Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

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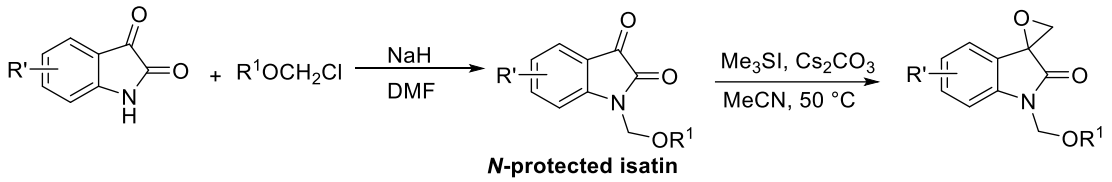
1. General Details

All air and moisture sensitive manipulations were carried out with standard Schlenk techniques nitrogen atmosphere. Column chromatography was performed using 200-300 mesh silica gels. Acetone, Dichloromethane (CH_2Cl_2) and Acetonitrile (MeCN) were dried and distilled from calcium hydride. Methyl *tert*-butyl ether (MTBE), Ether (Et_2O), Tetrahydrofuran (THF), 1,4-Dioxane and Toluene were dried and distilled from metal sodium and benzophenone. The dry Ethanol was purchased from Energy Chemical Inc. The NMR spectra were recorded on a Varian MERCURY plus-400 (400 MHz), Bruker Ascend^{TM} 400 (400 MHz), and Bruker Ascend^{TM} 500 (500 MHz) spectrometer with chemical shifts reported in ppm relative to the residual deuterated solvents. Mass spectrometry analysis was carried out using an electrospray spectrometer Waters Micromass Q-TOF Premier Mass Spectrometer and Fourier Transform Ion Cyclotron Mass Spectrometry at the Instrumental Analysis Center of Shanghai Jiao Tong University. Melting points were measured with SGW X-4 micro melting point apparatus. Optical rotations were measured on a Rudolph Research Analytical Autopol VI automatic polarimeter using a 50 mm path-length cell at 589 nm. Chiral analyses were performed on a Shimadzu LC-2010 HPLC system and using Daicel Chiralcel columns with *n*-hexane/*i*-propyl alcohol as an elue. Chiralpak AD-H, OD-H, OJ-H and IE were purchased from Daicel Chiral Technologies (China) Co., Ltd.

2. Preparation of Starting Materials and Chiral BOX Ligands

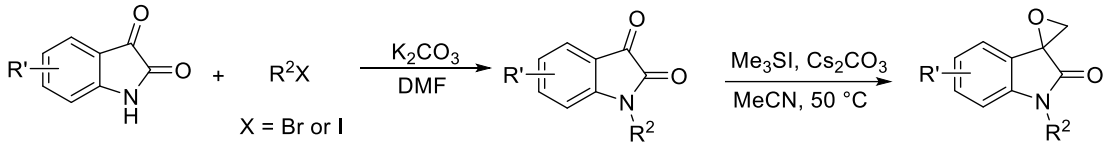
2.1 General Procedure for Preparation of Spiro-Epoxyoxindole



Method A: Non-commercial available R^1OCH_2Cl reagents were prepared according to the literature procedure.[1] A solution of alcohol (R^1OH) (1.0 equiv) and paraformaldehyde (1.0 equiv) in TMSCl was stirred for 3-5 h at room temperature and then concentrated to the crude product (R^1OCH_2Cl), which was used in the subsequent step without further purification.

To a solution of isatin (1.0 equiv.) in dry DMF (0.50 M) was added sodium hydride (60% wt, 1.2 equiv) at 0 °C under nitrogen atmosphere. After stirring for 10-20 min at room temperature, alcohol chloromethyl ether (R^1OCH_2Cl) (1.2 equiv) was added dropwise to the above mixture. After warming to room temperature, the reaction mixture was stirred overnight. The reaction was then quenched by water and extracted with EtOAc. The organic layer was separated and washed with water, then the organic layer was dried over anhydrous Na_2SO_4, filtered and concentrated in vacuum. The crude product *N*-protected isatin was used in the subsequent step without further purification.[2]

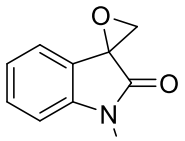
Trimethylsulphonium iodide (2.0 equiv.), cesium carbonate (2.0 equiv) and acetonitrile (0.50 M) were added to a flame-dried flask. The resulting mixture was stirred at 50 °C for 1 h under nitrogen atmosphere. A solution of *N*-protected isatin (1.0 equiv) in acetonitrile was added slowly. The suspension was stirred overnight at 50 °C. After completion of reaction (monitored by TLC), the mixture was filtered through a celite bed. The filtrate was evaporated to dryness and the residue was purified by flash chromatography on silica gel, eluting with petroleum ether/ethyl acetate 10:1 (v/v), to afford the pure product.[3]



***N*-protected isatin**

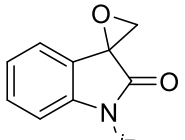
Method B: To a solution of isatin (1.0 equiv) in DMF (0.50 M) was added potassium carbonate (2.0 equiv) and R^2X (X = Br or I), the reaction mixture was stirred overnight at room temperature. The reaction was then quenched by water and extracted with CH_2Cl_2. The organic layer was separated and washed with water, then the organic layer was dried over anhydrous Na_2SO_4, filtered and concentrated in vacuum. The crude product *N*-protected isatin was used in the subsequent step without further purification.[4]

The epoxidation followed the procedure shown in **Method A**.



1a

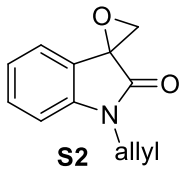
1-Methylspiro[indoline-3,2'-oxiran]-2-one (1a). The product was prepared following the general procedure **Method B** and obtained (starting from 30 mmol of the corresponding isatin; 4.1 g, 78% yield) as a pale pink solid. Mp = 81~82 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39 (td, J = 7.5, 1.5 Hz, 1H), 7.13 – 7.06 (m, 2H), 6.92 (d, J = 8.0 Hz, 1H), 3.58 (d, J = 7.0 Hz, 1H), 3.44 (d, J = 6.5 Hz, 1H), 3.28 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.8, 145.1, 130.4, 122.9, 122.7, 122.1, 108.9, 56.4, 54.1, 26.7; HRMS (ESI) calcd for $C_{10}H_9NNaO_2$ $(M+Na)^+$ 198.0525, found 198.0524.



S1

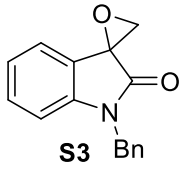
1-Isopropylspiro[indoline-3,2'-oxiran]-2-one (S1). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.3 g, 64% yield) as a yellow solid. Mp = 42~44 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (td, J = 8.0, 1.6 Hz, 1H), 7.13 – 7.03 (m, 3H), 4.66 (hept, J = 6.8 Hz, 1H), 3.57 (d, J = 6.8 Hz, 1H), 3.41 (d, J = 6.8 Hz, 1H), 1.51 (d, J = 6.8 Hz,

6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 143.8, 130.2 123.2, 122.33, 122.31, 110.5, 56.2, 54.4, 44.5, 19.5, 19.3; HRMS (ESI) calcd for $C_{12}H_{13}NNaO_2$ $(M+Na)^+$ 226.0838, found 226.0832.



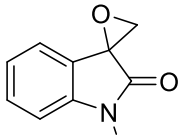
S2

1-Allylspiro[indoline-3,2'-oxiran]-2-one (S2). The product was prepared following the general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.0 g, 50% yield) as a white solid. Mp = 65~67 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (td, J = 7.6, 1.6 Hz, 1H), 7.13 – 7.06 (m, 2H), 6.93 (d, J = 7.6 Hz, 1H), 5.91 – 5.81 (m, 1H), 5.32 – 5.23 (m, 2H), 4.47 – 4.34 (m, 2H), 3.61 (d, J = 6.8 Hz, 1H), 3.45 (d, J = 6.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 144.3, 131.0, 130.3, 122.9, 122.7, 122.2, 118.1, 109.8, 56.3, 54.2, 42.9; HRMS (ESI) calcd for $C_{12}H_{11}NNaO_2$ $(M+Na)^+$ 224.0682, found 224.0680.



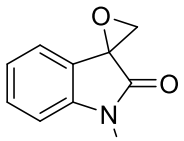
S3

1-Benzylspiro[indoline-3,2'-oxiran]-2-one (S3). The product was prepared following the general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.4 g, 56% yield) as a yellow solid. Mp = 97~98 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 – 7.32 (m, 4H), 7.30 – 7.24 (m, 2H), 7.12 (dd, J = 7.6, 1.6 Hz, 1H), 7.04 (td, J = 7.6, 0.8 Hz, 1H), 6.81 (d, J = 7.6 Hz, 1H), 5.00 (d, J = 15.6 Hz, 1H), 4.93 (d, J = 15.6 Hz, 1H), 3.65 (d, J = 6.8 Hz, 1H), 3.47 (d, J = 6.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 144.3, 135.3, 130.3, 128.9, 127.8, 127.4, 122.9, 122.7, 122.2, 109.9, 56.4, 54.3, 44.3; HRMS (ESI) calcd for $C_{16}H_{13}NNaO_2$ $(M+Na)^+$ 274.0838, found 274.0833.



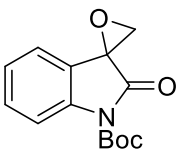
S4

1-(Methoxymethyl)spiro[indoline-3,2'-oxiran]-2-one (S4). The product was prepared following the general procedure **Method A** and obtained (starting from 10 mmol of the corresponding isatin; 0.88 g, 43% yield) as a pale pink solid. Mp = 78~80 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 – 7.36 (m, 1H), 7.15 – 7.10 (m, 3H), 5.20 (d, J = 10.8 Hz, 1H), 5.15 (d, J = 11.2 Hz, 1H), 3.62 (d, J = 6.4 Hz, 1H), 3.47 (d, J = 6.8 Hz, 1H), 3.37 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.5, 143.4, 130.6, 123.5, 122.3, 122.2, 110.4, 71.7, 56.5, 56.4, 54.5; HRMS (ESI) calcd for $C_{11}H_{11}NNaO_3$ $(M+Na)^+$ 228.0631, found 228.0626.



S5

1-((Benzyloxy)methyl)spiro[indoline-3,2'-oxiran]-2-one (S5). The product was prepared following the general procedure **Method A** and obtained (starting from 50 mmol of the corresponding isatin; 9.0 g, 64% yield) as a pale yellow solid. Mp = 106~108 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.40 – 7.36 (m, 1H), 7.33 – 7.26 (m, 5H), 7.16 (d, J = 8.0 Hz, 1H), 7.14 – 7.10 (m, 2H), 5.32 (d, J = 11.0 Hz, 1H), 5.28 (d, J = 11.5 Hz, 1H), 4.61 (d, J = 12.0 Hz, 1H), 4.57 (d, J = 12.0 Hz, 1H), 3.57 (d, J = 6.5 Hz, 1H), 3.42 (d, J = 7.0 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.3, 143.4, 137.1, 130.5, 128.4, 127.90, 127.87, 123.4, 122.19, 122.17, 110.5, 71.1, 70.0, 56.4, 54.5; HRMS (ESI) calcd for $C_{17}H_{15}NNaO_3$ $(M+Na)^+$ 304.0944, found 304.0939.

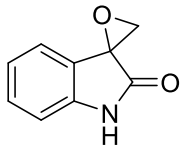


S6

To a solution of **S7** (322 mg, 2.0 mmol, 1.0 equiv) and 4-dimethylaminopyridine (244 mg, 2.0 mmol, 1.0 equiv) in CH_2Cl_2 (2.0 mL) was added triethylamine (202 mg, 2.0 mmol, 2.0 equiv) and di-*tert*-butyl dicarbonate (872 mg, 4.0 mmol, 2.0 equiv) at

room temperature. After stirring overnight, the solvent was removed under vacuum and the residue was purified by flash chromatography on silica gel, eluting with petroleum ether/ethyl acetate 3:1 (v/v), to afford S**6** as a yellow solid.[3]

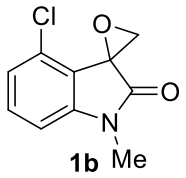
***tert*-Butyl 2-oxospiro[indoline-3,2'-oxirane]-1-carboxylate (S6)**. 418 mg, 80% yield, yellow solid. Mp = 57~59 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (d, J = 8.0 Hz, 1H), 7.42 (td, J = 8.0, 1.2 Hz, 1H), 7.20 (td, J = 7.6, 1.2 Hz, 1H), 7.12 (dd, J = 7.6, 1.6 Hz, 1H), 3.61 (d, J = 6.8 Hz, 1H), 3.43 (d, J = 6.8 Hz, 1H), 1.65 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.2, 148.9, 141.4, 130.7, 124.8, 121.9, 121.8, 115.7, 84.9, 56.2, 55.5, 28.1; HRMS (ESI) calcd for $C_{14}H_{15}NNaO_4$ $(M+Na)^+$ 284.0893, found 284.0896.



S7

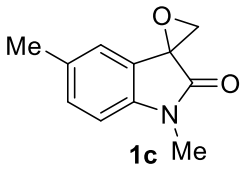
This substrate was prepared according to literature reported procedure. To a solution of trimethylsulphonium iodide (6.1 g, 30 mmol, 2.0 equiv) in dry DMF (40 mL), sodium hydride (60% wt, 5.8 g, 144 mmol, 7.2 equiv) was added at room temperature. The resulting mixture was stirred for 1 h under nitrogen atmosphere. Then the reaction mixture was stirred at -20 °C. To this solution isatin (3.0 g, 20 mmol, 1.0 equiv) in dry DMF (10 mL) was added dropwise over 20 min. The suspension was stirred overnight at -20 °C. After that, the mixture was poured into the ice water slowly, then extracted with EtOAc, washed with brine solution and dried over anhydrous Na_2SO_4. The solvent was removed under vacuum and the residue was purified by flash chromatography on silica gel, eluting with petroleum ether/ethyl acetate 3:1 (v/v), to afford the pure product as a yellow solid.[3]

Spiro[indoline-3,2'-oxiran]-2-one (S7). 2.0 g, 62% yield, yellow solid. Mp = 168~170 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.62 (s, 1H), 7.33 (td, J = 7.6, 1.6 Hz, 1H), 7.14 – 7.04 (m, 2H), 6.97 (d, J = 7.6 Hz, 1H), 3.59 (d, J = 6.4 Hz, 1H), 3.45 (d, J = 6.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.0, 142.1, 130.5, 123.00, 122.96, 122.5, 110.9, 56.6, 54.3; HRMS (ESI) calcd for $C_9H_7NNaO_2$ $(M+Na)^+$ 184.0369, found 184.0360.



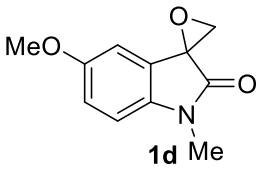
1b

4-Chloro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1b). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.8 g, 86% yield) as a white solid. Mp = 124~125 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.31 (t, J = 8.0 Hz, 1H), 7.00 (dd, J = 8.4, 0.8 Hz, 1H), 6.83 (dd, J = 8.0, 0.8 Hz, 1H), 4.06 (d, J = 7.2 Hz, 1H), 3.49 (d, J = 7.2 Hz, 1H), 3.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.1, 146.8, 131.3, 130.6, 124.1, 118.8, 107.4, 56.8, 50.5, 26.9; HRMS (ESI) calcd for $C_{10}H_8ClNNaO_2$ $(M+Na)^+$ 232.0136, found 232.0143.



1c

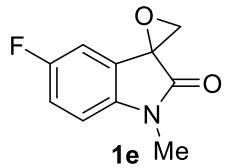
1,5-Dimethylspiro[indoline-3,2'-oxiran]-2-one (1c). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.3 g, 69% yield) as a white solid. Mp = 104~105 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18 (ddd, J = 8.0, 2.0, 0.8 Hz, 1H), 6.95 – 6.92 (m, 1H), 6.81 (d, J = 8.0 Hz, 1H), 3.58 (d, J = 6.8 Hz, 1H), 3.42 (d, J = 6.8 Hz, 1H), 3.26 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.7, 142.7, 132.6, 130.6, 122.8, 122.6, 108.6, 56.5, 54.1, 26.7, 21.0; HRMS (ESI) calcd for $C_{11}H_{11}NNaO_2$ $(M+Na)^+$ 212.0682, found 212.0688.



1d

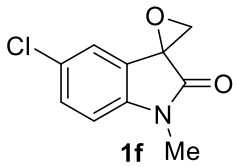
5-Methoxy-1-methylspiro[indoline-3,2'-oxiran]-2-one (1d). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.4 g, 68% yield) as an orange solid. Mp = 122~124 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.91 (dd, J = 8.4, 2.4 Hz, 1H), 6.83 (d, J = 8.4 Hz, 1H), 6.72 (d, J = 2.8 Hz, 1H), 3.79 (s, 3H), 3.58 (d, J = 6.4 Hz, 1H), 3.41 (d, J = 6.8 Hz,

1H), 3.26 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 156.3, 138.4, 123.9, 115.1, 109.4, 109.0, 56.7, 55.9, 54.2, 26.8; HRMS (ESI) calcd for $C_{11}H_{11}NNaO_3$ $(M+Na)^+$ 228.0631, found 228.0635.



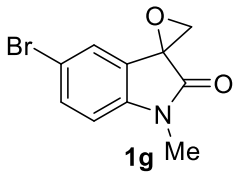
1e

5-Fluoro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1e). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.2 g, 62% yield) as a white solid. Mp = 153~155 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.09 (td, J = 8.8, 2.8 Hz, 1H), 6.89 – 6.83 (m, 2H), 3.60 (d, J = 6.8 Hz, 1H), 3.42 (d, J = 6.8 Hz, 1H), 3.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 159.3 (d, J = 240.8 Hz), 141.0 (d, J = 2.1 Hz), 124.4 (d, J = 8.5 Hz), 116.7 (d, J = 23.6 Hz), 110.4 (d, J = 25.3 Hz), 109.5 (d, J = 7.9 Hz), 56.4 (d, J = 2.1 Hz), 54.3, 26.8; ^{19}F NMR (470 MHz, $CDCl_3$) δ -119.76; HRMS (ESI) calcd for $C_{10}H_8FNNaO_2$ $(M+Na)^+$ 216.0431, found 216.0438.



1f

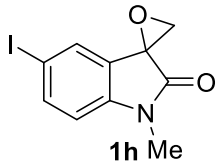
5-Chloro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1f). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.2 g, 57% yield) as a pale yellow solid. Mp = 157~158 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 (dd, J = 8.4, 2.0 Hz, 1H), 7.09 (d, J = 2.0 Hz, 1H), 6.85 (d, J = 8.4 Hz, 1H), 3.59 (d, J = 6.8 Hz, 1H), 3.43 (d, J = 6.4 Hz, 1H), 3.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.3, 143.6, 130.3, 128.5, 124.5, 122.6, 109.8, 56.2, 54.3, 26.8; HRMS (ESI) calcd for $C_{10}H_8ClNNaO_2$ $(M+Na)^+$ 232.0136, found 232.0140.



1g

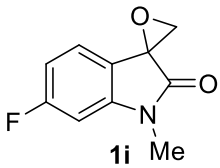
5-Bromo-1-methylspiro[indoline-3,2'-oxiran]-2-one (1g). The product was prepared

following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.5 g, 59% yield) as a pale yellow solid. Mp = 158~159 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 (dd, J = 8.4, 2.0 Hz, 1H), 7.22 (d, J = 2.0 Hz, 1H), 6.81 (d, J = 8.4 Hz, 1H), 3.59 (d, J = 6.8 Hz, 1H), 3.43 (d, J = 6.8 Hz, 1H), 3.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.2, 144.0, 133.2, 125.4, 124.8, 115.6, 110.3, 56.1, 54.3, 26.8; HRMS (ESI) calcd for $C_{10}H_9BrNO_2$ $(M+H)^+$ 253.9811, found 253.9815.



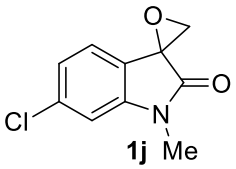
1h

5-Iodo-1-methylspiro[indoline-3,2'-oxiran]-2-one (1h). The product was prepared following general procedure **Method B** and obtained (starting from 8.0 mmol of the corresponding isatin; 1.5 g, 62% yield) as a pale yellow solid. Mp = 152~153 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (dd, J = 8.4, 1.6 Hz, 1H), 7.39 (d, J = 2.0 Hz, 1H), 6.71 (d, J = 8.0 Hz, 1H), 3.58 (d, J = 6.8 Hz, 1H), 3.43 (d, J = 6.4 Hz, 1H), 3.26 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 144.7, 139.1, 130.9, 125.1, 110.8, 85.2, 55.9, 54.3, 26.8; HRMS (ESI) calcd for $C_{10}H_9INO_2$ $(M+H)^+$ 301.9672, found 301.9678.



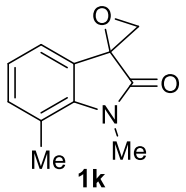
1i

6-Fluoro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1i). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.3 g, 67% yield) as a pink solid. Mp = 92~93 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.06 (dd, J = 8.5, 5.0 Hz, 1H), 6.79 – 6.74 (m, 1H), 6.68 (dd, J = 8.5, 2.5 Hz, 1H), 3.58 (d, J = 6.5 Hz, 1H), 3.43 (d, J = 6.5 Hz, 1H), 3.27 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.1, 164.5 (d, J = 246.8 Hz), 146.8 (d, J = 11.6 Hz), 123.5 (d, J = 10.0 Hz), 117.9 (d, J = 3.0 Hz), 109.2 (d, J = 22.9 Hz), 98.0 (d, J = 27.5 Hz), 56.1, 54.0, 26.8; ^{19}F NMR (470 MHz, $CDCl_3$) δ -108.26; HRMS (ESI) calcd for $C_{10}H_8FNNaO_2$ $(M+Na)^+$ 216.0431, found 216.0435.



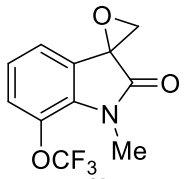
1j

6-Chloro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1j). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.2 g, 57% yield) as a yellow solid. Mp = 142~144 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.06 (dd, J = 8.0, 2.0 Hz, 1H), 7.02 (d, J = 7.5 Hz, 1H), 6.93 (d, J = 2.0 Hz, 1H), 3.59 (d, J = 6.5 Hz, 1H), 3.44 (d, J = 6.5 Hz, 1H), 3.27 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.7, 146.2, 136.3, 123.1, 122.8, 121.0, 109.7, 56.1, 54.2, 26.8; HRMS (ESI) calcd for $C_{10}H_8ClNNaO_2$ $(M+Na)^+$ 232.0136, found 232.0141.



1k

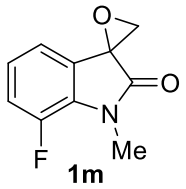
1,7-Dimethylspiro[indoline-3,2'-oxiran]-2-one (1k). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.2 g, 63% yield) as a pale yellow solid. Mp = 105~106 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.10 (dd, J = 7.5, 1.0 Hz, 1H), 6.96 (t, J = 7.5 Hz, 1H), 6.93 (dd, J = 7.5, 1.5 Hz, 1H), 3.57 (d, J = 6.5 Hz, 1H), 3.55 (s, 3H), 3.39 (d, J = 6.5 Hz, 1H), 2.59 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.6, 142.8, 134.2, 123.4, 122.9, 120.7, 119.9, 56.0, 54.6, 30.1, 19.0; HRMS (ESI) calcd for $C_{11}H_{11}NNaO_2$ $(M+Na)^+$ 212.0682, found 212.0690.



1l

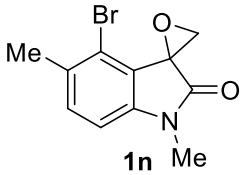
1-Methyl-7-(trifluoromethoxy)spiro[indoline-3,2'-oxiran]-2-one (1l). The product was prepared following general procedure **Method B** and obtained (starting from 4.3 mmol of the corresponding isatin; 0.55 g, 49% yield) as a white solid. Mp = 78~79 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.27 (dd, J = 8.0, 1.5 Hz, 1H), 7.01 (dd, J = 2.5, 1.0 Hz, 1H), 6.92 (d, J = 8.5 Hz, 1H), 3.62 (d, J = 6.5 Hz, 1H), 3.46 (d, J = 7.0 Hz, 1H), 3.30

(s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.5, 144.9 (q, J = 1.9 Hz), 143.6, 124.3, 123.6, 120.5 (q, J = 255.5 Hz), 116.2, 109.4, 56.2, 54.4, 26.9; ^{19}F NMR (470 MHz, $CDCl_3$) δ -58.42; HRMS (ESI) calcd for $C_{11}H_9F_3NO_3$ $(M+H)^+$ 260.0529, found 260.0527.



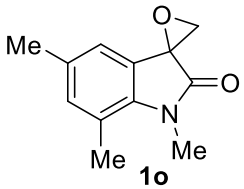
1m

7-Fluoro-1-methylspiro[indoline-3,2'-oxiran]-2-one (1m). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.5 g, 78% yield) as a yellow solid. Mp = 103~104 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.13 – 7.09 (m, 1H), 7.04 – 6.99 (m, 1H), 6.90 (dd, J = 7.5, 1.5 Hz, 1H), 3.59 (d, J = 6.5 Hz, 1H), 3.49 (d, J = 2.5 Hz, 3H), 3.43 (d, J = 6.5 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.5, 148.0 (d, J = 243.4 Hz), 131.5 (d, J = 9.0 Hz), 125.7 (d, J = 3.6 Hz), 123.6 (d, J = 6.2 Hz), 118.5 (d, J = 19.2 Hz), 117.9 (d, J = 3.5 Hz), 56.3 (d, J = 3.8 Hz), 54.6, 29.3 (d, J = 5.5 Hz); ^{19}F NMR (470 MHz, $CDCl_3$) δ -136.84; HRMS (ESI) calcd for $C_{10}H_8FNNaO_2$ $(M+Na)^+$ 216.0431, found 216.0438.



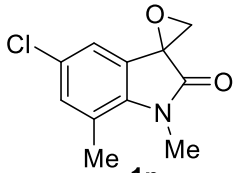
1n

4-Bromo-1,5-dimethylspiro[indoline-3,2'-oxiran]-2-one (1n). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.8 g, 67% yield) as a white solid. Mp = 146~148 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25 (dd, J = 8.0, 0.5 Hz, 1H), 6.78 (d, J = 8.0 Hz, 1H), 4.22 (d, J = 7.0 Hz, 1H), 3.43 (d, J = 7.0 Hz, 1H), 3.25 (s, 3H), 2.36 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.2, 144.8, 132.9, 131.7, 120.8, 120.6, 107.6, 57.6, 50.0, 26.7, 22.0; HRMS (ESI) calcd for $C_{11}H_{10}BrNNaO_2$ $(M+Na)^+$ 289.9787, found 289.9791.



1o

1,5,7-Trimethylspiro[indoline-3,2'-oxiran]-2-one (1o). The product was prepared following general procedure **Method B** and obtained (starting from 10 mmol of the corresponding isatin; 1.5 g, 74% yield) as an orange solid. Mp = 134~136 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.91 (s, 1H), 6.74 (s, 1H), 3.56 (dd, J = 6.5, 1.5 Hz, 1H), 3.52 (d, J = 1.5 Hz, 3H), 3.37 (dd, J = 6.5, 1.5 Hz, 1H), 2.54 (s, 3H), 2.27 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.6, 140.3, 134.6, 132.5, 123.4, 120.5, 120.4, 56.1, 54.6, 30.0, 20.7, 18.8; HRMS (ESI) calcd for $C_{12}H_{13}NNaO_2$ $(M+Na)^+$ 226.0838, found 226.0840.

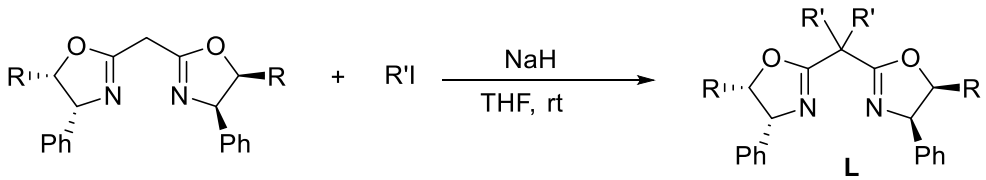


1p

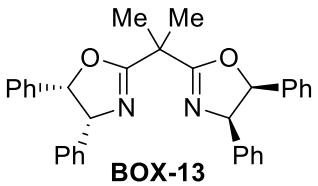
5-Chloro-1,7-dimethylspiro[indoline-3,2'-oxiran]-2-one (1p). The product was prepared following general procedure **Method B** and obtained (starting from 5.1 mmol of the corresponding isatin; 0.66 g, 58% yield) as yellow solid. Mp = 149~150 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.10 – 7.09 (m, 1H), 6.90 (d, J = 1.5 Hz, 1H), 3.58 (d, J = 6.5 Hz, 1H), 3.53 (s, 3H), 3.38 (d, J = 6.5 Hz, 1H), 2.57 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 172.2, 141.3, 133.6, 128.1, 125.1, 122.3, 120.2, 55.8, 54.7, 30.1, 18.8; HRMS (ESI) calcd for $C_{11}H_{11}ClNO_2$ $(M+H)^+$ 224.0473, found 224.0477.

2.2 Preparation of Chiral BOX Ligands

BOX-13, **BOX-14**, **BOX-16**, **SL20** were synthesized according to the literatures.[5]



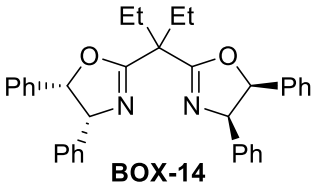
L



BOX-13

(4*R*,4'*R*,5*S*,5'*S*)-2,2'-(Propane-2,2-diyl)bis(4,5-diphenyl-4,5-dihydrooxazole)

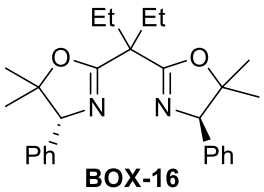
(BOX-13). 210 mg, 86% yield, white solid, Mp = 160~161 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.04 – 6.94 (m, 20H) 5.96 (d, J = 10.0 Hz, 2H), 5.59 (d, J = 10.0 Hz, 2H), 1.92 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.4, 137.5, 136.2, 127.9, 127.62, 127.61, 127.4, 126.9, 126.6, 86.3, 73.8, 39.6, 24.8; HRMS (ESI) calcd for $C_{33}H_{31}N_2O_2$ $(M+H)^+$ 487.2380, found 487.2380.



BOX-14

(4*R*,4'*R*,5*S*,5'*S*)-2,2'-(Pentane-3,3-diyl)bis(4,5-diphenyl-4,5-dihydrooxazole)

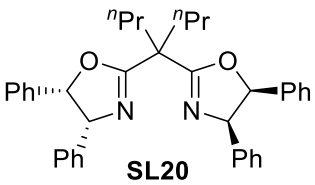
(BOX-14). 200 mg, 78% yield, white solid, Mp = 91~93 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.05 – 6.90 (m, 20H), 5.95 (d, J = 10.0 Hz, 2H), 5.59 (d, J = 10.0 Hz, 2H), 2.50 – 2.41 (m, 2H), 2.35 – 2.27 (m, 2H), 1.14 (t, J = 7.5 Hz, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.0, 137.5, 136.1, 127.9, 127.6, 127.4, 126.9, 126.7, 86.0, 73.7, 47.6, 25.9, 8.8; HRMS (ESI) calcd for $C_{35}H_{35}N_2O_2$ $(M+H)^+$ 515.2693, found 515.2695.



BOX-16

(4*R*,4'*R*)-2,2'-(Pentane-3,3-diyl)bis(5,5-dimethyl-4-phenyl-4,5-dihydrooxazole)

(BOX-16). 120 mg, 57% yield, white solid, Mp = 115~116 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31 – 7.22 (m, 10H), 4.89 (s, 2H), 2.28 – 2.19 (m, 2H), 2.15 – 2.07 (m, 2H), 1.58 (s, 6H), 0.97 (t, J = 7.5 Hz, 6H), 0.84 (s, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.8, 139.1, 128.0, 127.4, 127.3, 86.9, 78.2, 46.7, 29.4, 24.3, 23.9, 8.2; HRMS (ESI) calcd for $C_{27}H_{35}N_2O_2$ $(M+H)^+$ 419.2693, found 419.2695.



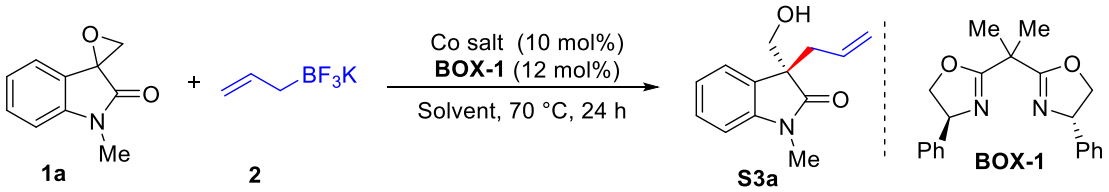
SL20

(4R,4'R,5S,5'S)-2,2'-(Heptane-4,4-diyl)bis(4,5-diphenyl-4,5-dihydrooxazole) (SL20). 180 mg, 66% yield, white solid, Mp = 179~180 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.05 – 6.90 (m, 20H), 5.94 (d, J = 10.0 Hz, 2H), 5.58 (d, J = 10.0 Hz, 2H), 2.43 – 2.37 (m, 2H), 2.28 – 2.21 (m, 2H), 1.60 – 1.49 (m, 4H), 1.07 (t, J = 7.0 Hz, 6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.2, 137.4, 136.0, 127.9, 127.6, 127.4, 126.9, 126.7, 86.1, 73.7, 46.9, 35.4, 17.7, 14.5; HRMS (ESI) calcd for $C_{37}H_{39}N_2O_2$ $(M+H)^+$ 543.3006, found 543.3008.

3. Asymmetric Ring Opening Reaction of Spiro-Epoxyoxindoles with Allylboron

3.1 Optimizations of Cobalt-Catalyzed Asymmetric Ring Opening Reaction of Spiro-Epoxyoxindoles with Allylboron

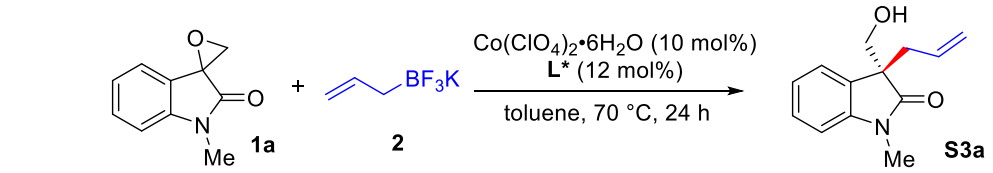
Table S1. Optimization of Solvent and Cobalt Salt[a]

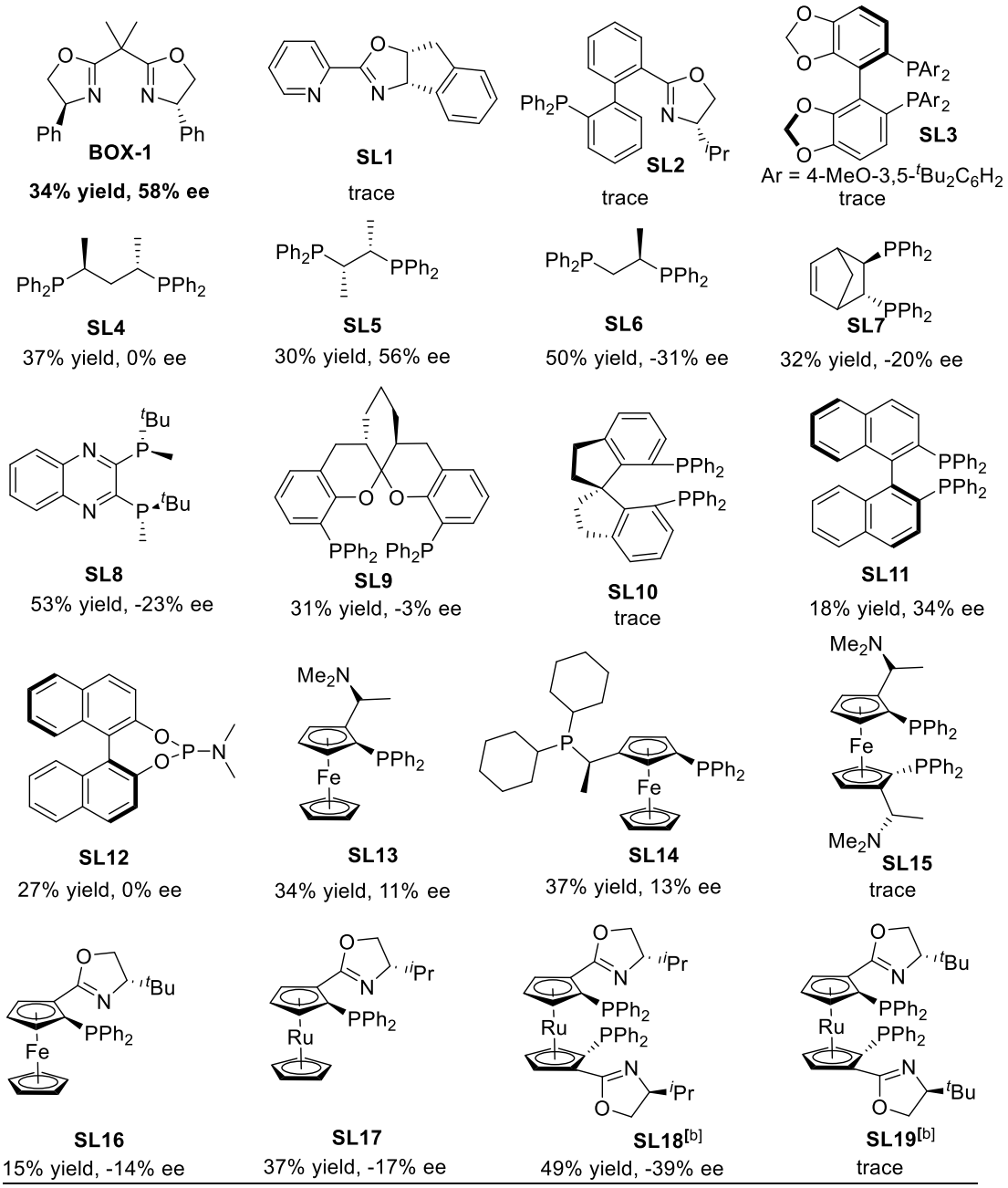


Entry	Co salt	Solvent	Yield [%][b]	ee [%][c]
1	$Co(OTf)_2 \cdot 2MeCN$	MTBE	23	53
2	$Co(OTf)_2 \cdot 2MeCN$	Et_2O	34	43
3	$Co(OTf)_2 \cdot 2MeCN$	THF	37	40
4	$Co(OTf)_2 \cdot 2MeCN$	Dioxane	30	40
5	$Co(OTf)_2 \cdot 2MeCN$	DCM	29	25
6	$Co(OTf)_2 \cdot 2MeCN$	toluene	34	54
7	$Co(OTf)_2 \cdot 2MeCN$	MeCN	25	43
8	$Co(OTf)_2 \cdot 2MeCN$	MeOH	ND	--
9	**$Co(ClO_4)_2 \cdot 6H_2O$**	**toluene**	**34**	**58**
10	$Co(BF_4)_2 \cdot 6H_2O$	toluene	27	50
11	CoI_2	toluene	trace	--

[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), Solvent (1.5 mL), Co salt (10 mol%), **BOX-1** (12 mol%). [b] Isolated yields. [c] Enantioselectivity was determined by HPLC using a chiral column.

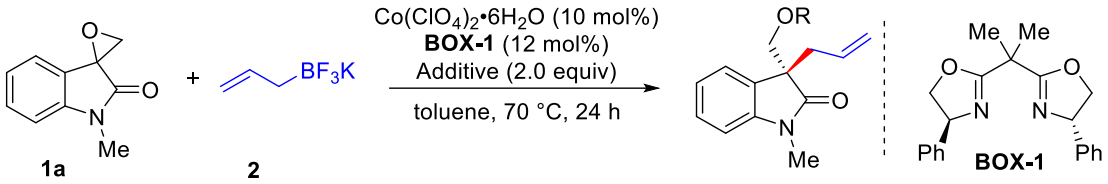
Scheme S1. Optimization of Chiral Ligands[a]





[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), toluene (1.5 mL), $Co(ClO_4)_2 \cdot 6H_2O$ (10 mol%), **L*** (12 mol%). Isolated yields. Enantioselectivity was determined by HPLC using a chiral column. [b] **L*** (6 mol%).

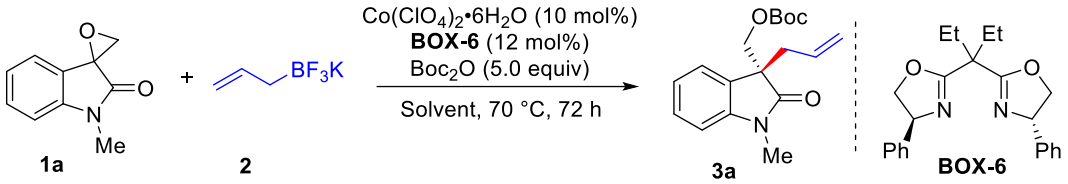
Table S2. Optimization of Additive[a]



Entry	Additive	Yield [%][b]	ee [%][c]
1	TMSOTf	trace	--
2	TFAA	trace	--
3	Ac_2O	trace	--
4[d]	Boc_2O	46	57
5[d,e]	Boc_2O	60	56
6[d,e,f]	**Boc_2O**	**79**	**59**
7[d,e,g]	Boc_2O	80	59

[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), toluene (1.5 mL), $Co(ClO_4)_2 \cdot 6H_2O$ (10 mol%), **BOX-1** (12 mol%), Additive (0.20 mmol 2.0 equiv) [b] Isolated yields. [c] Enantioselectivity was determined by HPLC using a chiral column. [d] R = Boc. [e] 72 h. [f] Boc_2O (5.0 equiv). [g] Boc_2O (10.0 equiv).

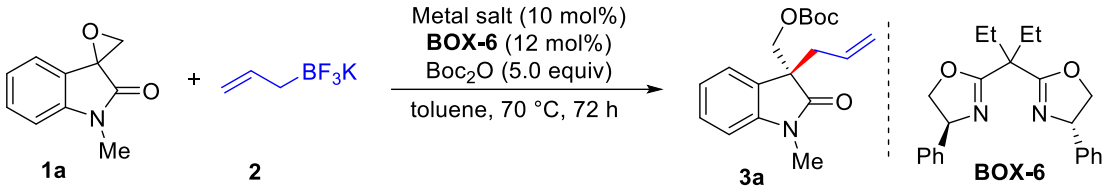
Table S3. Optimization of Solvent and Temperatures[a]



Entry	Solvent	Yield [%][b]	ee [%][c]
1	MTBE	89	59
2	Et_2O	92	59
3	ETBT	94	39
4	THF	81	32
5	DCM	83	27
6	**toluene**	**83**	**73**
7	Hexane	92	54
8	Acetone	12	47
9	DMF	trace	--
10	DMSO	trace	--
11	Benzene	64	71
12	*o*-xylene	84	71
13	*p*-xylene	64	61
14	Chlorobenzene	90	55
15[d]	toluene	74	60
16[e]	toluene	46	65

[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), Solvent (1.5 mL), $Co(ClO_4)_2 \cdot 6H_2O$ (10 mol%), **BOX-6** (12 mol%), Boc_2O (0.50 mmol, 5.0 equiv). [b] Isolated yields. [c] Enantioselectivity was determined by HPLC using a chiral column. [d] 100 °C. [e] 40 °C.

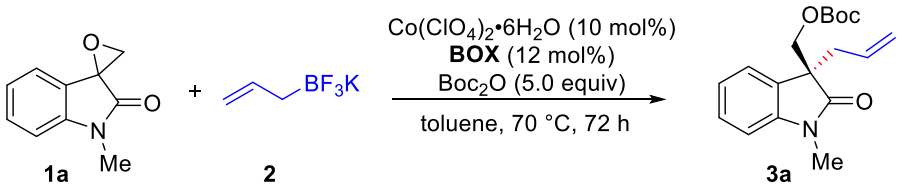
Table S4. Optimization of Metal Salt[a]

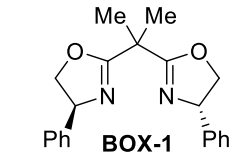


Entry	Metal salt	Yield [%][b]	ee [%][c]
1	$Co(OTf)_2 \cdot 2MeCN$	44	64
2	**$Co(ClO_4)_2 \cdot 6H_2O$**	**83**	**73**
3	$Co(BF_4)_2 \cdot 6H_2O$	73	66
4	$Co(acac)_2$	ND	--
5	$Co(OAc)_2$	ND	--
6	$CoBr_2$	60	20
7	$Ni(ClO_4)_2 \cdot 6H_2O$	ND	--
8	$Cu(ClO_4)_2 \cdot 6H_2O$	ND	--
9	$Ni(OTf)_2$	ND	--
10	$Sc(OTf)_3$	ND	--
11	$Yb(OTf)_3$	ND	--

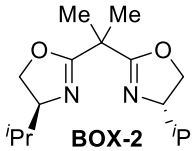
[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), toluene (1.5 mL), Metal salt (10 mol%), **BOX-6** (12 mol%), Boc_2O (0.50 mmol 5.0 equiv) [b] Isolated yields. [c] Enantioselectivity was determined by HPLC using a chiral column.

Scheme S2. Optimization of Chiral Ligands[a]

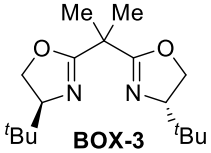




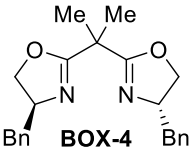
79% yield, -59% ee



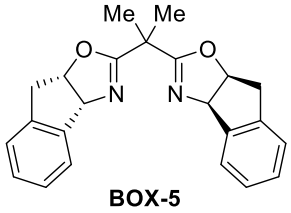
28% yield, -7% ee



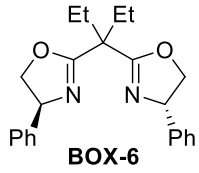
80% yield, -3% ee



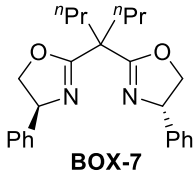
78% yield, -3% ee



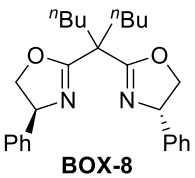
42% yield, 12% ee



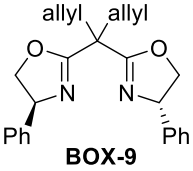
83% yield, -73% ee



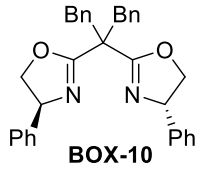
74% yield, -55% ee



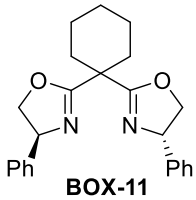
67% yield, -62% ee



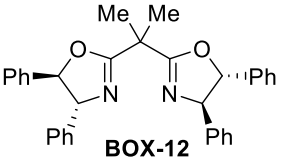
72% yield, -57% ee



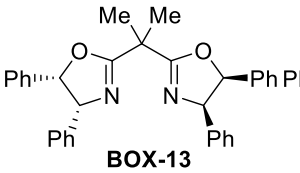
66% yield, -72% ee



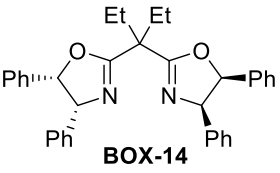
85% yield, -35% ee



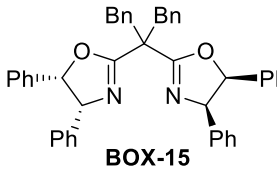
30% yield, 40% ee



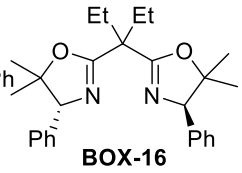
75% yield, 70% ee



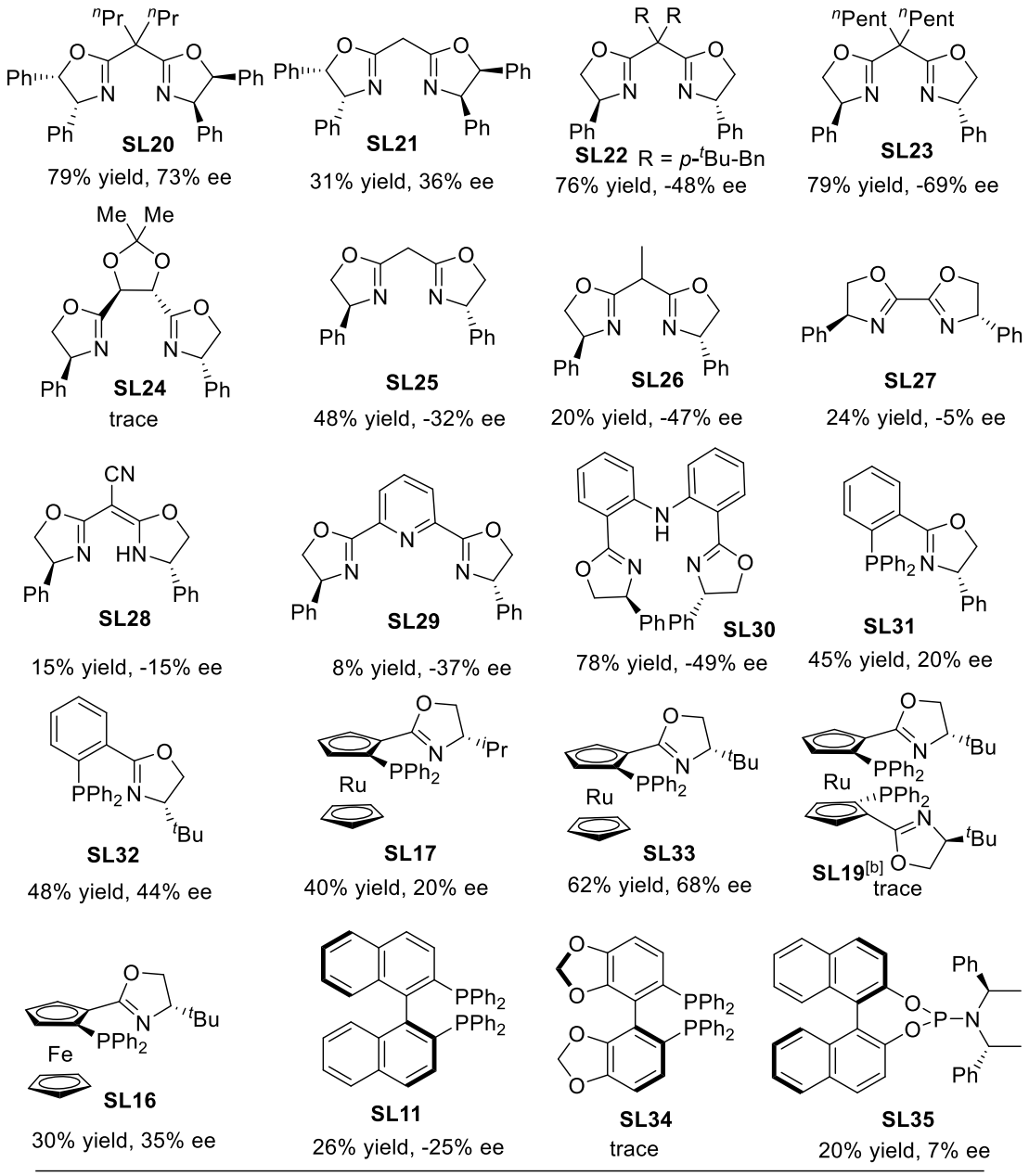
82% yield, 78% ee



87% yield, 73% ee

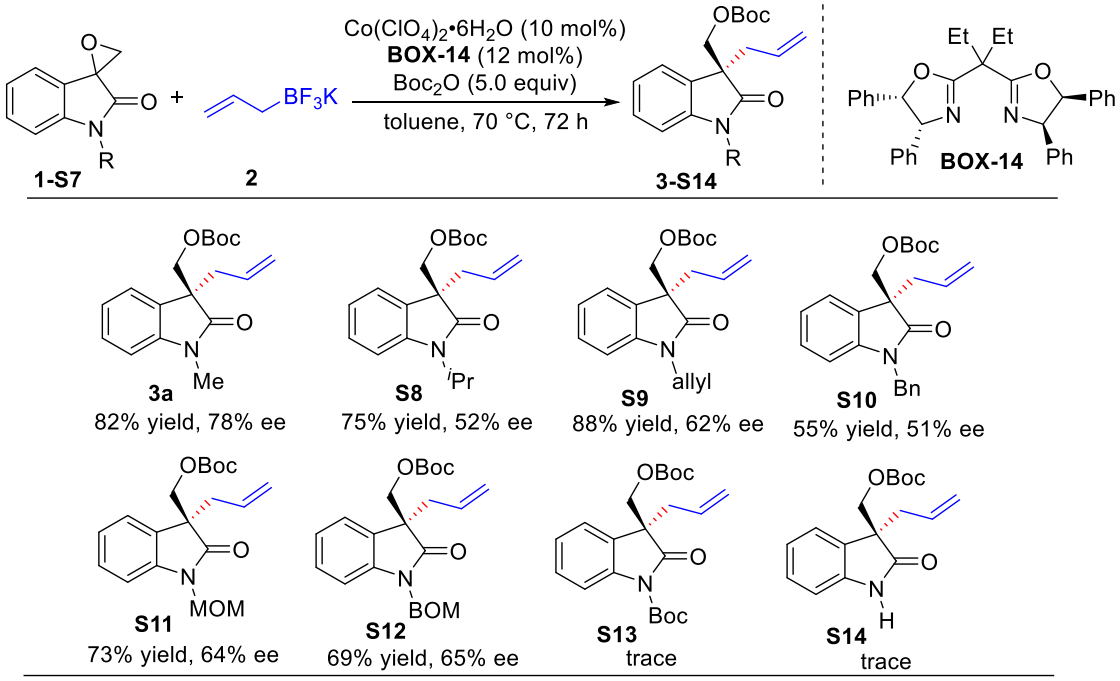


78% yield, 60% ee



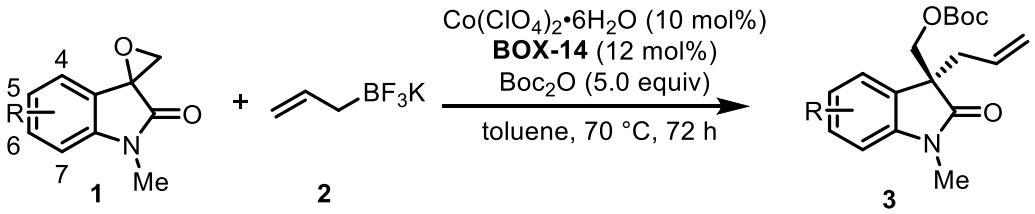
[a] Reaction conditions: **1a** (0.10 mmol, 1.0 equiv), **2** (0.20 mmol, 2.0 equiv), toluene (1.5 mL), $Co(ClO_4)_2 \cdot 6H_2O$ (10 mol%), **L*** (12 mol%), Boc_2O (0.50 mmol, 5.0 equiv). Isolated yields. Enantioselectivity was determined by HPLC using a chiral column. [b] **L*** (6 mol%).

Scheme S3. Optimization of R Group[a]

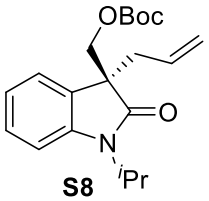


[a] Reaction conditions: **1-S7** (0.20 mmol, 1.0 equiv), **2** (0.40 mmol, 2.0 equiv), toluene (3.0 mL), $Co(ClO_4)_2·6H_2O$ (10 mol%), **BOX-14** (12 mol%), Boc_2O (1.0 mmol, 5.0 equiv). Isolated yields. Enantioselectivity was determined by HPLC using a chiral column.

3.2 General Procedure for the Enantioselective Catalysis

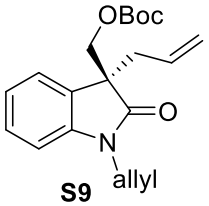


To a dried Schlenk tube were added $Co(ClO_4)_2·6H_2O$ (7.4 mg, 0.020 mmol) and ligand **BOX-14** (12.4 mg, 0.024 mmol) under N_2; 3.0 mL of toluene was subsequently added using a syringe. The resulting mixture was stirred at room temperature for 30 min, after which the Spiro-Epoxyoxidoles **1** (0.20 mmol) and Potassium Allyltrifluoroborate **2** (0.40 mmol) were added. The mixture was stirred at 70 °C for 72 hours, then it was cooled to room temperature, and the solvent was removed by rotary evaporation. The residue was purified by preparative TLC on silica gel (normal ratio: petroleum ether/ethyl acetate = 6/1) to give the product **3**. The ee was determined by chiral HPLC.



S8

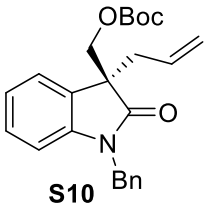
(*S*)-(3-Allyl-1-isopropyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (S8). 51.8 mg, 75% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30 (dd, J = 7.5, 1.5 Hz, 1H), 7.24 (dd, J = 7.5, 1.5 Hz, 1H), 7.03 (td, J = 7.5, 1.0 Hz, 1H), 6.99 (d, J = 7.5 Hz, 1H), 5.39 – 5.31 (m, 1H), 5.03 – 4.99 (m, 1H), 4.92 – 4.89 (m, 1H), 4.62 (hept, J = 7.0 Hz, 1H), 4.43 (d, J = 10.5 Hz, 1H), 4.24 (d, J = 11.0 Hz, 1H), 2.63 – 2.55 (m, 2H), 1.46 (t, J = 7.0 Hz, 6H), 1.34 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.4, 153.1, 142.8, 131.2, 129.4, 128.1, 124.2, 121.8, 119.2, 109.7, 82.0, 69.4, 52.2, 43.9, 38.0, 27.6, 19.5, 19.3; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min. t_{R1} = 8.2 min (major), t_{R2} = 11.8 min (minor)]; ee = 52%, $[\alpha]^{25}_{D}$ = -16.0 (c = 0.15, $CHCl_3$); HRMS (ESI) calcd for $C_{20}H_{28}NO_4$ $(M+H)^+$ 346.2013, found 346.2014.



S9

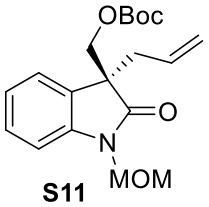
(*S*)-*tert*-Butyl ((1,3-diallyl-2-oxoindolin-3-yl)methyl) carbonate (S9). 60.4 mg, 88% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30 (dd, J = 7.5, 1.0 Hz, 1H), 7.25 (td, J = 8.0, 1.0 Hz, 1H), 7.05 (td, J = 7.5, 1.0 Hz, 1H), 6.80 (d, J = 7.5 Hz, 1H), 5.84 – 5.77 (m, 1H), 5.46 – 5.38 (m, 1H), 5.23 – 5.19 (m, 1H), 5.18 – 5.15 (m, 1H), 5.06 – 5.02 (m, 1H), 4.96 – 4.93 (m, 1H), 4.51 (d, J = 10.5 Hz, 1H), 4.41 – 4.36 (m, 1H), 4.34 – 4.29 (m, 1H), 4.28 (d, J = 10.5 Hz, 1H), 2.65 – 2.57 (m, 2H), 1.32 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.6, 153.0, 143.2, 131.1, 131.0, 128.8, 128.3, 124.0, 122.3, 119.5, 117.1, 109.0, 82.1, 69.1, 52.7, 42.1, 37.9, 27.6; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min. t_{R1} = 10.3 min (major), t_{R2} = 14.6 min (minor)]; ee = 62%, $[\alpha]^{25}_{D}$ = -16.0 (c = 0.15, $CHCl_3$); $[\alpha]^{25}_{D}$ =

-19.0 (c = 0.20, $CHCl_3$); HRMS (ESI) calcd for $C_{20}H_{26}NO_4$ $(M+H)^+$ 344.1856, found 344.1857.



S10

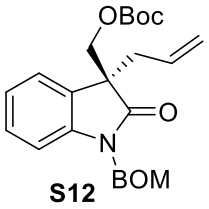
(*S*)-(3-Allyl-1-benzyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (S10). 43.3 mg, 55% yield, pale gummy ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31 – 7.21 (m, 6H), 7.14 (td, *J* = 8.0, 1.5 Hz, 1H), 7.02 (td, *J* = 7.5, 1.0 Hz, 1H), 6.64 (d, *J* = 8.0 Hz, 1H), 5.45 (ddt, *J* = 17.0, 10.0, 7.0 Hz, 1H), 5.07 (dd, *J* = 17.0, 2.0 Hz, 1H), 5.05 (d, *J* = 16.0 Hz, 1H), 4.98 – 4.95 (m, 1H), 4.83 (d, *J* = 16.0 Hz, 1H), 4.56 (d, *J* = 10.5 Hz, 1H), 4.34 (d, *J* = 10.5 Hz, 1H), 2.69 – 2.61 (m, 2H), 1.34 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.0, 153.1, 143.2, 135.5, 131.2, 128.8, 128.7, 128.4, 127.4, 127.1, 124.0, 122.4, 119.6, 109.2, 82.2, 69.3, 52.7, 43.7, 38.0, 27.6; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} =10.8 min (major), t_{R2} = 17.2 min (minor)]; ee = 51%, $[\alpha]^{25}_D$ = -10.0 (c = 1.00, $CHCl_3$); HRMS (ESI) calcd for $C_{24}H_{28}NO_4$ $(M+H)^+$ 394.2013, found 394.2014.



S11

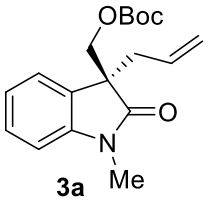
(S)-(3-Allyl-1-(methoxymethyl)-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (S11). 50.7 mg, 73% yield, colorless ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 – 7.27 (m, 2H), 7.10 (td, *J* = 8.0, 1.0 Hz, 1H), 7.04 (d, *J* = 8.0 Hz, 1H), 5.46 – 5.37 (m, 1H), 5.17 (d, *J* = 11.0 Hz, 1H), 5.11 (d, *J* = 11.0 Hz, 1H), 5.05 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.97 – 4.94 (m, 1H), 4.52 (d, *J* = 10.5 Hz, 1H), 4.28 (d, *J* = 10.5 Hz, 1H), 3.30 (s, 3H), 2.66 – 2.57 (m, 2H), 1.31 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.5, 152.9, 142.3, 131.0, 128.6, 128.3, 124.0, 122.9, 119.7, 109.6, 82.2, 71.2, 69.1, 56.0, 53.2,

38.0, 27.6; HPLC [Daicel Chiralpak OD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min. t_{R1} = 7.0 min (major), t_{R2} = 40.1 min (minor)]; ee = 64%, $[\alpha]^{25}_{D}$ = -39.9 (c = 0.10, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{26}NO_5$ $(M+H)^+$ 348.1805, found 348.1806.



S12

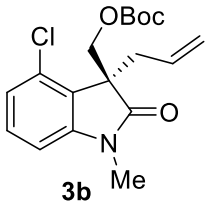
(*S*)-(3-Allyl-1-((benzyloxy)methyl)-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (S12). 58.4 mg, 69% yield, yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 – 7.26 (m, 7H), 7.14 – 7.09 (m, 2H), 5.47 – 5.38 (m, 1H), 5.30 (d, *J* = 11.5 Hz, 1H), 5.21 (d, *J* = 11.0 Hz, 1H), 5.07 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.97 – 4.94 (m, 1H), 4.53 (d, *J* = 10.5 Hz, 1H), 4.51 (d, *J* = 11.5 Hz, 1H), 4.46 (d, *J* = 11.5 Hz, 1H), 4.30 (d, *J* = 10.5 Hz, 1H), 2.66 – 2.56 (m, 2H), 1.27 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.5, 153.0, 142.3, 137.3, 131.0, 128.6, 128.3, 128.2, 127.8, 127.1, 123.9, 123.0, 119.7, 109.8, 82.3, 70.1, 69.3, 69.1, 53.1, 38.0, 27.5; HPLC [Daicel Chiralpak OD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min. t_{R1} = 9.7 min (major), t_{R2} = 55.0 min (minor)]; ee = 65%, $[\alpha]^{25}_{D}$ = -21.3 (c = 0.21, $CHCl_3$); HRMS (ESI) calcd for $C_{25}H_{30}NO_5$ $(M+H)^+$ 424.2118, found 424.2121.



3a

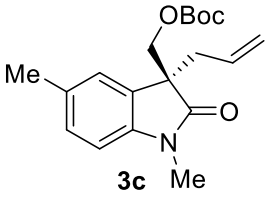
(*S*)-(3-Allyl-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3a). 52.0 mg, 82% yield, colorless gummy oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.31 – 7.26 (m, 2H), 7.06 (td, *J* = 7.6, 1.2 Hz, 1H), 6.83 (dd, *J* = 8.0, 1.2 Hz, 1H), 5.40 (ddt, *J* = 17.2, 10.0, 7.2 Hz, 1H), 5.02 (dd, *J* = 16.8, 1.6 Hz, 1H), 4.95 – 4.92 (m, 1H), 4.48 (d, *J* = 10.4 Hz, 1H), 4.25 (d, *J* = 10.4 Hz, 1H), 3.21 (s, 3H), 2.66 – 2.54 (m, 2H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.7, 153.1, 144.0, 131.2, 128.9, 128.4, 124.0, 122.4,

119.4, 108.0, 82.2, 69.0, 52.5, 38.1, 27.6, 26.2; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.1 min (major), t_{R2} = 11.0 min (minor)]; ee = 78%, $[\alpha]^{25}_{D}$ = -22.6 (c = 0.31, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{24}NO_4$ $(M+H)^+$ 318.1700, found 318.1702.



3b

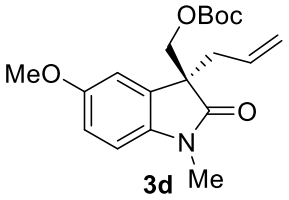
(*S*)-(3-Allyl-4-chloro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3b). 52.1 mg, 74% yield, white solid, Mp = 65~67 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 (t, *J* = 8.0 Hz, 1H), 7.00 (dd, *J* = 8.4, 0.8 Hz, 1H), 6.73 (dd, *J* = 7.6, 0.8 Hz, 1H), 5.25 (ddt, *J* = 17.2, 10.0, 7.2 Hz, 1H), 5.07 – 5.00 (m, 1H), 4.87 – 4.83 (m, 1H), 4.84 (d, *J* = 10.4 Hz, 1H), 4.37 (d, *J* = 10.4 Hz, 1H), 3.20 (s, 3H), 2.94 (dd, *J* = 13.2, 7.2 Hz, 1H), 2.61 (dd, *J* = 13.2, 7.6 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.4, 152.8, 146.2, 131.0, 130.5, 129.7, 124.8, 123.5, 119.3, 106.5, 82.2, 67.2, 54.6, 34.9, 27.6, 26.5; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.1 min (major), t_{R2} = 14.7 min (minor)]; ee = 57%, $[\alpha]^{25}_{D}$ = -11.0 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}ClNO_4$ $(M+H)^+$ 352.1310, found 352.1311.



3c

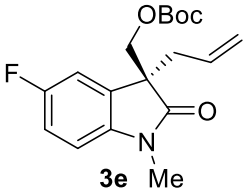
(*S*)-(3-Allyl-1,5-dimethyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3c). 53.7 mg, 81% yield, colorless gummy oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.11 – 7.07 (m, 2H), 6.72 (d, *J* = 7.6 Hz, 1H), 5.40 (ddt, *J* = 17.2, 10.0, 7.2 Hz, 1H), 5.03 (dd, *J* = 17.2, 1.6 Hz, 1H), 4.93 (dd, *J* = 10.0, 1.6 Hz, 1H), 4.46 (d, *J* = 10.4 Hz, 1H), 4.26 (d, *J* = 10.4 Hz, 1H), 3.18 (s, 3H), 2.63 – 2.53 (m, 2H), 2.34 (s, 3H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.7, 153.1, 141.6, 131.8, 131.3, 128.9, 128.6, 124.8, 119.3,

107.7, 82.2, 69.0, 52.6, 38.1, 27.6, 26.3, 21.2; HPLC [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 7.2 min (major), t_{R2} = 9.8 min (minor)]; ee = 72%, $[\alpha]^{25}_{D}$ = -12.0 (c = 0.19, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{25}NNaO_4$ $(M+Na)^+$ 354.1676, found 354.1677.



3d

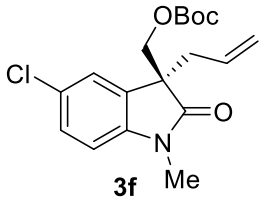
(*S*)-(3-Allyl-5-methoxy-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3d). 59.1 mg, 85% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.92 (d, *J* = 2.5 Hz, 1H), 6.81 (dd, *J* = 8.5, 2.5 Hz, 1H), 6.73 (d, *J* = 8.5 Hz, 1H), 5.41 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.03 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.95 – 4.93 (m, 1H), 4.44 (d, *J* = 10.5 Hz, 1H), 4.25 (d, *J* = 11.0 Hz, 1H), 3.80 (s, 3H), 3.18 (s, 3H), 2.63 – 2.54 (m, 2H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.4, 155.9, 153.1, 137.5, 131.2, 130.3, 119.4, 112.6, 111.6, 108.3, 82.3, 69.0, 55.8, 52.9, 38.2, 27.6, 26.3; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 10.8 min (major), t_{R2} = 14.9 min (minor)]; ee = 72%, $[\alpha]^{25}_{D}$ = -8.99 (c = 0.12, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{26}NO_5$ $(M+H)^+$ 348.1805 found 348.1807.



3e

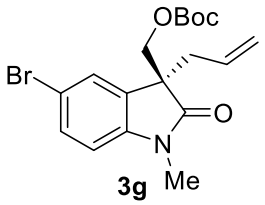
(*S*)-(3-Allyl-5-fluoro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3e). 48.3 mg, 72% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.06 (dd, *J* = 7.5, 2.5 Hz, 1H), 6.99 (td, *J* = 8.5, 2.5 Hz, 1H), 6.75 (dd, *J* = 8.5, 4.0 Hz, 1H), 5.39 (ddt, *J* = 17.0, 10.0, 7.0 Hz, 1H), 5.03 (dd, *J* = 17.5, 2.0 Hz, 1H), 4.97 – 4.94 (m, 1H), 4.45 (d, *J* = 10.5 Hz, 1H), 4.25 (d, *J* = 10.5 Hz, 1H), 3.20 (s, 3H), 2.64 – 2.55 (m, 2H), 1.37 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.4, 159.2 (d, *J* = 239.1 Hz), 153.0, 139.9 (d, *J* = 2.1 Hz), 130.8, 130.6 (d, *J* = 8.4 Hz), 119.8, 114.6 (d, *J* = 23.2 Hz),

112.3 (d, *J* = 24.9 Hz), 108.4 (d, *J* = 8.2 Hz), 82.5, 68.7, 53.1 (d, *J* = 2.0 Hz), 38.1, 27.6, 26.4; ^{19}F NMR (470 MHz, $CDCl_3$) δ -120.80; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 9.0 min (major), t_{R2} = 12.3 min (minor)]; ee = 67%, $[\alpha]^{25}_D$ = -15.7 (c = 0.14, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{22}FNNaO_4$ $(M+Na)^+$ 358.1425, found 358.1427.



3f

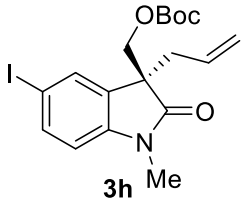
(*S*)-(3-Allyl-5-chloro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3f). 49.2 mg, 70% yield, white ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 – 7.26 (m, 2H), 6.76 (d, *J* = 9.0 Hz, 1H), 5.39 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.04 (dd, *J* = 17.0, 1.5 Hz, 1H), 4.97 – 4.95 (m, 1H), 4.45 (d, *J* = 11.0 Hz, 1H), 4.26 (d, *J* = 10.5 Hz, 1H), 3.19 (s, 3H), 2.63 – 2.55 (m, 2H), 1.38 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.3, 153.0, 142.6, 130.7, 128.4, 127.8, 124.5, 119.9, 109.0, 82.5, 68.6, 52.9, 38.1, 27.6, 26.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.9 min (major), t_{R2} = 11.1 min (minor)]; ee = 60%, $[\alpha]^{25}_D$ = -5.06 (c = 0.75, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}ClNO_4$ $(M+H)^+$ 352.1310, found 352.1311.



3g

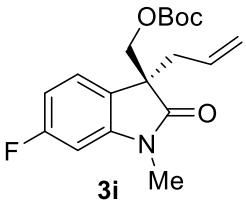
(*S*)-(3-Allyl-5-bromo-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3g). 50.7 mg, 64% yield, pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43 – 7.39 (m, 2H), 6.71 (d, *J* = 8.0 Hz, 1H), 5.39 (ddt, *J* = 17.0, 10.0, 7.0 Hz, 1H), 5.04 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.98 – 4.95 (m, 1H), 4.45 (d, *J* = 11.0 Hz, 1H), 4.26 (d, *J* = 10.5 Hz, 1H), 3.19 (s, 3H), 2.63 – 2.52 (m, 2H), 1.38 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.2, 153.0, 143.1, 131.3, 131.0, 130.6, 127.2, 119.9, 115.1, 109.5, 82.6, 68.6, 52.9,

38.1, 27.6, 26.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 9.2 min (major), t_{R2} = 11.4 min (minor)]; ee = 68%, $[\alpha]^{25}_{D}$ = -2.84 (c = 0.38, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}BrNO_4$ $(M+H)^+$ 396.0805, found 396.0805.



