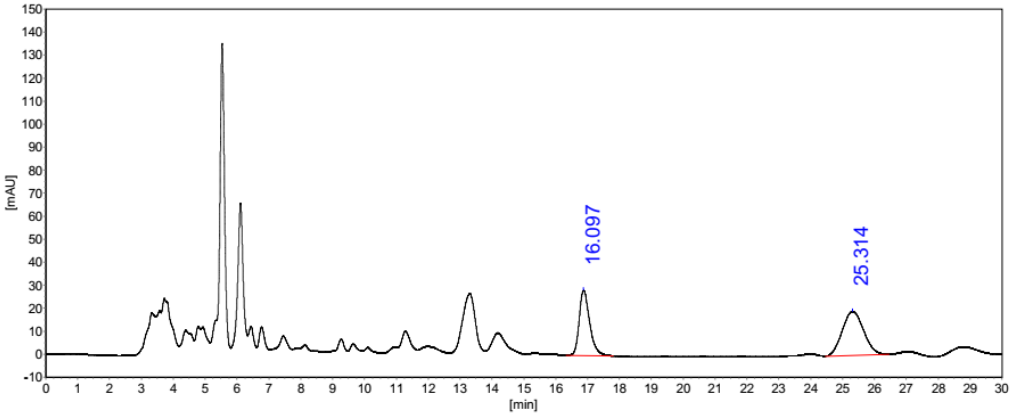
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		20.352	112.7	2958.9	2.3364	2.3364	+ BB
2		21.852	3900.1	123683.5	97.6636	97.6636	+ BB
	Total:		**4012.8**	**126642.4**	**100.0000**	**100.0000**	



3qa

Inject Time: 2019-10-08 17:08:28 Stop Time: 2019-10-08 17:38:28

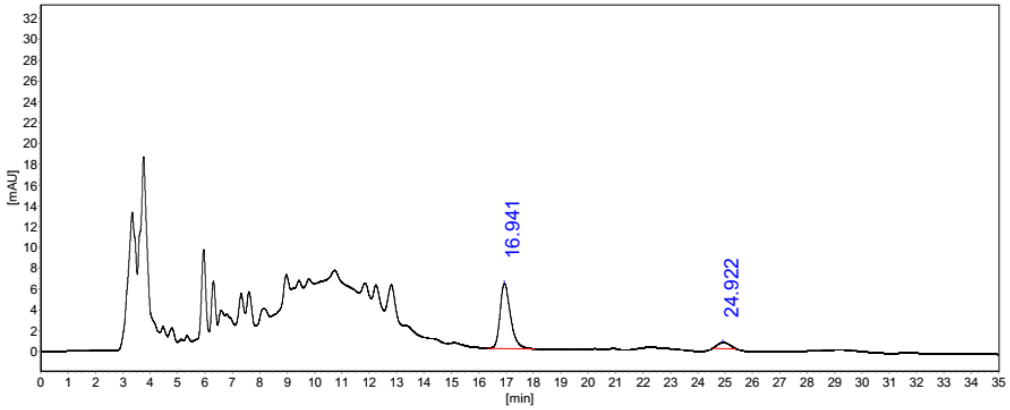
Comment：



Analysis Results

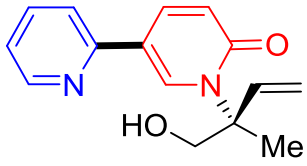
No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.097	19132.4	547063.7	50.0956	50.8397	+ BB
2		25.314	15690.2	544975.6	49.9044	49.1603	+ BB
	Total:		**34822.6**	**1092039.2**	**100.0000**	**100.0000**	

Comment：



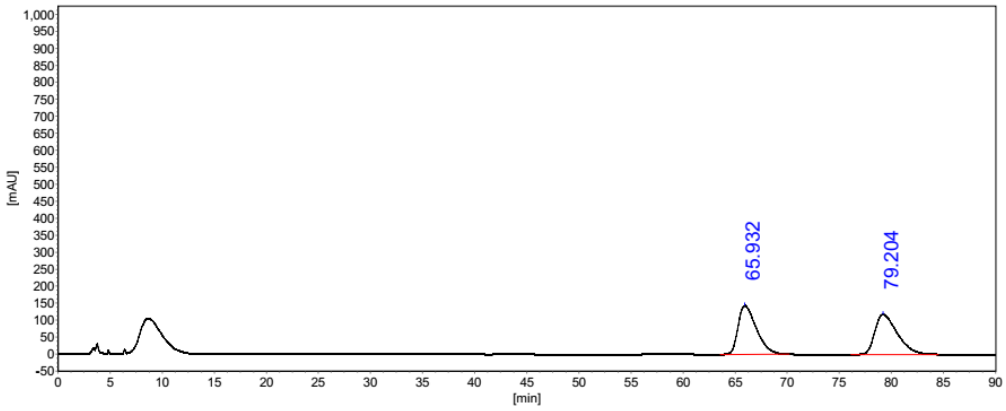
Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		16.941	6224.0	164600.6	90.2115	90.2115	+ BB
2		24.922	584.8	17860.2	9.7885	9.7885	+ BB
	Total:		**6808.8**	**182460.8**	**100.0000**	**100.0000**	



5

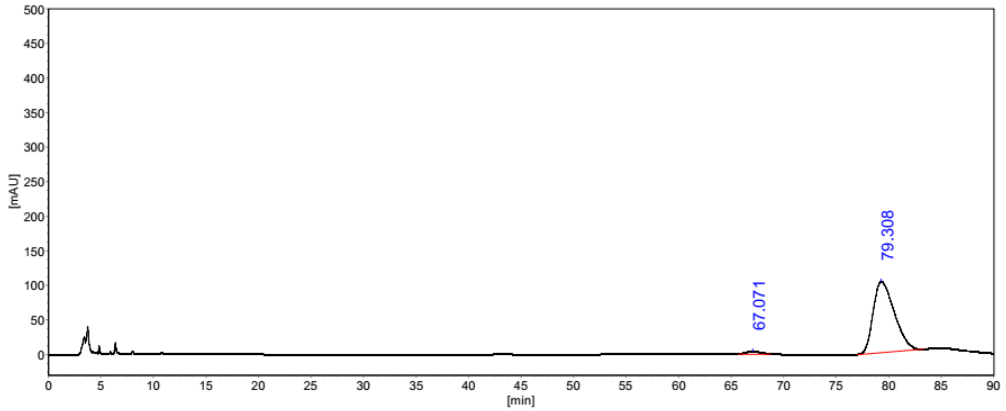
Inject Time: 2019-09-14 10:29:57 Stop Time: 2019-09-14 11:59:57
Comment:



Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		65.932	143463.5	17491493.2	49.9319	49.9319	+ BB
2		79.204	117415.2	17539217.4	50.0681	50.0681	+ BB
	Total:		**260878.7**	**35030710.5**	**100.0000**	**100.0000**	

Inject Time: 2019-09-14 12:08:31 Stop Time: 2019-09-14 13:38:31
Comment:



Analysis Results

No.	Compound	R.Time	Height	Area	Area%	Conc.	Type
1		67.071	3325.7	336802.9	2.2800	2.2800	+ BB
2		79.308	102692.7	14435132.8	97.7200	97.7200	+ BB
	Total:		**106018.4**	**14771935.8**	**100.0000**	**100.0000**	