

## Supporting Information for

### **Asymmetric Total Synthesis of Montanine-type Amaryllidaceae**

#### **Alkaloids**

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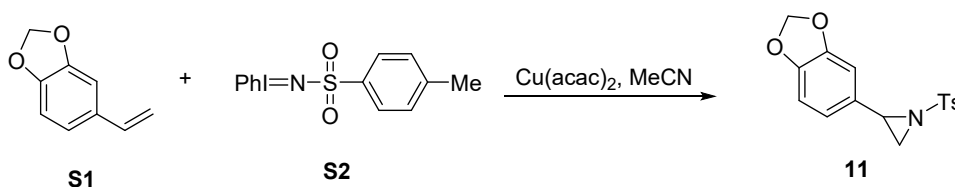
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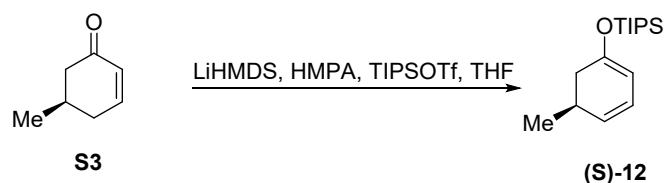
## 1. General experimental

All reactions sensitive to air or moisture were carried out under argon atmosphere in dry, freshly distilled, solvents under anhydrous conditions, unless otherwise noted. Anhydrous THF, DME and toluene were distilled over sodium benzophenone ketyl under Argon. Anhydrous  $\text{CH}_2\text{Cl}_2$  was distilled over calcium hydride under Argon. Anhydrous MeOH was distilled over magnesium under Argon. All other solvents and reagents were used as obtained from commercial sources without further purification. Reactions were magnetically stirred and monitored by thin layer chromatography (TLC) with 0.15-0.2 mm pre-coated silica gel (10-40  $\mu\text{m}$ ) plates, using UV light as the visualizing agent or aqueous potassium permanganate and ethanolic phosphomolybdic acid as developing agents. Column chromatography was performed with silica gel (200-300 mesh) under pressure. NMR spectra were recorded on ( $^1\text{H}$  at 400 MHz, 600 MHz and  $^{13}\text{C}$  at 100 MHz, 150 MHz) Bruker spectrometers. Chemical shifts ( $\delta$ ) were given in ppm with reference to solvent signals [ $^1\text{H}$  NMR:  $\text{CDCl}_3$  (7.26),  $\text{CD}_3\text{OD}$  (3.31),  $\text{CD}_3\text{COCD}_3$  (2.05);  $^{13}\text{C}$  NMR:  $\text{CDCl}_3$  (77.2),  $\text{CD}_3\text{OD}$  (49.0),  $\text{CD}_3\text{COCD}_3$  (29.7)]. The following abbreviations were used to explain multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad. IR spectra were collected on Perkin Elmer FT-IR L1600300 spectrometer. High-resolution mass spectra were recorded on Bruker microTOF II.

## 2. Experimental procedures and characterization data

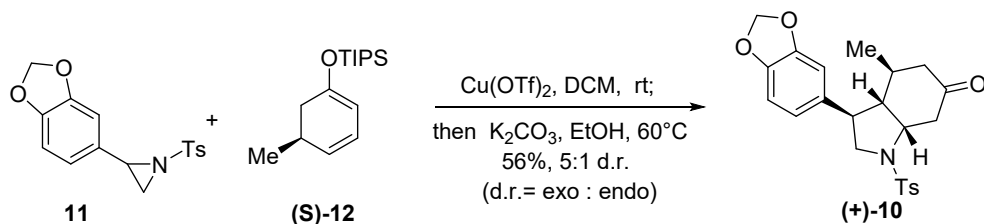


Following a reported procedure [1] with slight modifications, to a solution of the (N-(arenesulfonylimino))phenyliodine **S2** [2] (PhI=NTs, 3.8 g, 10.12 mmol, 1.0 equiv) in dry CH<sub>3</sub>CN (40 mL) were added sequentially the alkene **S1** (2.2 g, 15.18 mmol, 1.5 equiv) and Cu(acac)<sub>2</sub> (79 mg, 0.3 mmol, 0.03 equiv) at RT. After stirring at the same temperature for 30 min, completion of reaction was realized as a clear solution formed upon dissolution of PhI=NTs. Et<sub>3</sub>N (3.0 v%) was added to the mixture before filtered through a pad of Celite (pretreated with EtOAc containing 0.5 v% Et<sub>3</sub>N) and concentrated. The residue was purified by flash column chromatography (petroleum ether/EtOAc, 6:1→3:1, containing 1.0 v% Et<sub>3</sub>N) to afford compound **11** (2.3 g, 73%) as a white solid. The spectral data of compound **11** agree with those previously reported [3].



Following a reported procedure [4] with slight modifications, to a solution of (5R)-5-Methyl-2-cyclohexen-1-one **S3** [5] (2.0 g, 18.16 mmol, 1.0 equiv) in THF (90 mL) was added HMPA (8 mL, 45.4 mmol, 2.5 equiv) at -78 °C. After 10 min, LiHMDS (20 mL, 1.1 equiv, 1.0 M in THF/ethylbenzene) was added dropwise and the mixture was continued to stir for 1 h. The reaction mixture was then allowed to stir at 0 °C for another 1 h, after then TIPSOTf (4.9 mL, 18.16 mmol, 1.0 equiv) was added dropwise at -78 °C. After stirring at this temperature for 1 h, the reaction mixture was quenched with sat. aq. NaHCO<sub>3</sub> (20 mL) and extracted with *n*-hexane (3 x 20 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (petroleum ether, 1% Et<sub>3</sub>N) to afford compound **(S)-12** (3.86 g, 80%) as a colorless oil.

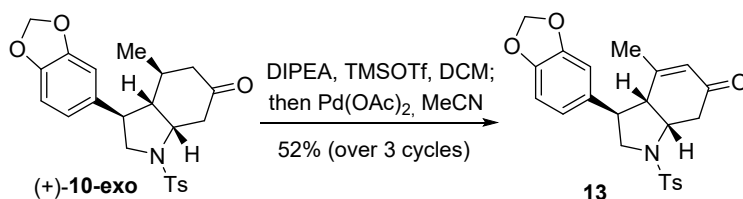
**Compound (S)-12:**  $[\alpha]_D^{23}$ : -32.1 (*c* 1.1, CHCl<sub>3</sub>); **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 5.77 (ddd, *J* = 9.6, 6.0, 2.0 Hz, 1H), 5.27 (dd, *J* = 9.6, 3.6 Hz, 1H), 5.09 (d br, *J* = 6.0 Hz, 1H), 2.59 – 2.54 (m, 1H), 2.29 (dd, *J* = 16.4, 8.4 Hz, 1H), 2.06 (ddd, *J* = 16.4, 13.6, 1.2, 1H), 1.22 – 1.15 (m, 3H), 1.12 – 1.09 (m, 18H), 1.06 (d, *J* = 7.2 Hz, 3H); **<sup>13</sup>C NMR** (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 153.9, 125.0, 123.8, 101.2, 37.5, 30.5, 20.6, 18.2 (6C), 12.9 (3C); **IR** (KBr): 2936, 1730, 1605, 1455, 1288, 1074, 815, 701 cm<sup>-1</sup>; **HRMS** (APCI, *m/z*) calcd for C<sub>16</sub>H<sub>31</sub>OSi[M+H]<sup>+</sup>: 267.2139, found 267.2140.



A solution of Cu(OTf)<sub>2</sub> (570 mg, 1.58 mmol, 0.1 equiv) in DCM (40 mL) was stirred at room temperature for 5 min. A separate flask was charged with aziridine **11** (5 g, 15.8 mmol, 1.0 equiv), silyldienol ethers **(S)-12** (5.0 g, 18.9 mmol, 1.2 equiv), and DCM (118 mL). The mixture solutions of **11** and **(S)-12** were added dropwise to the copper salt. Full conversion of the aziridine **11** was observed after stirring for 0.5 h at room temperature, then the reaction was continued to stirred for another 3 h until the deprotection of silyl ethers finished, then K<sub>2</sub>CO<sub>3</sub> (10.9 g, 79 mmol, 5.0 equiv) and EtOH (474 mL) were added sequentially and the reaction mixture was heated to 60°C. After stirred for 18 h, the reaction was quenched with H<sub>2</sub>O (50 mL) and extracted with DCM (3 x 80 mL). The combined organic layers were washed with brine (50 mL), dried (MgSO<sub>4</sub>), filtered and concentrated. The crude product was purified by column chromatography (petroleum ether/EtOAc, 6:1 to 2:1) to afford **(+)-10** (3.77 g, 56%, d.r. 5:1 (d.r.=exo: endo)) as a white foam.

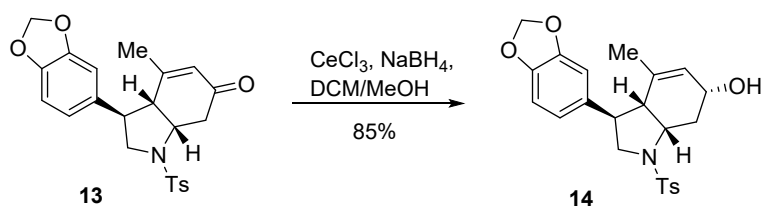
**Compound (+)-10 - exo:** ee = 99%,  $[\alpha]_D^{23}$ : +14.3 (*c* 0.6, CHCl<sub>3</sub>), **HPLC:** Daicel CHIRALPAK IA column, 30% IPA in hexanes, 0.7 mL/min,  $\lambda$  = 214 nm, *t<sub>R</sub>*(minor) = 18.6 min, *t<sub>R</sub>*(major) = 35.9 min; **TLC** (petroleum ether:EtOAc, 2:1 v/v): *R<sub>f</sub>* = 0.44 (UV, phosphomolybdic acid); **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.73 (d, *J* = 8.0 Hz, 2H), 7.37 (d, *J* = 8.0 Hz, 2H), 6.72 (d, *J* = 7.6 Hz, 1H), 6.58 (dd, *J* = 8.0, 1.6 Hz, 1H), 6.49 (d, *J* = 1.6 Hz, 1H), 5.95 (s, 2H), 4.08 – 4.02 (m, 1H), 3.80 (dd, *J* = 9.6, 7.2 Hz, 1H), 3.27 – 3.20 (m, 1H), 3.07 (t, *J* = 10.0 Hz, 1H), 2.98 (dd, *J* = 16.4, 6.0 Hz, 1H), 2.55 (dd, *J* = 16.0, 11.2 Hz, 1H), 2.48 (s, 3H), 2.36 – 2.34 (m, 1H), 1.98 – 1.89 (m, 3H), 0.71 (d, *J* = 6.4 Hz, 3H); **<sup>13</sup>C NMR** (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 209.3, 148.4, 147.3, 144.2, 134.1, 132.6, 130.1 (2C), 127.8 (2C), 121.4, 108.8, 107.3, 101.4, 57.8, 55.8, 51.5, 48.6, 45.3, 45.3, 30.9, 21.8, 21.1; **IR** (KBr):

2958, 1717, 1490, 1345, 1163, 1038, 814, 665, 548  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{23}\text{H}_{25}\text{NNaO}_5\text{S}[\text{M}+\text{Na}]^+$ : 450.1346, found 450.1350.



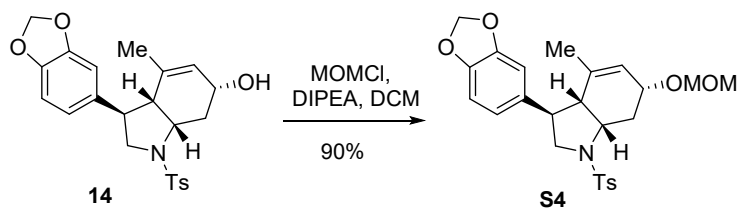
To a solution of ketone (+)-**10-exo** (1.3 g, 3.04 mmol, 1.0 equiv) in dry DCM (76 mL) were added sequentially DIPEA (5.18 mL, 30.4 mmol, 10 equiv) and TMSOTf (2.76 mL, 15.2 mmol, 5.0 equiv) at room temperature. After stirring at this temperature for 4 h, the reaction mixture was quenched with sat. aq.  $\text{NaHCO}_3$  (30 mL) and extracted with cold *n*-Pentane (3 x 20 mL) at  $0^\circ\text{C}$ . The combined organic layers were washed with sat. aq.  $\text{NaHCO}_3$  (20 mL), brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. To a solution of the residue in MeCN (76 mL) was added  $\text{Pd(OAc)}_2$  (889 mg, 3.96 mmol, 1.3 equiv) at RT. After stirring at this temperature for 4 h, the resulting mixture were filtered through a pad of Celite. The filtrate was concentrated *in vacuo* and the residue was purified by column chromatography (petroleum ether/EtOAc, 5:1 $\rightarrow$ 3:1) to afford compound (-)-**13** (400 mg, 31%) as a white foam. The recovered starting material was subjected to the above conditions twice more to give **13** (678 mg, 52% over 3 cycles).

**Compound 13**:  $[\alpha]_{\text{D}}^{25} = -129.5$  (c 1.0,  $\text{CHCl}_3$ ); TLC (petroleum ether:EtOAc, 2:1 v/v):  $R_f = 0.43$  (UV,  $\text{KMnO}_4$ );  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.77 (d,  $J = 8.4$  Hz, 2H), 7.38 (d,  $J = 7.8$  Hz, 2H), 6.73 (d,  $J = 7.8$  Hz, 1H), 6.57 (dd,  $J = 8.4, 1.8$  Hz, 1H), 6.47 (d,  $J = 1.2$  Hz, 1H), 5.96 (s, 2H), 5.82 (s, 1H), 4.45 (dt,  $J = 12.0, 6.6$  Hz, 1H), 3.89 (td,  $J = 6.6, 1.8$  Hz, 1H), 3.38 – 3.31 (m, 2H), 2.90 (dd,  $J = 16.8, 6.6$  Hz, 1H), 2.54 – 2.47 (m, 2H), 2.48 (s, 3H), 1.41 (d,  $J = 1.2$  Hz, 3H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$ : 196.3, 158.6, 148.5, 147.5, 144.2, 135.1, 132.2, 130.2 (2C), 127.6 (2C), 127.3, 121.5, 108.8, 107.1, 101.5, 59.4, 55.8, 50.6, 49.1, 41.6, 24.0, 21.8; **IR** (KBr): 2924, 2854, 1669, 1489, 1446, 1248, 1163, 1095, 1036, 664  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{23}\text{H}_{23}\text{NNaO}_5\text{S}[\text{M}+\text{Na}]^+$ : 448.1189, found 448.1175.

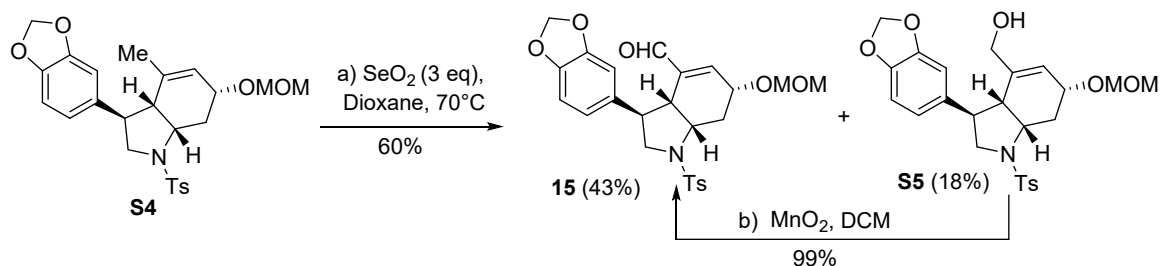


To a solution of enone **13** (127 mg, 0.30 mmol, 1.0 equiv) in dry MeOH/CH<sub>2</sub>Cl<sub>2</sub> (2:1, 8 mL) was added CeCl<sub>3</sub> (221 mg, 0.90 mmol, 3.0 equiv) at room temperature. The resulting mixture was stirred at RT for 20 min before NaBH<sub>4</sub> (22.6 mg, 0.60 mol, 2.0 equiv) was added at 0°C. After stirring at room temperature for 0.5 h the reaction mixture was quenched with sat. aq. NH<sub>4</sub>Cl (10 mL) and extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine (10 mL), dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (petroleum ether/EtOAc, 4:1→2:1) to afford compound **14** (108.5 mg, 85%) as a white foam.

**Compound 14:** [ $\alpha$ ]D<sup>25</sup> = -96.9 (c 1.0, CHCl<sub>3</sub>); TLC (petroleum ether:EtOAc, 2:1 v/v):  $R_f$  = 0.27 (UV, (UV, KMnO<sub>4</sub>); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.77 (d,  $J$  = 7.8 Hz, 2H), 7.37 (d,  $J$  = 8.4 Hz, 2H), 6.68 (d,  $J$  = 7.8 Hz, 1H), 6.52 (dd,  $J$  = 7.8, 1.8 Hz, 1H), 6.39 (d,  $J$  = 1.2 Hz, 1H), 5.93 (s, 2H), 5.40 (s, 1H), 4.31 (dd,  $J$  = 4.8, 2.4 Hz, 1H), 4.05 (ddd,  $J$  = 12.0, 7.8, 4.2 Hz, 1H), 3.79 (dd,  $J$  = 10.2, 7.8 Hz, 1H), 3.21 (td,  $J$  = 10.8, 7.2 Hz, 1H), 3.10 (t,  $J$  = 10.2 Hz, 1H), 2.52 – 2.48 (m, 1H), 2.48 (s, 3H), 2.21 – 2.18 (m, 1H), 1.68 – 1.64 (brs, 1H, -OH), 1.64 – 1.58 (m, 1H), 1.16 (s, 3H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 148.1, 147.0, 143.9, 134.9, 134.8, 133.7, 130.0 (2C), 128.3, 127.6 (2C), 121.4, 108.6, 107.3, 101.2, 66.8, 59.0, 56.5, 49.3, 49.3, 37.8, 22.5, 21.7; IR (KBr): 2915, 2876, 1505, 1489, 1341, 1164, 1038, 814, 666, 588 cm<sup>-1</sup>; HRMS (ESI, m/z) calcd for C<sub>23</sub>H<sub>25</sub>NNaO<sub>5</sub>S[M+Na]<sup>+</sup>: 450.1346, found 450.1343.



To a stirred solution of **14** (300 mg, 0.70 mmol, 1.0 equiv) in dry DCM (11 mL) were added sequentially DIPEA (0.61 mL, 3.51 mmol, 5.0 equiv) and MOMCl (0.16 mL, 2.11 mmol, 3.0 equiv) at 0°C. After stirring at room temperature for 6 h, the reaction mixture was quenched with sat. aq. NaHCO<sub>3</sub> (10 mL) and extracted with DCM (3 x 10 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (petroleum ether/EtOAc, 8:1→5:1) to afford compound **S4** (298.1 mg, 90%) as a white foam.

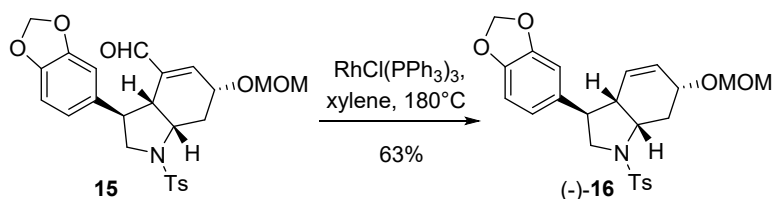


To a stirred solution of **S4** (90 mg, 0.19 mmol, 1.0 equiv) in dioxane (9.0 mL) was added  $\text{SeO}_2$  (64 mg, 0.57 mmol, 3.0 equiv) at room temperature. After heating at  $70^\circ\text{C}$  for 5 h, the reaction was quenched with sat. aq.  $\text{NaHCO}_3$  (10 mL) and extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by column chromatography (petroleum ether/EtOAc, 5:1  $\rightarrow$  1:1) to afford aldehyde **15** (40.0 mg, 43%) and **S5** (16.8 mg, 18%) as a white foam.

To a stirred solution of **S5** (16.8 mg, 0.034 mmol, 1.0 equiv) in DCM (1.6 mL) was added  $\text{MnO}_2$  (60 mg, 0.69 mmol, 20 equiv) at room temperature. After stirring for 1 h until the starting material was completely consumed, the resulting mixture was diluted with DCM (3 mL) and filtered through a pad of Celite. The filtrate was concentrated *in vacuo* to afford the **15** (16.5 mg, 99%) which was used in the next step without further purification.

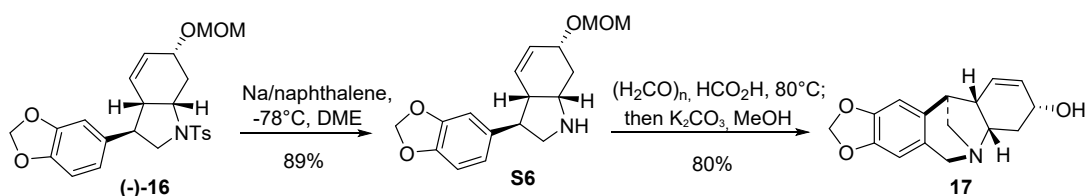
**Compound 15**:  $[\alpha]_{\text{D}}^{25} = -86.6$  (c 1.0,  $\text{CHCl}_3$ ); TLC (petroleum ether:EtOAc, 2:1 v/v):  $R_f = 0.62$  (UV,  $\text{KMnO}_4$ );  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$ : 9.12 (s, 1H), 7.77 (d,  $J = 7.8$  Hz, 2H), 7.39 (d,  $J = 7.8$  Hz, 2H), 6.68 (s, 1H), 6.63 (d,  $J = 7.8$  Hz, 1H), 6.42 (dd,  $J = 7.8, 1.8$  Hz, 1H), 6.38 (d,  $J = 1.8$  Hz, 1H), 5.92 (dd,  $J = 3.0, 1.2$  Hz, 2H), 4.81 (d,  $J = 7.2$  Hz, 1H), 4.76 (d,  $J = 6.6$  Hz, 1H), 4.46 – 4.43 (m, 1H), 4.08 (ddd,  $J = 12.6, 7.8, 4.8$  Hz, 1H), 3.83 (dd,  $J = 10.2, 7.8$  Hz, 1H), 3.44 (s, 3H), 3.26 (t,  $J = 10.2$  Hz, 1H), 3.15 (td,  $J = 10.8, 7.2$  Hz, 1H), 2.72 – 2.63 (m, 2H), 2.49 (s, 3H), 1.92 (dd,  $J = 23.4, 12.6$  Hz, 1H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$ : 191.3, 149.2, 148.0, 147.1, 144.2, 140.0, 134.5, 131.3, 130.2 (2C), 127.5 (2C), 121.4, 108.1, 107.6, 101.2, 95.8, 71.4, 58.6, 55.9, 55.4, 50.2, 42.4, 34.6, 21.8; **IR** (KBr): 2879, 2859, 1698, 1618, 1497, 1342, 1249, 1167, 1103, 1047, 664, 547  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{25}\text{H}_{27}\text{NNaO}_7\text{S}[\text{M}+\text{Na}]^+$ : 508.1400, found 508.1403.





To a solution of substrate **15** (30 mg, 0.062 mmol, 1.0 equiv) in xylene (3.0 mL) in a sealed tube,  $\text{RhCl}(\text{PPh}_3)_3$  (115 mg, 0.124 mmol, 2.0 equiv) was added. The reaction mixture was then degassed by bubbling argon directly through the mixture for 30 min and then were heated at  $180^\circ\text{C}$  for 0.5 h, the resulting mixture were filtered through a pad of Celite. The filtrate was concentrated *in vacuo* and the residue was purified by column chromatography (petroleum ether: EtOAc = 10:1  $\rightarrow$  5:1) to afford compound (-)-**16** (17.8 mg, 63%).

**Compound (-)-16:**  $[\alpha]_{\text{D}}^{20} = -76.3$  (c 0.6,  $\text{CHCl}_3$ ); TLC (petroleum ether:EtOAc, 2:1 v/v):  $R_f = 0.61$  (UV, phosphomolybdic acid);  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.77 (d,  $J = 8.0$  Hz, 2H), 7.37 (d,  $J = 8.0$  Hz, 2H), 6.71 (d,  $J = 8.0$  Hz, 1H), 6.52 (dd,  $J = 7.6, 1.6$  Hz, 1H), 6.44 (d,  $J = 2.0$  Hz, 1H), 5.93 (s, 2H), 5.75 (dd,  $J = 10.4, 1.2$  Hz, 1H), 5.38 – 5.34 (m, 1H), 4.73 (dd,  $J = 20.8, 6.8$  Hz, 2H), 4.27 – 4.23 (m, 1H), 4.02 – 3.98 (m, 1H), 3.79 (td,  $J = 6.0, 2.0$  Hz, 1H), 3.40 (s, 3H), 3.16 – 3.08 (m, 2H), 2.63 – 2.58 (m, 1H), 2.47 (s, 3H), 2.23 (t,  $J = 5.6$  Hz, 1H), 1.73 – 1.64 (m, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 148.0, 146.9, 143.7, 134.4, 131.8, 131.3, 129.9 (2C), 127.5 (2C), 125.5, 121.0, 108.5, 107.2, 101.1, 95.2, 71.6, 57.8, 55.6, 55.5, 48.9, 45.4, 35.0, 21.6; **IR** (KBr): 2904, 2589, 1924, 1507, 1250, 1043, 812, 667, 550  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{24}\text{H}_{27}\text{NNaO}_6\text{S}[\text{M}+\text{Na}]^+$ : 480.1451, found 480.1471.

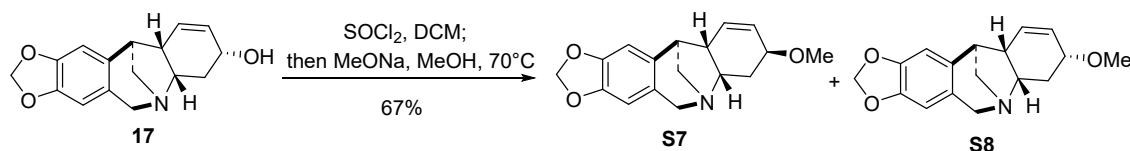


To a solution of naphthalene (2.8 g, 21.9 mmol, 58.8 equiv) in anhydrous DME (12 mL) was added finely chopped sodium metal (532 mg, 23 mmol, 62.2 equiv) at room temperature. The reaction was stirred for 2 h, during which a dark green solution appeared [6]. (-)-**16** (170 mg, 0.37 mmol, 1.0 equiv) in DME (18.5 mL) was cooled to  $-78^\circ\text{C}$ . The Na-naphthalenide solution was added dropwise to this reaction using a syringe, until a dark green colour persisted for 5 min. After stirring at  $-78^\circ\text{C}$  for 30 min, the reaction mixture was quenched with sat. aq.  $\text{NH}_4\text{Cl}$  (5.0 mL) and stirred for 5 min

at the same temperature. after then it was allowed to warm at rt, potassium carbonate (1.6 g, 11.5 mmol, 31.0 equiv) was added to the mixture and stirred for 30 min. The suspension was extracted with DCM (3 x 30 mL), The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was filtered through a short plug of silica gel (DCM/MeOH, 20:1) to afford the crude **S6** (100 mg, 89%), which was used directly into next step without intensive purification.

To a stirred solution of **S6** (100 mg, 0.33 mmol, 1.0 equiv) in HCO<sub>2</sub>H (8.3 mL) was added Paraformaldehyde (100 mg, 3.3 mmol, 10 equiv) at room temperature. Then the reaction was heated to 80 °C. After stirring at this temperature for 2 h, the reaction mixture was quenched with sat. aq. NaHCO<sub>3</sub> at 0 °C until the pH of the solution was 7-8, then extracted with DCM (3 x 30 mL) and chloroform/Isopropanol (10:1, 3 x 30 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was redissolved in MeOH (8.3 mL) and K<sub>2</sub>CO<sub>3</sub> (68 mg, 0.5 mmol, 1.5 equiv) was added at rt. After stirring at this temperature for 30 min, the resulting mixture was filtered and concentrated. The residue was purified by column chromatography (DCM/MeOH, 20:1) to afford **17** (71.5 mg, 80%) as a white foam.

**Compound 17**: [ $\alpha$ ]D<sup>20</sup> = +74.6 (c 1.0, CHCl<sub>3</sub>); TLC (DCM:MeOH, 20:1 v/v): *R<sub>f</sub>* = 0.26 (UV, phosphomolybdic acid); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>)  $\delta$ : 6.58 (s, 1H), 6.47 (s, 1H), 6.07 (ddd, *J* = 6.0, 4.2, 2.4 Hz, 1H), 5.89 (s, 2H), 5.74 (dd, *J* = 9.6, 2.4 Hz, 1H), 4.23 – 4.19 (m, 2H), 3.77 (d, *J* = 18.6 Hz, 1H), 3.39 (dd, *J* = 11.4, 2.4 Hz, 1H), 3.30 (dd, *J* = 12.0, 5.4 Hz, 1H), 2.86 – 2.84 (m, 1H), 2.81 – 2.79 (m, 2H), 2.11 – 2.05 (m, 1H), 1.94 – 1.89 (m, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 146.7, 146.0, 135.1, 132.8, 130.3, 125.8, 107.7, 107.0, 100.9, 64.2, 61.3, 61.3, 53.6, 50.1, 45.6, 34.8; IR (KBr): 2895, 1850, 1480, 1301, 1236, 1035, 931, 867, 730, 557 cm<sup>-1</sup>; HRMS (ESI, *m/z*) calcd for C<sub>16</sub>H<sub>17</sub>NO<sub>3</sub>[M+H]<sup>+</sup>: 272.1281, found 272.1285.