3h

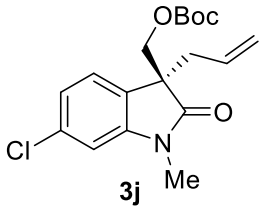
(*S*)-(3-Allyl-5-iodo-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3h). 58.5 mg, 66% yield, pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.56 (d, *J* = 2.0 Hz, 1H), 6.62 (d, *J* = 8.5 Hz, 1H), 5.38 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.04 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.97 – 4.95 (m, 1H), 4.43 (d, *J* = 11.0 Hz, 1H), 4.26 (d, *J* = 11.0 Hz, 1H), 3.18 (s, 3H), 2.61 – 2.52 (m, 2H), 1.38 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.0, 153.0, 143.8, 137.3, 132.7, 131.4, 130.6, 119.9, 110.1, 84.9, 82.6, 68.6, 52.7, 38.1, 27.7, 26.3; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 9.4 min (major), t_{R2} = 12.4 min (minor)]; ee = 73%, $[\alpha]^{25}_{D}$ = -1.20 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}INO_4$ $(M+H)^+$ 444.0666, found 444.0667.



3i

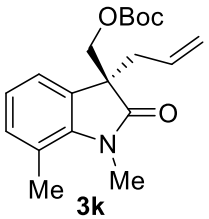
(*S*)-(3-Allyl-6-fluoro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3i). 50.3 mg, 75% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.22 (dd, *J* = 8.5, 5.5 Hz, 1H), 6.77 – 6.71 (m, 1H), 6.58 (dd, *J* = 8.5, 2.0 Hz, 1H), 5.38 (ddt, *J* = 17.0, 9.5, 7.5 Hz, 1H), 5.02 (dd, *J* = 17.5, 2.0 Hz, 1H), 4.96 – 4.93 (m, 1H), 4.47 (d, *J* = 10.5 Hz, 1H), 4.23 (d, *J* = 11.0 Hz, 1H), 3.19 (s, 3H), 2.62 – 2.53 (m, 2H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.1, 163.3 (d, *J* = 243.6 Hz), 153.0, 145.5 (d, *J*

= 11.4 Hz), 130.9, 125.1 (d, *J* = 9.8 Hz), 124.1 (d, *J* = 3.0 Hz), 119.7, 108.4 (d, *J* = 22.1 Hz), 96.9 (d, *J* = 27.5 Hz), 82.4, 68.8, 52.3, 38.1, 27.6, 26.4; ^{19}F NMR (470 MHz, $CDCl_3$) δ -111.92; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.3 min (major), t_{R2} = 12.4 min (minor)]; ee = 77%, $[\alpha]^{25}_D$ = -17.5 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}FNO_4$ $(M+H)^+$ 336.1606, found 336.1606.



3j

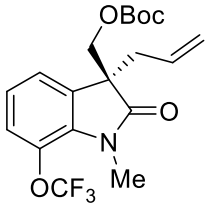
(*S*)-(3-Allyl-6-chloro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3j). 49.9 mg, 71% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.20 (d, *J* = 8.0 Hz, 1H), 7.04 (dd, *J* = 8.0, 2.0 Hz, 1H), 6.83 (d, *J* = 1.5 Hz, 1H), 5.38 (ddt, *J* = 17.0, 10.0, 7.0 Hz, 1H), 5.02 (dd, *J* = 17.0, 1.5 Hz, 1H), 4.96 – 4.94 (m, 1H), 4.46 (d, *J* = 10.5 Hz, 1H), 4.23 (d, *J* = 10.5 Hz, 1H), 3.19 (s, 3H), 2.62 – 2.53 (m, 2H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.7, 153.0, 145.2, 134.3, 130.7, 127.2, 125.0, 122.2, 119.8, 108.8, 82.4, 68.7, 52.4, 38.0, 27.6, 26.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.4 min (major), t_{R2} = 11.5 min (minor)]; ee = 67%, $[\alpha]^{25}_D$ = -17.0 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}ClNO_4$ $(M+H)^+$ 352.1310, found 352.1311.



3k

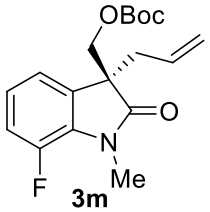
(*S*)-(3-Allyl-1,7-dimethyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3k). 57.0 mg, 86% yield, colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.11 (d, *J* = 7.0 Hz, 1H), 7.01 (d, *J* = 7.5 Hz, 1H), 6.94 (t, *J* = 7.5 Hz, 1H), 5.39 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.02 (dd, *J* = 17.0, 1.5 Hz, 1H), 4.95 – 4.92 (m, 1H), 4.42 (d, *J* = 11.0 Hz,

1H), 4.24 (d, *J* = 10.5 Hz, 1H), 3.48 (s, 3H), 2.58 (d, *J* = 7.0 Hz, 2H), 2.57 (s, 3H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.4, 153.1, 141.7, 132.2, 131.3, 129.5, 122.3, 121.8, 119.6, 119.3, 82.2, 69.3, 51.8, 38.4, 29.6, 27.6, 19.1; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 7.8 min (major), t_{R2} = 11.3 min (minor)]; ee = 73%, $[\alpha]^{25}_D$ = -22.2 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{26}NO_4$ $(M+H)^+$ 332.1856, found 332.1857.



3l

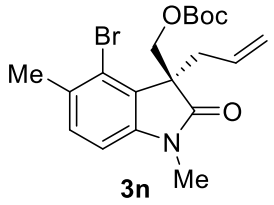
(*S*)-(3-Allyl-1-methyl-2-oxo-7-(trifluoromethoxy)indolin-3-yl)methyl *tert*-butyl carbonate (3l). 52.2 mg, 65% yield, white ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.20 – 7.16 (m, 2H), 6.82 (d, *J* = 8.5 Hz, 1H), 5.43 – 5.34 (m, 1H), 5.02 (d, *J* = 17.0 Hz, 1H), 4.96 (d, *J* = 10.0 Hz, 1H), 4.48 (d, *J* = 11.0 Hz, 1H), 4.26 (d, *J* = 11.0 Hz, 1H), 3.21 (s, 3H), 2.65 – 2.55 (m, 2H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.5, 152.9, 144.6 (q, *J* = 2.1 Hz), 142.6, 130.5, 130.4, 121.6, 120.6 (q, *J* = 255.2 Hz), 120.0, 118.3, 108.4, 82.6, 68.5, 53.0, 38.1, 27.5, 26.4; ^{19}F NMR (470 MHz, $CDCl_3$) δ -58.40; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min. t_{R1} = 8.7 min (major), t_{R2} = 9.9 min (minor)]; ee = 63%, $[\alpha]^{25}_D$ = -13.0 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{23}F_3NO_5$ $(M+H)^+$ 402.1523, found 402.1523.



3m

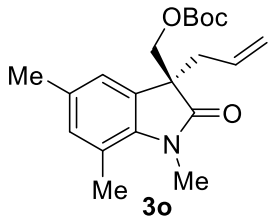
(*S*)-(3-Allyl-7-fluoro-1-methyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3m). 49.6 mg, 74% yield, pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.07 (dd, *J* = 7.0, 2.0 Hz, 1H), 7.04 – 6.96 (m, 2H), 5.38 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.02

(dd, *J* = 17.0, 1.5 Hz, 1H), 4.97 – 4.95 (m, 1H), 4.46 (d, *J* = 10.5 Hz, 1H), 4.26 (d, *J* = 11.0 Hz, 1H), 3.42 (d, *J* = 3.0 Hz, 3H), 2.58 (d, *J* = 7.5 Hz, 2H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.4, 153.0, 147.7 (d, *J* = 241.9 Hz), 131.8 (d, *J* = 3.1 Hz), 130.7, 130.6 (d, *J* = 8.1 Hz), 122.9 (d, *J* = 6.2 Hz), 119.8 (d, *J* = 3.2 Hz), 119.7, 116.4 (d, *J* = 19.1 Hz), 82.4, 68.9, 53.0 (d, *J* = 1.9 Hz), 38.3, 28.7 (d, *J* = 5.6 Hz), 27.6; ^{19}F NMR (470 MHz, $CDCl_3$) δ -136.64; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 6.7 min (major), t_{R2} = 9.7 min (minor)]; ee = 66%, $[\alpha]^{25}_D$ = -15.6 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{23}FNO_4$ $(M+H)^+$ 336.1606, found 336.1606.



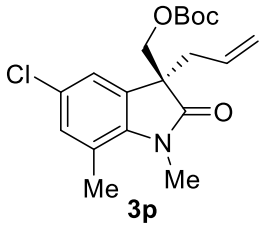
3n

(*S*)-(3-Allyl-4-bromo-1,5-dimethyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3n). 57.4 mg, 70% yield, white solid, Mp = 75~77 °C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.17 (d, *J* = 7.5 Hz, 1H), 6.68 (d, *J* = 7.5 Hz, 1H), 5.23 (ddt, *J* = 17.0, 10.0, 7.0 Hz, 1H), 5.04 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.97 (d, *J* = 10.5 Hz, 1H), 4.84 (dd, *J* = 10.0, 2.0 Hz, 1H), 4.33 (d, *J* = 10.5 Hz, 1H), 3.18 (s, 3H), 3.08 (dd, *J* = 13.5, 7.0 Hz, 1H), 2.55 (dd, *J* = 13.5, 7.5 Hz, 1H), 2.38 (s, 3H), 1.32 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.4, 152.8, 144.2, 132.0, 130.7, 130.3, 126.7, 122.0, 119.1, 106.8, 82.2, 67.0, 55.7, 34.6, 27.6, 26.4, 22.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.4 min (major), t_{R2} = 14.7 min (minor)]; ee = 63%, $[\alpha]^{25}_D$ = -14.4 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{25}BrNO_4$ $(M+H)^+$ 410.0961, found 410.0962.



3o

(*S*)-(3-Allyl-1,5,7-trimethyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3o). 62.2 mg, 90% yield, pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 6.92 (s, 1H), 6.81 (s, 1H), 5.39 (ddt, *J* = 17.0, 10.0, 7.5 Hz, 1H), 5.02 (d, *J* = 17.0 Hz, 1H), 4.94 (d, *J* = 10.0 Hz, 1H), 4.40 (d, *J* = 11.0 Hz, 1H), 4.24 (d, *J* = 10.5 Hz, 1H), 3.45 (s, 3H), 2.56 (d, *J* = 7.0 Hz, 2H), 2.52 (s, 3H), 2.28 (s, 3H), 1.37 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.4, 153.1, 139.3, 132.6, 131.6, 131.4, 129.6, 122.4, 119.2, 119.1, 82.2, 69.3, 51.9, 38.4, 29.6, 27.6, 20.8, 18.9; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 6.9 min (major), t_{R2} = 9.9 min (minor)]; ee = 68%, $[\alpha]^{25}_{D}$ = -15.7 (c = 0.50, $CHCl_3$); HRMS (ESI) calcd for $C_{20}H_{28}NO_4$ $(M+H)^+$ 346.2013, found 346.2014.



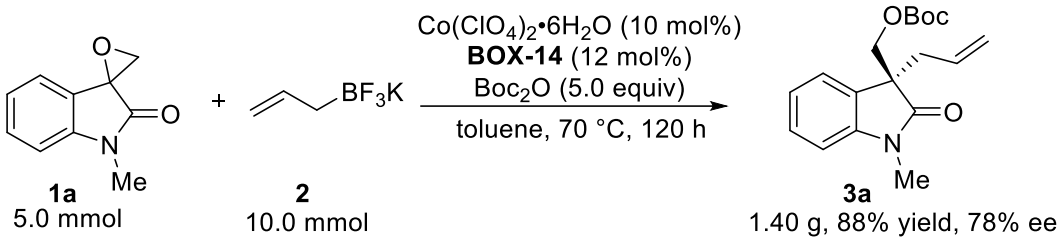
3p

(*S*)-(3-Allyl-5-chloro-1,7-dimethyl-2-oxoindolin-3-yl)methyl *tert*-butyl carbonate (3p). 49.7 mg, 68% yield, pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.09 (d, *J* = 2.0 Hz, 1H), 7.02 – 7.00 (m, 1H), 5.37 (ddt, *J* = 17.5, 10.0, 7.5 Hz, 1H), 5.03 (dd, *J* = 17.5, 2.0 Hz, 1H), 4.97 – 4.95 (m, 1H), 4.38 (d, *J* = 11.0 Hz, 1H), 4.25 (d, *J* = 11.0 Hz, 1H), 3.46 (s, 3H), 2.56 (d, *J* = 7.0 Hz, 2H), 2.54 (s, 3H), 1.39 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.0, 153.0, 140.4, 131.7, 131.3, 130.8, 127.4, 122.0, 121.1, 119.7, 82.5, 68.9, 52.2, 38.4, 29.6, 27.6, 18.9; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 8.0 min (major), t_{R2} = 11.0 min (minor)]; ee = 77%, $[\alpha]^{25}_{D}$ = -12.5 (c = 0.40, $CHCl_3$); HRMS (ESI) calcd for $C_{19}H_{25}ClNO_4$ $(M+H)^+$ 366.1467, found 366.1467.

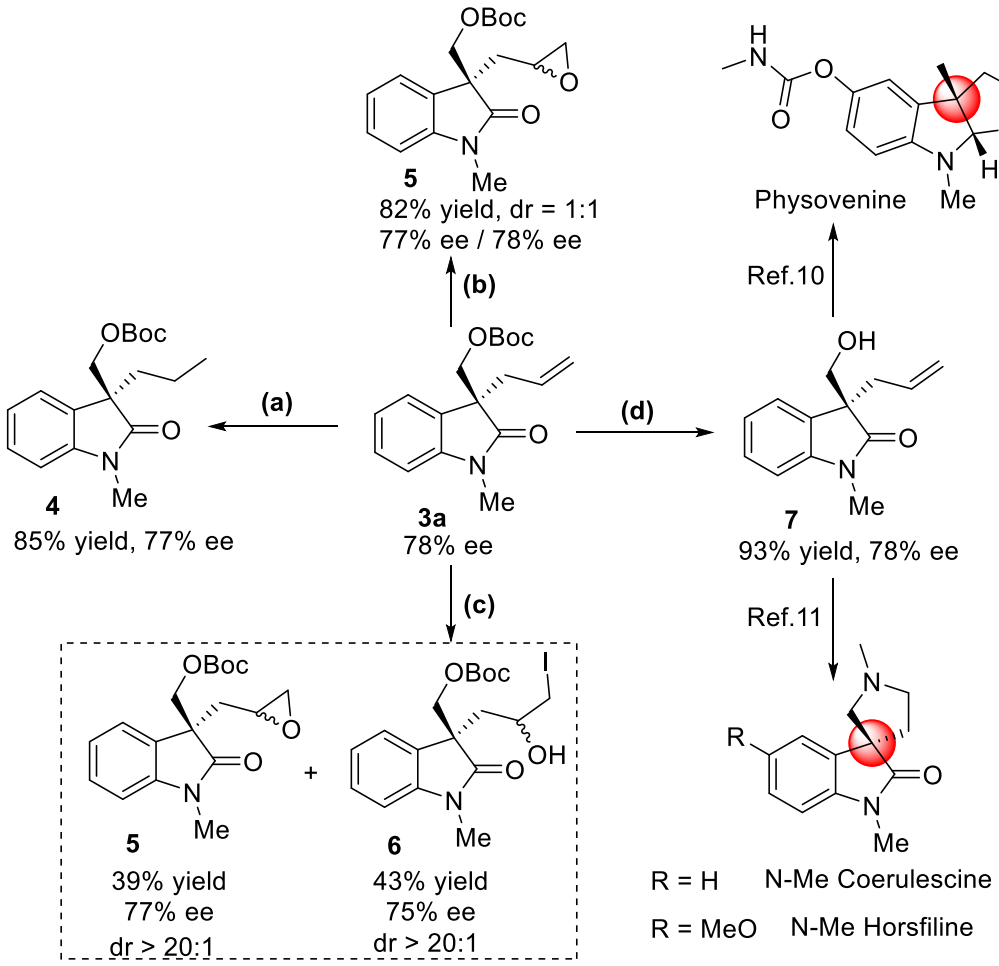
4. Transformations

To confirm the scalability of the present protocol, the scaleup reaction of spiro-epoxyoxindole **1a** with potassium allyltrifluoroborate **2** was carried out, and product **3a** was readily isolated in 88% yield and 78% ee (Scheme S4).

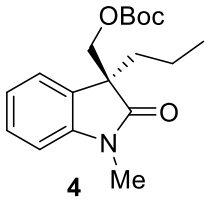
Scheme S4. Scale-Up Reaction of **1a** with **2**



Scheme S5. Transformations of **3a**



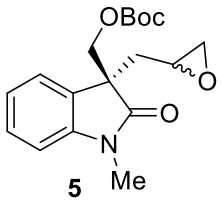
(a) To a solution of **3a** (31.7 mg, 0.10 mmol, 1.0 equiv) in MeOH (3.0 mL), 10% Pd/C (20.0 mg) as added in one portion under nitrogen atmosphere. Then the vial was charged with 1 atm. of H_2 three times (balloon) and the reaction mixture was stirred at room temperature overnight. Then the reaction mixture was filtered through a plug of silica gel. The solvent was removed under vacuum and the residue was purified by preparative TLC on silica gel (petroleum ether/ethyl acetate = 5/1) to give the product **4** as a colorless gummy oil (27.1 mg, 85% yield).[6]



4

(*S*)-*tert*-Butyl ((1-methyl-2-oxo-3-propylindolin-3-yl)methyl) carbonate (4). Colorless gummy oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.29 (td, J = 7.5, 1.5 Hz, 1H), 7.25 (dd, J = 7.5, 1.5 Hz, 1H), 7.06 (td, J = 7.5, 1.0 Hz, 1H), 6.84 (d, J = 8.0 Hz, 1H), 4.44 (d, J = 11.0 Hz, 1H), 4.22 (d, J = 10.5 Hz, 1H), 3.22 (s, 3H), 1.91 – 1.77 (m, 2H), 1.34 (s, 9H), 1.08 – 0.98 (m, 1H), 0.91 – 0.82 (m, 1H), 0.78 (t, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.4, 153.1, 144.2, 129.5, 128.3, 123.6, 122.4, 108.0, 82.1, 69.6, 53.0, 35.9, 27.6, 26.2, 17.1, 14.1; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 7.4 min (major), t_{R2} = 14.5 min (minor)]; ee = 77%, $[\alpha]^{25}_D$ = -7.56 (c = 0.28, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{26}NO_4$ $(M+H)^+$ 320.1856, found 320.1858.

(b) To a solution of **3a** (31.7 mg, 0.10 mmol, 1.0 equiv) in CH_2Cl_2 (2.0 mL) was added *m*-CPBA (75%, 46.0 mg, 0.20 mmol, 2.0 equiv.) at 0 °C. The reaction mixture was then stirred at room temperature overnight. Then treated with saturated aqueous Na_2SO_3. The phases were separated and removed under vacuum and the residue was purified by preparative TLC on silica gel (petroleum ether/ethyl acetate = 4/1) to give the product **5** (27.4 mg, 82% yield) as a pale yellow ointment.[7]

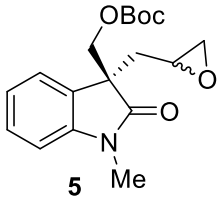


5

***tert*-Butyl (((3*S*)-1-methyl-3-(oxiran-2-ylmethyl)-2-oxoindolin-3-yl)methyl) carbonate (5)**. Diastereomers can be separated by preparative TLC on silica gel. ^{1}H NMR analysis of the crude mixture showed a dr of 1:1. First diastereoisomers (**5-1**): pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36 (dd, J = 7.0, 1.0 Hz, 1H), 7.33 (td, J = 7.5, 1.0 Hz, 1H), 7.10 (td, J = 7.5, 1.0 Hz, 1H), 6.88 (d, J = 8.0 Hz, 1H), 4.50 (d, J = 10.5 Hz, 1H), 4.22 (d, J = 11.0 Hz, 1H), 3.25 (s, 3H), 2.64 – 2.60 (m, 1H), 2.58 – 2.56 (m, 1H), 2.44 (dd, J = 5.0, 2.5 Hz, 1H), 2.22 (dd, J = 14.0, 5.5 Hz, 1H), 2.01 (dd, J = 14.0, 6.0 Hz, 1H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.6, 153.0, 143.7, 128.8, 128.6, 124.3, 122.7, 108.3, 82.4, 69.0, 51.4, 48.0, 46.5, 36.6, 27.6, 26.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 14.0 min (major), t_{R2} = 17.7 min (minor)]; ee = 77%, $[\alpha]^{25}_D$ = -12.0 (c = 0.20, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{24}NO_5$ $(M+H)^+$ 334.1649, found 334.1650. Second diastereoisomers (**5-2**): pale yellow ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.30 (m, 2H), 7.08 (td, J = 7.5, 1.0 Hz, 1H), 6.88 (dd, J = 8.0, 1.0 Hz, 1H), 4.48 (d, J = 11.0 Hz, 1H), 4.26 (d, J = 10.5 Hz, 1H), 3.26 (s, 3H), 2.71 – 2.67 (m, 1H), 2.52 (dd, J = 5.0, 4.0 Hz, 1H), 2.31 (dd, J = 5.0, 2.5 Hz, 1H), 2.17 (dd, J = 14.0, 4.5 Hz, 1H), 2.07 (dd, J = 14.0, 7.5 Hz, 1H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.6, 153.0, 144.0, 128.8, 128.7, 124.1, 122.5, 108.4, 82.4, 69.0, 51.1, 48.0, 46.8, 36.9, 27.6, 26.5; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 15.6 min (major), t_{R2} = 33.1 min (minor)]; ee = 78%, $[\alpha]^{25}_D$ = -20.5 (c = 0.15, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{24}NO_5$ $(M+H)^+$ 334.1649, found 334.1651.

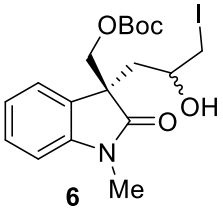
(c) To a solution of **3a** (63.4 mg, 0.20 mmol, 1.0 equiv) and $NaHCO_3$ (50.4 mg, 0.60 mmol, 3.0 equiv) in MeCN (4.0 mL) was added I_2 (153 mg, 0.60 mmol, 3.0 equiv) portionwise. The mixture was stirred at room temperature for 13 hours. Then treated with saturated aqueous $Na_2S_2O_3$. The phases were separated and removed under

vacuum and the residue was purified by preparative TLC on silica gel (petroleum ether/ethyl acetate = 4/1) to give the product **5** (26.0 mg, 39% yield) a pale yellow ointment and **6** (39.7 mg, 43% yield) as a white ointment.[8]



5

***tert*-Butyl (((3*S*)-1-methyl-3-(oxiran-2-ylmethyl)-2-oxoindolin-3-yl)methyl) carbonate (5)**. Pale yellow ointment, ^{1}H NMR analysis of the crude mixture showed a dr of >20:1. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36 (dd, J = 7.0, 1.0 Hz, 1H), 7.33 (td, J = 7.5, 1.0 Hz, 1H), 7.10 (td, J = 7.5, 1.0 Hz, 1H), 6.88 (d, J = 8.0 Hz, 1H), 4.50 (d, J = 11.0 Hz, 1H), 4.22 (d, J = 11.0 Hz, 1H), 3.25 (s, 3H), 2.64 – 2.60 (m, 1H), 2.58 – 2.56 (m, 1H), 2.44 (dd, J = 5.0, 2.5 Hz, 1H), 2.22 (dd, J = 14.0, 6.0 Hz, 1H), 2.01 (dd, J = 14.0, 6.0 Hz, 1H), 1.36 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 176.6, 153.0, 143.7, 128.8, 128.7, 124.3, 122.7, 108.3, 82.4, 69.0, 51.4, 48.0, 46.5, 36.6, 27.6, 26.4; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 14.0 min (major), t_{R2} = 17.7 min (minor)]; ee = 77%, $[\alpha]^{25}_{D}$ = -11.2 (c = 0.25, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{24}NO_5$ $(M+H)^+$ 334.1649, found 334.1649.

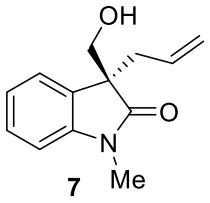


6

***tert*-Butyl (((3S)-3-(2-hydroxy-3-iodopropyl)-1-methyl-2-oxoindolin-3-yl)methyl) carbonate (6)**. White ointment; ^{1}H NMR analysis of the crude mixture showed a dr of >20:1. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.31 (m, 2H), 7.10 (td, J = 7.5, 1.0 Hz, 1H), 6.88 (dd, J = 8.0, 1.0 Hz, 1H), 4.57 (d, J = 10.5 Hz, 1H), 4.25 (d, J = 11.0 Hz, 1H), 3.81 – 3.74 (m, 1H), 3.50 (d, J = 3.5 Hz, 1H), 3.27 (dd, J = 10.5, 4.5 Hz, 1H), 3.25 (s, 3H), 3.19 (dd, J = 10.0, 5.0 Hz, 1H), 2.23 (dd, J = 15.0, 2.5 Hz, 1H), 1.99 (dd, J = 14.5, 9.5 Hz, 1H), 1.37 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.9, 152.9,

143.2, 129.8, 128.9, 124.1, 123.1, 108.6, 82.6, 68.6, 67.5, 51.2, 40.0, 27.6, 26.6, 14.8; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 25.1 min (major), t_{R2} = 48.2 min (minor)]; ee = 75%, $[\alpha]^{25}_{D}$ = -17.5 (c = 0.40, $CHCl_3$); HRMS (ESI) calcd for $C_{18}H_{25}INO_5$ $(M+H)^+$ 462.0772, found 462.0774.

(d) 3a (570 mg, 1.80 mmol) was dissolved in 36.0 mL of 6 M HCl in MeOH. The mixture was stirred overnight at room temperature. The reaction was quenched with saturated $NaHCO_3$ aqueous solution, and the mixture was extracted with EtOAc and dried over anhydrous Na_2SO_4. After filtration, the residue was purified by flash chromatography on silica gel, eluting with petroleum ether/ethyl acetate 2:1 (v/v), to afford the product **7** as a white ointment (362 mg, 93% yield).[9]



7

(*S*)-3-Allyl-3-(hydroxymethyl)-1-methylindolin-2-one (7). White ointment; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31 (td, *J* = 7.5, 1.0 Hz, 1H), 7.23 (dd, *J* = 7.5, 1.0 Hz, 1H), 7.09 (td, *J* = 7.5, 1.0 Hz, 1H), 6.87 (d, *J* = 8.0 Hz, 1H), 5.45 (ddt, *J* = 17.5, 10.0, 8.0 Hz, 1H), 5.03 (dd, *J* = 17.0, 1.5 Hz, 1H), 4.96 – 4.92 (m, 1H), 3.90 (dd, *J* = 11.0, 9.5 Hz, 1H), 3.76 (dd, *J* = 11.0, 3.0 Hz, 1H), 3.21 (s, 3H), 2.71 – 2.60 (m, 2H), 2.45 – 2.39 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 178.9, 144.1, 131.8, 129.5, 128.4, 123.3, 122.6, 119.1, 108.2, 66.4, 54.1, 37.3, 26.2; [Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min. t_{R1} = 11.7 min (minor), t_{R2} = 12.8 min (major)]; ee = 78%, $[\alpha]^{25}_{D}$ = -3.14 (c = 0.70, $CHCl_3$); HRMS (ESI) calcd for $C_{13}H_{16}NO_2$ $(M+H)^+$ 218.1176, found 218.1175.

5. References

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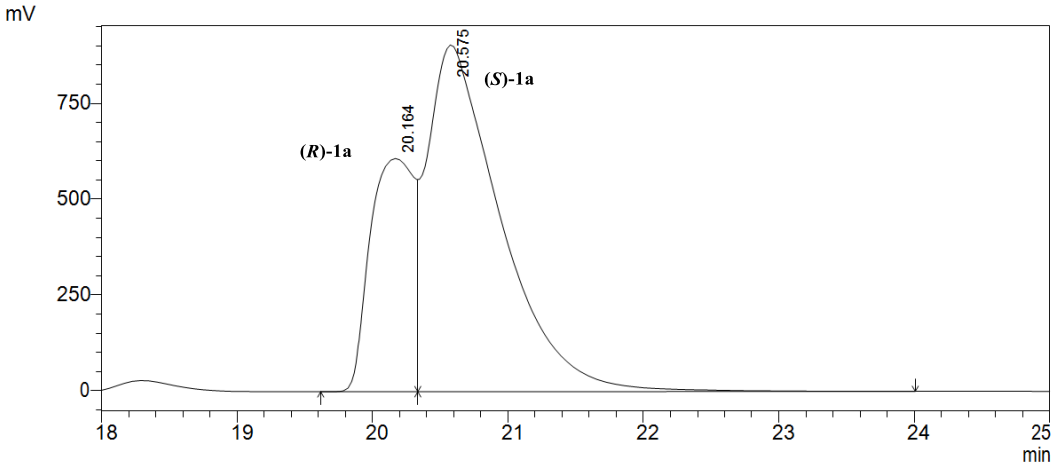
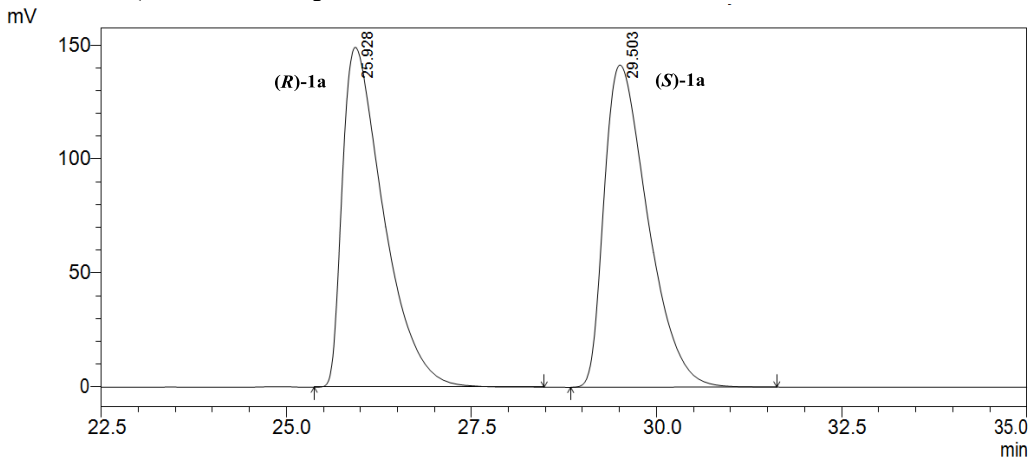
6. X-Ray Crystal Structure Data

The two enantionmers of **1a** were separated by preparative chiral HPLC (Preparative Daicel Chiralpak OD-H, hexane/*i*-PrOH = 92/8, 254 nm, 8.0 mL/min. t_{R1} = 37.1 min (*R*), t_{R2} = 42.2 min (*S*)). The first (t_{R1}) enatiomer was used in the stereochemical course experiment shown in Scheme 3b. Colorless crystal of **enantiopure 1a** suitable for X-ray crystallographic analysis were obtained by recrystallization from ethyl acetate/petroleum ether. The ORTEP drawing of (*R*)-**1a** is shown in Figure S1. The crystal structure has been deposited at the Cambridge Crystallographic Centre (deposition number: CCDC 1965672). The two enantionmers of **1a** could not be separated well by the Daicel Chiralpak OD-H column, but could be separated well by the Daicel Chiralpak OJ-H column.

1a HPLC (Daicel Chiralpak OD-H, hexane/*i*-PrOH = 95/5, 254 nm, 0.8 mL/min.)



1a HPLC (Daicel Chiralpak OJ-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min.)



PeakTable

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2	29.503	5799733	141464	50.034	48.660
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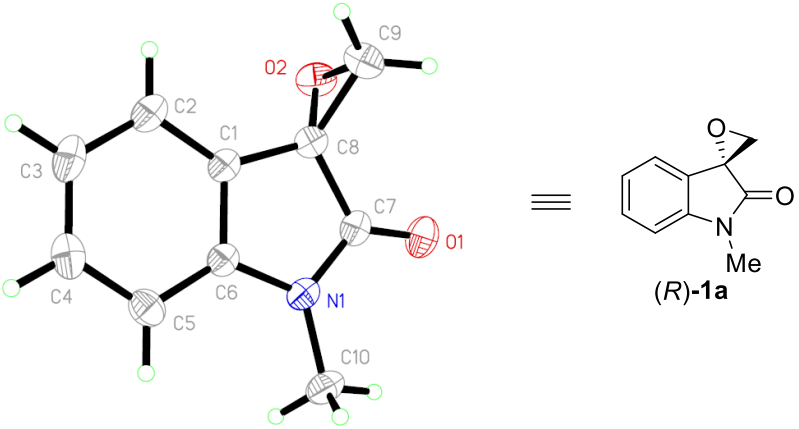

Figure S1 (*R*)-**1a**

Table S5. Crystal data and structure refinement for a_a.

Identification code	a_a
Empirical formula	C10 H9 N O2
Formula weight	175.18
Temperature	296(2) K
Wavelength	1.54178 A
Crystal system, space group	Orthorhombic, P2(1)2(1)2(1)
Unit cell dimensions	a = 4.5388(9) A alpha = 90 deg.
	b = 13.550(3) A beta = 90 deg.
	c = 14.103(3) A gamma = 90 deg.
Volume	867.4(3) A^3
Z, Calculated density	4, 1.341 Mg/m^3
Absorption coefficient	0.777 mm^-1
F(000)	368
Crystal size	0.200 x 0.180 x 0.160 mm
Theta range for data collection	4.525 to 68.206 deg.
Limiting indices	-5<=h<=5, -16<=k<=16, -14<=l<=16
Reflections collected / unique	8405 / 1578 [R(int) = 0.0490]
Completeness to theta = 67.679	99.0 %
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1578 / 0 / 119
Goodness-of-fit on F^2	1.039
Final R indices [I>2sigma(I)]	R1 = 0.0307, wR2 = 0.0892
R indices (all data)	R1 = 0.0399, wR2 = 0.0911
Absolute structure parameter	0.03(9)
Extinction coefficient	n/a
Largest diff. peak and hole	0.094 and -0.098 e.A^-3

checkCIF/PLATON report

Structure factors have been supplied for datablock(s) a_a

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No syntax errors found. CIF dictionary Interpreting this report

Datablock: a_a

Bond precision: C-C = 0.0031 A Wavelength=1.54178

Cell: a=4.5388(9) b=13.550(3) c=14.103(3)
alpha=90 beta=90 gamma=90
Temperature: 296 K

	Calculated	Reported
Volume	867.4(3)	867.4(3)
Space group	P 21 21 21	P 21 21 21
Hall group	P 2ac 2ab	P 2ac 2ab
Moiety formula	C10 H9 N O2	C10 H9 N O2
Sum formula	C10 H9 N O2	C10 H9 N O2
Mr	175.18	175.18
Dx,g cm-3	1.342	1.341
Z	4	4
Mu (mm-1)	0.777	0.777
F000	368.0	368.0
F000'	369.18	
h,k,lmax	5,16,16	5,16,16
Nref	1594[968]	1578
Tmin,Tmax	0.856,0.883	0.636,0.753
Tmin'	0.856	

Correction method= # Reported T Limits: Tmin=0.636 Tmax=0.753
AbsCorr = ?

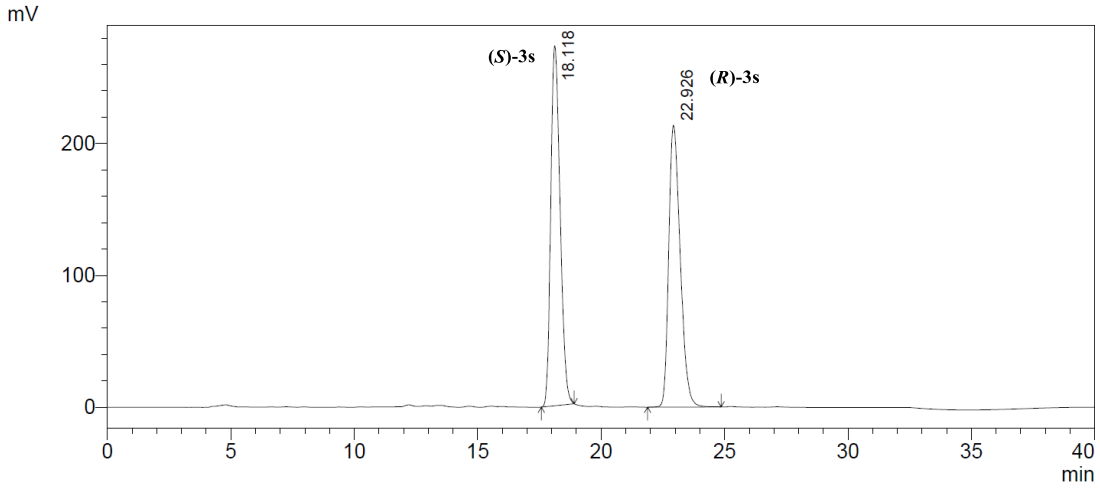
Data completeness= 1.63/0.99 Theta(max)= 68.206

R(reflections)= 0.0307(1396) wR2(reflections)= 0.0911(1578)

S = 1.039 Npar= 119

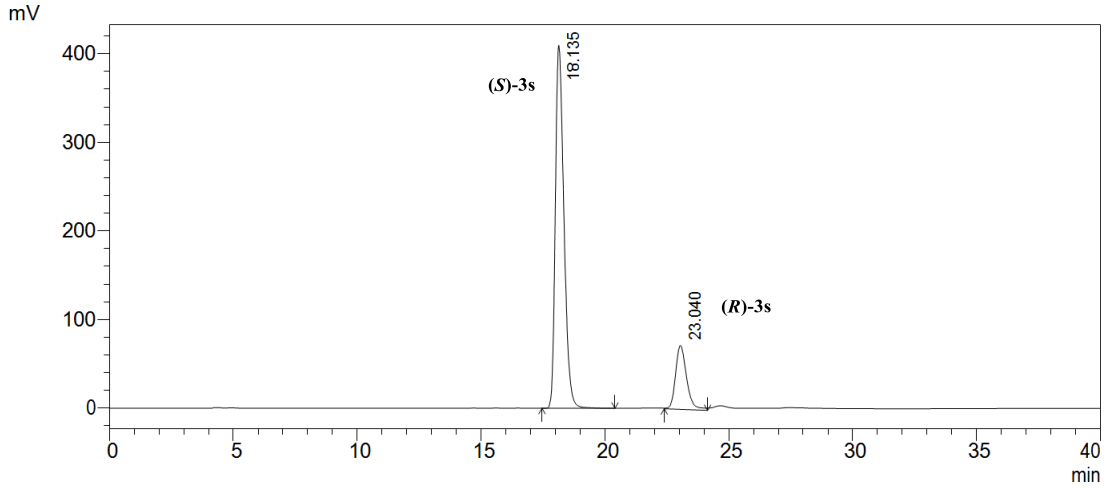
The two enantionmers of **3n** were separated by preparative chiral HPLC (Preparative Daicel Chiralpak IE, hexane/*i*-PrOH = 92/8, 254 nm, 8.0 mL/min. t_{R1} = 32.5 min (major), t_{R2} = 42.7 min (minor)). Colorless crystal of major **enantiopure 3n** suitable for X-ray crystallographic analysis were obtained by recrystallization from *n*-hexane. The ORTEP drawing of (*S*)-**3n** is shown in Figure S2. The crystal structure has been deposited at the Cambridge Crystallographic Centre (deposition number: CCDC 1956332).

3n HPLC (Daicel Chiralpak IE, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min.)



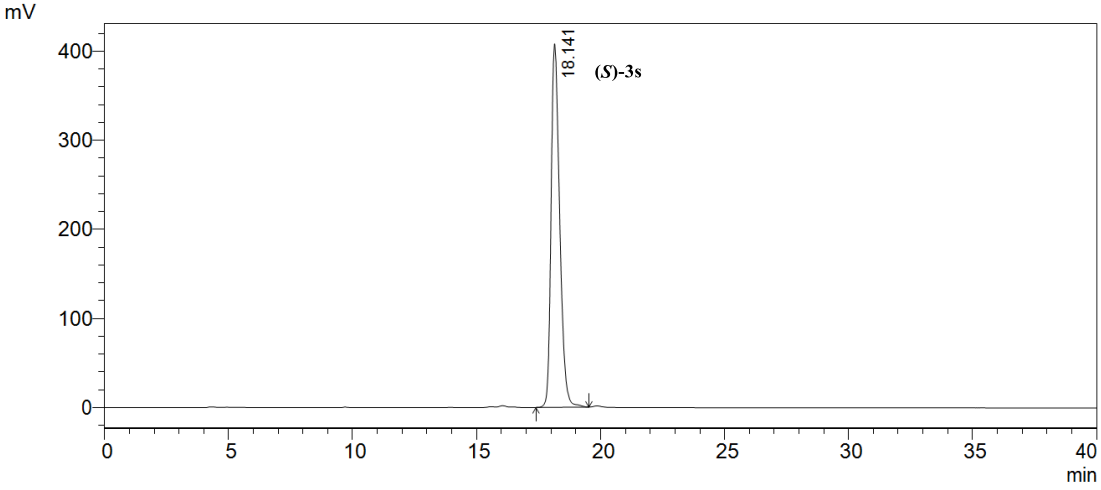
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	18.118	7172307	272946	50.885	56.081
2	22.926	6922901	213752	49.115	43.919
Total		14095208	486698	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	18.135	9857243	409689	81.519	85.026
2	23.040	2234760	72151	18.481	14.974
Total		12092003	481840	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	18.141	9843571	407740	100.000	100.000
Total		9843571	407740	100.000	100.000

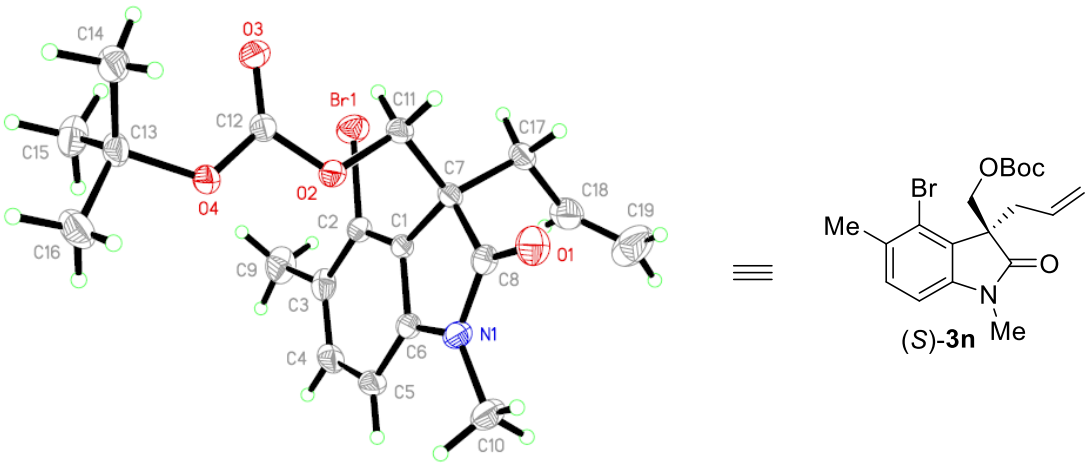


Figure S2 (*S*)-**3s**

Table S6. Crystal data and structure refinement for t_a.

Identification code	t_a
Empirical formula	C19 H24 Br N O4
Formula weight	410.30
Temperature	173(2) K
Wavelength	1.54178 A
Crystal system, space group	Monoclinic, P2(1)
Unit cell dimensions	a = 9.4837(7) A alpha = 90 deg.
	b = 21.349(2) A beta = 95.070(7) deg.
	c = 9.5572(10) A gamma = 90 deg.
Volume	1927.5(3) A^3
Z, Calculated density	4, 1.414 Mg/m^3
Absorption coefficient	3.095 mm^-1
F(000)	848
Crystal size	0.200 x 0.200 x 0.200 mm
Theta range for data collection	4.645 to 68.181 deg.
Limiting indices	-11<=h<=11, -25<=k<=25, -11<=l<=11
Reflections collected / unique	18309 / 6958 [R(int) = 0.0226]
Completeness to theta = 67.679	99.6 %
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	6958 / 1 / 461
Goodness-of-fit on F^2	1.014
Final R indices [I>2sigma(I)]	R1 = 0.0208, wR2 = 0.0530
R indices (all data)	R1 = 0.0212, wR2 = 0.0534
Absolute structure parameter	0.017(5)
Extinction coefficient	n/a
Largest diff. peak and hole	0.292 and -0.280 e.A^-3

checkCIF/PLATON report

Structure factors have been supplied for datablock(s) t_a

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Datablock: t_a

Bond precision: C-C = 0.0039 A Wavelength=1.54178

Cell: a=9.4837(7) b=21.349(2) c=9.5572(10)
alpha=90 beta=95.070(7) gamma=90
Temperature: 173 K

	Calculated	Reported
Volume	1927.5(3)	1927.5(3)
Space group	P 21	P 21
Hall group	P 2yb	P 2yb
Moiety formula	C19 H24 Br N O4	?
Sum formula	C19 H24 Br N O4	C19 H24 Br N O4
Mr	410.29	410.30
Dx,g cm-3	1.414	1.414
Z	4	4
Mu (mm-1)	3.095	3.095
F000	848.0	848.0
F000'	847.48	
h,k,lmax	11,25,11	11,25,11
Nref	7065[3636]	6958
Tmin,Tmax	0.565,0.538	0.541,0.753
Tmin'	0.513	

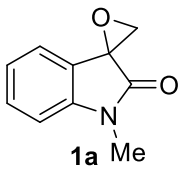
Correction method= # Reported T Limits: Tmin=0.541 Tmax=0.753
AbsCorr = ?

Data completeness= 1.91/0.98 Theta(max)= 68.181

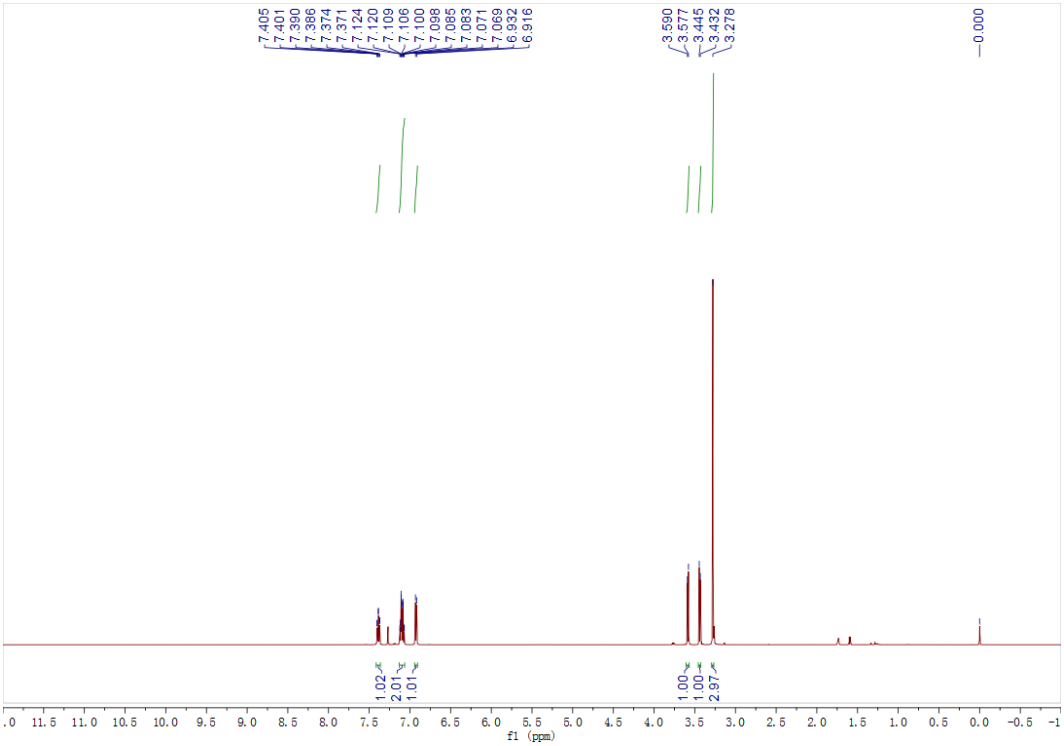
R(reflections)= 0.0208(6866) wR2(reflections)= 0.0534(6958)

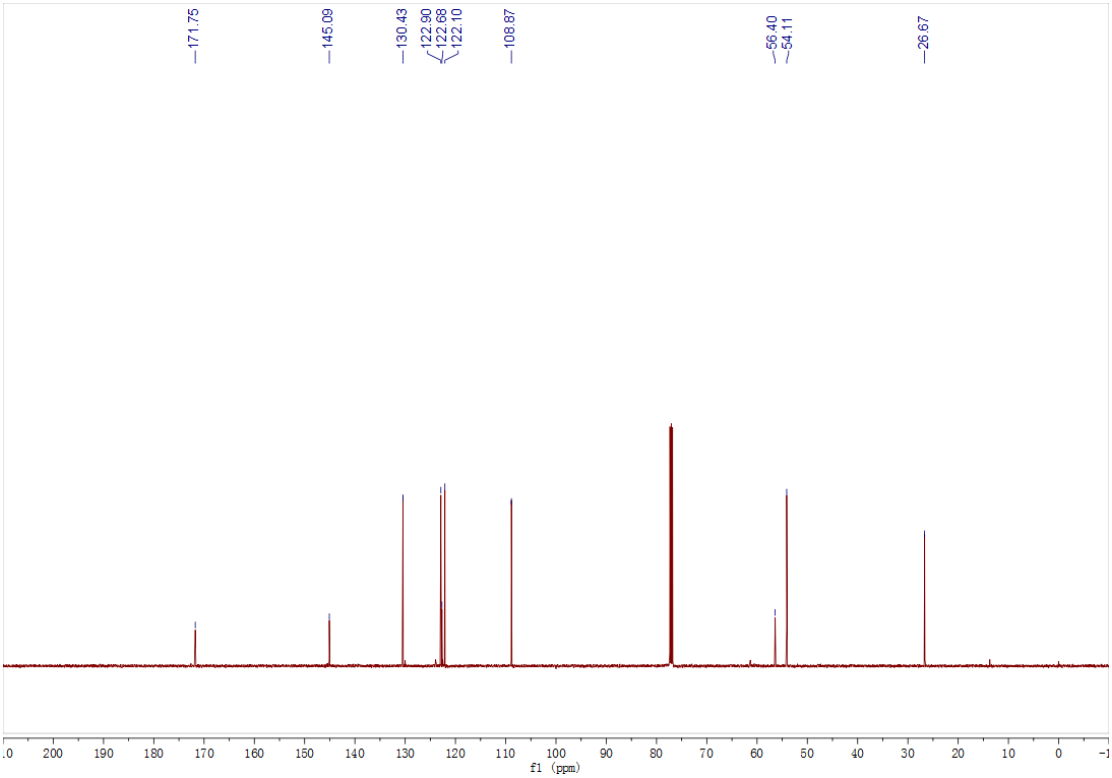
S = 1.014 Npar= 461

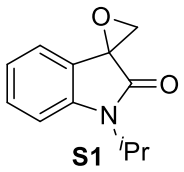
7. Spectra of New Products and HPLC Charts



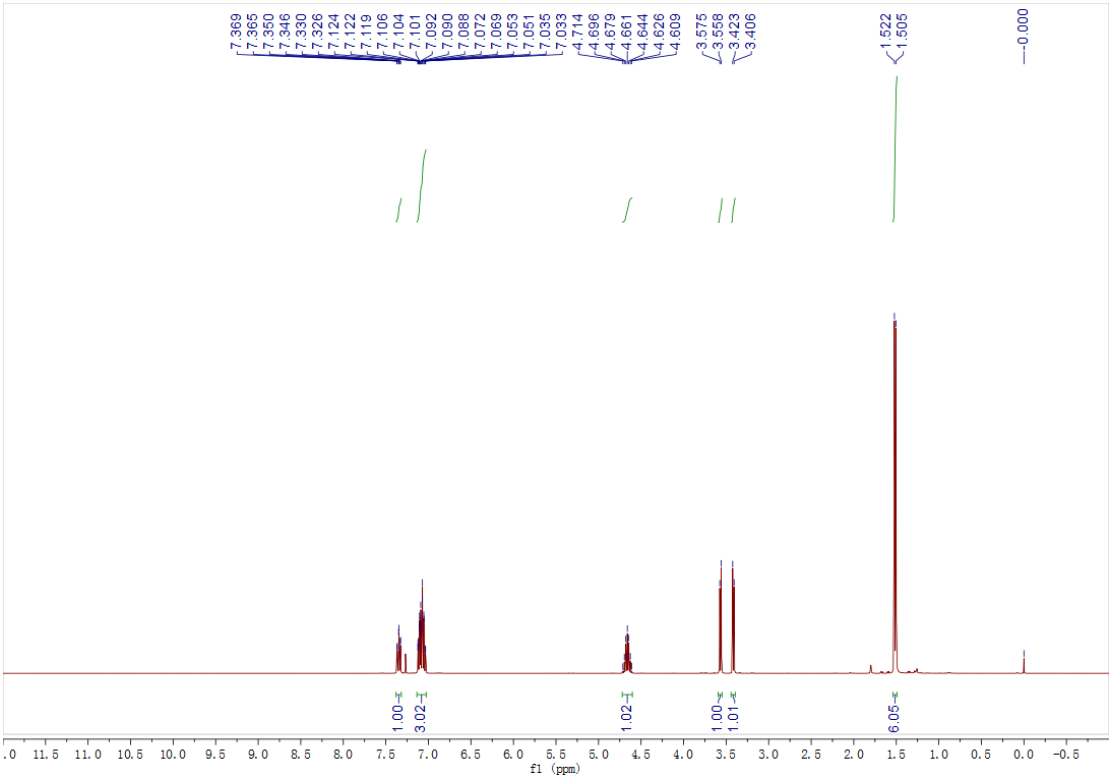
1a






O
O
N
iPr

S1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7.365
7.350
7.346
7.330
7.326
7.124
7.122
7.119
7.106
7.104
7.101
7.092
7.090
7.088
7.072
7.069
7.053
7.051
7.035
7.033
4.714
4.696
4.679
4.661
4.644
4.626
4.609
3.575
3.558
3.423
3.406
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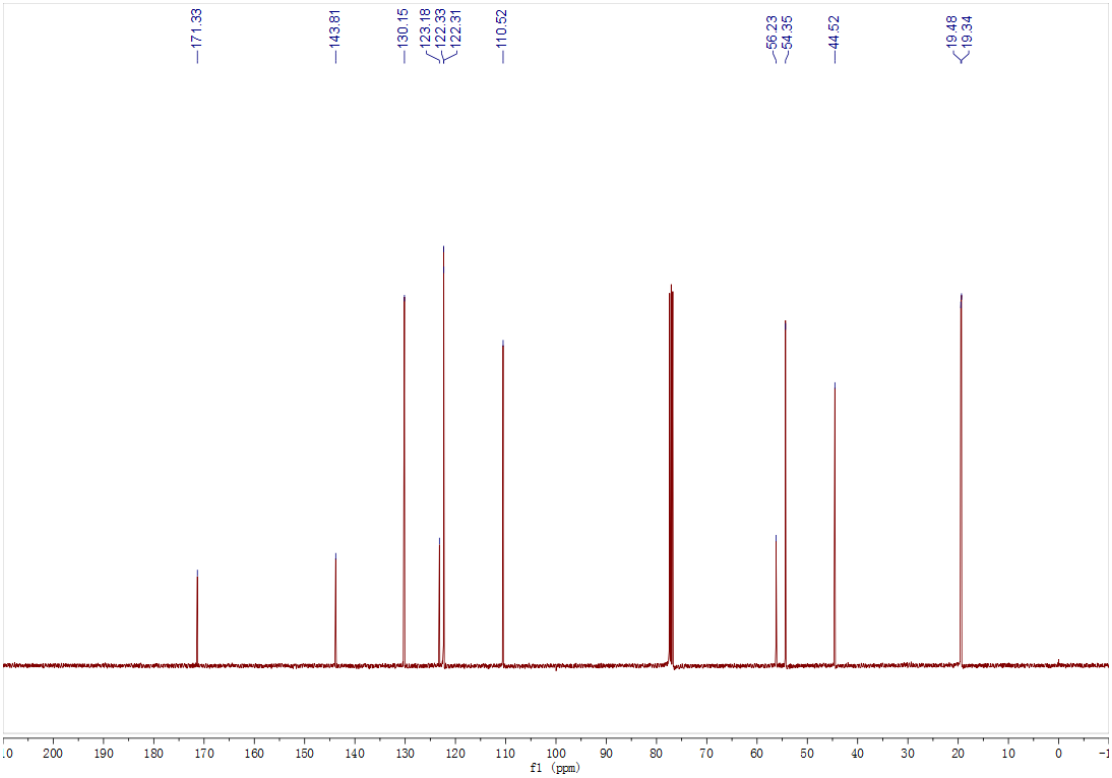
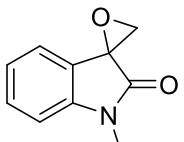
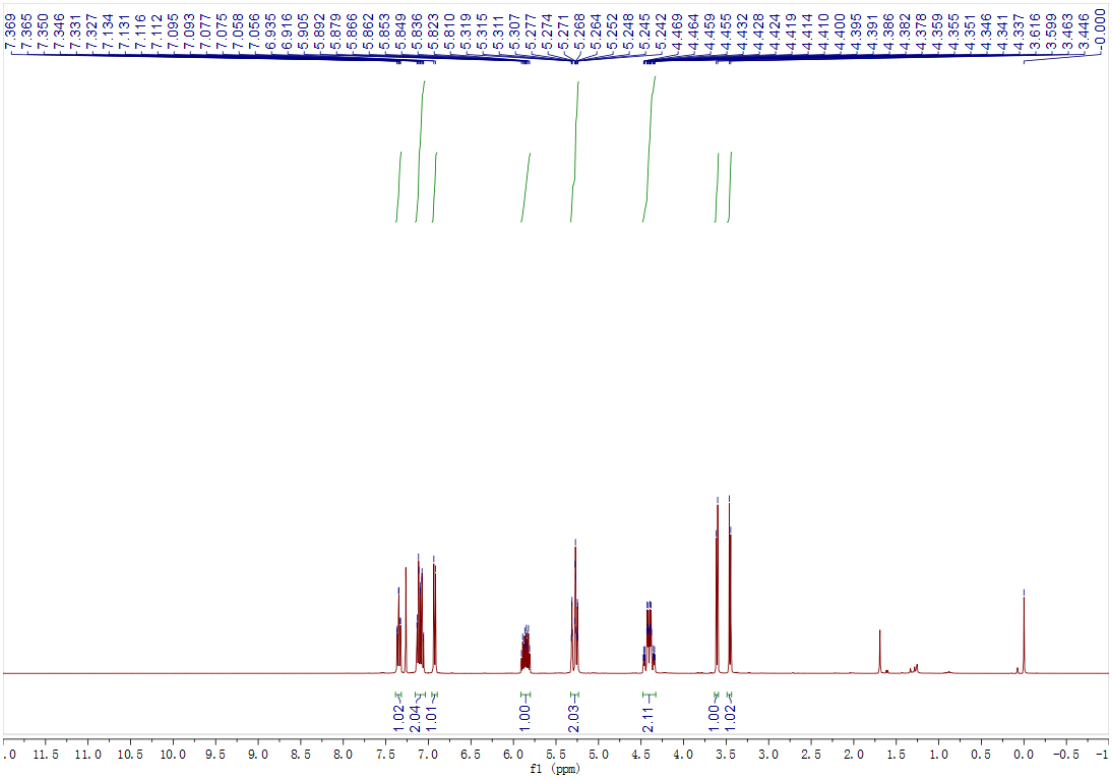
1.505
0.000
1.00
3.02
1.02
1.00
1.01
6.05
f1 (ppm)


171.33
143.81
130.15
123.18
122.33
122.31
110.52
56.23
54.35
44.52
19.48
19.34
f1 (ppm)


O
O
N
allyl

S2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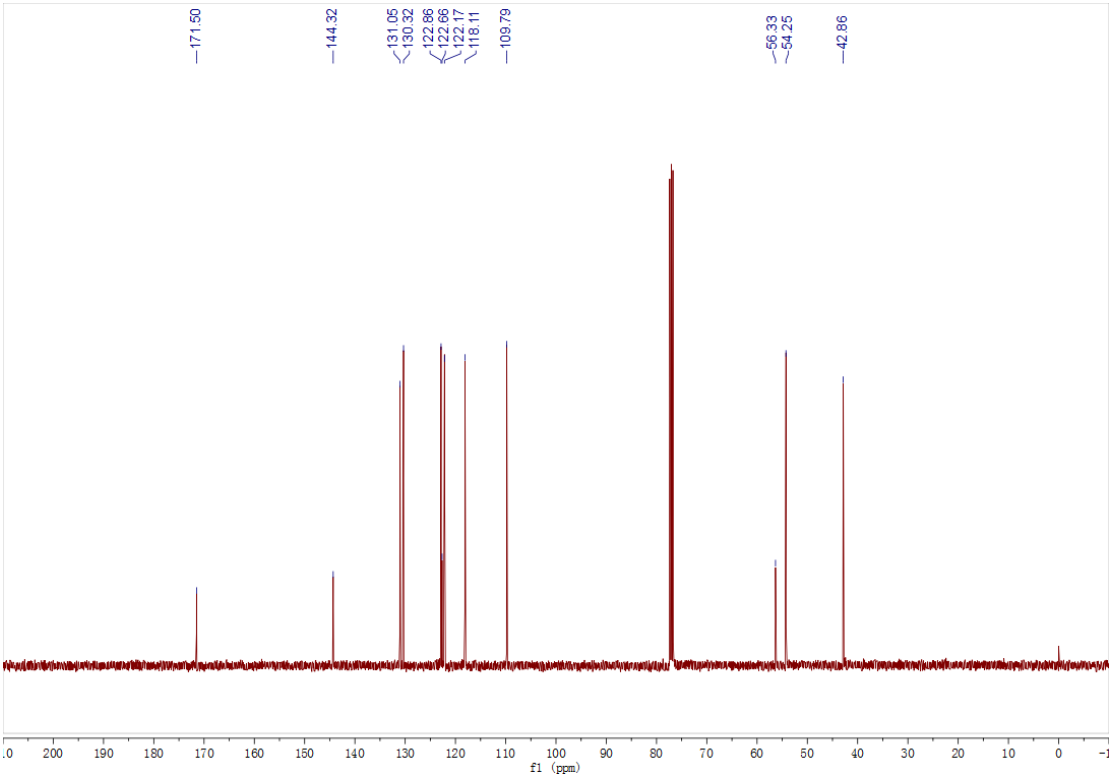
7.365
7.350
7.346
7.331
7.327
7.134
7.131
7.116
7.112
7.095
7.093
7.077
7.075
7.058
7.056
6.935
6.916
5.905
5.892
5.879
5.866
5.862
5.853
5.849
5.836
5.823
5.810
5.319
5.315
5.311
5.307
5.277
5.274
5.271
5.268
5.264
5.252
5.248
5.245
5.242
4.469
4.464
4.459
4.455
4.432
4.428
4.424
4.419
4.414
4.410
4.400
4.395
4.391
4.386
4.382
4.378
4.359
4.355
4.351
4.346
4.341
4.337
3.616
3.599
3.463
3.446
0.000
1.02
2.04
1.01
1.00
2.03
2.11
1.00
1.02
f1 (ppm)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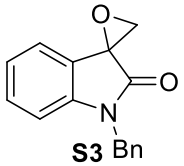
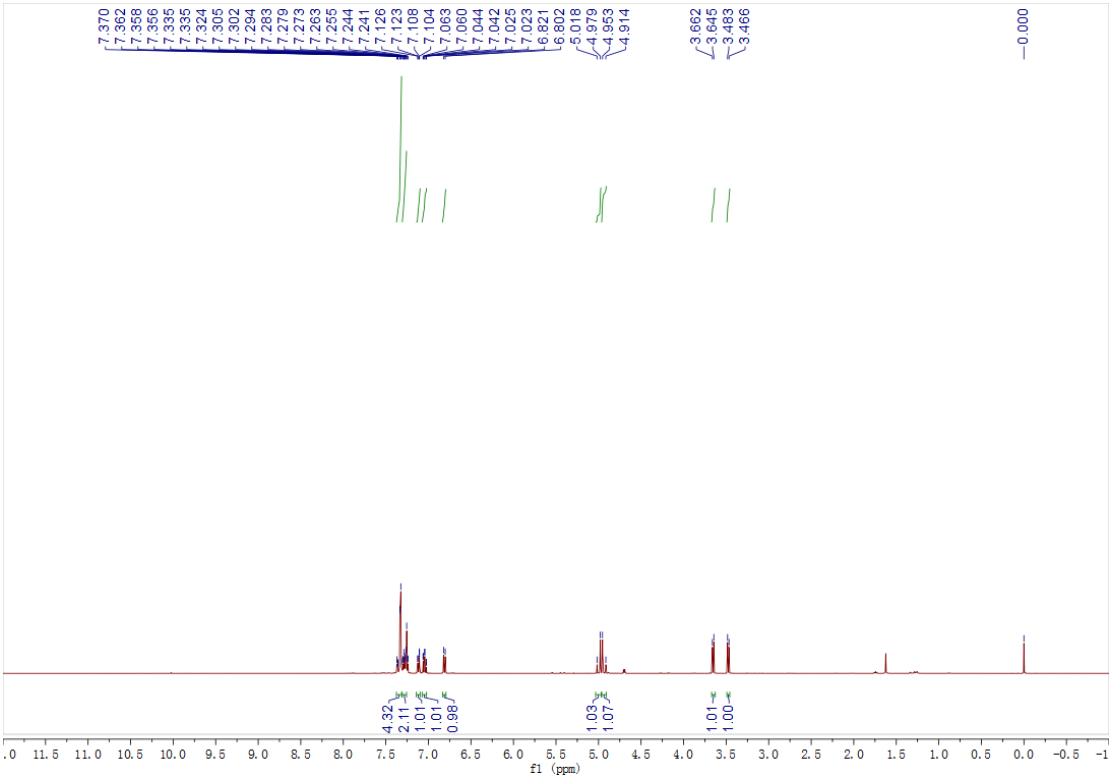
130.32
122.86
122.66
122.17
118.11
109.79
56.33
54.25
42.86
f1 (ppm)


O
O
N
Bn

S3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7.356
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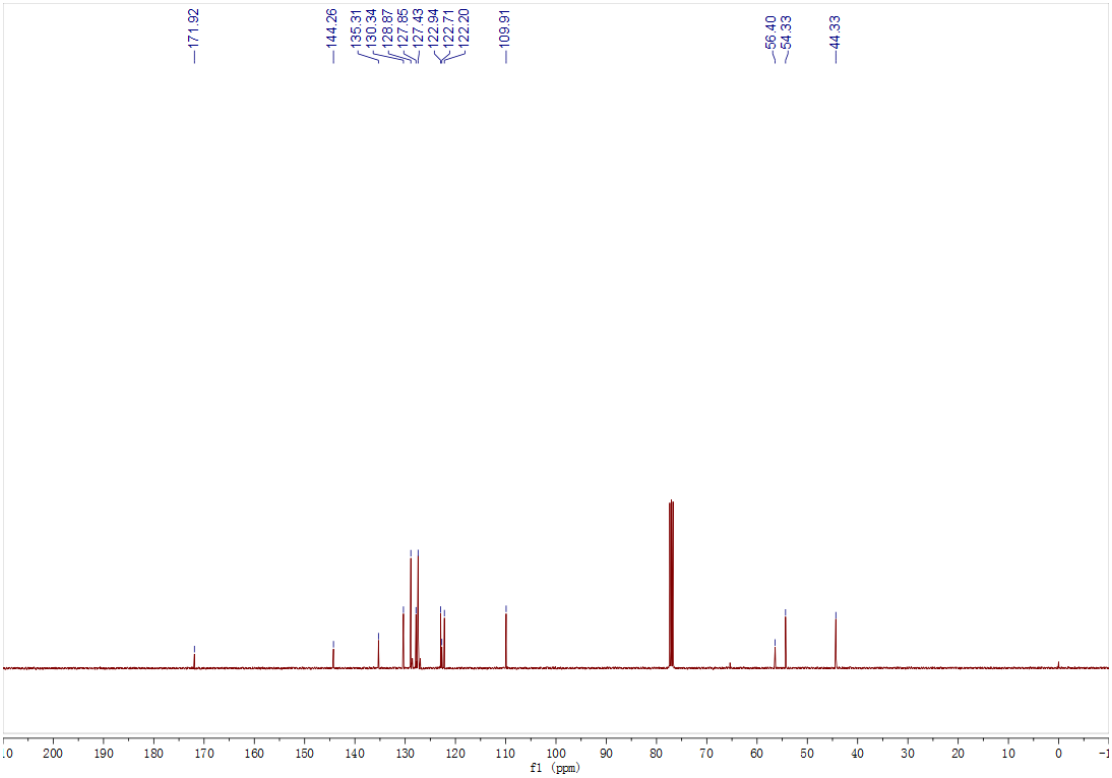
7.335
7.324
7.305
7.302
7.294
7.283
7.279
7.273
7.263
7.255
7.244
7.241
7.126
7.123
7.108
7.104
7.063
7.060
7.044
7.042
7.025
7.023
6.821
6.802
5.018
4.979
4.953
4.914
3.662
3.645
3.483
3.466
0.000
4.32
2.11
1.01
1.01
0.98
1.03
1.07
1.01
1.00
f1 (ppm)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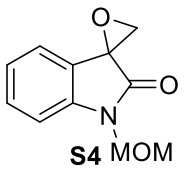
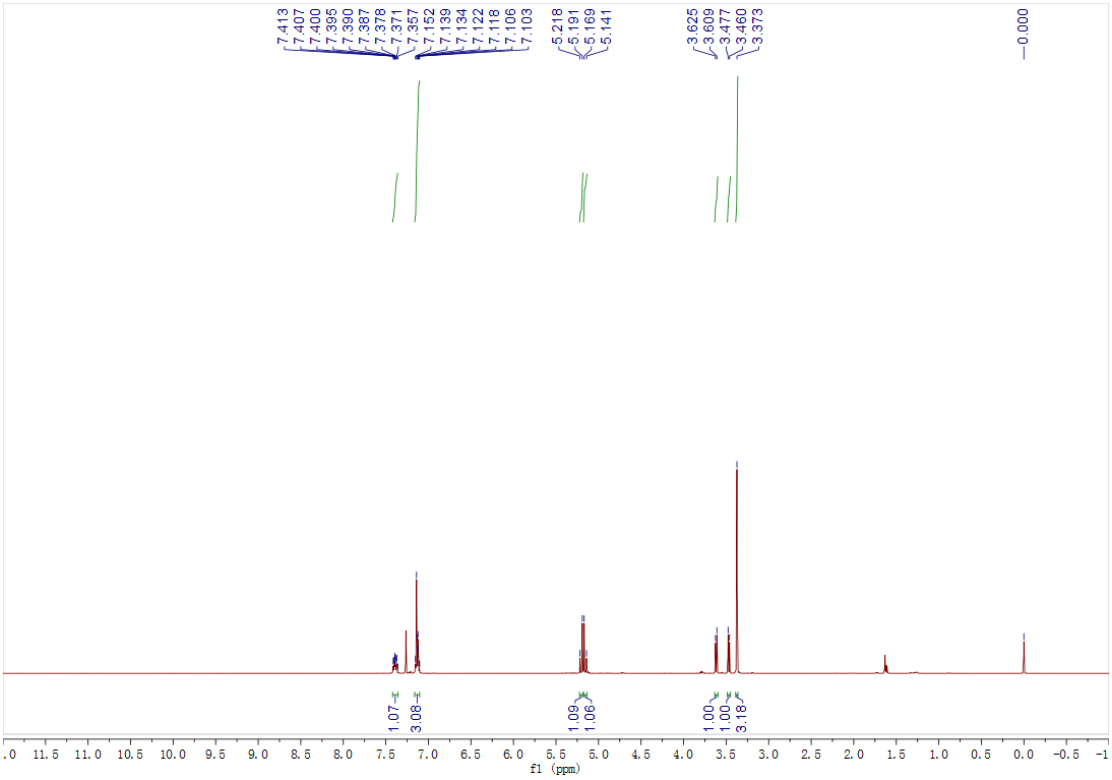
127.43
122.94
122.71
122.20
109.91
56.40
54.33
44.33
f1 (ppm)


