Supporting Information

Ruthenium-Catalyzed 1,3-Indolyl Migration within α,α-Disubstituted Allylic Alcohols

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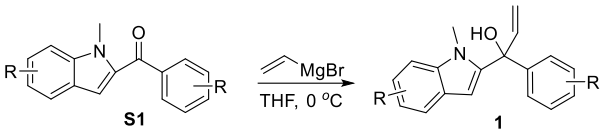
I General information

^{1}H NMR and **^{13}C NMR** spectra were recorded on a Bruker Avance 600 MHz and 400 MHz instruments. Chemical shifts were reported in parts per million (ppm), and the residual solvent peak was used as an internal reference: proton (chloroform δ 7.26), carbon (chloroform δ 77.0) or tetramethylsilane (TMS δ 0.00) was used as a reference. Multiplicity was indicated as follows: s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet), dd (doublet of doublet), bs (broad singlet). Coupling constants were reported in Hertz (Hz). All high resolution mass spectra (**HRMS**) were obtained on a Bruker Apex-2. For thin layer chromatography (**TLC**), Qingdao Haiyang Chemical was used, and compounds were visualized with a UV light at 254 nm. Further visualization was achieved by staining with iodine, or potassium permanganate solution followed by heating using a heat gun. Flash chromatography separations were performed on Qingdao Haiyang Chemical 200-300 mesh silica gel. All reactions were carried out under a nitrogen atmosphere. All commercially available reagents were used as received for the reactions without any purification. All solvents were dried on alumina columns using a solvent dispensing system.

II General procedure

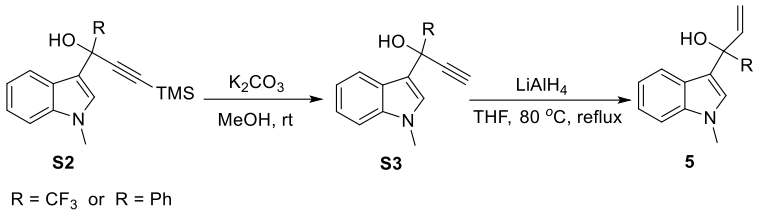
General procedure for preparation of allylic alcohols 1



Allylic alcohols were prepared by vinyl-magnesium bromide added to **S1**. To a solution of indoloyl-2-ketones[1] **S1** (1 mmol) in dry THF was added vinyl-magnesium bromide (1 M in THF, 1.2 equiv.) under nitrogen by a syringe over 5 min at 0 °C. Then, the reaction mixture was allowed to warm to room temperature and stirred for 3 h. The reaction was quenched via the addition of saturated aqueous NH_4Cl at 0 °C, and the mixture was extracted with ethyl acetate. The organic layer was washed with brine and dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude product was purified by flash column chromatography on silica gel using EtOAc in hexanes to afford the

allylic alcohols **1**.

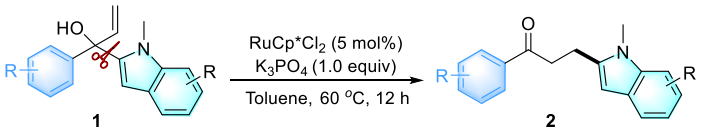
General procedure for preparation of allylic alcohols 3 or 5



K_2CO_3 (3.0 equiv.) was added to alcohol[2] **S2** in MeOH and stirring was continued at room temperature for 2 h. The crude was filtered under a pad of celite and washed with dichloromethane. The residue was washed with ammonium chloride and brine and dried over Na_2SO_4. After evaporation of the solvent, the residue was purified by column chromatography on silica gel to afford the corresponding propargylic alcohol **S3**.

To a flame-dried flask equipped with a magnetic stir bar were added $LiAlH_4$ (3.0 equiv., 1 M in THF) and THF. Propargylic alcohol **S3** (1.0 equiv.) was added slowly to the mixture and then reflux at 80 °C for 5 h. The reaction was quenched with potassium sodium tartrate solution at 0 °C and then extracted with EtOAc. The organic phase was combined and washed with brine, dried over Na_2SO_4, and concentrated. The residue was purified by column chromatography on silica gel to afford the corresponding allylic alcohol **5**.

General procedure for Ruthenium catalyzes 1,3-migration of indole

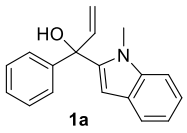


To a vial equipped with a dried stir bar was added allylic alcohols **1** (0.1 mmol), $RuCp^*Cl_2$ (5 mol%), K_3PO_4 (1.0 equiv), toluene (0.5 mL) in the glovebox. The reaction mixture was taken outside the glovebox and allowed to stir at 60 °C (oil bath) for 12 h. The reaction mixture was added to water (10 mL), and extracted with EtOAc (3 × 5 mL). The organic layer was washed with aqueous $NaHCO_3$ and brine and dried over Na_2SO_4. And the residue was purified by column chromatography with silica gel to give pure products **2**.

III The analytical and spectral characterization data

Allyl alcohols 1:

1-(1-Methyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1a)

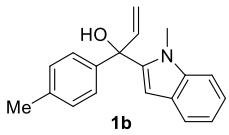


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 208.0 mg of brown liquid in 79% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.59 (m, 1H), 7.35-7.29 (m, 4H), 7.28-7.26 (m, 1H), 7.25-7.20 (m, 2H), 7.12-7.08 (m, 1H), 6.56 (dd, *J* = 16.8 Hz, 10.8 Hz, 1H), 6.50 (s, 1H), 5.29-5.25 (m, 2H), 3.47 (s, 3H), 2.40 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.4, 143.2, 142.3, 138.8, 128.5, 127.5, 126.7, 126.1, 122.2, 121.0, 119.7, 113.5, 109.3, 102.8, 76.6, 31.6.