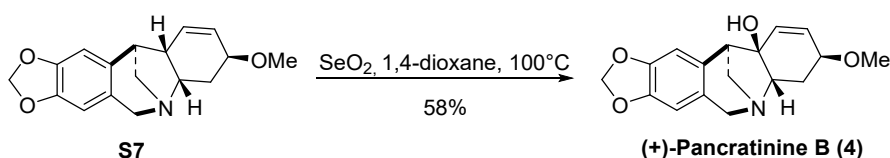


To a stirred solution of **17** (66 mg, 0.243 mmol, 1.0 equiv) in DCM (6 mL) was added SOCl<sub>2</sub> (124  $\mu$ L, 1.7 mmol, 7.0 equiv) at room temperature. After stirring for 30 min until the starting material was completely consumed, the resulting mixture was concentrated *in vacuo* and the residue was

dissolved in MeOH (6 mL). MeONa (5.4M (30 wt.%) solution in methanol, 0.46 mL, 2.43 mmol, 10 equiv) was added at room temperature. The reaction mixture was heated to 70 °C and stirred for 5 h before quenched with sat. aq. NH<sub>4</sub>Cl (5 mL) and extracted with DCM (3 x 10 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (DCM/MeOH, 30:1→10:1) to afford **S7** (17.2 mg, 25%) and **S8** (29.2 mg, 42%) as white foam.

**Compound S7:** [ $\alpha$ ]D<sup>20</sup> = +21.4 (c 0.7, CHCl<sub>3</sub>); TLC (DCM:MeOH, 20:1 v/v):  $R_f$  = 0.43 (UV, phosphomolybdic acid); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>)  $\delta$ : 6.55 (s, 1H), 6.46 (s, 1H), 5.99 (dd,  $J$  = 10.2, 1.2 Hz, 1H), 5.89 (s, 2H), 5.70 (ddd,  $J$  = 6.0, 4.2, 2.4 Hz, 1H), 4.24 (d,  $J$  = 16.2 Hz, 1H), 3.88 – 3.86 (m, 1H), 3.80 (d,  $J$  = 16.2 Hz, 1H), 3.41 (s, 3H), 3.32 (m, 1H), 2.89 (s br, 1H), 2.82 (s, 2H), 2.75 (s, 1H), 2.47 (d,  $J$  = 12.0 Hz, 1H), 1.45 – 1.41 (m, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 146.7, 146.1, 134.7, 132.3, 130.2, 125.3, 107.7, 106.8, 100.9, 72.4, 61.7, 61.2, 56.3, 54.7, 50.0, 45.9, 34.5; IR (KBr): 2886, 1729, 1484, 1344, 1230, 1038, 937, 825, 710, 525 cm<sup>-1</sup>; HRMS (ESI, m/z) calcd for C<sub>17</sub>H<sub>20</sub>NO<sub>3</sub>[M+H]<sup>+</sup>: 286.1438, found 286.1446.

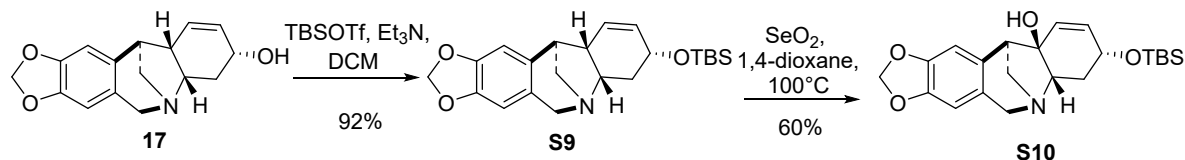
**Compound S8:** TLC (DCM:MeOH, 20:1 v/v):  $R_f$  = 0.41 (UV, phosphomolybdic acid); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>)  $\delta$ : 6.59 (s, 1H), 6.51 (s, 1H), 6.13 – 6.11 (m, 1H), 5.91 (s, 2H), 5.80 (dd,  $J$  = 10.2, 3.0 Hz, 1H), 4.60 (d,  $J$  = 16.2 Hz, 1H), 4.12 (d,  $J$  = 16.8 Hz, 1H), 3.74 – 3.64 (m, 3H), 3.46 (s, 3H), 3.06 (d,  $J$  = 11.4 Hz, 1H), 2.94 – 2.92 (m, 2H), 2.42 (s br, 1H), 2.01 – 1.97 (m, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 147.4, 147.0, 133.2, 130.7, 129.7, 121.5, 107.3, 106.9, 101.3, 71.3, 63.4, 60.1, 57.5, 52.4, 49.1, 45.2, 30.2; IR (KBr): 2925, 1500, 1484, 1341, 1235, 1101, 1035, 930, 865, 825; HRMS (ESI, m/z) calcd for C<sub>17</sub>H<sub>20</sub>NO<sub>3</sub>[M+H]<sup>+</sup>: 286.1438, found 286.1439.



To a stirred solution of **S7** (16 mg, 0.056 mmol, 1.0 equiv) in dioxane (2.8 mL) was added SeO<sub>2</sub> (18.6 mg, 0.168 mmol, 3.0 equiv) at room temperature. After heating at 100 °C for 8 h, the reaction was quenched with sat. aq. NaHCO<sub>3</sub> (2 mL) and extracted with DCM (3 x 5 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (DCM/MeOH, 20:1→10:1) to afford (+)-**pancratinine B (4)**<sup>[7]</sup>

(9.8 mg, 58%) as a white foam.

**(+)-pancratinine B (4)**: TLC (DCM:MeOH, 20:1 v/v):  $R_f = 0.32$  (UV, phosphomolybdic acid);  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 6.63 (s, 1H), 6.55 (s, 1H), 6.15 (d,  $J = 10.2$  Hz, 1H), 5.94 (s, 2H), 5.78 (d,  $J = 10.8$  Hz, 1H), 4.29 (d,  $J = 16.8$  Hz, 1H), 3.95 (m, 1H), 3.84 (d,  $J = 16.8$  Hz, 1H), 3.44 (s, 3H), 2.99 (dd,  $J = 12.0, 1.8$  Hz, 1H), 2.92 (s, 1H), 2.85 (d,  $J = 11.4$  Hz, 1H), 2.65 (d,  $J = 2.4$  Hz, 1H), 2.36 (br d,  $J = 12.6$  Hz, 1H), 1.58 (m, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 147.8, 146.3, 134.7, 131.5, 129.2, 126.7, 110.1, 107.4, 101.2, 83.4, 72.5, 68.2, 62.4, 56.5, 55.2, 49.9, 31.9; **IR** (KBr): 2855, 1732, 1484, 1260, 1036, 934, 801, 524  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{17}\text{H}_{20}\text{NO}_4[\text{M}+\text{H}]^+$ : 302.1387, found 302.1388; (+)-Pancratinine B (**4**):  $[\alpha]_{\text{D}}^{20} = +2.8$  (c 0.4, MeOH); Natural (+)-Pancratinine B <sup>[7]</sup>:  $[\alpha]_{\text{D}}^{20} = +1.9$  (c 0.7, MeOH).

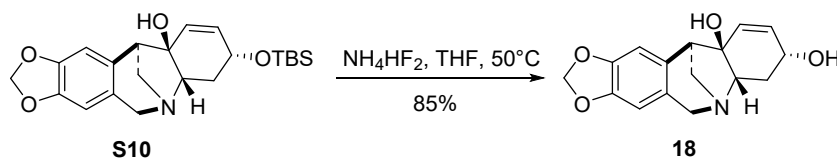


To the solution of **17** (90 mg, 0.332 mmol, 1.0 equiv) in DCM (17 mL) were added sequentially  $\text{Et}_3\text{N}$  (0.14 mL, 0.996 mmol, 3.0 equiv) and TBSOTf (0.15 mL, 0.664 mmol, 2.0 equiv) at room temperature. After stirring at this temperature for 1 h, the reaction mixture was quenched with sat. aq.  $\text{NaHCO}_3$  (10 mL) and extracted with DCM (3 x 20 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by column chromatography (petroleum ether/ $\text{EtOAc}$ , 5:1 $\rightarrow$ 2:1) to afford **S9** (118.7 mg, 92%).

To a stirred solution of **S9** (58 mg, 0.15 mmol, 1.0 equiv) in dioxane (7.5 mL) was added  $\text{SeO}_2$  (50 mg, 0.45 mmol, 3.0 equiv) at room temperature. After heating at 100  $^\circ\text{C}$  for 8 h, the reaction was quenched with sat. aq.  $\text{NaHCO}_3$  (20 mL) and extracted with DCM (3 x 20 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by column chromatography (DCM/MeOH, 20:1 $\rightarrow$ 10:1) to afford tertiary alcohol **S10** (36.2 mg, 60%) as a white foam.

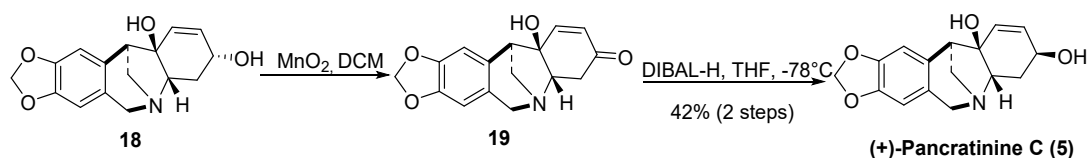
**Compound S10**:  $[\alpha]_{\text{D}}^{25} = +12.5$  (c 1.0,  $\text{CHCl}_3$ ); TLC (DCM:MeOH, 20:1, v/v):  $R_f = 0.51$  (UV, phosphomolybdic acid);  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 6.56 (s, 1H), 6.52 (s, 1H), 6.11 (dd,  $J = 10.0, 2.0$  Hz, 1H), 5.92 (s, 2H), 5.79 (dd,  $J = 10.0, 2.0$  Hz, 1H), 4.39 (d,  $J = 17.6$  Hz, 1H), 4.35 – 4.32 (m, 1H), 3.88 (d,  $J = 17.2$  Hz, 1H), 3.36 (dd,  $J = 12.0, 2.0$  Hz, 1H), 3.01 (t,  $J = 7.6$  Hz, 1H),

2.87 (dd,  $J = 12.0, 2.4$  Hz, 1H), 2.69 (d,  $J = 2.8$  Hz, 1H), 2.33 – 2.27 (m, 1H), 1.66 – 1.59 (m, 1H), 0.90 (s, 9H), 0.09 (s, 6H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 147.7, 146.1, 139.4, 130.4, 129.9, 126.4, 109.9, 106.7, 101.1, 83.5, 71.9, 65.3, 60.4, 52.5, 51.5, 40.1, 26.0 (3C), 18.3, -4.4, -4.6; IR (KBr): 2930, 1483, 1342, 1242, 1095, 939, 840, 772, 596  $\text{cm}^{-1}$ ; HRMS (ESI,  $m/z$ ) calcd for  $\text{C}_{22}\text{H}_{32}\text{NO}_4\text{Si}[\text{M}+\text{H}]^+$ : 402.2095, found 402.2099.



To a stirred solution of **S10** (20 mg, 0.05 mmol, 1.0 equiv) in dry THF (1.5 mL) was added  $\text{NH}_4\text{HF}_2$  (43 mg, 0.75 mmol, 15 equiv) at room temperature. After heating at 50 °C for 5 h, the reaction mixture was cooled to room temperature and purified directly by Preparative TLC ( $\text{CHCl}_3/\text{MeOH}/\text{NH}_4\text{OH}$ , 80:4:1) to afford **18** (12.2 mg, 85%) as a white foam.

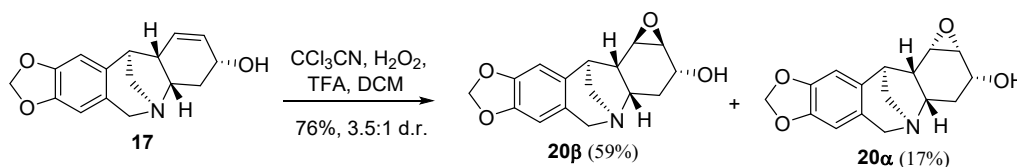
**Compound 18**:  $[\alpha]_{\text{D}}^{25} = +69.4$  (c 1.0,  $\text{CHCl}_3$ ); TLC ( $\text{CHCl}_3:\text{MeOH}:\text{NH}_4\text{OH}$ , 90:9:1 v/v):  $R_f = 0.50$  (UV, phosphomolybdic acid);  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ )  $\delta$ : 6.66 (s, 1H), 6.55 (s, 1H), 6.30 (dd,  $J = 10.2, 5.4$  Hz, 1H), 5.94 (s, 2H), 5.88 (d,  $J = 10.2$  Hz, 1H), 4.25 (t,  $J = 7.2$ , 1H), 4.20 (d,  $J = 16.2$  Hz, 1H), 3.80 (d,  $J = 16.2$  Hz, 1H), 3.51 (dd,  $J = 12.0, 2.4$  Hz, 1H), 2.91 (s br, 1H), 2.76 (d,  $J = 11.4$  Hz, 1H), 2.62 (d,  $J = 1.8$  Hz, 1H), 2.19 (d,  $J = 8.4$  Hz, 1H), 1.88 (dt,  $J = 14.4, 4.2$  Hz, 1H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ )  $\delta$ : 147.8, 146.2, 134.0, 131.5, 129.5, 126.9, 110.2, 107.8, 101.2, 82.6, 67.4, 63.3, 62.4, 54.3, 49.6, 31.6; IR (KBr): 2851, 1735, 1485, 1378, 1261, 1038, 861, 637, 579  $\text{cm}^{-1}$ ; HRMS (ESI,  $m/z$ ) calcd for  $\text{C}_{16}\text{H}_{18}\text{NO}_4[\text{M}+\text{H}]^+$ : 288.1230, found 288.1242.



To a stirred solution of **18** (12 mg, 0.041 mmol, 1.0 equiv) in degassed DCM (1.6 mL) was added  $\text{MnO}_2$  (71 mg, 0.82 mmol, 20 equiv) at room temperature. After stirring for 30 min until the starting material was completely consumed, the resulting mixture was diluted with DCM (3 mL) and filtered through a pad of Celite. The filtrate was concentrated *in vacuo* to afford the crude **19**, which was used immediately into next step without purification.

To a solution of crude **19** obtained above in THF (1.6 mL) was added DIBAL-H (51  $\mu$ L, 1.2 M in toluene, 0.06 mmol, 1.5 equiv) at  $-78$   $^{\circ}$ C. After stirring at the same temperature for 10 min, the reaction mixture was quenched with MeOH (0.5 mL) and extracted with DCM (3 x 10 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by Preparative TLC ( $\text{CHCl}_3/\text{MeOH}/\text{NH}_4\text{OH}$ , 80:4:1) to afford (+)-pancratinine **C** (**5**) (5.0 mg, 42%) and **18** (1.2 mg, 10%) as a white solid.

**Pancratinine C**: TLC ( $\text{CHCl}_3:\text{MeOH}:\text{NH}_4\text{OH}$ , 90:9:1 v/v):  $R_f = 0.45$  (UV, phosphomolybdic acid);  $^1\text{H NMR}$  (400 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$ : 6.63 (s, 1H), 6.59 (s, 1H), 6.03 (d,  $J = 10.4$  Hz, 1H), 5.92 (s, 2H), 5.76 (d,  $J = 10.4$  Hz, 1H), 4.31 (m, 1H), 4.31 (d,  $J = 16.4$  Hz, 1H), 3.94 (d,  $J = 16.4$  Hz, 1H), 3.08 (s, 1H), 3.05 (d br,  $J = 12.0$  Hz, 1H), 2.92 (d,  $J = 11.2$  Hz, 1H), 2.73 (d,  $J = 1.6$  Hz, 1H), 2.30 (d br,  $J = 12.8$  Hz, 1H), 1.62 (m, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$ : 147.0, 145.8, 135.0, 130.9, 129.6, 123.5, 109.4, 105.8, 100.5, 81.2, 66.9, 62.1, 60.6, 54.2, 48.8, 32.9; **IR** (KBr): 2923, 1735, 1502, 1487, 1238, 1218, 1051, 1034, 820  $\text{cm}^{-1}$ ; **HRMS** (ESI,  $m/z$ ) calcd for  $\text{C}_{16}\text{H}_{18}\text{NO}_4[\text{M}+\text{H}]^+$ : 288.1236, found 288.1237. our synthetic (+)-Pancratinine C:  $[\alpha]_{\text{D}}^{20} = +2.3$  (c 0.4, MeOH); Natural (-)-Pancratinine C [\[7\]](#):  $[\alpha]_{\text{D}}^{20} = -1.8$  (c 0.5, MeOH).

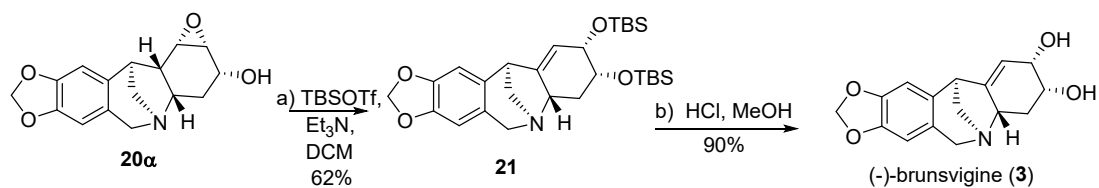


To a solution of  $\text{CCl}_3\text{CN}$  (50  $\mu$ L, 0.5 mmol, 13.5 equiv) in dry DCM (0.2 mL) was added 30% aqueous  $\text{H}_2\text{O}_2$  (50  $\mu$ L, 0.5 mmol, 13.5 equiv), the mixture was stirred at room temperature for 1.5 h. Then the solution was transferred via syringe to a flask containing **17** (10 mg, 0.037 mmol, 1.0 equiv) in a mixture solvent of DCM (0.2 mL) and TFA (40  $\mu$ L, 0.56 mmol, 15 equiv). The resulting reaction mixture was stirred at room temperature for 10 h. Then, the reaction mixture was treated with 33% aqueous  $\text{NH}_3$  solution and adjusted the pH to approximately 10, then extracted with DCM (3 x 10 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by chromatography on silica gel column (DCM/MeOH = 20:1  $\rightarrow$  10:1, 1%  $\text{NH}_4\text{OH}$ ) to afford epoxide **20** (8.0 mg, 76%, d.r. = 3.5:1) as a white foam.

**Compound 20 $\beta$** :  $[\alpha]_{\text{D}}^{25} = +65.4$  ( $\text{CHCl}_3$ , c=1.0); TLC ( $\text{CHCl}_3:\text{MeOH}:\text{NH}_4\text{OH}$ , 80:2:1 v/v):  $R_f = 0.56$  (UV,  $\text{KMnO}_4$ );  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$ : 6.61 (s, 1H), 6.47 (s, 1H), 5.92 (s, 2H), 4.32

(d,  $J = 1.8$  Hz, 1H), 4.20 (d,  $J = 16.2$  Hz, 1H), 3.76 (d,  $J = 16.2$  Hz, 1H), 3.65 (d,  $J = 10.8$  Hz, 1H), 3.28 (s, 1H), 3.08 – 3.06 (m, 2H), 3.02 (s, 1H), 2.95 (d,  $J = 11.4$  Hz, 1H), 2.78 (d,  $J = 7.2$  Hz, 1H), 2.20 (d,  $J = 14.4$  Hz, 1H), 1.80 (dt,  $J = 15.0, 3.0$  Hz, 1H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ )  $\delta$ : 147.2, 146.4, 133.2, 124.4, 108.0, 107.2, 101.1, 65.2, 61.4, 59.8, 55.3, 54.4, 54.0, 47.0, 44.2, 27.3; IR (KBr): 2919, 2858, 1502, 1483, 1232, 1034, 1012, 852, 792  $\text{cm}^{-1}$ ; HRMS (ESI,  $m/z$ ) calcd for  $\text{C}_{16}\text{H}_{18}\text{NO}_4[\text{M}+\text{H}]^+$ : 288.1230, found 288.1225.

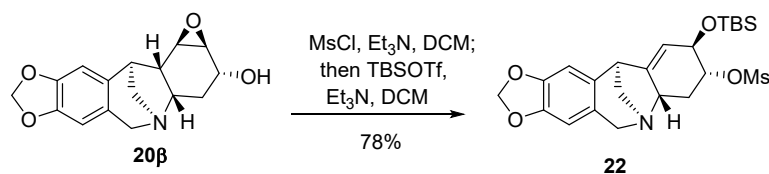
**Compound 20 $\alpha$** :  $[\alpha]_{\text{D}}^{25} = -16.8$ , ( $\text{CHCl}_3$ ,  $c=0.5$ ); ( $\text{CHCl}_3:\text{MeOH}:\text{NH}_4\text{OH}$ , 80:2:1 v/v):  $R_f = 0.19$  (UV,  $\text{KMnO}_4$ );  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ )  $\delta$ : 6.53 (s, 1H), 6.44 (s, 1H), 5.88 (s, 2H), 4.31 (d,  $J = 17.4$  Hz, 1H), 4.00 (d,  $J = 11.4, 4.2$  Hz, 1H), 3.69 (d,  $J = 17.4$  Hz, 1H), 3.46 – 3.45 (m, 1H), 3.28 – 3.27 (m, 2H), 3.22 – 3.18 (m, 1H), 3.13 (s, 1H), 2.88 (d,  $J = 10.8$  Hz, 1H), 2.43 (d,  $J = 8.4$  Hz, 1H), 2.17 – 2.13 (m, 1H), 1.64 (q,  $J = 12.0$  Hz, 1H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ )  $\delta$ : 146.5, 145.8, 137.4, 125.0, 106.7, 106.5, 100.8, 66.7, 64.0, 59.5, 57.0, 55.5, 53.5, 48.2, 44.6, 34.3; IR (KBr): 2920, 2851, 1502, 1483, 1257, 1232, 1036  $\text{cm}^{-1}$ ; HRMS (ESI,  $m/z$ ) calcd for  $\text{C}_{16}\text{H}_{18}\text{NO}_4[\text{M}+\text{H}]^+$ : 288.1230, found 288.1232.



To a solution of **20 $\alpha$**  (55 mg, 0.191 mmol, 1.0 equiv) in DCM (6.4 mL) were added sequentially  $\text{Et}_3\text{N}$  (133  $\mu\text{L}$ , 0.955 mmol, 5.0 equiv) and TBSOTf (132  $\mu\text{L}$ , 0.573 mmol, 3.0 equiv) at room temperature. After stirring at this temperature for 6 h, the reaction was quenched with sat. aq.  $\text{NaHCO}_3$  (5 mL) and extracted with DCM (3 x 5 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated. The residue was purified by column chromatography (petroleum ether:EtOAc, 6:1 $\rightarrow$ 2:1) to afford **21** (61.2 mg, 62%).

To a solution of the **21** (59.2 mg, 0.115 mmol, 1.0 equiv) in MeOH (6.4 mL) were added 1N HCl (230  $\mu\text{L}$ , 0.230 mmol, 2.0 equiv) at room temperature. After stirred for 5 h, the reaction mixture was treated with 33% aqueous  $\text{NH}_3$  solution and adjusted the pH to approximately 9, then extracted with EtOAc (3 x 10 mL). The combined organic layers were washed with brine, dried ( $\text{MgSO}_4$ ), filtered and concentrated, the residue was purified by column chromatography ( $\text{CHCl}_3/\text{MeOH}/\text{NH}_4\text{OH}$ , 150:10:1 $\rightarrow$ 100:10:1) to afford compound (-)-Brunsvigine (**3**) (29.6 mg, 90%).

**Compound (-)-Brunsvigine (3):** TLC (CHCl<sub>3</sub>:MeOH:NH<sub>4</sub>OH, 90:9:1 v/v):  $R_f = 0.61$  (UV, KMnO<sub>4</sub>); <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>)  $\delta$ : 6.57 (s, 1H), 6.49 (s, 1H), 5.91, 5.88 (ABq,  $J = 1.2$  Hz, 2 $\times$ 1H), 5.75 (dd,  $J = 3.0, 2.4$  Hz, 1H), 4.34, 3.82 (ABq,  $J = 16.2$  Hz, 2 $\times$ 1H), 4.16 (t,  $J = 4.2$  Hz, 1H), 3.72-3.68 (m, 1H), 3.30 (brs, 1H), 3.20 (dd,  $J = 11.4, 3.6$  Hz, 1H), 3.07-3.06 (m, 2H), 2.20-2.17 (m, 1H), 1.47 (q,  $J = 11.4$  Hz, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 155.8, 147.1, 146.2, 132.1, 124.8, 115.6, 107.5, 107.1, 101.0, 68.8, 66.3, 63.5, 61.4, 55.9, 45.6, 33.1; <sup>1</sup>H NMR (600 MHz, CD<sub>3</sub>OD)  $\delta$ : 6.59 (s, 1H), 6.53 (s, 1H), 5.87, 5.86 (ABq,  $J = 1.2$  Hz, 2 $\times$ 1H), 5.70 (dd,  $J = 3.6, 2.4$  Hz, 1H), 4.58 (s, 1H, OH), 4.27, 3.85 (ABq,  $J = 16.2$  Hz, 2 $\times$ 1H), 4.04 (t,  $J = 3.6$  Hz, 1H), 3.61-3.58 (m, 1H), 3.37 (brs, 1H), 3.26 (dd,  $J = 12.0, 4.8$  Hz, 1H), 3.05 (brs, 2H), 2.04 (ddd,  $J = 12.0, 5.4, 3.0$  Hz, 1H), 1.54 (q,  $J = 12.0$  Hz, 1H); <sup>13</sup>C NMR (150 MHz, CD<sub>3</sub>OD)  $\delta$ : 154.2, 148.4, 147.7, 133.2, 125.0, 117.7, 108.4, 107.9, 102.2, 69.8, 67.1, 64.6, 61.3, 56.4, 46.5, 33.0; IR (KBr): 2292, 2853, 1498, 1384, 1238, 1081, 1032, 928, 803 cm<sup>-1</sup>; HRMS (ESI, m/z) calcd for C<sub>16</sub>H<sub>18</sub>NO<sub>4</sub>S[M+H]<sup>+</sup>: 288.1230, found 288.1232.  $[\alpha]_D^{25} = -72.8$  (c = 0.5, EtOH); Natural (-)-Brunsvigine<sup>[8]</sup>:  $[\alpha]_D^{20} = -76.6$  (c = 1.0, EtOH); **Note:** The spectroscopic data were consistent with those previously reported.<sup>[9]</sup>

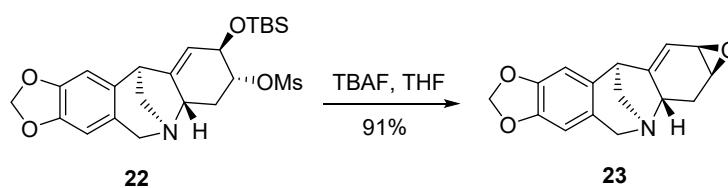


To a solution of **20β** (30 mg, 0.104 mmol, 1.0 equiv) in DCM (3.5 mL) were added sequentially Et<sub>3</sub>N (43  $\mu$ L, 0.312 mmol, 3.0 equiv) and MsCl (12  $\mu$ L, 0.156 mmol, 1.5 equiv) at room temperature. After stirring at this temperature for 0.5 h, the reaction mixture was filtered through a short plug of silica gel (DCM/MeOH, 40:1). The filtrate was concentrated *in vacuo* and the residue was redissolved in DCM (3.5 mL), Et<sub>3</sub>N (73  $\mu$ L, 0.052 mmol, 5.0 equiv) and TBSOTf (72  $\mu$ L, 0.312 mmol, 3.0 equiv) were added sequentially at room temperature. After stirred for 5 h, the reaction mixture was quenched with sat. aq. NaHCO<sub>3</sub> (2 mL) and extracted with DCM (3 x 5 mL). The combined organic layers were washed with brine, dried (MgSO<sub>4</sub>), filtered and concentrated. The residue was purified by column chromatography (DCM/MeOH, 60:1 $\rightarrow$ 40:1) to afford **22** (39.1 mg, 78%).

**Compound 22:**  $[\alpha]_D^{25} = -95.3$  (c 1.0, CHCl<sub>3</sub>); (CH<sub>2</sub>Cl<sub>2</sub>:MeOH, 40:1 v/v):  $R_f = 0.60$  (UV, KMnO<sub>4</sub>);

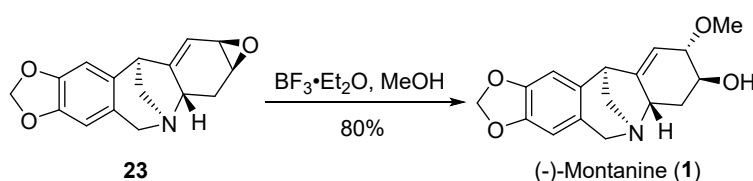


**<sup>1</sup>H NMR** (600 MHz, CDCl<sub>3</sub>) δ: 6.55 (s, 1H), 6.47 (s, 1H), 5.89 (dd, *J* = 8.4, 1.2 Hz, 2H), 5.45 – 5.44 (m, 1H), 4.56 (ddd, *J* = 12.0, 7.2, 4.2 Hz, 1H), 4.41 – 4.39 (m, 1H), 4.29 (d, *J* = 16.8 Hz, 1H), 3.80 (d, *J* = 16.8 Hz, 1H), 3.45 (d, *J* = 9.6 Hz, 1H), 3.22 (d, *J* = 1.8 Hz, 1H), 3.05 – 2.99 (m, 2H), 3.02 (s, 3H), 2.65 (dt, *J* = 10.8, 3.6 Hz, 1H), 1.82 (q, *J* = 12.0 Hz, 1H), 0.88 (s, 9H), 0.10 (d, *J* = 3.0 Hz, 6H); **<sup>13</sup>C NMR** (150 MHz, CDCl<sub>3</sub>) δ: 153.9, 147.1, 146.2, 131.5, 124.6, 116.4, 107.8, 107.0, 101.0, 84.3, 72.1, 62.2, 61.2, 55.9, 45.5, 38.5, 36.9, 25.9, 18.1 (3C), -4.2 (2C); **IR** (KBr): 2926, 2854, 1483, 1359, 1234, 1175, 1039, 937, 875, 834 cm<sup>-1</sup>; **HRMS** (ESI, *m/z*) calcd for C<sub>23</sub>H<sub>34</sub>NO<sub>6</sub>SSi[M+H]<sup>+</sup>: 480.1871, found 480.1865.