O
O
N

S4 MOM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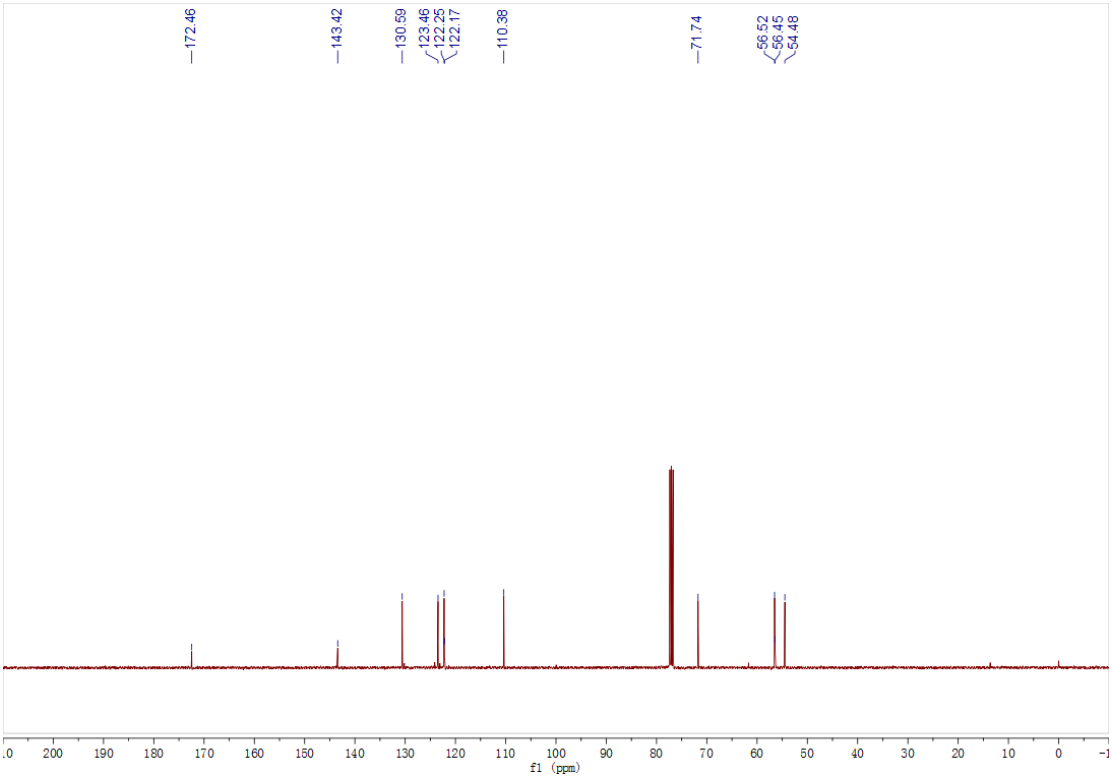
7.371
7.357
7.152
7.139
7.134
7.122
7.118
7.106
7.103
5.218
5.191
5.169
5.141
3.625
3.609
3.477
3.460
3.373
0.000
1.07
3.08
1.09
1.06
1.00
1.00
3.18
f1 (ppm)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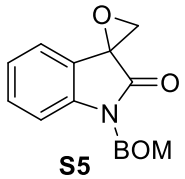
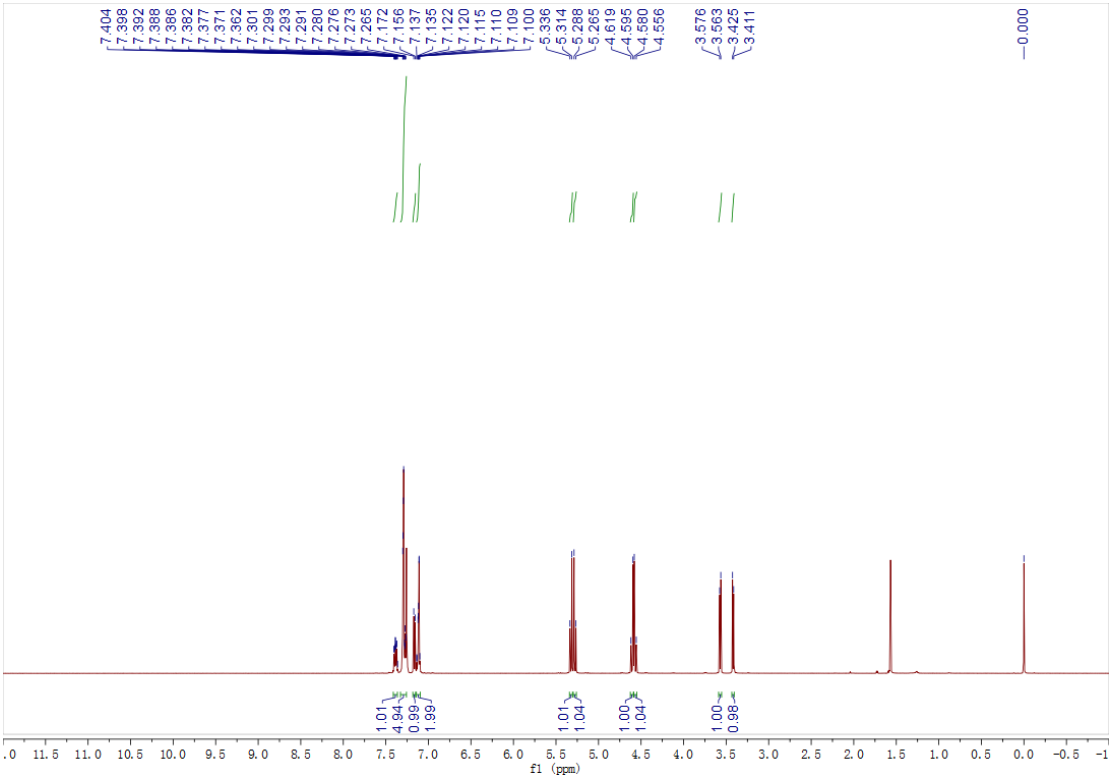
56.52
56.45
54.48
f1 (ppm)


O
O
N
BOM

S5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7.382
7.377
7.371
7.362
7.301
7.299
7.293
7.291
7.280
7.276
7.273
7.265
7.172
7.156
7.137
7.135
7.122
7.120
7.115
7.110
7.109
7.100
5.336
5.314
5.288
5.265
4.619
4.595
4.580
4.556
3.576
3.563
3.425
3.411
0.000
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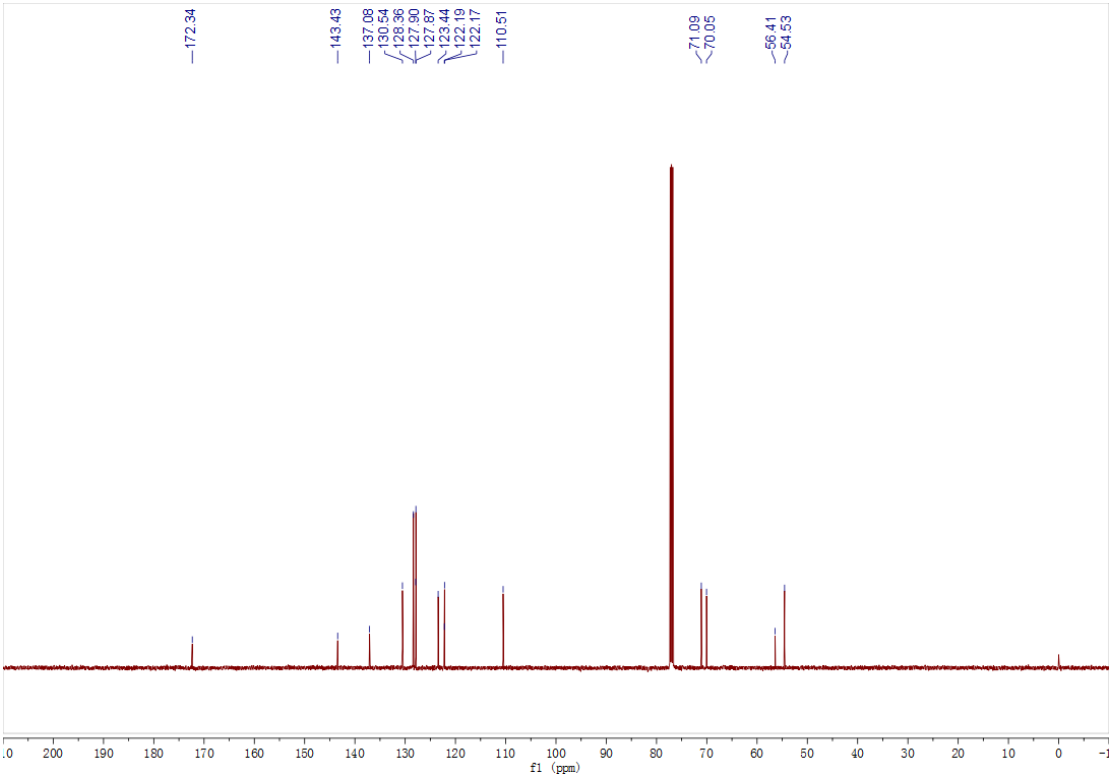
0.99
1.99
1.01
1.04
1.00
1.04
1.00
0.98
f1 (ppm)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130.54
128.36
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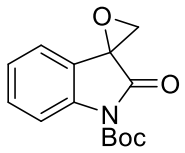
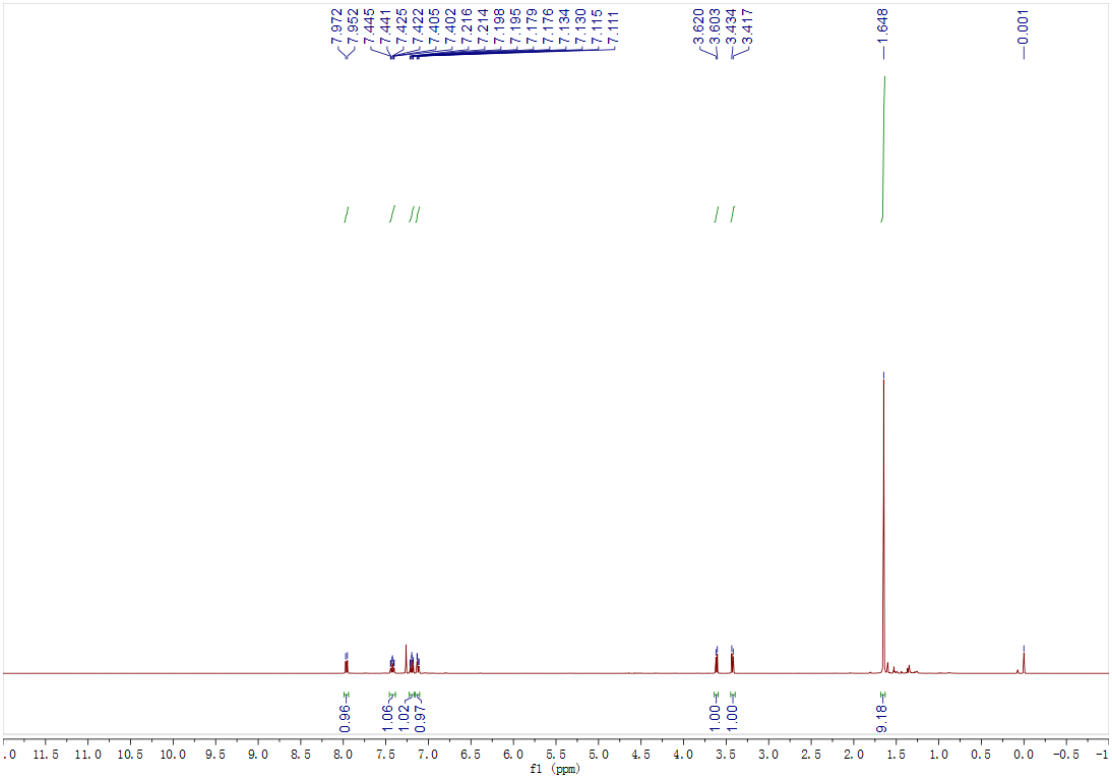
122.19
122.17
110.51
71.09
70.05
56.41
54.53
f1 (ppm)


O
O
N
Boc

S6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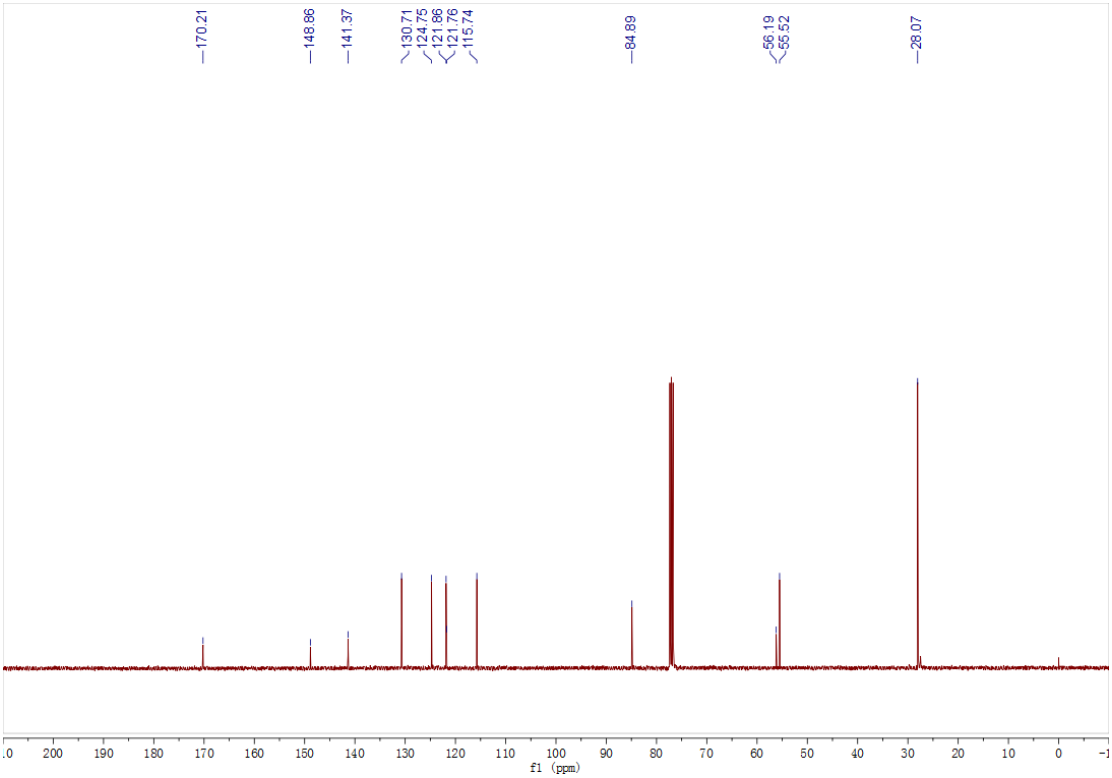
7.425
7.422
7.405
7.402
7.216
7.214
7.198
7.195
7.179
7.176
7.134
7.130
7.115
7.111
3.620
3.603
3.434
3.417
1.648
0.001
0.96
1.06
1.02
0.97
1.00
1.00
9.18
f1 (ppm)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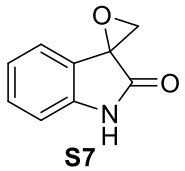
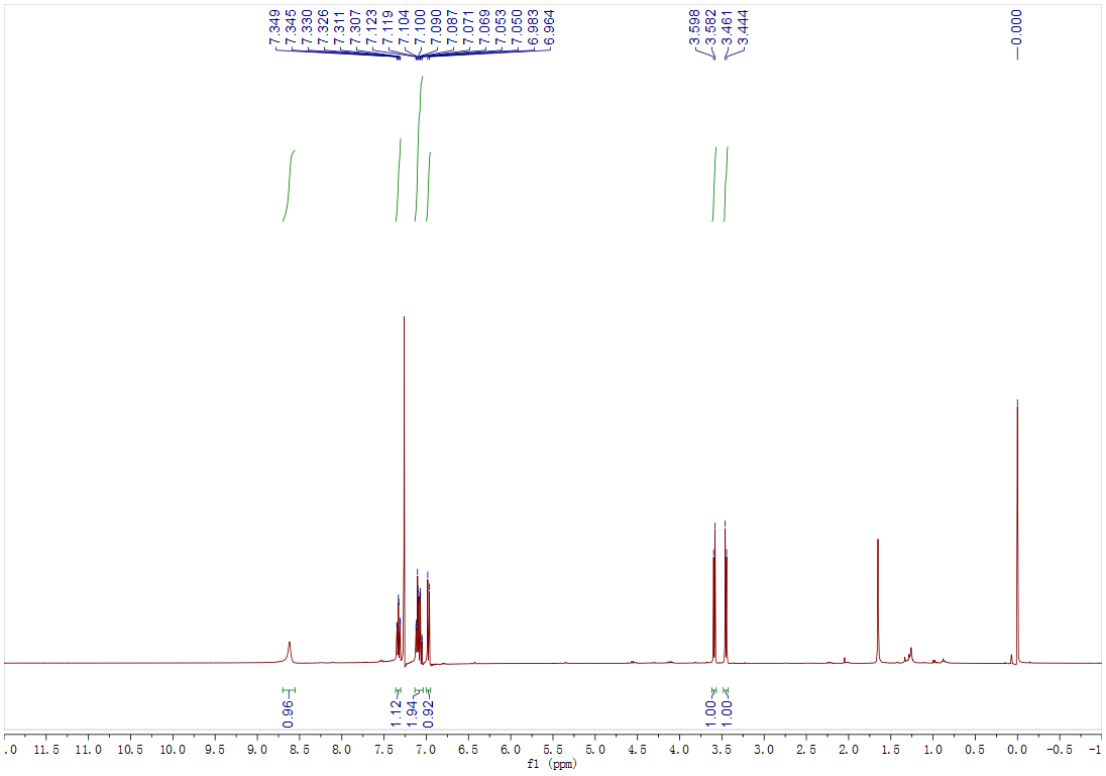
121.86
121.76
115.74
84.89
56.19
55.52
28.07
f1 (ppm)


O
O
N
H

S7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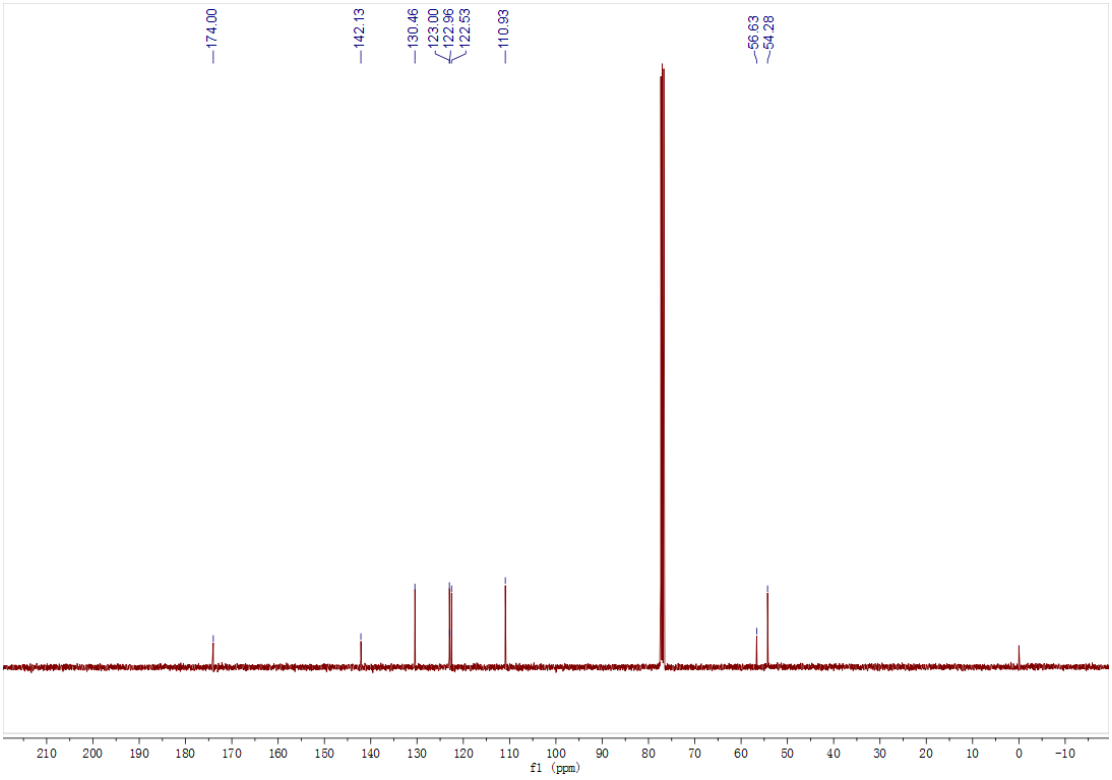
7.311
7.307
7.123
7.119
7.104
7.100
7.090
7.087
7.071
7.069
7.053
7.050
6.983
6.964
3.598
3.582
3.461
3.444
0.000
0.96
1.12
1.94
0.92
1.00
1.00
f1 (ppm)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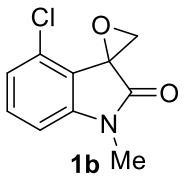
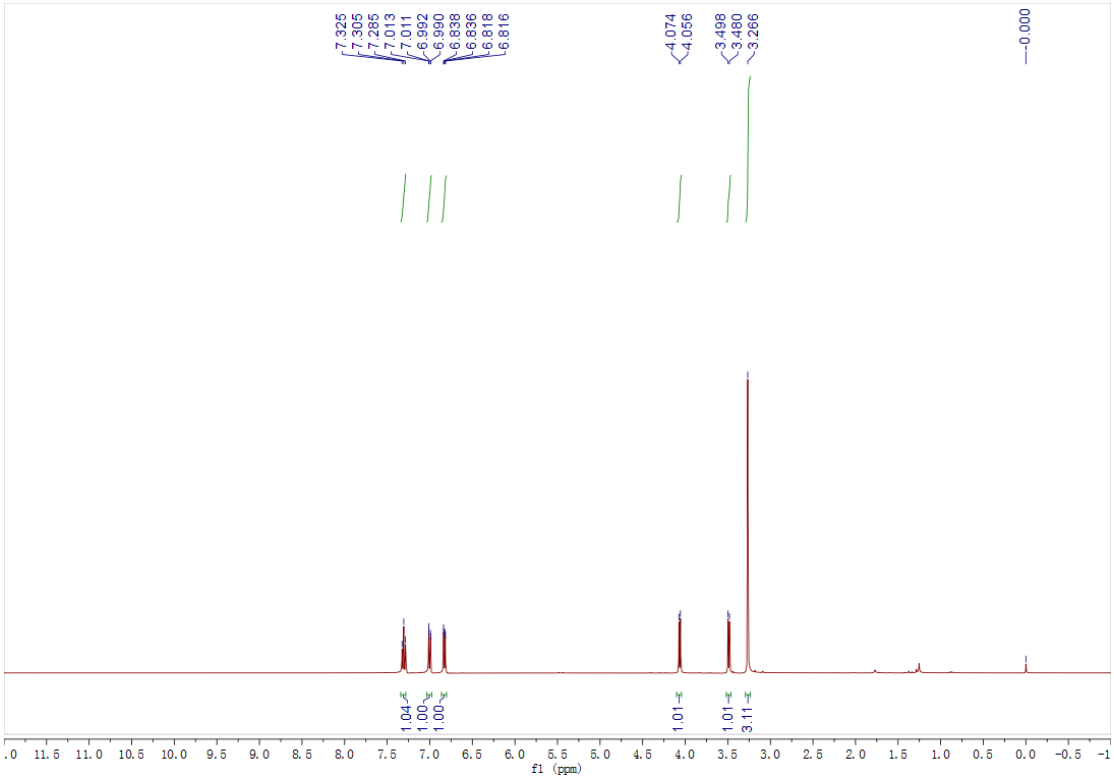
122.53
110.93
56.63
54.28
f1 (ppm)


Cl
O
O
N
Me

1b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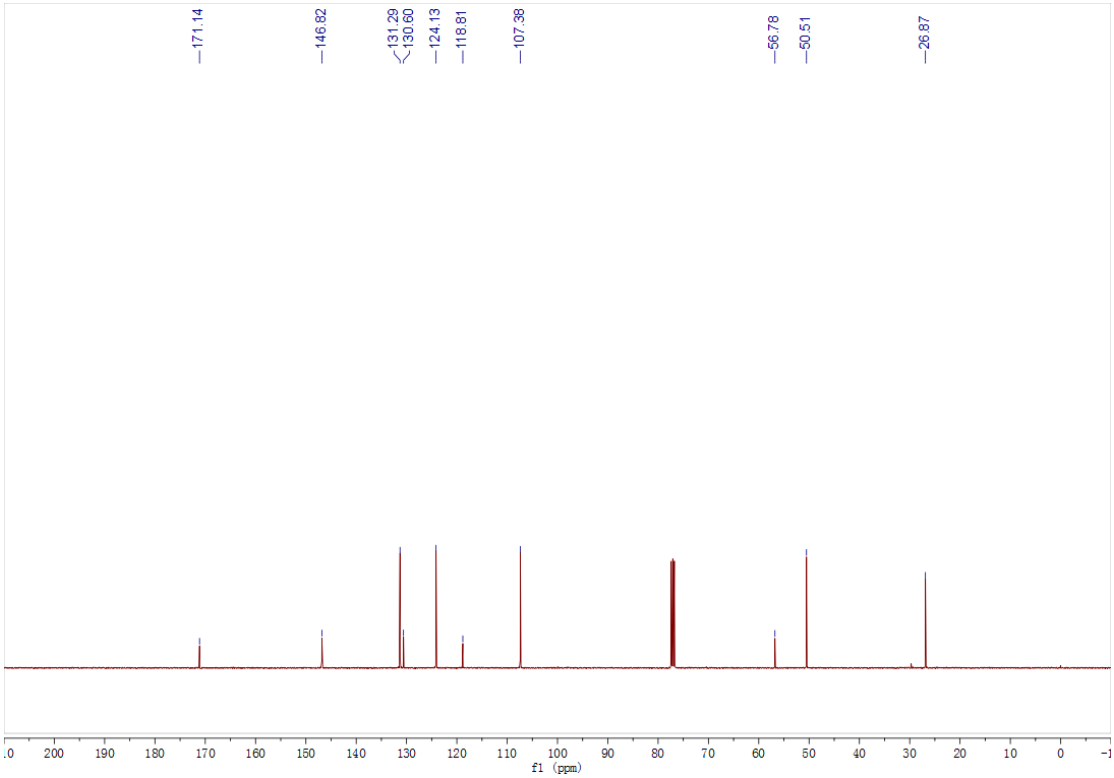
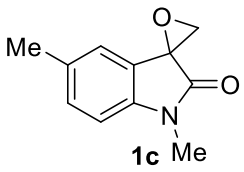
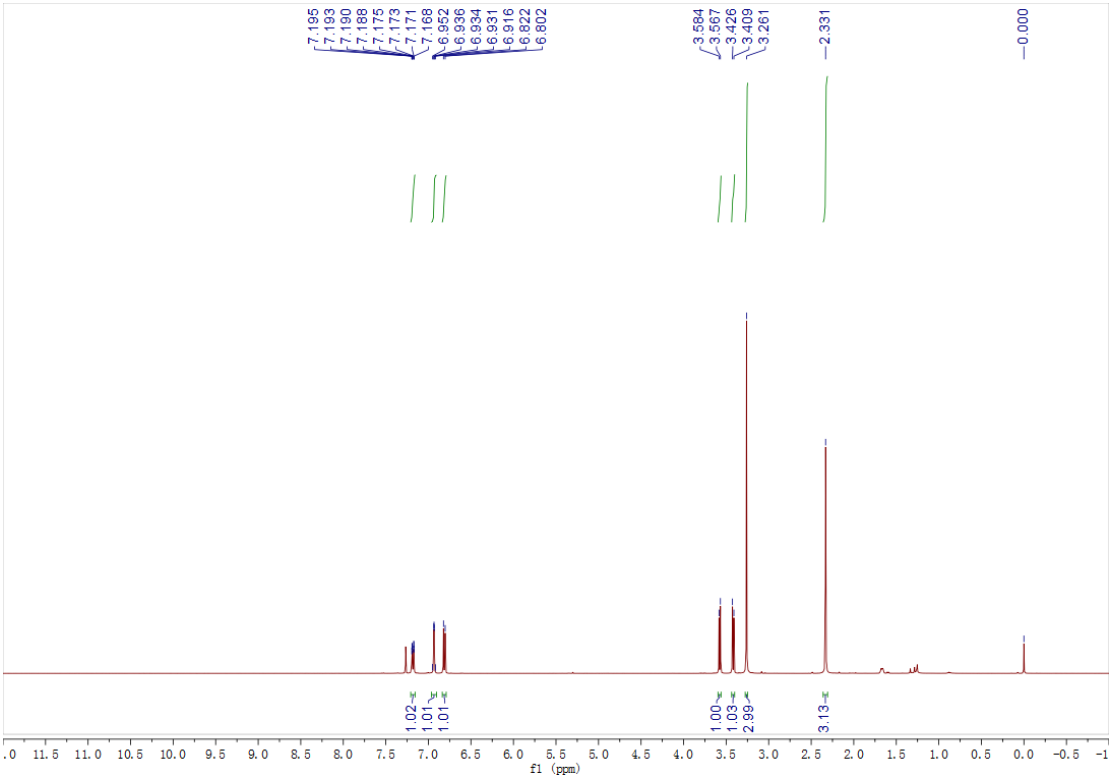
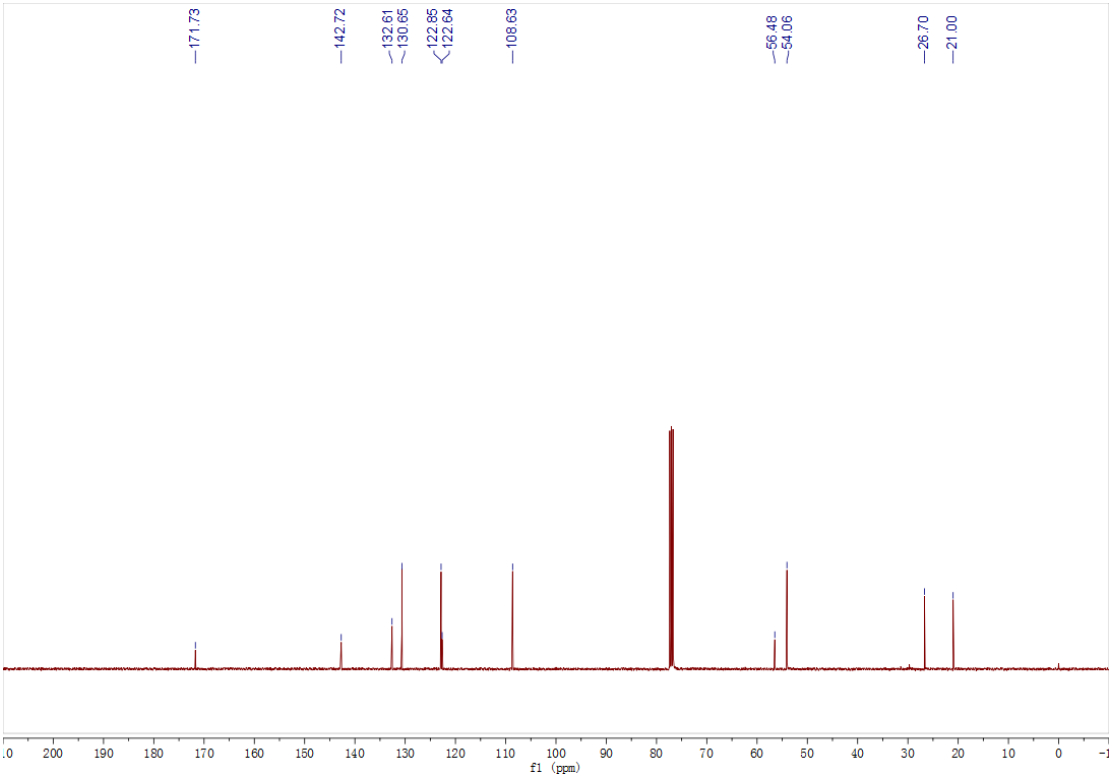
7.011
6.992
6.990
6.838
6.836
6.818
6.816
4.074
4.056
3.498
3.480
3.266
0.000
1.04
1.00
1.00
1.01
1.01
3.11
f1 (ppm)

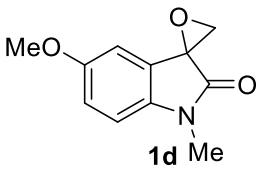

171.14
146.82
131.29
130.60
124.13
118.81
107.38
56.78
50.51
26.87
f1 (ppm)


O
Me
O
N
Me

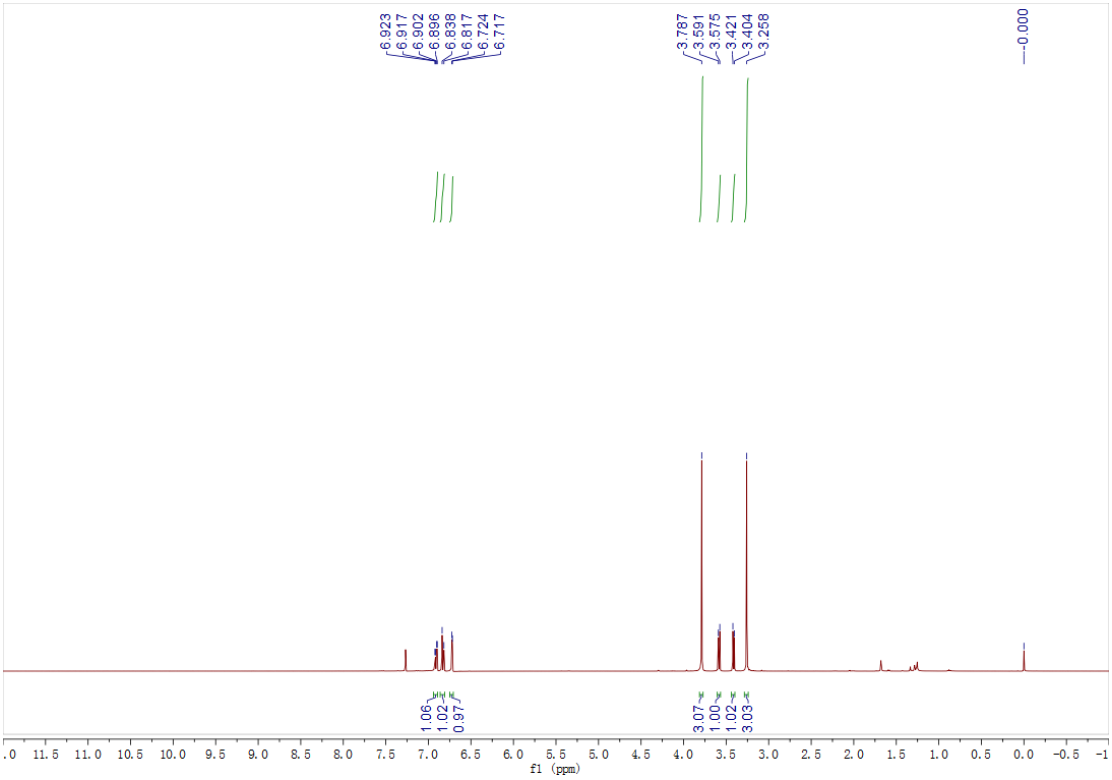
1c

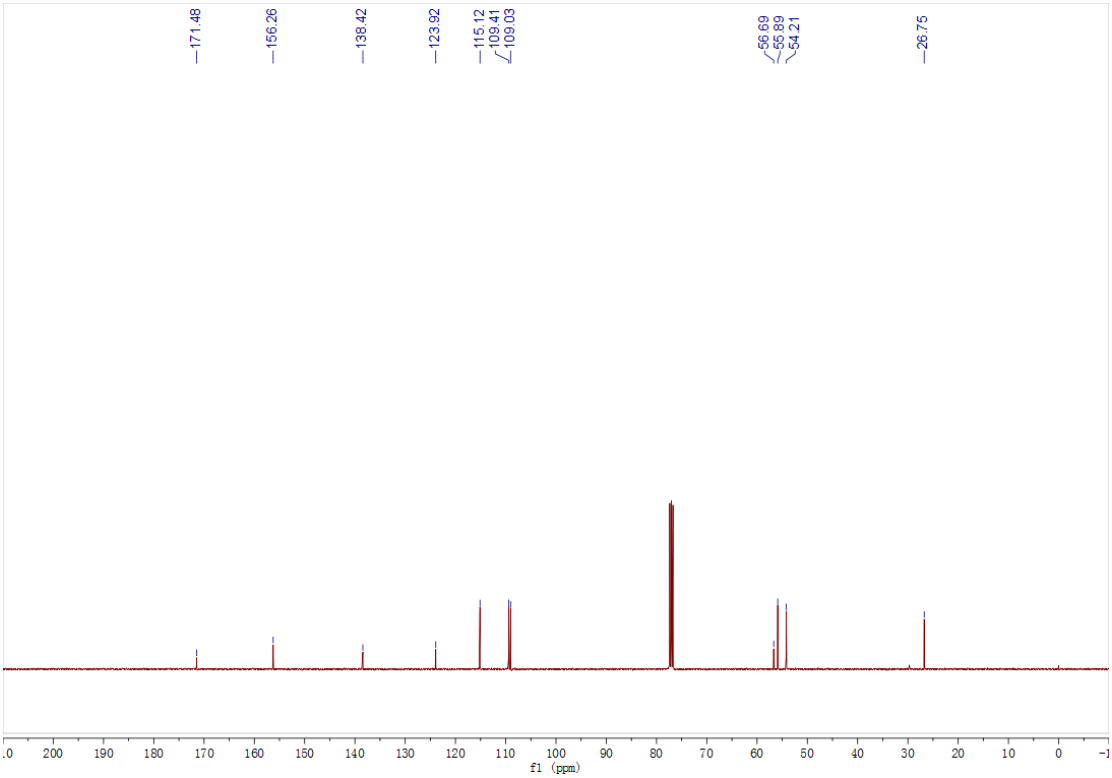

7.195
7.193
7.190
7.188
7.175
7.173
7.171
7.168
6.952
6.936
6.934
6.931
6.916
6.822
6.802
3.584
3.567
3.426
3.409
3.261
2.331
0.000
1.02
1.01
1.01
1.00
1.03
2.99
3.13
f1 (ppm)

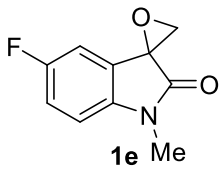

171.73
142.72
132.61
130.65
122.85
122.64
108.63
56.48
54.06
26.70
21.00
f1 (ppm)


MeO
O
O
N
Me

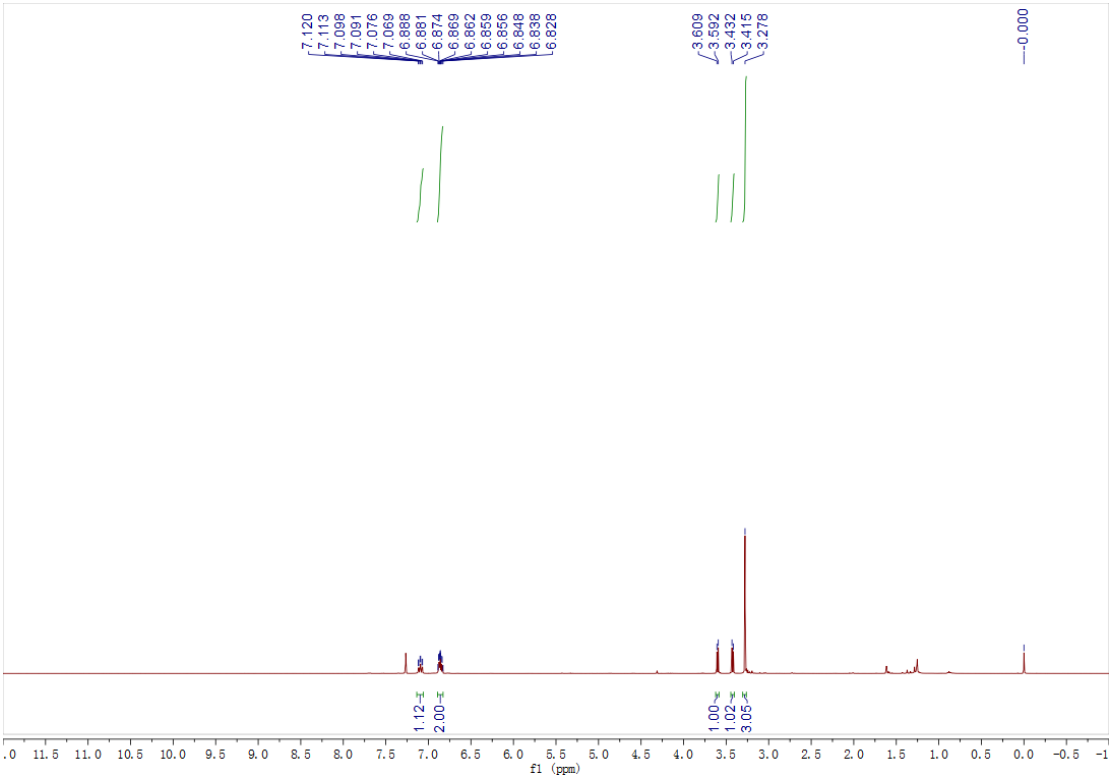
1d

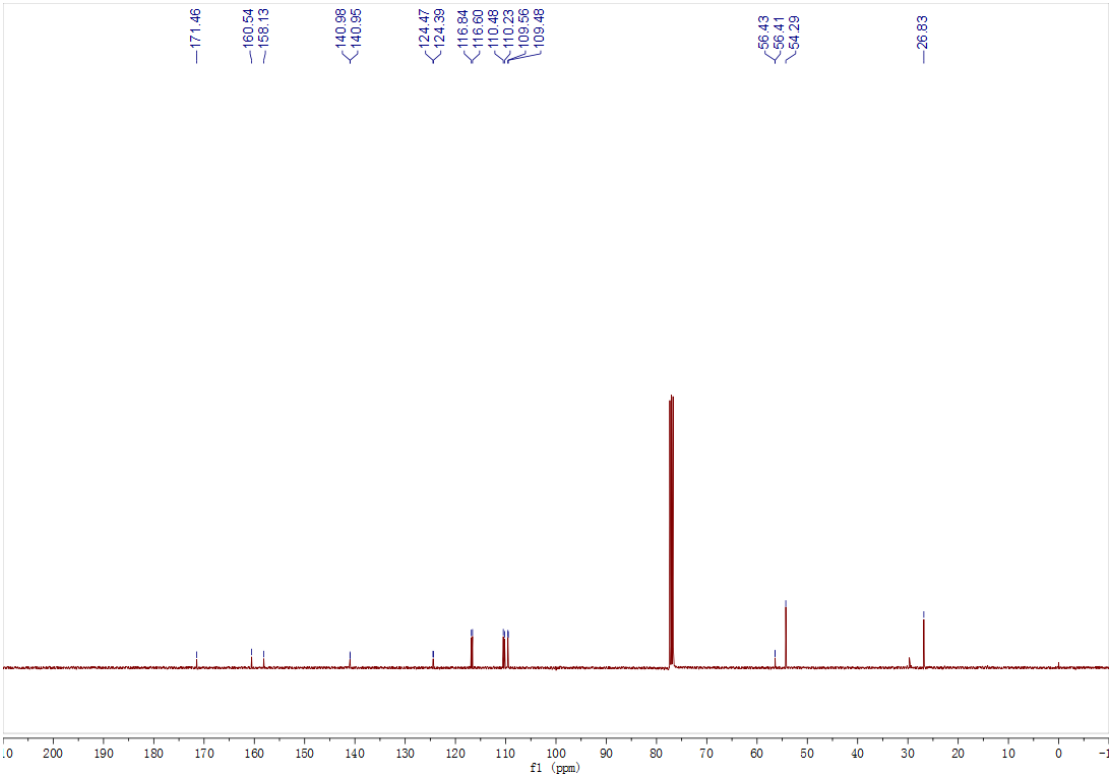

6.923
6.917
6.902
6.896
6.838
6.817
6.724
6.717
3.787
3.591
3.575
3.421
3.404
3.258
0.000
1.06
1.02
0.97
3.07
1.00
1.02
3.03
f1 (ppm)

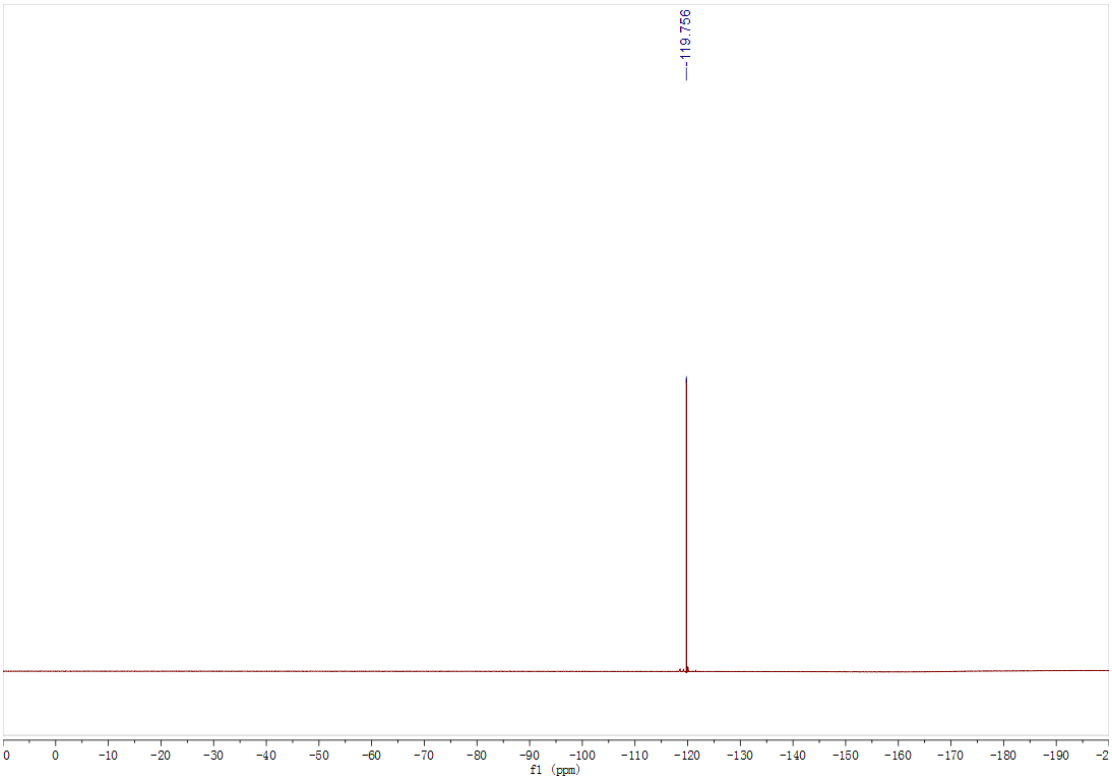

171.48
156.26
138.42
123.92
115.12
109.41
109.03
56.69
55.89
54.21
26.75
f1 (ppm)


O
F
O
N
Me

1e


7.120
7.113
7.098
7.091
7.076
7.069
6.888
6.881
6.874
6.869
6.862
6.859
6.856
6.848
6.838
6.828
3.609
3.592
3.432
3.415
3.278
0.000
1.12
2.00
1.00
1.02
3.05
f1 (ppm)


171.46
160.54
158.13
140.98
140.95
124.47
124.39
116.84
116.60
110.48
110.23
109.56
109.48
56.43
56.41
54.29
26.83
f1 (ppm)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0
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-40
-50
-60
-70
-80
-90
-100
-110
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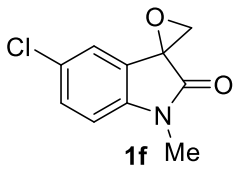
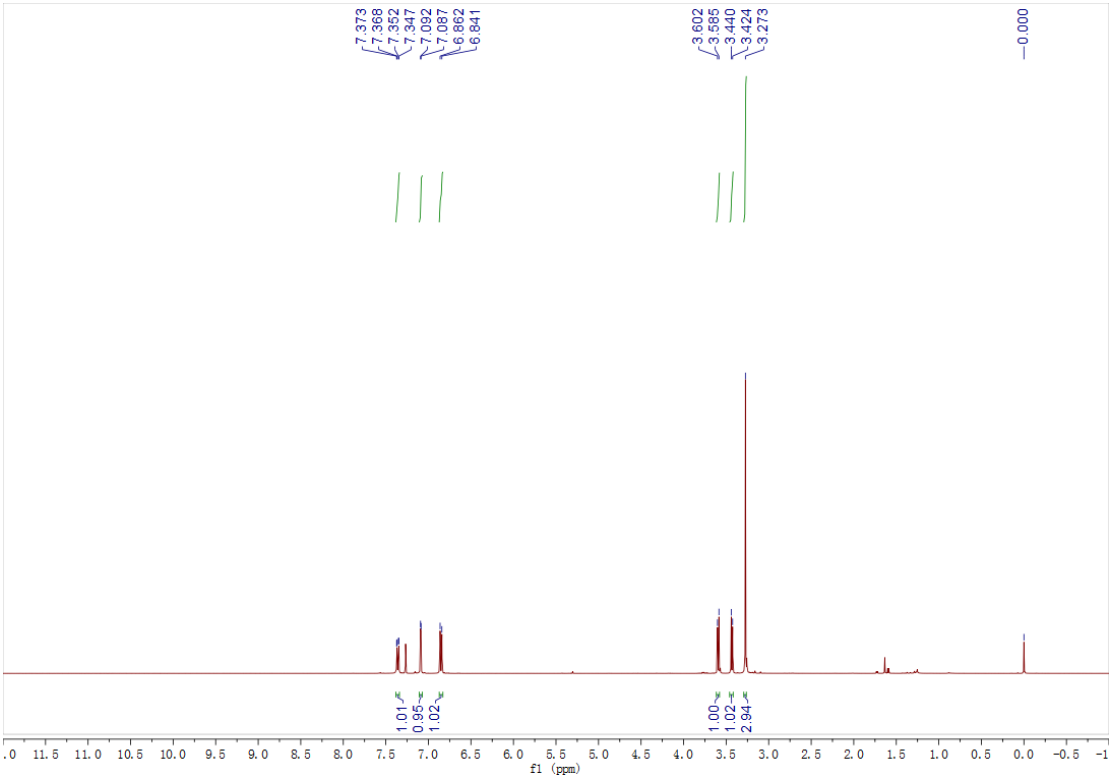
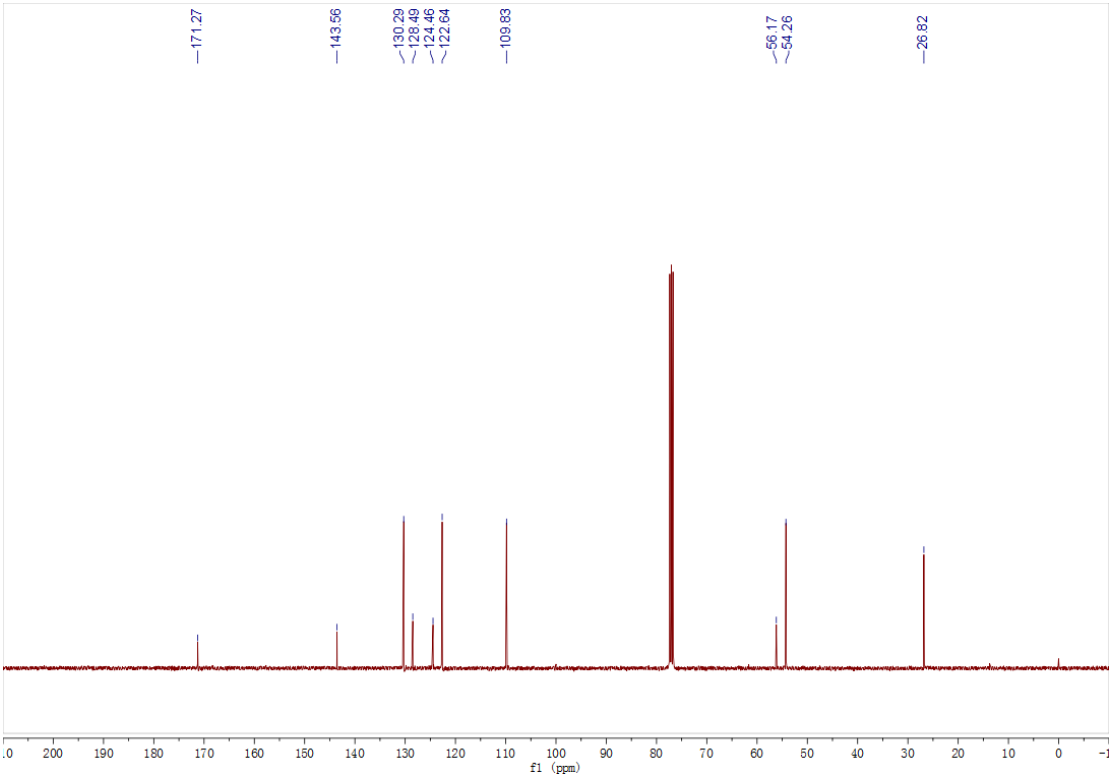
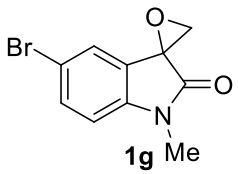
-140
-150
-160
-170
-180
-190
-2
f1 (ppm)


Cl
O
O
N
Me

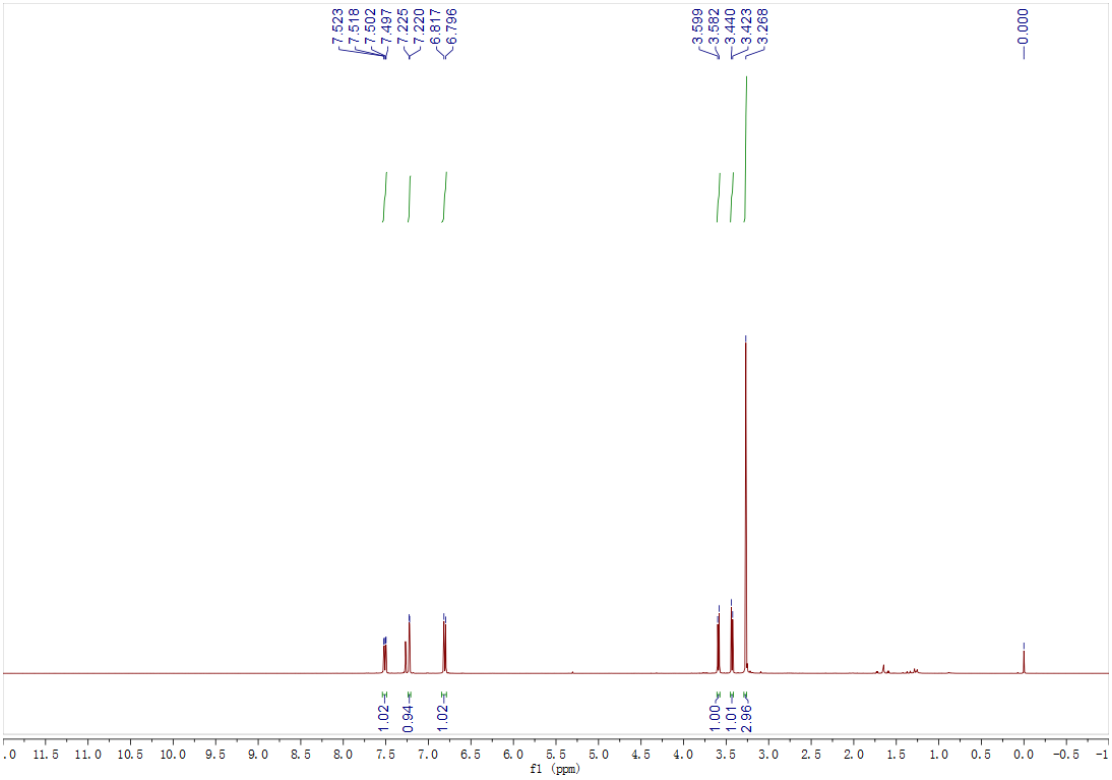
1f

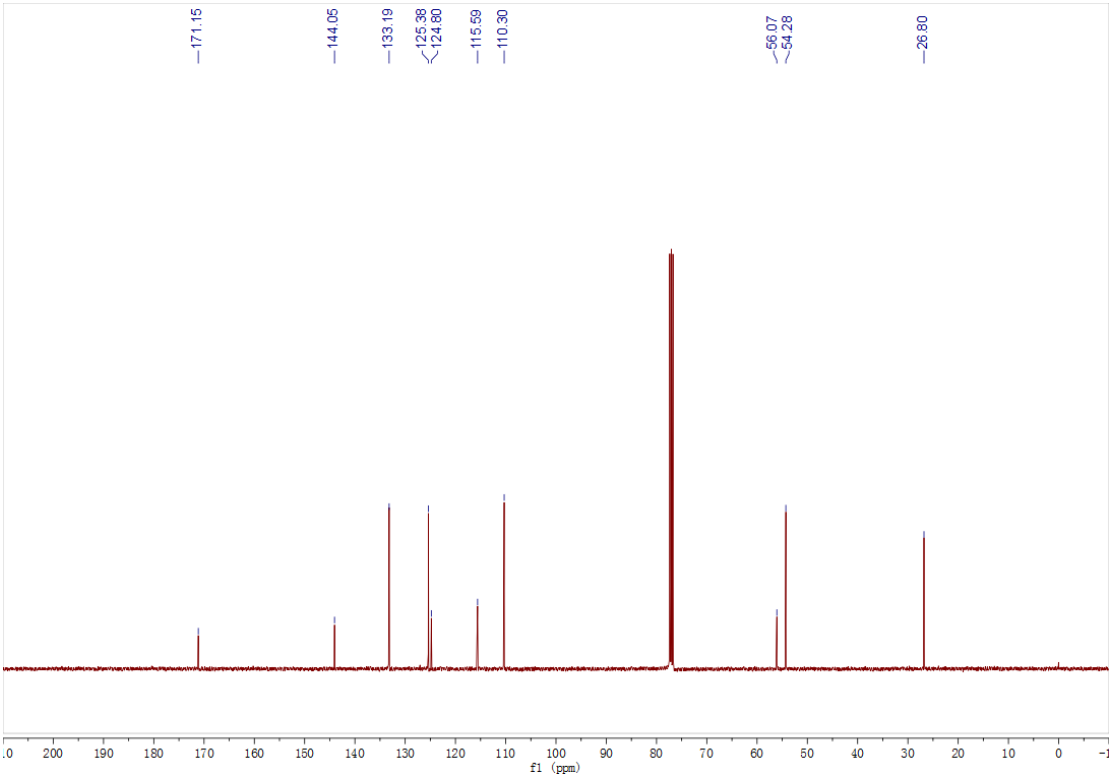

7.373
7.368
7.352
7.347
7.092
7.087
6.862
6.841
3.602
3.585
3.440
3.424
3.273
0.000
1.01
0.95
1.02
1.00
1.02
2.94
f1 (ppm)

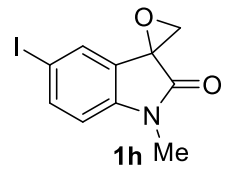

171.27
143.56
130.29
128.49
124.46
122.64
109.83
56.17
54.26
26.82
f1 (ppm)


Br
O
O
N
Me

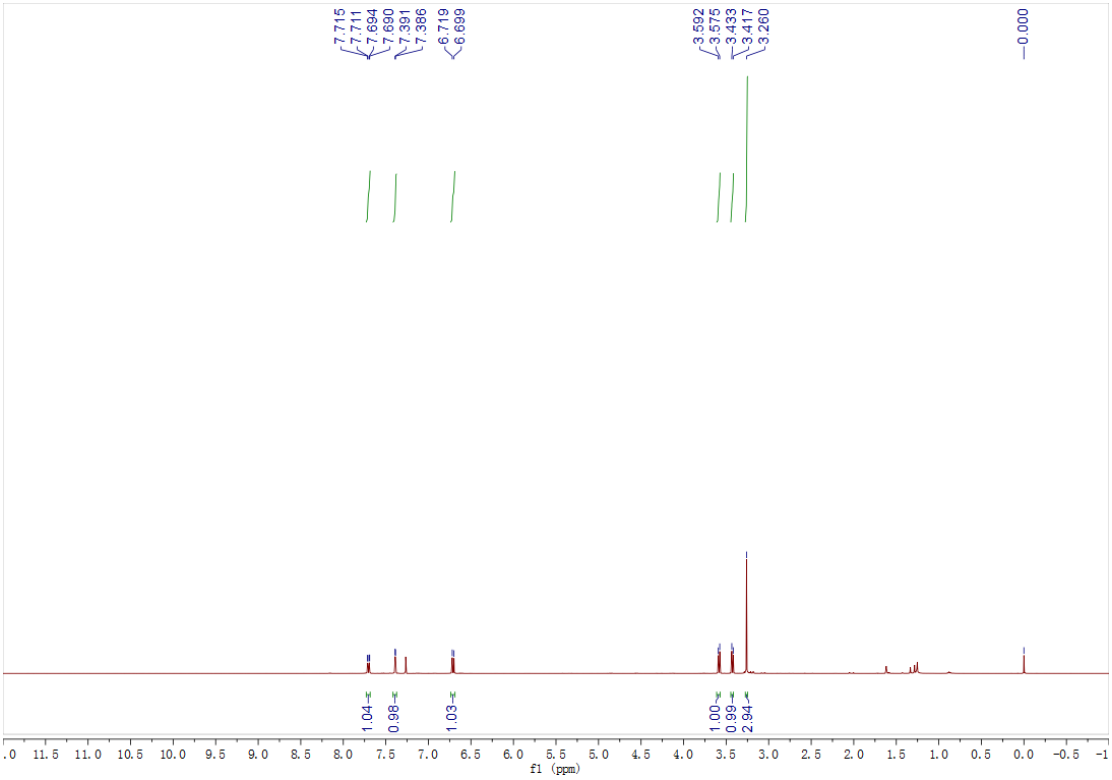
1g

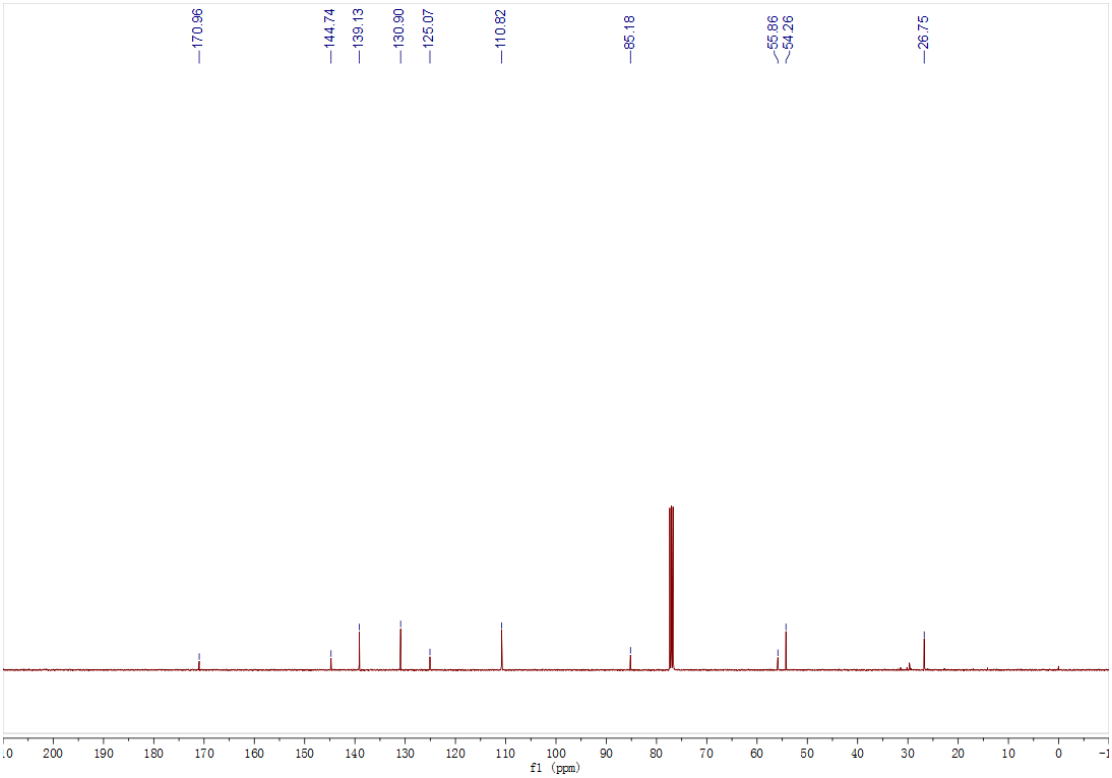

7.523
7.518
7.502
7.497
7.225
7.220
6.817
6.796
3.599
3.582
3.440
3.423
3.268
0.000
1.02
0.94
1.02
1.00
1.01
2.96
f1 (ppm)

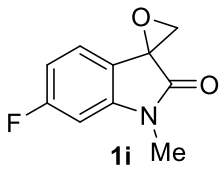

171.15
144.05
133.19
125.38
124.80
115.59
110.30
56.07
54.28
26.80
f1 (ppm)


O
I
O
N
Me

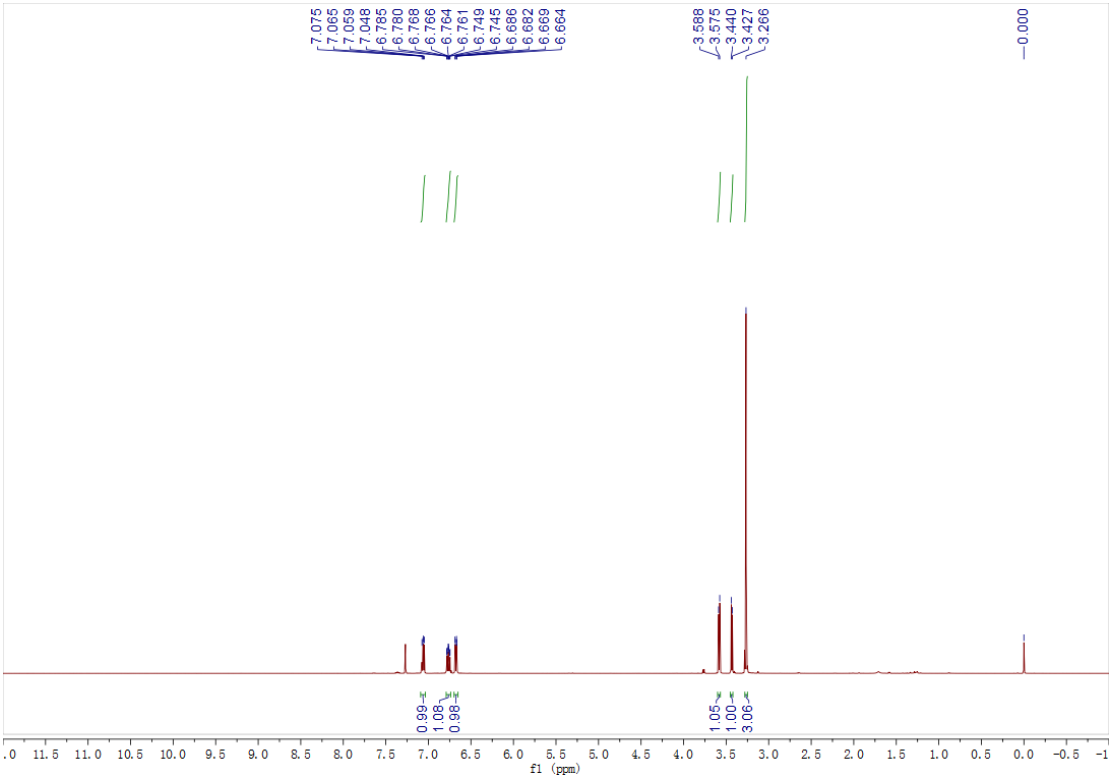
1h

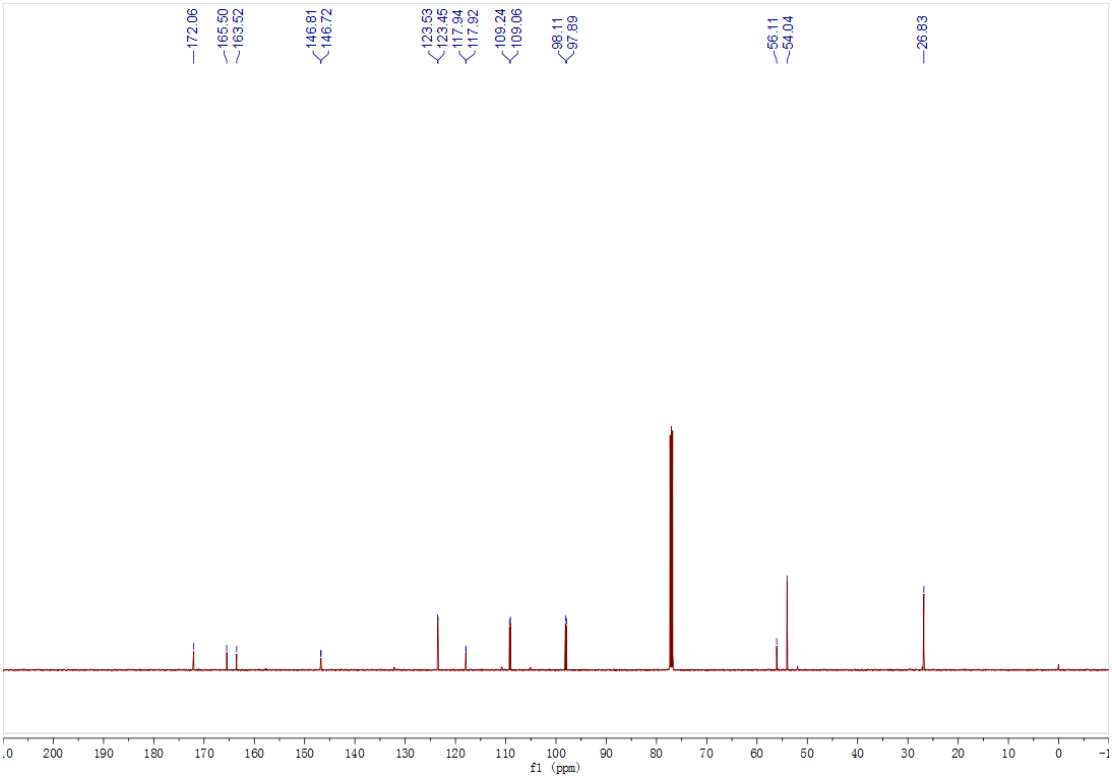

7.715
7.711
7.694
7.690
7.391
7.386
6.719
6.699
3.592
3.575
3.433
3.417
3.260
0.000
1.04
0.98
1.03
1.00
0.99
2.94
f1 (ppm)

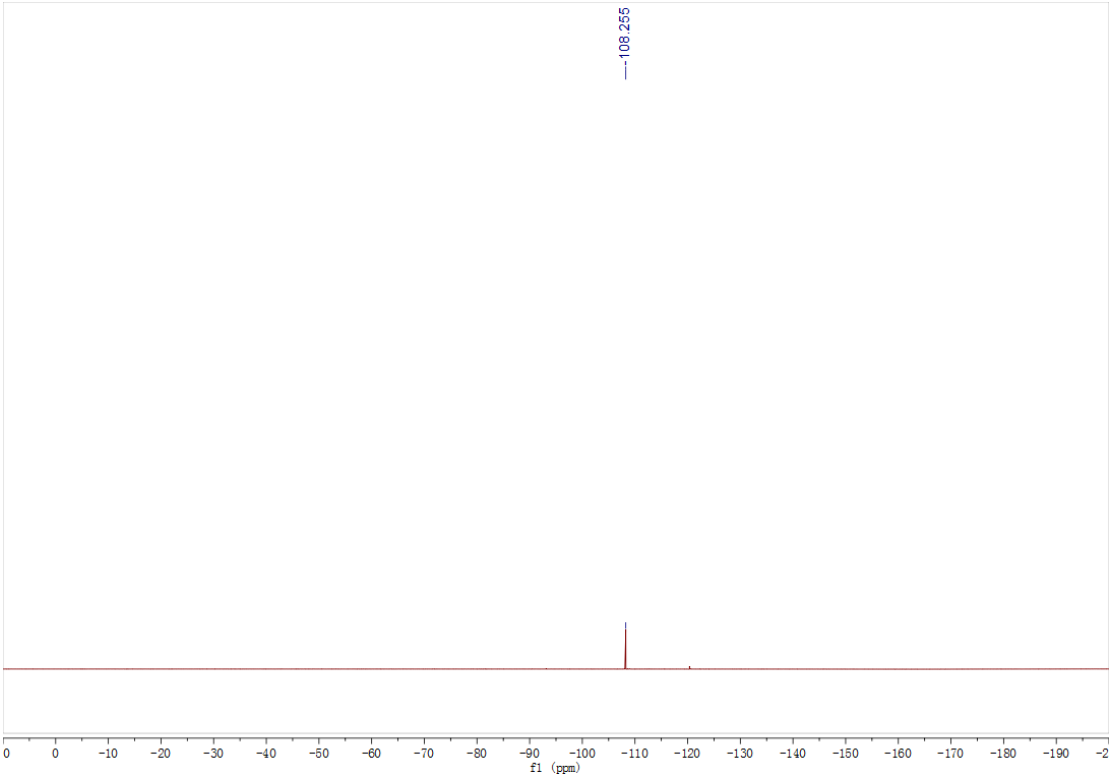

170.96
144.74
139.13
130.90
125.07
110.82
85.18
55.86
54.26
26.75
f1 (ppm)

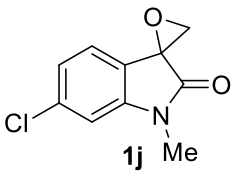

O
O
F
N
Me

1i

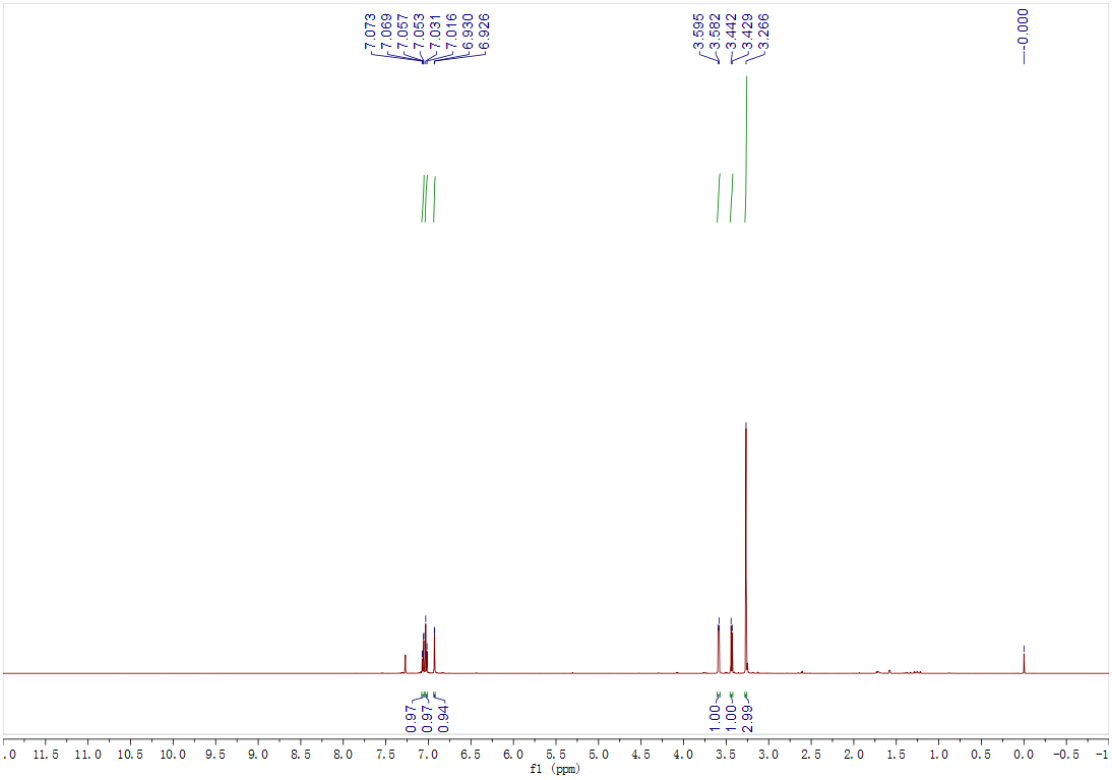

7.075
7.065
7.059
7.048
6.785
6.780
6.768
6.766
6.764
6.761
6.749
6.745
6.686
6.682
6.669
6.664
3.588
3.575
3.440
3.427
3.266
0.000
0.99
1.08
0.98
1.05
1.00
3.06
f1 (ppm)