To a stirred solution of **22** (20 mg, 0.042 mmol, 1.0 equiv) in THF (1.4 mL) was added TBAF (42 μL, 1.0 M in THF, 0.042 mmol, 1.0 equiv) at room temperature. After stirred for 1 h, the reaction solvent was concentrated *in vacuo*, the residue was purified by column chromatography (DCM/MeOH, 40:1→30:1) to afford **23** (10.2 mg, 91%).

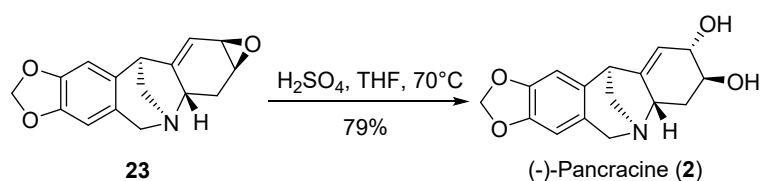
**Compound 23**: [α]<sub>D</sub><sup>25</sup> = -33.6 (*c* = 1.0, MeOH); (CH<sub>2</sub>Cl<sub>2</sub>:MeOH, 40:1 v/v): *R<sub>f</sub>* = 0.40 (UV, KMnO<sub>4</sub>); **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>) δ: 6.52 (s, 1H), 6.43 (s, 1H), 5.87 (dd, *J* = 10.4, 1.6 Hz, 2H), 5.81 (dd, *J* = 4.0, 2.4 Hz, 1H), 4.32 (d, *J* = 16.8 Hz, 1H), 3.75 (d, *J* = 16.8 Hz, 1H), 3.46 – 3.45 (m, 1H), 3.40 – 3.30 (m, 2H), 3.28 (d, *J* = 2.0 Hz, 1H), 3.02 (dd, *J* = 11.6, 1.6 Hz, 1H), 2.92 (dd, *J* = 11.2, 2.4 Hz, 1H), 2.70 (ddd, *J* = 14.0, 7.6, 2.4 Hz, 1H), 1.34 – 1.25 (m, 1H); **<sup>13</sup>C NMR** (150 MHz, CDCl<sub>3</sub>) δ: 155.8, 146.9, 146.1, 132.5, 124.8, 110.1, 107.3, 106.9, 100.9, 60.7, 59.8, 55.2, 52.6, 47.7, 45.4, 27.4; **IR** (KBr): 2918, 2851, 1503, 1483, 1331, 1234, 1038, 936, 814, 770 cm<sup>-1</sup>; **HRMS** (ESI, *m/z*) calcd for C<sub>16</sub>H<sub>16</sub>NO<sub>3</sub>[M+H]<sup>+</sup>: 270.1125, found 270.1126.



To a stirred solution of **23** (10 mg, 0.037 mmol, 1.0 equiv) in MeOH (1.0 mL) was added BF<sub>3</sub>·Et<sub>2</sub>O (20 μL, 0.149 mmol, 4.0 equiv) at 0°C. After stirred for 15 minutes at this temperature, the reaction mixture was treated with 3N NaOH solution and adjusted the pH to approximately 8, then extracted

with DCM (3 x 5 mL). The resulting mixture was dried (MgSO<sub>4</sub>), filtered and concentrated, the residue was purified by column chromatography (CHCl<sub>3</sub>/MeOH/NH<sub>4</sub>OH, 100:10:1) to afford (-)-Montanine (**1**) (8.9 mg, 80%).

**Compound (-)-Montanine (1):** TLC (CHCl<sub>3</sub>:MeOH:NH<sub>4</sub>OH, 90:9:1 v/v):  $R_f$  = 0.80 (UV, KMnO<sub>4</sub>); **<sup>1</sup>H NMR** (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 6.55 (s, 1H), 6.46 (s, 1H), 5.89 (d,  $J$  = 1.2 Hz, 1H), 5.87 (d,  $J$  = 1.2 Hz, 1H), 5.57 (brs, 1H), 4.34, 3.82 (ABq,  $J$  = 16.8 Hz, 2 $\times$ 1H), 4.09 (d,  $J$  = 3.0 Hz, 1H), 3.48 – 3.47 (m, 1H), 3.44 (s, 3H), 3.44 – 3.40 (m, 1H), 3.29 (d,  $J$  = 1.8 Hz, 1H), 3.09 – 3.03 (m, 2H), 2.16 (ddd,  $J$  = 13.2, 5.4, 3.6 Hz, 1H), 1.58 (td,  $J$  = 12.6, 3.6 Hz, 1H); **<sup>13</sup>C NMR** (150 MHz, CDCl<sub>3</sub>)  $\delta$ : 154.2, 146.9, 146.1, 132.6, 124.7, 113.2, 107.4, 107.0, 100.9, 79.9, 69.2, 61.0, 58.8, 57.7, 55.5, 45.7, 32.8; **IR** (KBr): 3402, 2924, 2853, 1503, 1483, 1333, 1234, 1081, 1039, 935 cm<sup>-1</sup>; **HRMS** (ESI,  $m/z$ ) calcd for C<sub>17</sub>H<sub>20</sub>NO<sub>4</sub>[M+H]<sup>+</sup>: 302.1387, found 302.1381;  $[\alpha]_D^{25}$  = -81.3 (c = 0.4, CHCl<sub>3</sub>); Natural (-)-Montanine<sup>[10]</sup>:  $[\alpha]_D^{26}$  = -87.6 (c = 0.57, CHCl<sub>3</sub>); **Note:** The spectroscopic data were consistent with those previously reported.<sup>[9]</sup>



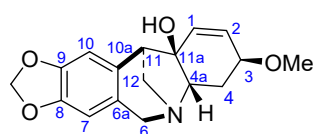
To a stirred solution of **23** (10 mg, 0.037 mmol, 1.0 equiv) in THF (0.3 mL) was added 3N H<sub>2</sub>SO<sub>4</sub> (0.3 mL) at room temperature. After heating at 70°C for 5 h, the reaction was quenched with 50 ml DCM/MeOH/NH<sub>4</sub>OH (100:10:1) at 0°C. The resulting mixture was dried (MgSO<sub>4</sub>), filtered and concentrated, the residue was purified by column chromatography (CHCl<sub>3</sub>/MeOH/NH<sub>4</sub>OH, 100:10:1) to afford (-)-Pancracine (**2**) (8.4 mg, 79%).

**Compound (-)-Pancracine (2):** TLC (CHCl<sub>3</sub>:MeOH:NH<sub>4</sub>OH, 90:9:1 v/v):  $R_f$  = 0.50 (UV, KMnO<sub>4</sub>); **<sup>1</sup>H NMR** (400 MHz, DMSO-*d*<sub>6</sub>)  $\delta$ : 6.66 (s, 1H), 6.57 (s, 1H), 5.91 (brs, 1H), 5.87 (brs, 1H), 5.35 (s, 1H), 4.73 (d,  $J$  = 6.0 Hz, 1H), 4.68 (d,  $J$  = 2.8 Hz, 1H), 4.13, 3.62 (ABq,  $J$  = 16.8 Hz, 2 $\times$ 1H), 3.73 (brs, 1H), 3.65 – 3.61 (m, 1H), 3.24 (brs, 1H), 3.22 – 3.17 (m, 1H), 2.85 (brs, 2H), 1.85 – 1.80 (m, 1H), 1.35 (td,  $J$  = 12.0, 2.4 Hz, 1H); **<sup>13</sup>C NMR** (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 152.5, 145.9, 145.2, 132.9, 125.3, 115.8, 107.2, 106.8, 100.4, 70.9, 68.8, 60.7, 57.9, 55.1, 44.8, 31.2; **IR** (KBr): 2881, 2182, 1503, 1487, 1335, 1278, 1234, 1029, 1012, 974, 932, 877, 774 cm<sup>-1</sup>; **HRMS** (ESI,  $m/z$ ) calcd for

$C_{16}H_{18}NO_4[M+H]^+$ : 288.1230, found 288.1222;  $[\alpha]_D^{25} = -70.3$  ( $c = 0.3$ , MeOH); Natural (-)-Pancracine [11]:  $[\alpha]_D^{24} = -74$  ( $c = 0.02$ , MeOH); **Note:** The spectroscopic data were consistent with those previously reported.[9]

### 3. NMR comparison of synthetic and natural products

**Table S1.  $^1H$  NMR Spectroscopic ( $CDCl_3$ , 27 °C) Comparison of Natural [7] and Our Synthetic Pancratinine B**

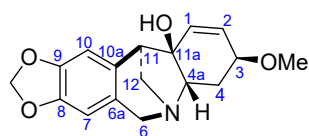


**Pancratinine B**

No.	Natural (300 MHz)	Ours (400 MHz)	$\Delta\delta$
	$\delta$ $^1H$ [ppm, mult, $J$ (Hz)]	$\delta$ $^1H$ [ppm, mult, $J$ (Hz)]	
1	5.77 (1H, d, 10.4 Hz)	5.78 (1H, d, 10.8 Hz)	0.01
2	6.15 (1H, d, 10.4 Hz)	6.15 (1H, d, 10.2 Hz)	0
3	3.97 (1H, m)	3.95 (1H, m)	0.02
4	2.40 (1H, d, 9.5 Hz)	2.36 (1H, br d, 12.6 Hz)	0.04
	1.57 (1H, dt, 12.6, 4.4 Hz)	1.58 (1H, m)	0.01
4a	2.96 (1H, s)	2.92 (1H, s)	0.04
6	4.32 (1H, d, 16.6 Hz)	4.29 (1H, d, 16.8 Hz)	0.03
	3.86 (1H, d, 16.6 Hz)	3.84 (1H, d, 16.8 Hz)	0.02
7	6.55 (1H, s)	6.55 (1H, s)	0
10	6.63 (1H, s)	6.63 (1H, s)	0
11	2.67 (1H, s)	2.65 (1H, d, $J = 2.4$ Hz)	0.02
12	3.02 (1H, d, 11.8 Hz)	2.99 (1H, dd, 12.0, 1.8 Hz)	0.03
	2.88 (1H, d, 11.8 Hz)	2.85 (1H, d, 11.4 Hz)	0.03
OCH <sub>2</sub> O	5.94 (2H, s)	5.94 (2H, s)	0
OMe	3.43 (3H, s)	3.44 (3H, s)	0.01

**Table S2.  $^{13}C$  NMR Spectroscopic ( $CDCl_3$ , 27 °C) Comparison of Natural [7] and Our Synthetic**

## Pancratinine B

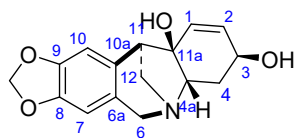


Pancratinine B

No.	Natural (75 MHz) $\delta^{13}\text{C}$ (ppm)	Ours (100 MHz) $\delta^{13}\text{C}$ (ppm)	$\Delta\delta$
1	134.6	134.7	0.1
2	130.3	131.5	0.2
3	71.4	72.5	1.1
4	29.3	31.9	2.6
4a	67.7	68.2	0.5
11a	81.8	83.4	1.6
6	60.3	62.4	2.1
6a	124.0	126.7	2.7
7	106.9	107.4	0.5
8	146.2	146.3	0.1
9	147.6	147.8	0.2
10	109.7	110.1	0.4
10a	127.7	129.2	1.5
11	48.8	49.9	1.1
12	53.7	55.2	1.5
OCH <sub>2</sub> O	100.9	101.2	0.3
OMe	56.1	56.5	0.4

Note: The  $^1\text{H}$  NMR spectroscopic data was identical to that reported in the literature. However, the partial deviation of  $^{13}\text{C}$  NMR spectra in  $\text{CDCl}_3$  was observed. The reason for such deviation could not be concluded at this stage. The structure of our synthetic ( $\pm$ )-Pancratinine B was determined by X-Ray Diffraction, and the Crystal data agree with those previously reported<sup>[7]</sup>; The  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectroscopic data of (+)-Pancratinine B were identical to the racemic ( $\pm$ )-Pancratinine B <sup>[3]</sup>.

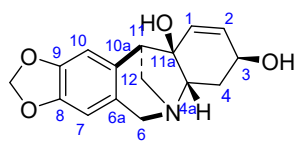
**Table S3. <sup>1</sup>H NMR Spectroscopic (CD<sub>3</sub>OD, 27 °C) Comparison of Natural [7] and Our Synthetic Pancratinine C**



**Pancratinine C**

No.	Natural (300 MHz)	Ours (400 MHz)	$\Delta\delta$
	$\delta$ <sup>1</sup> H [ppm, mult, <i>J</i> (Hz)]	$\square$ $\delta$ <sup>1</sup> H [ppm, mult, <i>J</i> (Hz)]	
1	5.74 (1H, d, 10.3 Hz)	5.76 (1H, d, 10.4 Hz)	0.02
2	6.01 (1H, d, 10.3 Hz)	6.03 (1H, d, 10.4 Hz)	0.02
3	4.30 (1H, m)	4.31 (1H, m)	0.01
4	2.32 (1H, d br, 13.0 Hz)	2.30 (1H, d br, 12.8 Hz)	0.02
	1.62 (1H, dt, 11.0, 4.3 Hz)	1.62 (1H, m)	0
4a	3.12 (1H, s)	3.08 (1H, s)	0.04
6	4.33 (1H, d, 16.2 Hz)	4.31 (1H, d, 16.4 Hz)	0.02
	3.98 (1H, d, 16.2 Hz)	3.94 (1H, d, 16.4 Hz)	0.04
7	6.58 (1H, s)	6.59 (1H, s)	0.01
10	6.62 (1H, s)	6.63 (1H, s)	0.01
11	2.75 (1H, d, 2.3 Hz)	2.73 (1H, d, 1.6 Hz)	0.02
12	3.06 (1H, dd, 11.5, 2.3 Hz)	3.05 (1H, d br, 12.0 Hz)	0.01
	2.95 (1H, d, 11.5 Hz)	2.92 (1H, d, 11.2 Hz)	0.03
OCH <sub>2</sub> O	5.89 (2H, s)	5.92 (2H, s)	0.03

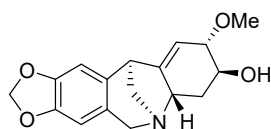
**Table S4. <sup>13</sup>C NMR Spectroscopic (CD<sub>3</sub>OD, 27 °C) Comparison of Natural [7] and Our Synthetic Pancratinine C**



**Pancratinine C**

No.	Natural (75 MHz) $\delta^{13}\text{C}$ (ppm)	Ours (100 MHz) $\square\delta^{13}\text{C}$ (ppm)	$\Delta\delta$
1	135.0	135.0	0
2	130.8	130.9	0.1
3	62.0	62.1	0.1
4	32.6	32.9	0.3
4a	67.0	66.9	0.1
11a	80.9	81.2	0.3
6	60.4	60.6	0.2
6a	123.1	123.5	0.4
7	105.8	105.8	0
8	145.9	145.8	0.1
9	147.0	147.0	0
10	109.5	109.4	0.1
10a	129.4	129.6	0.2
11	48.7	48.8	0.1
12	54.1	54.2	0.1
OCH <sub>2</sub> O	100.5	100.5	0

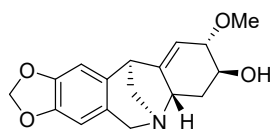
**Table S5. Comparison of the <sup>1</sup>H-NMR data (CDCl<sub>3</sub>, 27 °C) for Fan's [9] and Our Synthetic Montanine (1)**



**Montanine**

No.	Fan's (400 MHz)	Ours (400 MHz)	$\Delta\delta$
	$\delta$ <sup>1</sup> H [ppm, mult, <i>J</i> (Hz)]	$\delta$ <sup>1</sup> H [ppm, mult, <i>J</i> (Hz)]	
1	6.55 (s, 1H)	6.55 (s, 1H)	0
2	6.45 (s, 1H)	6.46 (s, 1H)	0.01
3	5.89 (s, 1 H)	5.89 (d, <i>J</i> = 1.2 Hz, 1H)	0
4	5.86 (s, 1 H)	5.87 (d, <i>J</i> = 1.2 Hz, 1H)	0.01
5	5.56 (brs, 1H)	5.57 (brs, 1H)	0.01
6	4.33, 3.80 (ABq, <i>J</i> = 16.8 Hz, 2 ×1H)	4.34, 3.82 (ABq, <i>J</i> = 16.8 Hz, 2×1H)	0.02
7	4.08 (brs, 1H)	4.09 (d, <i>J</i> = 3.0 Hz, 1H)	0.01
8	3.48 (brs, 1H)	3.48 – 3.47 (m, 1H)	0
9	3.44 (s, 3H)	3.44 (s, 3H)	0
10	3.44–3.39 (m, 1H)	3.44 – 3.40 (m, 1H)	0
11	3.28 (brs, 1H)	3.29 (d, <i>J</i> = 1.8 Hz, 1H)	0.01
12	3.09–3.00 (m, 2H)	3.09 – 3.03 (m, 2H)	0
13	2.67 (brs, 1H, OH)	-	-
14	2.16 (ddd, <i>J</i> = 3.5, 5.1, 12.8 Hz, 1H)	2.16 (ddd, <i>J</i> = 13.2, 5.4, 3.6 Hz, 1H)	0
15	1.56 ppm (td, <i>J</i> = 3.7, 12.5 Hz, 1H)	1.58 (td, <i>J</i> = 12.6, 3.6 Hz, 1H)	0.02

**Table S6. Comparison of the  $^{13}\text{C}$ -NMR data ( $\text{CDCl}_3$ , 27 °C) for Fan's <sup>[9]</sup> and Our Synthetic Montanine (1)**

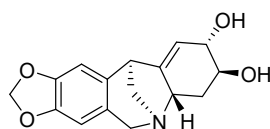


**Montanine**

No.	Fan's (100 MHz)	Ours (150 MHz)	$\Delta\delta$
	$\delta^{13}\text{C}$ (ppm)	$\delta^{13}\text{C}$ (ppm)	
1	154.1	154.2	0.1
2	146.7	146.9	0.2
3	145.9	146.1	0.2
4	132.4	132.6	0.2
5	124.6	124.7	0.1
6	112.9	113.2	0.3
7	107.2	107.4	0.2
8	106.8	107.0	0.2
9	100.7	100.9	0.2
10	79.7	79.9	0.2
11	68.9	69.2	0.3
12	60.8	61.0	0.2
13	58.6	58.8	0.2
14	57.5	57.7	0.2
15	55.3	55.5	0.2
16	45.6	45.7	0.1
17	32.7	32.8	0.1



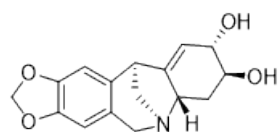
**Table S7. Comparison of the  $^1\text{H}$ -NMR data (DMSO- $d_6$ , 27 °C) for Fan's<sup>[9]</sup> and Our Synthetic Pancracine (2)**



**Pancracine**

No.	Fan's (400 MHz)	Ours (600 MHz)	$\Delta\delta$
	$\delta$ $^1\text{H}$ [ppm, mult, $J$ (Hz)]	$\delta$ $^1\text{H}$ [ppm, mult, $J$ (Hz)]	
1	6.67 (s, 1H)	6.66 (s, 1H)	0.01
2	6.57 (s, 1H)	6.57 (s, 1H)	0
3	5.91, 5.88 (ABq, $J = 0.8$ Hz, $2 \times 1\text{H}$ )	5.91 (brs, 1H), 5.87 (brs, 1H)	0
4	5.35 (brs, 1H)	5.35 (s, 1H)	0
5	4.73 (d, $J = 6.0$ Hz, 1H, OH)	4.73 (d, $J = 6.0$ Hz, 1H)	0
6	4.69 (d, $J = 3.2$ Hz, 1H, OH) 1H),	4.68 (d, $J = 2.8$ Hz, 1H)	0.01
7	4.13, 3.62 (ABq, $J = 16.8$ Hz, $2 \times 1\text{H}$ ) 1H)	4.13, 3.62 (ABq, $J = 16.8$ Hz, $2 \times 1\text{H}$ )	0
8	3.72 (brs, 1H)	3.73 (brs, 1H)	0.01
9	3.64-3.61 (m, 1H)	3.65 – 3.61 (m, 1H)	0
10	3.24 (brs, 1H)	3.24 (brs, 1H)	0
11	3.23-3.17 (m, 1H)	3.22 – 3.17 (m, 1H)	0
12	2.85 (brs, 2H)	2.85 (brs, 2H)	0
13	1.85-1.80 (m, 1H)	1.85 – 1.80 (m, 1H)	0
14	1.34 (td, $J = 2.2, 12.1$ Hz, 1H)	1.35 (td, $J = 12.0, 2.4$ Hz, 1H)	0.01

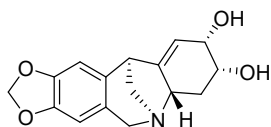
**Table S8. Comparison of the  $^{13}\text{C}$ -NMR data (DMSO- $d_6$ , 27 °C) for Fan's<sup>[9]</sup> and Our Synthetic Pancracine (2)**



Pancracine

No.	Fan's (100 MHz)	Ours (150 MHz)	$\Delta\delta$
	$\delta^{13}\text{C}$ (ppm)	$\delta^{13}\text{C}$ (ppm)	
1	152.4	152.5	0.1
2	145.9	145.9	0
3	145.2	145.2	0
4	132.9	132.9	0
5	125.3	125.3	0
6	115.8	115.8	0
7	107.2	107.2	0
8	106.8	106.8	0
9	100.4	100.4	0
10	70.9	70.9	0
11	68.8	68.8	0
12	60.7	60.7	0
13	57.9	57.9	0
14	55.1	55.1	0
15	44.8	44.8	0
16	31.1	31.2	0.1

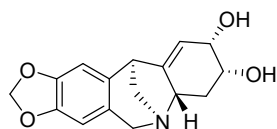
**Table S9. Comparison of the  $^1\text{H-NMR}$  data ( $\text{CDCl}_3$ ,  $27\text{ }^\circ\text{C}$ ) for Fan's [9] and Our Synthetic Brunsvigine (3)**



**Brunsvigine**

No.	Fan's (400 MHz)	Ours (600 MHz)	$\Delta\delta$
	$\delta\text{ }^1\text{H}$ [ppm, mult, $J$ (Hz)]	$\delta\text{ }^1\text{H}$ [ppm, mult, $J$ (Hz)]	
1	6.57 (1H, s)	6.57 (s, 1H)	0
2	6.49 (1H, s)	6.49 (s, 1H)	0
3	5.91, 5.88 ( $2\times 1\text{ H}$ , ABq, 1.2 Hz)	5.91, 5.88 ( $2\times 1\text{H}$ , ABq, 1.2 Hz)	0
4	5.77-5.70 (1H, m)	5.75 (1H, dd, 3.0, 2.4 Hz)	0.01
5	4.34, 3.82 ( $2\times 1\text{H}$ , ABq, 16.4 Hz)	4.34, 3.82 ( $2\times 1\text{H}$ , ABq, 16.4Hz)	0
6	4.17-4.15 (1H, m)	4.16 (1H, t, 4.2 Hz,)	0
7	3.73-3.66 (1H, m)	3.72-3.68 (1H, m)	0
8	3.30 (1 H, brs)	3.30 (1H, brs)	0
9	3.16-3.13 (1H, m)	3.20 (1H, dd, 11.4, 3.6 Hz,)	0.04
10	3.10-3.04 (2H, m)	3.07-3.06 (2H, m)	0.01
11	2.21-2.16 (1H, m)	2.20-2.17 (1H, m)	0.01
12	1.47 (1H, q, 12.0 Hz)	1.47 (1H, q, 11.4 Hz)	0

**Table S10. Comparison of the  $^{13}\text{C}$ -NMR data ( $\text{CD}_3\text{OD}$ ,  $27\text{ }^\circ\text{C}$ ) for Fan's<sup>[9]</sup> and Our Synthetic Brunsvigine (3)**



**Brunsvigine**

No.	Fan's (100 MHz)	Ours (150 MHz)	$\Delta\delta$
	$\delta^{13}\text{C}$ (ppm)	$\delta^{13}\text{C}$ (ppm)	
1	154.3	154.2	0.1
2	148.4	148.4	0
3	147.6	147.7	0.1
4	133.2	133.2	0
5	125.1	125.0	0.1
6	117.6	117.7	0.1
7	108.4	108.4	0
8	107.8	107.9	0.1
9	102.1	102.2	0.1
10	69.8	69.8	0
11	67.1	67.1	0
12	64.5	64.6	0.1
13	61.4	61.3	0.1
14	56.3	56.4	0.1
15	46.5	46.5	0
16	33.0	33.0	0

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### 5. ECD calculation of **5**

Experimental section: The conformation of **5** generated by BALLOON were subjected to semiempirical PM3 quantum mechanical geometry optimizations using the Gaussian 09 program. Duplicate conformations were identified and removed when the root-mean-square (RMS) distance was less than 0.5 Å for any two geometry-optimized conformations. The remaining conformations were further optimized at the B3LYP/6-31G (d) level in MeOH with the IEFPCM solvation model using Gaussian 09, and the duplicate conformations emerging after these calculations were removed according to the same RMS criteria above. The harmonic vibrational frequencies were calculated to confirm the stability of the final conformers. The electronic circular dichroism (ECD) spectrum were calculated for each conformer using the TDDFT methodology at the LC-wPBE/6-311G(d,p) level with MeOH as solvent by the IEFPCM solvation model implemented in Gaussian 09 program. The ECD spectra for each conformer were simulated using a Gaussian function with a bandwidth  $\sigma$  of 0.6 eV. The spectra were combined after Boltzmann weighting according to their population contributions and UV correction was applied.

**Table S11.** Important thermodynamic parameters (a.u.) and Boltzmann distributions of the optimized (3S, 4aS, 5R, 11R, 11aR)-**5** at B3LYP/6-31G (d) level in MeOH.