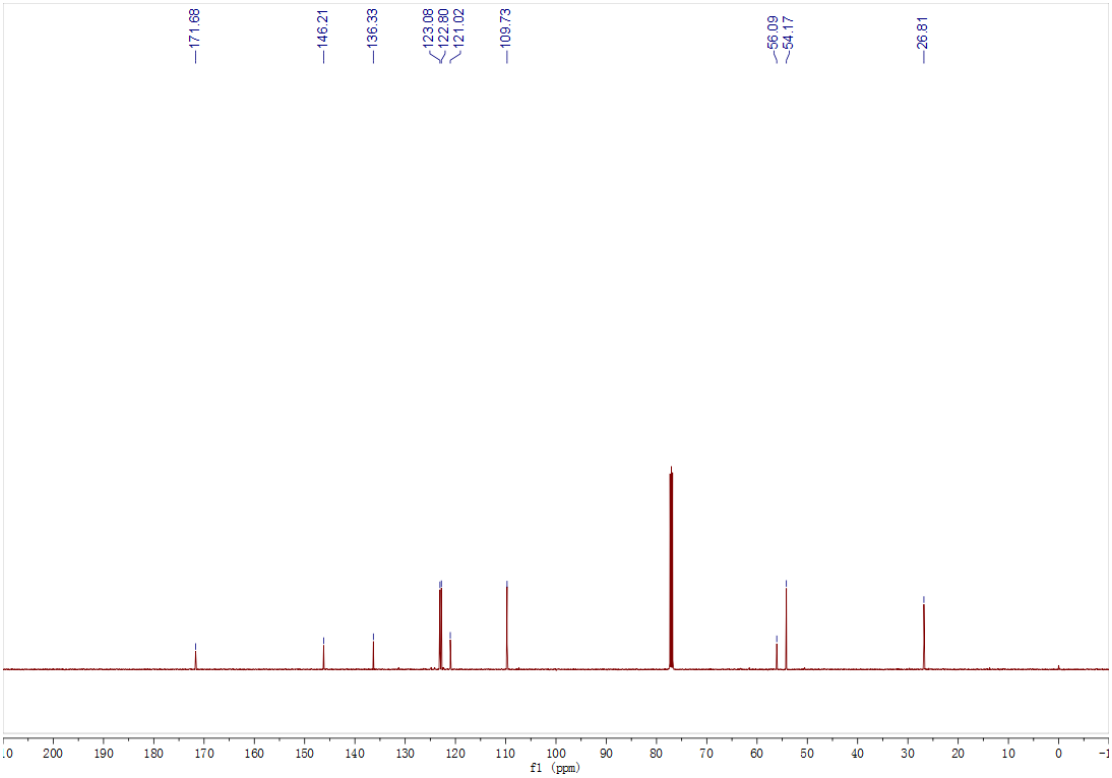

172.06
165.50
163.52
146.81
146.72
123.53
123.45
117.94
117.92
109.24
109.06
98.11
97.89
56.11
54.04
26.83
f1 (ppm)


-108.255
0
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-2
f1 (ppm)


O
O
Cl
N
Me

1j


7.073
7.069
7.057
7.053
7.031
7.016
6.930
6.926
3.595
3.582
3.442
3.429
3.266
0.000
0.97
0.97
0.94
1.00
1.00
2.99
f1 (ppm)


171.68
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136.33
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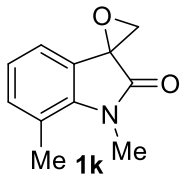
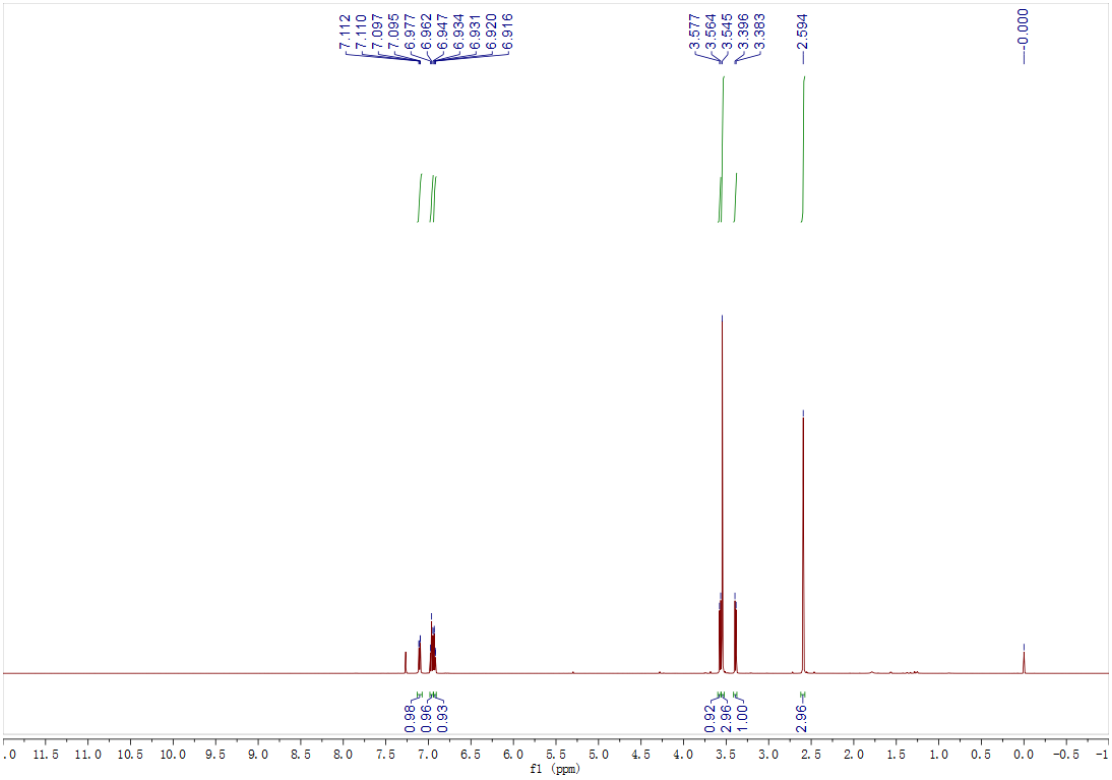
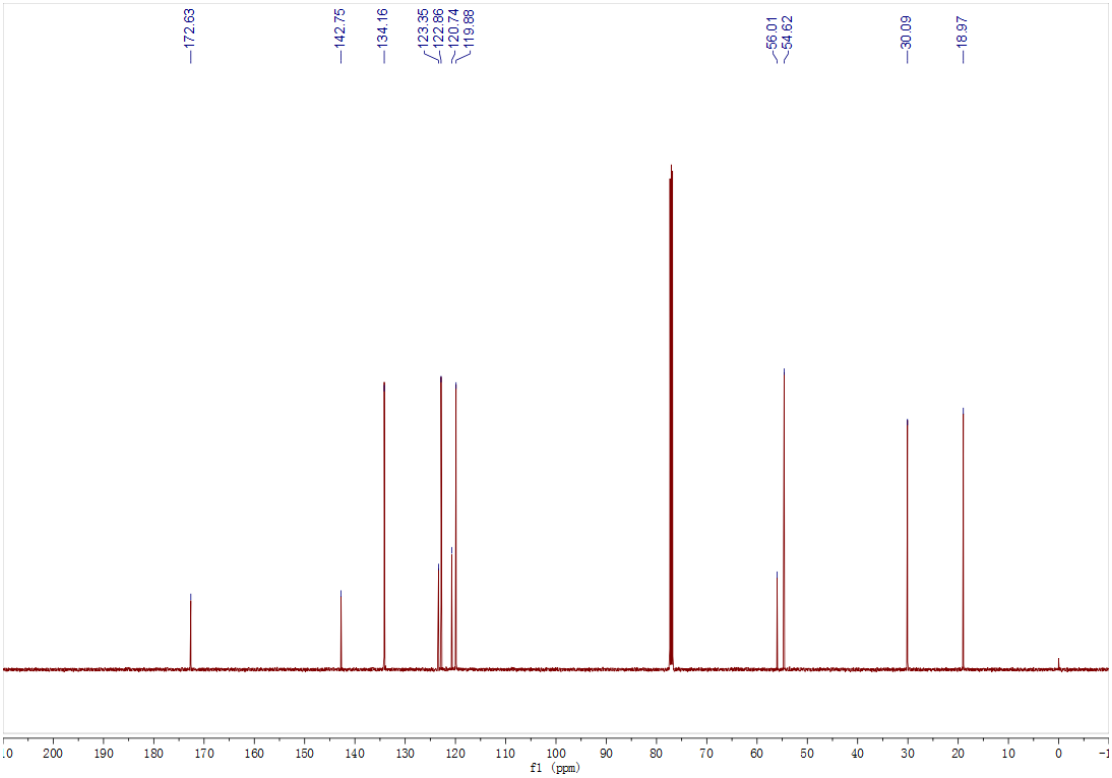
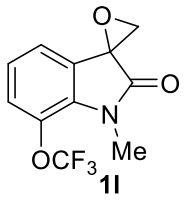
122.80
121.02
109.73
56.09
54.17
26.81
f1 (ppm)


O
O
N
Me
Me

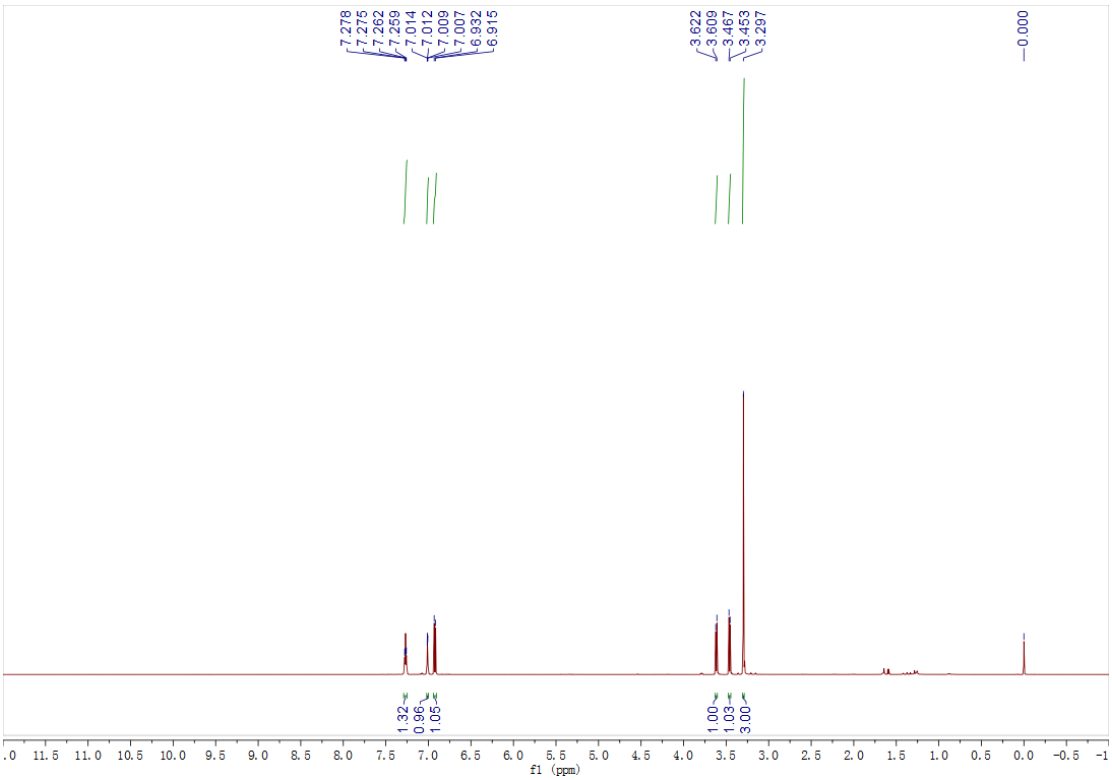
1k

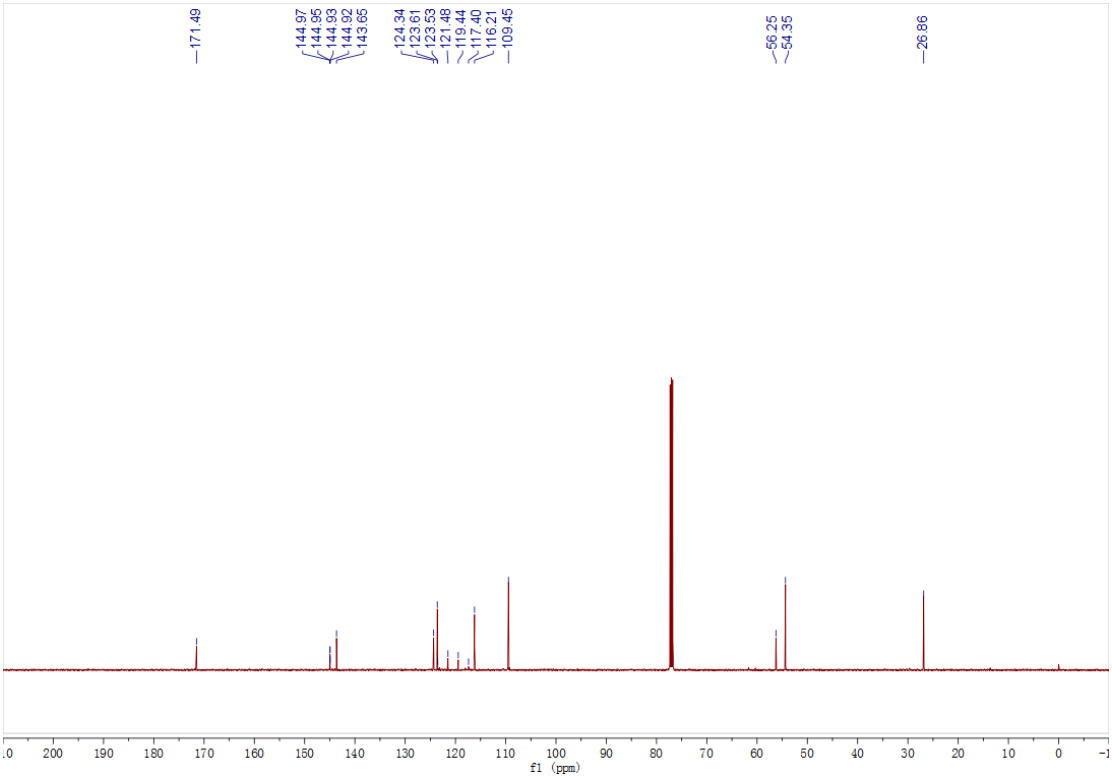

7.112
7.110
7.097
7.095
6.977
6.962
6.947
6.934
6.931
6.920
6.916
3.577
3.564
3.545
3.396
3.383
2.594
0.000
0.98
0.96
0.93
0.92
2.96
1.00
2.96
f1 (ppm)

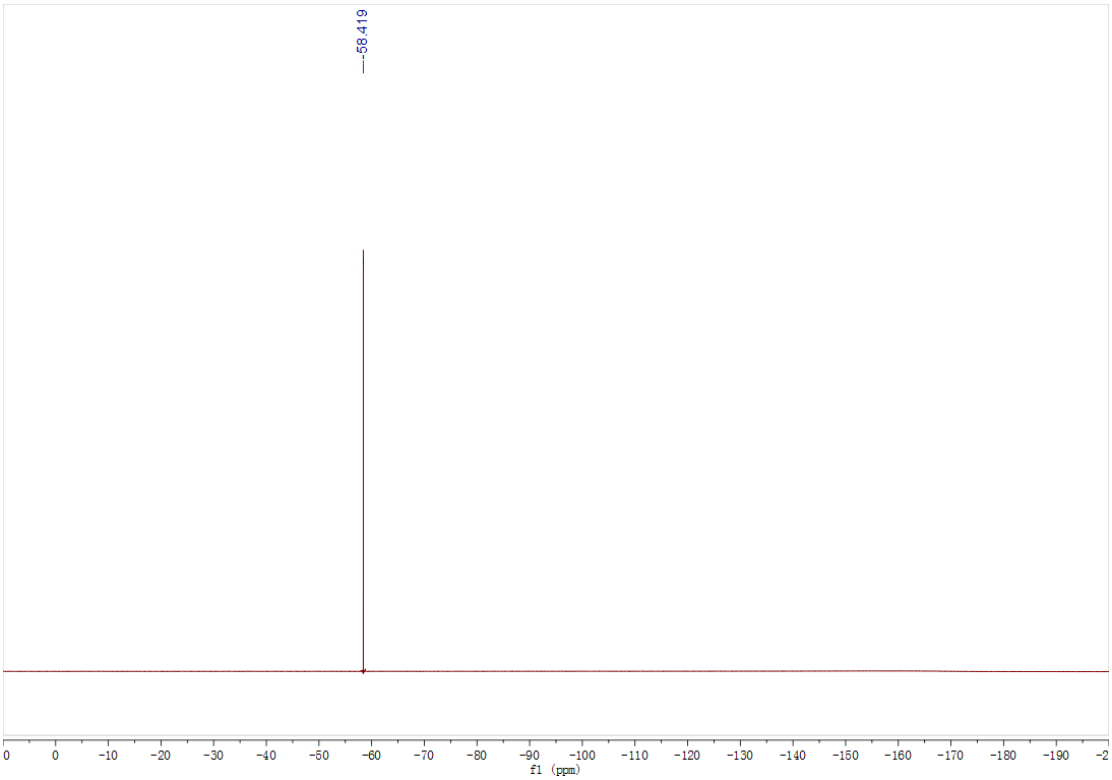

172.63
142.75
134.16
123.35
122.86
120.74
119.88
56.01
54.62
30.09
18.97
f1 (ppm)


O
O
N
Me
OCF3

1l


7.278
7.275
7.262
7.259
7.014
7.012
7.009
7.007
6.932
6.915
3.622
3.609
3.467
3.453
3.297
0.000
1.32
0.96
1.05
1.00
1.03
3.00
f1 (ppm)


171.49
144.97
144.95
144.93
144.92
143.65
124.34
123.61
123.53
121.48
119.44
117.40
116.21
109.45
56.25
54.35
26.86
f1 (ppm)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-90
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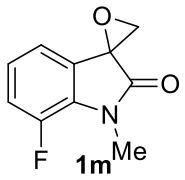
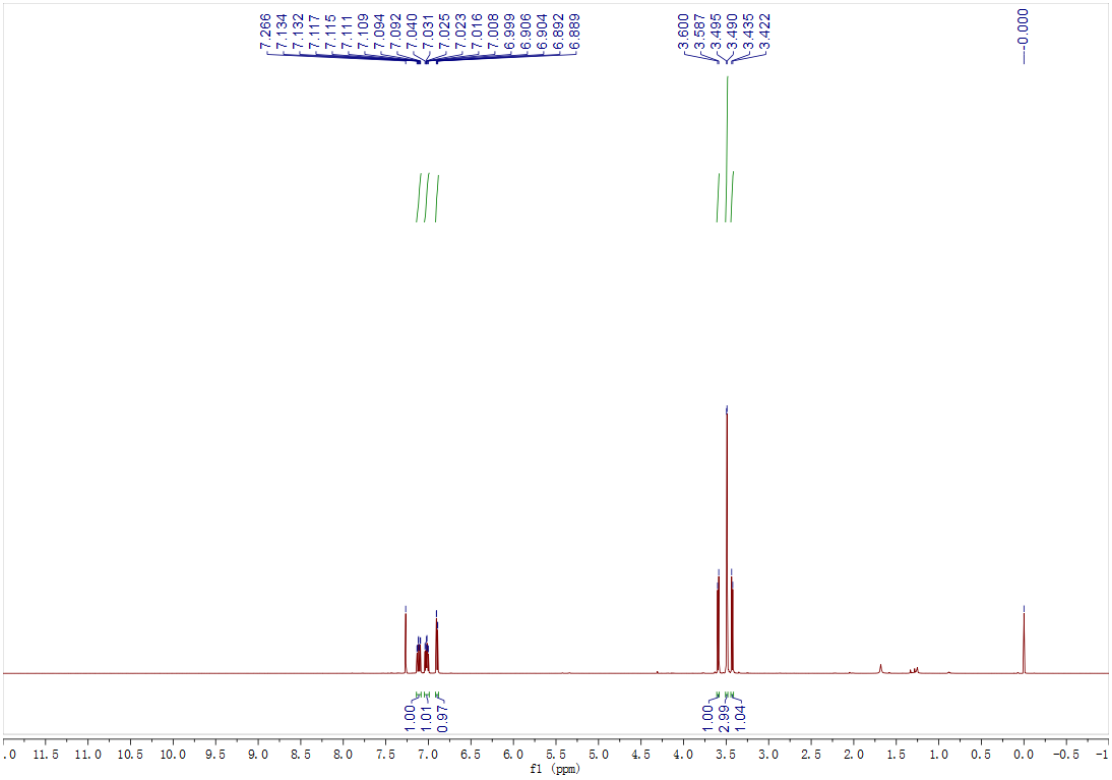
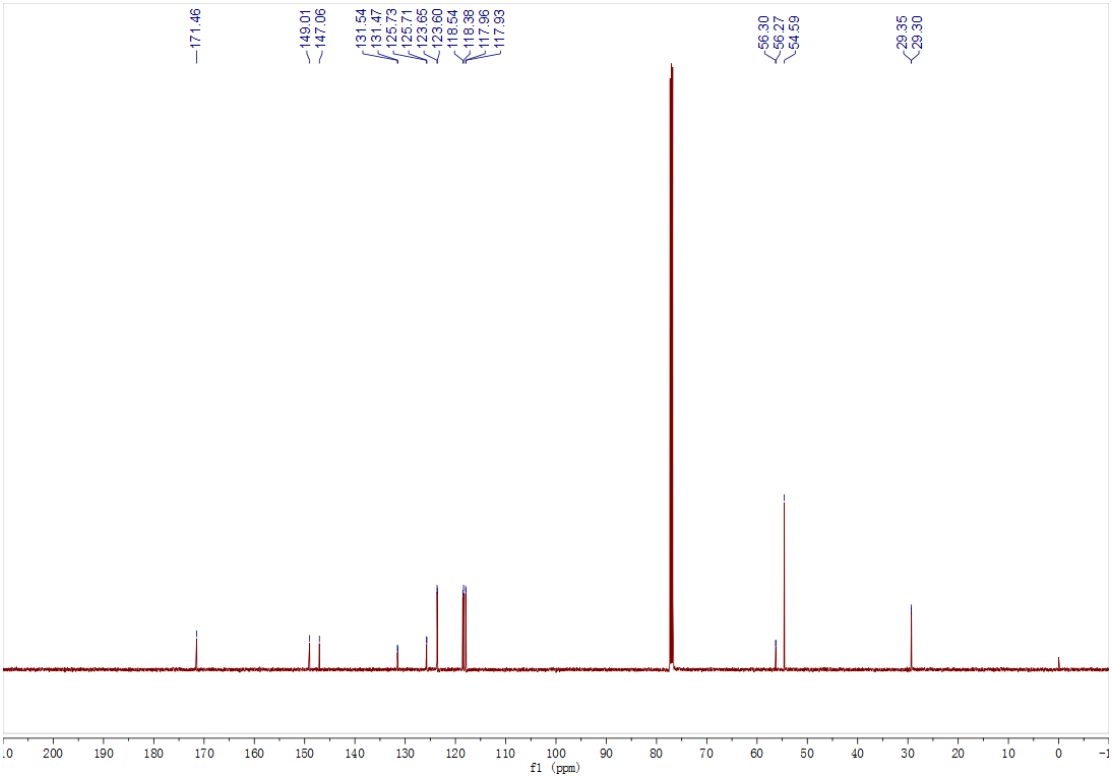
-160
-170
-180
-190
-2
f1 (ppm)


O
O
N
Me
F

1m


7.266
7.134
7.132
7.117
7.115
7.111
7.109
7.094
7.092
7.040
7.031
7.025
7.023
7.016
7.008
6.999
6.906
6.904
6.892
6.889
3.600
3.587
3.495
3.490
3.435
3.422
0.000
1.00
1.01
0.97
1.00
2.99
1.04
f1 (ppm)


171.46
149.01
147.06
131.54
131.47
125.73
125.71
123.65
123.60
118.54
118.38
117.96
117.93
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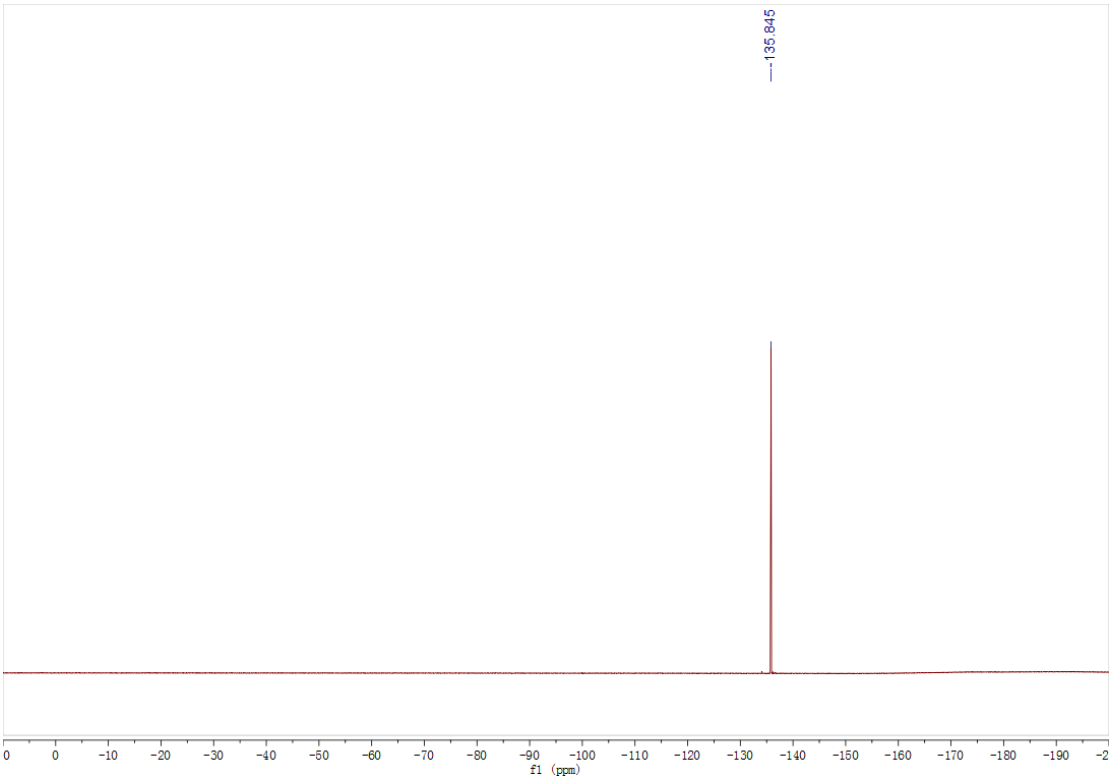
56.27
54.59
29.35
29.30
f1 (ppm)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0
0
-10
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-40
-50
-60
-70
-80
-90
-100
-110
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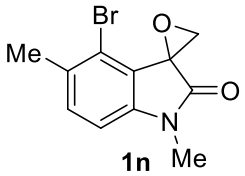
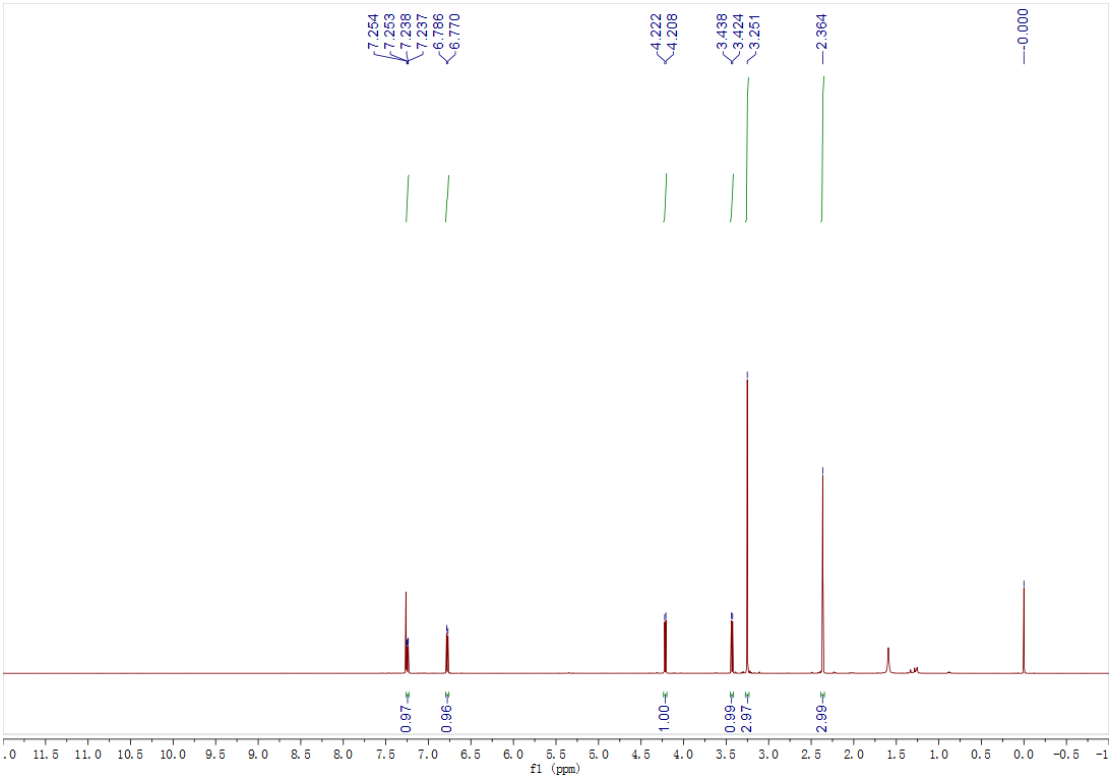
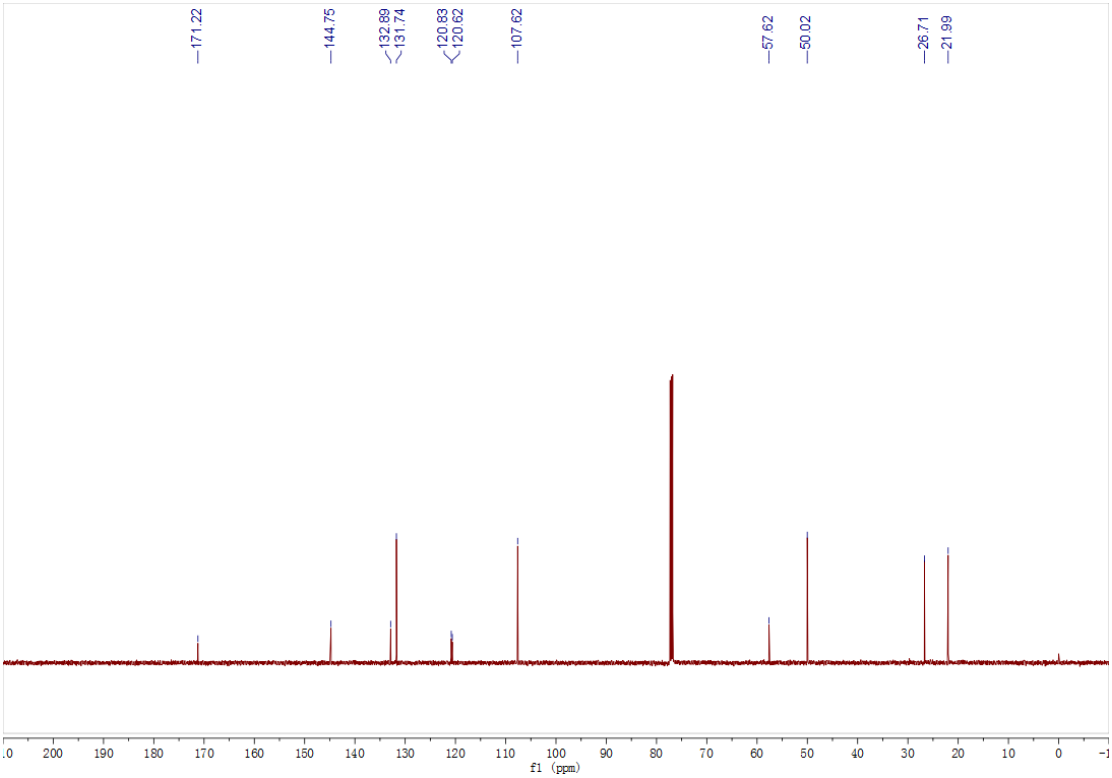
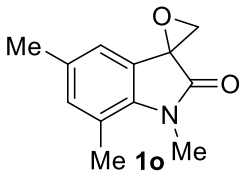
-160
-170
-180
-190
-2
f1 (ppm)

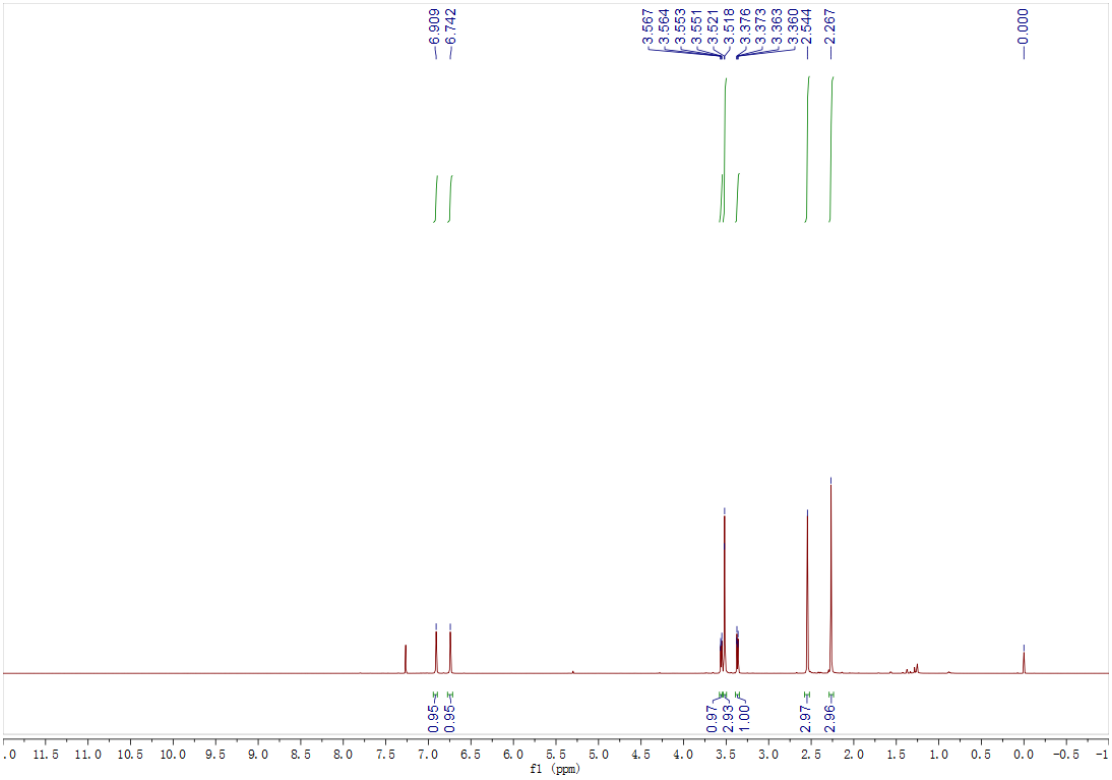

Br
O
Me
O
N
Me

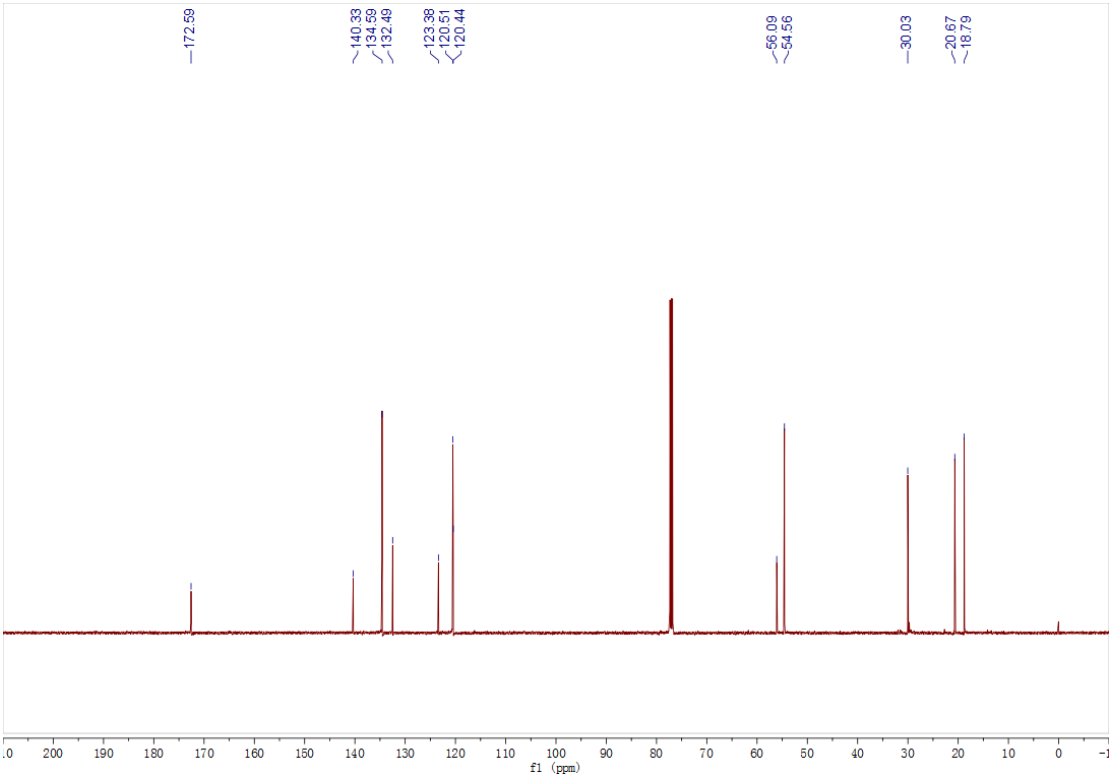
1n

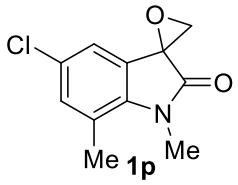

7.254
7.253
7.238
7.237
6.786
6.770
4.222
4.208
3.438
3.424
3.251
2.364
0.000
0.97
0.96
1.00
0.99
2.97
2.99
f1 (ppm)

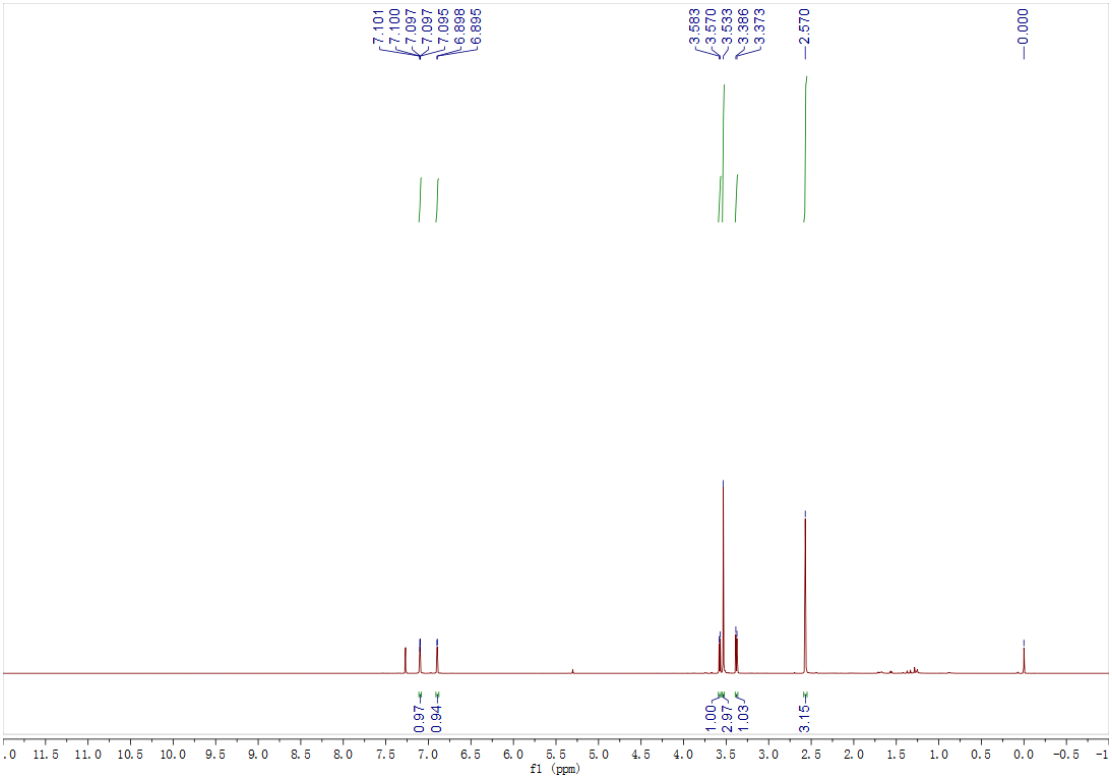

171.22
144.75
132.89
131.74
120.83
120.62
107.62
57.62
50.02
26.71
21.99
f1 (ppm)

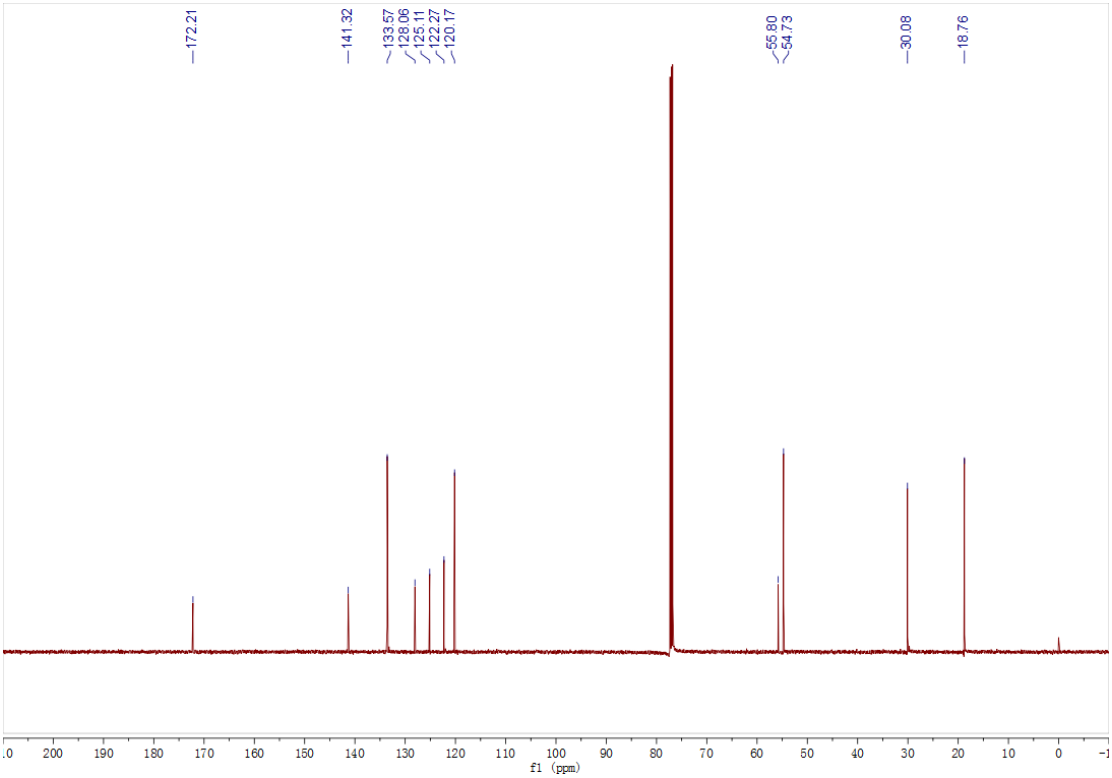

Me
O
O
N
Me
Me 1o

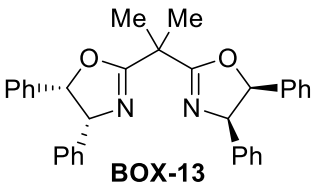

6.909
6.742
3.567
3.564
3.553
3.551
3.521
3.518
3.376
3.373
3.363
3.360
2.544
2.267
0.000
0.95
0.95
0.97
2.93
1.00
2.97
2.96
f1 (ppm)


172.59
140.33
134.59
132.49
123.38
120.51
120.44
56.09
54.56
30.03
20.67
18.79
f1 (ppm)

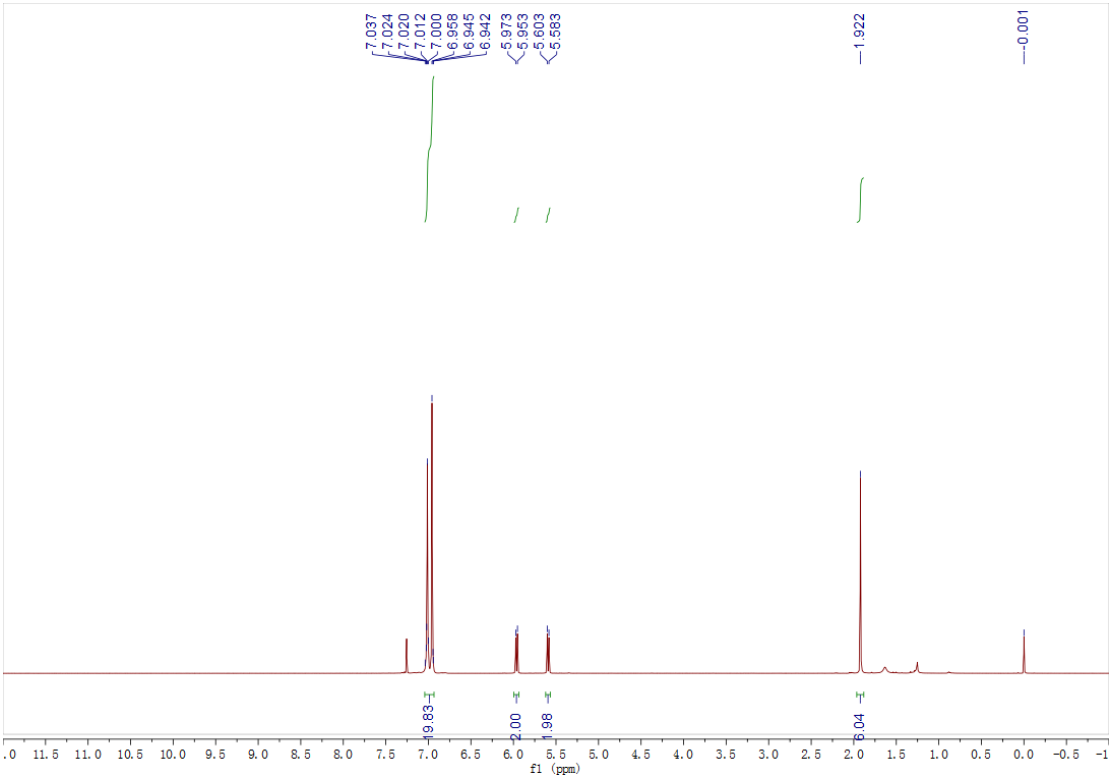

Cl
O
O
N
Me
Me
1p

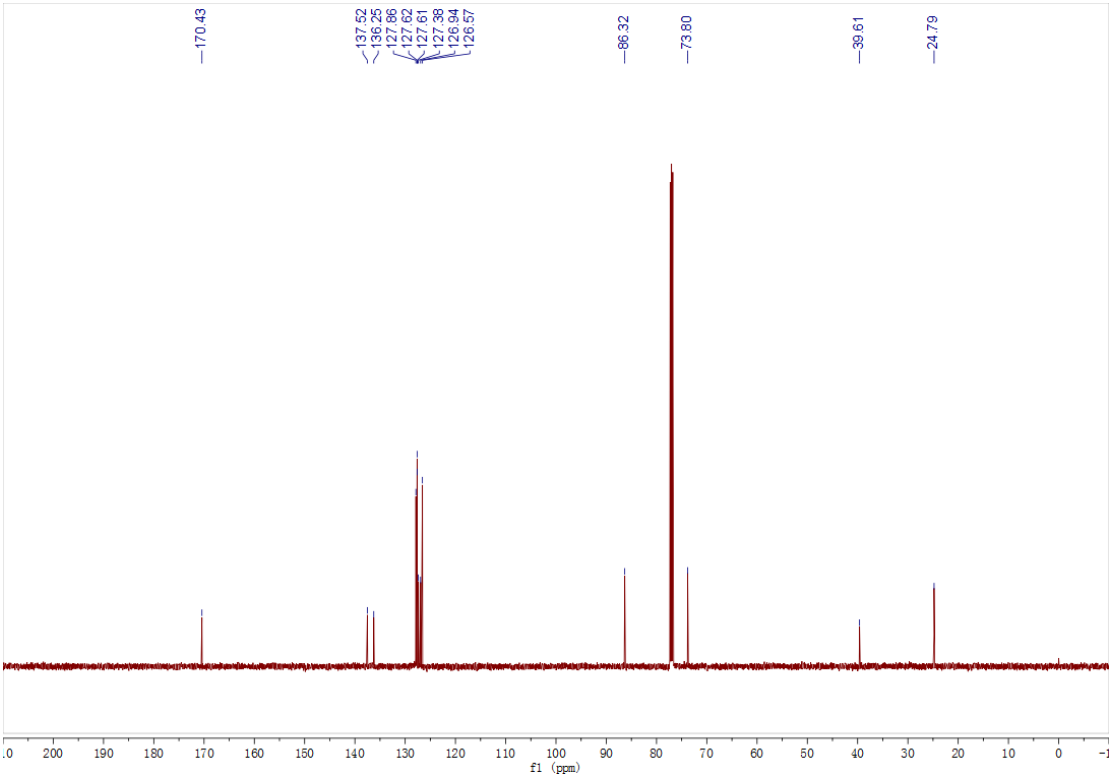

7.101
7.100
7.097
7.097
7.095
6.898
6.895
3.583
3.570
3.533
3.386
3.373
2.570
0.000
0.97
0.94
1.00
2.97
1.03
3.15
f1 (ppm)

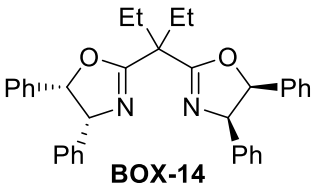

172.21
141.32
133.57
128.06
125.11
122.27
120.17
55.80
54.73
30.08
18.76
f1 (ppm)


Me
Me
O
O
Ph
N
N
Ph
Ph
Ph

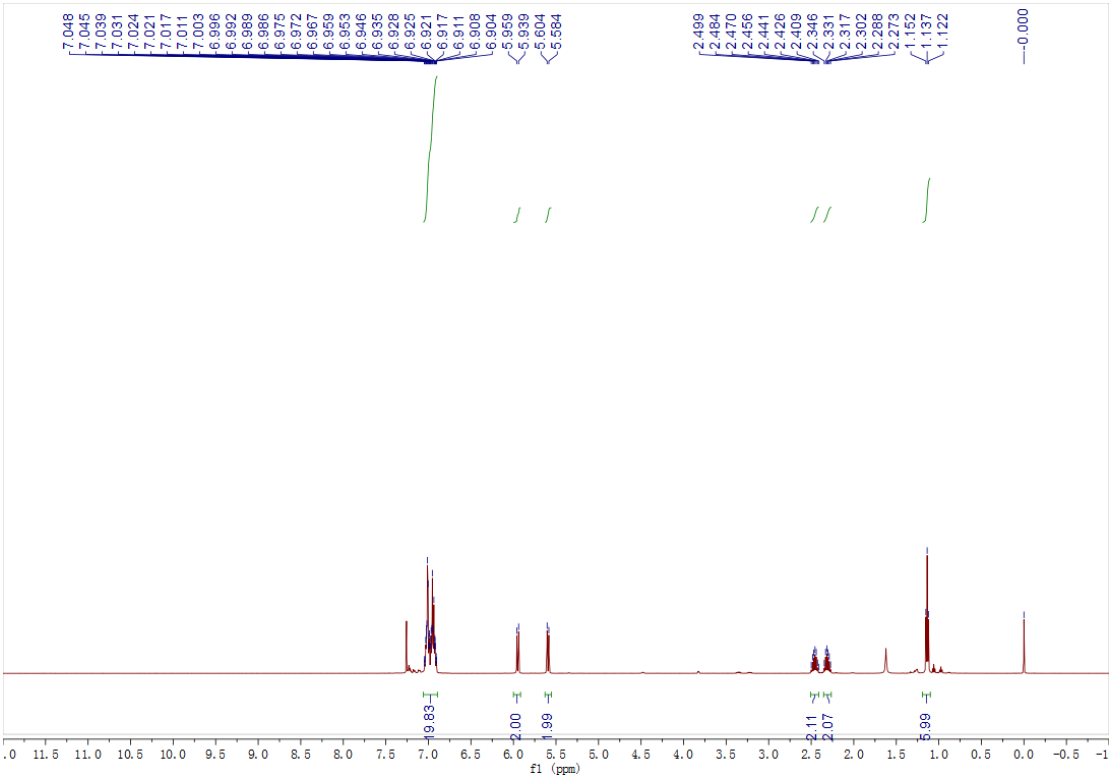
BOX-13

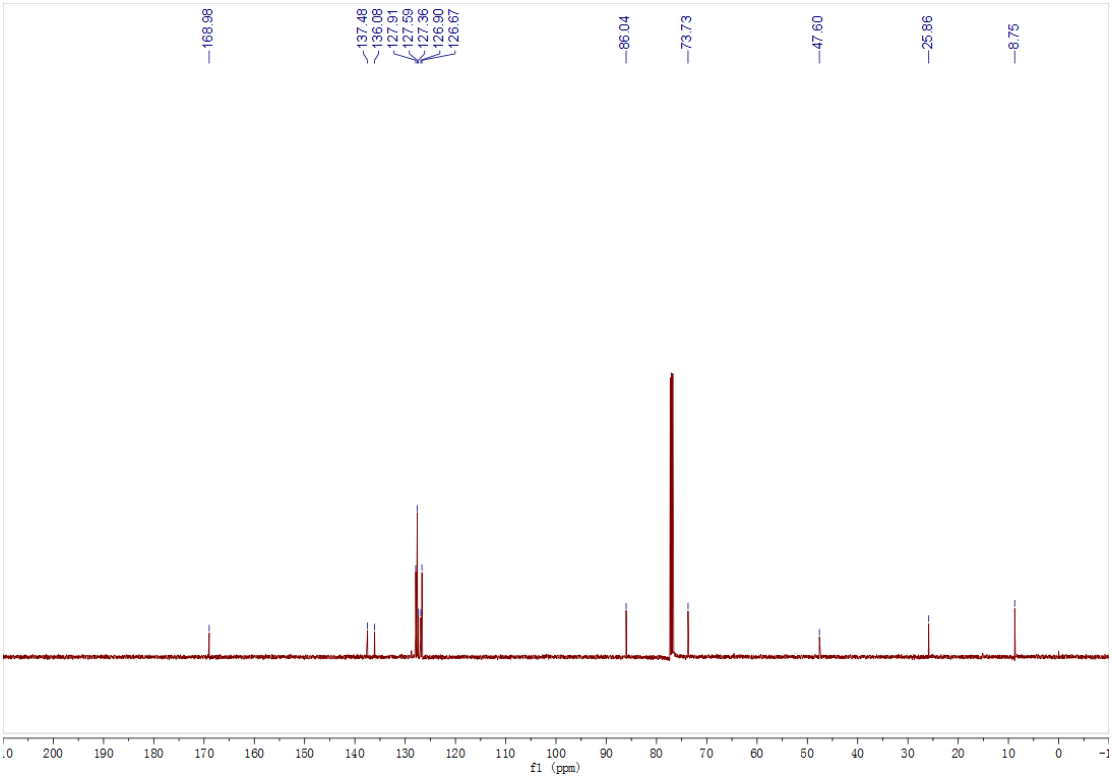

7.037
7.024
7.020
7.012
7.000
6.958
6.945
6.942
5.973
5.953
5.603
5.583
1.922
0.001
9.83
2.00
1.98
6.04
f1 (ppm)

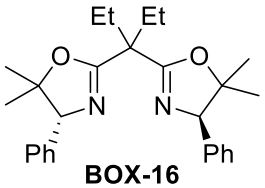

170.43
137.52
136.25
127.66
127.62
127.61
127.38
126.94
126.57
86.32
73.80
39.61
24.79
f1 (ppm)


Et
Et
O
O
Ph
N
N
Ph
Ph
Ph

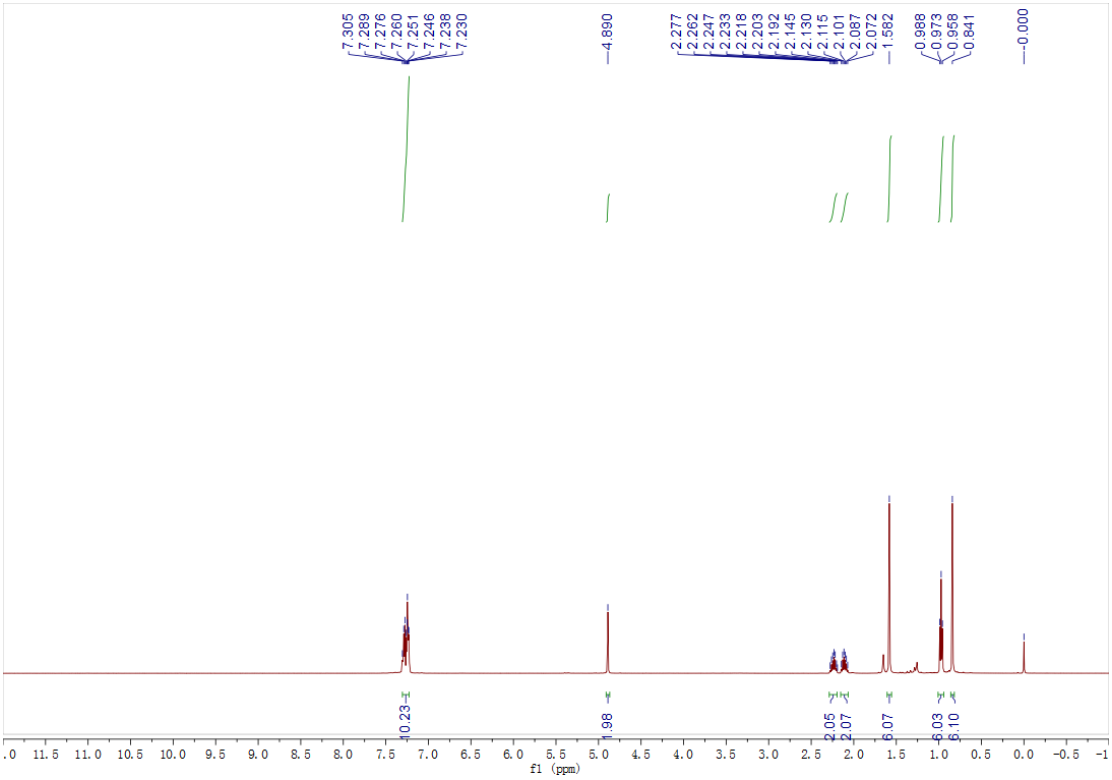
BOX-14

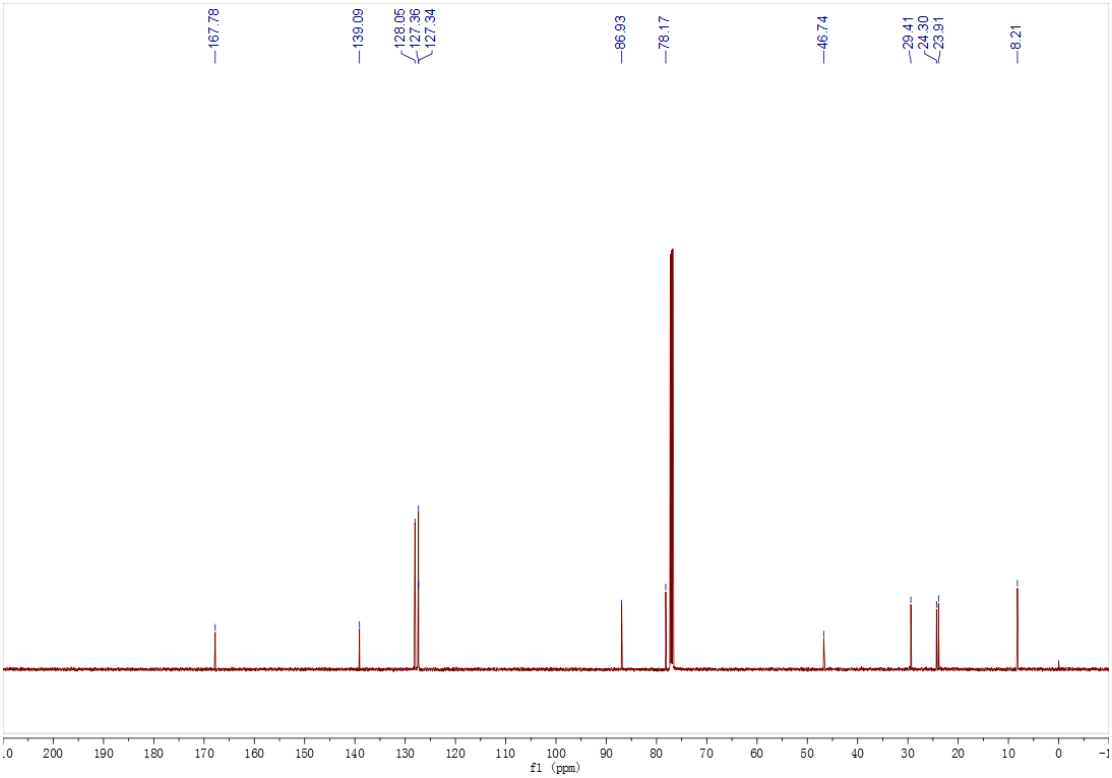

7.048
7.045
7.039
7.031
7.024
7.021
7.017
7.011
7.003
6.996
6.992
6.989
6.986
6.975
6.972
6.967
6.959
6.953
6.946
6.935
6.928
6.925
6.921
6.917
6.911
6.908
6.904
5.959
5.939
5.604
5.584
2.499
2.484
2.470
2.456
2.441
2.426
2.409
2.346
2.331
2.317
2.302
2.288
2.273
1.152
1.137
1.122
0.000
9.83
2.00
1.99
2.11
2.07
5.99
f1 (ppm)

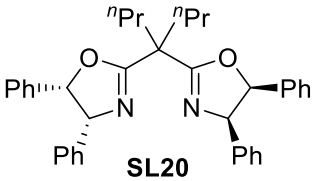

168.98
137.48
136.08
127.91
127.59
127.36
126.90
126.67
86.04
73.73
47.60
25.86
8.75
f1 (ppm)


Et
Et
O
O
N
N
Ph
Ph

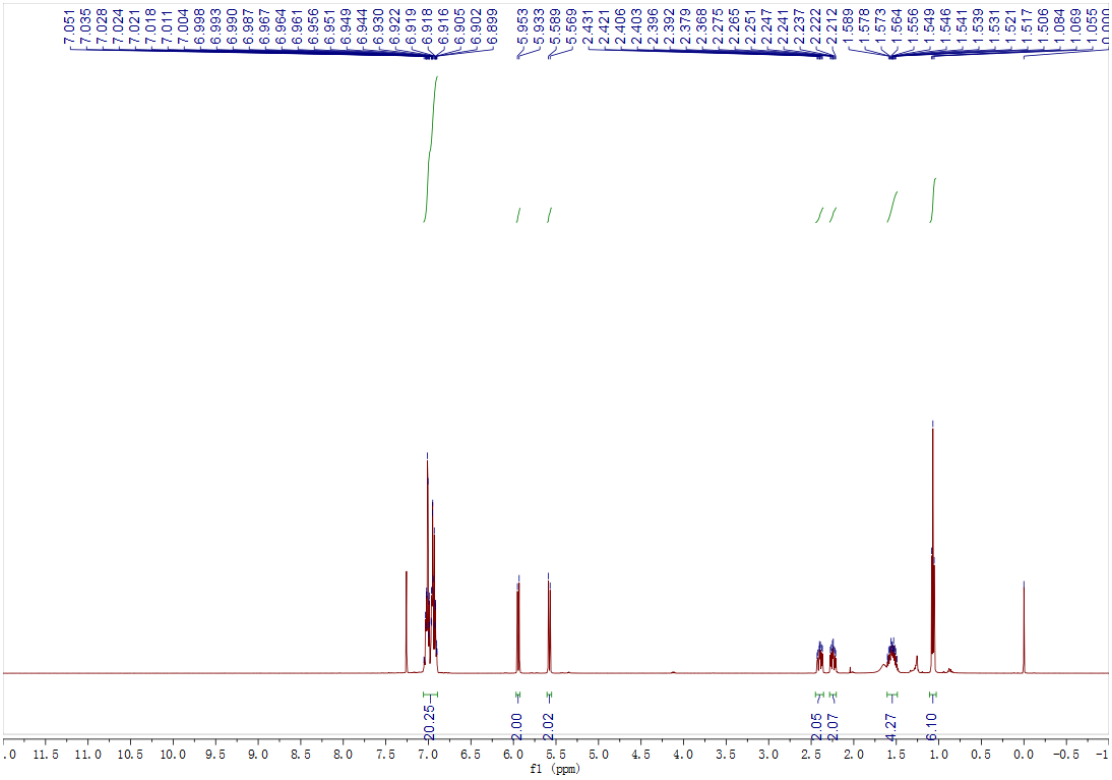
BOX-16

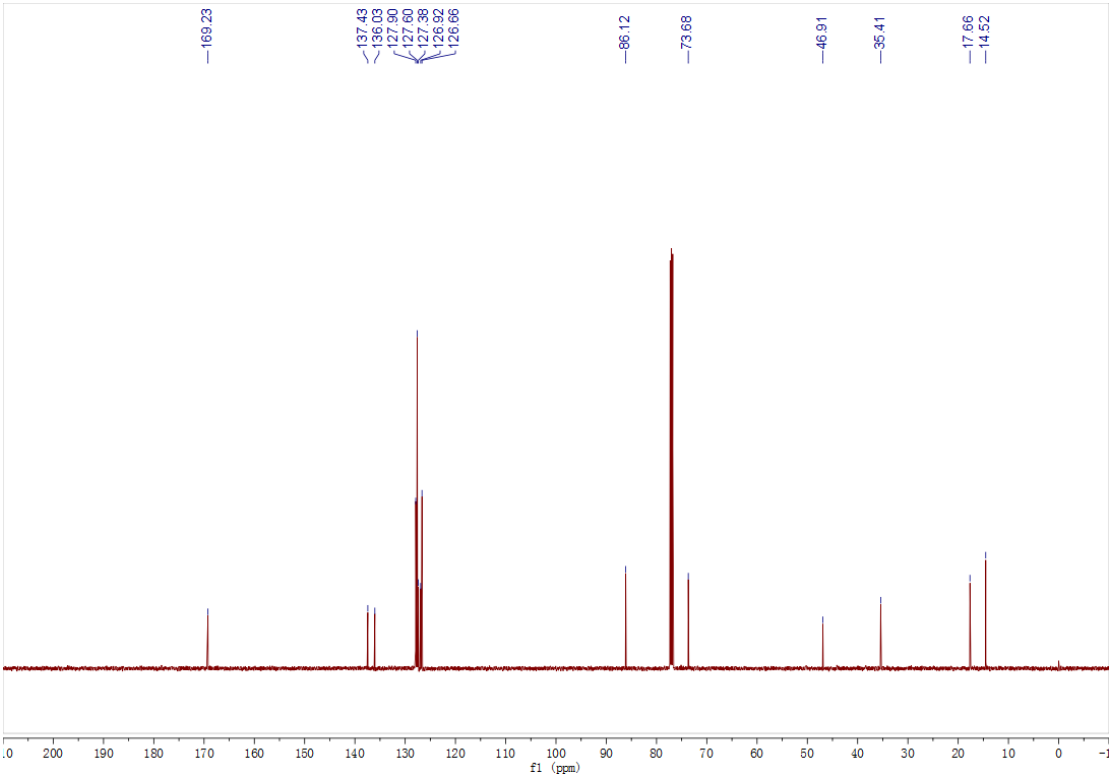

7.305
7.289
7.276
7.260
7.251
7.246
7.238
7.230
4.890
2.277
2.262
2.247
2.233
2.218
2.203
2.192
2.145
2.130
2.115
2.101
2.087
2.072
1.582
0.988
0.973
0.958
0.841
0.000
10.23
1.98
2.05
2.07
6.07
6.03
8.10
f1 (ppm)

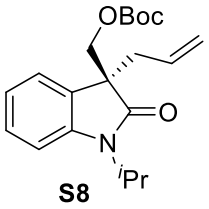

167.78
139.09
128.05
127.36
127.34
86.93
78.17
46.74
29.41
24.30
23.91
8.21
f1 (ppm)


nPr
nPr
O
O
Ph
N
N
Ph
Ph
Ph

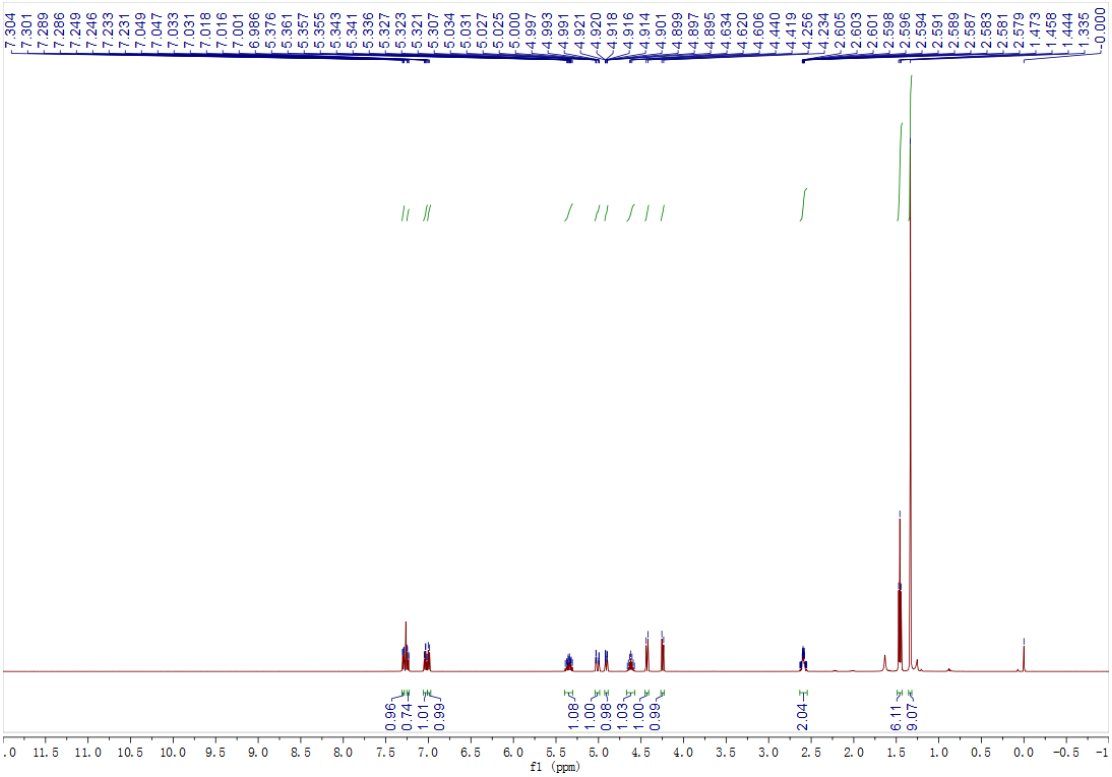
SL20

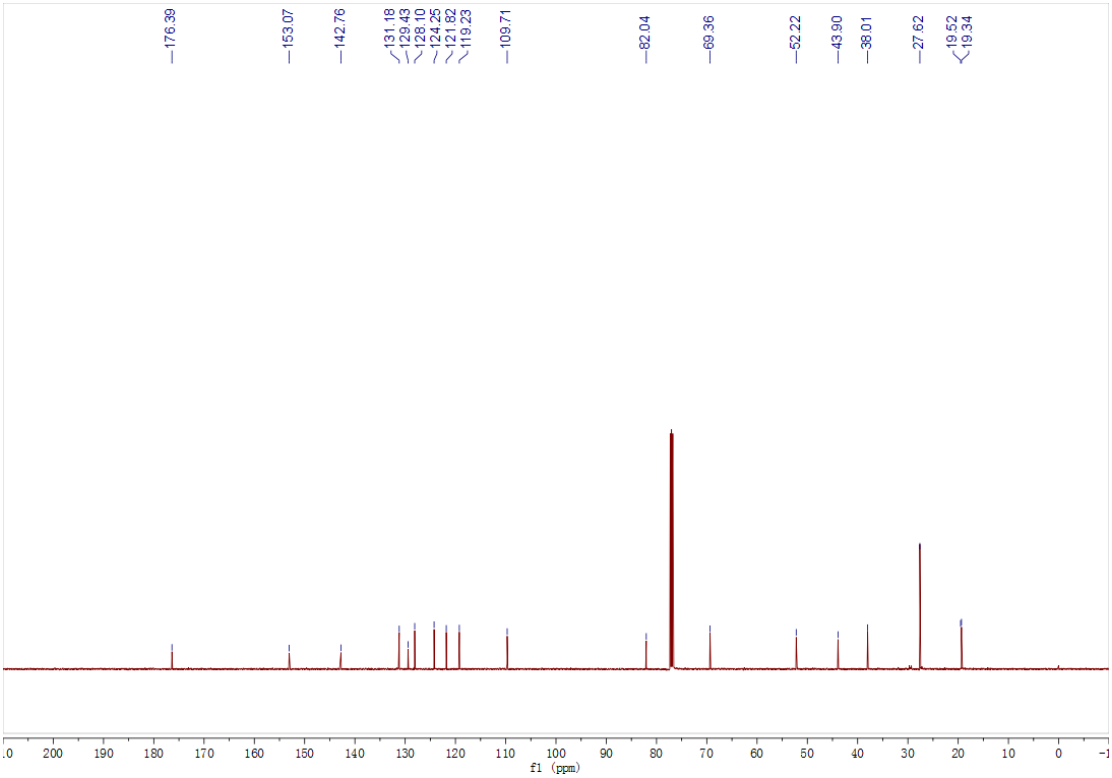

7.051
7.035
7.028
7.024
7.021
7.018
7.011
7.004
6.998
6.993
6.990
6.987
6.967
6.964
6.961
6.956
6.951
6.949
6.944
6.930
6.922
6.919
6.918
6.916
6.905
6.902
6.899
5.953
5.933
5.589
5.569
2.431
2.421
2.406
2.403
2.396
2.392
2.379
2.368
2.275
2.265
2.251
2.247
2.241
2.237
2.222
2.212
1.589
1.578
1.573
1.564
1.556
1.549
1.546
1.541
1.539
1.531
1.521
1.517
1.506
1.084
1.069
1.055
20.25
2.00
2.02
2.05
2.07
4.27
6.10
f1 (ppm)

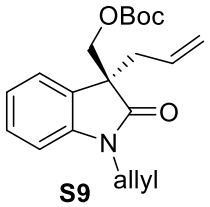

169.23
137.43
136.03
127.90
127.60
127.38
126.92
126.66
86.12
73.68
46.91
35.41
17.66
14.52
f1 (ppm)


OBoc
O
N
iPr

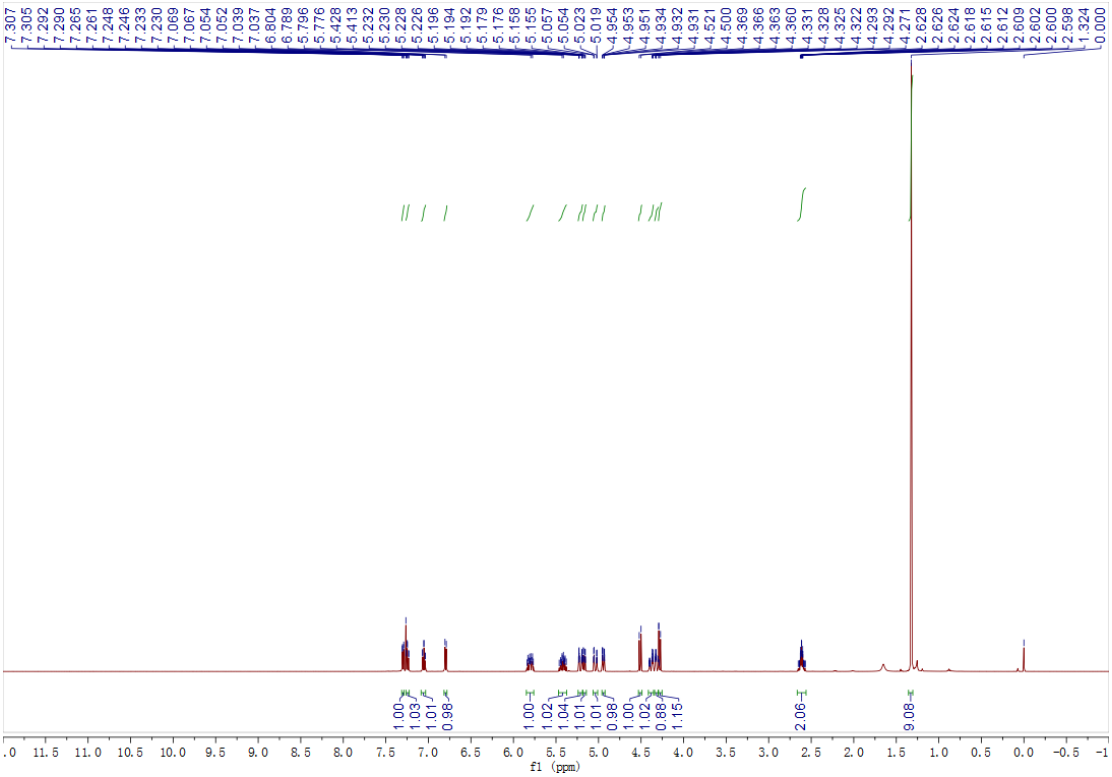
S8

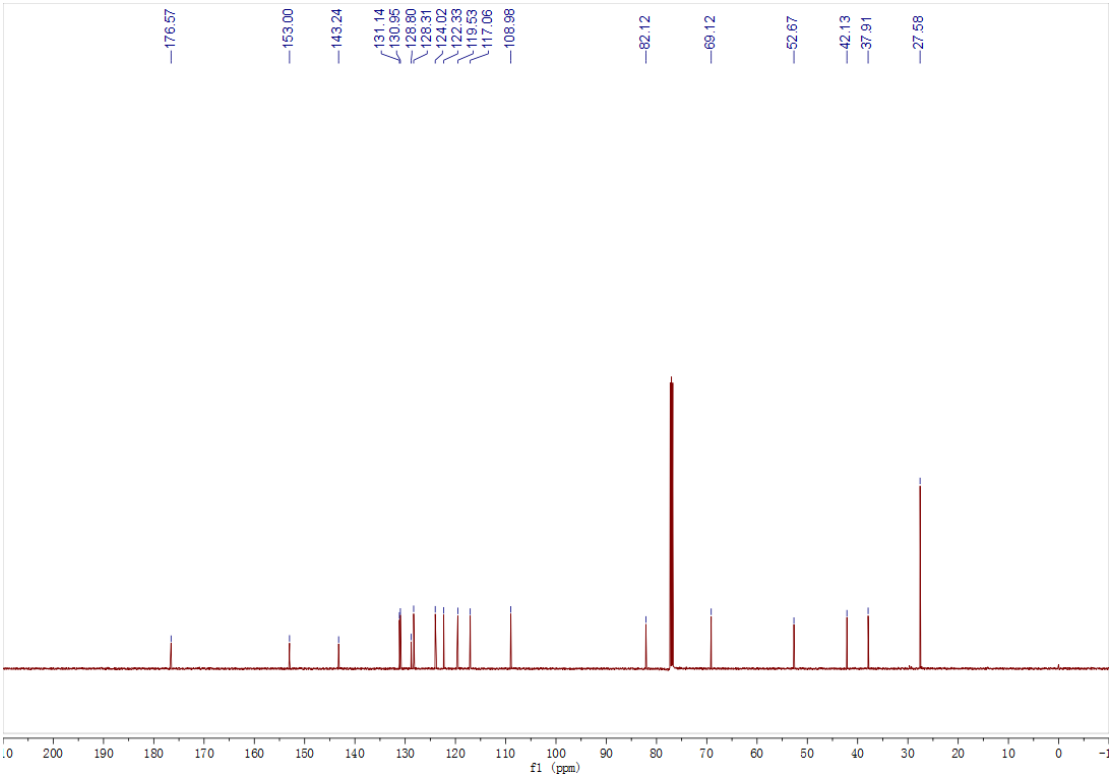

7.304
7.301
7.289
7.286
7.249
7.246
7.233
7.231
7.049
7.047
7.033
7.031
7.018
7.016
7.001
6.986
5.376
5.361
5.357
5.355
5.343
5.341
5.336
5.327
5.323
5.321
5.307
5.034
5.031
5.027
5.025
5.000
4.997
4.993
4.991
4.921
4.920
4.918
4.916
4.914
4.901
4.899
4.897
4.895
4.634
4.620
4.606
4.440
4.419
4.256
4.234
2.605
2.603
2.601
2.598
2.596
2.594
2.591
2.589
2.587
2.583
2.581
2.579
1.473
1.458
1.444
1.335
0.000
0.96
0.74
1.01
0.99
1.08
1.00
0.98
1.03
1.00
0.99
2.04
6.11
9.07
f1 (ppm)

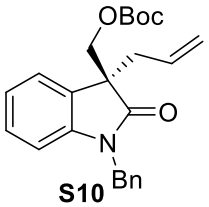

176.39
153.07
142.76
131.18
129.43
128.10
124.25
121.82
119.23
109.71
82.04
69.36
52.22
43.90
38.01
27.62
19.52
19.34
f1 (ppm)


OBoc
O
N
allyl

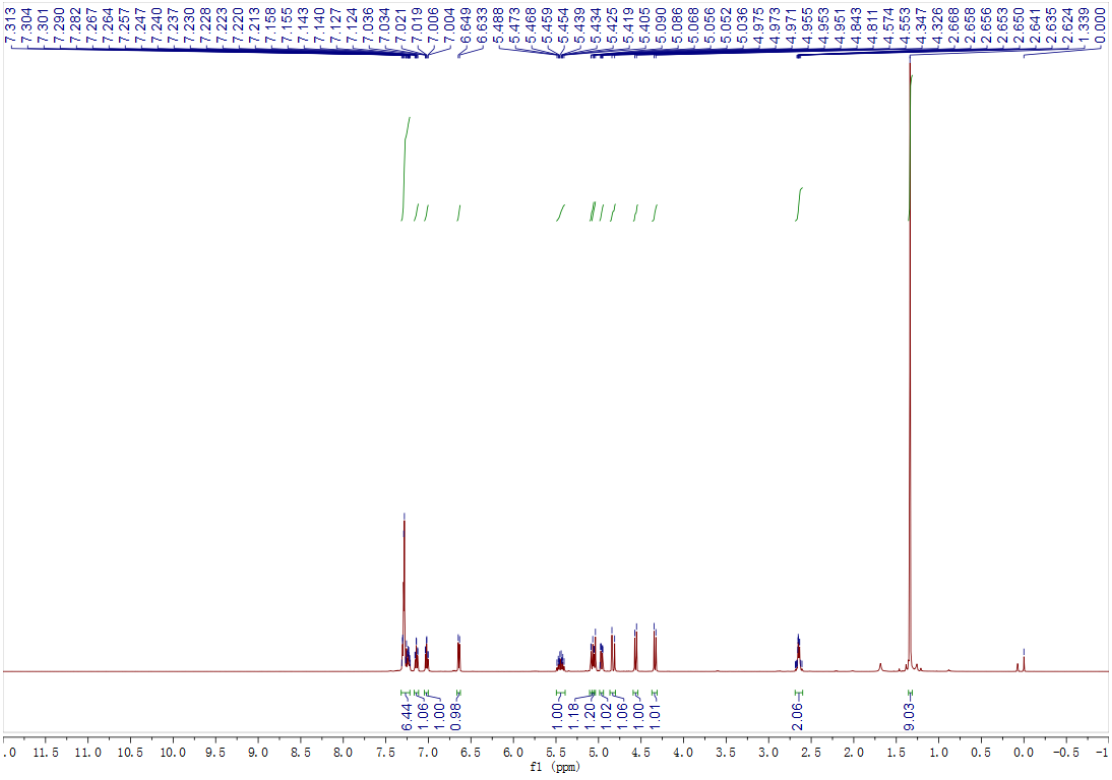
S9

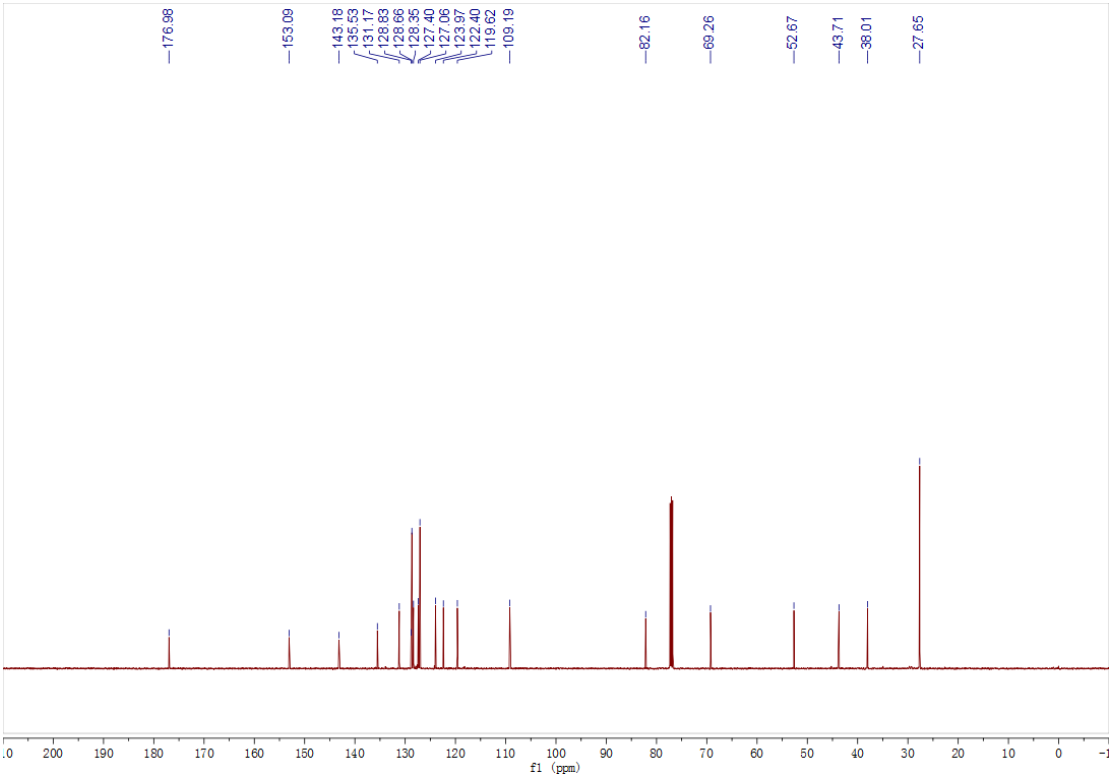

7.307
7.305
7.292
7.290
7.265
7.261
7.248
7.246
7.233
7.230
7.069
7.067
7.054
7.052
7.039
7.037
6.804
6.789
5.796
5.776
5.428
5.413
5.232
5.230
5.228
5.226
5.196
5.194
5.192
5.179
5.176
5.158
5.155
5.057
5.054
5.023
5.019
4.954
4.953
4.951
4.934
4.932
4.931
4.521
4.500
4.369
4.366
4.363
4.360
4.331
4.328
4.325
4.322
4.293
4.292
4.271
2.628
2.626
2.624
2.618
2.615
2.612
2.609
2.602
2.600
2.598
1.324
0.000
1.00
1.03
1.01
0.98
1.00
1.02
1.04
1.01
1.01
0.98
1.00
1.02
0.88
1.15
2.06
9.08
f1 (ppm)

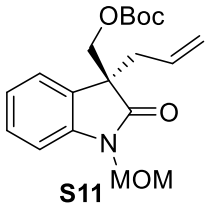

176.57
153.00
143.24
131.14
130.95
128.80
128.31
124.02
122.33
119.53
117.06
108.98
82.12
69.12
52.67
42.13
37.91
27.58
f1 (ppm)



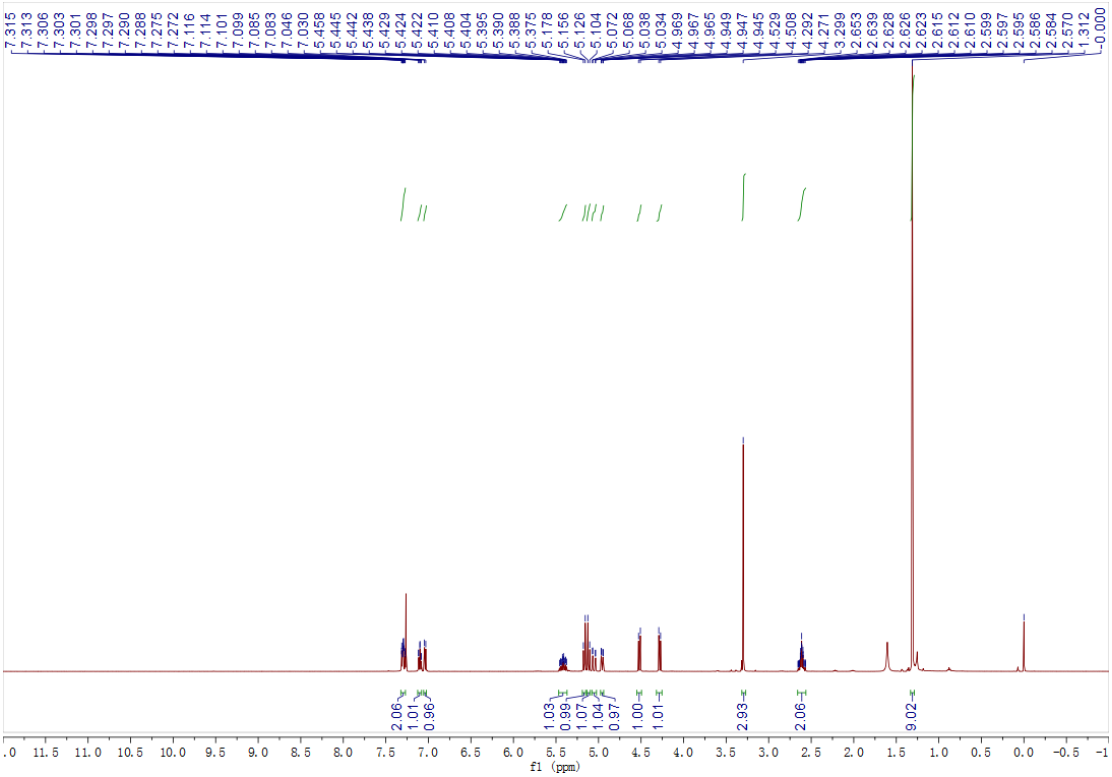
S10

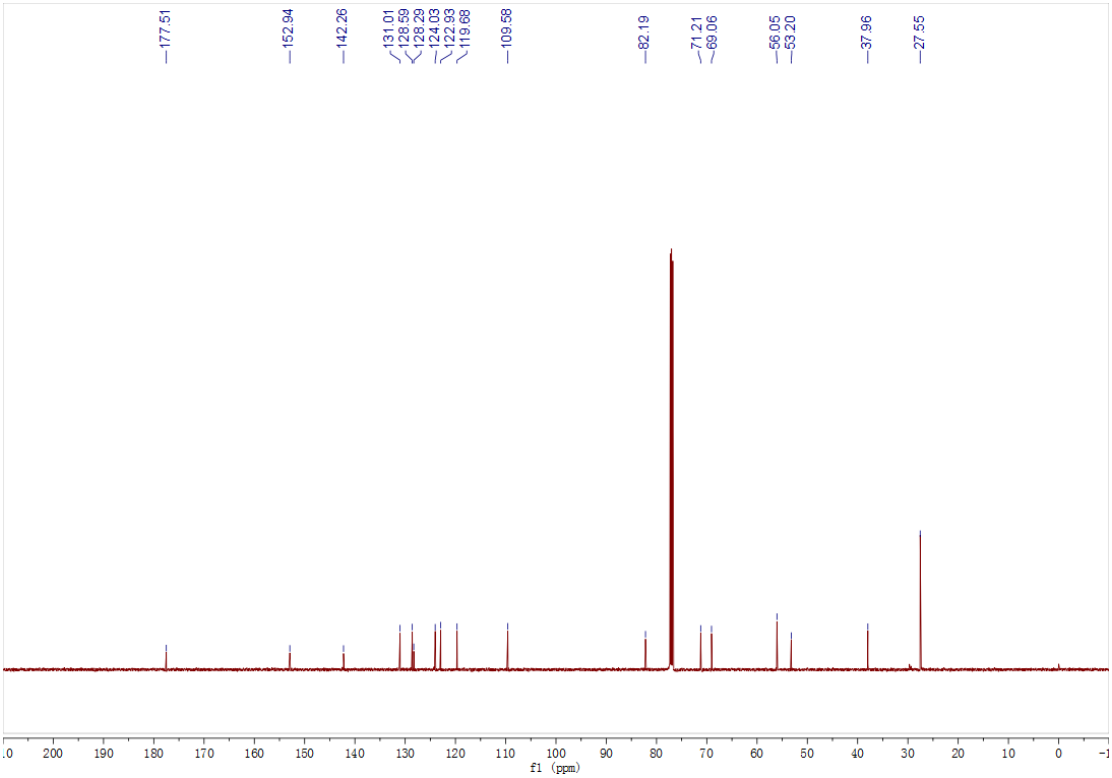


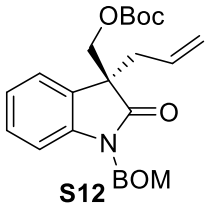



OBoc
O
N
MOM

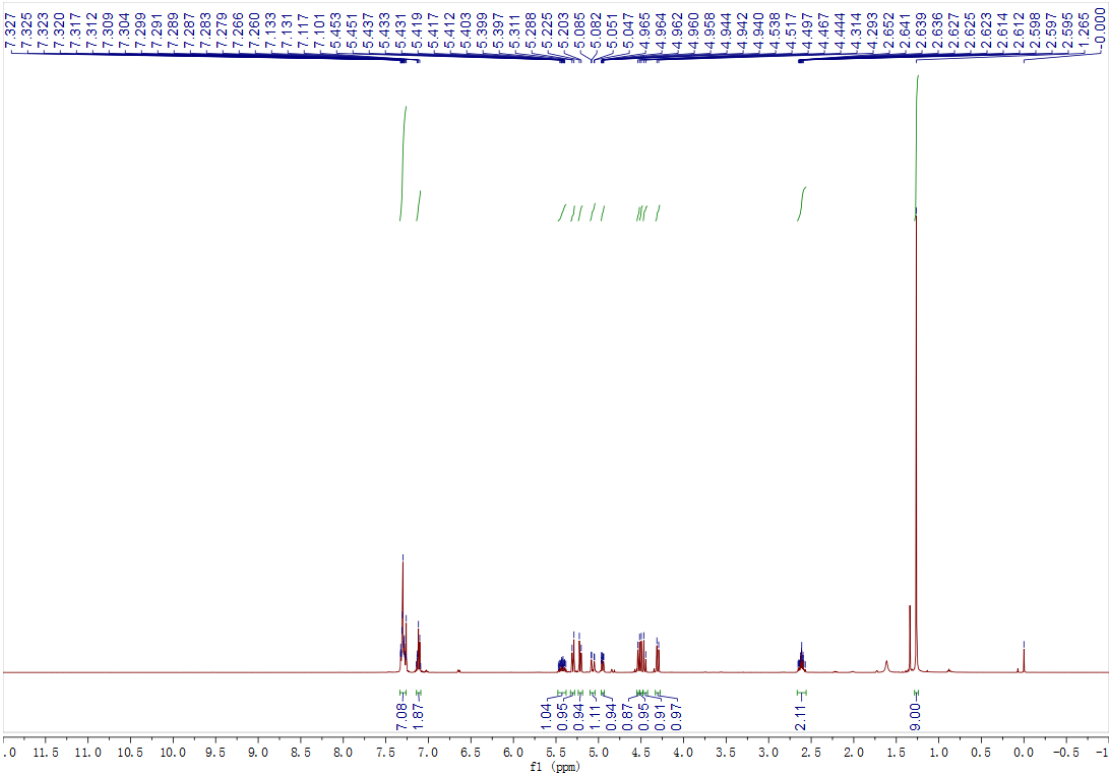
S11

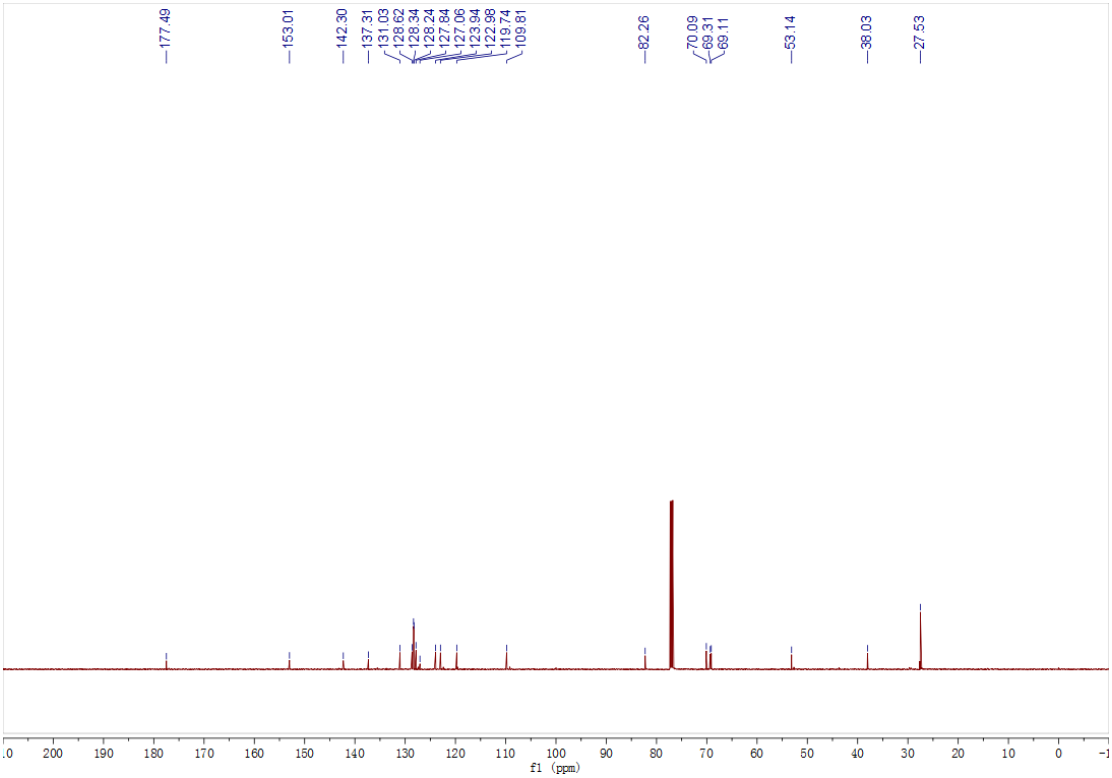

7.315
7.313
7.306
7.303
7.301
7.298
7.297
7.290
7.288
7.275
7.272
7.116
7.114
7.101
7.099
7.085
7.083
7.046
7.030
5.458
5.445
5.442
5.438
5.429
5.424
5.422
5.410
5.408
5.404
5.395
5.390
5.388
5.375
5.178
5.156
5.126
5.104
5.072
5.068
5.038
5.034
4.969
4.967
4.965
4.949
4.947
4.945
4.529
4.508
4.292
4.271
3.299
2.653
2.639
2.628
2.626
2.623
2.615
2.612
2.610
2.599
2.597
2.595
2.586
2.584
2.570
1.312
0.000
2.06
1.01
0.96
1.03
0.99
1.07
1.04
0.97
1.00
1.01
2.93
2.06
9.02
f1 (ppm)


177.51
152.94
142.26
131.01
128.59
128.29
124.03
122.93
119.68
109.58
82.19
71.21
69.06
56.05
53.20
37.96
27.55
f1 (ppm)


OBoc
O
N
BOM

S12


7.08
1.87
1.04
0.95
0.94
1.11
0.94
0.87
0.95
0.91
0.97
2.11
9.00
f1 (ppm)


177.49
153.01
142.30
137.31
131.03
128.62
128.34
128.24
127.84
127.06
123.94
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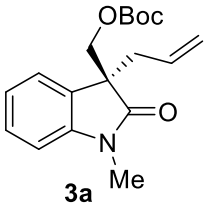
82.26
70.09
69.31
69.11
53.14
38.03
27.53
f1 (ppm)



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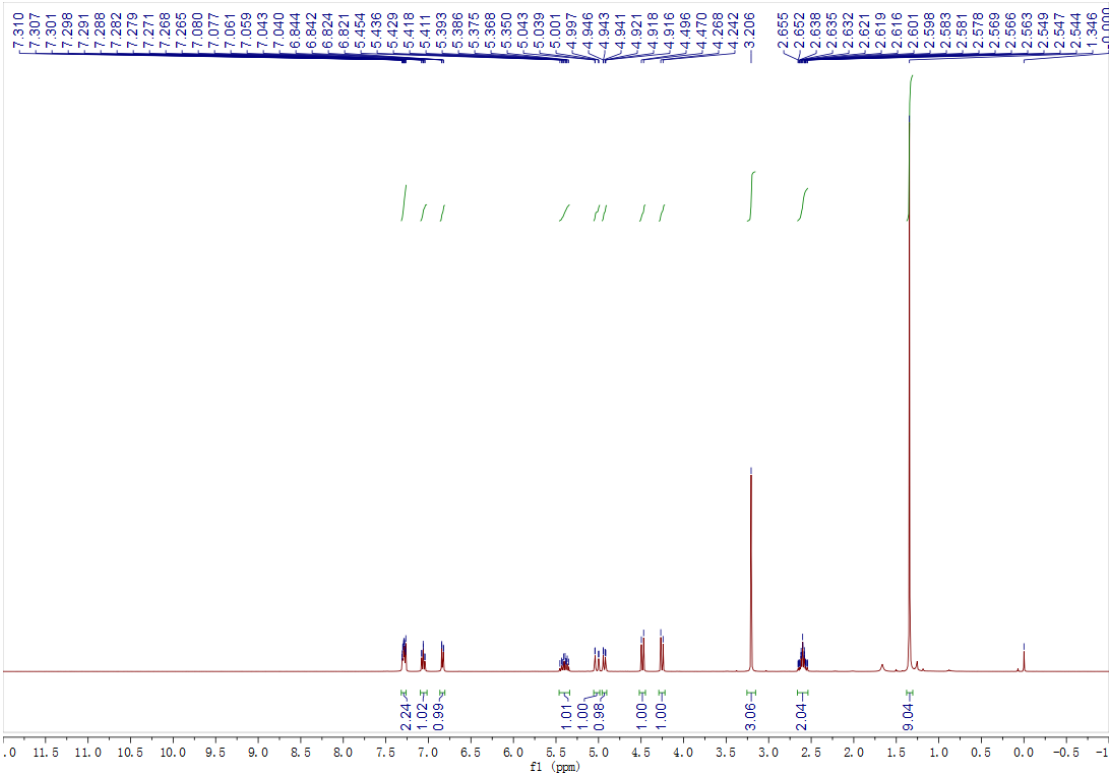
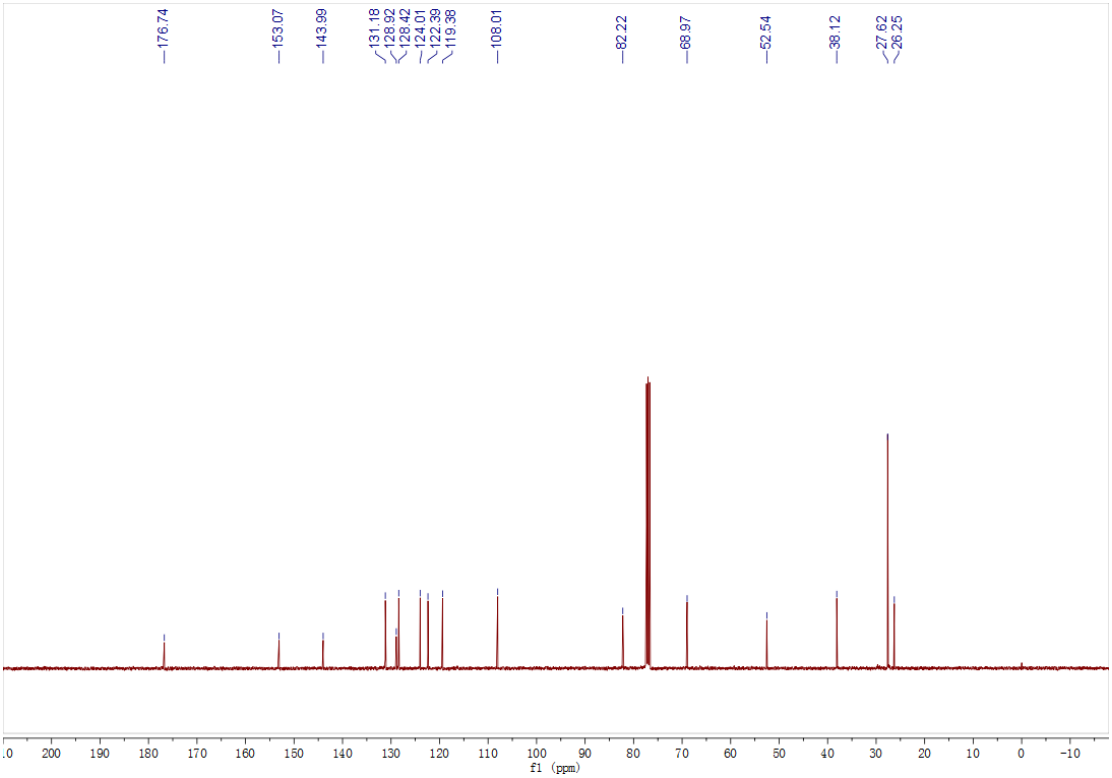
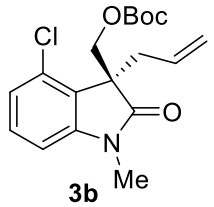
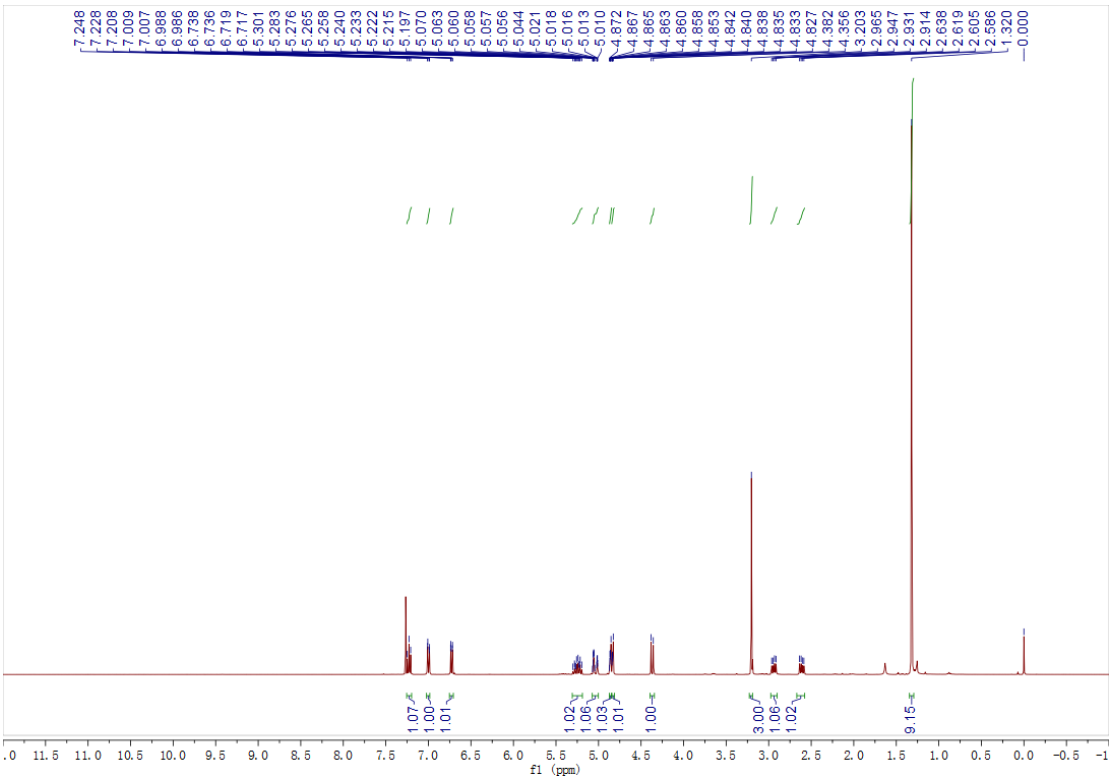





OBoc
Cl
O
N
Me

3b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6.738
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6.719
6.717
5.301
5.283
5.276
5.265
5.258
5.240
5.233
5.222
5.215
5.197
5.070
5.063
5.060
5.058
5.057
5.056
5.044
5.021
5.018
5.016
5.013
5.010
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4.867
4.865
4.863
4.860
4.858
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4.842
4.840
4.838
4.835
4.833
4.827
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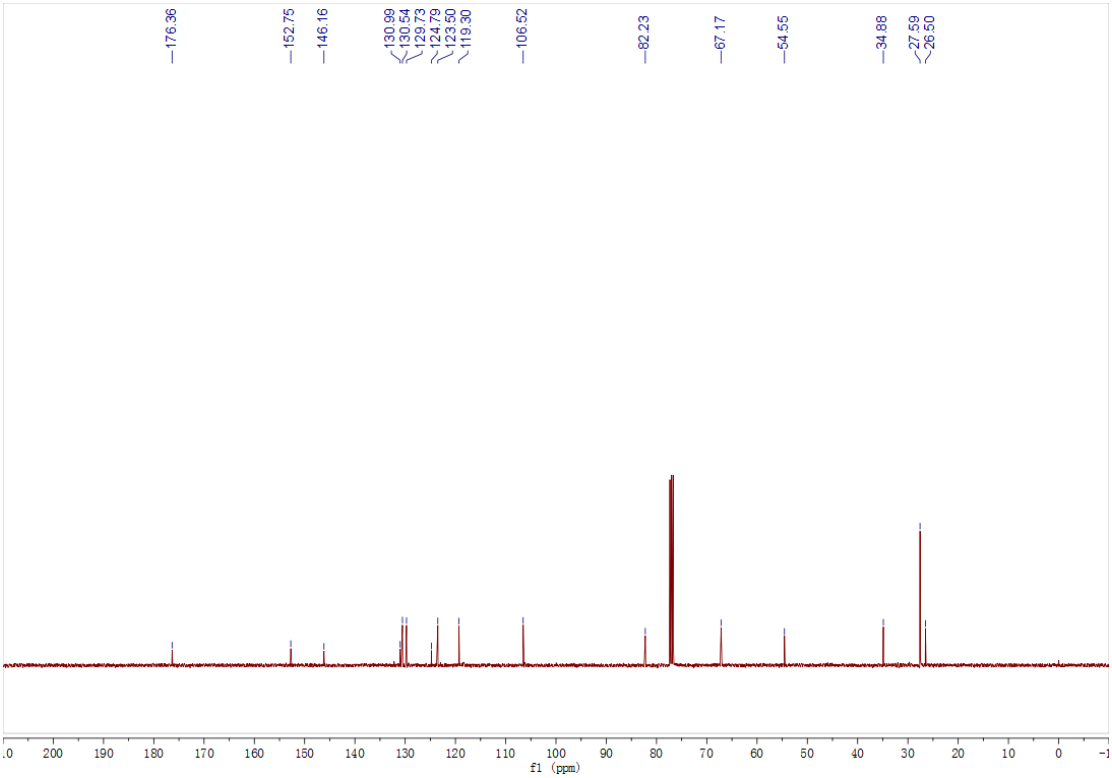
4.356
3.203
2.965
2.947
2.931
2.914
2.638
2.619
2.605
2.586
1.320
0.000
1.07
1.00
1.01
1.02
1.06
1.03
1.01
1.00
3.00
1.06
1.02
9.15
f1 (ppm)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146.16
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130.54
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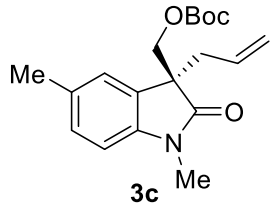
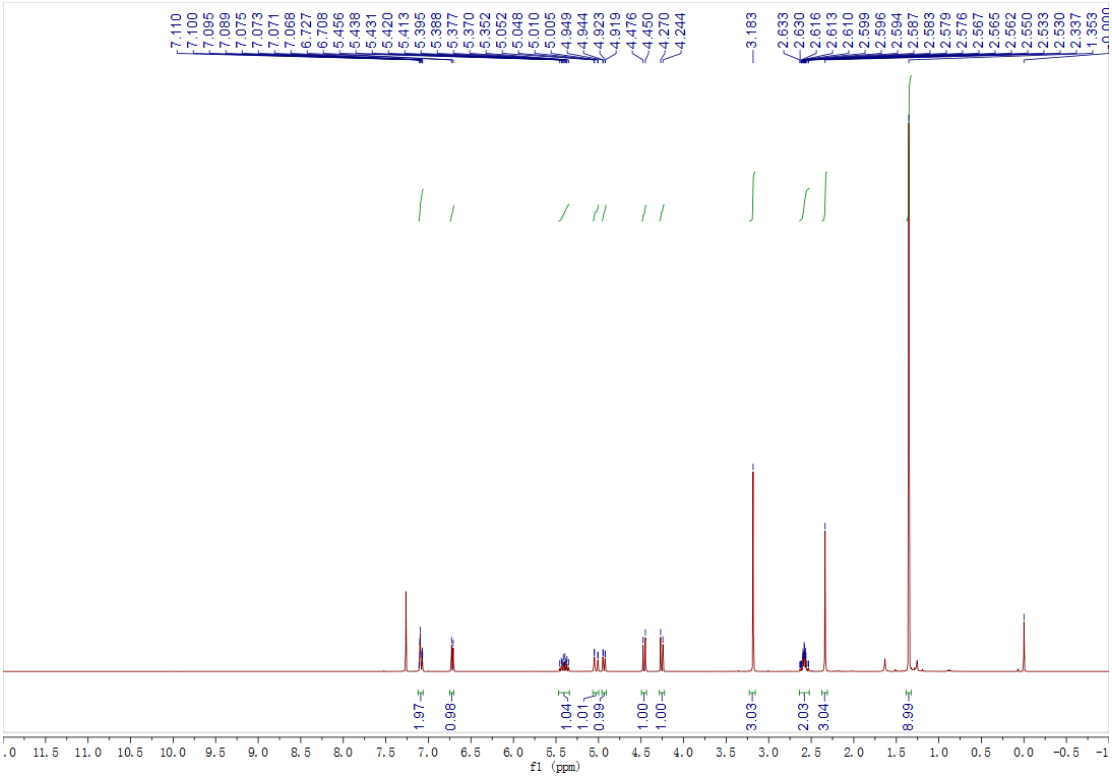
123.50
119.30
106.52
82.23
67.17
54.55
34.88
27.59
26.50
f1 (ppm)


OBoc
Me
O
N
Me

3c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7.089
7.075
7.073
7.071
7.068
6.727
6.708
5.456
5.438
5.431
5.420
5.413
5.395
5.388
5.377
5.370
5.352
5.052
5.048
5.010
5.005
4.949
4.944
4.923
4.919
4.476
4.450
4.270
4.244
3.183
2.633
2.630
2.616
2.613
2.610
2.599
2.596
2.594
2.587
2.583
2.579
2.576
2.567
2.565
2.562
2.550
2.533
2.530
2.337
1.353
1.97
0.98
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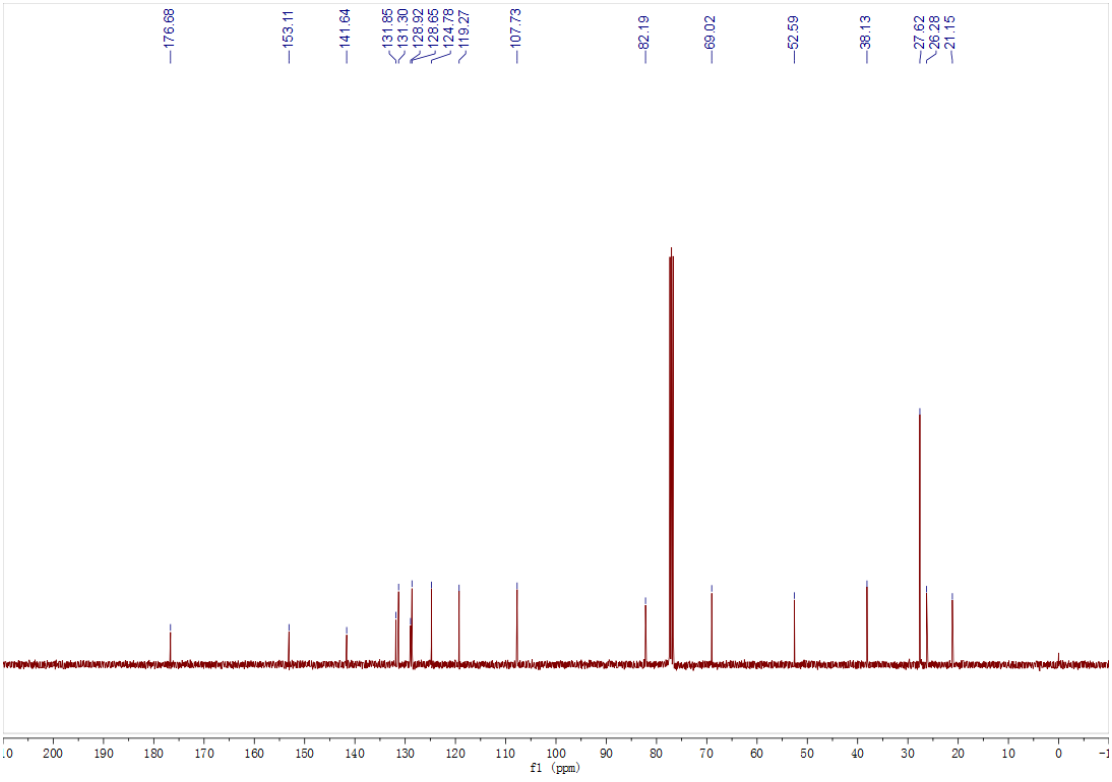
1.01
0.99
1.00
1.00
3.03
2.03
3.04
8.99
f1 (ppm)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141.64
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131.30
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124.78
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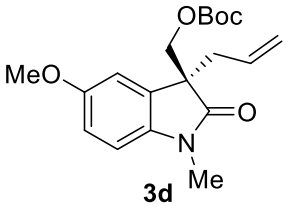
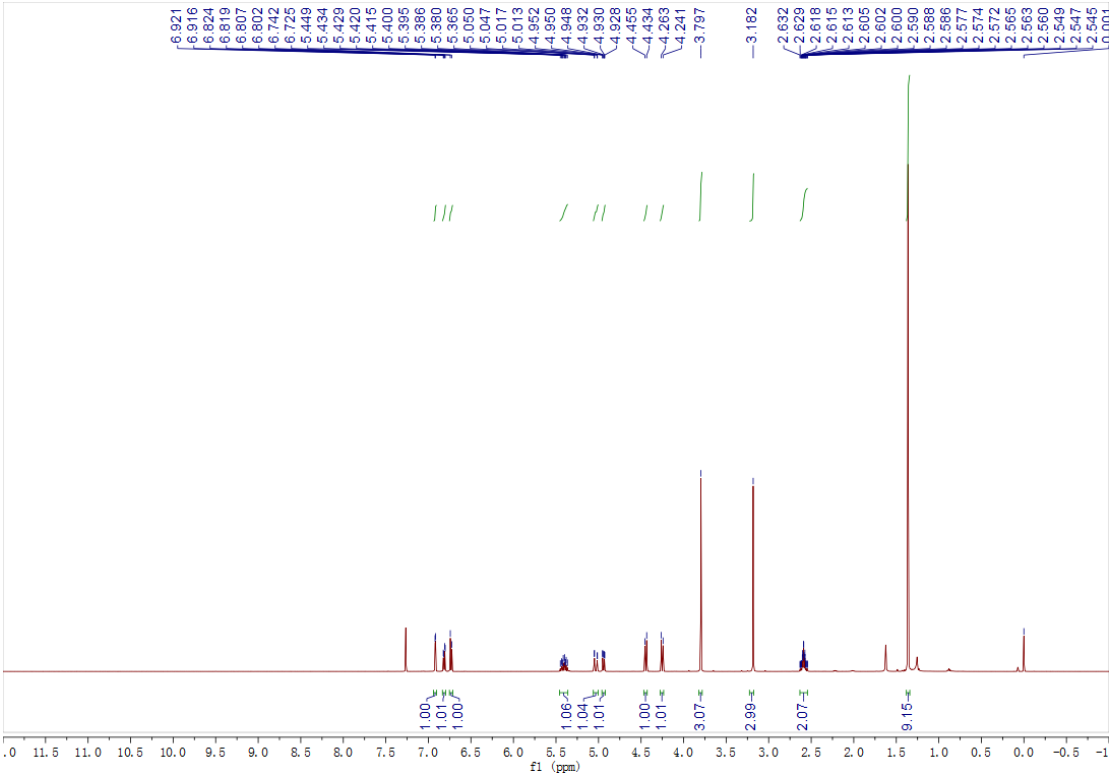
107.73
82.19
69.02
52.59
38.13
27.62
26.28
21.15
f1 (ppm)


OBoc
MeO
O
N
Me

3d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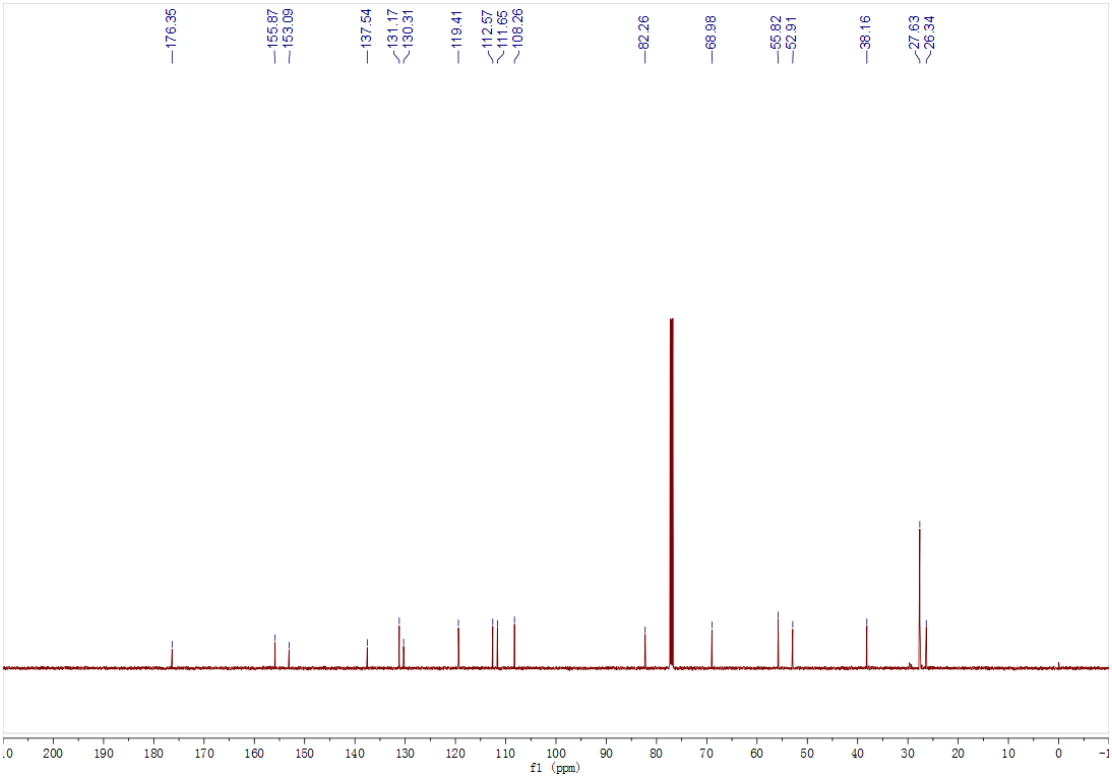
6.824
6.819
6.807
6.802
6.742
6.725
5.449
5.434
5.429
5.420
5.415
5.400
5.395
5.386
5.380
5.365
5.050
5.047
5.017
5.013
4.952
4.950
4.948
4.932
4.930
4.928
4.455
4.434
4.263
4.241
3.797
3.182
2.632
2.629
2.618
2.615
2.613
2.605
2.602
2.600
2.590
2.588
2.586
2.577
2.574
2.572
2.565
2.563
2.560
2.549
2.547
2.545
1.00
1.01
1.00
1.06
1.04
1.01
1.00
1.01
3.07
2.99
2.07
9.15
f1 (ppm)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130.31
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112.57
111.65
108.26
82.26
68.98
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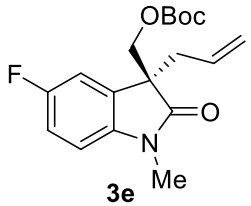
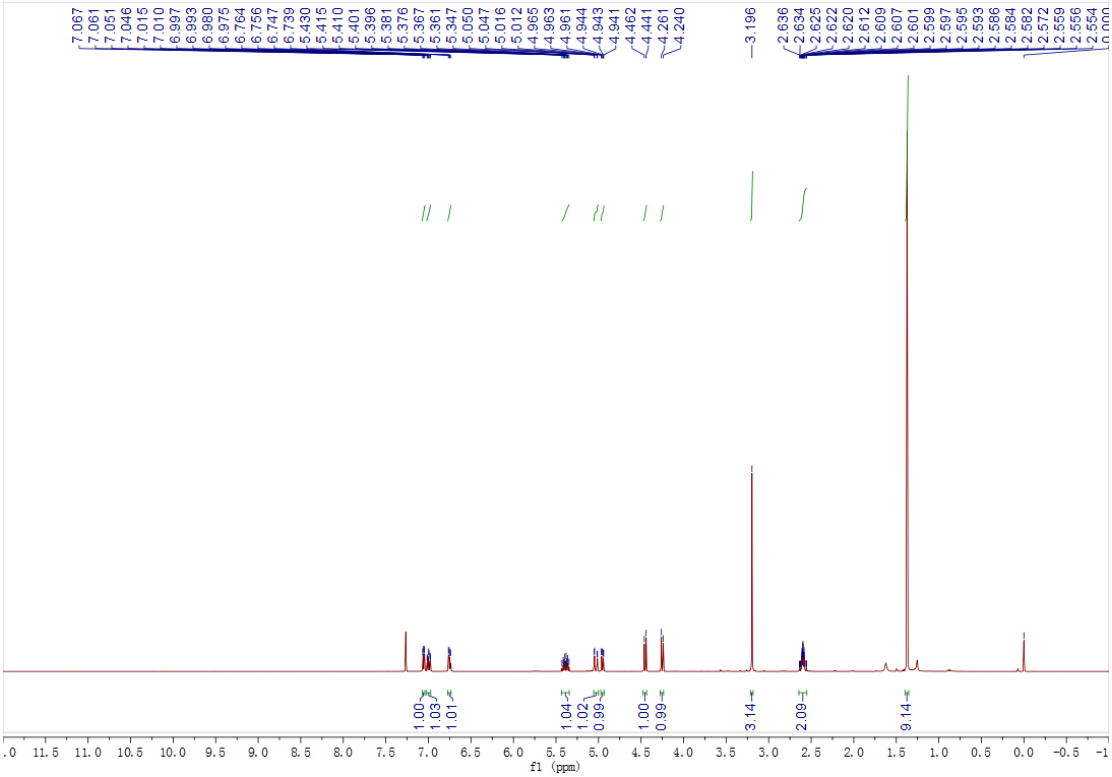
52.91
38.16
27.63
26.34
f1 (ppm)


OBoc
F
O
N
Me

3e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6.764
6.756
6.747
6.739
5.430
5.415
5.410
5.401
5.396
5.381
5.376
5.367
5.361
5.347
5.050
5.047
5.016
5.012
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4.961
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4.943
4.941
4.462
4.441
4.261
4.240
3.196
2.636
2.634
2.625
2.622
2.620
2.612
2.609
2.607
2.601
2.599
2.597
2.595
2.593
2.586
2.584
2.582
2.572
2.559
2.556
2.554
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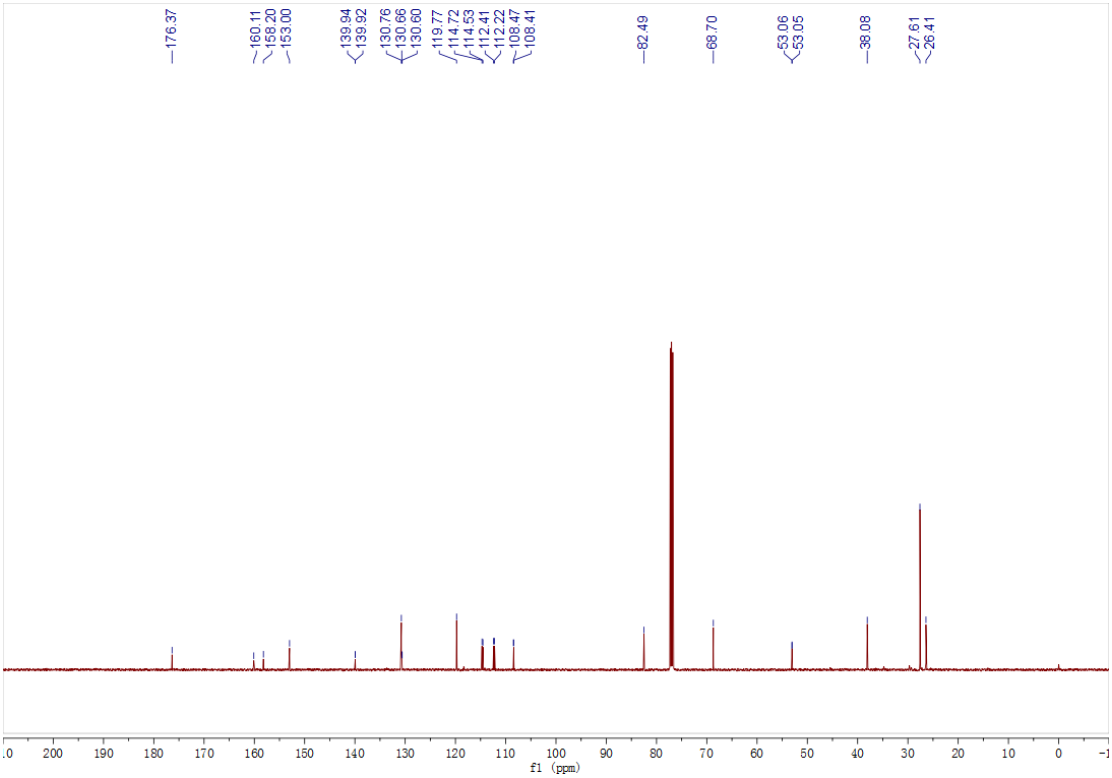
1.03
1.01
1.04
1.02
0.99
1.00
0.99
3.14
2.09
9.14
f1 (ppm)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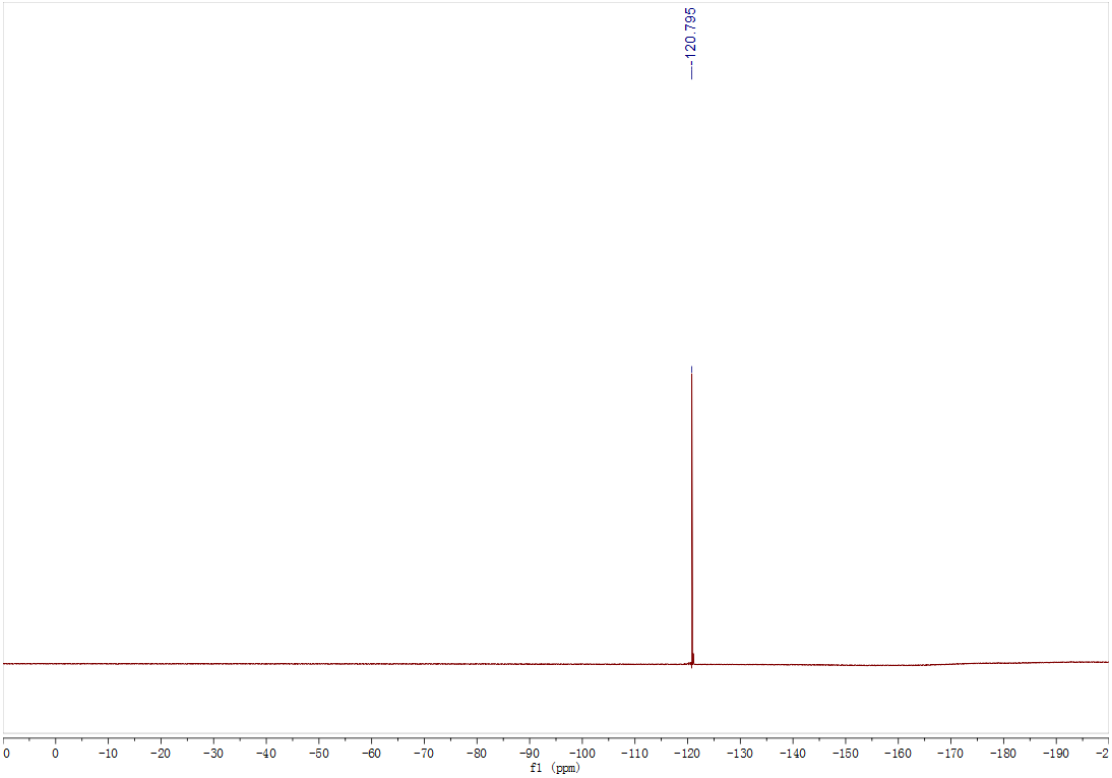
139.92
130.76
130.66
130.60
119.77
114.72
114.53
112.41
112.22
108.47
108.41
82.49
68.70
53.06
53.05
38.08
27.61
26.41
f1 (ppm)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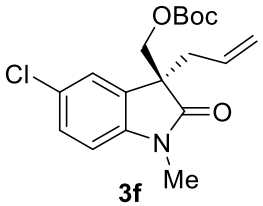
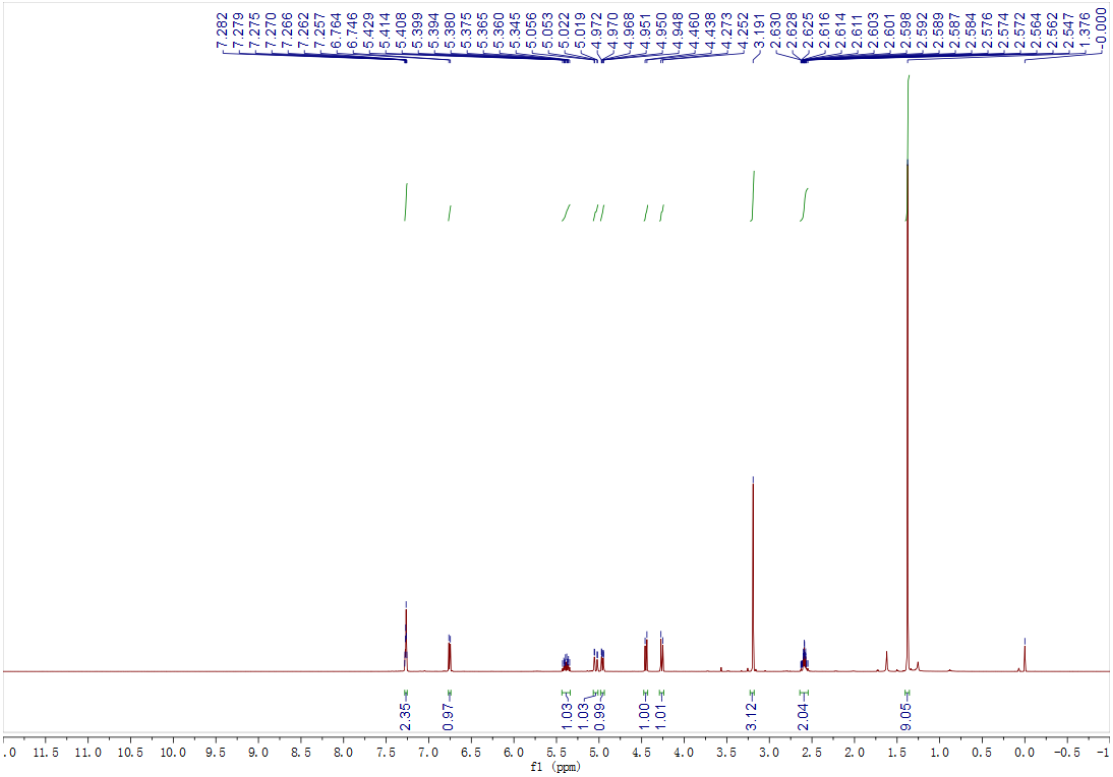
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-2
f1 (ppm)


OBoc
Cl
O
N
Me

3f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5.399
5.394
5.380
5.375
5.365
5.360
5.345
5.056
5.053
5.022
5.019
4.972
4.970
4.968
4.951
4.950
4.948
4.460
4.438
4.273
4.252
3.191
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2.628
2.625
2.616
2.614
2.611
2.603
2.601
2.598
2.592
2.589
2.587
2.584
2.576
2.574
2.572
2.564
2.562
2.547
1.376
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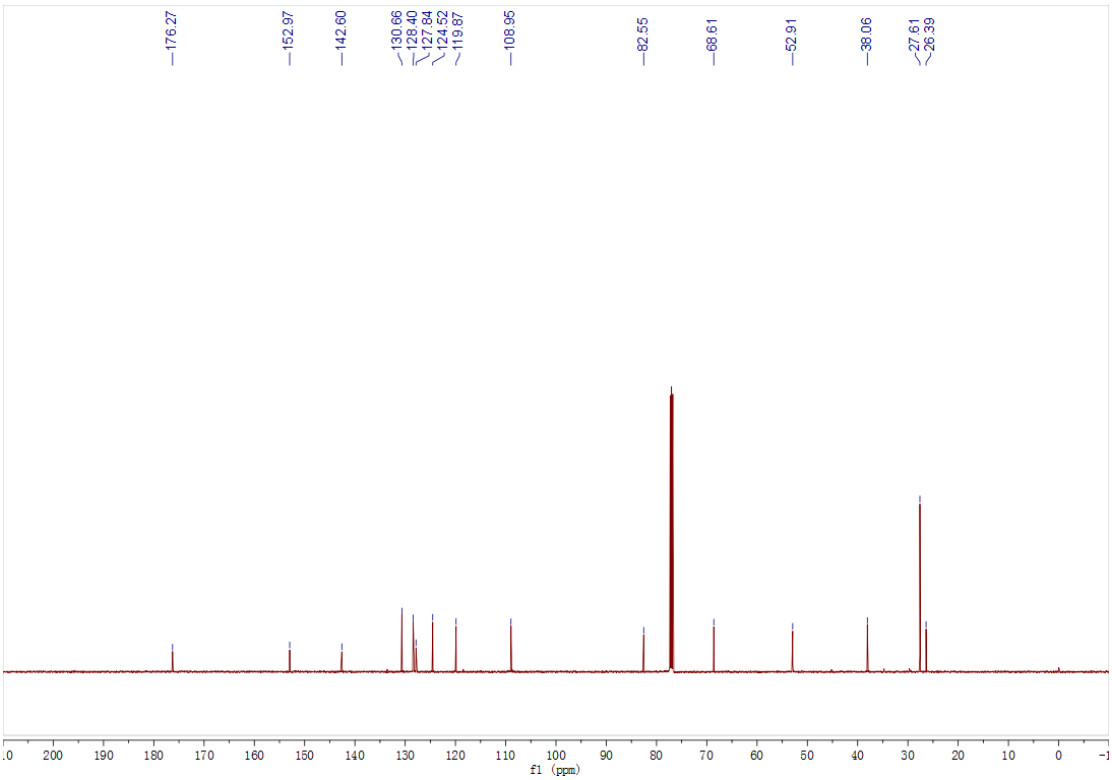
1.03
1.03
0.99
1.00
1.01
3.12
2.04
9.05
f1 (ppm)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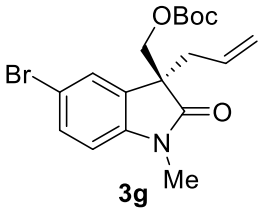
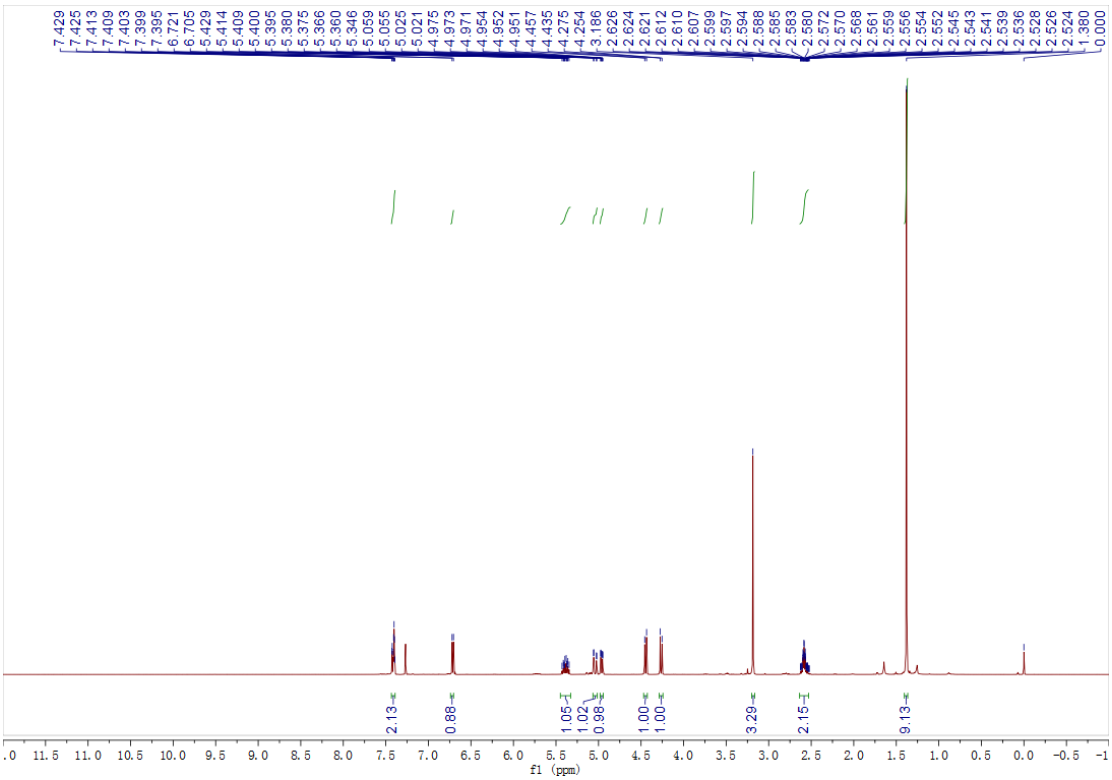
82.55
68.61
52.91
38.06
27.61
26.39
f1 (ppm)