Conformation	Gibbs free energies (Hartree)	Boltzmann distribution
1	-975.239481	44.9%
2	-975.238470	32.9%
3	-975.237631	7.9%
4	-975.236506	6.1%
5	-975.237563	3.6%
6	-975.235549	1.3%

**Table S12.** Optimized coordinate of (3S, 4aS, 5R, 11R, 11aR)-**5** at B3LYP/6-31G (d) level in MeOH.

Conformation 1						
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<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.221532	-0.694941	0.139882	H	1.133026	0.814061	-1.491712
C	-3.423332	0.631223	-0.235555	O	0.782354	-1.652741	-1.241397
C	-2.398266	1.554267	-0.222156	O	5.558687	0.291592	-0.481164
C	-1.125233	1.112392	0.191033	H	-2.567853	2.583426	-0.525442
C	-0.921932	-0.223326	0.586452	H	-1.837761	-2.186955	0.844408
C	-1.986097	-1.153291	0.548302	H	-6.054351	-0.277548	0.551223
O	-4.394941	-1.398608	0.004056	H	-5.962362	-0.757243	-1.188105
C	-5.394197	-0.423338	-0.315211	H	0.11873	2.65223	-0.695844
O	-4.730569	0.808904	-0.62189	H	-0.136639	2.843885	1.030383
C	0.045337	2.09513	0.246393	H	0.405428	-1.540173	1.678668
N	1.343674	1.46107	0.514539	H	3.378053	0.25022	-1.977263
C	1.750886	0.575419	-0.619572	H	3.414376	1.838177	-1.189952
C	1.402697	-0.90585	-0.20138	H	4.21304	0.836994	0.8936
C	0.464854	-0.654385	1.037586	H	4.658477	-1.838949	0.702307
C	3.215565	0.774834	-1.024098	H	2.405047	-2.753044	0.44365
C	4.21246	0.209523	-0.006831	H	2.146487	0.272453	2.082355
C	3.843114	-1.210931	0.345782	H	0.593491	1.037276	2.459286
C	2.609692	-1.708275	0.215229	H	-0.121178	-1.306443	-1.342947
C	1.171782	0.548951	1.669223	H	5.609225	-0.25343	-1.283711
Conformation 2							
<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.223923	-0.690302	0.145379	H	1.143275	0.81468	-1.505423
C	-3.423928	0.636816	-0.227656	O	0.768739	-1.648731	-1.257882
C	-2.396308	1.55701	-0.217941	O	5.54875	0.187647	-0.477686
C	-1.12262	1.110965	0.188888	H	-2.564498	2.586956	-0.51938
C	-0.92108	-0.225553	0.582012	H	-1.84077	-2.187047	0.841085
C	-1.987954	-1.152479	0.54767	H	-6.055286	-0.266862	0.567522
O	-4.399864	-1.39066	0.01411	H	-5.969234	-0.744257	-1.172684

C	-5.397807	-0.412834	-0.300933	H	0.122356	2.646861	-0.702693
O	-4.732505	0.818516	-0.607764	H	-0.127751	2.840159	1.02426
C	0.050635	2.09047	0.24018	H	0.40859	-1.547684	1.664641
N	1.349086	1.454786	0.504992	H	3.409826	0.238664	-1.972581
C	1.75527	0.56985	-0.631017	H	3.415052	1.830187	-1.184149
C	1.39943	-0.911446	-0.217442	H	4.149145	0.789696	0.929674
C	0.466755	-0.660514	1.02547	H	4.663214	-1.879078	0.627223
C	3.223887	0.761215	-1.026228	H	2.398055	-2.772955	0.389728
C	4.201804	0.189237	0.004883	H	2.153263	0.258979	2.06692
C	3.842766	-1.239501	0.308609	H	0.603463	1.027384	2.451168
C	2.604983	-1.724434	0.183648	H	-0.13167	-1.293708	-1.356018
C	1.177911	0.539551	1.65787	H	5.799482	1.112043	-0.630823
Conformation 3							
<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.223524	-0.692285	0.142829	H	1.139065	0.815517	-1.496912
C	-3.423737	0.635155	-0.228798	O	0.773418	-1.650779	-1.251649
C	-2.396841	1.556121	-0.215851	O	5.506852	0.295765	-0.594858
C	-1.123574	1.110644	0.192879	H	-2.565082	2.586315	-0.516376
C	-0.921895	-0.226358	0.584532	H	-1.840602	-2.18894	0.839111
C	-1.987981	-1.154056	0.546881	H	-6.057079	-0.272105	0.558283
O	-4.398775	-1.393406	0.00848	H	-5.965052	-0.746737	-1.182328
C	-5.396657	-0.416018	-0.308287	H	0.122215	2.648696	-0.694288
O	-4.731795	0.816448	-0.61111	H	-0.13072	2.83904	1.032489
C	0.049212	2.090733	0.247439	H	0.406008	-1.549005	1.668585
N	1.347048	1.454644	0.512828	H	3.400013	0.24845	-1.976272
C	1.754576	0.571398	-0.624756	H	3.416467	1.835066	-1.186105
C	1.399976	-0.909799	-0.211446	H	4.171403	0.81988	0.90599
C	0.465336	-0.661079	1.030349	H	4.654007	-1.875074	0.642969
C	3.218626	0.770329	-1.028523	H	2.40253	-2.767478	0.403567

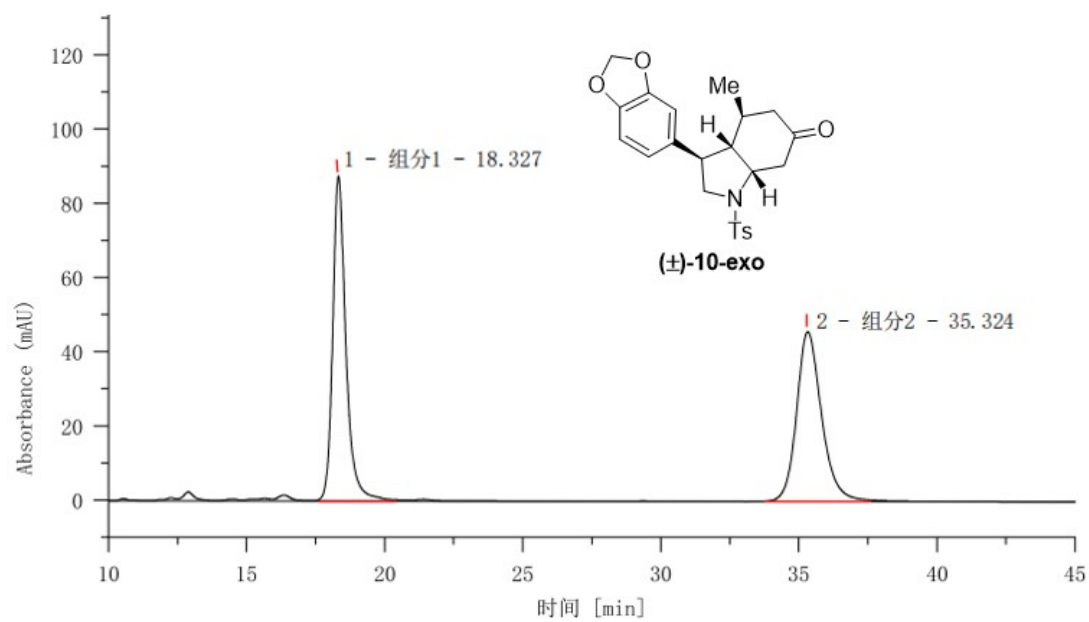


C	4.204147	0.204739	-0.009438	H	2.15012	0.258943	2.074521
C	3.841387	-1.226003	0.31543	H	0.599355	1.025746	2.457576
C	2.606325	-1.718887	0.193372	H	-0.125385	-1.2937	-1.356647
C	1.174971	0.539118	1.664358	H	6.153718	0.046129	0.083312
Conformation 4							
<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.234317	-0.678237	0.174735	H	1.09058	0.761936	-1.482124
C	-3.434189	0.647227	-0.203291	O	0.691219	-1.665668	-1.15941
C	-2.406486	1.566249	-0.196064	O	5.53407	0.208243	-0.55777
C	-1.132315	1.115943	0.205369	H	-2.574498	2.597604	-0.49304
C	-0.932877	-0.219229	0.595674	H	-1.852308	-2.17459	0.869599
C	-2.000574	-1.13989	0.578945	H	-6.284074	-0.454331	-0.000075
O	-4.427796	-1.363585	0.10205	H	-5.487613	-0.78928	-1.587265
C	-5.336653	-0.468946	-0.545687	H	0.116567	2.632966	-0.714652
O	-4.758438	0.840683	-0.529237	H	-0.124099	2.856165	1.009865
C	0.043148	2.092066	0.237182	H	0.388742	-1.534386	1.695572
N	1.341169	1.45243	0.50678	H	3.369401	0.22836	-1.999524
C	1.732838	0.551178	-0.621783	H	3.363661	1.824572	-1.230206
C	1.40106	-0.919774	-0.167107	H	4.165872	0.830258	0.874867
C	0.453416	-0.656142	1.044285	H	4.697097	-1.833169	0.632416
C	3.190439	0.755902	-1.052838	H	2.427744	-2.740281	0.526516
C	4.201153	0.211665	-0.038423	H	2.137796	0.276736	2.089067
C	3.862943	-1.21057	0.315005	H	0.582785	1.045255	2.452648
C	2.621417	-1.702821	0.255486	H	1.341393	-1.95234	-1.82066
C	1.164225	0.550114	1.669624	H	5.780968	1.131713	-0.722201
Conformation 5							
<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.074142	-0.734131	0.26563	H	1.486628	0.711276	-1.367243
C	-3.316541	0.41943	-0.477852	O	1.090903	-1.587631	-0.591476

C	-2.354026	1.393042	-0.642763	O	3.832954	-0.994452	-1.932178
C	-1.102628	1.185388	-0.026797	H	-2.553495	2.284577	-1.230294
C	-0.860418	0.029503	0.736308	H	-1.678092	-1.861949	1.454746
C	-1.859198	-0.961008	0.877307	H	-5.95807	-0.464048	0.317389
O	-4.185731	-1.542565	0.241226	H	-5.657502	-1.384665	-1.207566
C	-5.204083	-0.77993	-0.416947	H	0.143907	2.517239	-1.199539
O	-4.58845	0.37699	-0.996312	H	-0.326577	3.16113	0.363965
C	-0.006228	2.242443	-0.148094	H	0.43547	-0.83948	2.233943
N	1.291156	1.843345	0.411552	H	3.624612	1.663802	-1.379338
C	1.936003	0.752176	-0.370283	H	3.826363	1.498616	0.366671
C	1.571247	-0.612254	0.351259	H	5.281401	-0.108735	-0.8437
C	0.501656	-0.146585	1.388037	H	4.81182	-1.757142	0.911079
C	3.446835	0.994421	-0.530369	H	2.541597	-1.945273	1.852561
C	4.214112	-0.321566	-0.725066	H	2.024944	1.152972	2.271641
C	3.980976	-1.193364	0.492232	H	0.395833	1.856231	2.342548
C	2.753514	-1.291754	1.008156	H	0.220844	-1.280641	-0.904937
C	1.069135	1.238329	1.740888	H	2.967526	-1.410902	-1.762742
Conformation 6							
<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Atom</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
C	-3.234756	-0.680105	0.172289	H	1.088518	0.762907	-1.475295
C	-3.434545	0.645904	-0.203729	O	0.697445	-1.668086	-1.156471
C	-2.407071	1.565171	-0.19409	O	5.489828	0.312973	-0.669951
C	-1.133093	1.114711	0.207753	H	-2.574982	2.596972	-0.489541
C	-0.93377	-0.221214	0.59584	H	-1.853028	-2.177255	0.865911
C	-2.00122	-1.142116	0.576715	H	-6.284359	-0.456264	-0.003886
O	-4.428106	-1.365608	0.097627	H	-5.487237	-0.788708	-1.591245
C	-5.336673	-0.469953	-0.54912	H	0.117271	2.63357	-0.707863
O	-4.758632	0.839608	-0.530375	H	-0.126787	2.854048	1.016432
C	0.042165	2.091202	0.242889	H	0.386023	-1.537725	1.696158

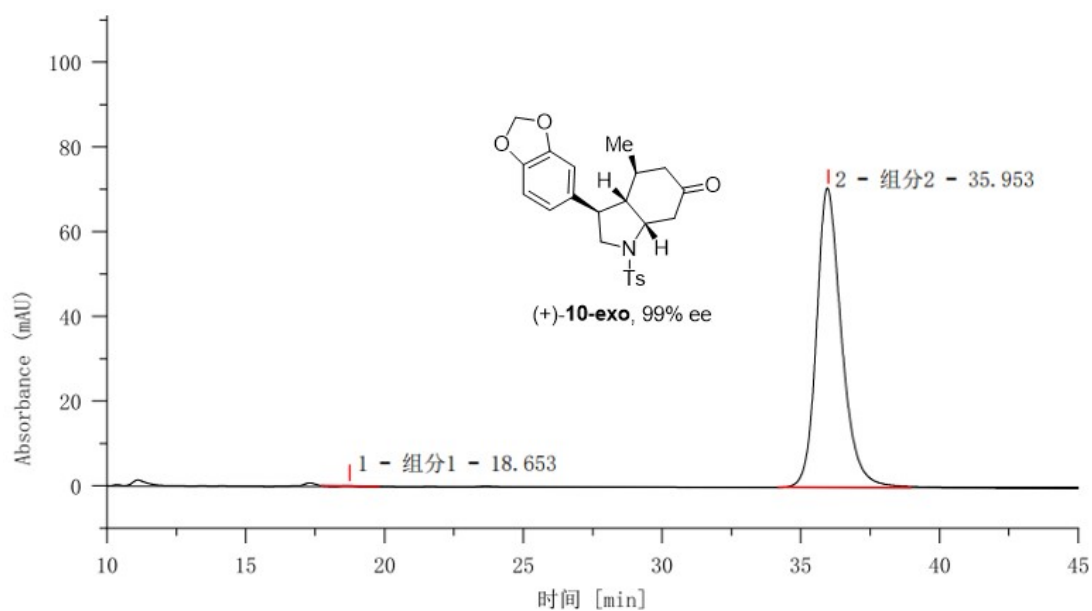
N	1.339469	1.451123	0.51362	H	3.362478	0.23606	-2.001972
C	1.733267	0.552084	-0.616777	H	3.366962	1.828136	-1.232513
C	1.402299	-0.918804	-0.163412	H	4.184456	0.861609	0.851963
C	0.451905	-0.658379	1.046294	H	4.688391	-1.828496	0.650888
C	3.186711	0.763699	-1.054528	H	2.432714	-2.735529	0.536655
C	4.202947	0.226967	-0.050053	H	2.133893	0.274305	2.095296
C	3.86166	-1.197116	0.323766	H	0.577731	1.04111	2.457336
C	2.62334	-1.697668	0.264189	H	1.344856	-1.928354	-1.831297
C	1.16086	0.547721	1.67444	H	6.158375	0.122024	0.006197

## 6. Copes of HPLC Traces.



Area Percent Report

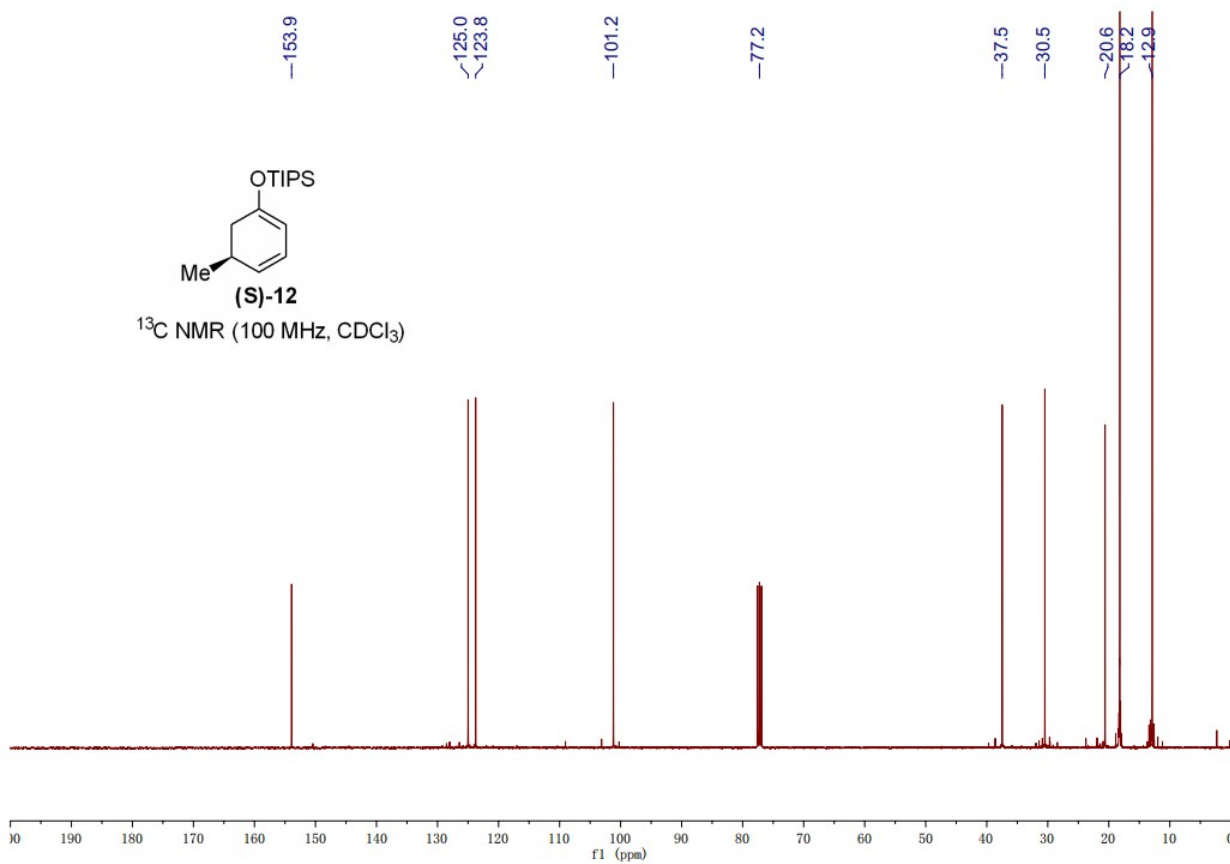
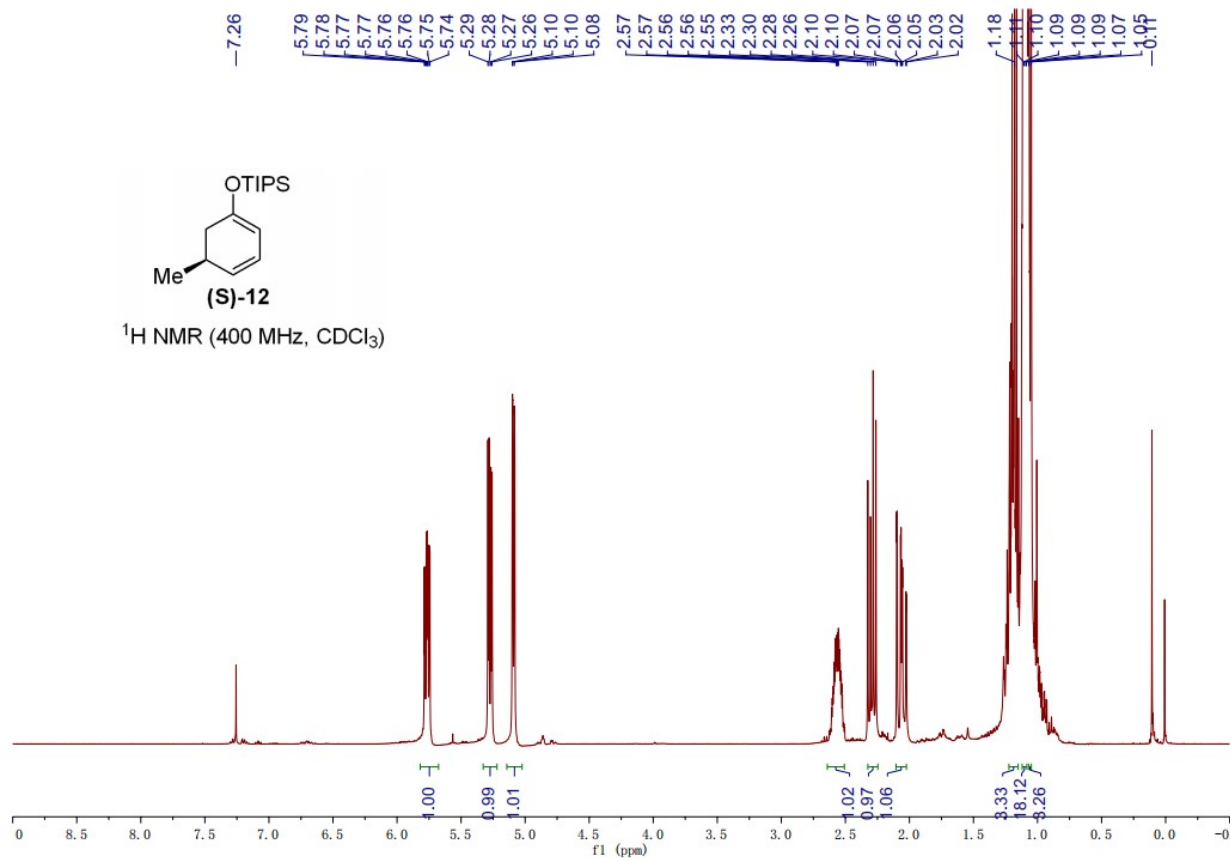
Peak	RetTime [min]	Height [mAU]	Area	Height %	Area %
1	18.327	87.557	2944357	65.672	50.648
2	35.324	45.767	2883930	34.328	49.352

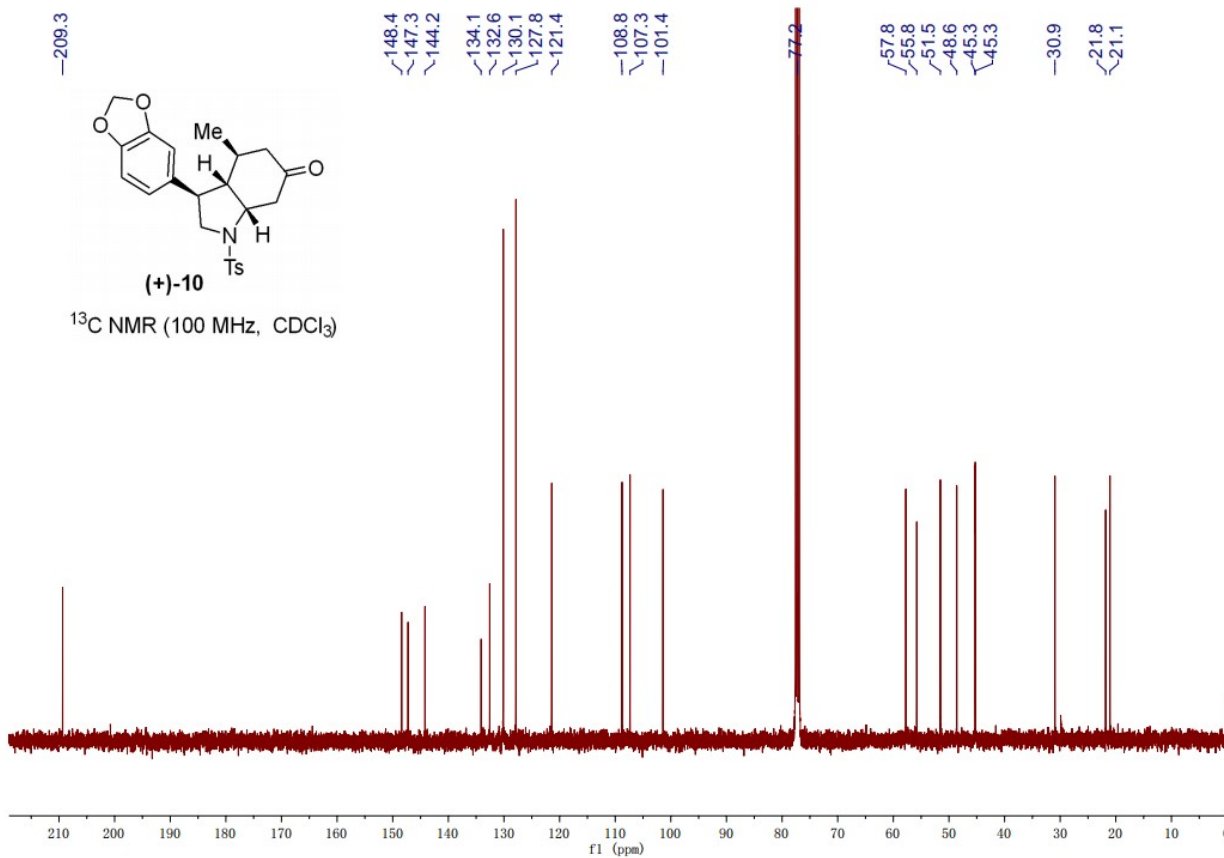
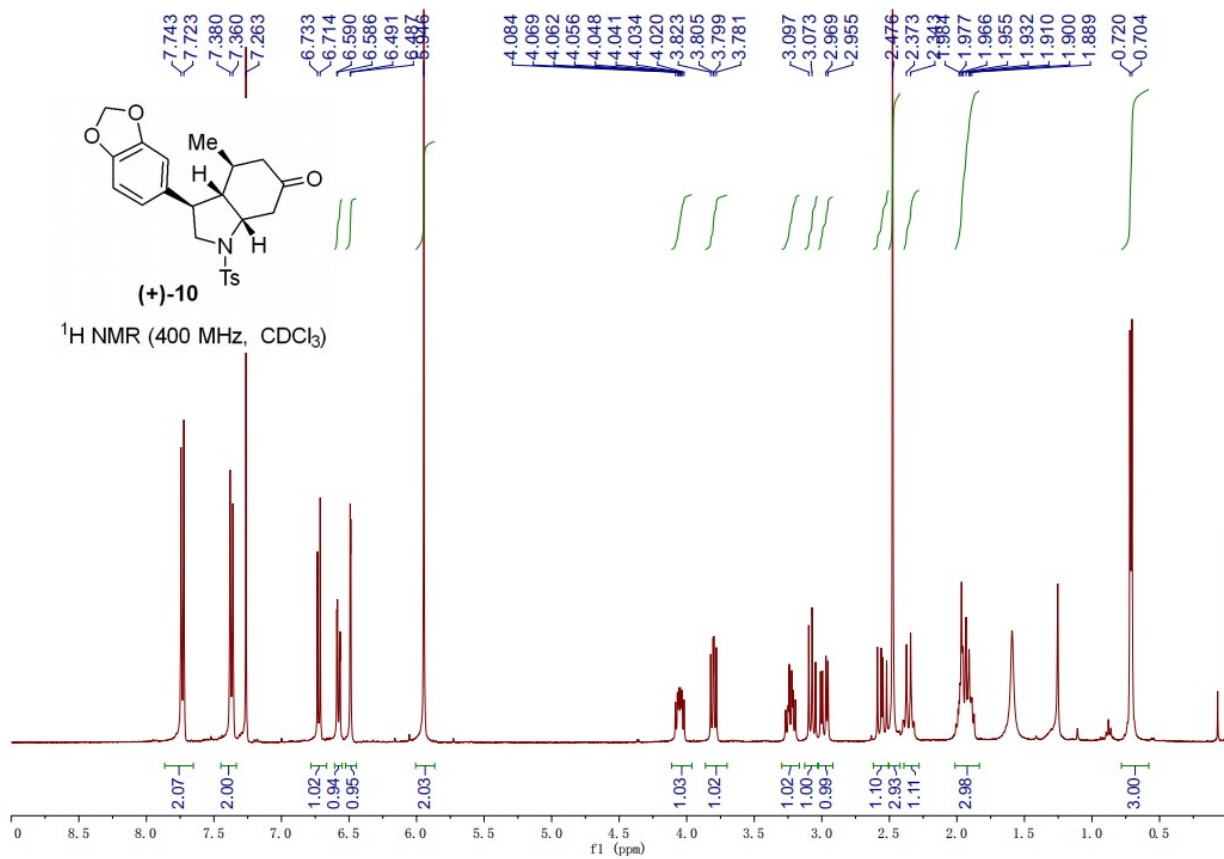


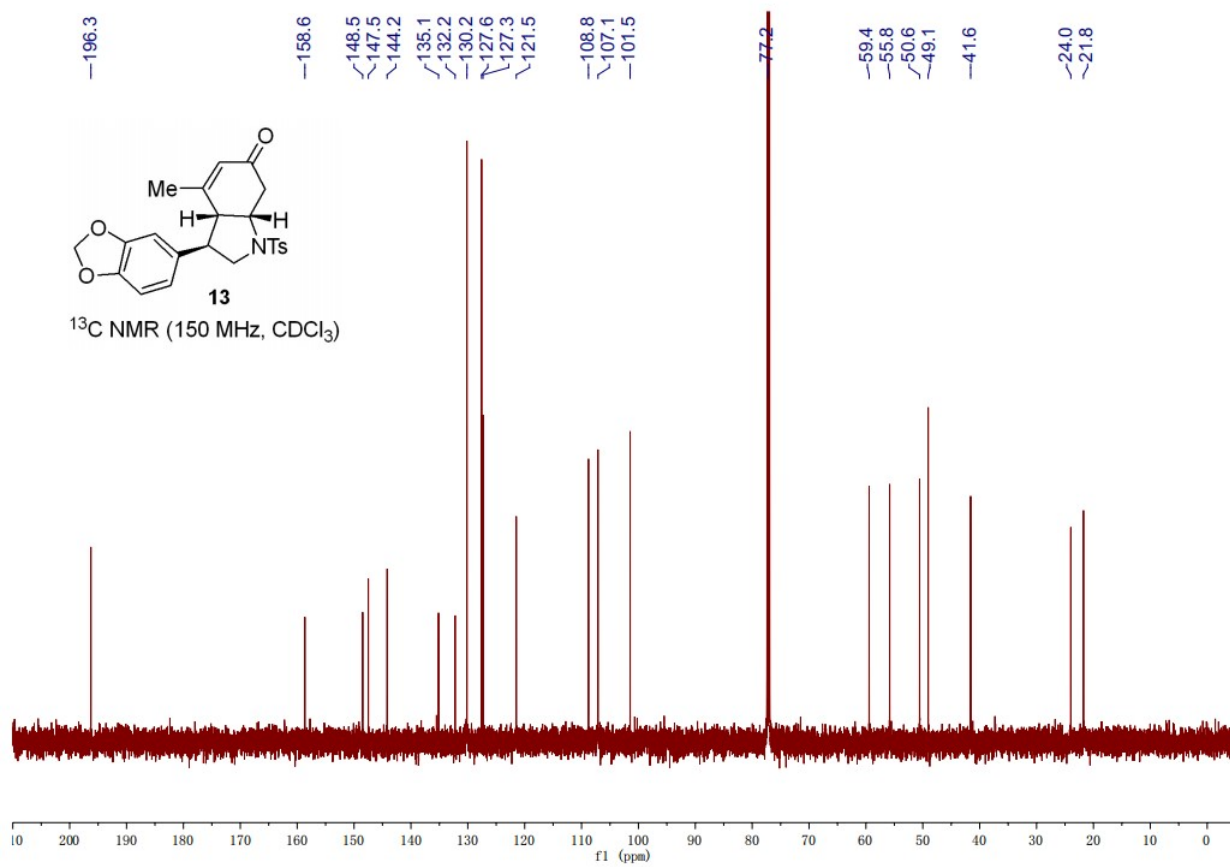
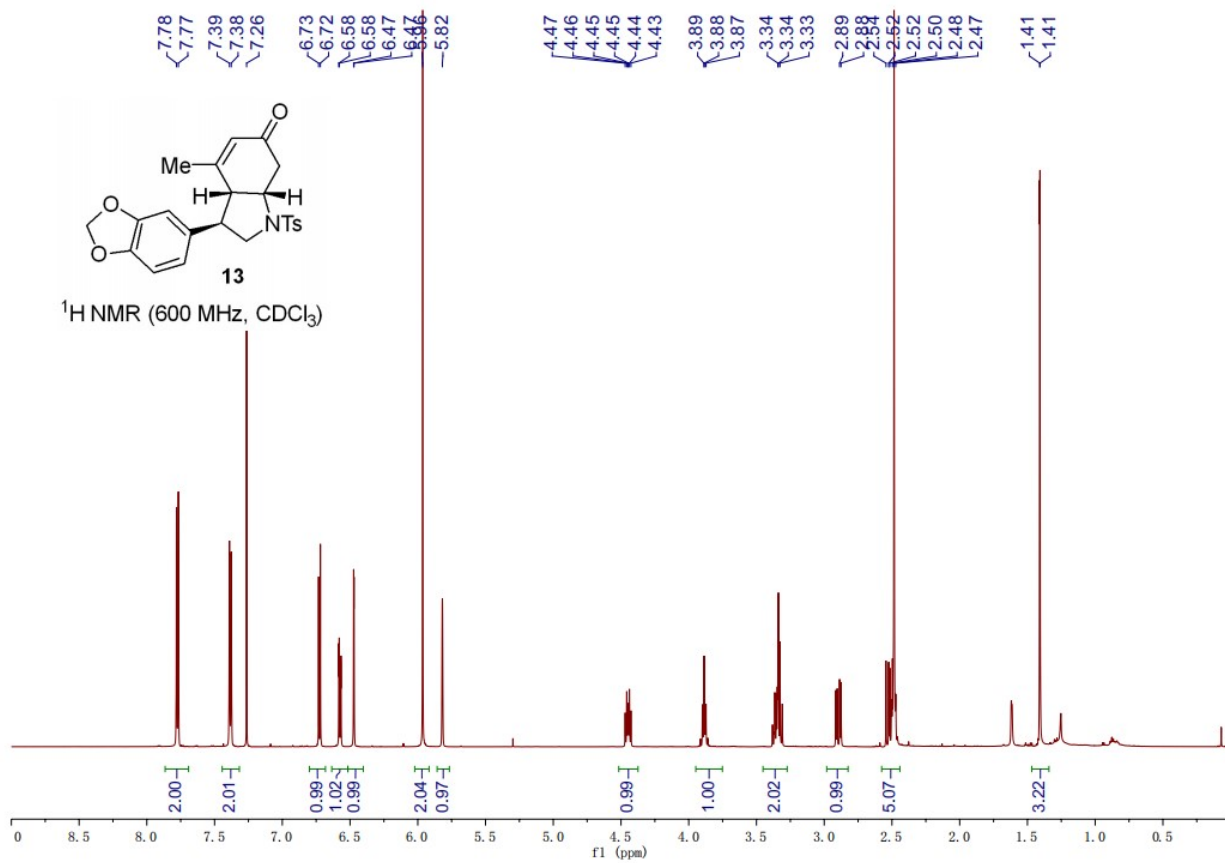
Area Percent Report