OBoc
Br
O
N
Me

3g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6.705
5.429
5.414
5.409
5.400
5.395
5.380
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5.360
5.346
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5.055
5.025
5.021
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4.973
4.971
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4.952
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2.607
2.599
2.597
2.594
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2.585
2.583
2.580
2.572
2.570
2.568
2.561
2.559
2.556
2.554
2.552
2.545
2.543
2.541
2.539
2.536
2.528
2.526
2.524
1.380
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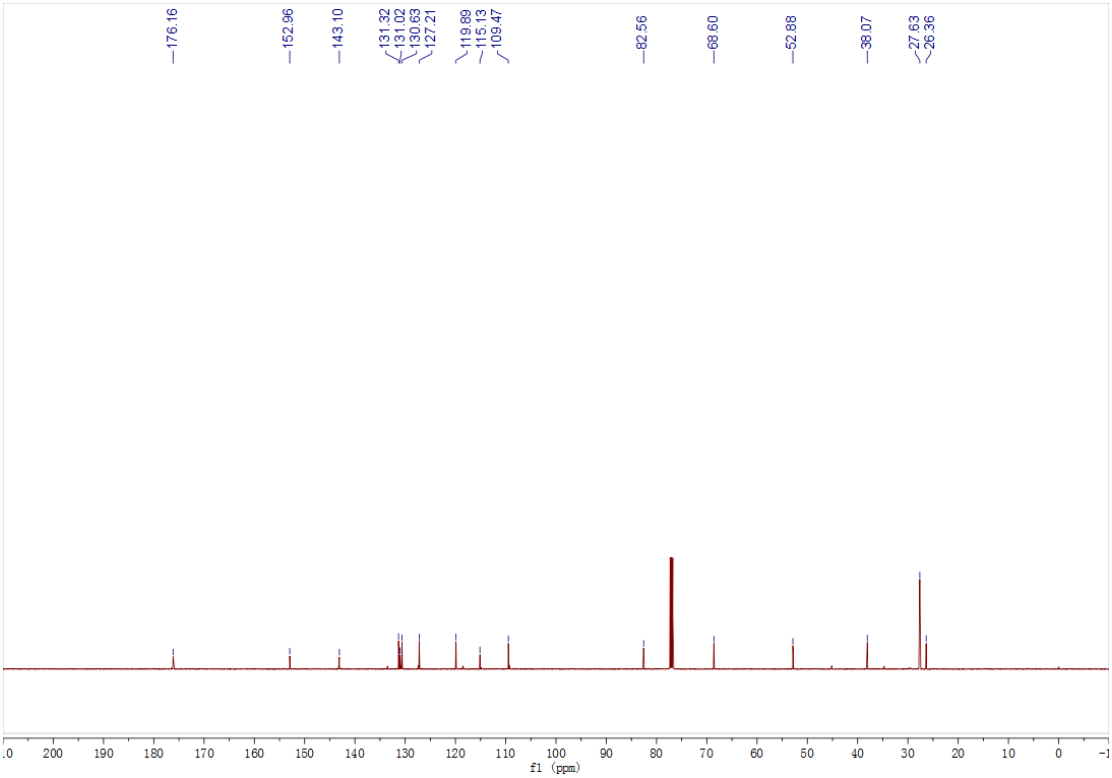
1.02
0.98
1.00
1.00
3.29
2.15
9.13
f1 (ppm)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131.02
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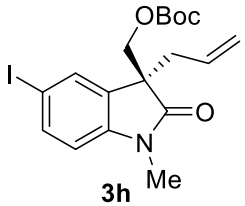
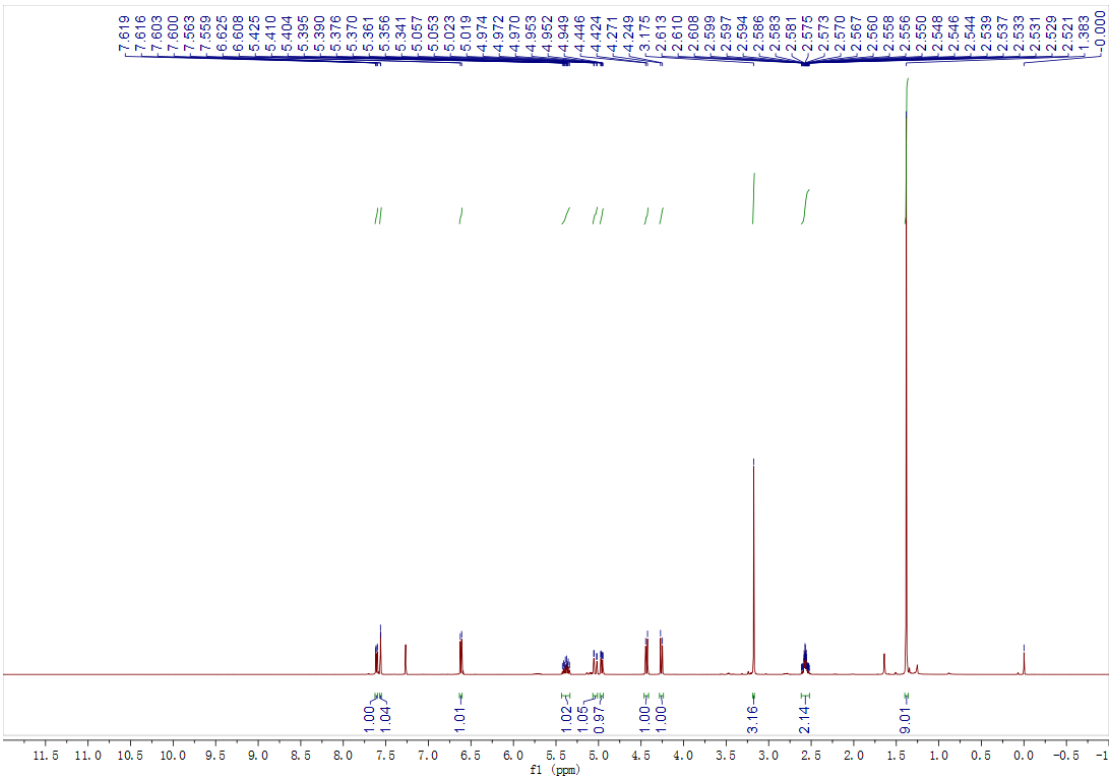
38.07
27.63
26.36
f1 (ppm)


OBoc
I
O
N
Me

3h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6.625
6.608
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5.410
5.404
5.395
5.390
5.376
5.370
5.361
5.356
5.341
5.057
5.053
5.023
5.019
4.974
4.972
4.970
4.953
4.952
4.949
4.446
4.424
4.271
4.249
3.175
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2.597
2.594
2.586
2.583
2.581
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2.573
2.570
2.567
2.560
2.558
2.556
2.550
2.548
2.546
2.544
2.539
2.537
2.533
2.531
2.529
2.521
1.383
0.000
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1.02
1.05
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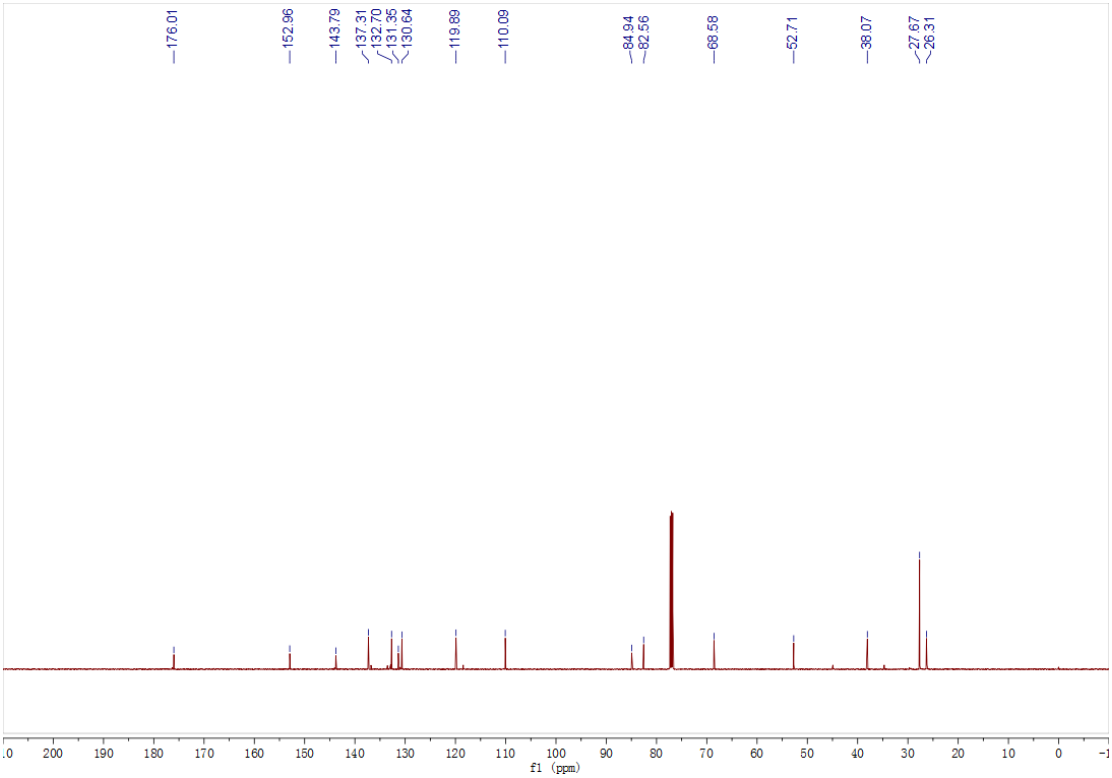
9.01
f1 (ppm)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131.35
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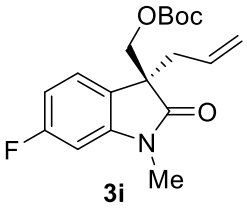
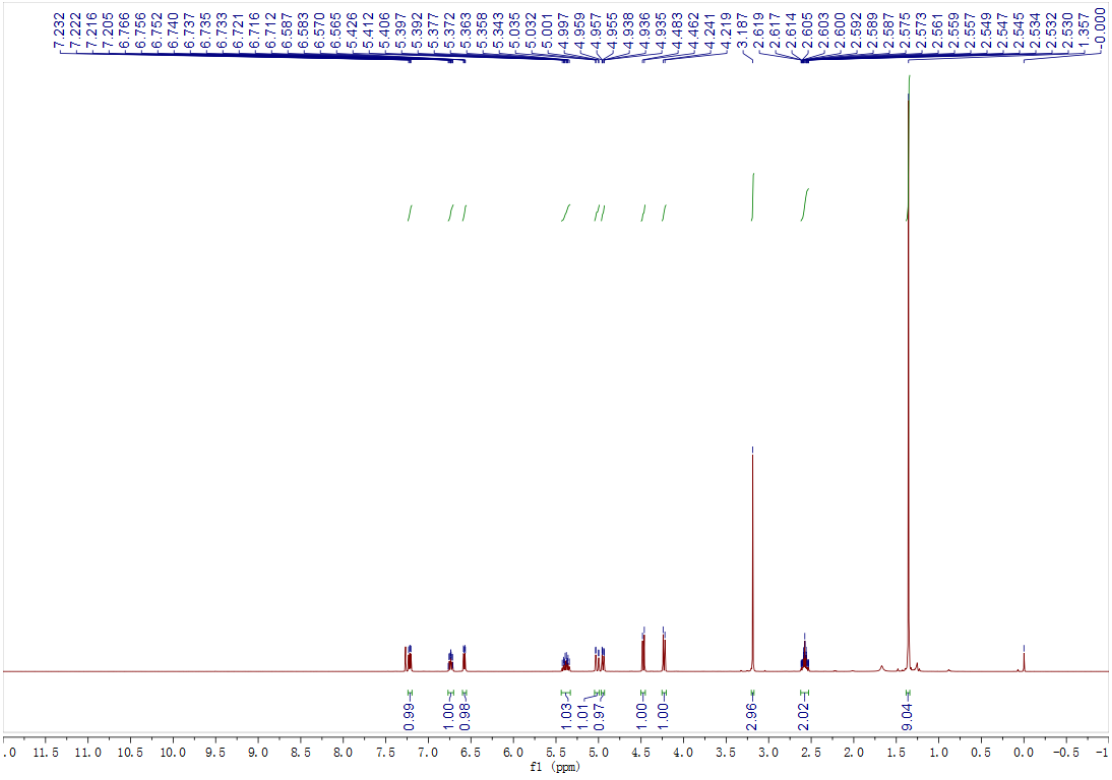
82.56
68.58
52.71
38.07
27.67
26.31
f1 (ppm)


OBoc
O
F
N
Me

3i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6.740
6.737
6.735
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6.716
6.712
6.587
6.583
6.570
6.565
5.426
5.412
5.406
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5.392
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5.358
5.343
5.035
5.032
5.001
4.997
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2.573
2.561
2.559
2.557
2.549
2.547
2.545
2.534
2.532
2.530
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1.00
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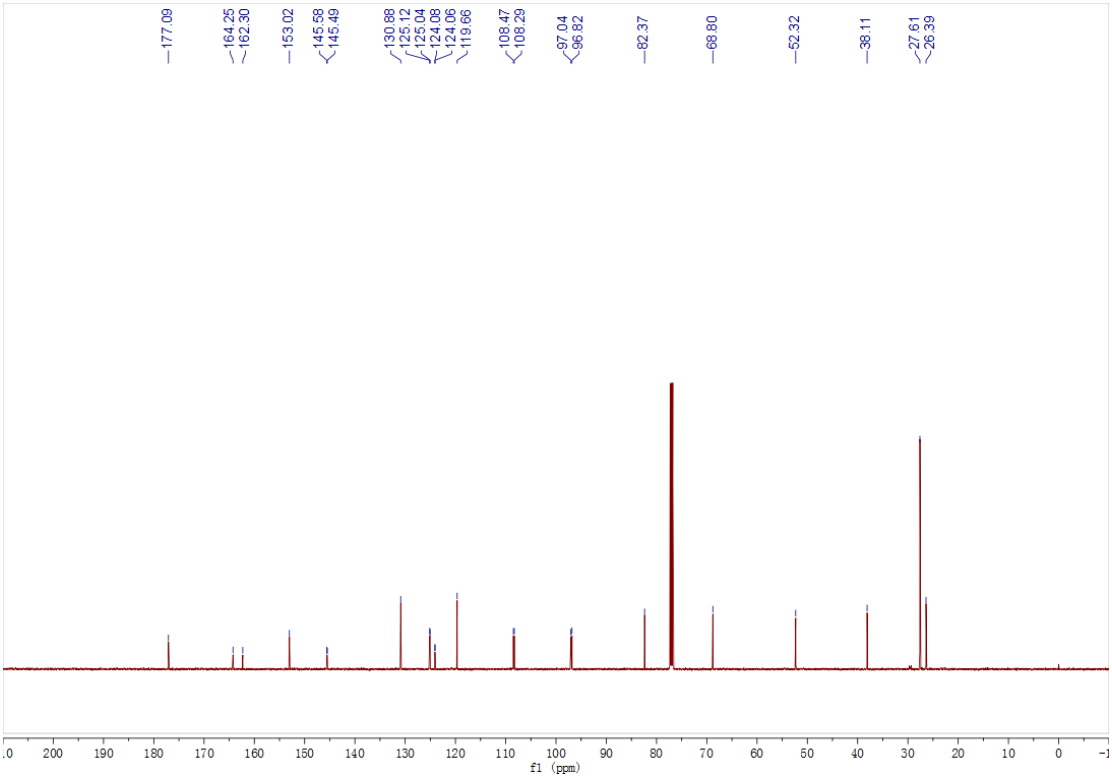
1.01
0.97
1.00
1.00
2.96
2.02
9.04
f1 (ppm)


177.09
164.25
162.30
153.02
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145.49
130.88
125.12
125.04
124.08
124.06
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97.04
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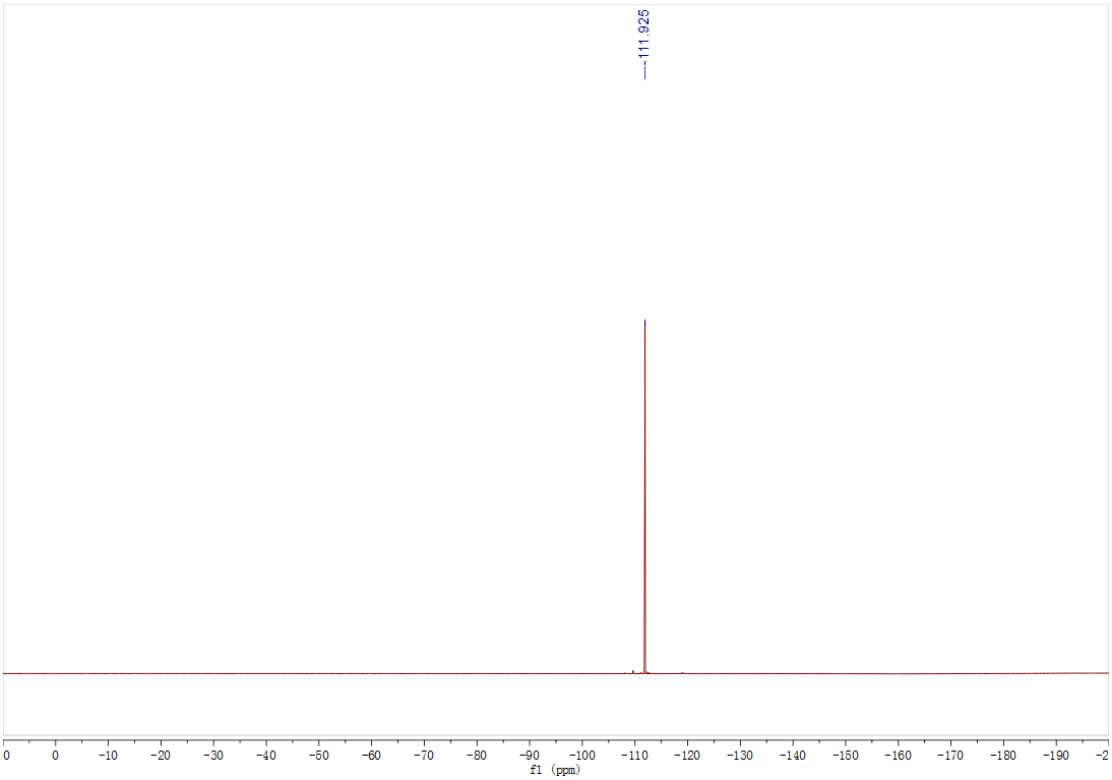
68.80
52.32
38.11
27.61
26.39
f1 (ppm)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-70
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-90
-100
-110
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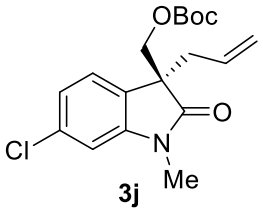
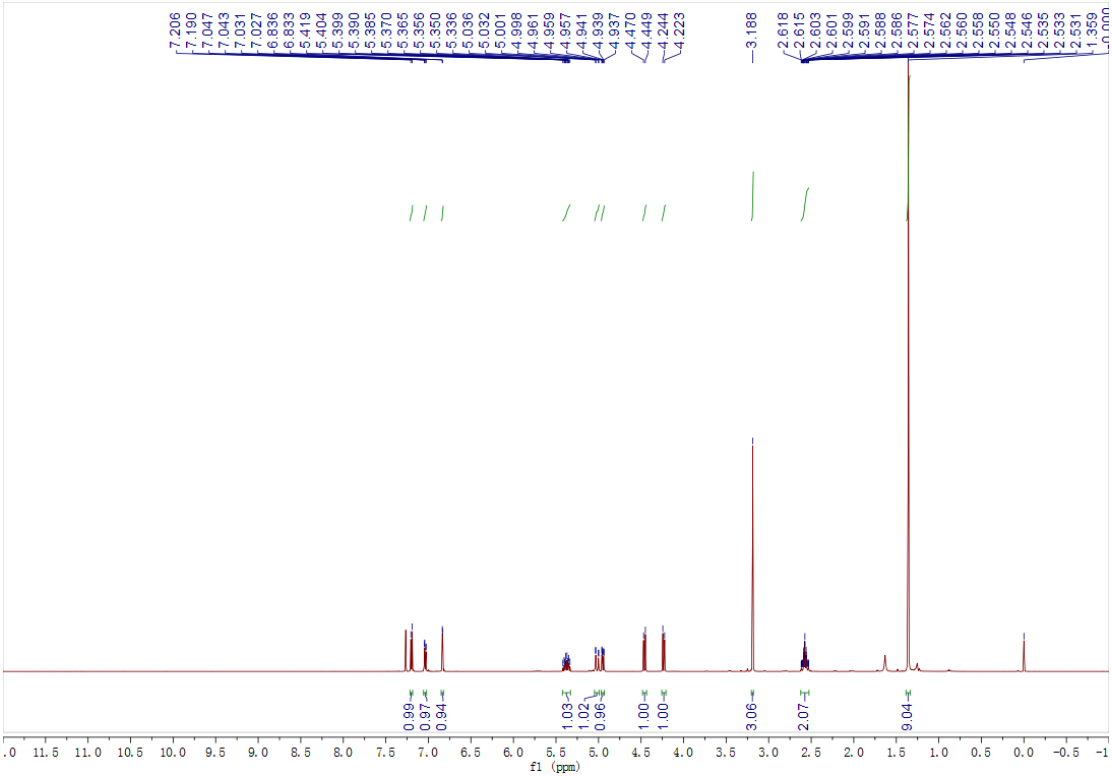
-160
-170
-180
-190
-2
f1 (ppm)


OBoc
O
Cl
N
Me

3j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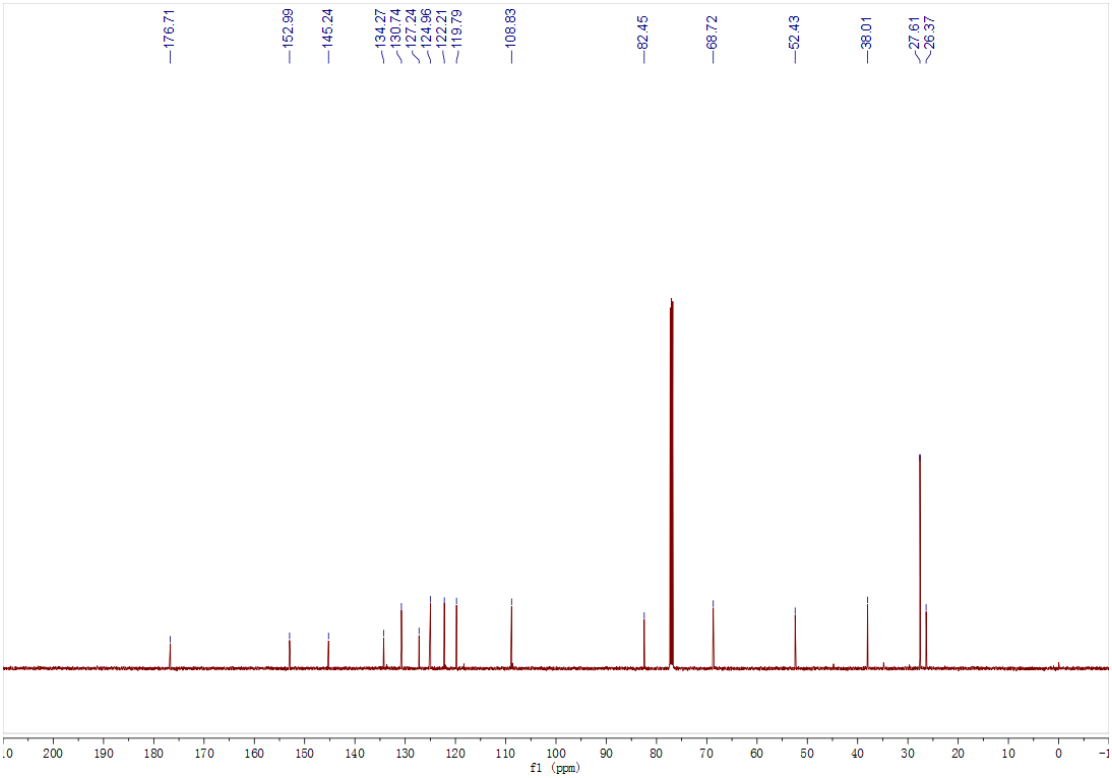
7.027
6.836
6.833
5.419
5.404
5.399
5.390
5.385
5.370
5.365
5.356
5.350
5.336
5.036
5.032
5.001
4.998
4.961
4.959
4.957
4.941
4.939
4.937
4.470
4.449
4.244
4.223
3.188
2.618
2.615
2.603
2.601
2.599
2.591
2.588
2.586
2.577
2.574
2.562
2.560
2.558
2.550
2.548
2.546
2.535
2.533
2.531
1.359
0.99
0.97
0.94
1.03
1.02
0.96
1.00
1.00
3.06
2.07
9.04
f1 (ppm)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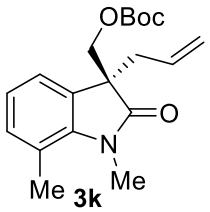
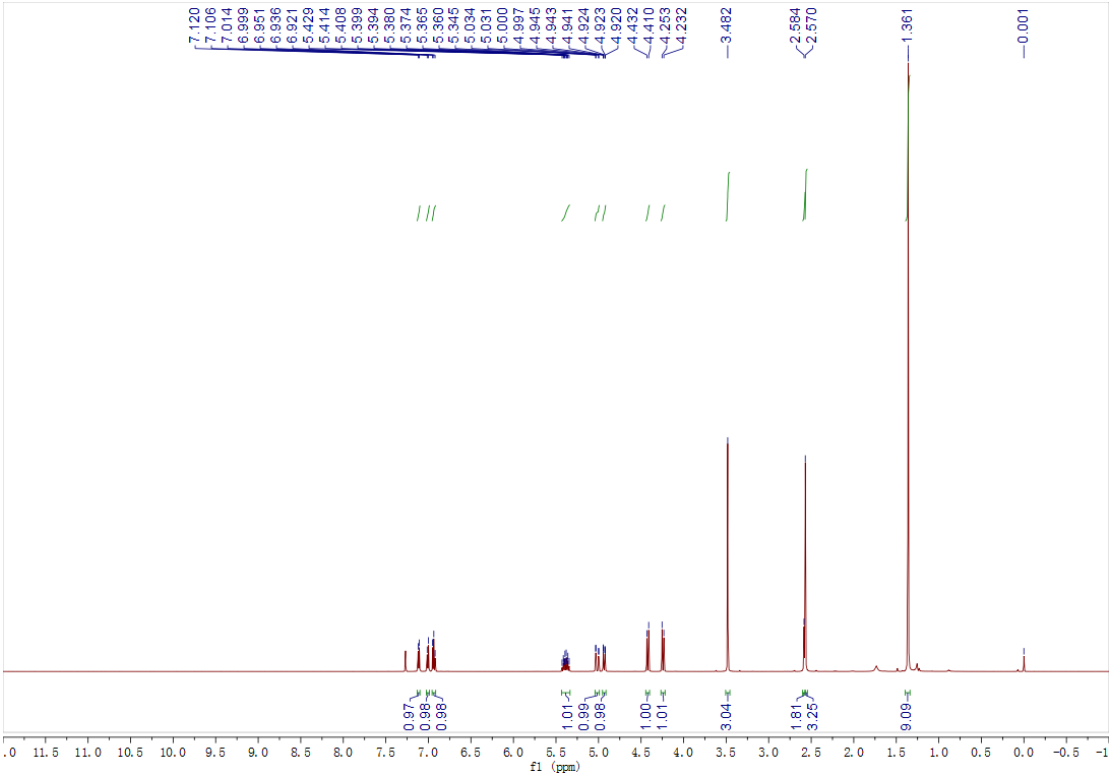
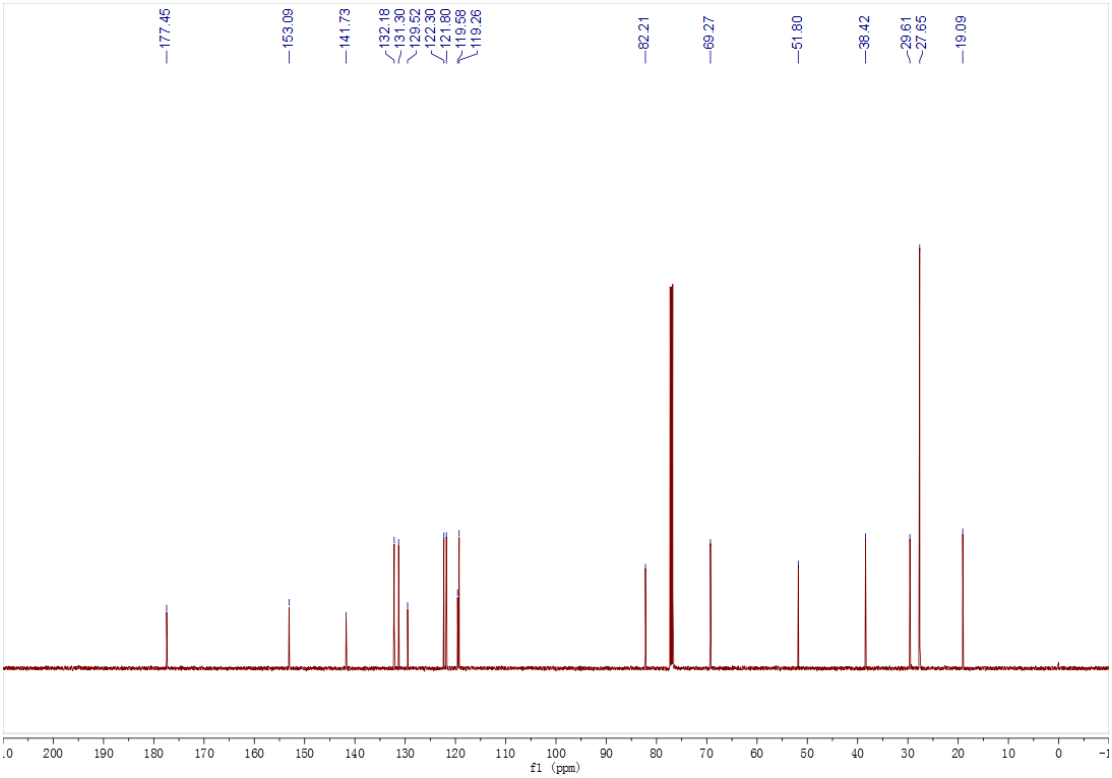
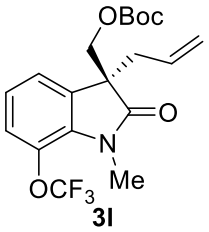
152.99
145.24
134.27
130.74
127.24
124.96
122.21
119.79
108.83
82.45
68.72
52.43
38.01
27.61
26.37
f1 (ppm)


OBoc
O
N
Me
Me

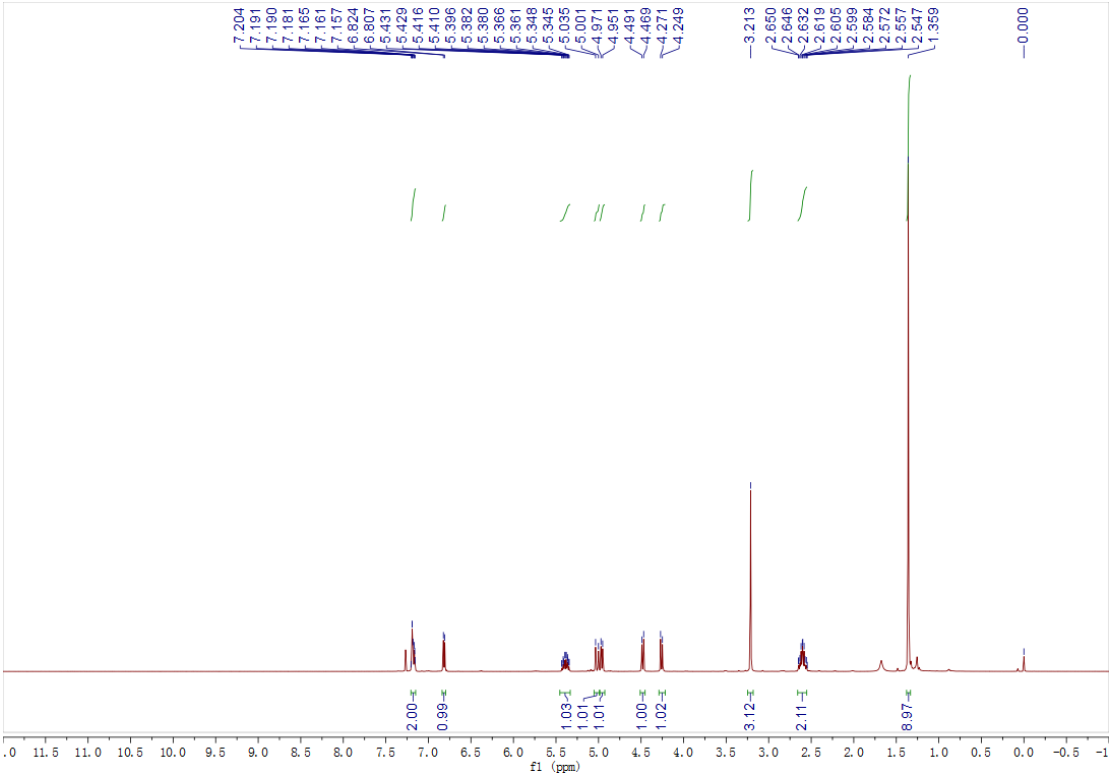
3k

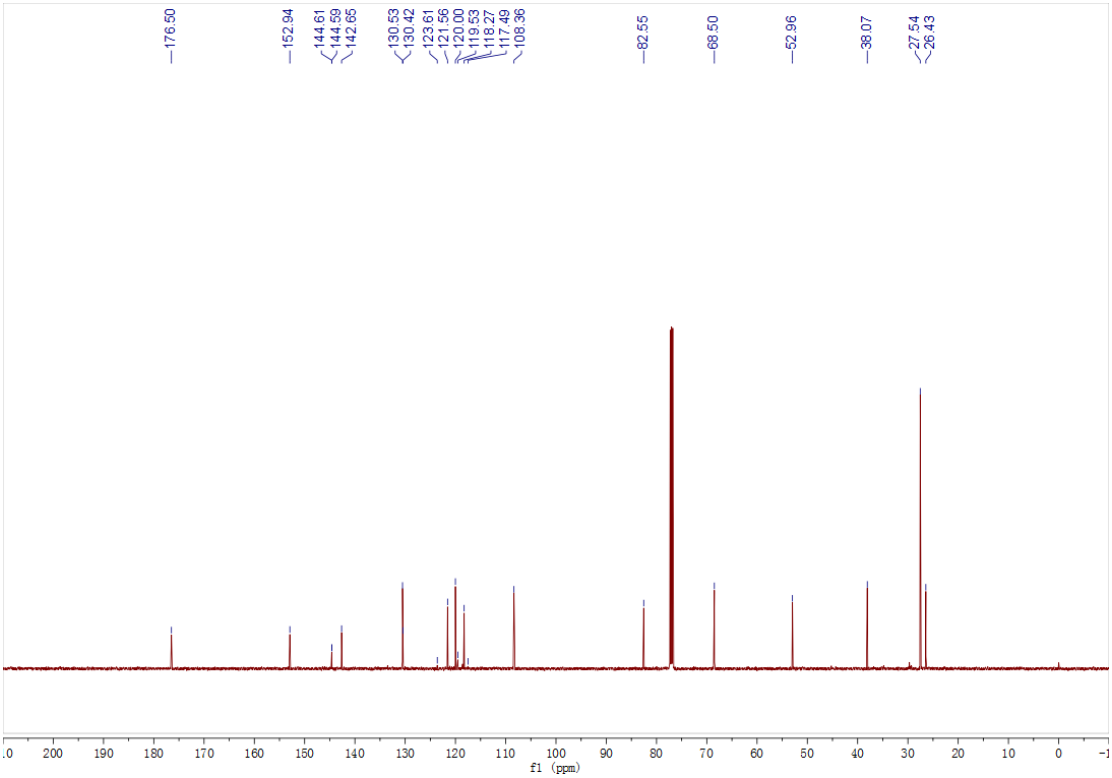

7.120
7.106
7.014
6.999
6.951
6.936
6.921
5.429
5.414
5.408
5.399
5.394
5.380
5.374
5.365
5.360
5.345
5.034
5.031
5.000
4.997
4.945
4.943
4.941
4.924
4.923
4.920
4.432
4.410
4.253
4.232
3.482
2.584
2.570
1.361
0.001
0.97
0.98
0.98
1.01
0.99
0.98
1.00
1.01
3.04
1.81
3.25
9.09
f1 (ppm)

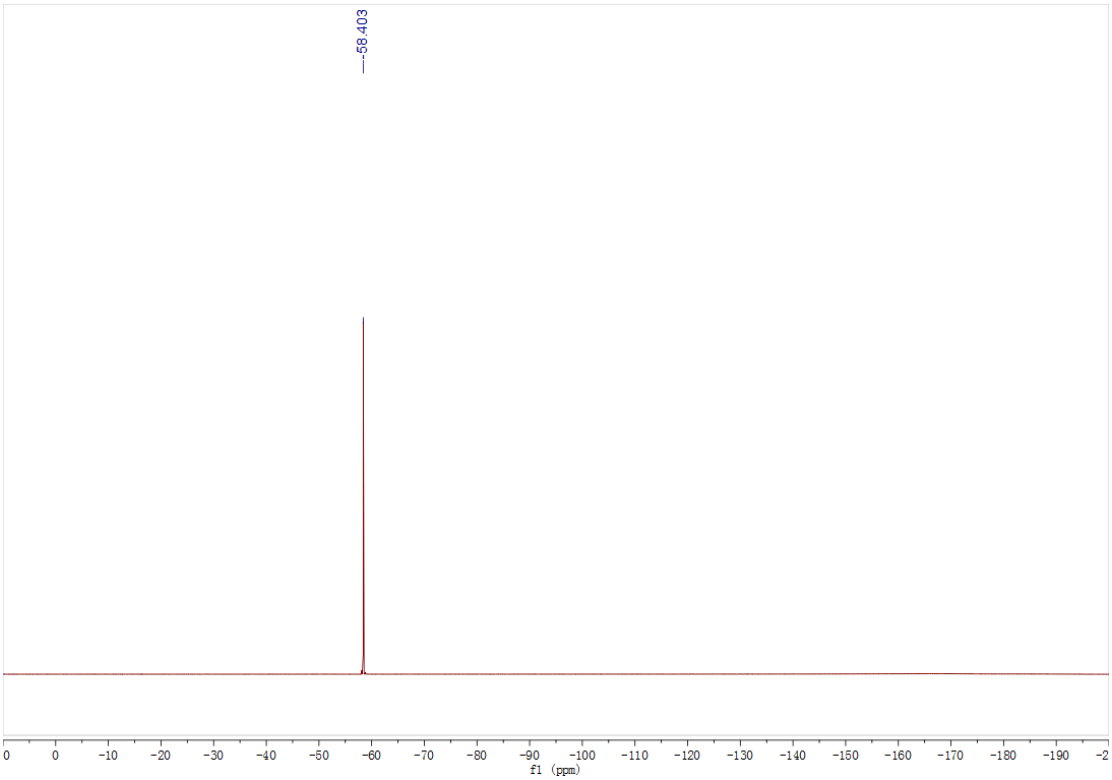

177.45
153.09
141.73
132.18
131.30
129.52
122.30
121.80
119.58
119.26
82.21
69.27
51.80
38.42
29.61
27.65
19.09
f1 (ppm)


OBoc
O
N
Me
OCF3

3l


7.204
7.191
7.190
7.181
7.165
7.161
7.157
6.824
6.807
5.431
5.429
5.416
5.410
5.396
5.382
5.380
5.366
5.361
5.348
5.345
5.035
5.001
4.971
4.951
4.491
4.469
4.271
4.249
3.213
2.650
2.646
2.632
2.619
2.605
2.599
2.584
2.572
2.557
2.547
1.359
0.000
2.00
0.99
1.03
1.01
1.01
1.00
1.02
3.12
2.11
8.97
f1 (ppm)


176.50
152.94
144.61
144.59
142.65
130.53
130.42
123.61
121.56
120.00
119.53
118.27
117.49
108.36
82.55
68.50
52.96
38.07
27.54
26.43
f1 (ppm)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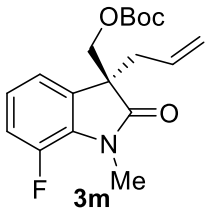
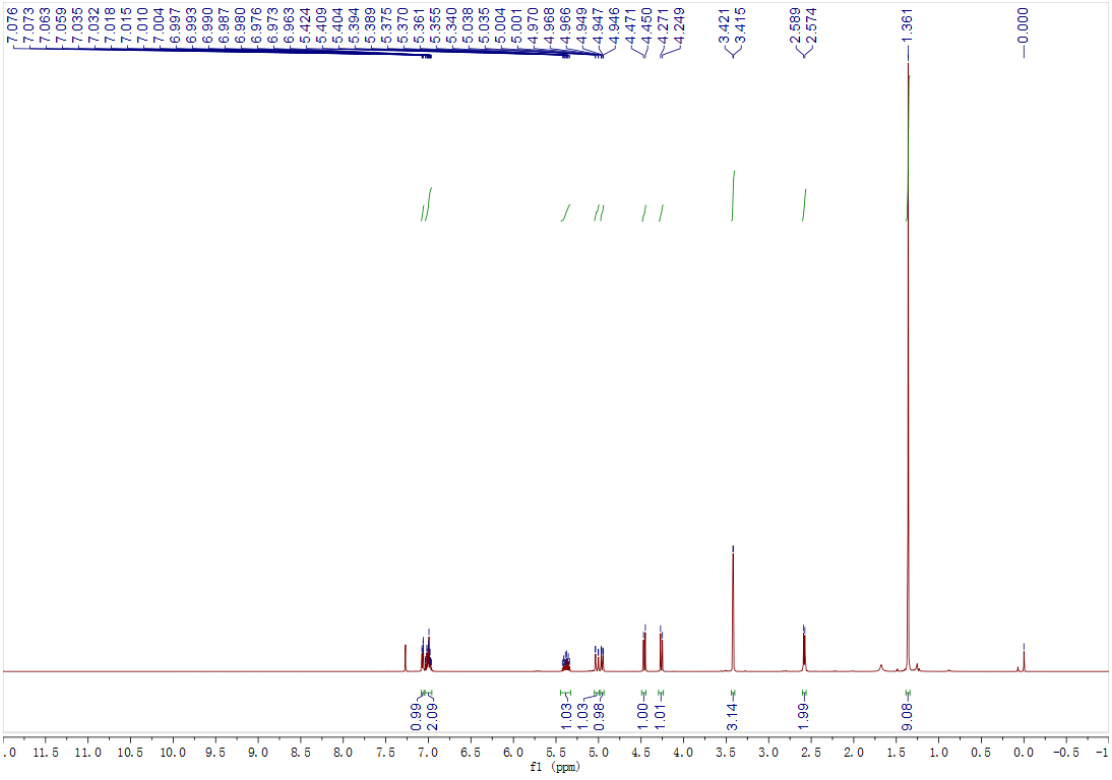
0
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-2
f1 (ppm)


OBoc
O
N
Me
F

3m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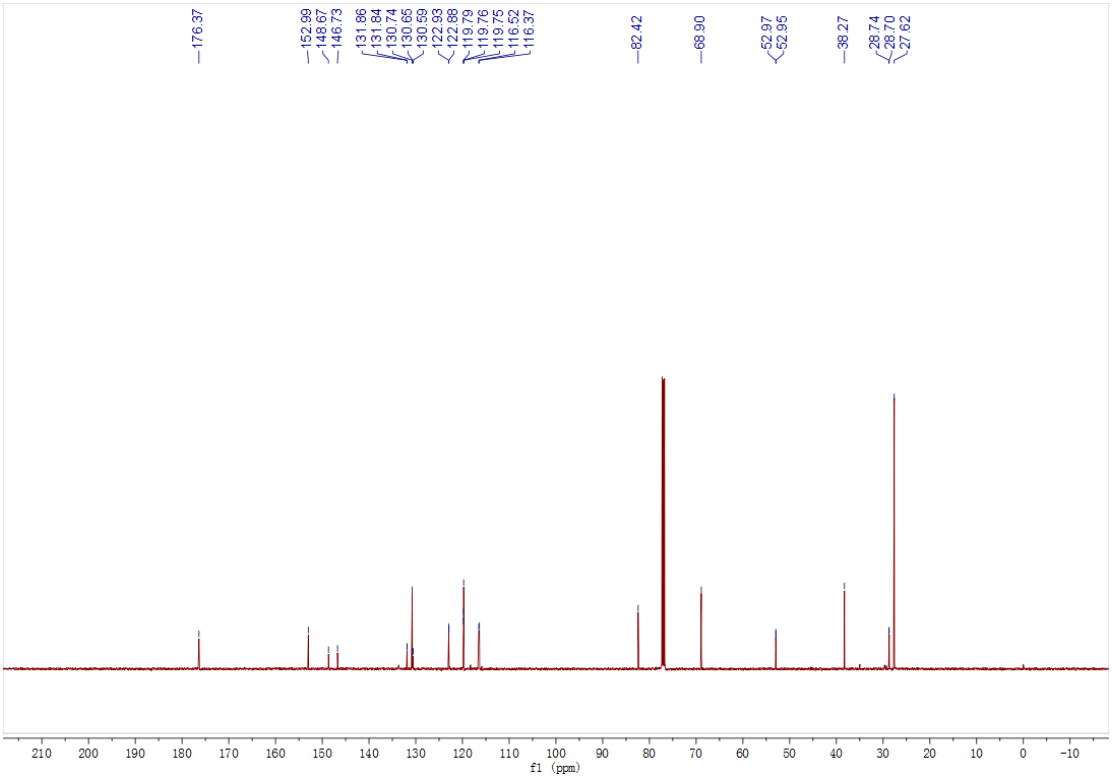
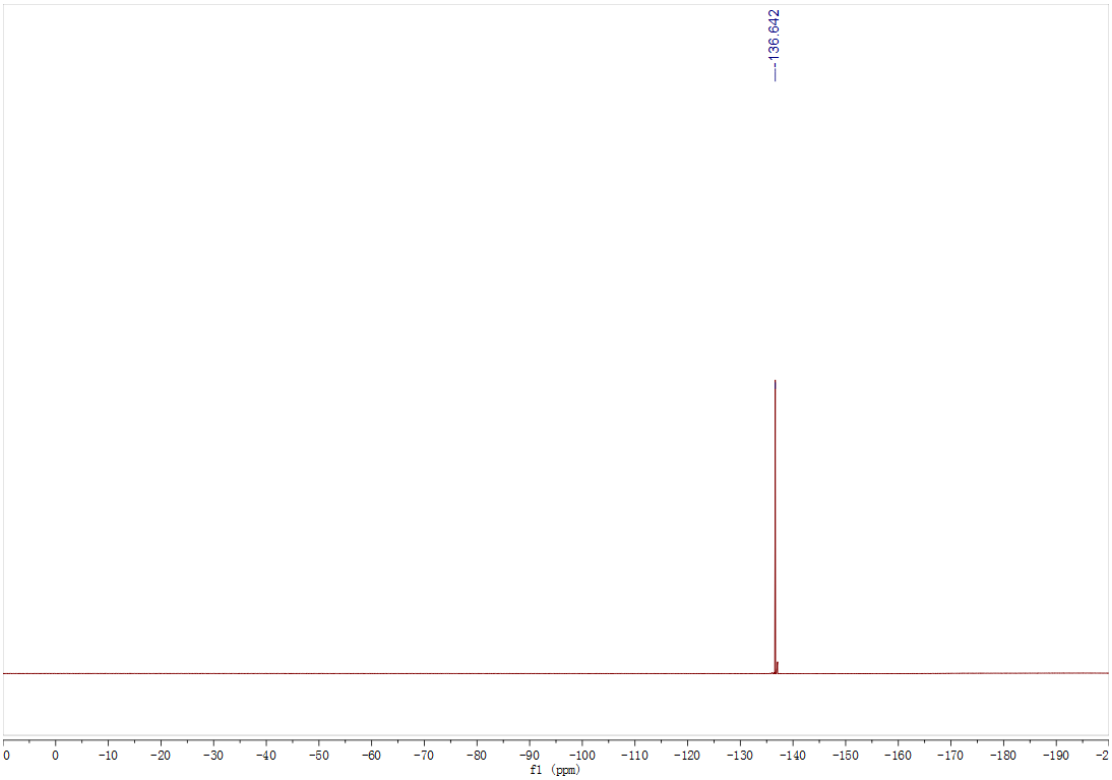
7.073
7.063
7.059
7.035
7.032
7.018
7.015
7.010
7.004
6.997
6.993
6.990
6.987
6.980
6.976
6.973
6.963
5.424
5.409
5.404
5.394
5.389
5.375
5.370
5.361
5.355
5.340
5.038
5.035
5.004
5.001
4.970
4.968
4.966
4.949
4.947
4.946
4.471
4.450
4.271
4.249
3.421
3.415
2.589
2.574
1.361
0.000
0.99
2.09
1.03
1.03
0.98
1.00
1.01
3.14
1.99
9.08
f1 (ppm)


176.37
152.99
148.67
146.73
131.86
131.84
130.74
130.65
130.59
122.93
122.88
119.79
119.76
119.75
116.52
116.37
82.42
68.90
52.97
52.95
38.27
28.74
28.70
27.62
f1 (ppm)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0
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
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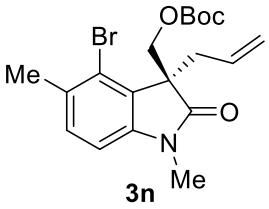
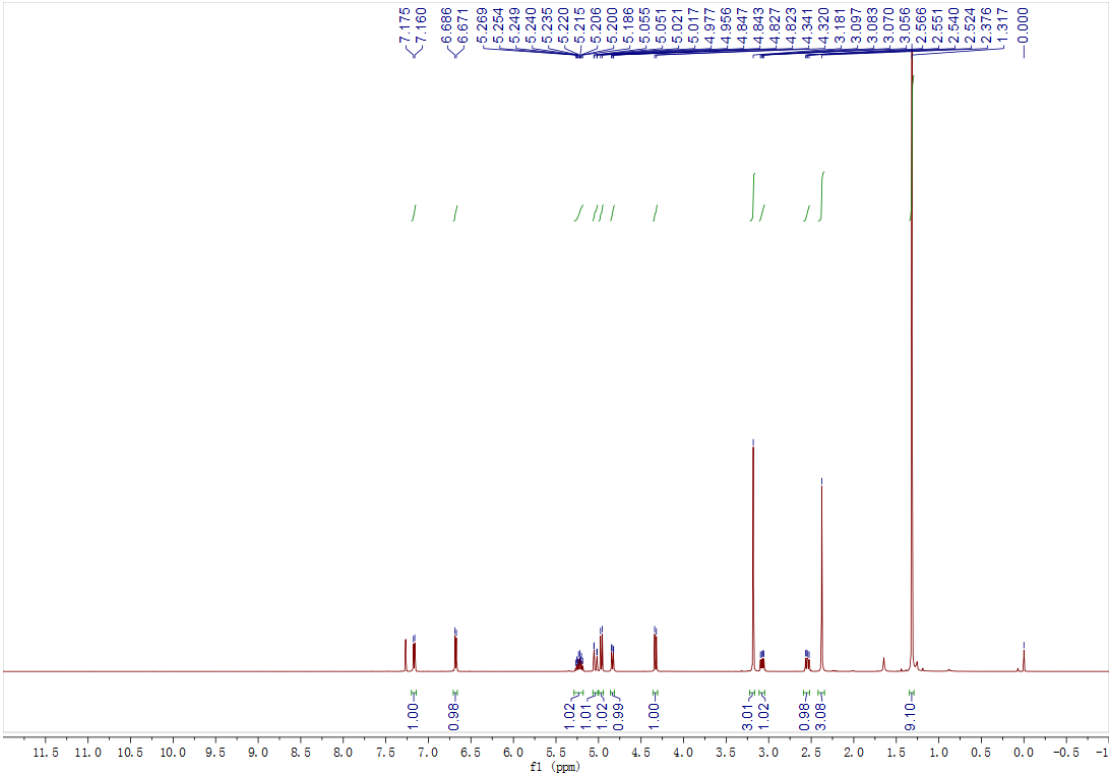
-150
-160
-170
-180
-190
-2
f1 (ppm)


OBoc
Br
Me
O
N
Me

3n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7.160
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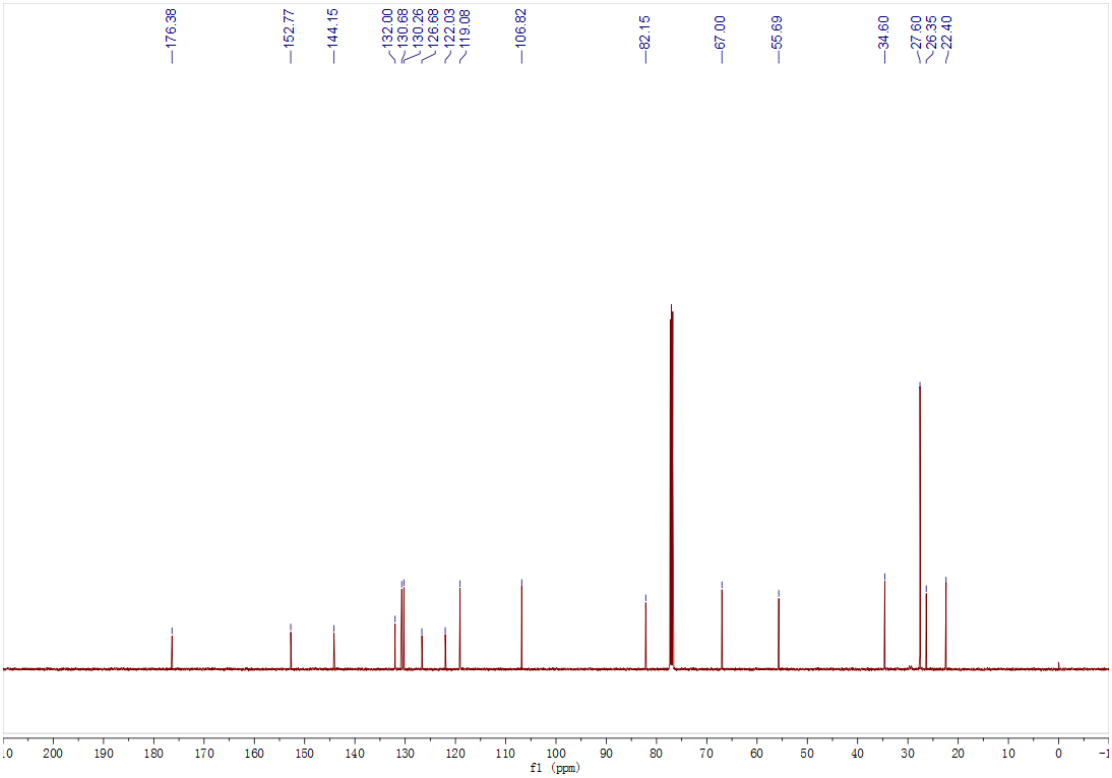
6.671
5.269
5.254
5.249
5.240
5.235
5.220
5.215
5.206
5.200
5.186
5.055
5.051
5.021
5.017
4.977
4.956
4.847
4.843
4.827
4.823
4.341
4.320
3.181
3.097
3.083
3.070
3.056
2.566
2.551
2.540
2.524
2.376
1.317
0.000
1.00
0.98
1.02
1.01
1.02
0.99
1.00
3.01
1.02
0.98
3.08
9.10
f1 (ppm)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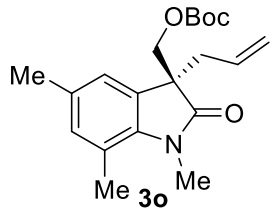
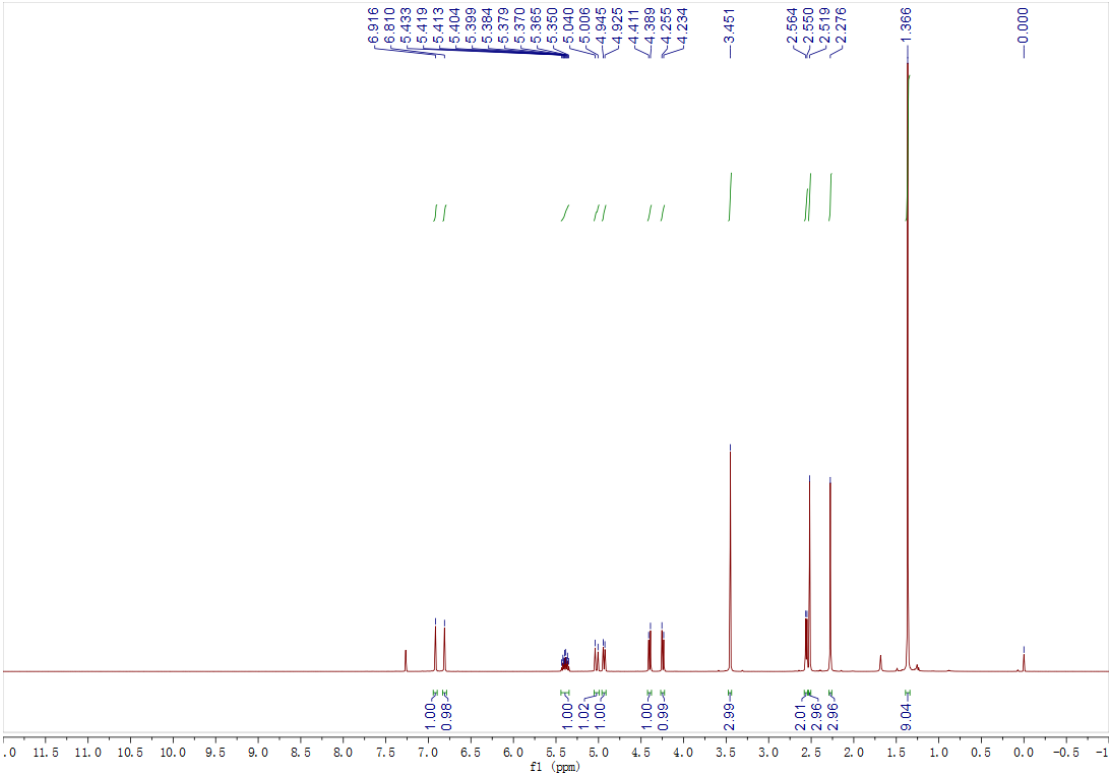
144.15
132.00
130.68
130.26
126.68
122.03
119.08
106.82
82.15
67.00
55.69
34.60
27.60
26.35
22.40
f1 (ppm)


OBoc
Me
O
N
Me
Me
3o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6.810
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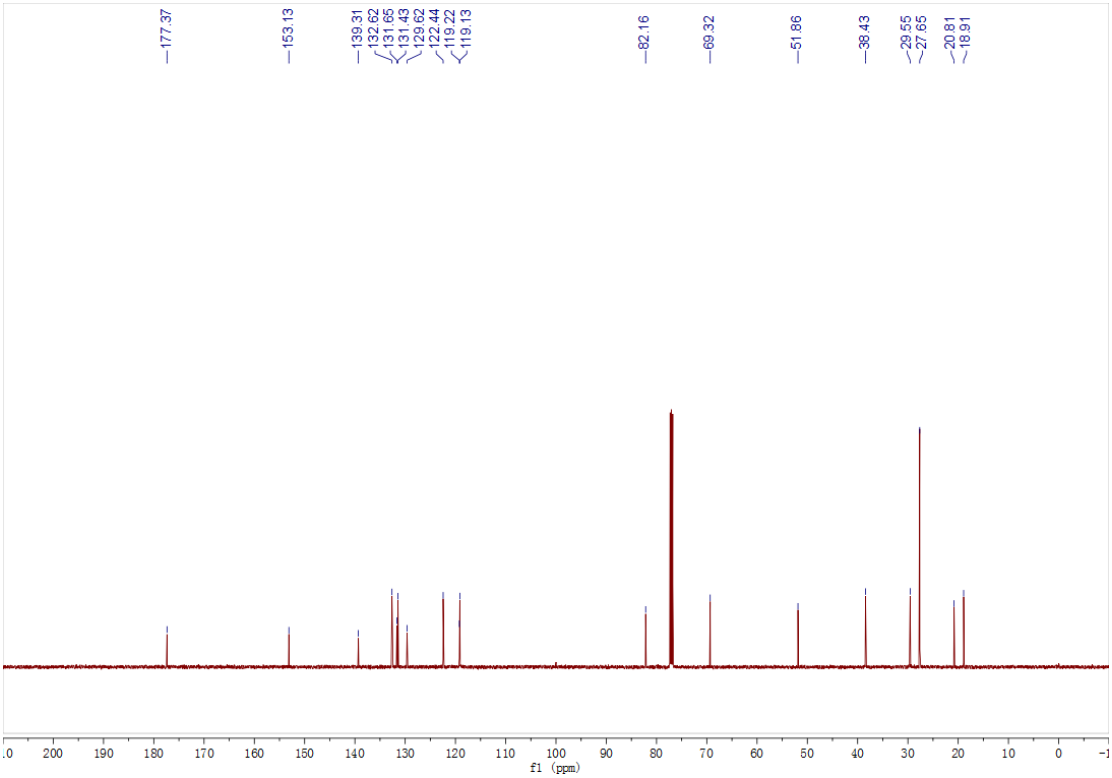
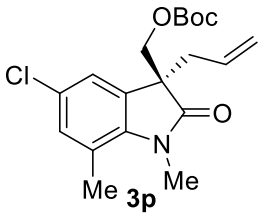
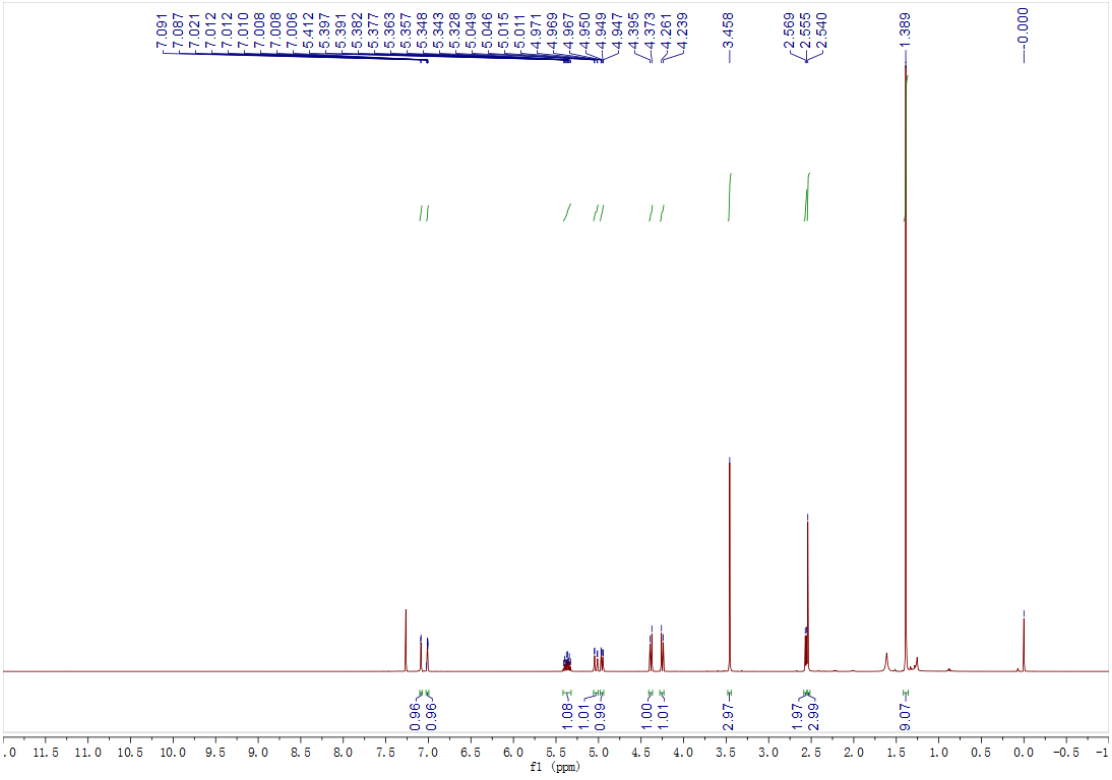
5.419
5.413
5.404
5.399
5.384
5.379
5.370
5.365
5.350
5.040
5.006
4.945
4.925
4.411
4.389
4.255
4.234
3.451
2.564
2.550
2.519
2.276
1.366
0.000
1.00
0.98
1.00
1.02
1.00
1.00
0.99
2.99
2.01
2.96
2.96
9.04
f1 (ppm)


177.37
153.13
139.31
132.62
131.65
131.43
129.62
122.44
119.22
119.13
82.16
69.32
51.86
38.43
29.55
27.65
20.81
18.91
f1 (ppm)


OBoc
Cl
O
N
Me
Me

3p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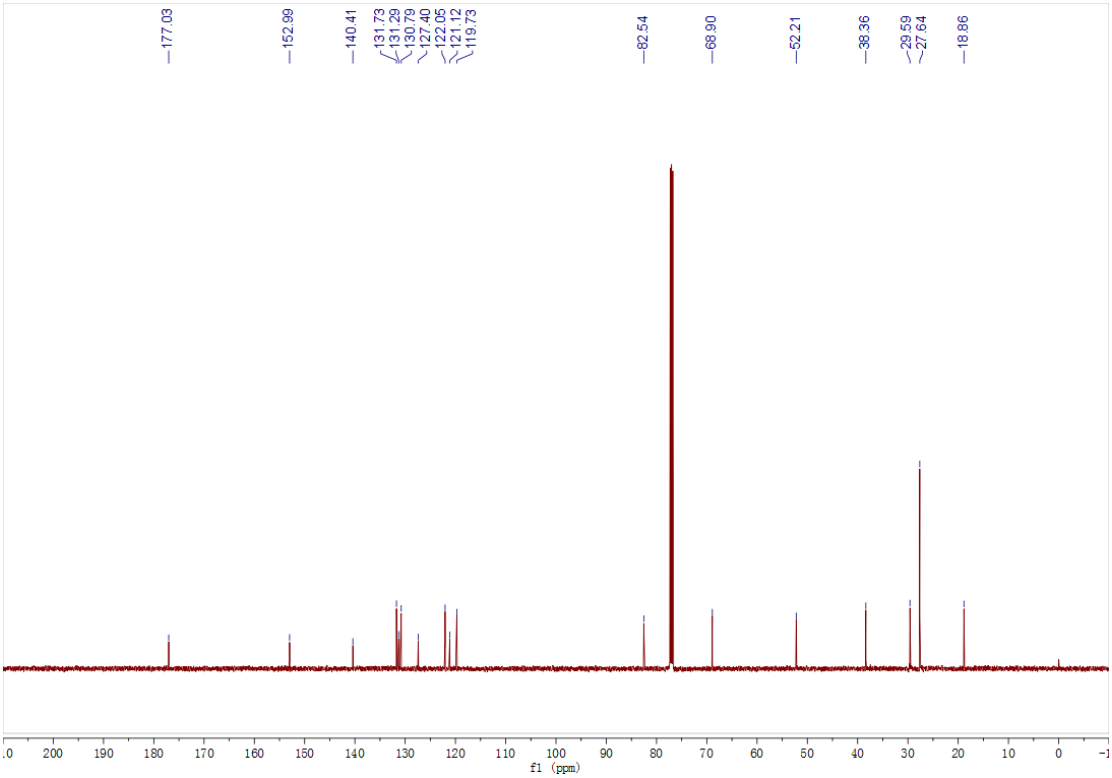
7.087
7.021
7.012
7.012
7.010
7.008
7.008
7.006
5.412
5.397
5.391
5.382
5.377
5.363
5.357
5.348
5.343
5.328
5.049
5.046
5.015
5.011
4.971
4.969
4.967
4.950
4.949
4.947
4.395
4.373
4.261
4.239
3.458
2.569
2.555
2.540
1.389
0.000
0.96
0.96
1.08
1.01
0.99
1.00
1.01
2.97
1.97
2.99
9.07
f1 (ppm)


177.03
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131.29
130.79
127.40
122.05
121.12
119.73
82.54
68.90
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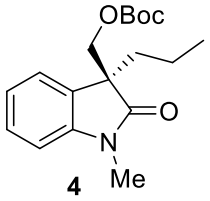
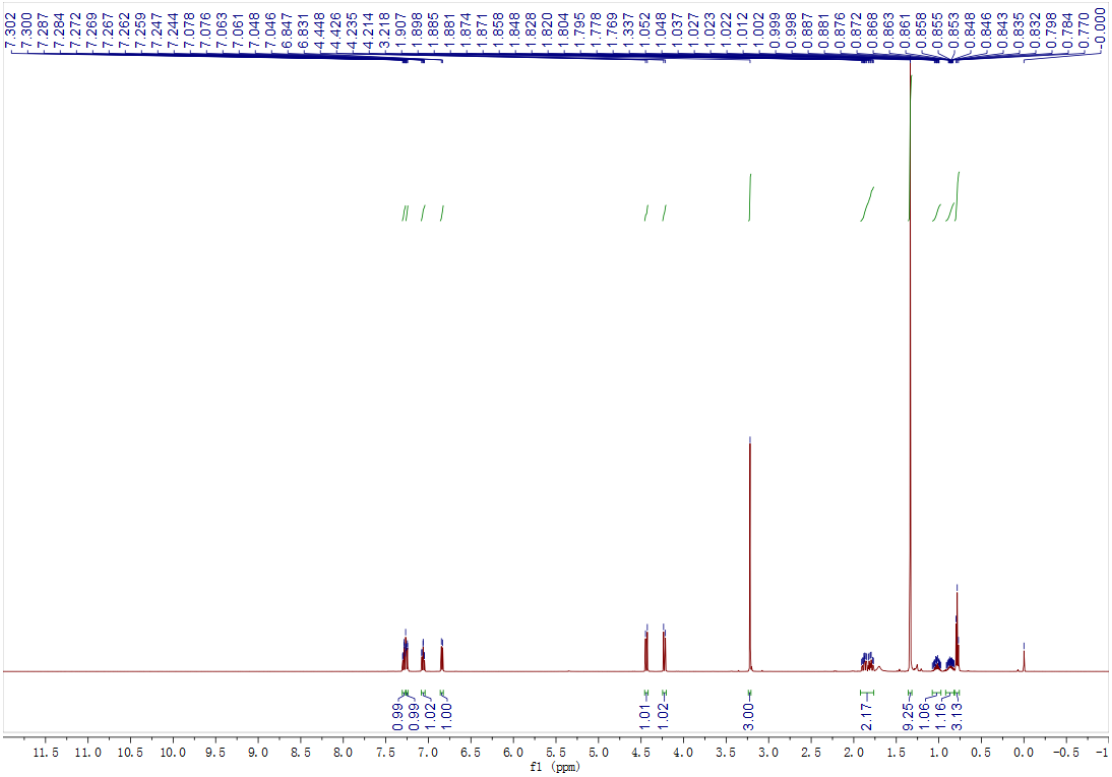
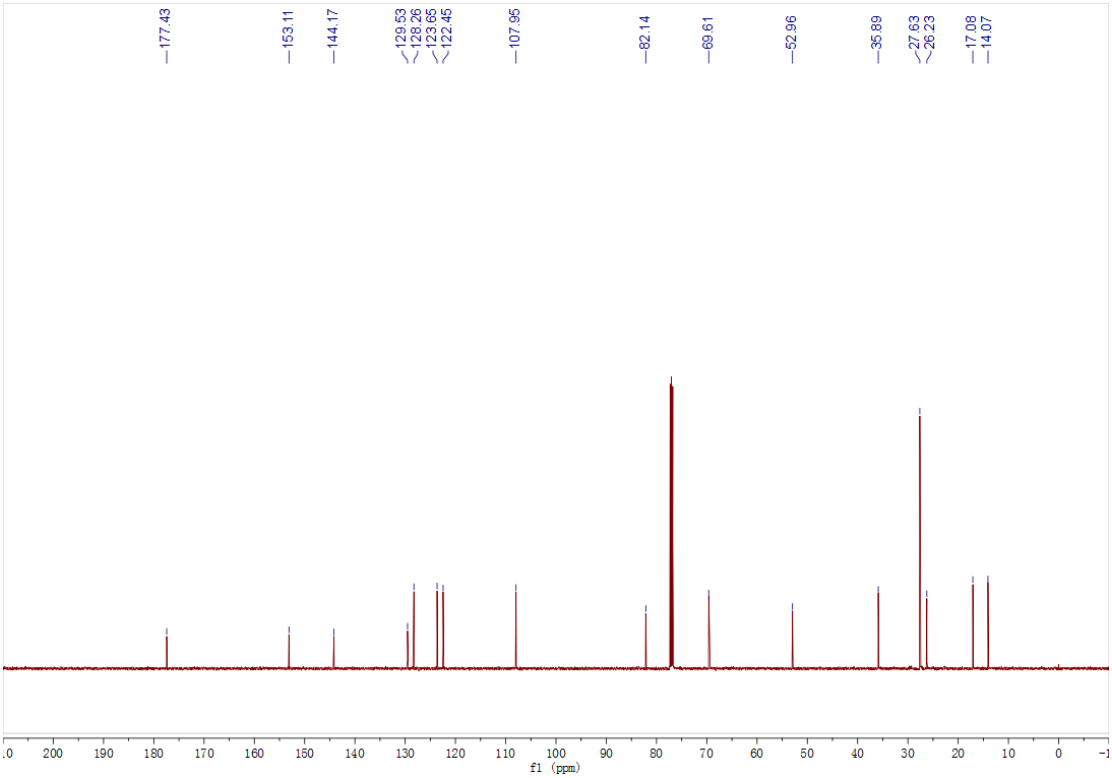
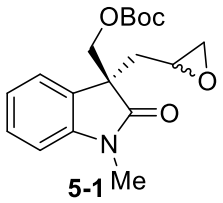
38.36
29.59
27.64
18.86
f1 (ppm)


OBoc
O
N
Me

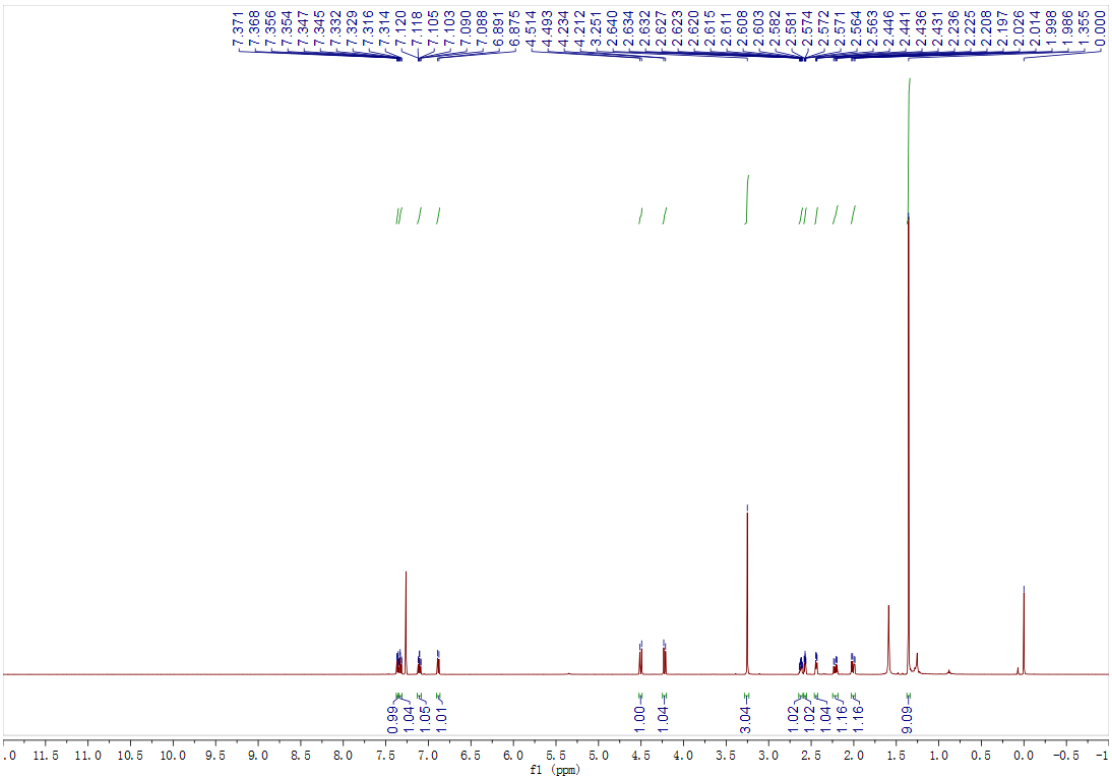
4

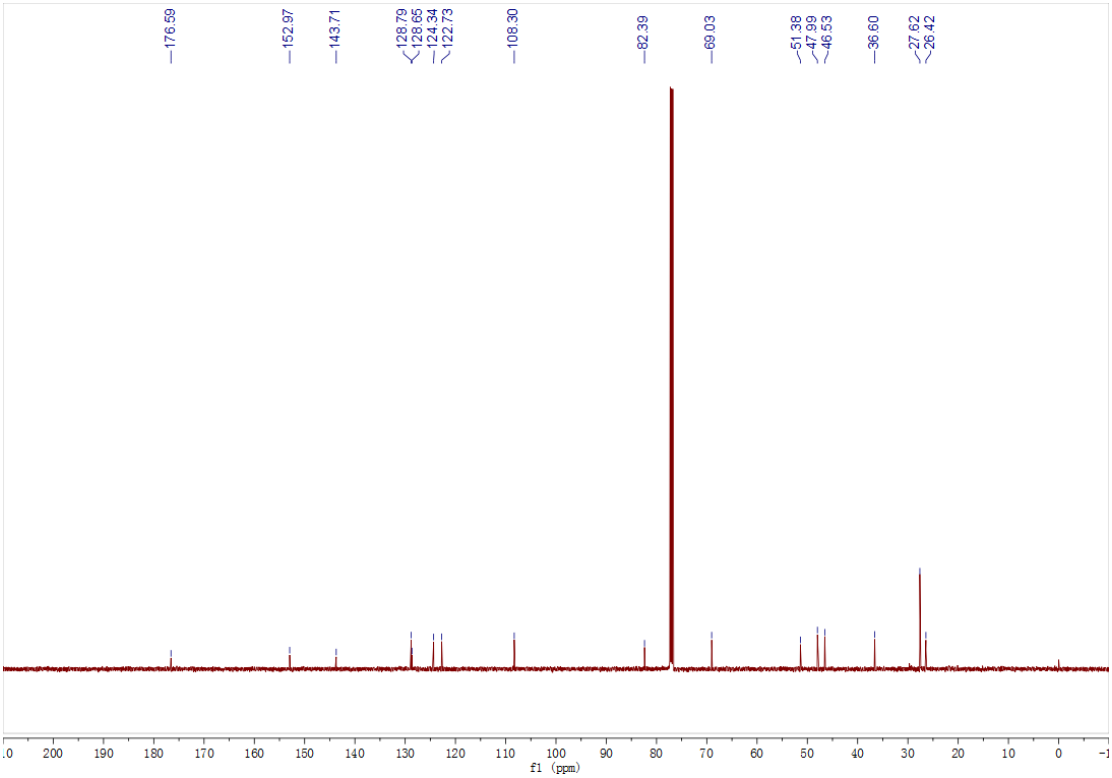

f1 (ppm)


177.43
153.11
144.17
129.53
128.26
123.65
122.45
107.95
82.14
69.61
52.96
36.89
27.63
26.23
17.08
14.07
f1 (ppm)


OBoc
O
O
N
Me

5-1


7.371
7.368
7.356
7.354
7.347
7.345
7.332
7.329
7.316
7.314
7.120
7.118
7.105
7.103
7.090
7.088
6.891
6.875
4.514
4.493
4.234
4.212
3.251
2.640
2.634
2.632
2.627
2.623
2.620
2.615
2.611
2.608
2.603
2.582
2.581
2.574
2.572
2.571
2.564
2.563
2.446
2.441
2.436
2.431
2.236
2.225
2.208
2.197
2.026
2.014
1.998
1.986
1.355
0.000
0.99
1.04
1.05
1.01
1.00
1.04
3.04
1.02
1.02
1.04
1.16
1.16
9.09
f1 (ppm)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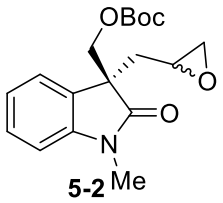
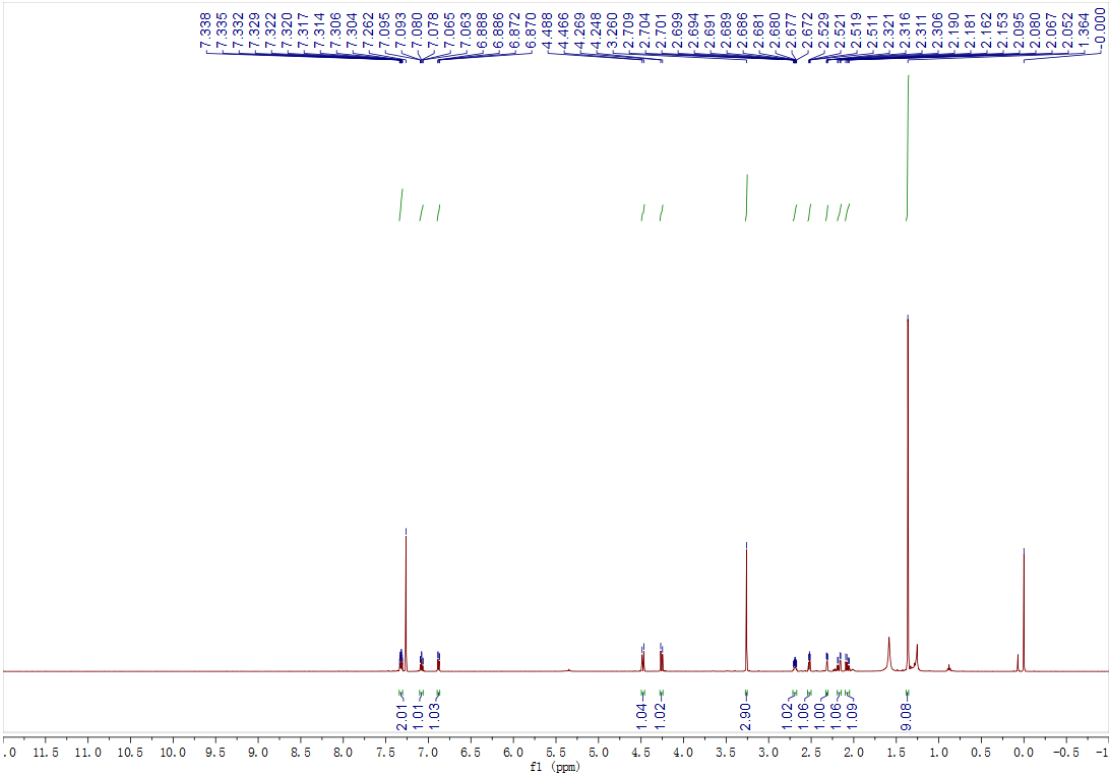
143.71
128.79
128.65
124.34
122.73
108.30
82.39
69.03
51.38
47.99
46.53
36.60
27.62
26.42
f1 (ppm)


OBoc
O
O
N
Me

5-2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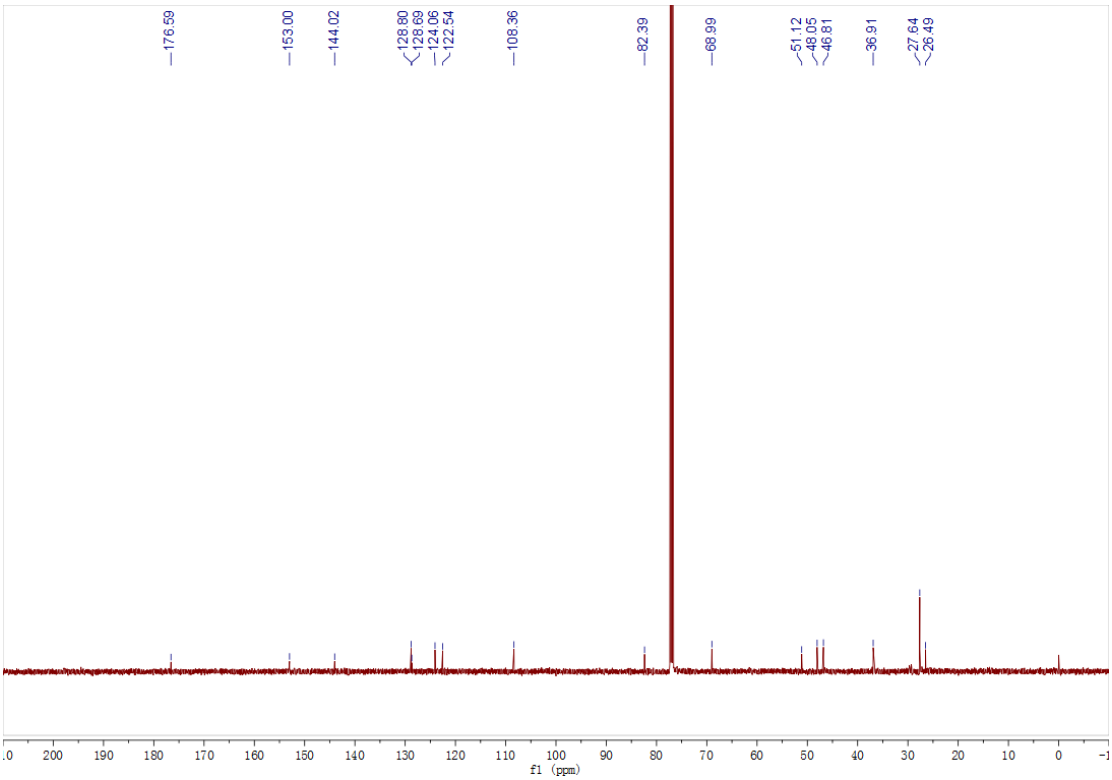
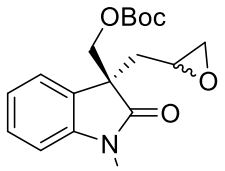
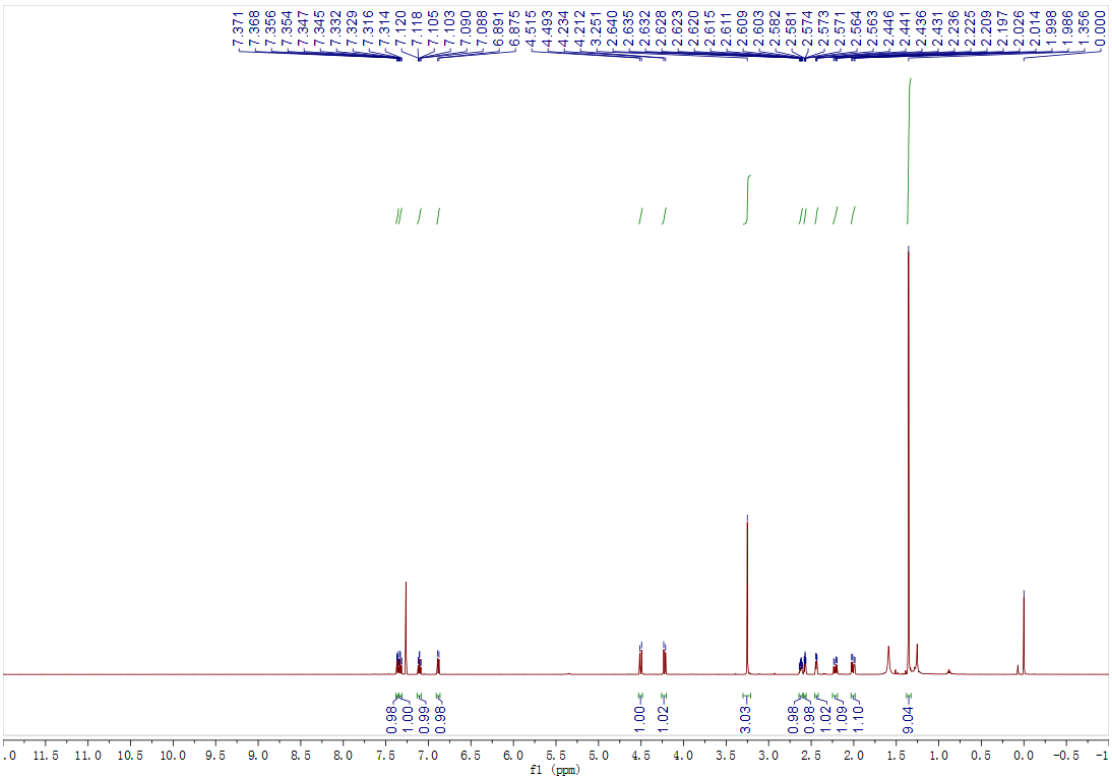
7.329
7.322
7.320
7.317
7.314
7.306
7.304
7.262
7.095
7.093
7.080
7.078
7.065
7.063
6.888
6.886
6.872
6.870
4.488
4.466
4.269
4.248
3.260
2.709
2.704
2.701
2.699
2.694
2.691
2.689
2.686
2.681
2.680
2.677
2.672
2.529
2.521
2.519
2.511
2.321
2.316
2.311
2.306
2.190
2.181
2.162
2.153
2.095
2.080
2.067
2.052
1.364
0.000
2.01
1.01
1.03
1.04
1.02
2.90
1.02
1.06
1.00
1.06
1.09
9.08
f1 (ppm)


176.59
153.00
144.02
128.80
128.69
124.06
122.54
108.36
82.39
68.99
51.12
48.05
46.81
36.91
27.64
26.49
f1 (ppm)


OBoc
O
O
N
Me

5 dr > 20:1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7.368
7.356
7.354
7.347
7.345
7.332
7.329
7.316
7.314
7.120
7.118
7.105
7.103
7.090
7.088
6.891
6.875
4.515
4.493
4.234
4.212
3.251
2.640
2.635
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2.225
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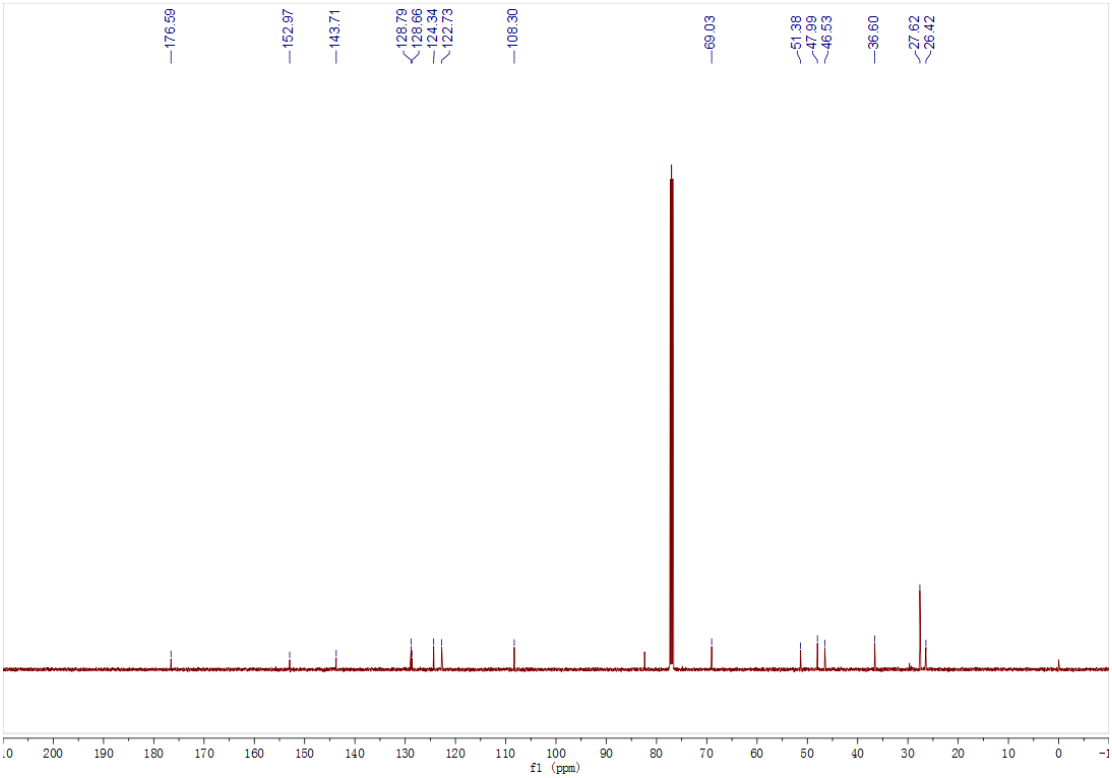
f1 (ppm)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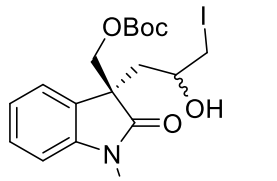
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Me

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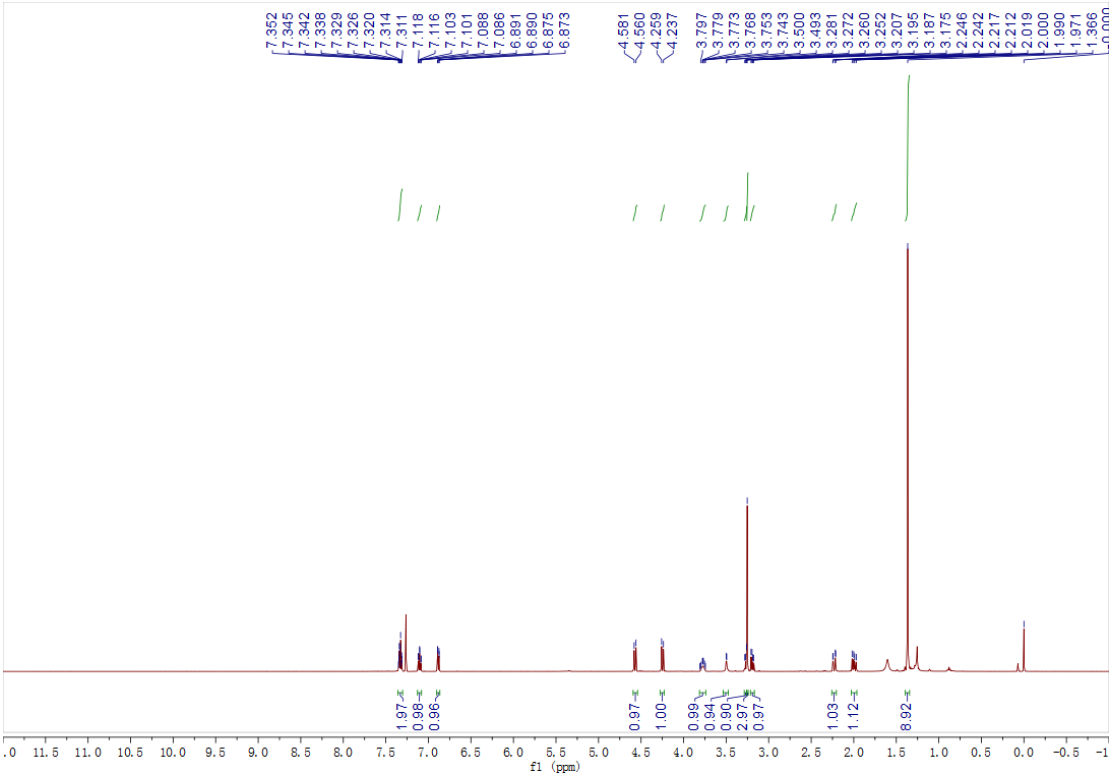
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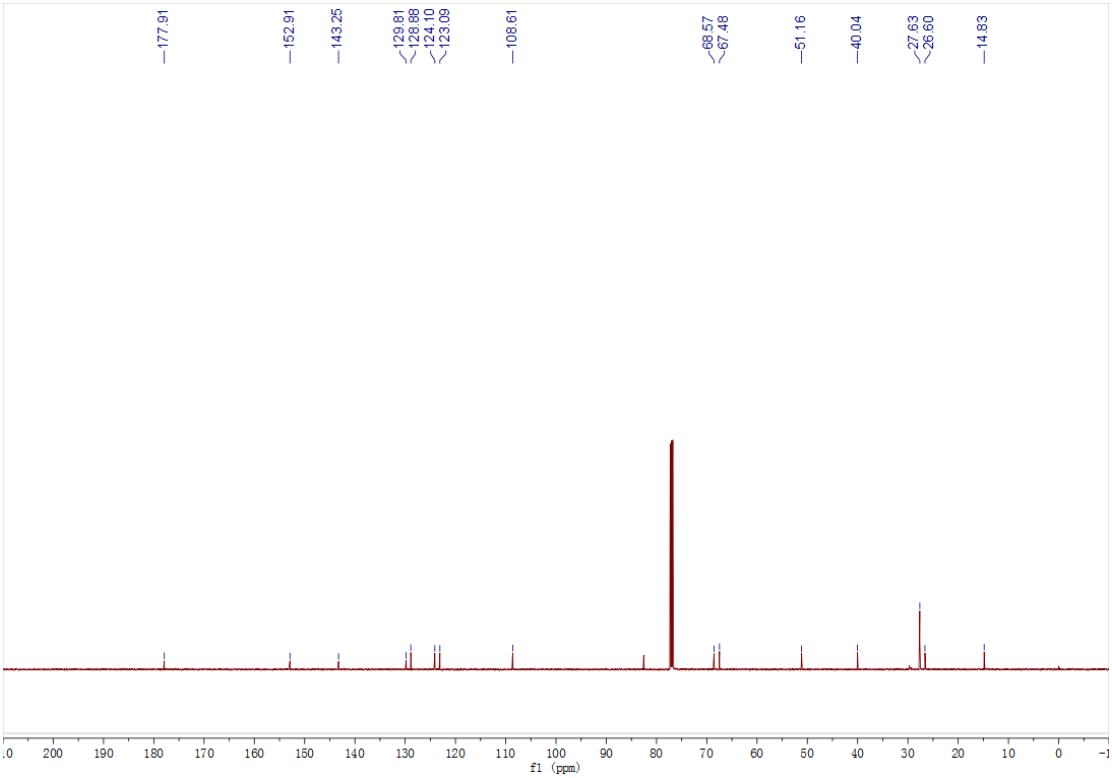
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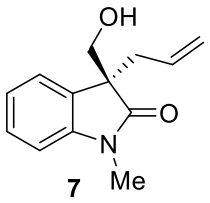
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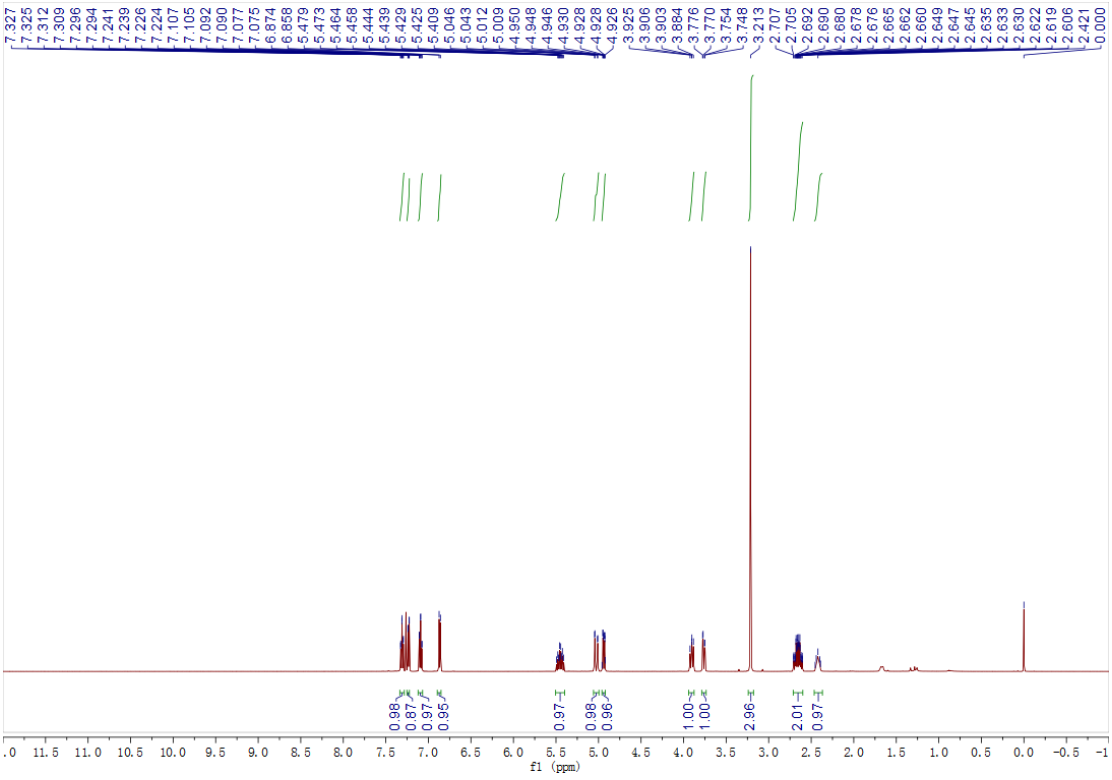
Me

7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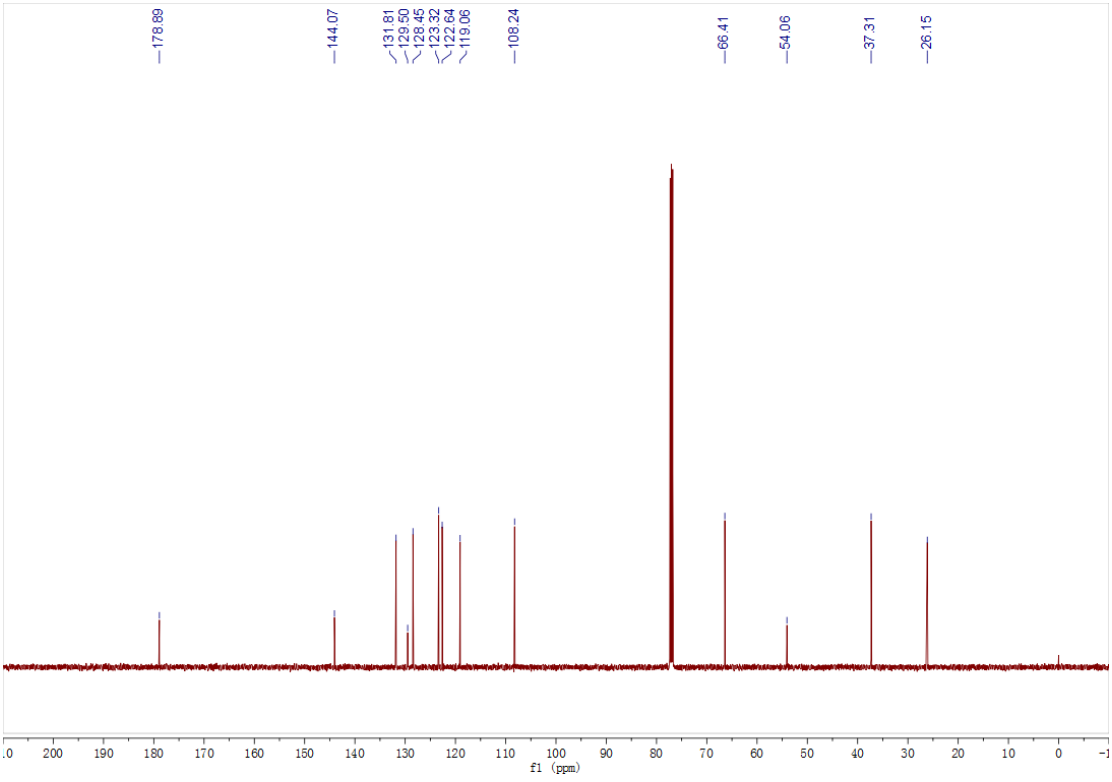
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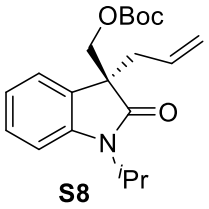
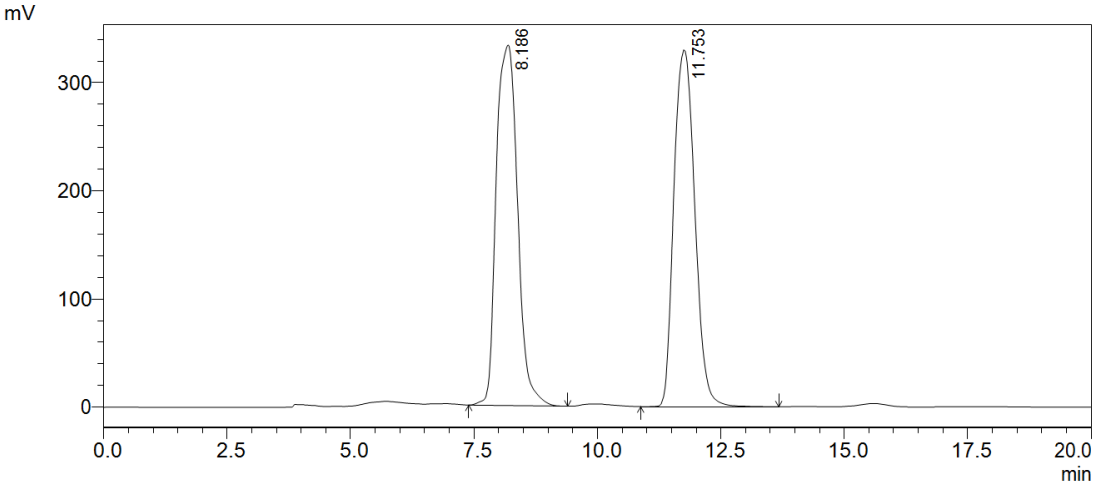
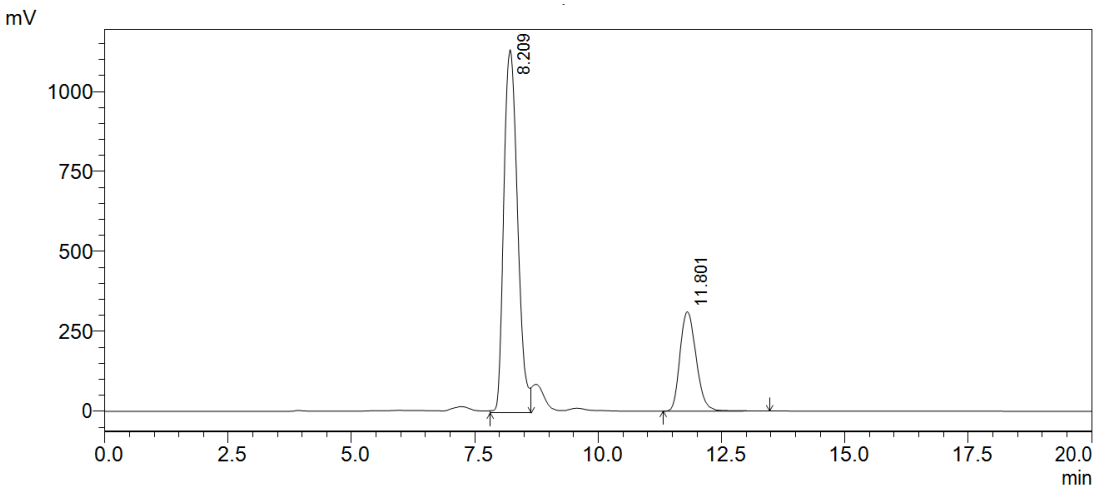


S8



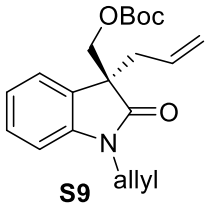
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.186	10021417	333302	50.735	50.221
2	11.753	9731211	330366	49.265	49.779
Total		19752628	663668	100.000	100.000

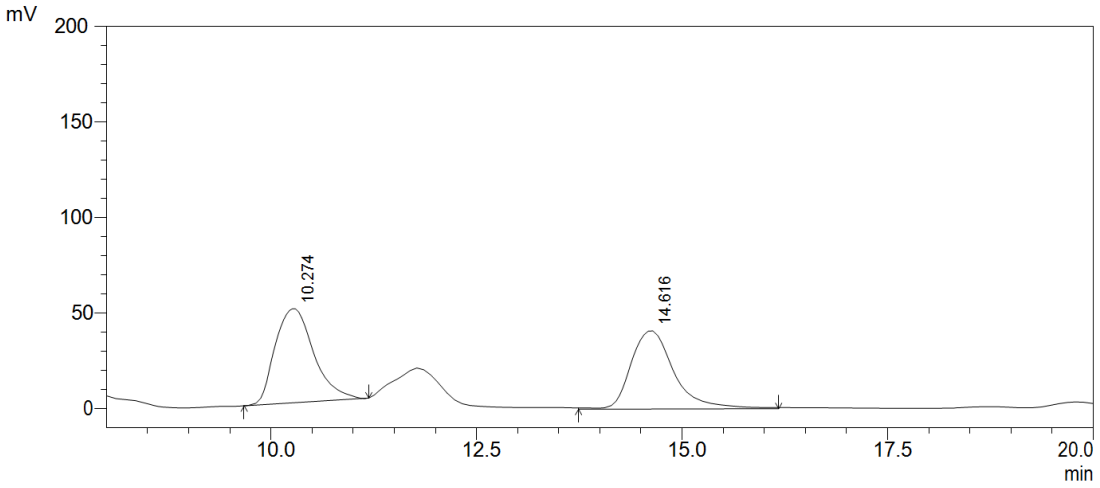


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.209	22119336	1136117	75.867	78.540
2	11.801	7036126	310429	24.133	21.460
Total		29155462	1446546	100.000	100.000

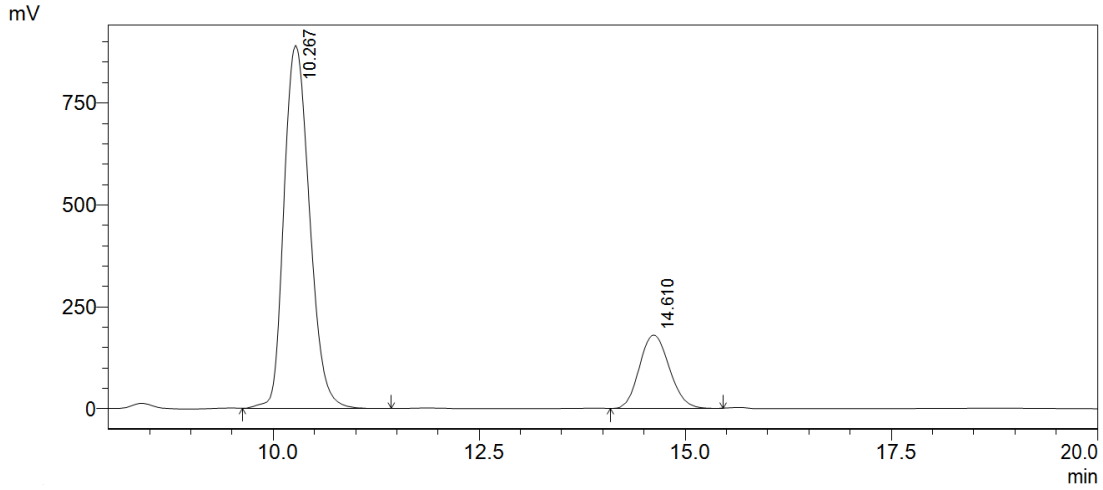


S9



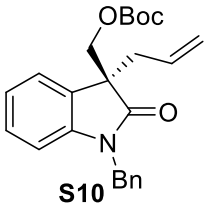
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.274	1605314	49409	51.761	54.590
2	14.616	1496098	41100	48.239	45.410
Total		3101413	90509	100.000	100.000

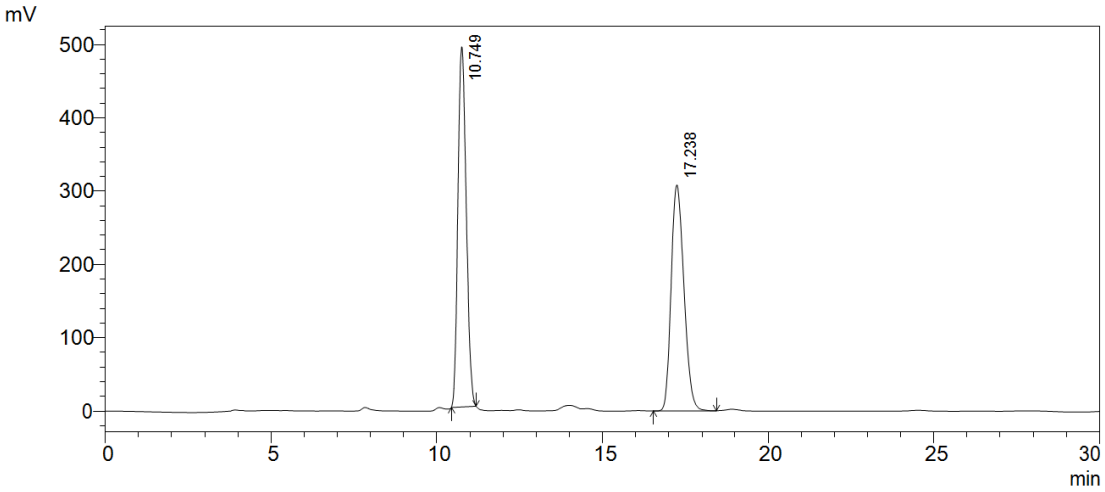


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.267	19190773	890459	80.888	83.159
2	14.610	4534215	180337	19.112	16.841
Total		23724989	1070797	100.000	100.000

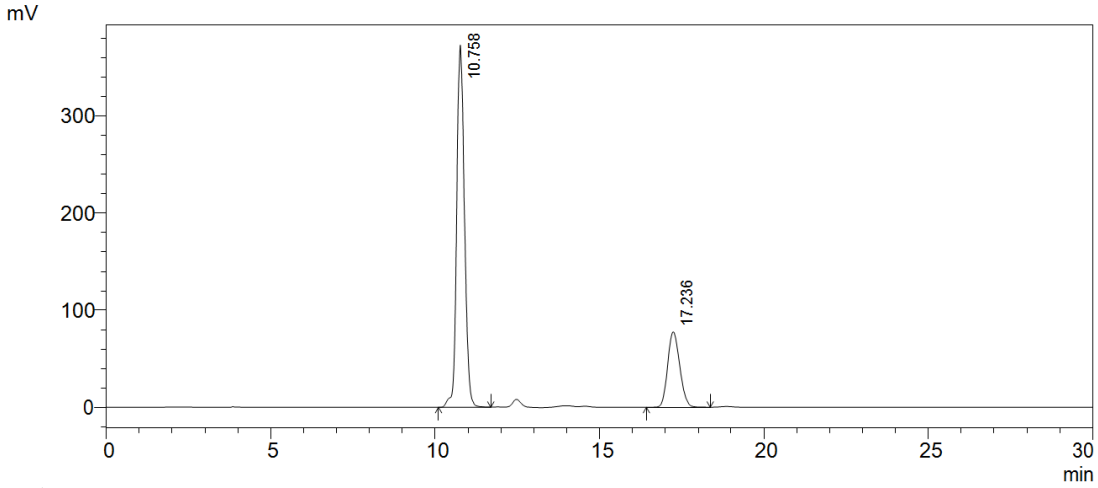


S10



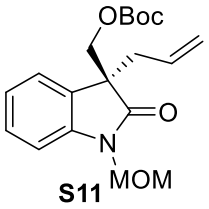
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.749	8555552	491382	50.838	61.442
2	17.238	8273472	308370	49.162	38.558
Total		16829024	799752	100.000	100.000

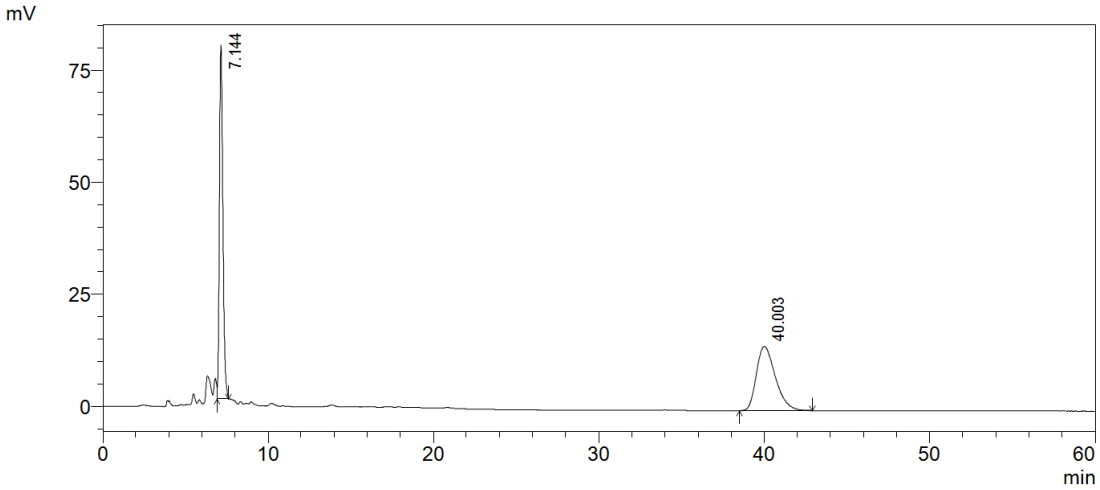


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.758	6134360	372711	75.583	82.763
2	17.236	1981693	77622	24.417	17.237
Total		8116053	450333	100.000	100.000

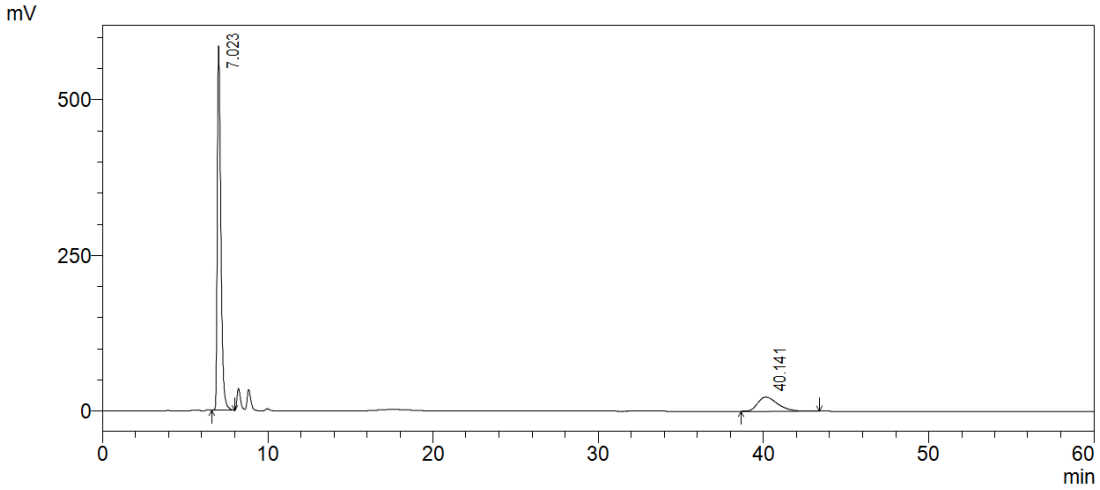


S11



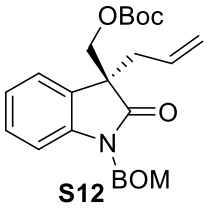
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.144	1145313	78905	49.939	84.603
2	40.003	1148099	14360	50.061	15.397
Total		2293412	93264	100.000	100.000

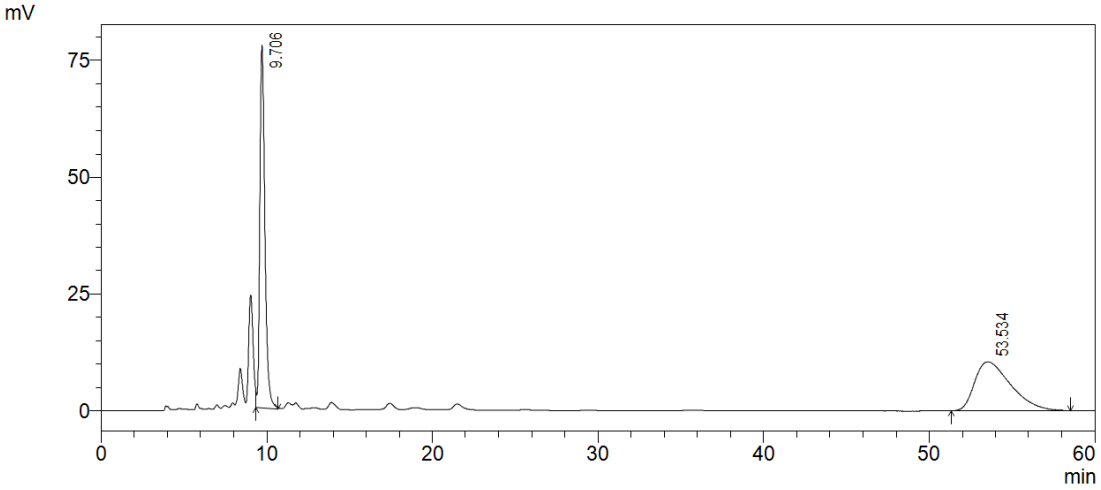


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.023	8763570	585279	82.054	96.251
2	40.141	1916646	22796	17.946	3.749
Total		10680217	608075	100.000	100.000

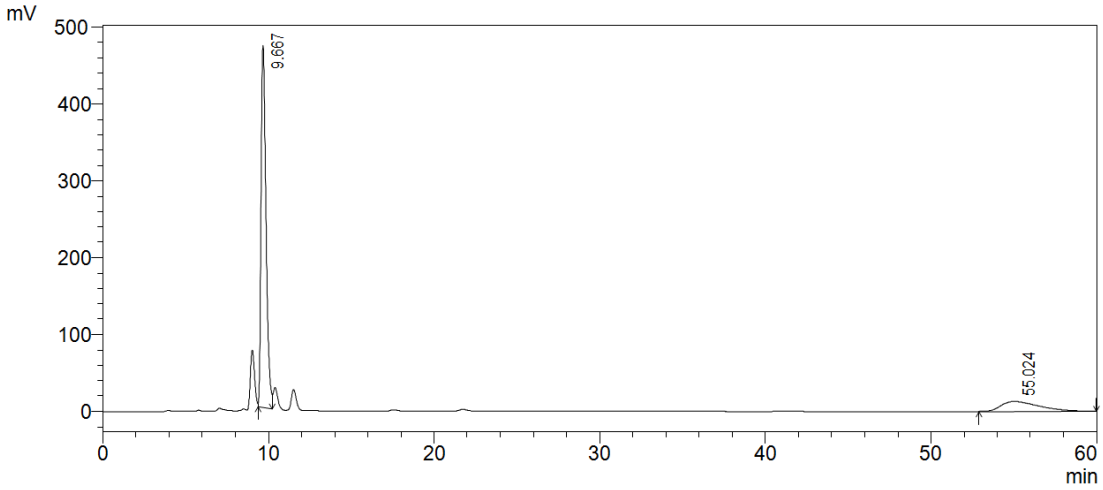


S12



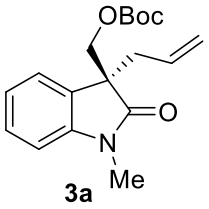
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.706	1646604	77586	50.854	88.098
2	53.534	1591301	10482	49.146	11.902
Total		3237905	88068	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.667	9731670	470862	82.616	97.351
2	55.024	2047786	12811	17.384	2.649
Total		11779456	483673	100.000	100.000



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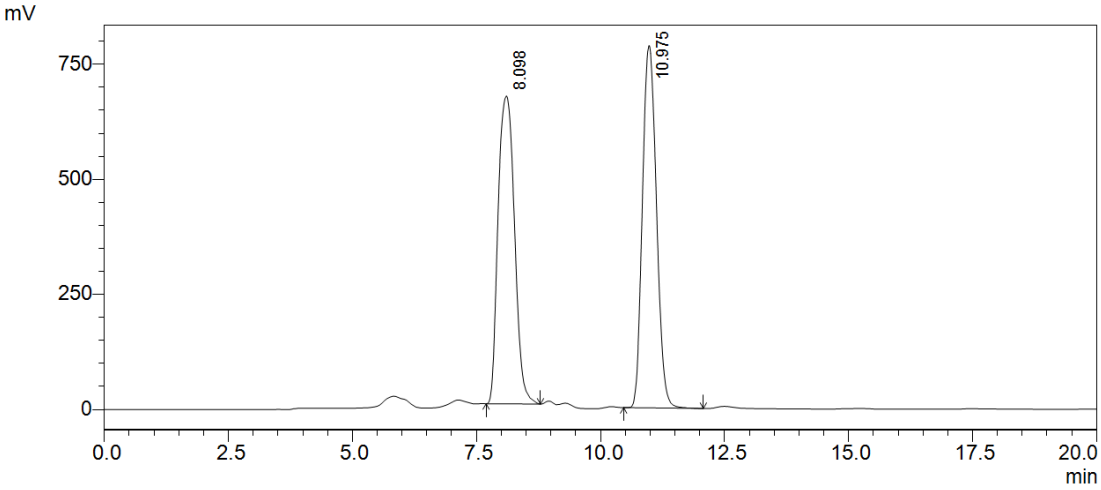
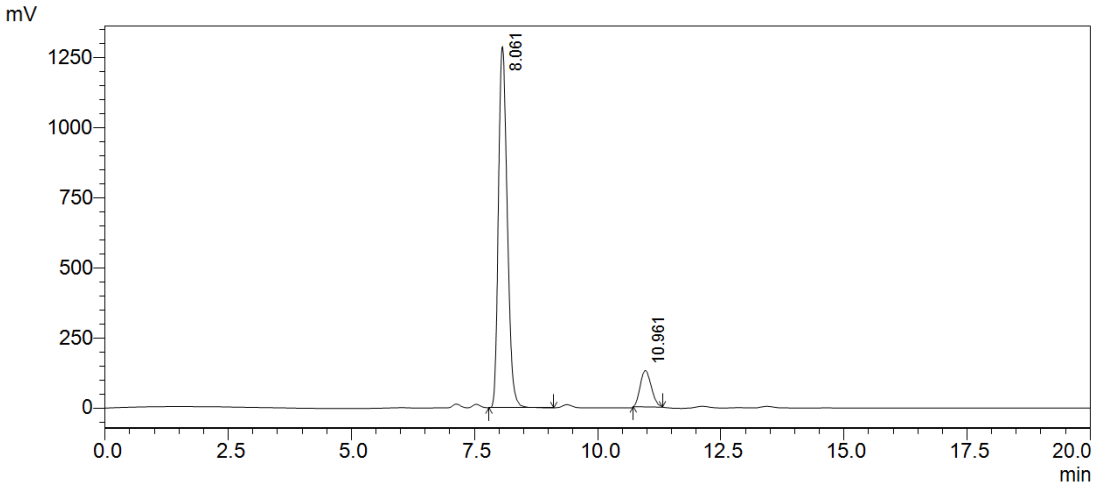


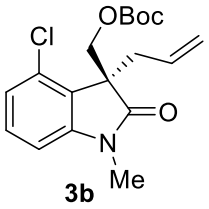
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.098	15407239	669526	49.817	45.957
2	10.975	15520428	787336	50.183	54.043
Total		30927667	1456862	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.061	16110840	1290913	88.832	90.834
2	10.961	2025383	130261	11.168	9.166
Total		18136223	1421174	100.000	100.000



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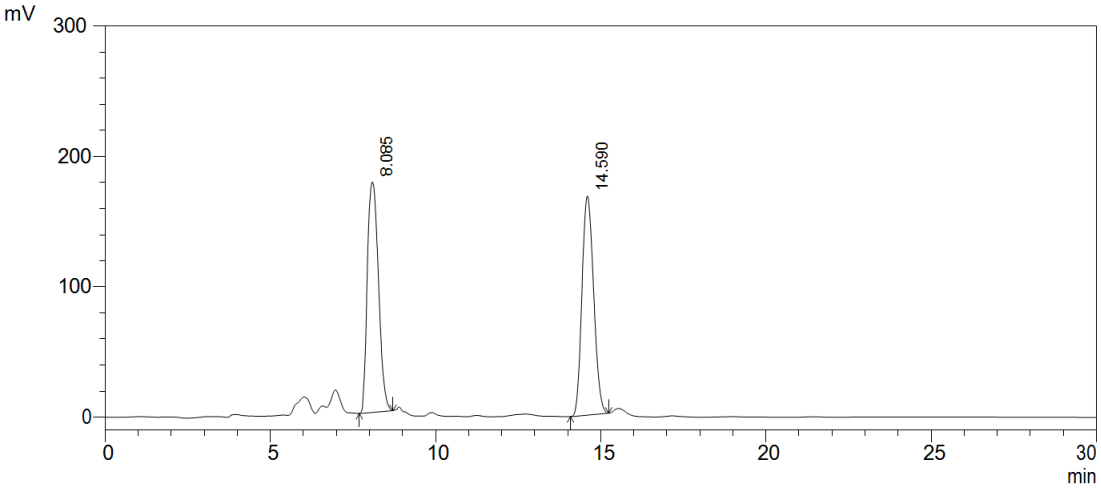
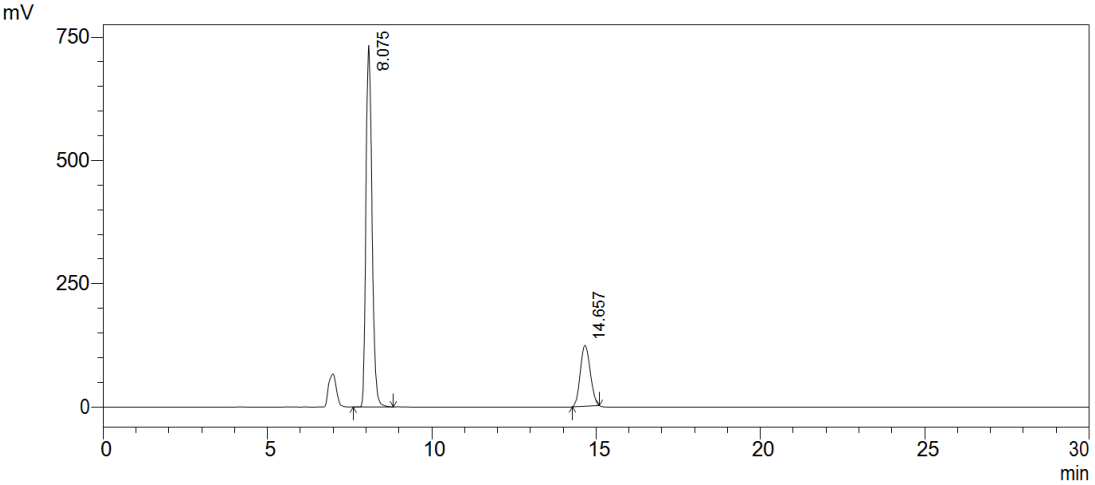


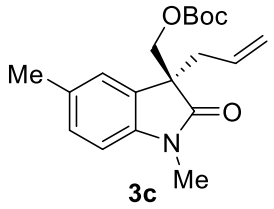
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.085	4153623	176837	50.150	51.259
2	14.590	4128836	168148	49.850	48.741
Total		8282459	344985	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.075	9428131	733155	78.485	85.562
2	14.657	2584473	123715	21.515	14.438
Total		12012604	856870	100.000	100.000



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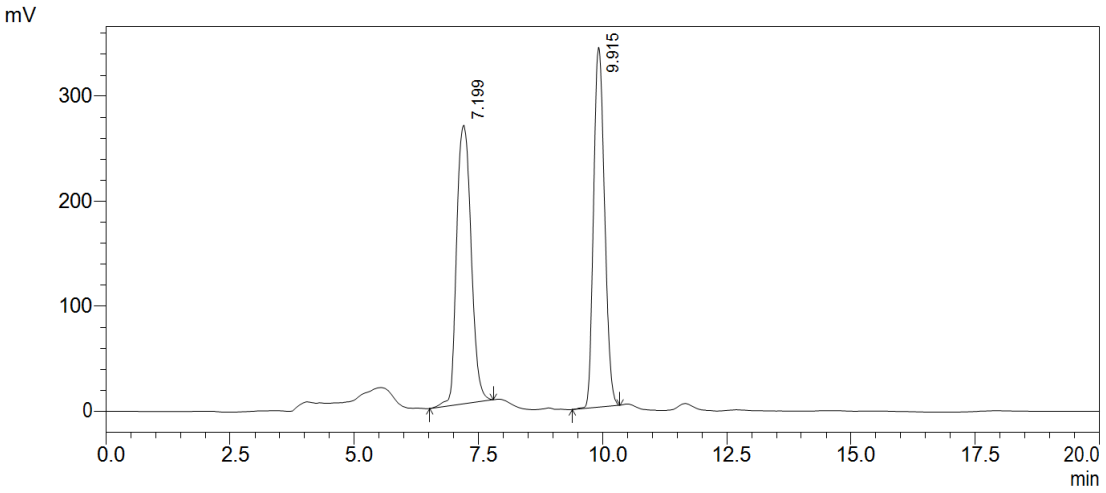
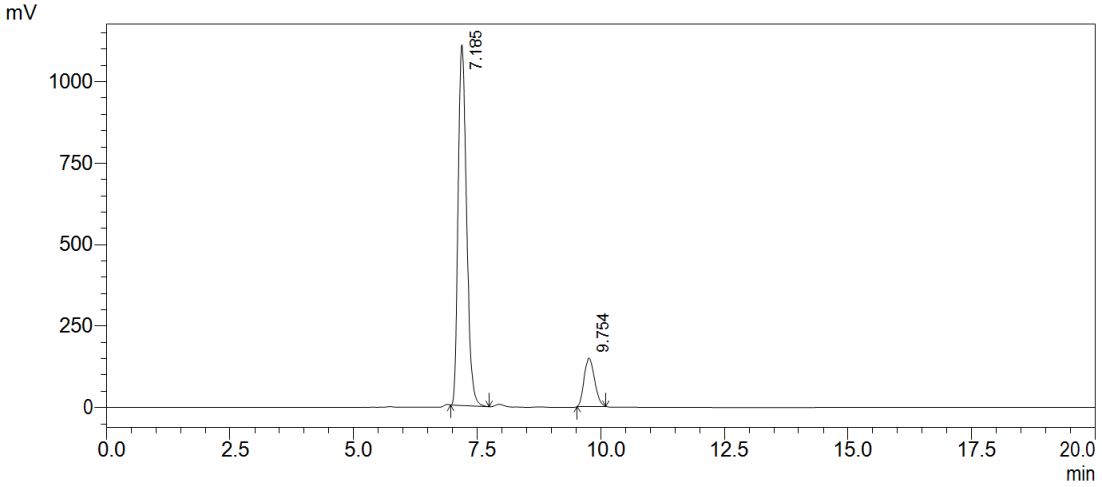


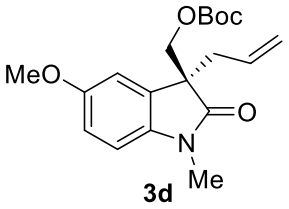
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.199	5406773	265318	50.650	43.634
2	9.915	5268064	342733	49.350	56.366
Total		10674837	608051	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.185	13152391	1108325	85.846	88.181
2	9.754	2168494	148552	14.154	11.819
Total		15320884	1256877	100.000	100.000



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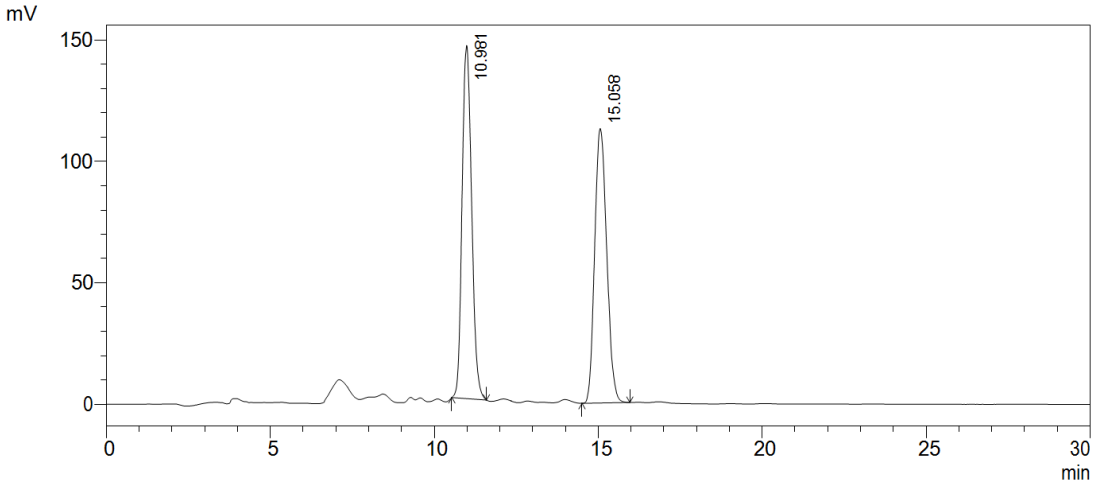
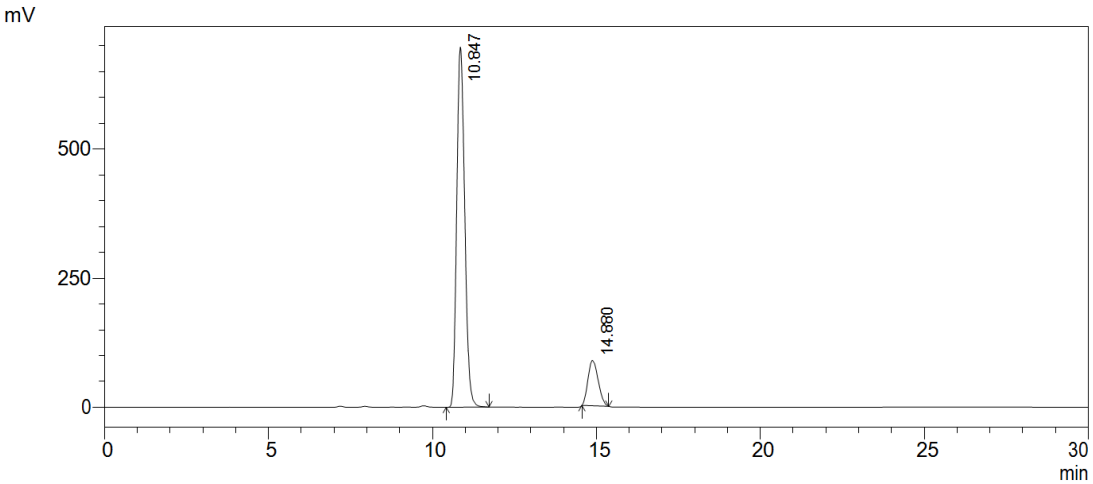


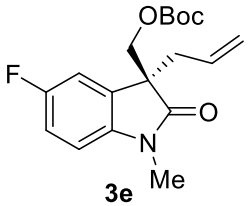
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.981	2953627	145512	50.542	56.267
2	15.058	2890223	113096	49.458	43.733
Total		5843850	258608	100.000	100.000

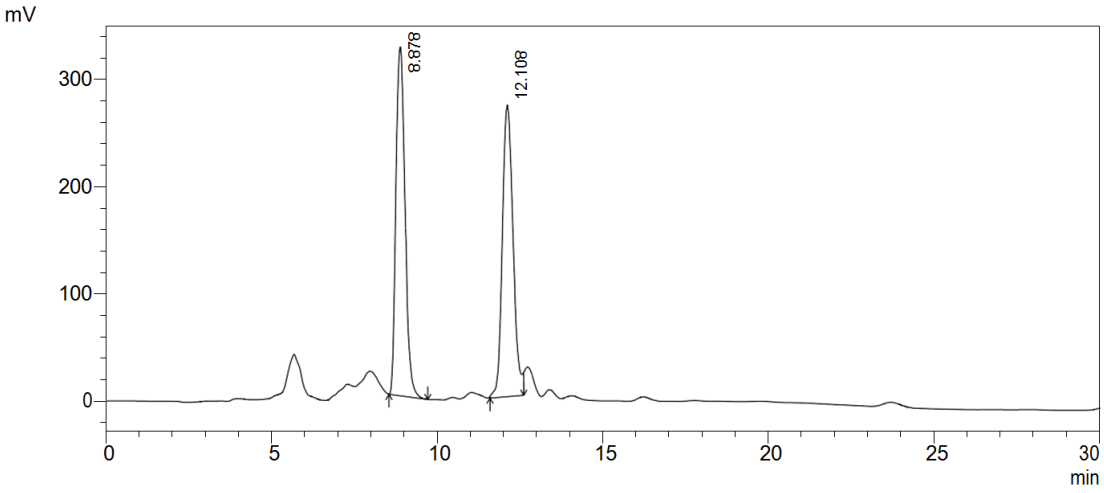


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.847	11797156	697977	86.098	88.795
2	14.880	1904841	88076	13.902	11.205
Total		13701997	786053	100.000	100.000

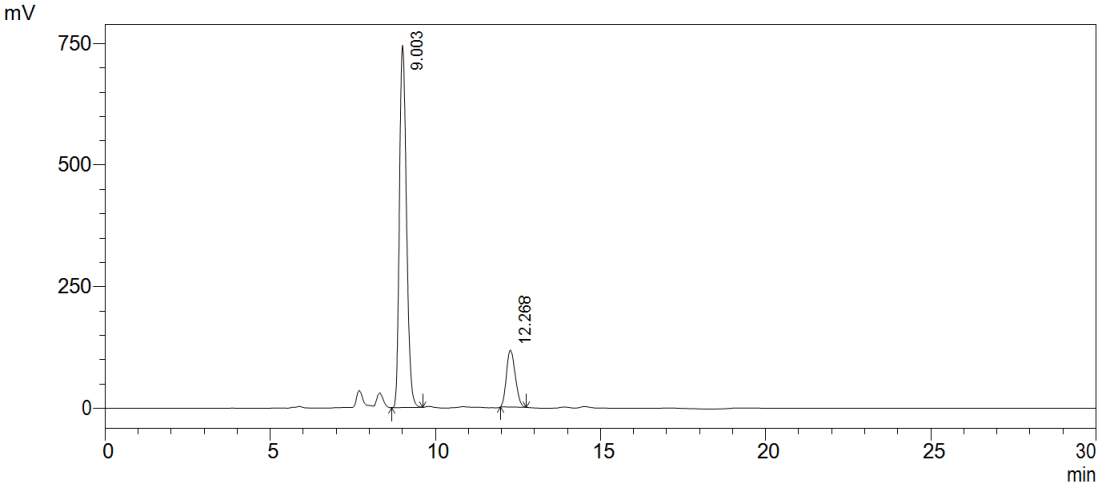


3e



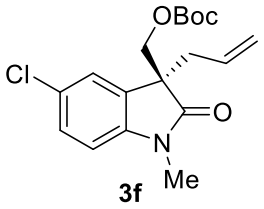
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.878	6212479	325704	50.329	54.474
2	12.108	6131307	272200	49.671	45.526
Total		12343786	597904	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.003	11019615	745527	83.483	86.400
2	12.268	2180220	117349	16.517	13.600
Total		13199835	862875	100.000	100.000



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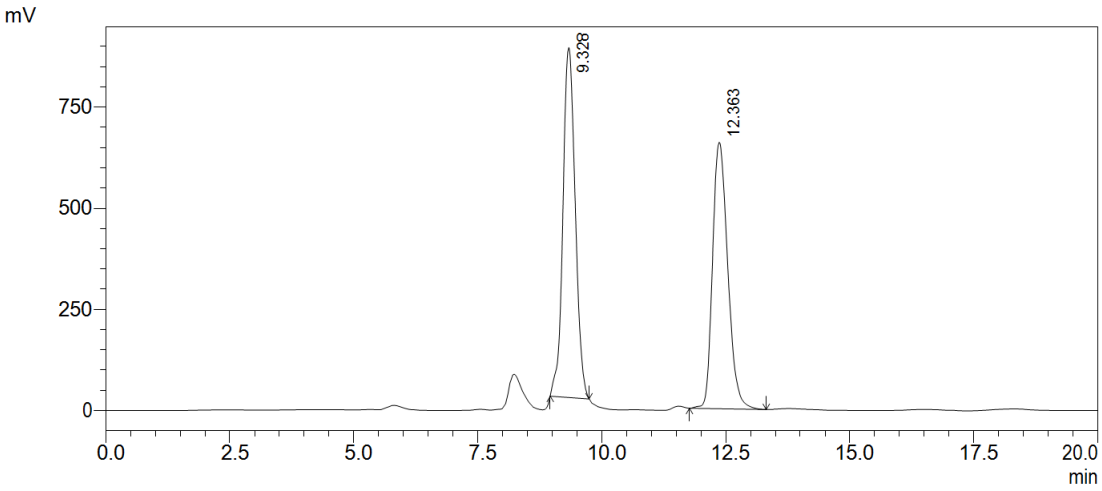
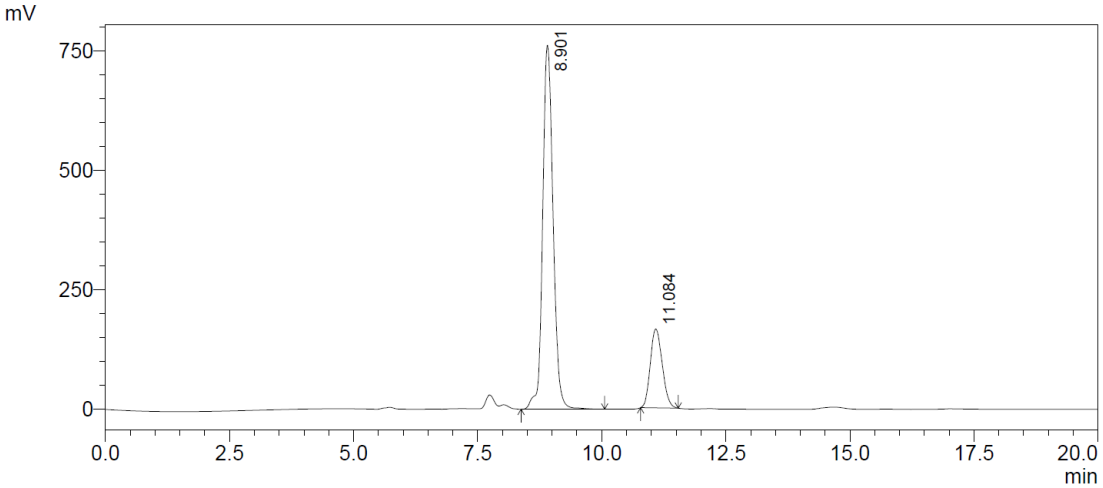


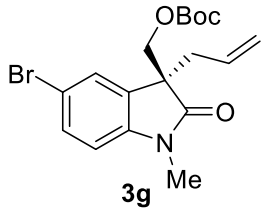
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.328	14947280	865628	51.556	56.777
2	12.363	14045316	658995	48.444	43.223
Total		28992596	1524623	100.000	100.000

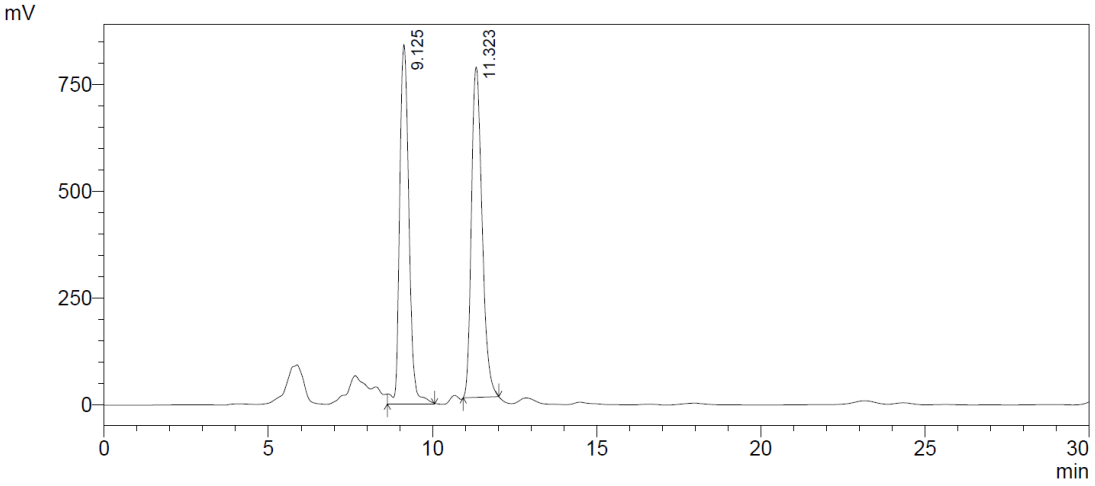


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.901	11135324	762007	80.134	82.200
2	11.084	2760517	165007	19.866	17.800
Total		13895841	927014	100.000	100.000