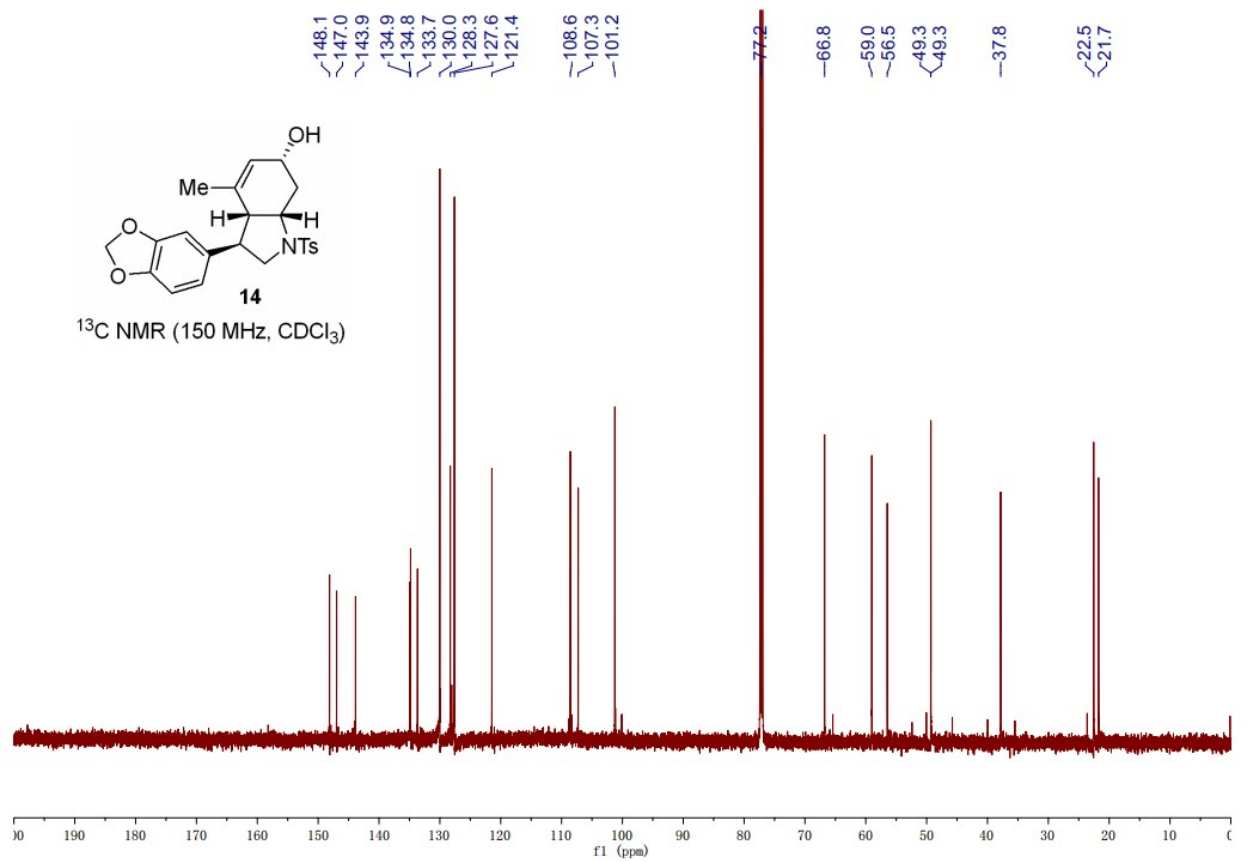
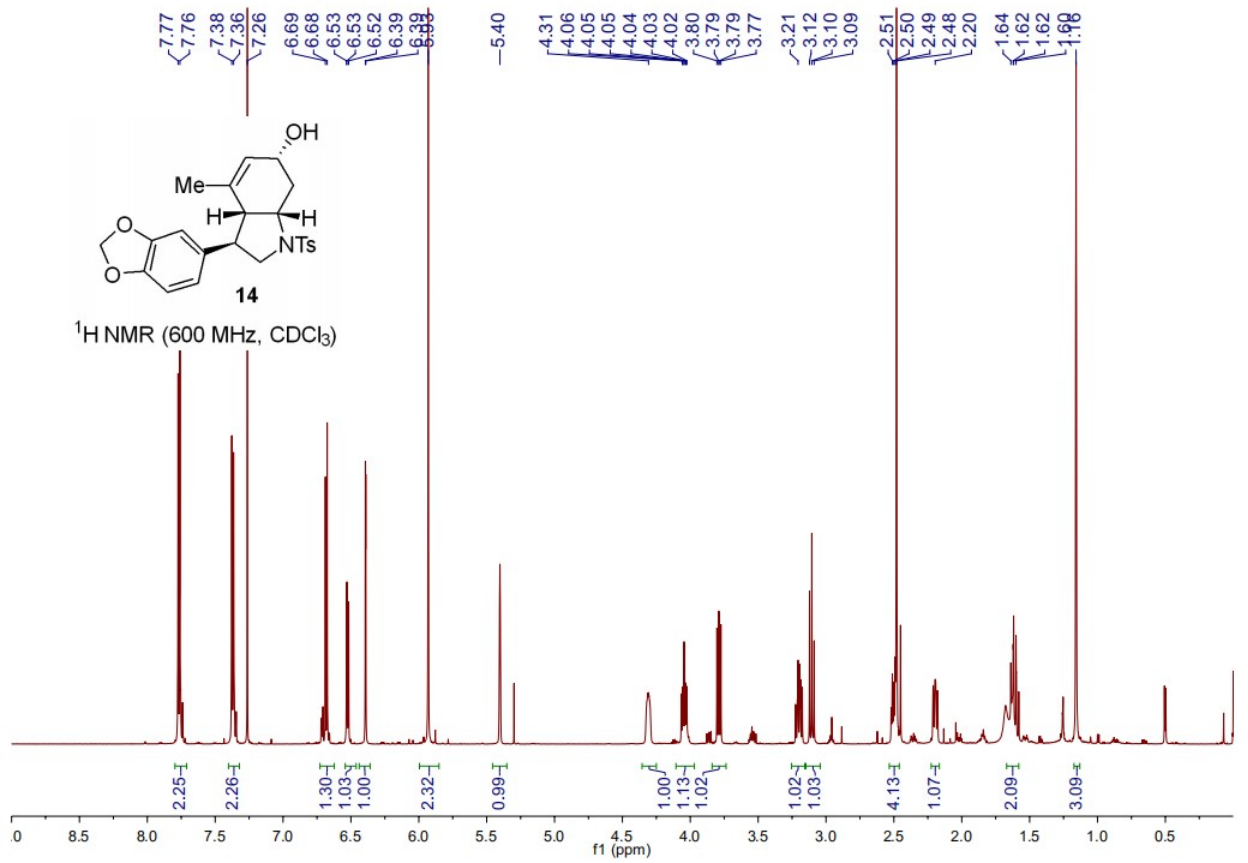
Peak	RetTime [min]	Height [mAU]	Area	Height %	Area %
1	18.653	0.211	20660	0.298	0.465
2	35.953	70.621	4423552	99.702	99.702

## 7. NMR spectra.

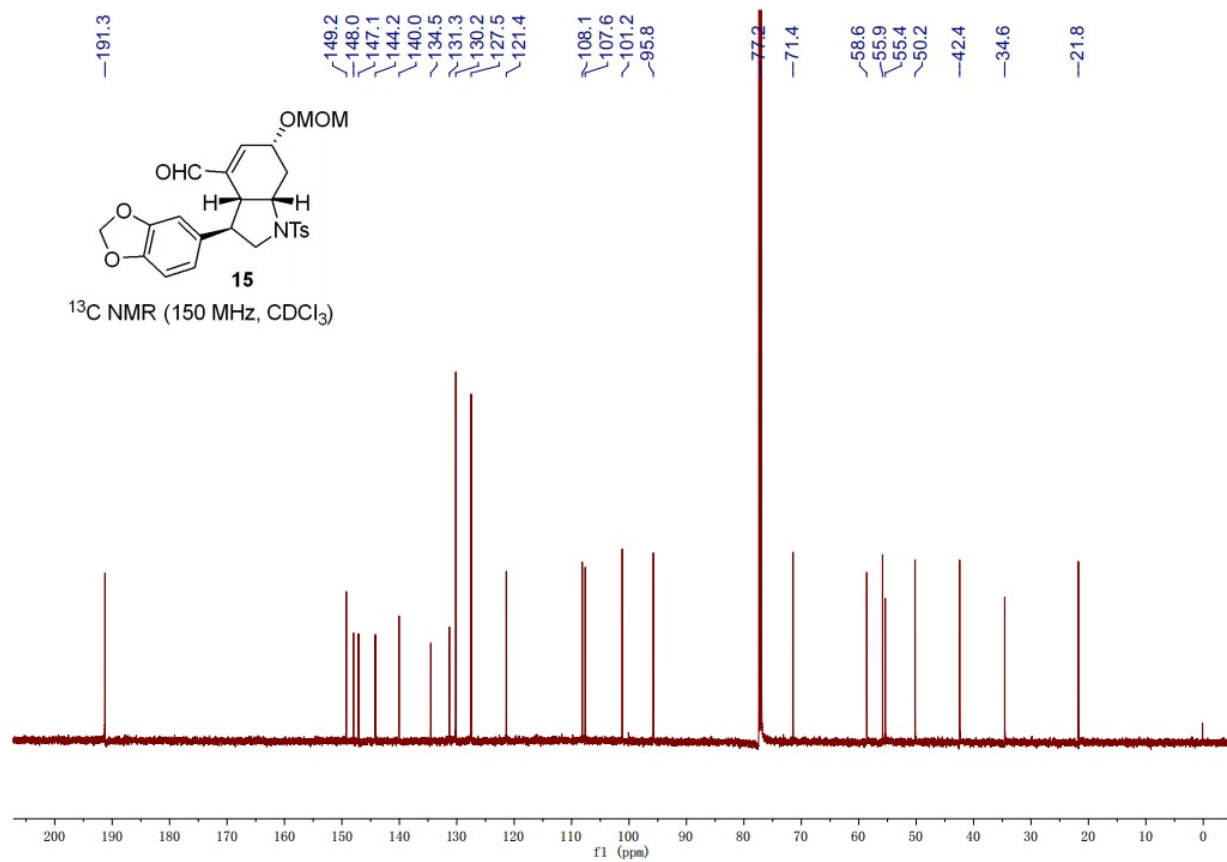
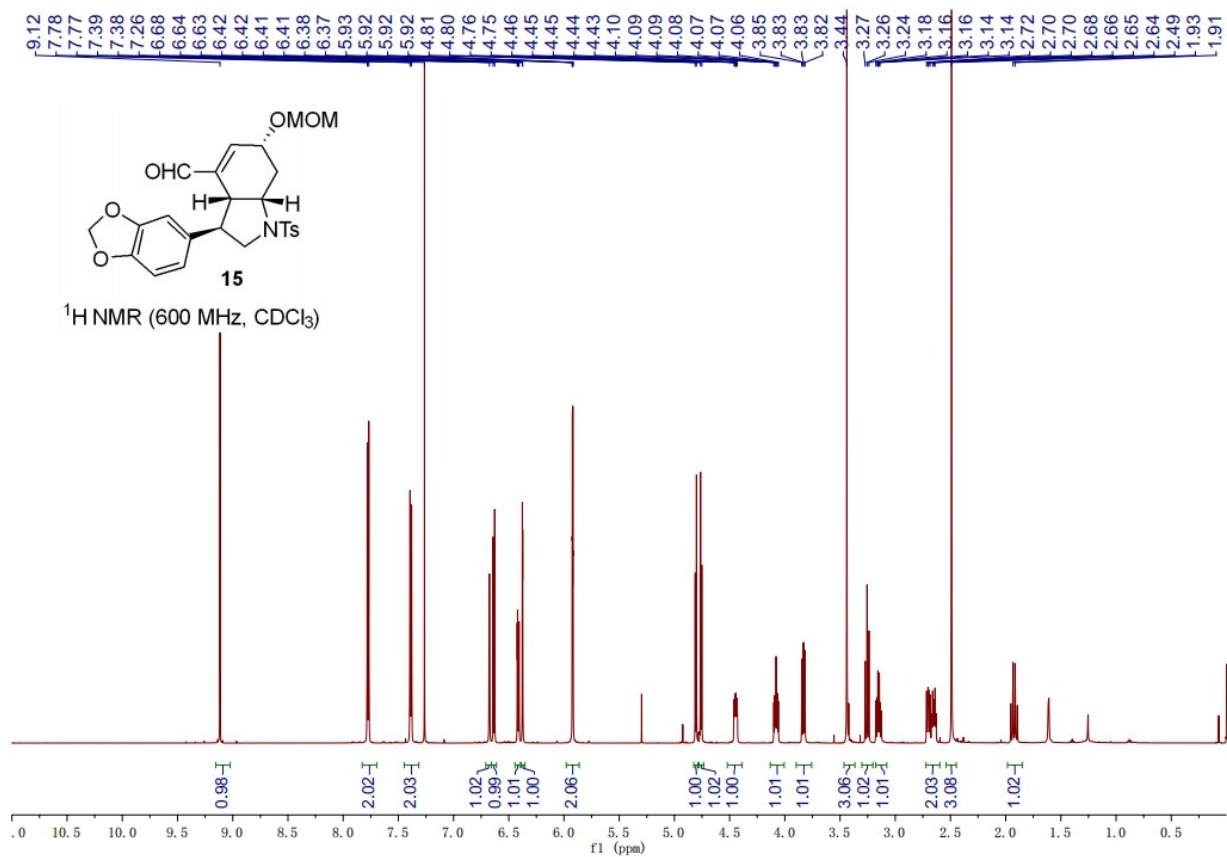


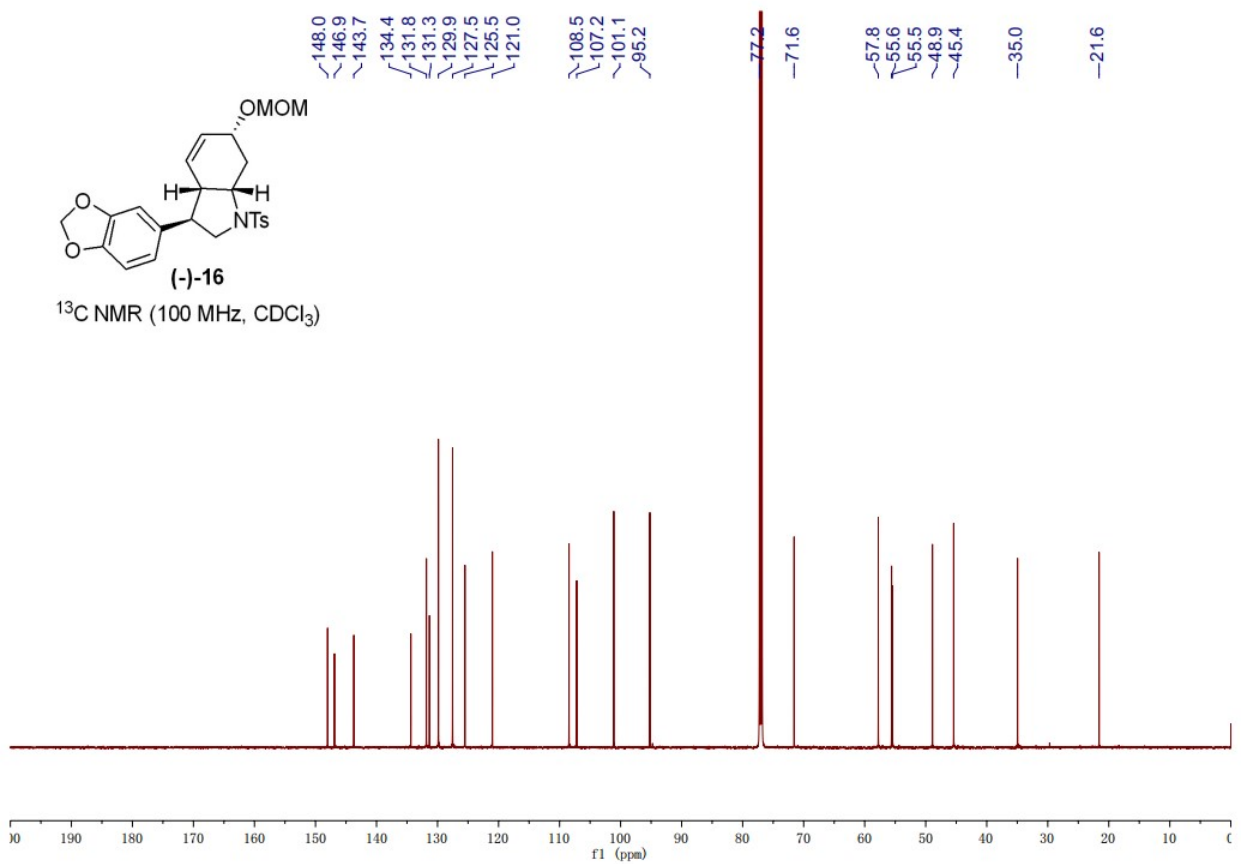
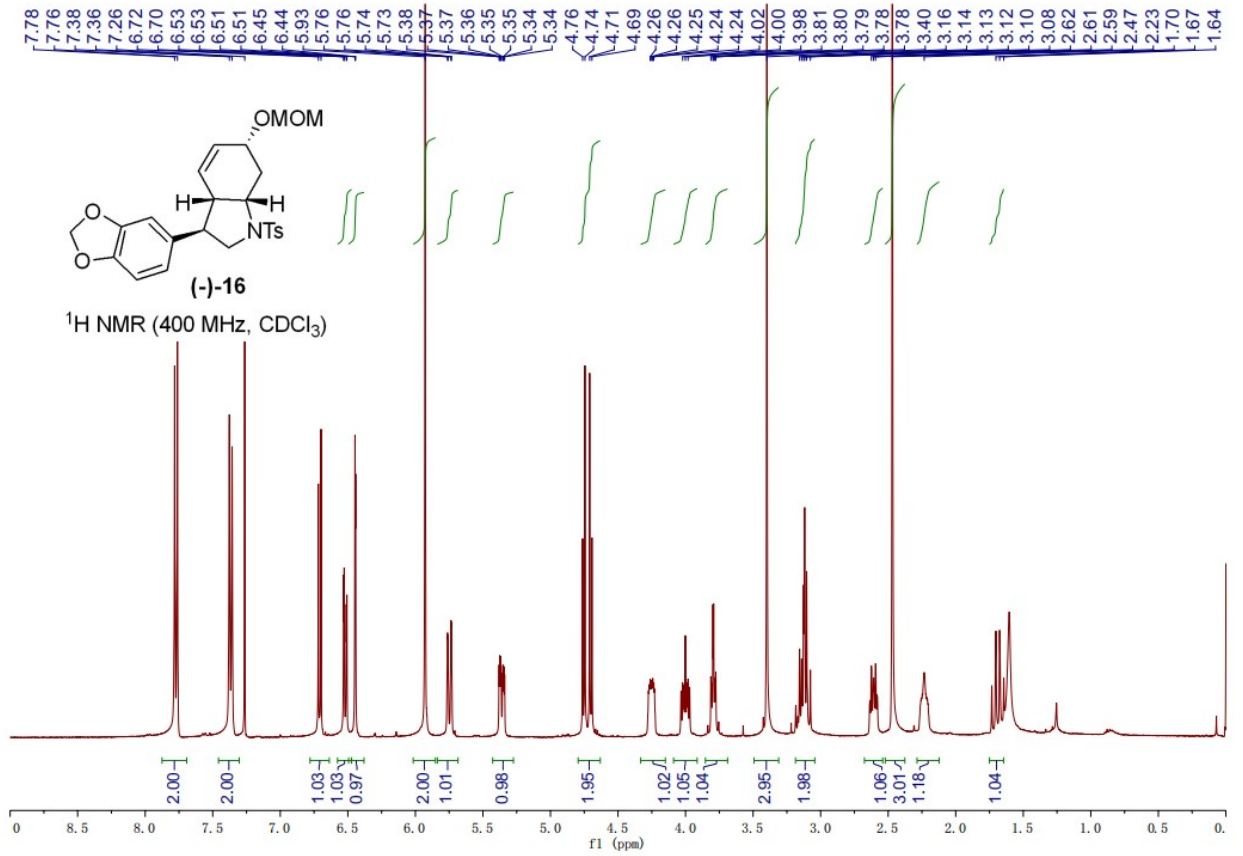


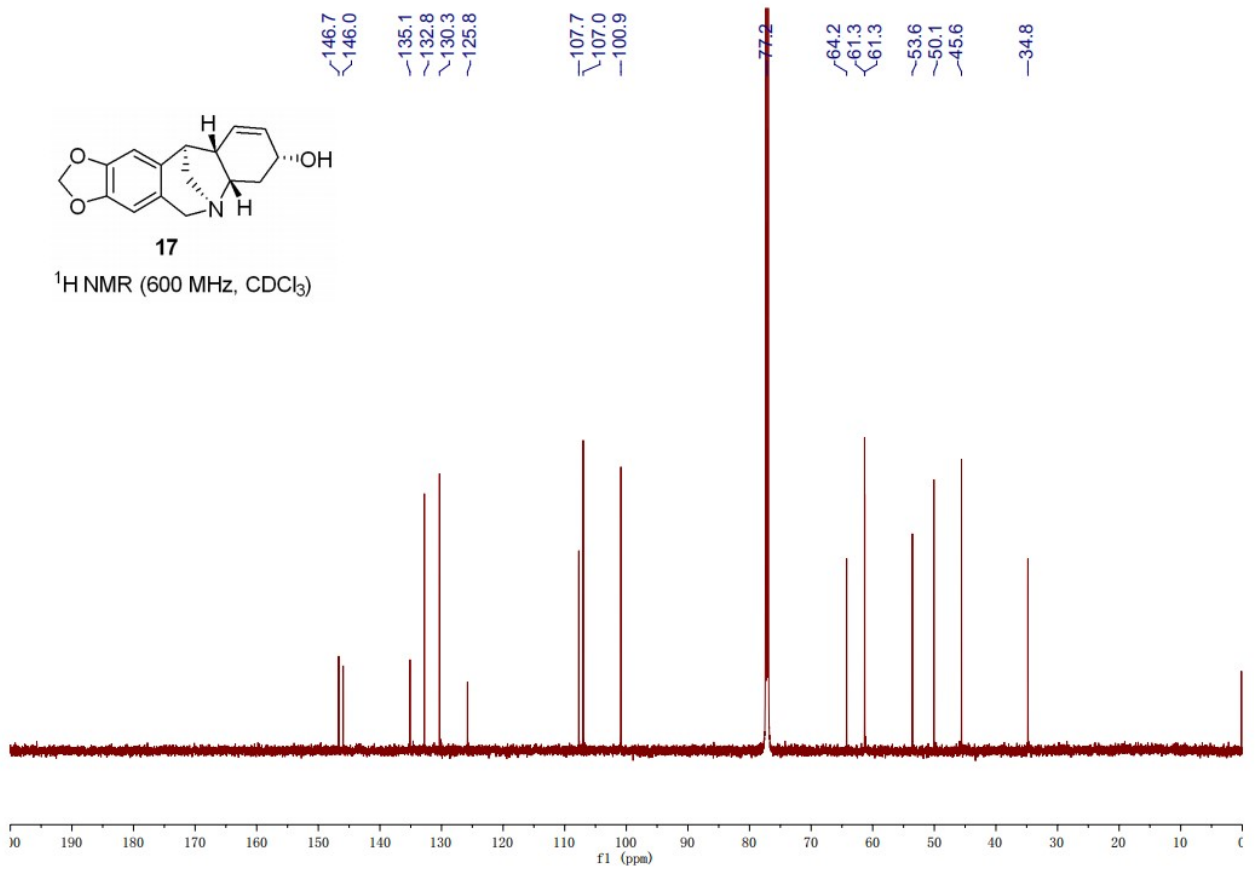
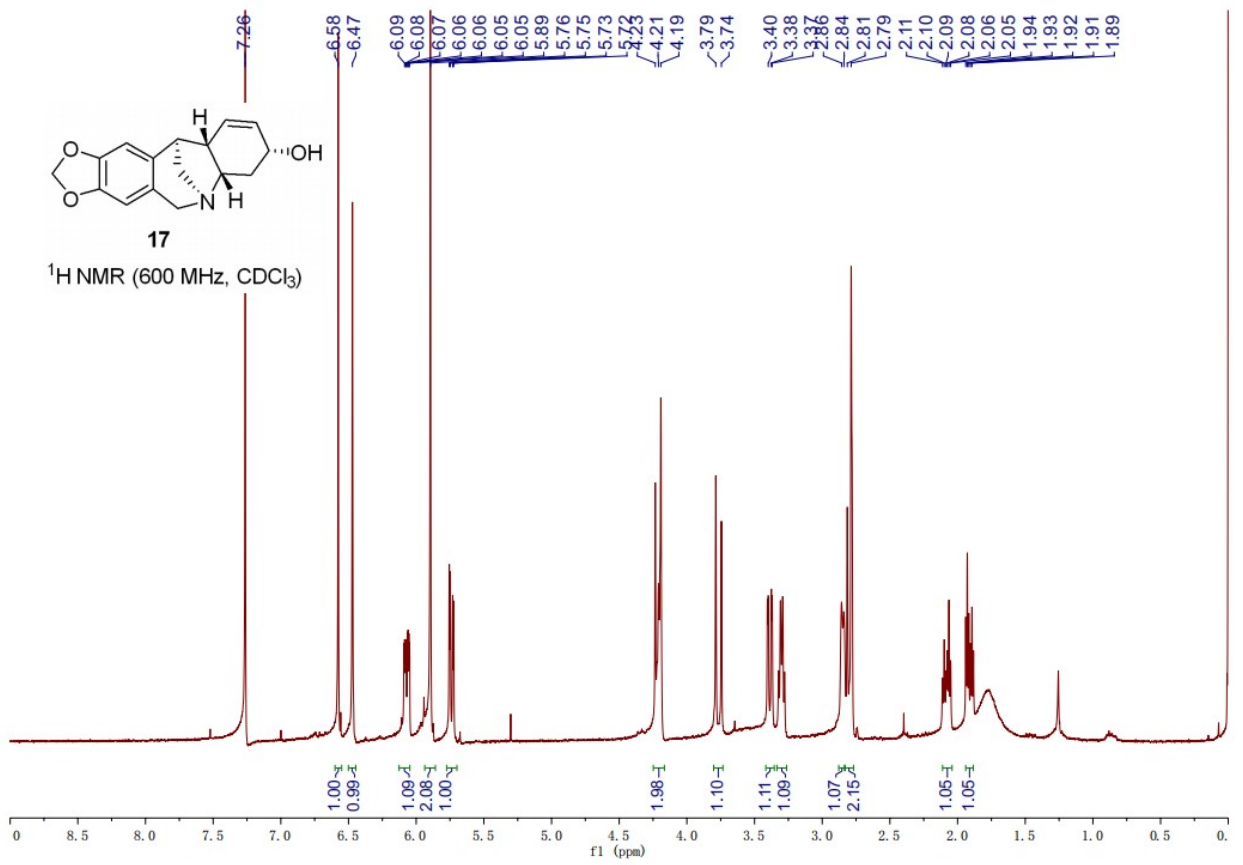