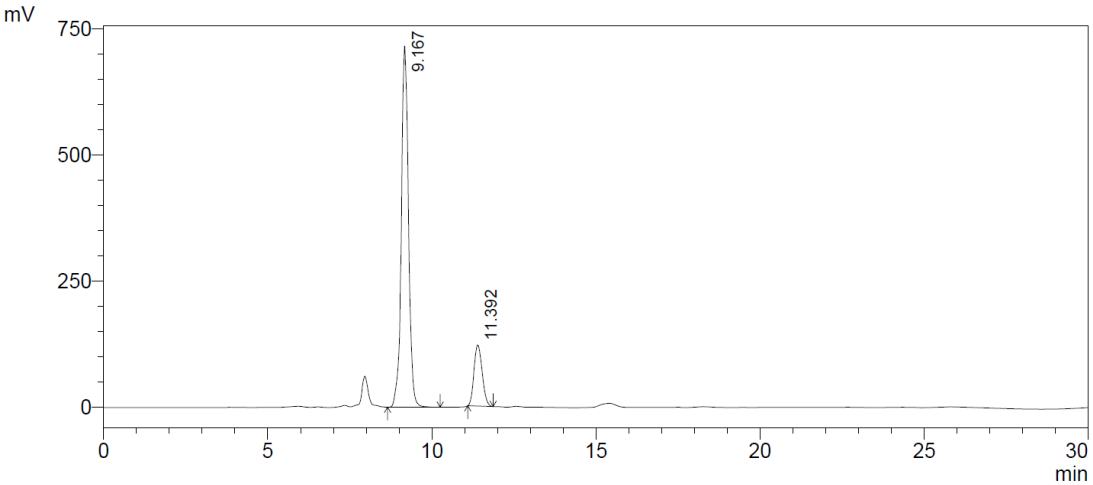


3g



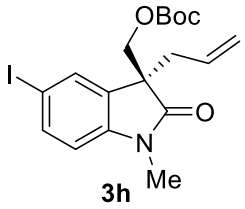
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.125	16568372	841494	48.727	52.115
2	11.323	17433828	773197	51.273	47.885
Total		34002200	1614691	100.000	100.000

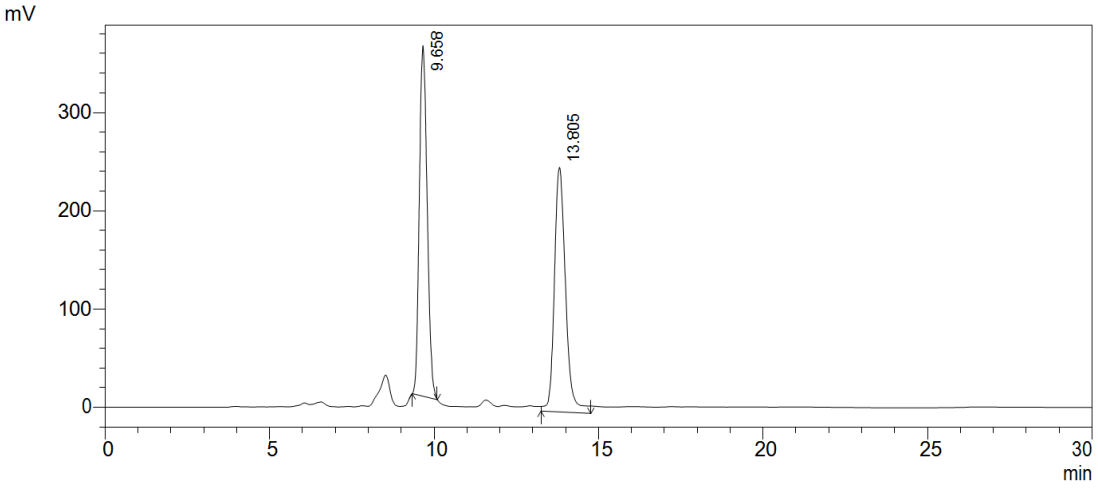


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.167	10850821	715259	83.803	85.528
2	11.392	2097130	121030	16.197	14.472
Total		12947951	836289	100.000	100.000

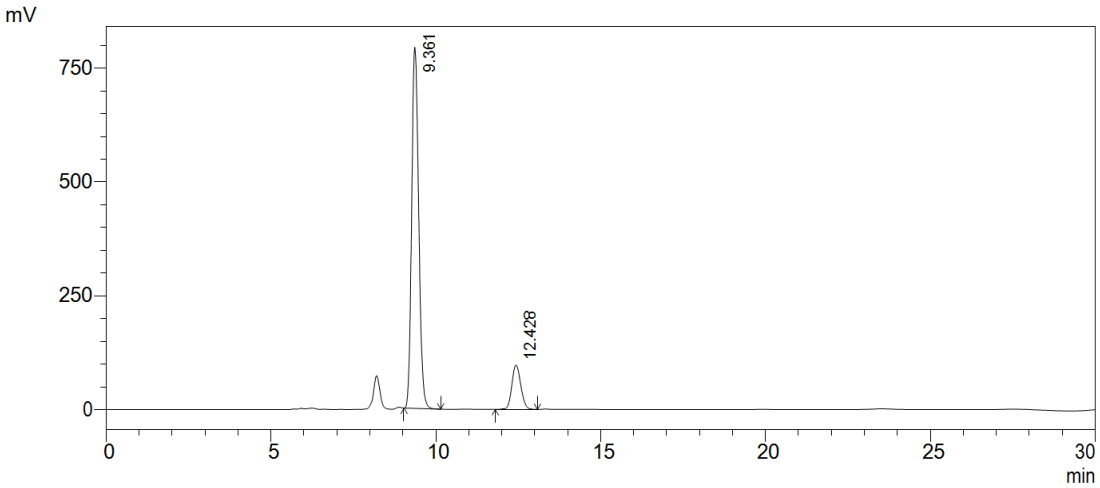


3h



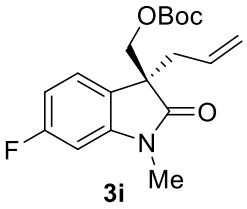
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.658	5930720	356810	50.013	58.891
2	13.805	5927681	249070	49.987	41.109
Total		11858401	605880	100.000	100.000

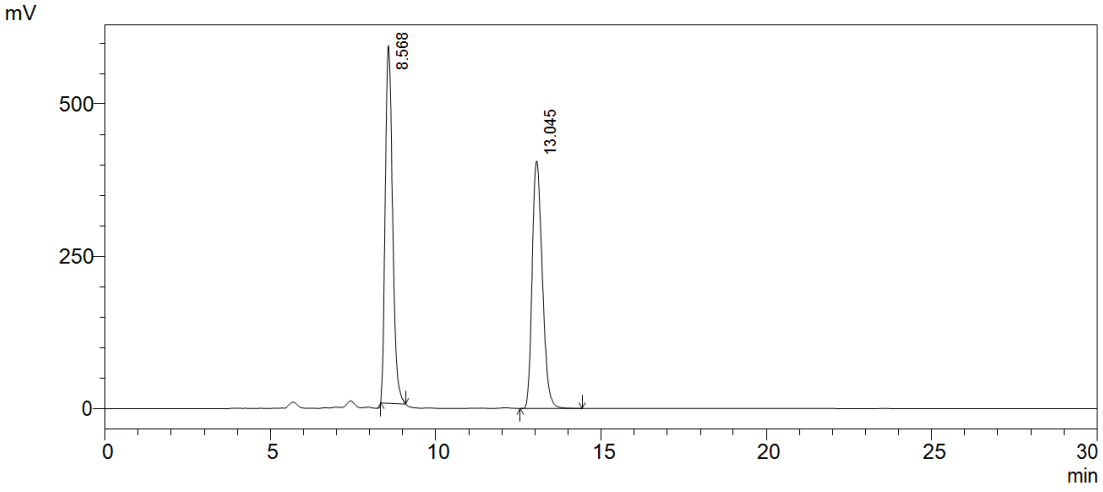


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.361	11759829	793974	86.421	89.077
2	12.428	1847793	97361	13.579	10.923
Total		13607622	891334	100.000	100.000

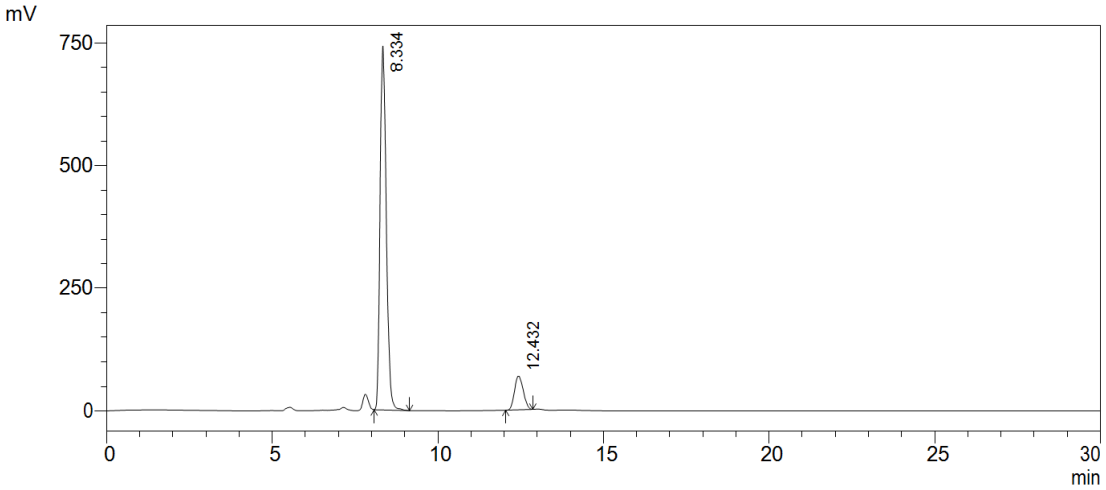


3i



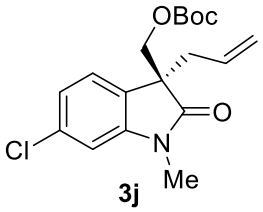
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.568	9029738	587567	51.083	59.117
2	13.045	8646966	406333	48.917	40.883
Total		17676704	993900	100.000	100.000

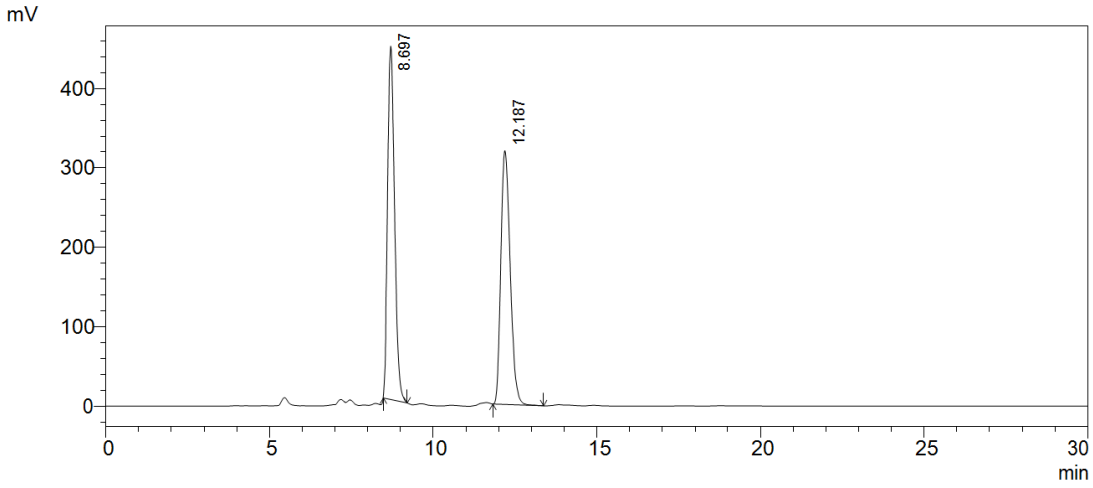


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.334	9706391	742329	88.422	91.412
2	12.432	1270968	69737	11.578	8.588
Total		10977359	812066	100.000	100.000

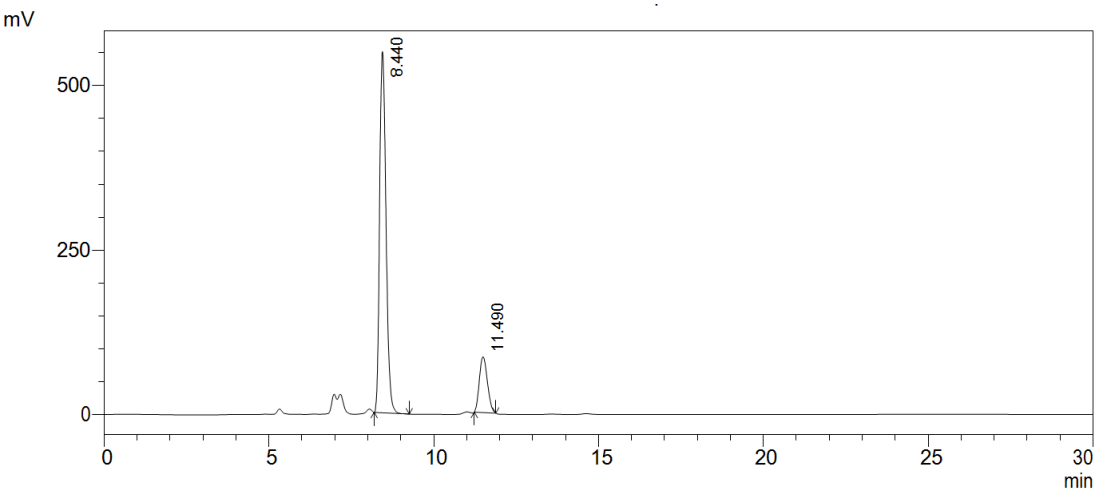


3j



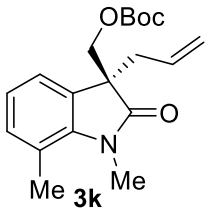
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.697	6605896	444907	50.959	58.202
2	12.187	6357389	319515	49.041	41.798
Total		12963285	764421	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.440	7360072	549358	83.707	86.626
2	11.490	1432625	84815	16.293	13.374
Total		8792697	634173	100.000	100.000



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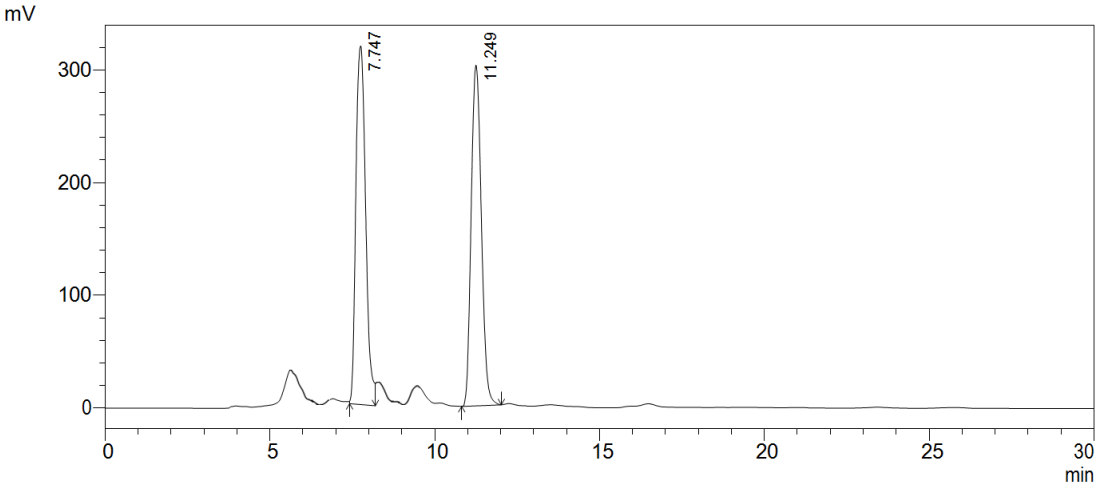
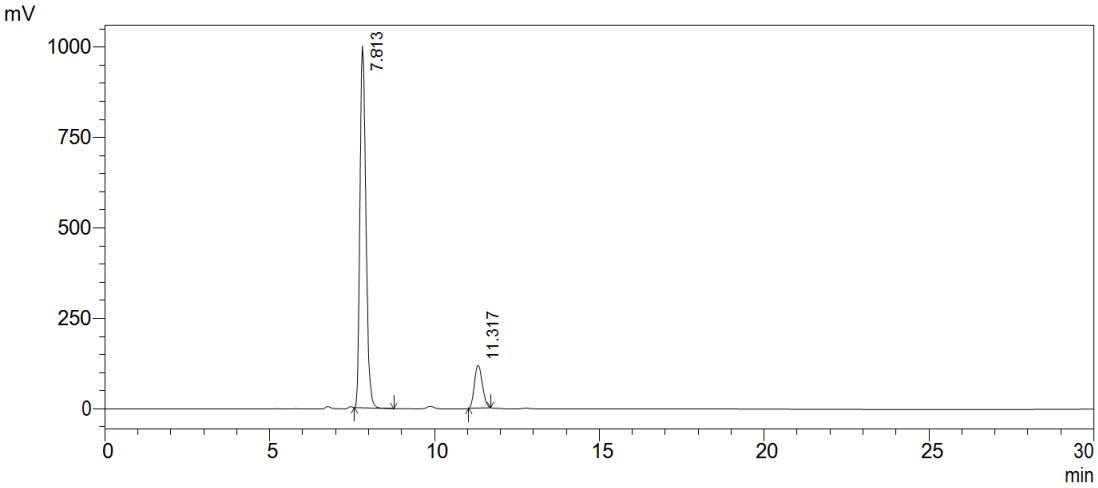


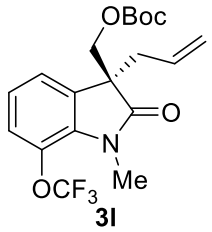
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.747	6533673	318008	50.286	51.305
2	11.249	6459300	301824	49.714	48.695
Total		12992974	619832	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.813	12666706	1000820	86.546	89.425
2	11.317	1969176	118355	13.454	10.575
Total		14635882	1119175	100.000	100.000



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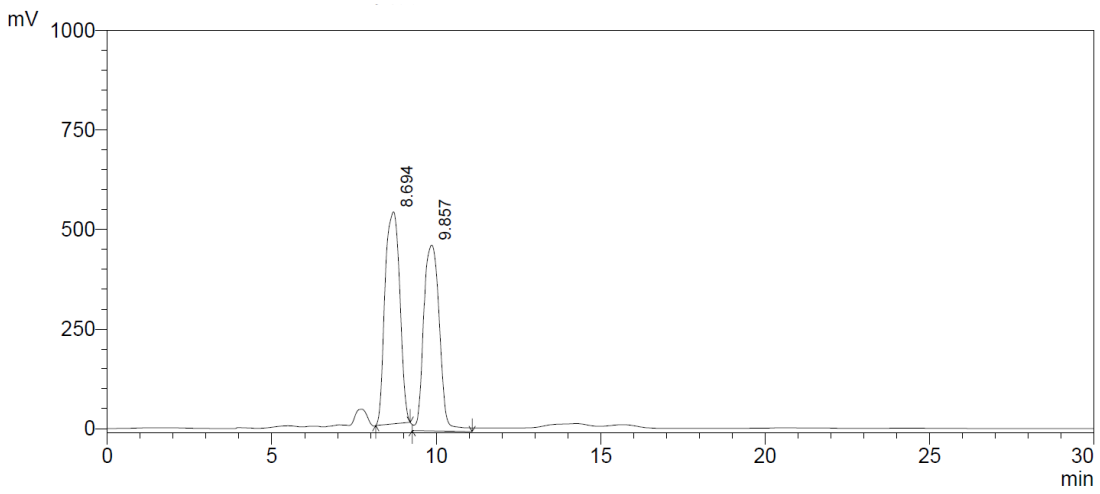
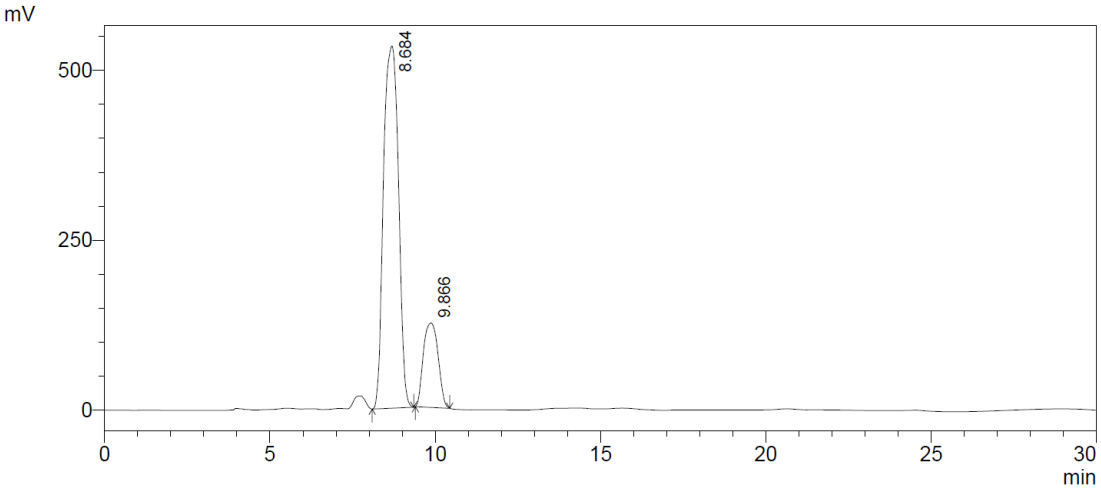


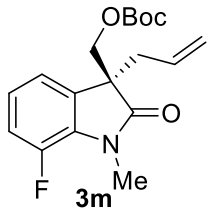
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.694	16591417	532832	51.348	53.279
2	9.857	15720527	467254	48.652	46.721
Total		32311943	1000085	100.000	100.000

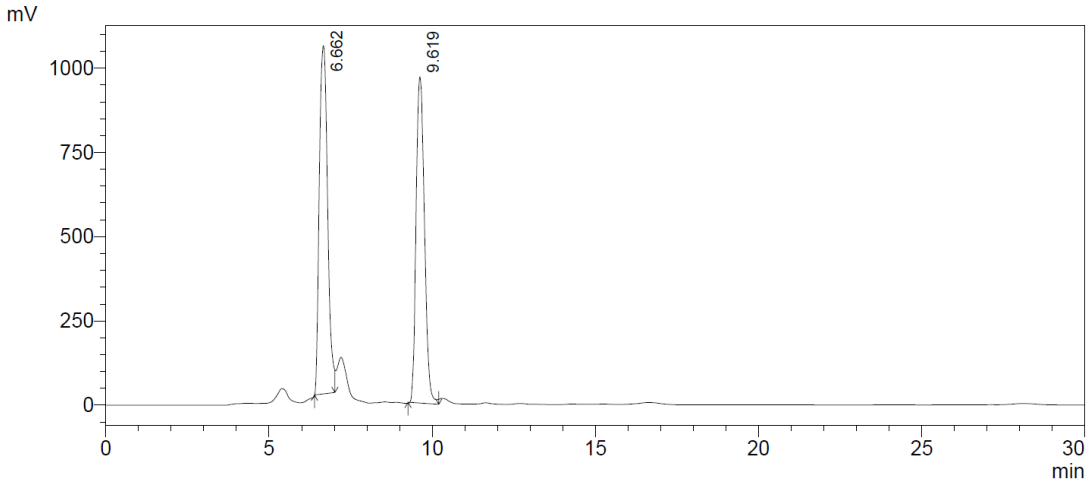


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.684	16789721	532773	81.327	81.085
2	9.866	3855111	124278	18.673	18.915
Total		20644833	657051	100.000	100.000

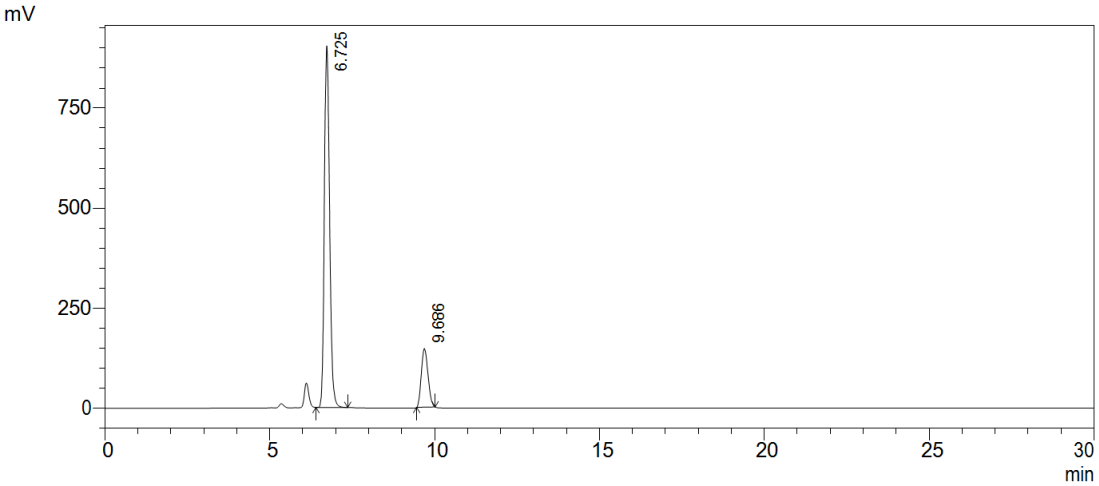


3m



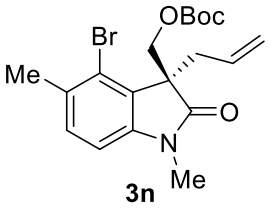
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.662	18192296	1033320	51.354	51.624
2	9.619	17232925	968290	48.646	48.376
Total		35425221	2001610	100.000	100.000

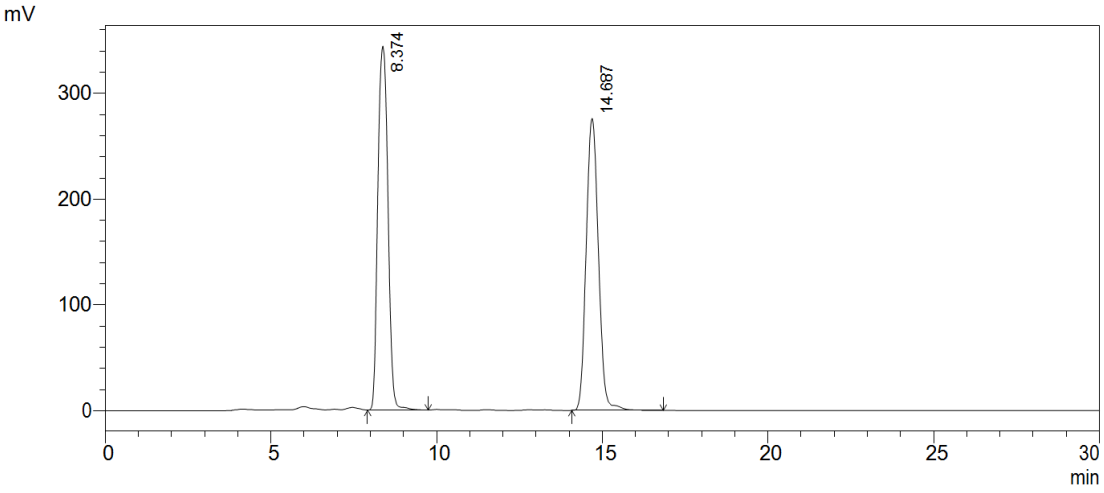


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.725	10008884	903681	82.970	86.025
2	9.686	2054378	146803	17.030	13.975
Total		12063262	1050484	100.000	100.000

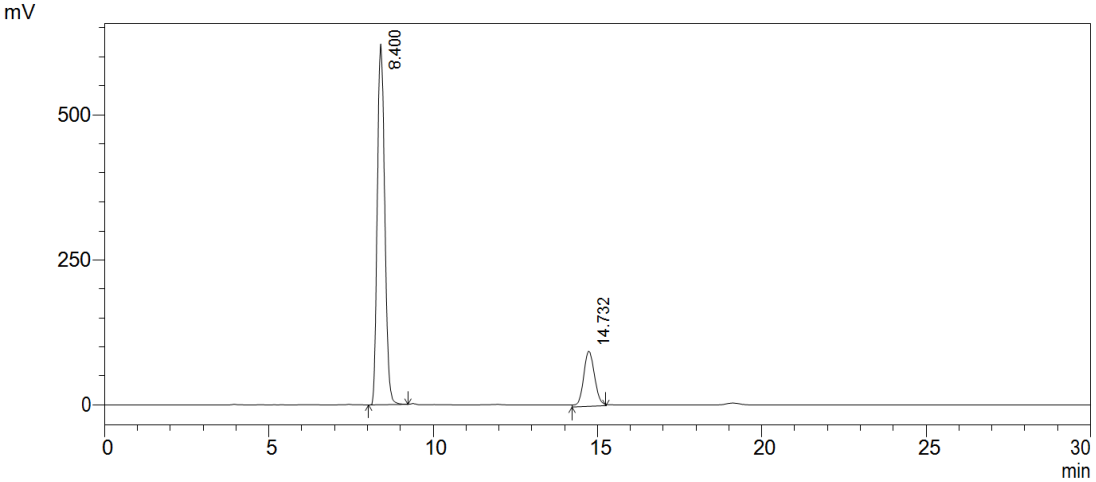


3n



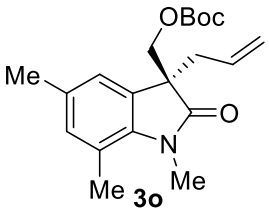
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.374	7316099	344098	50.821	55.488
2	14.687	7079659	276028	49.179	44.512
Total		14395758	620125	100.000	100.000

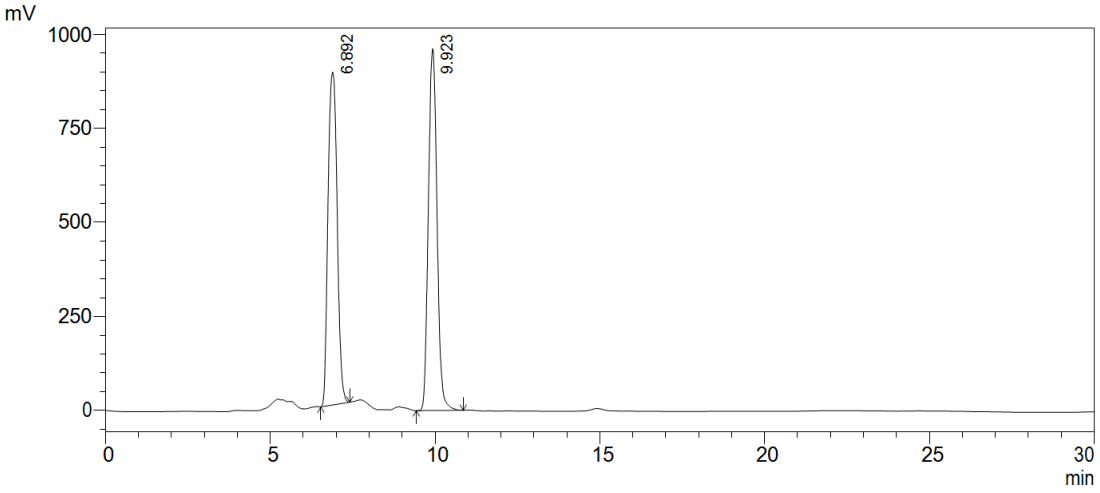


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.400	9796157	621959	81.489	86.719
2	14.732	2225276	95250	18.511	13.281
Total		12021433	717209	100.000	100.000

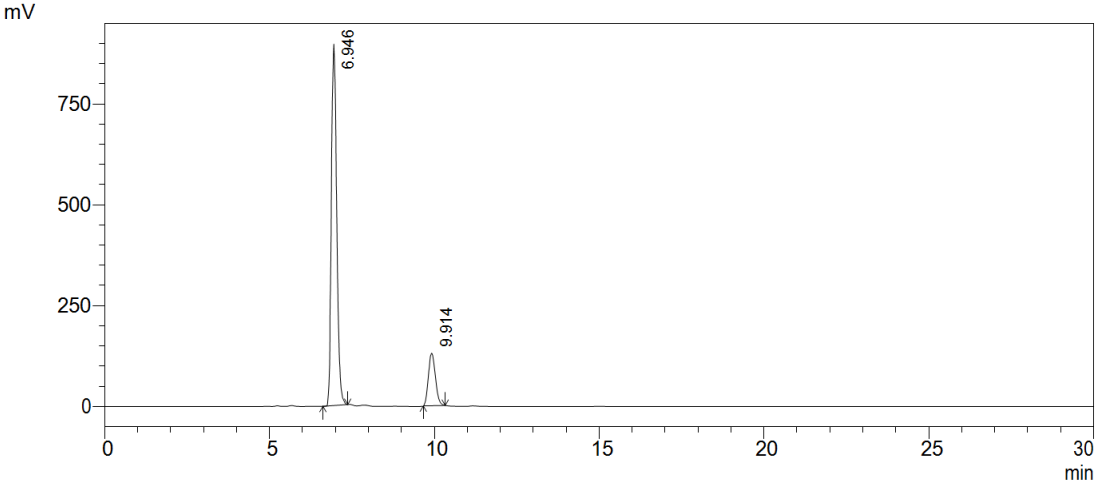


3o



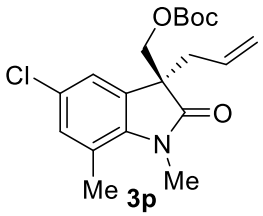
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.892	17067852	885008	49.329	47.922
2	9.923	17532333	961772	50.671	52.078
Total		34600185	1846780	100.000	100.000

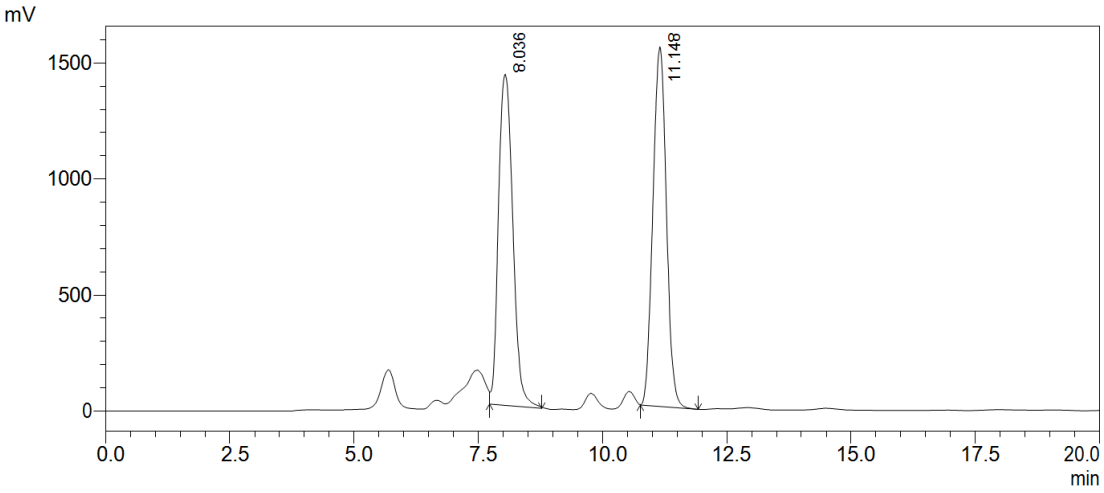


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.946	10080843	896214	83.974	87.307
2	9.914	1923873	130300	16.026	12.693
Total		12004715	1026514	100.000	100.000

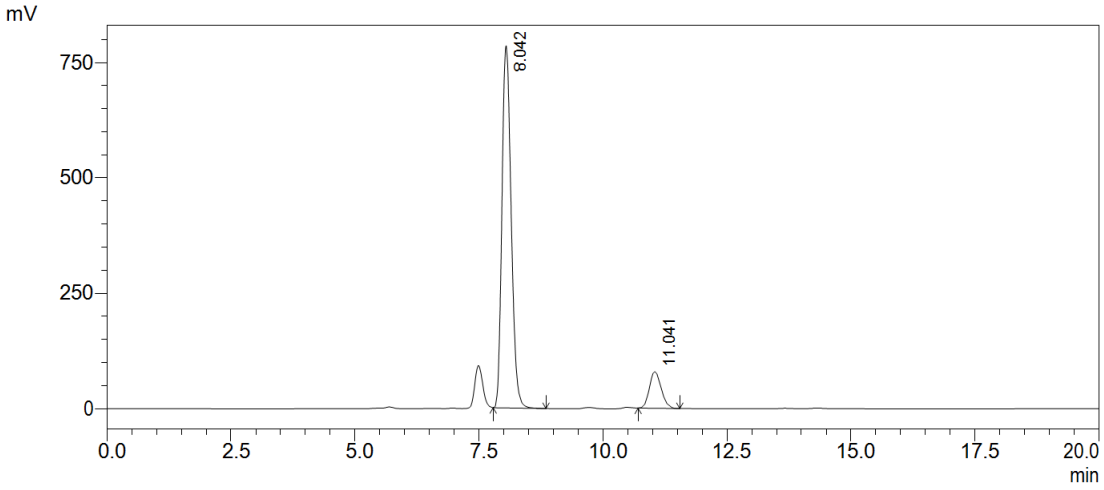


3p



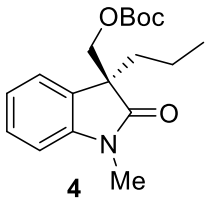
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.036	28620885	1426618	49.525	47.924
2	11.148	29170144	1550223	50.475	52.076
Total		57791030	2976842	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.042	10143698	784697	88.609	90.778
2	11.041	1304048	79713	11.391	9.222
Total		11447746	864411	100.000	100.000



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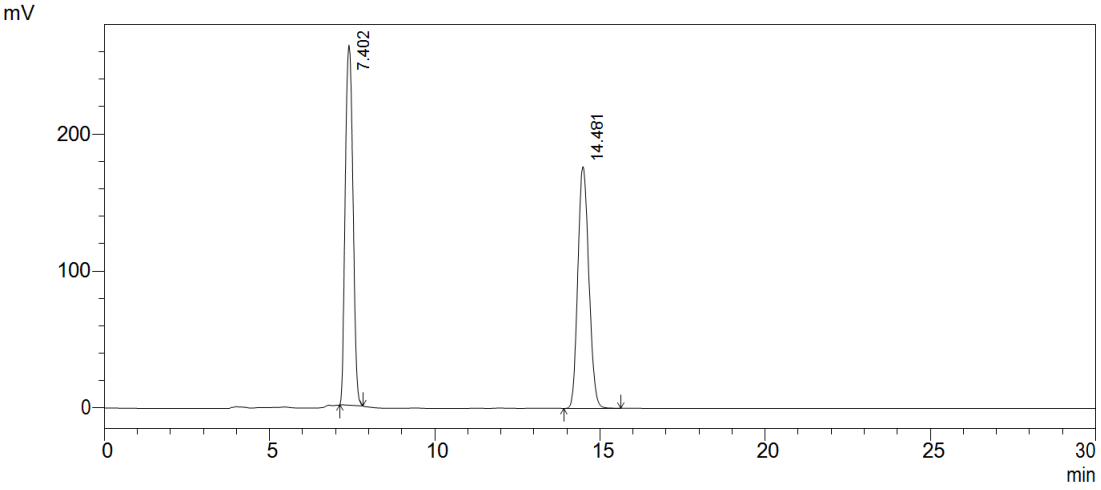
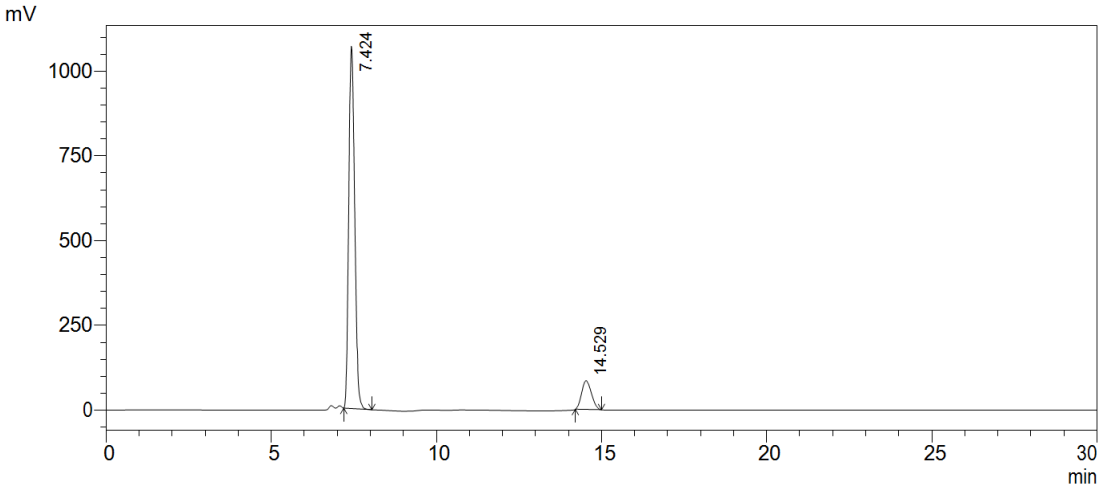


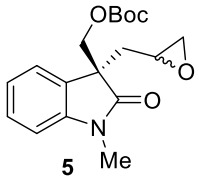
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.402	4256790	262743	51.075	59.838
2	14.481	4077674	176351	48.925	40.162
Total		8334464	439093	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.424	13389030	1069135	88.495	92.672
2	14.529	1740736	84544	11.505	7.328
Total		15129766	1153679	100.000	100.000



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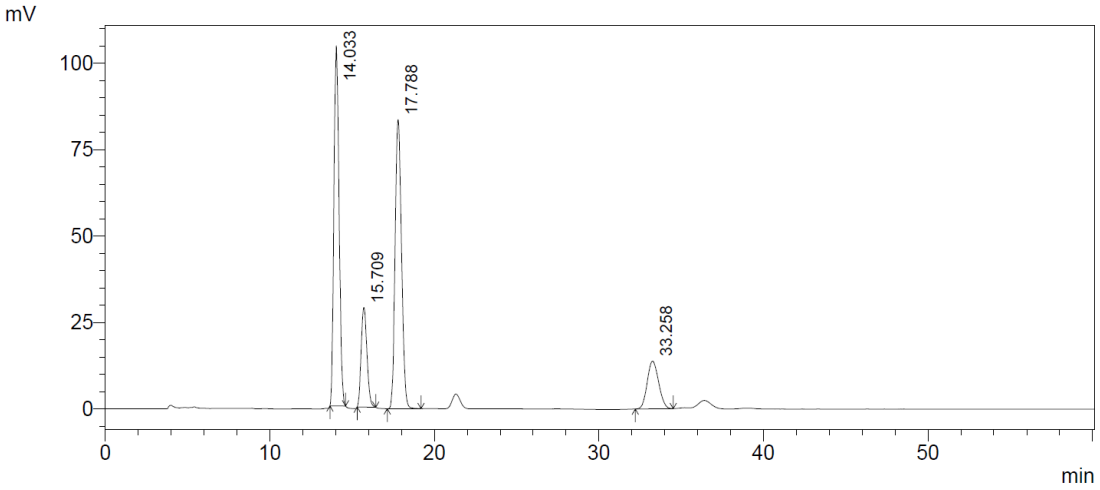
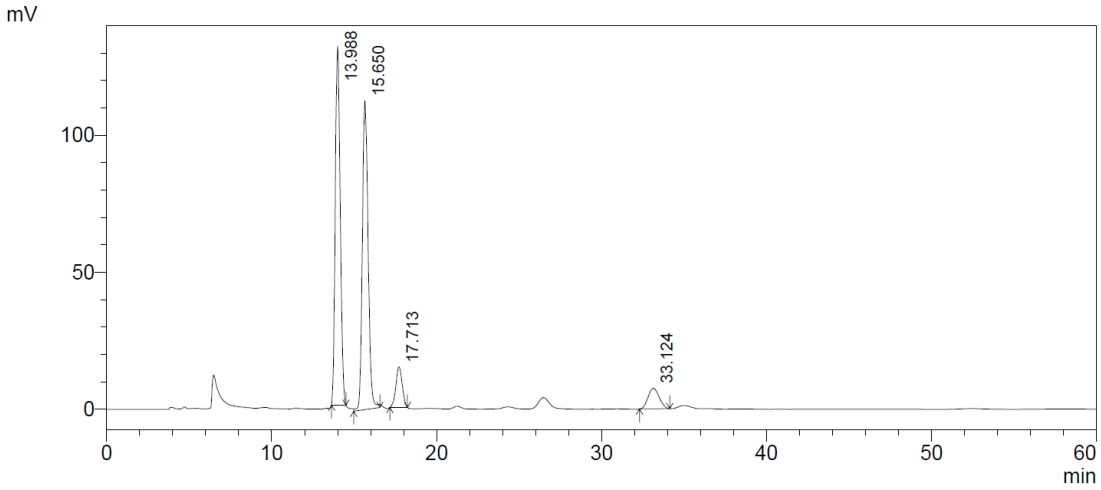


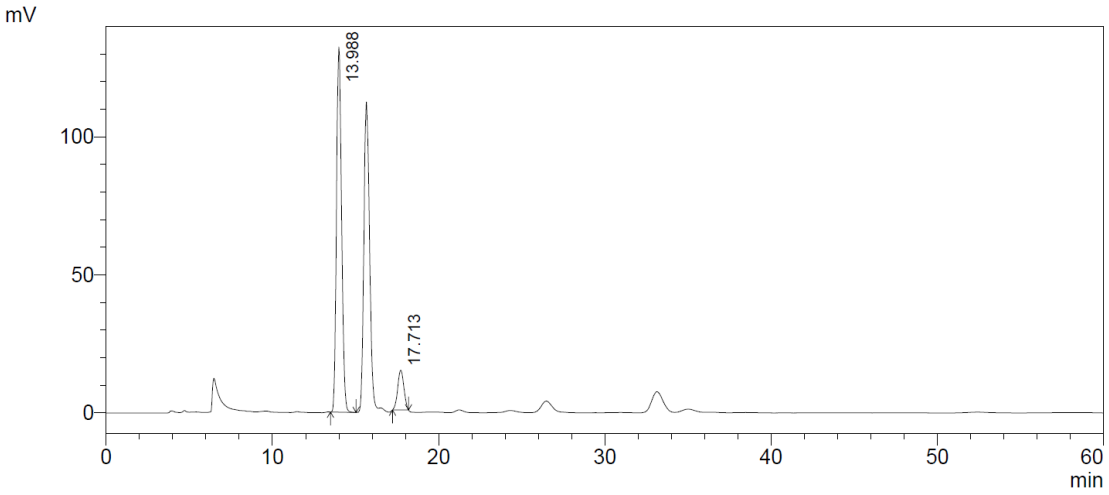
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.033	2275647	104196	38.516	45.210
2	15.709	704541	28838	11.925	12.513
3	17.788	2265434	83641	38.343	36.291
4	33.258	662706	13797	11.216	5.986
Total		5908328	230472	100.000	100.000



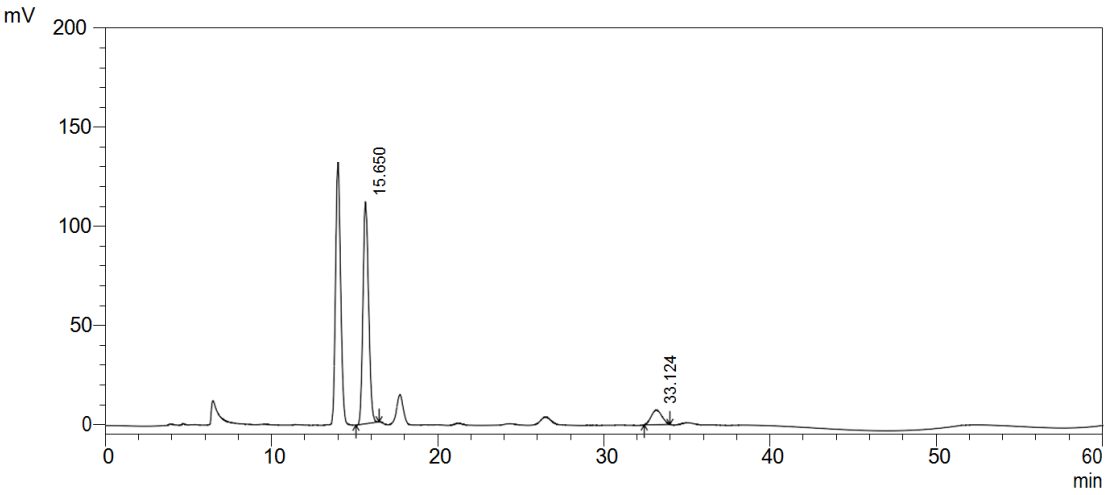
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.988	2745078	130979	44.120	49.258
2	15.650	2731955	112650	43.909	42.365
3	17.713	394899	14767	6.347	5.554
4	33.124	349874	7507	5.623	2.823
Total		6221806	265903	100.000	100.000



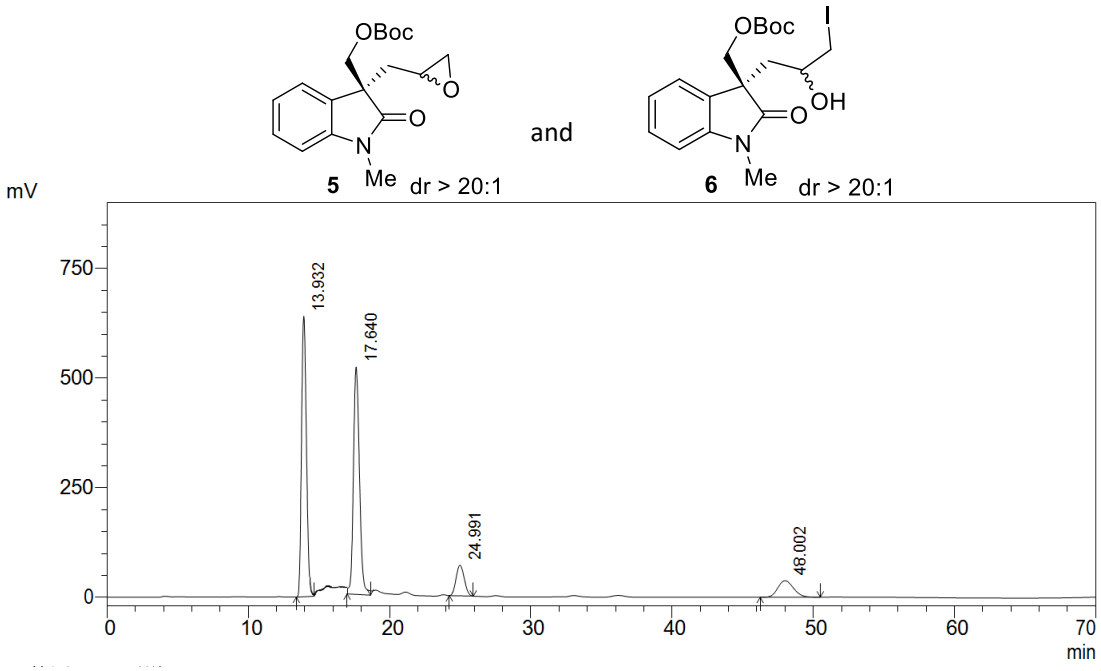
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.988	2819750	132212	88.375	90.196
2	17.713	370932	14371	11.625	9.804
Total		3190682	146582	100.000	100.000



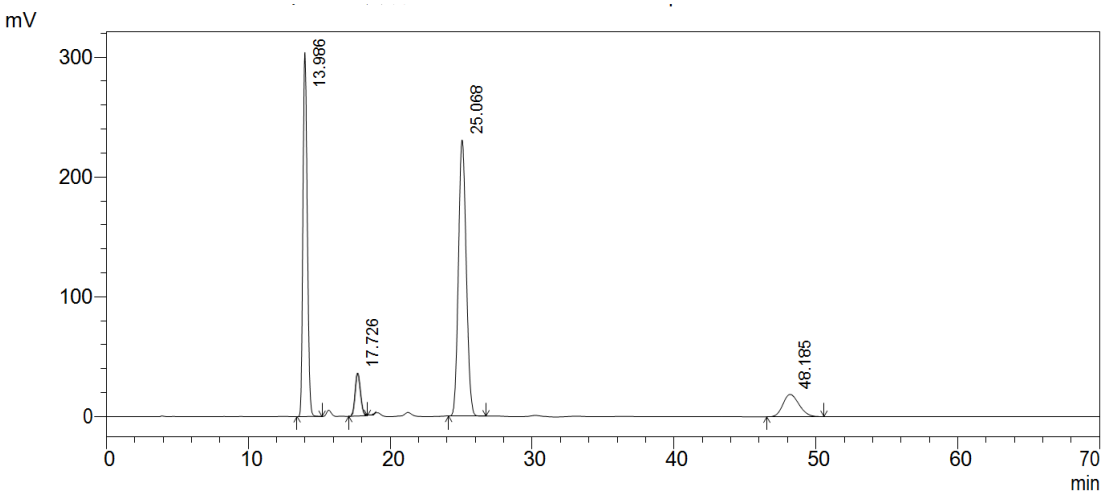
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.650	2638700	111708	89.062	93.904
2	33.124	324071	7252	10.938	6.096
Total		2962772	118960	100.000	100.000



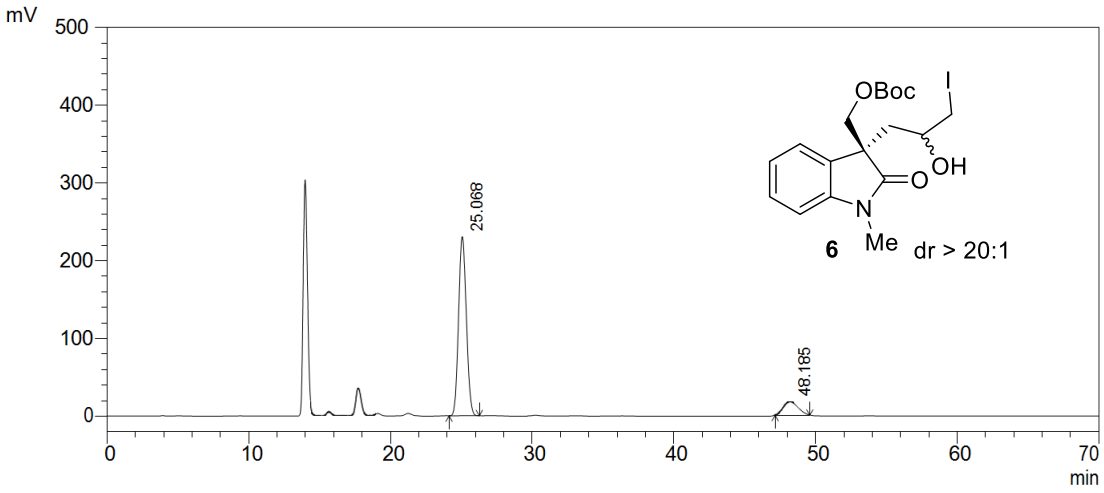
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.932	15299904	640298	41.843	50.526
2	17.640	15510325	519065	42.418	40.960
3	24.991	2830202	70026	7.740	5.526
4	48.002	2924809	37868	7.999	2.988
Total		36565242	1267256	100.000	100.000



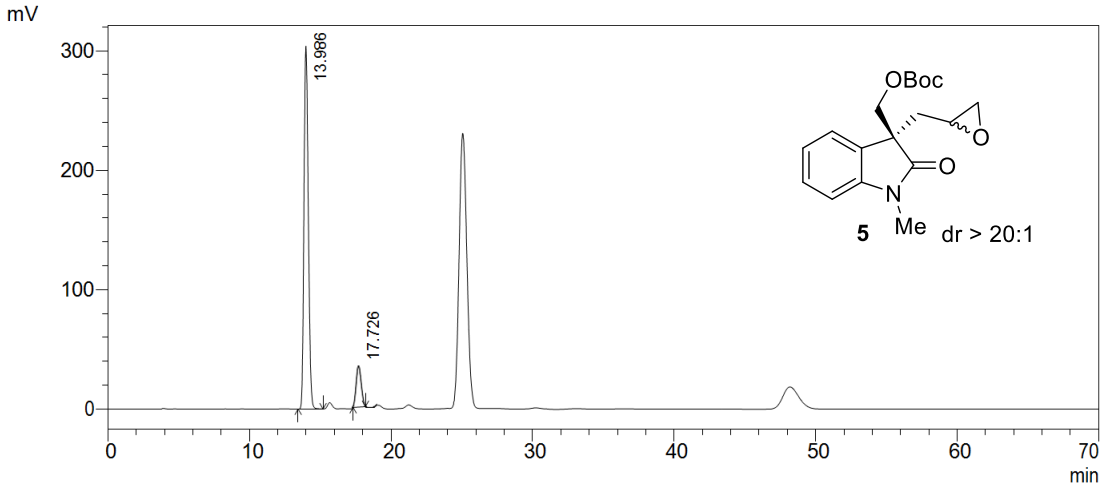
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.986	6444545	303928	36.604	51.628
2	17.726	922736	35753	5.241	6.073
3	25.068	8765055	230380	49.785	39.135
4	48.185	1473557	18623	8.370	3.163
Total		17605894	588684	100.000	100.000



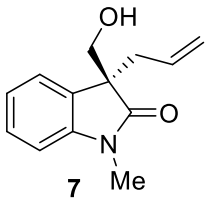
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	25.068	8754642	230320	87.463	92.996
2	48.185	1254932	17346	12.537	7.004
Total		10009575	247666	100.000	100.000

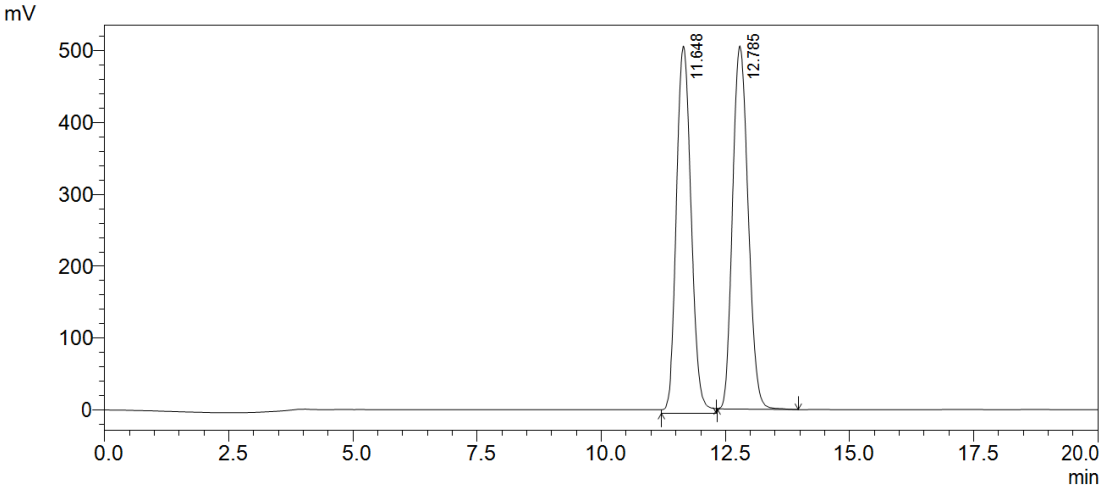


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.986	6444545	303928	88.397	89.820
2	17.726	845884	34448	11.603	10.180
Total		7290430	338376	100.000	100.000

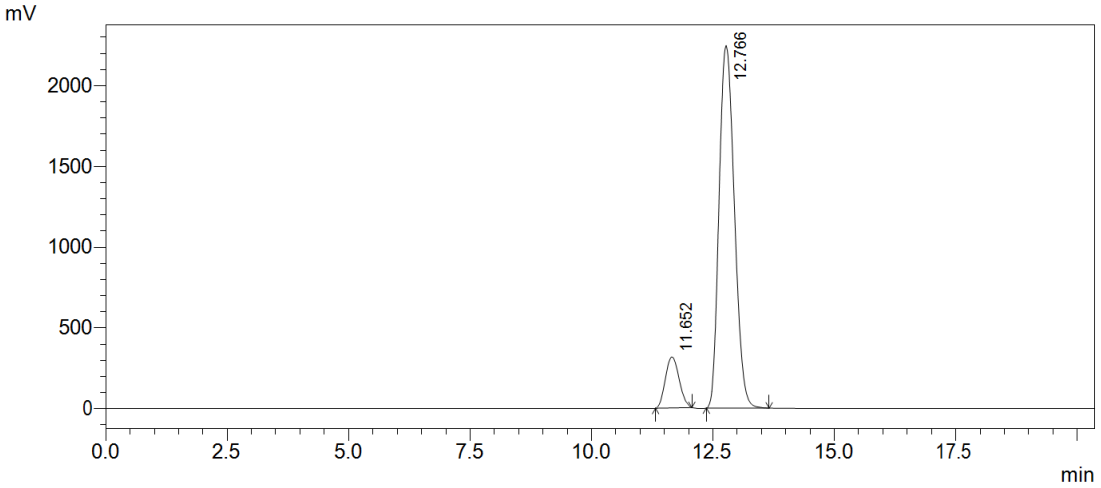


7



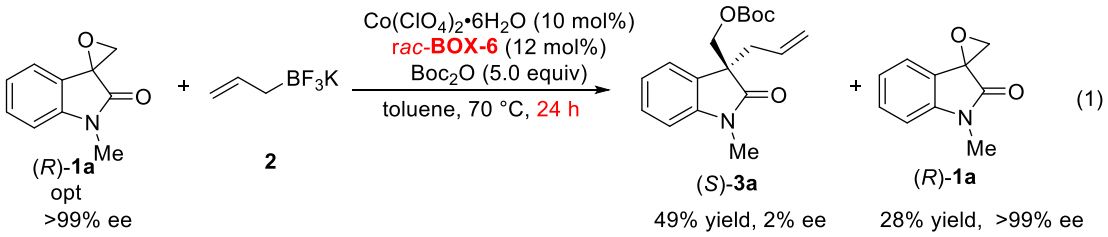
PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.648	10664562	511637	49.176	50.282
2	12.785	11021934	505897	50.824	49.718
Total		21686496	1017534	100.000	100.000

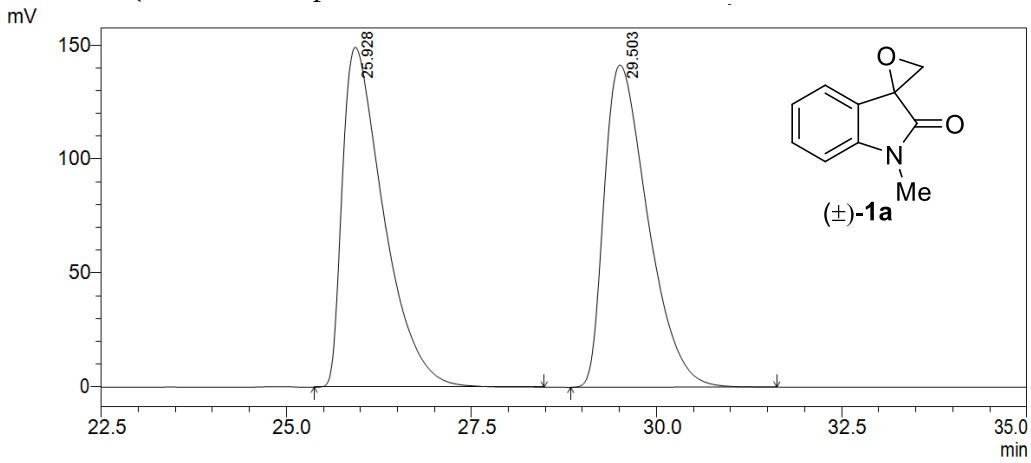


PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.652	6162146	315744	11.125	12.325
2	12.766	49226269	2246019	88.875	87.675
Total		55388415	2561763	100.000	100.000

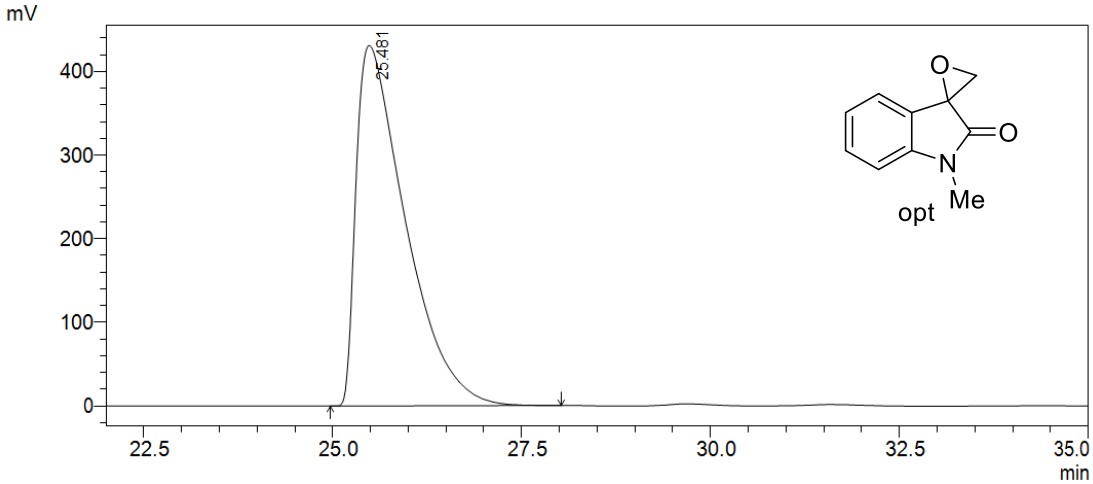


1a HPLC (Daicel Chiralpak OJ-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min.)



PeakTable

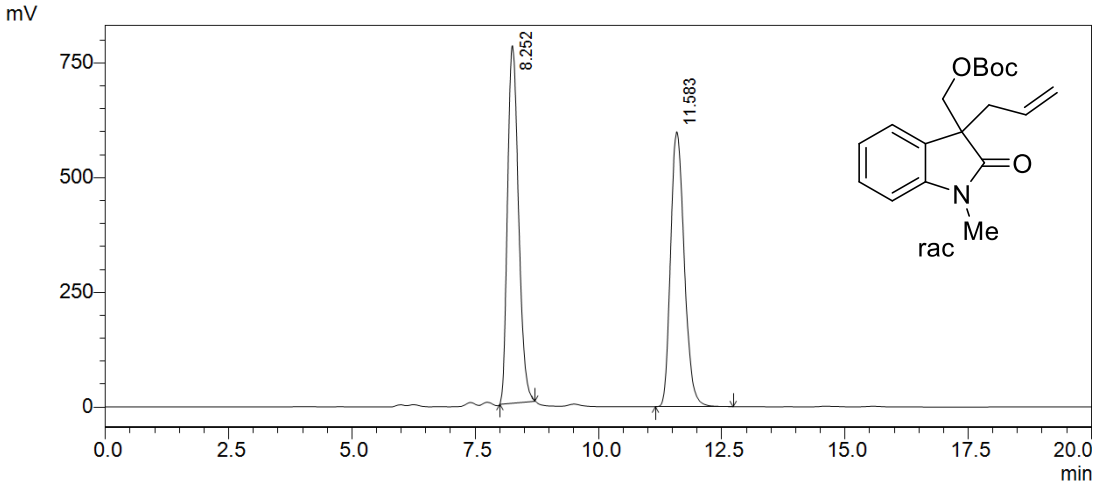
Peak#	Ret. Time	Area	Height	Area %	Height %
1	25.928	5791739	149254	49.966	51.340
2	29.503	5799733	141464	50.034	48.660
Total		11591472	290719	100.000	100.000



PeakTable

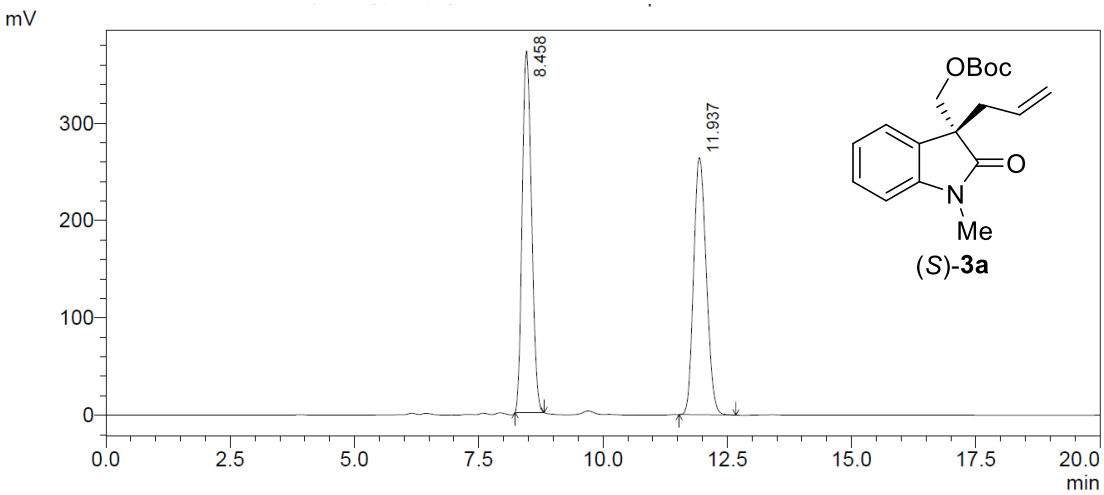
Peak#	Ret. Time	Area	Height	Area %	Height %
1	25.481	19589413	431225	100.000	100.000
Total		19589413	431225	100.000	100.000

3a HPLC (Daicel Chiralpak AD-H, hexane/*i*-PrOH = 90/10, 254 nm, 0.8 mL/min.)



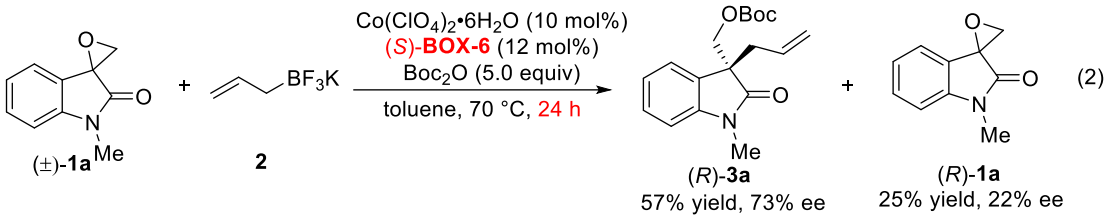
PeakTable

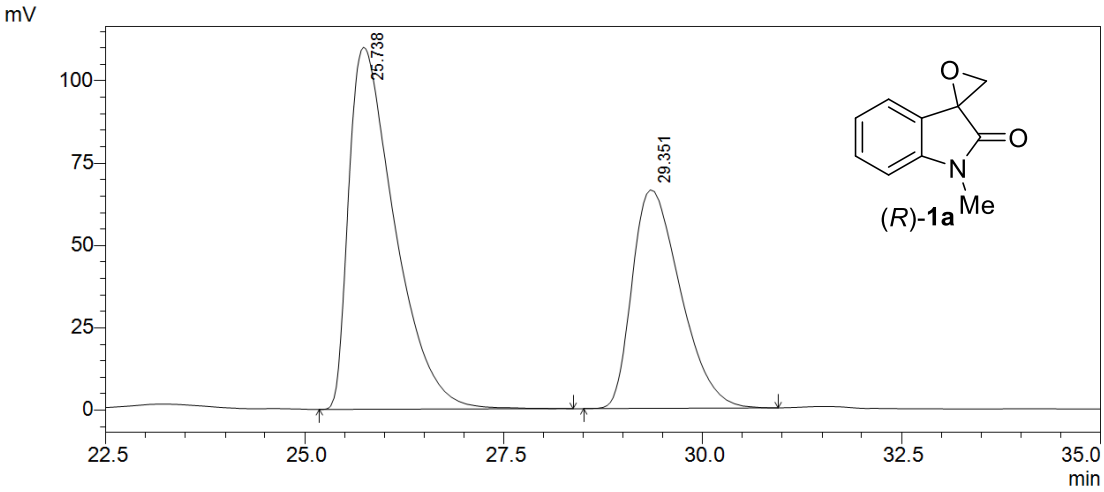
Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.252	12066139	779455	51.111	56.560
2	11.583	11541616	598646	48.889	43.440
Total		23607755	1378100	100.000	100.000



PeakTable

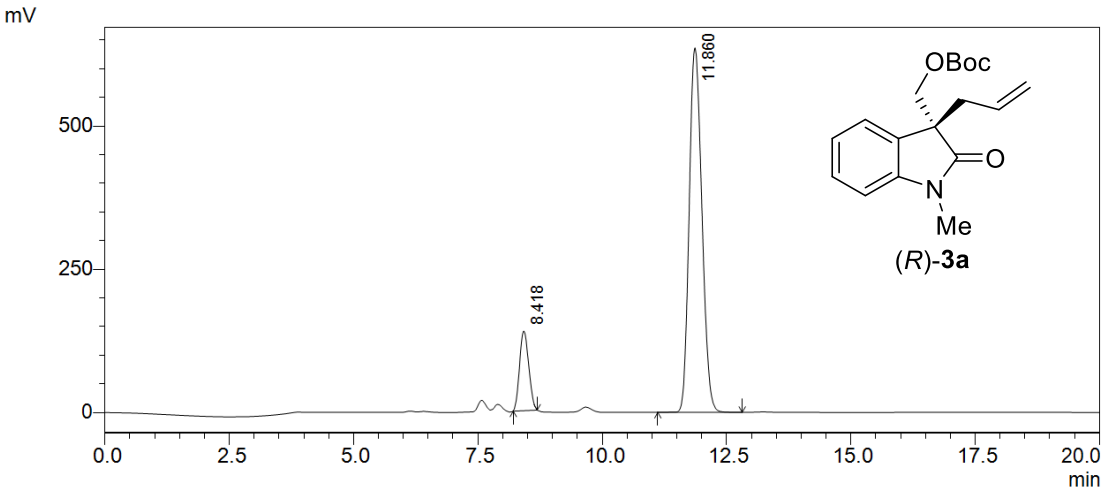
Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.458	4854673	371509	50.915	58.427
2	11.937	4680144	264338	49.085	41.573
Total		9534817	635847	100.000	100.000





PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	25.738	4417917	109992	61.141	62.348
2	29.351	2807905	66424	38.859	37.652
Total		7225822	176417	100.000	100.000



PeakTable

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.418	1770303	138809	13.515	17.910
2	11.860	11328631	636245	86.485	82.090
Total		13098934	775054	100.000	100.000