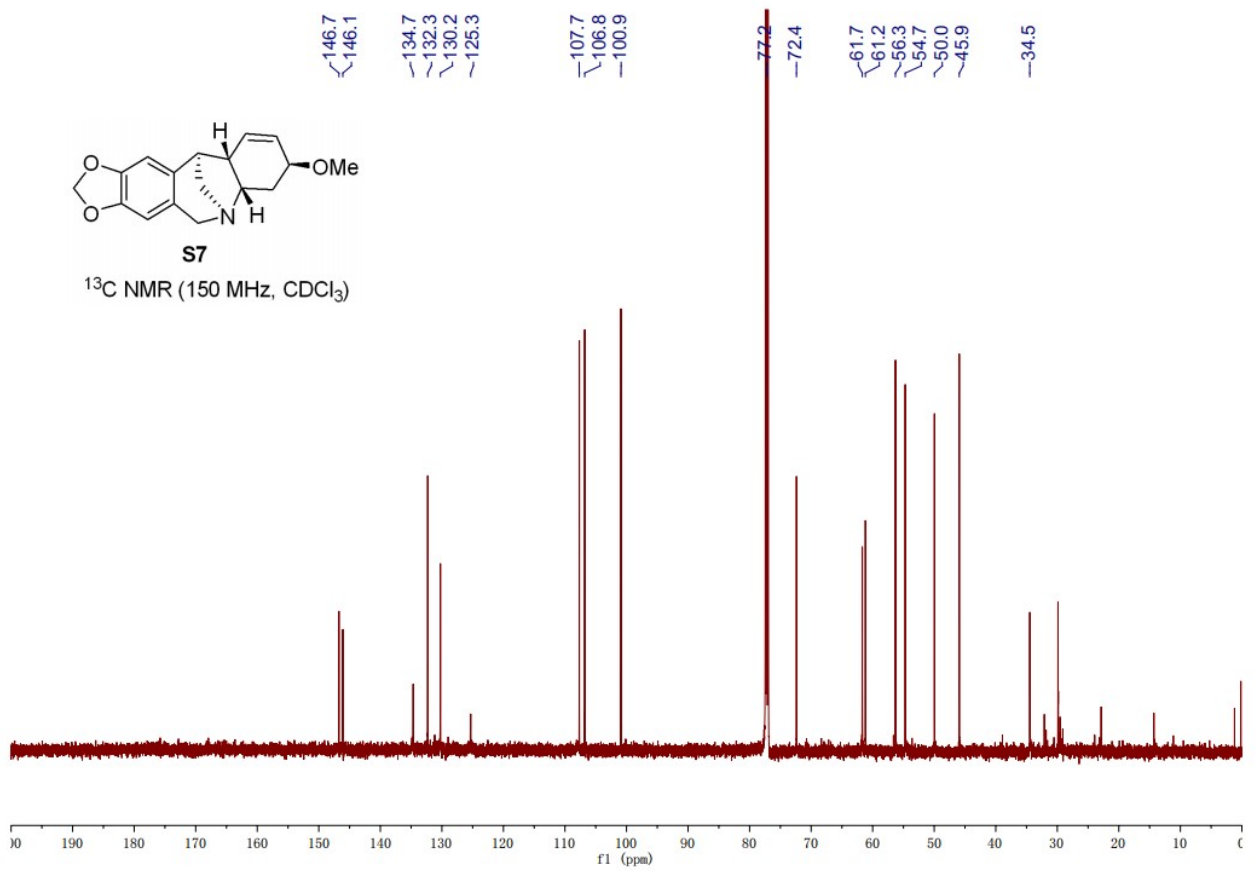
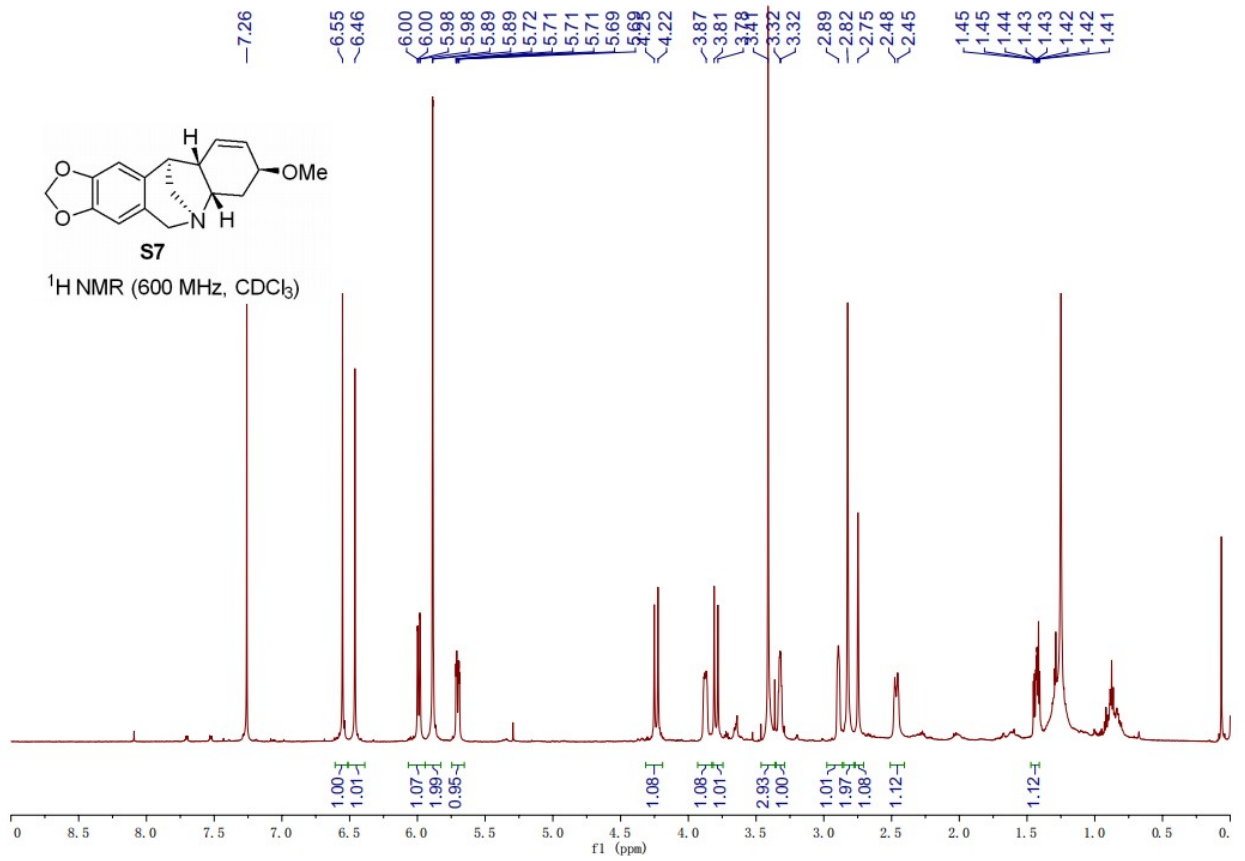


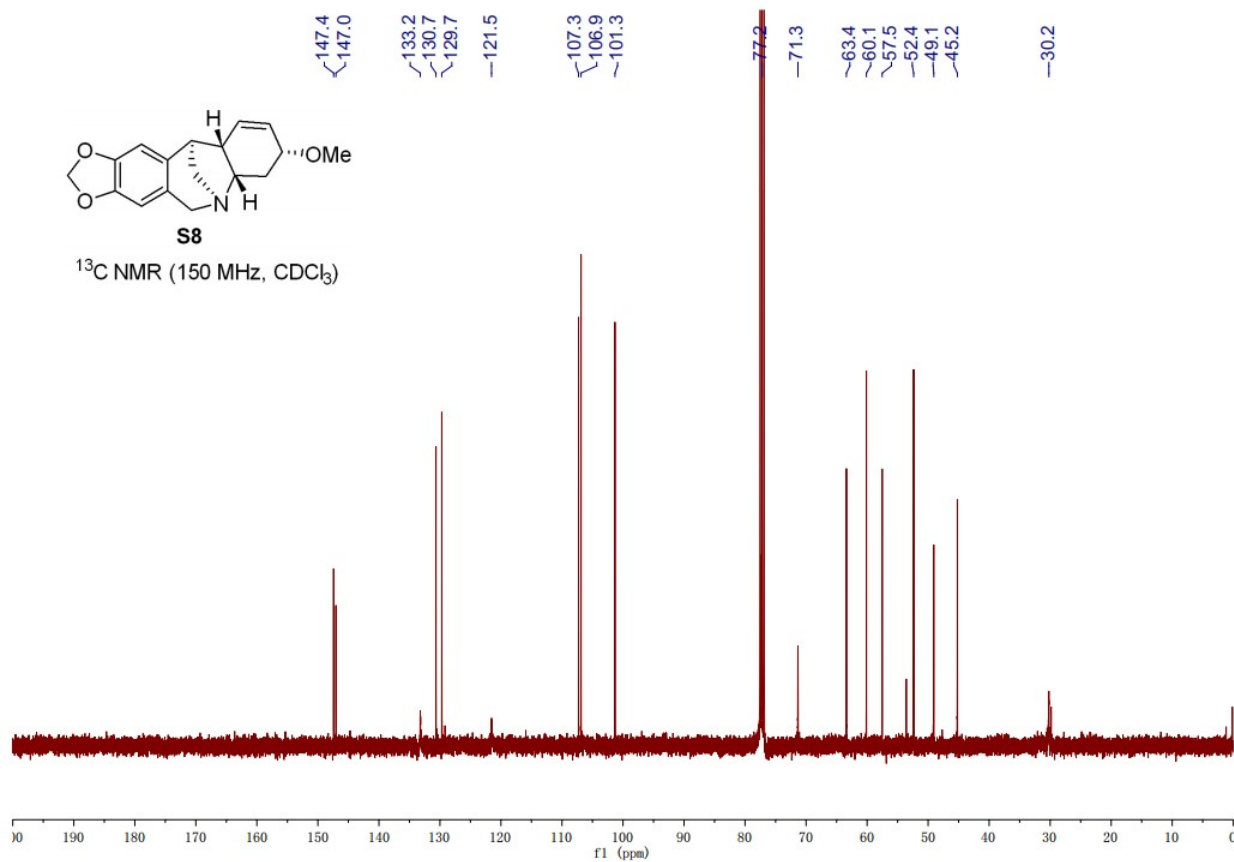
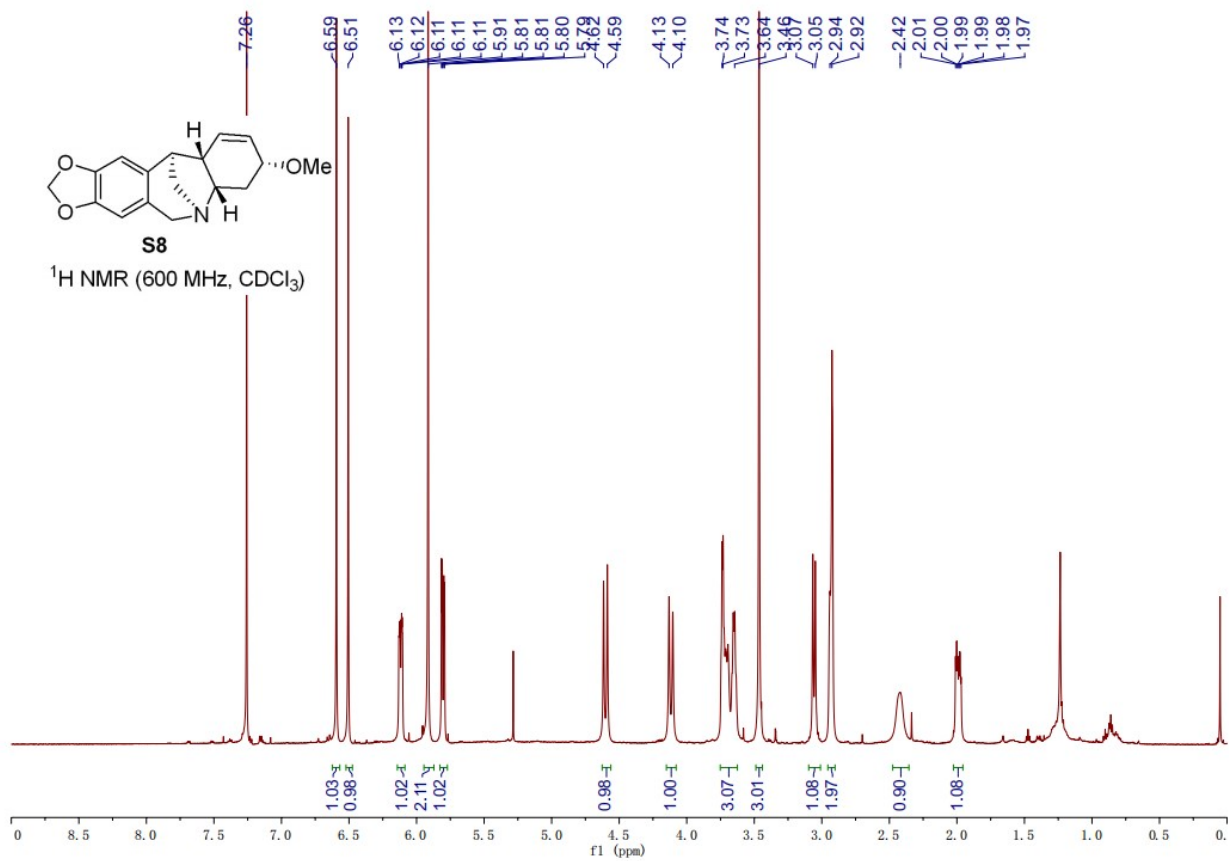


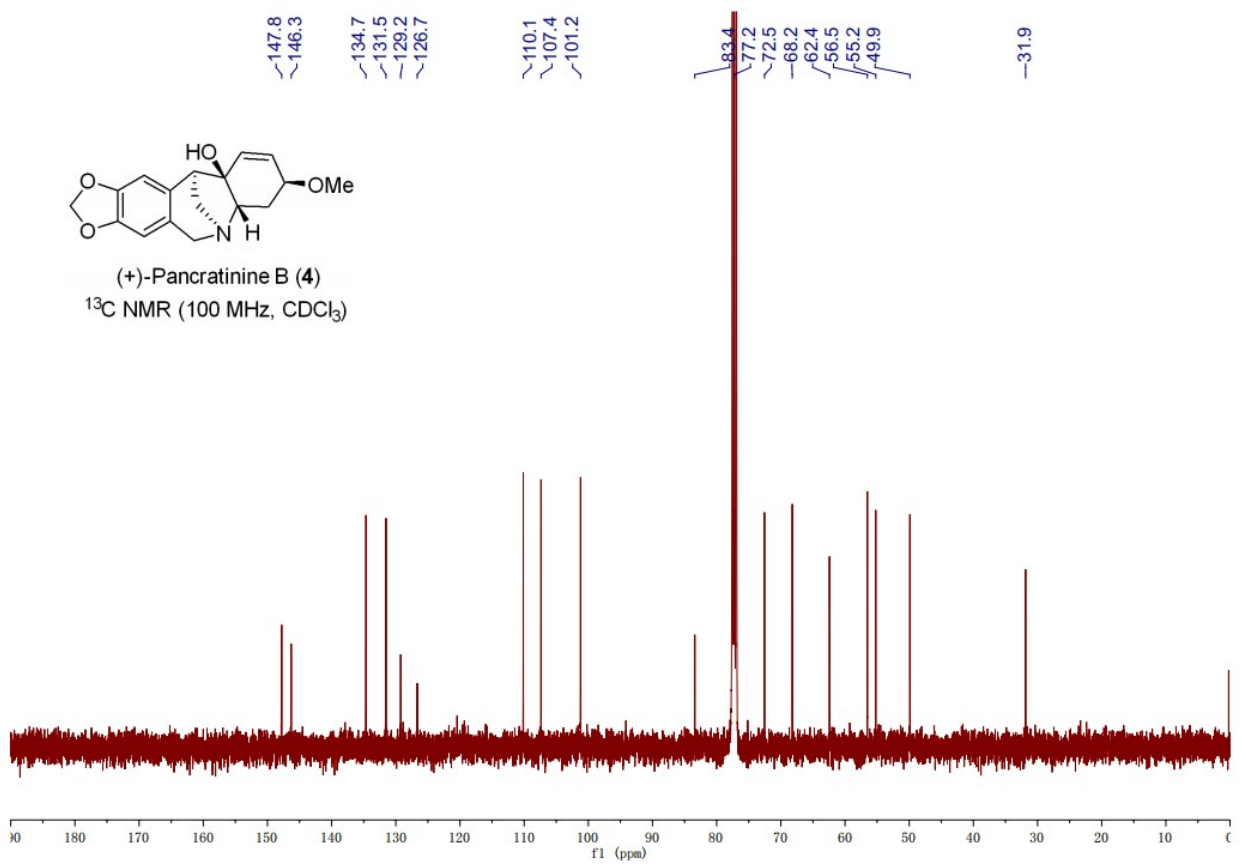
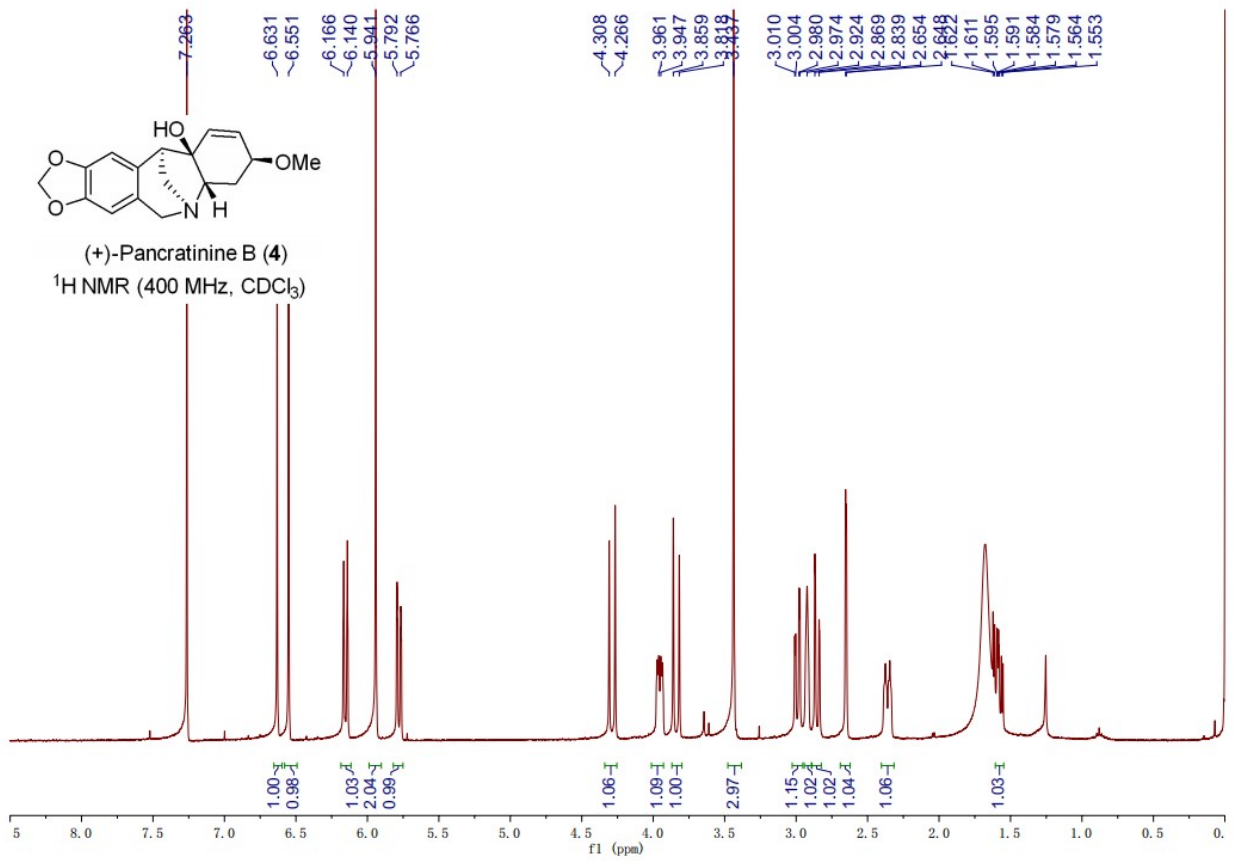


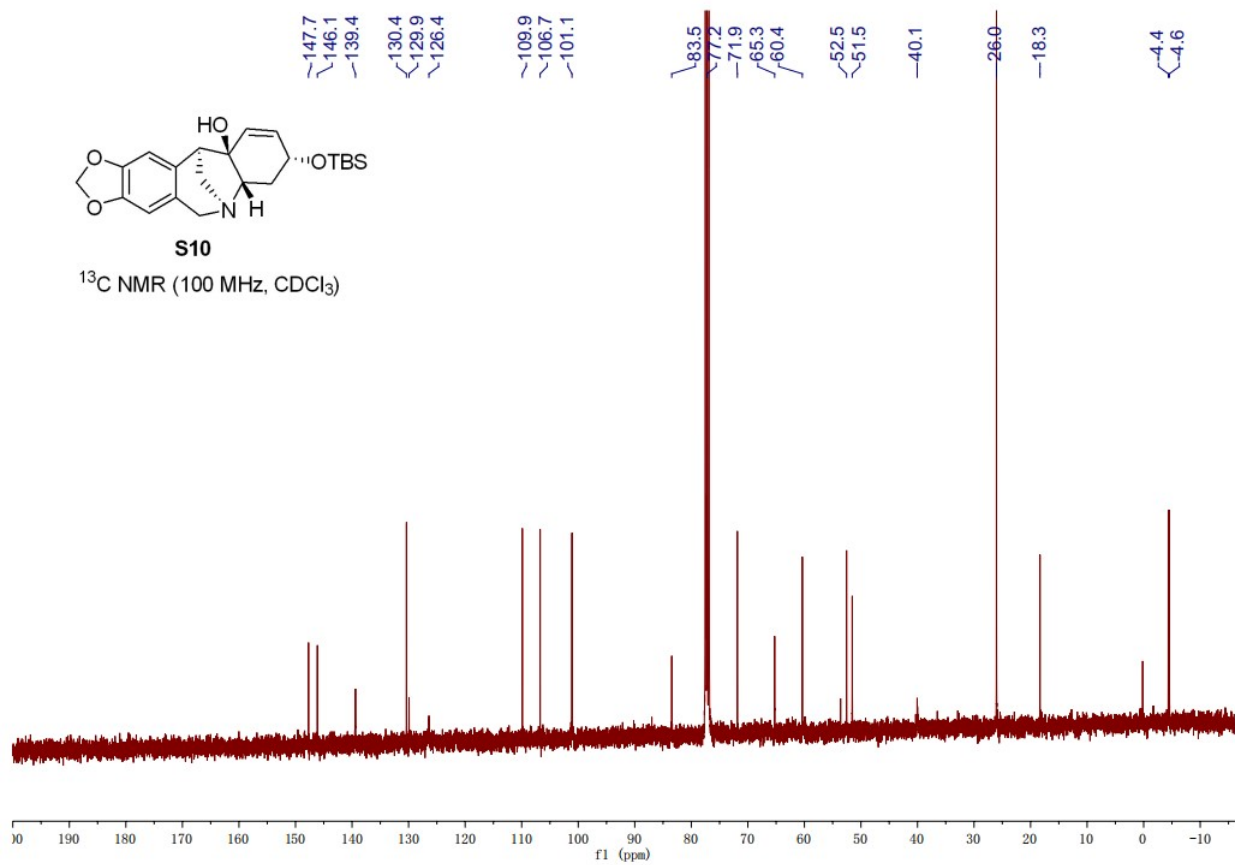
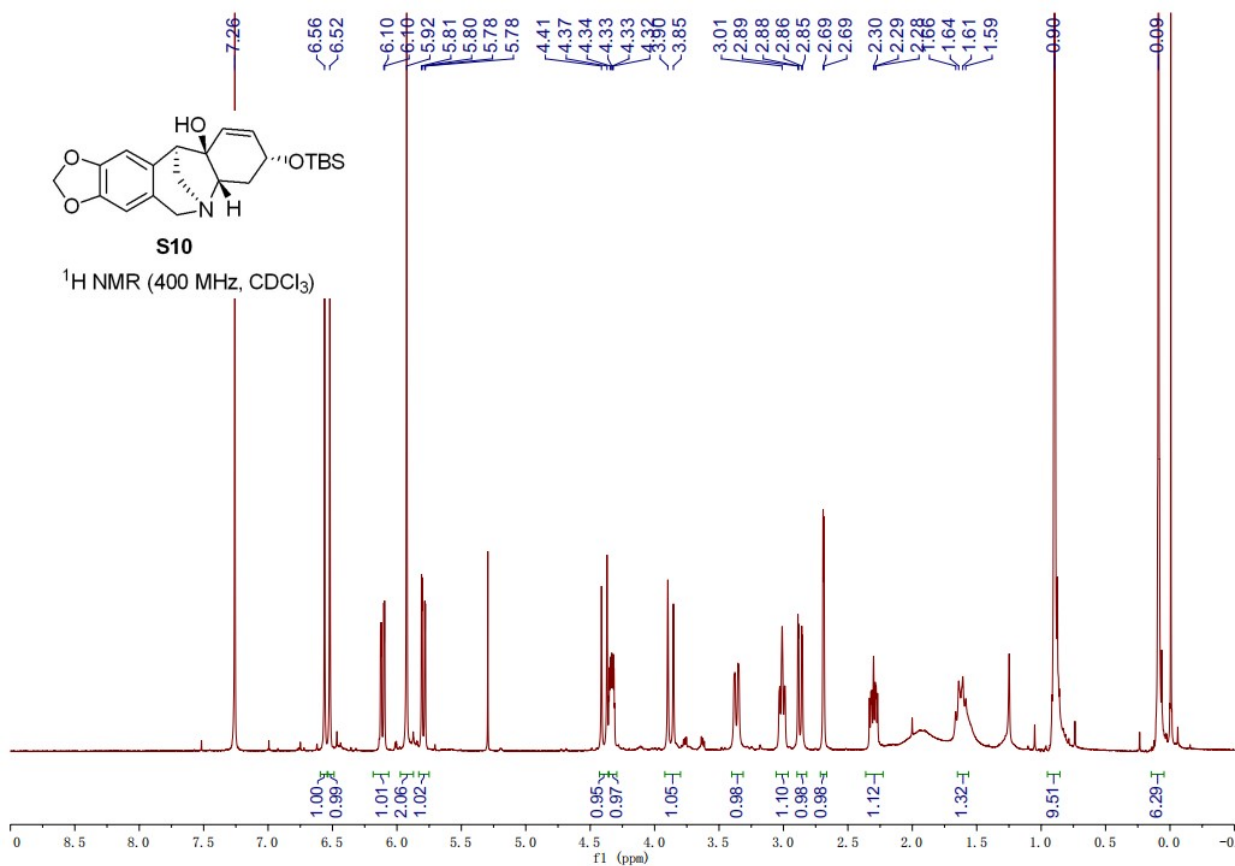


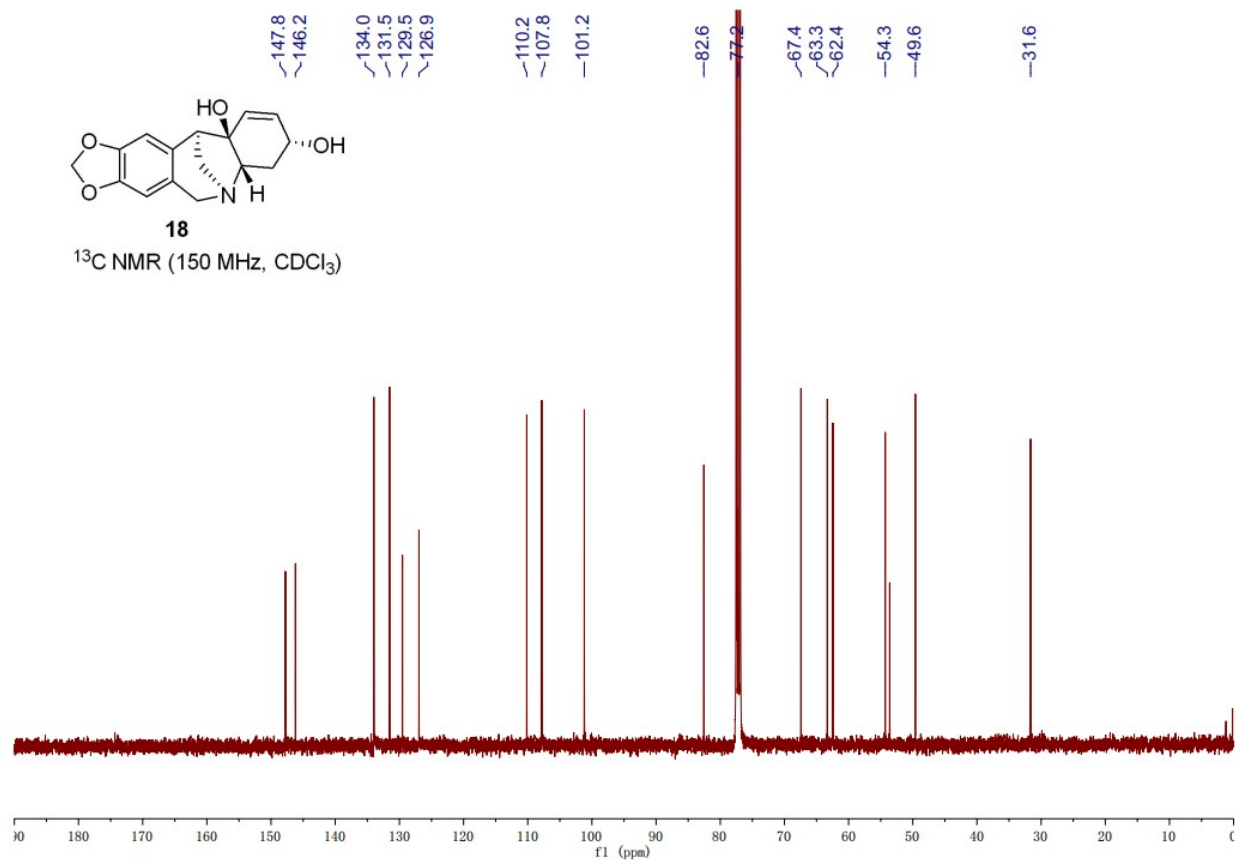
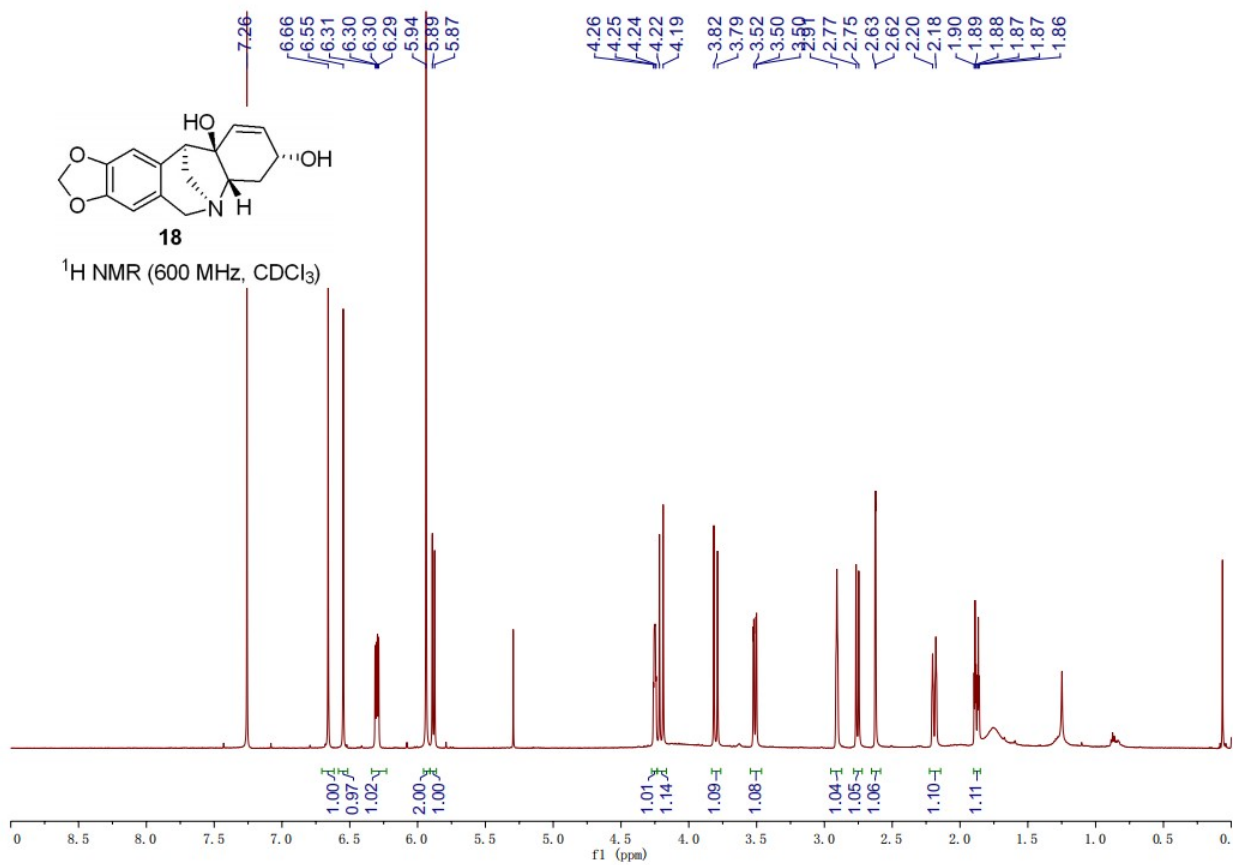




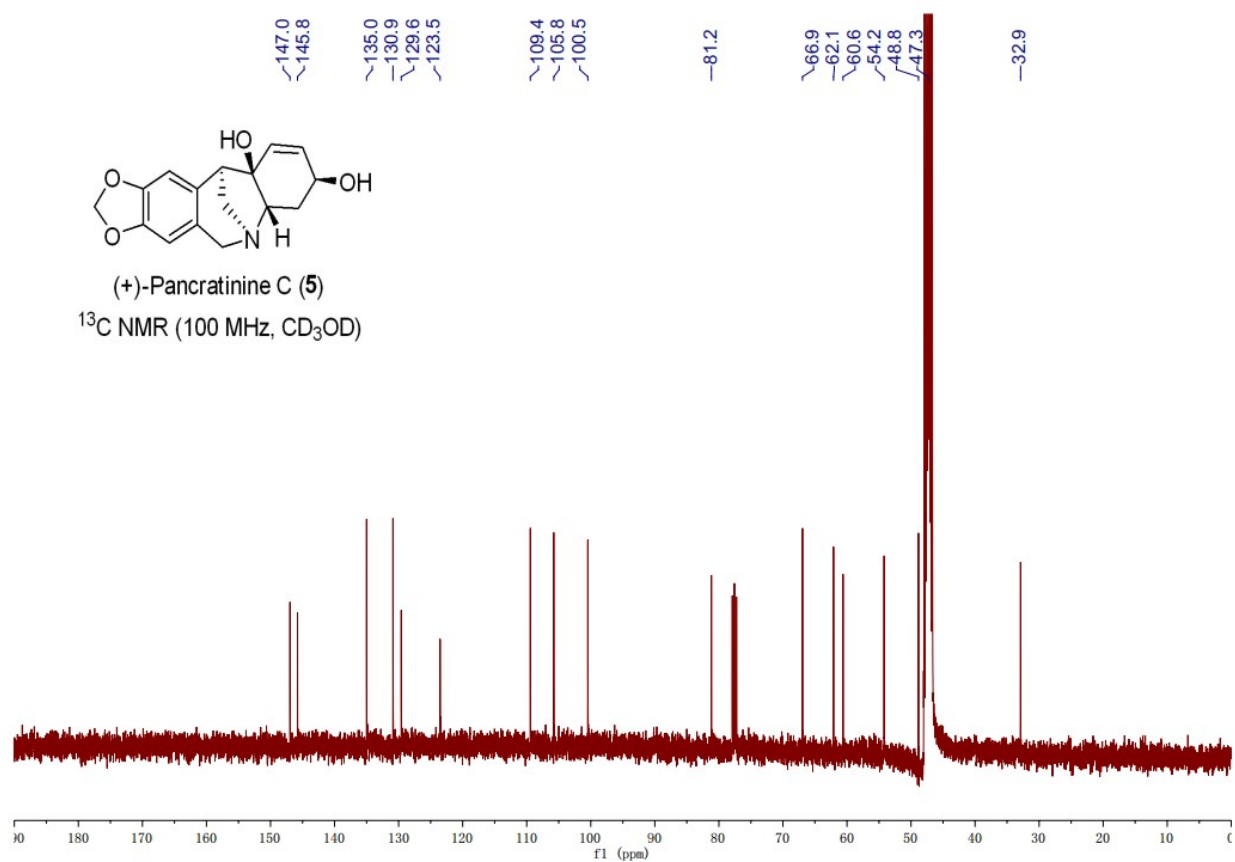
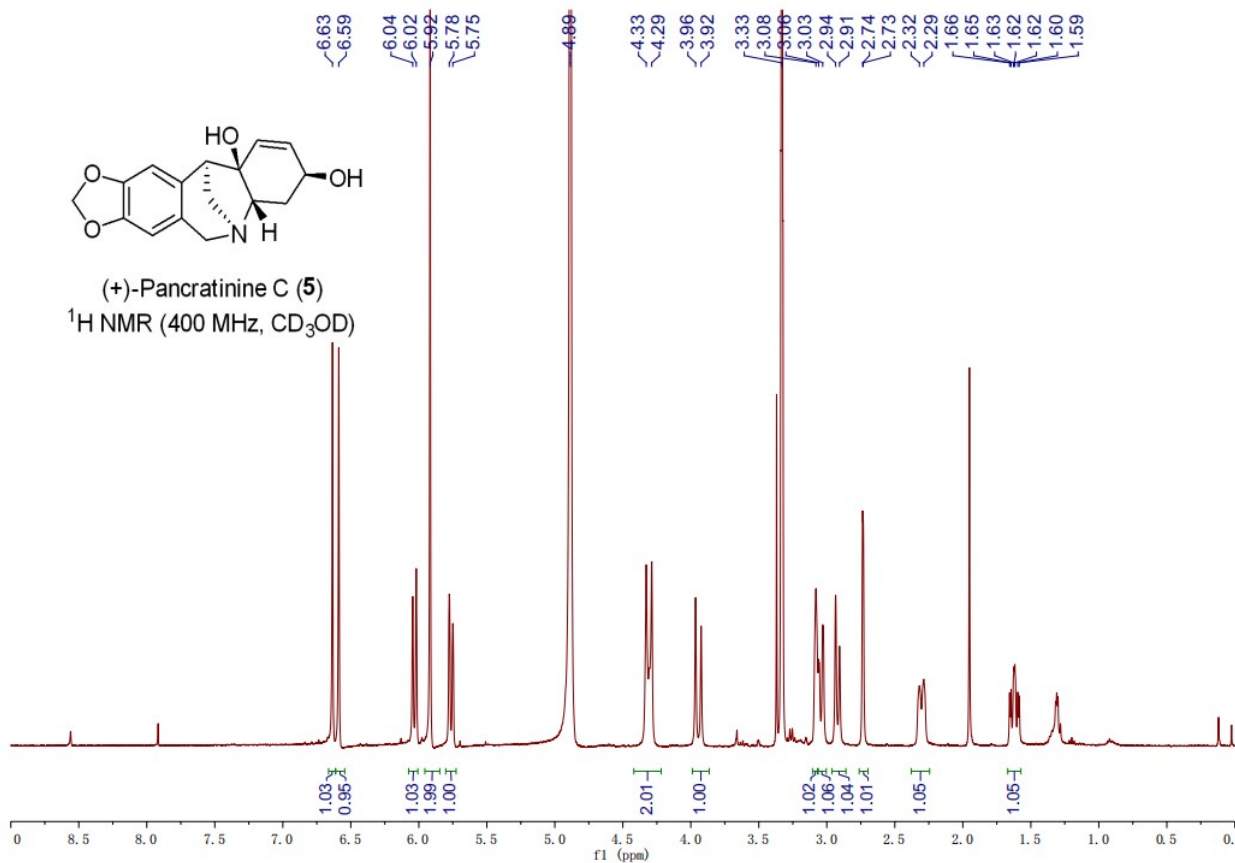


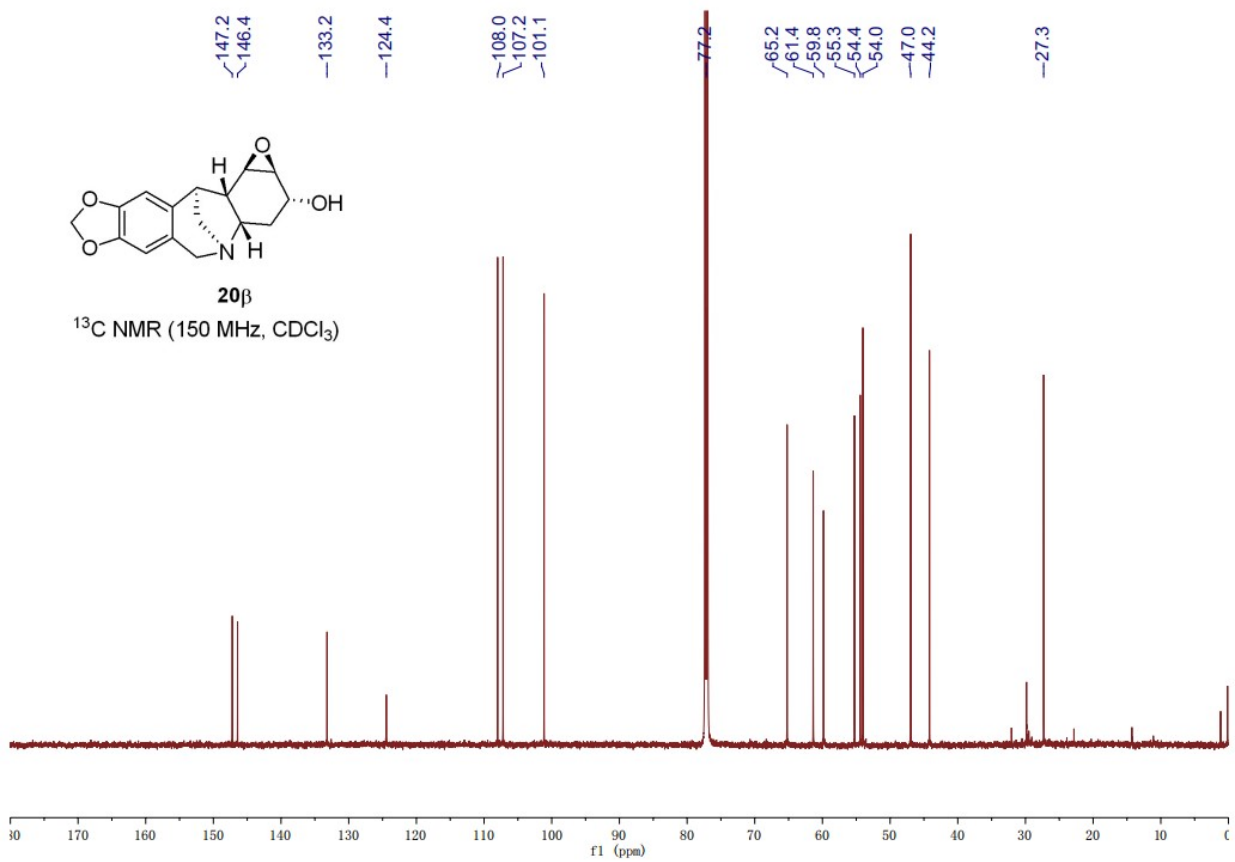
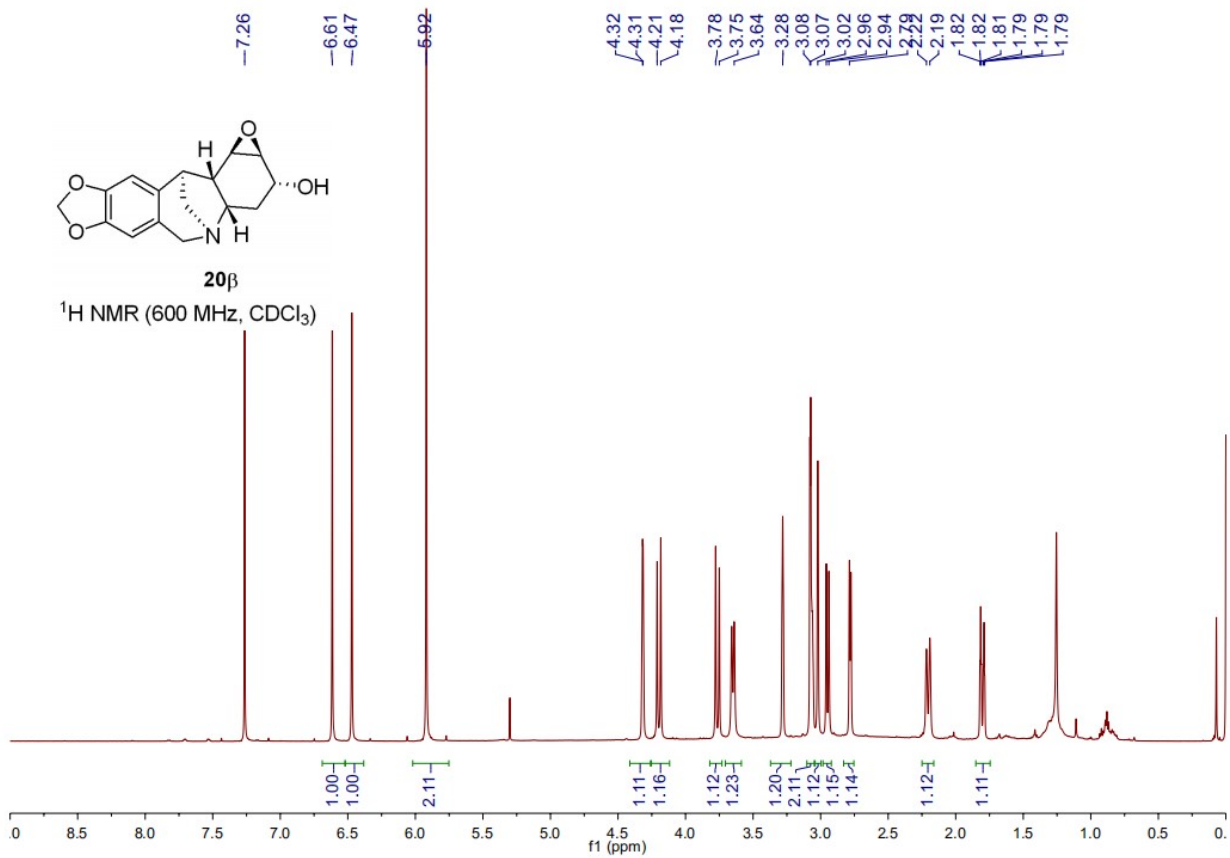


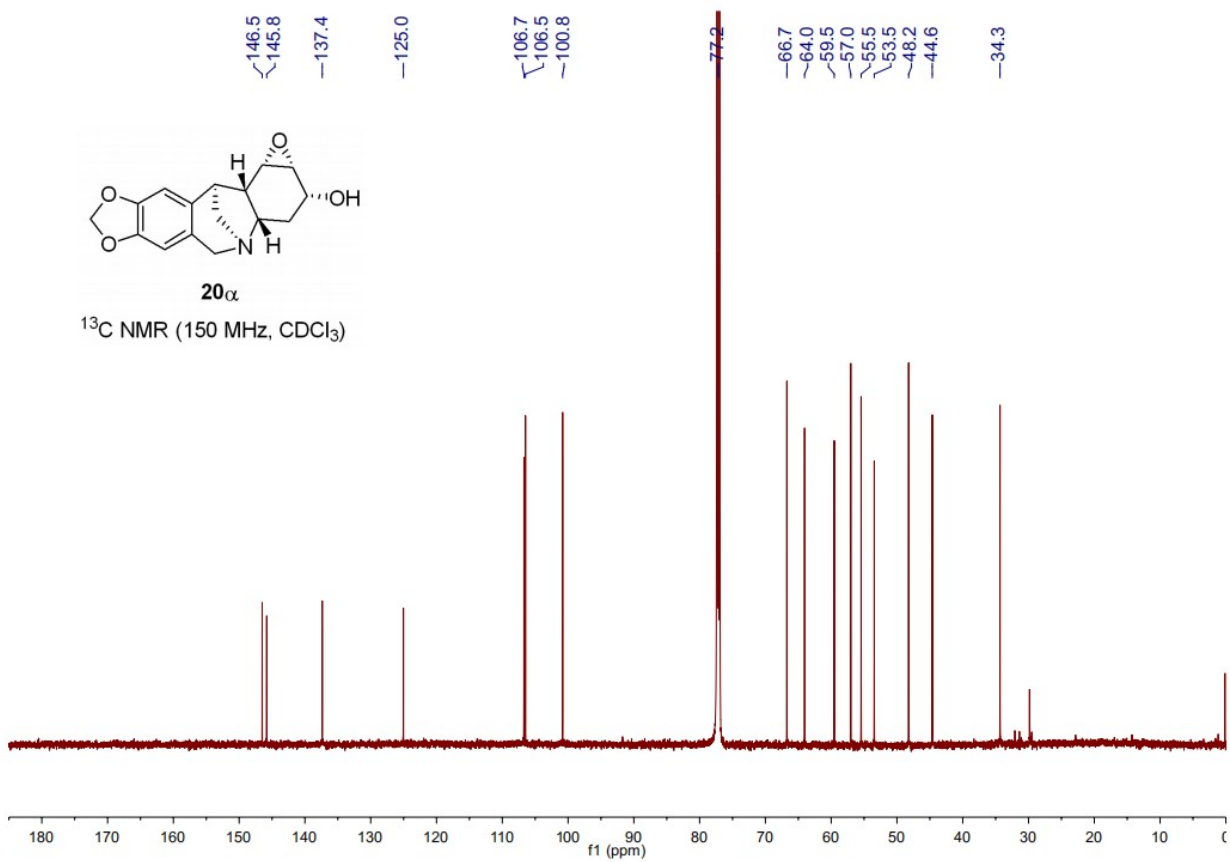
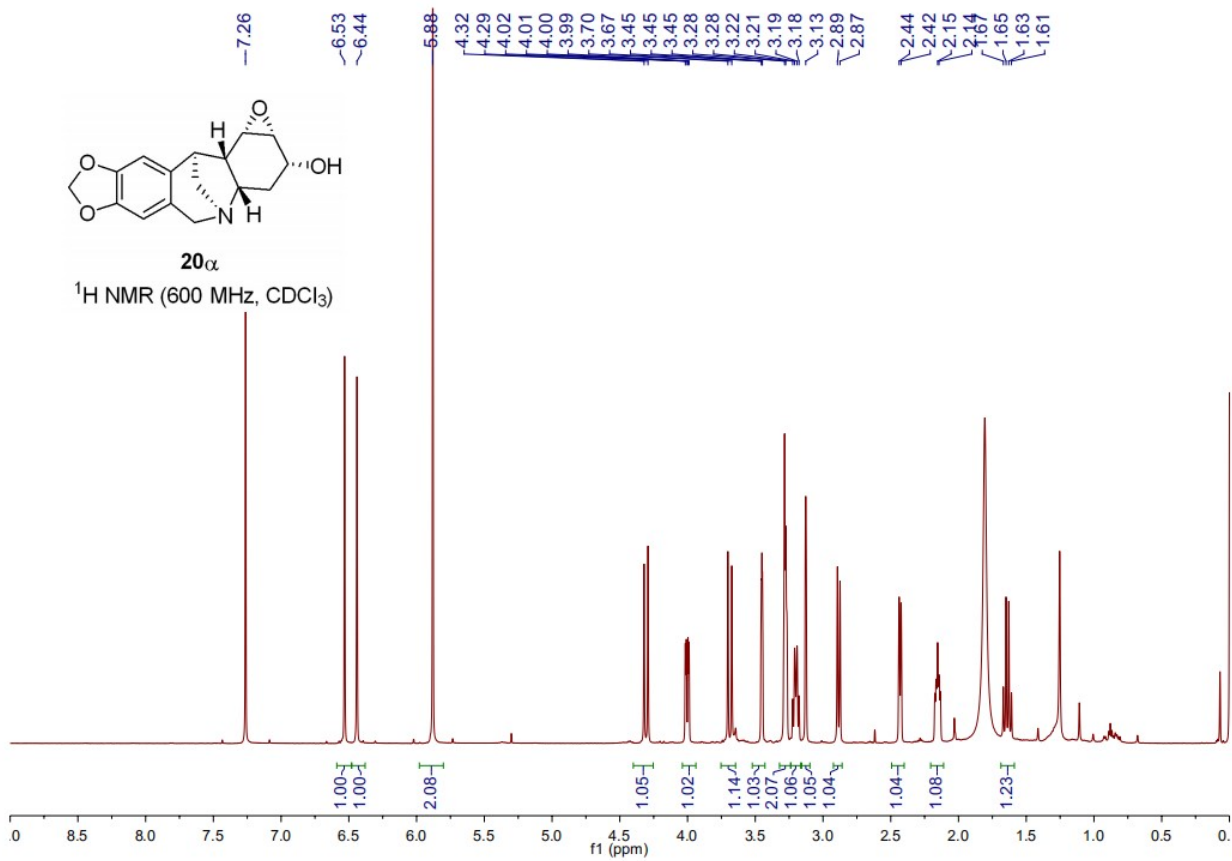


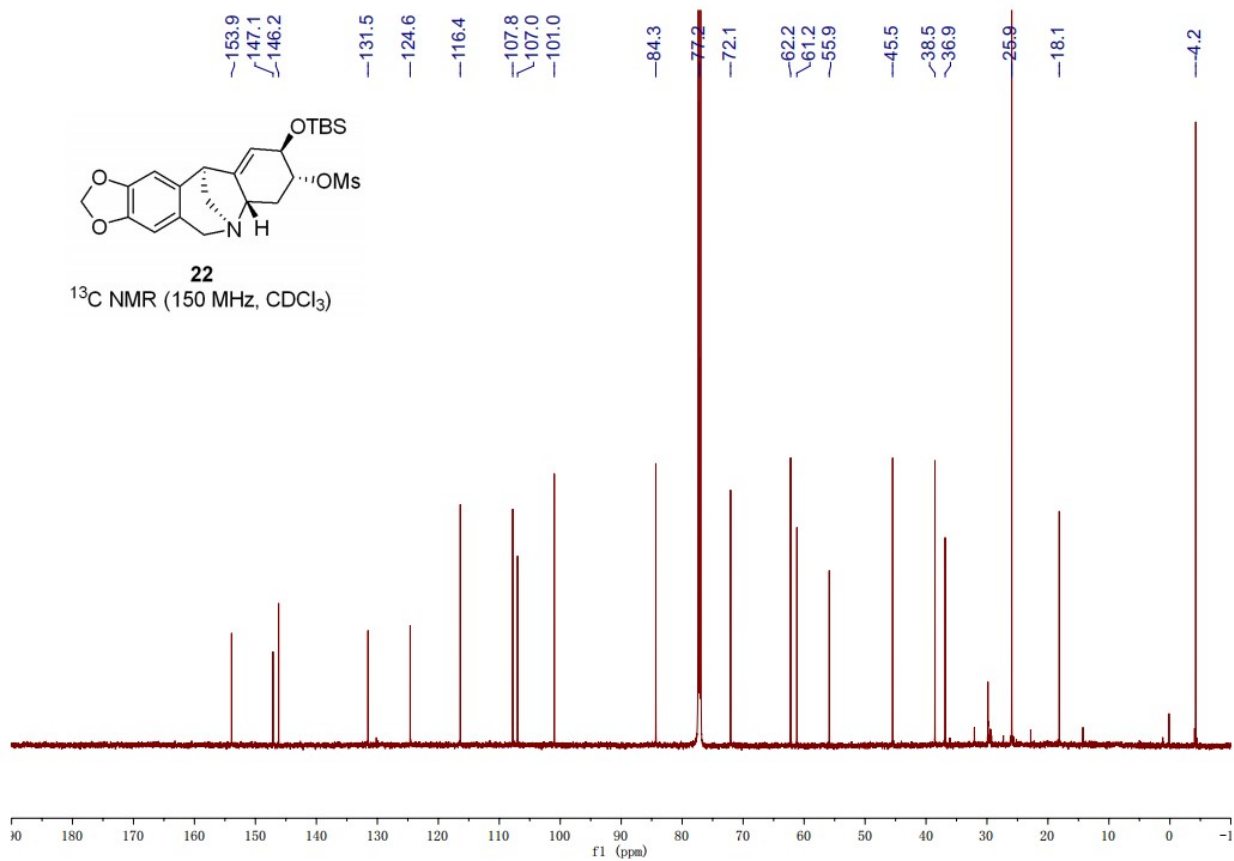
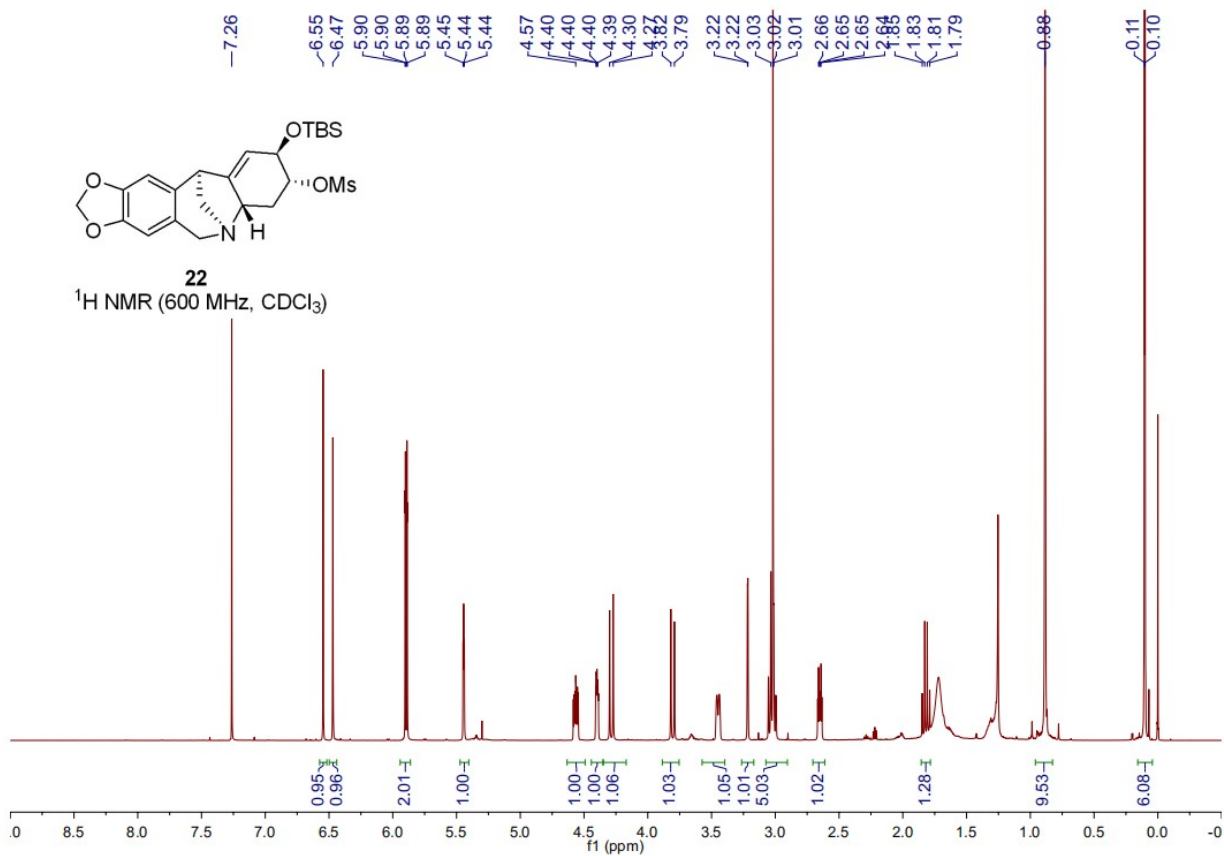


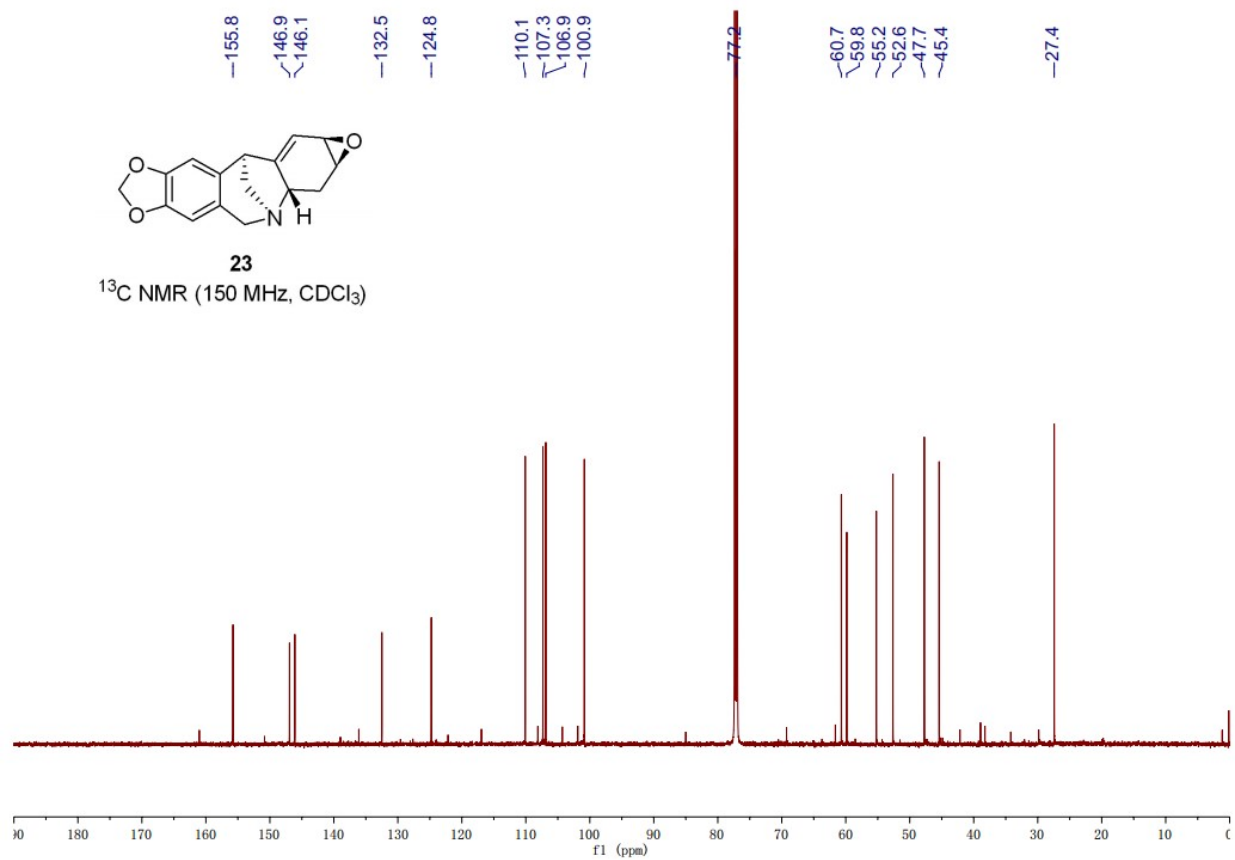
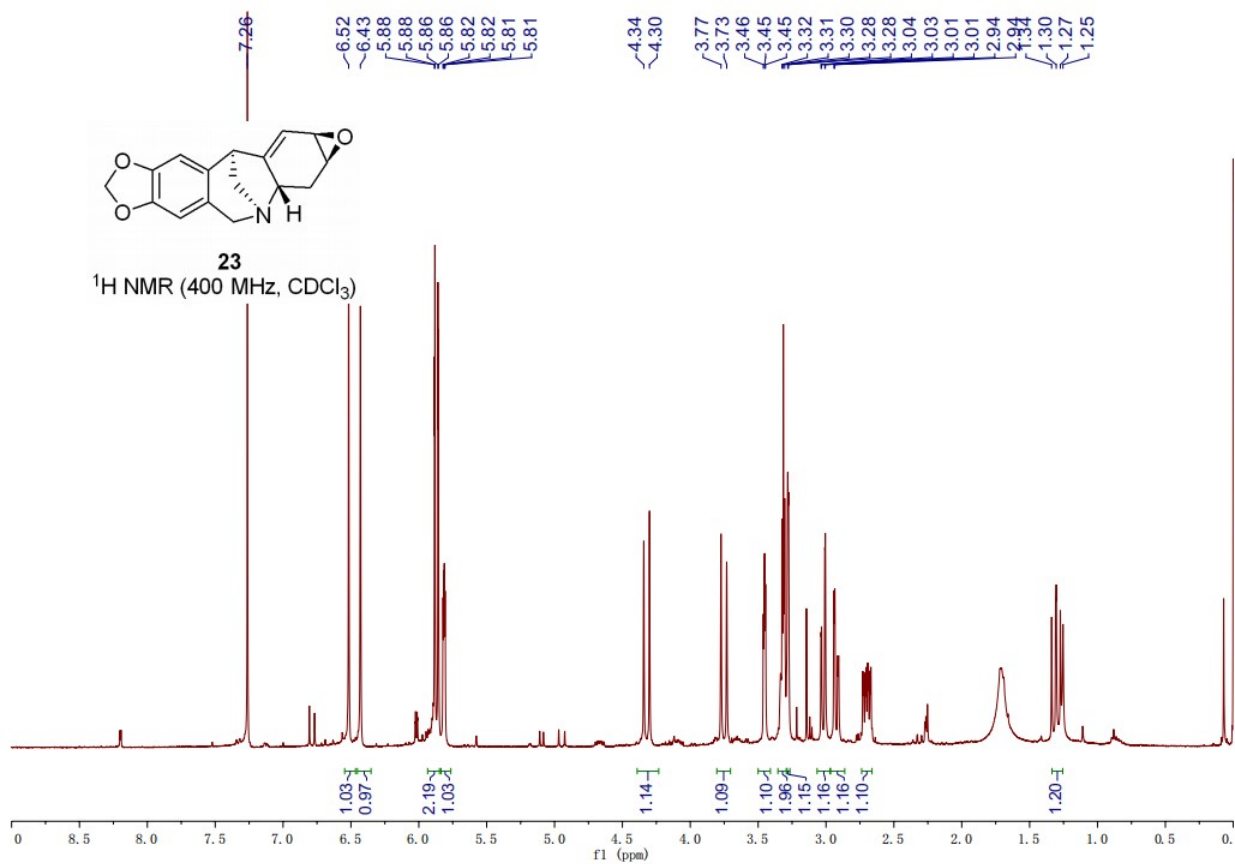


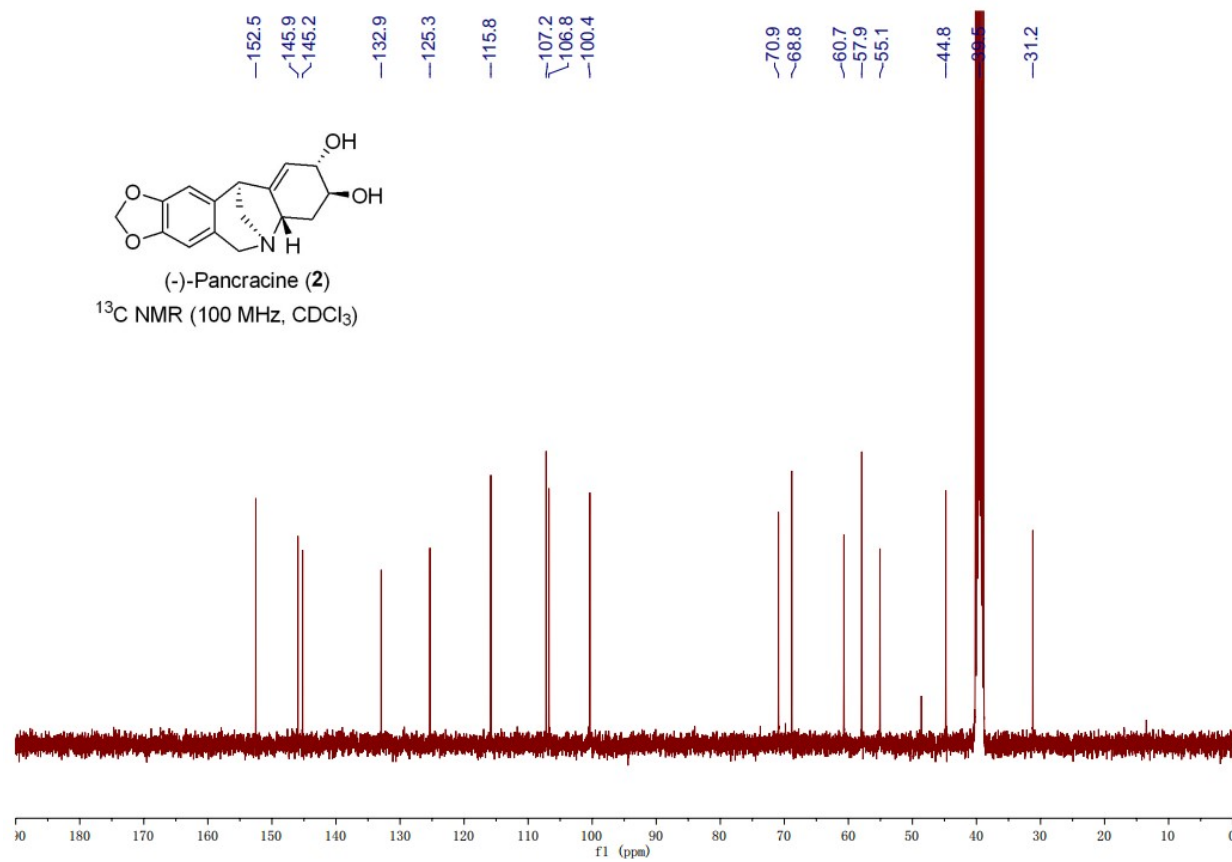
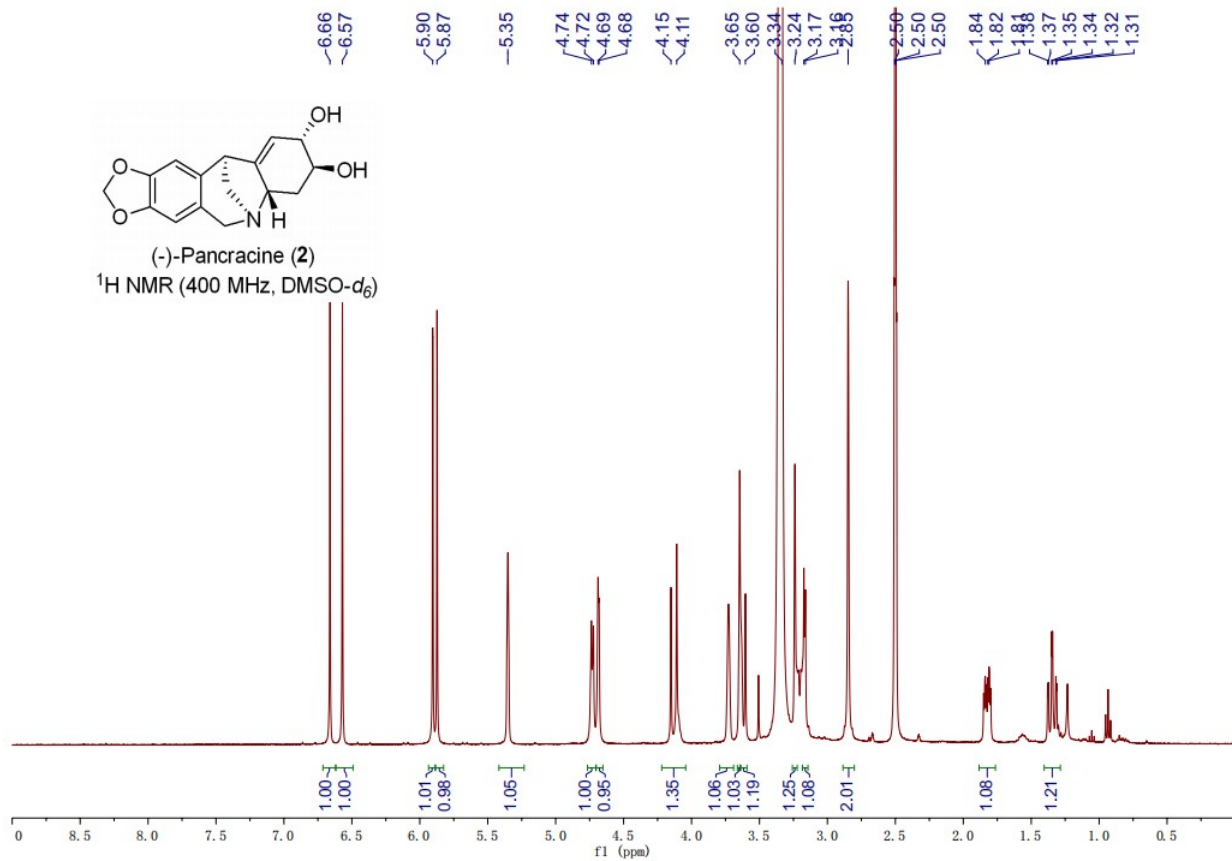


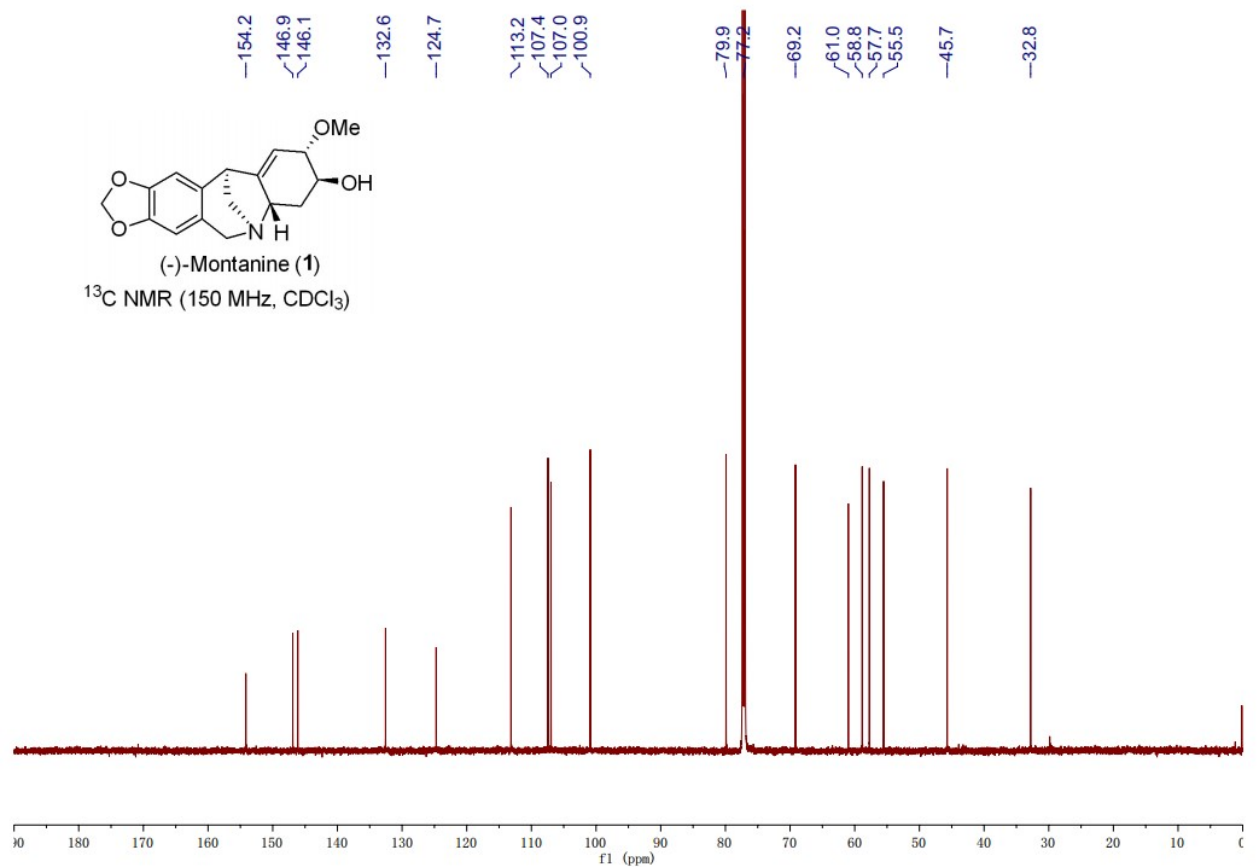
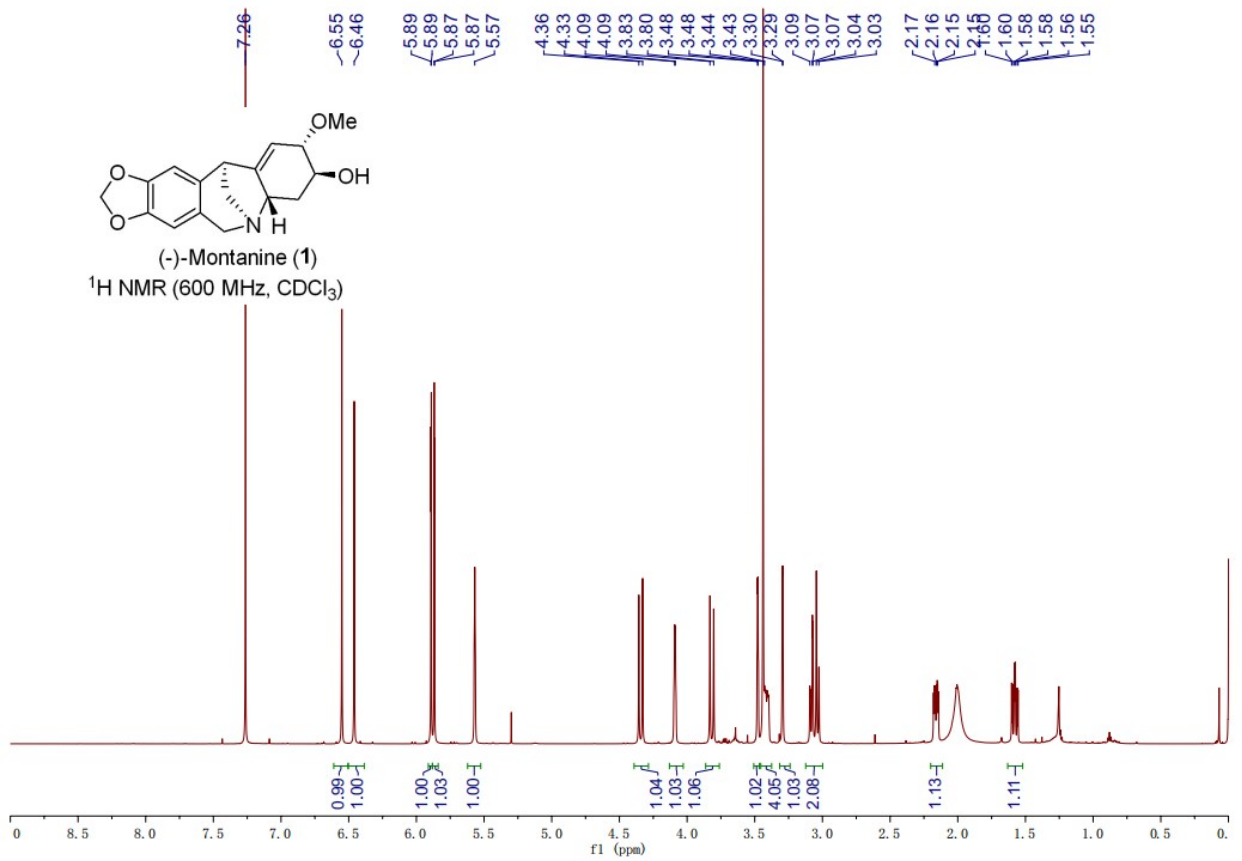


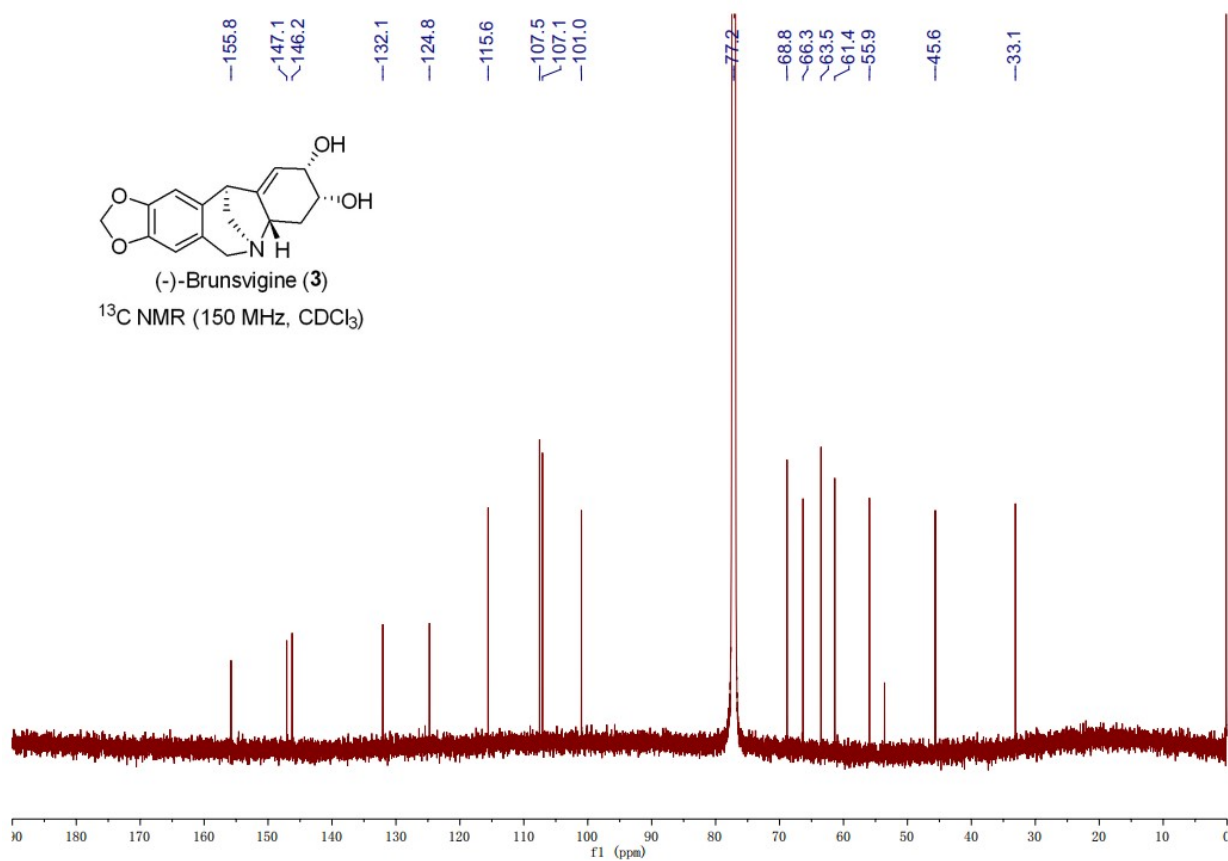
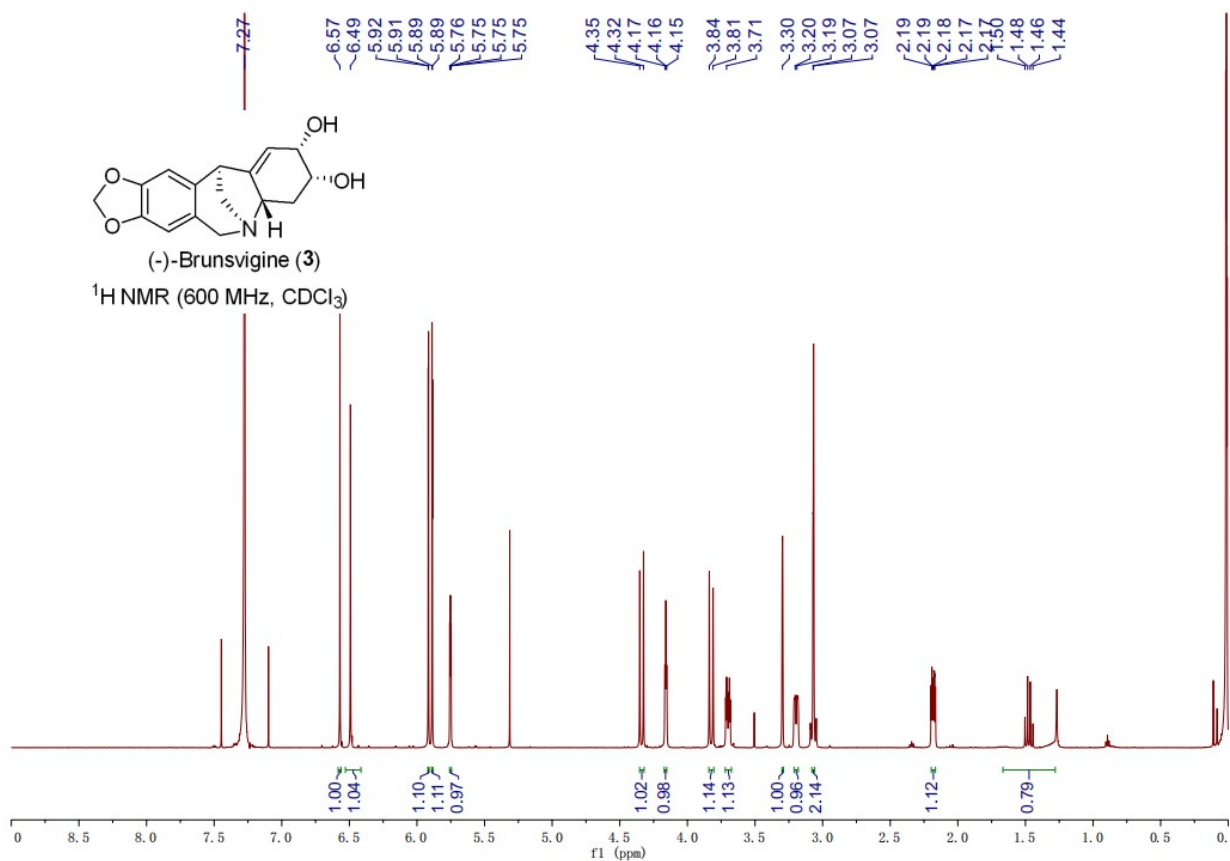




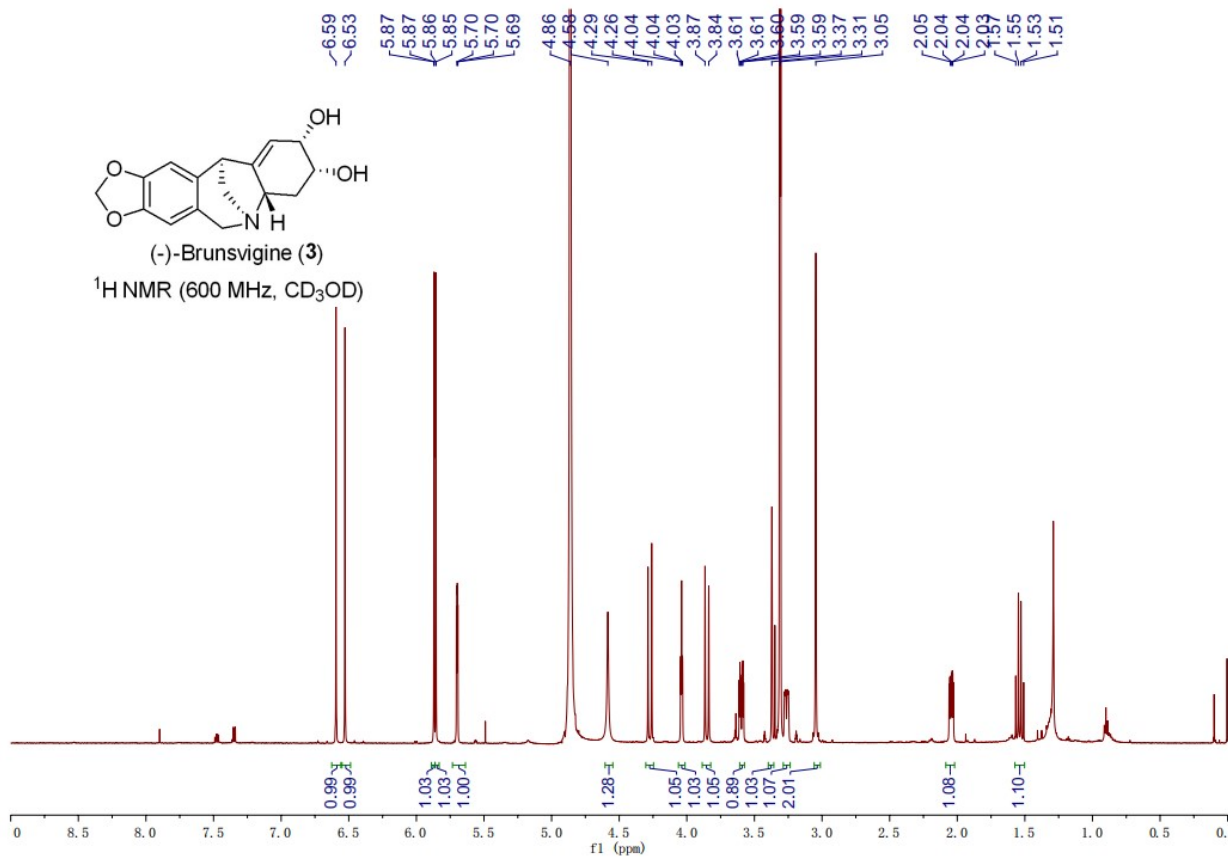












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