1-(1-Methyl-1*H*-indol-2-yl)-1-(*p*-tolyl)prop-2-en-1-ol (1b)

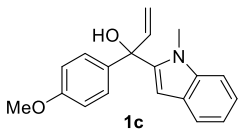


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 194.1 mg of brown liquid in 70% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58-7.56 (m, 1H), 7.23-7.17 (m, 4H), 7.10-7.06 (m, 3H), 6.51 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.46 (s, 1H), 5.24-5.20 (m, 2H), 3.45 (s, 3H), 2.41 (s, 1H), 2.32 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.3, 142.4, 140.5, 138.8, 137.1, 129.1, 126.7, 126.1, 122.1, 120.9, 119.6, 113.3, 109.3, 102.6, 76.5, 31.6, 21.2.

1-(4-Methoxyphenyl)-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1c)



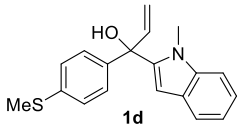
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 202.4 mg of yellow liquid in 69% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.6 Hz, 1H), 7.27-7.25 (m, 2H), 7.24-7.18

(m, 2H), 7.12-7.08 (m, 1H), 6.86-6.82 (m, 2H), 6.54 (dd, *J* = 16.8 Hz, 10.4 Hz 1H), 6.47 (s, 1H), 5.28-5.21 (m, 2H), 3.80 (s, 3H), 3.50 (s, 3H), 2.36 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.0, 143.3, 142.5, 138.9, 135.6, 127.5, 126.7, 122.2, 120.9, 119.7, 113.8, 113.4, 109.3, 102.6, 76.4, 55.4, 31.7.

1-(1-Methyl-1*H*-indol-2-yl)-1-(4-(methylthio)phenyl)prop-2-en-1-ol (1d)



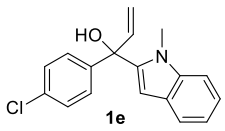
1d

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 232.1 mg of brown liquid in 75% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.6 Hz, 1H), 7.27-7.24 (m, 2H), 7.22-7.17 (m, 4H), 7.12-7.08 (m, 1H), 6.57-6.52 (m, 1H), 6.49 (s, 1H), 5.29-5.23 (m, 2H), 3.49 (s, 3H), 2.47 (s, 3H), 2.39 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.0, 142.1, 140.3, 138.8, 137.7, 126.7, 126.4, 122.3, 121.0, 119.7, 113.6, 109.3, 102.8, 76.4, 31.7, 15.8.

1-(4-Chlorophenyl)-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1e)



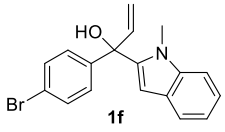
1e

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 268.0 mg of brown liquid in 90% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.6 Hz, 1H), 7.29-7.21 (m, 6H), 7.13-7.09 (m, 1H), 6.55-6.48 (m, 2H), 5.30-5.22 (m, 2H), 3.46 (s, 3H), 2.41 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.8, 142.0, 141.7, 138.9, 133.4, 128.6, 127.7, 126.6, 122.5, 121.0, 119.9, 113.9, 109.4, 102.9, 76.3, 31.7.

1-(4-Bromophenyl)-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1f)



1f

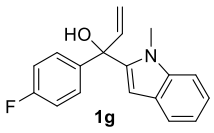
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was

performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 239.6 mg of brown liquid in 70% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.58 (m, 1H), 7.45-7.43 (m, 2H), 7.25-7.20 (m, 4H), 7.13-7.09 (m, 1H), 6.55-6.48 (m, 2H), 5.30-5.23 (m, 2H), 3.47 (s, 3H), 2.40 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.8, 142.6, 141.6, 138.9, 131.6, 128.0, 126.6, 122.5, 121.6, 121.0, 119.9, 113.9, 109.4, 102.9, 76.3, 31.7.

1-(4-Fluorophenyl)-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1g)



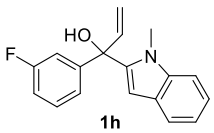
1g

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 250.4 of yellow liquid in 89% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60-7.57 (m, 1H), 7.32-7.27 (m, 2H), 7.24-7.22 (m, 2H), 7.12-7.08 (m, 1H), 7.00-6.96 (m, 2H), 6.55-6.48 (m, 2H), 5.28-5.20 (m, 2H), 3.46 (s, 3H), 2.42 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 162.2 (d, *J* = 246.4 Hz), 143.0, 142.0, 139.2 (d, *J* = 3.0 Hz), 138.9, 128.0 (d, *J* =8.1 Hz), 126.6, 122.4, 121.0, 119.8, 115.2 (d, *J* = 21.2 Hz), 113.7, 109.3, 102.8, 76.3, 31.6.

1-(3-Fluorophenyl)-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1h)



1h

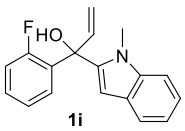
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 239.1 mg of yellow liquid in 85% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.58 (m, 1H), 7.28-7.20 (m, 3H), 7.15-7.09 (m, 2H), 7.06-7.03 (m, 1H), 6.97-6.92 (m, 1H), 6.55-6.49 (m, 2H), 5.30-5.25 (m, 2H), 3.46 (s, 3H), 2.42 (s, 1H), 1.53 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 163.1 (d, *J* = 247.5 Hz), 146.2 (d, *J* = 6.1 Hz), 142.7, 141.7, 138.9, 129.9 (d, *J* =8.1 Hz), 126.6, 122.4, 121.9 (d, *J* = 2.0 Hz), 121.1, 119.8, 114.4 (d, *J* = 21.2 Hz), 113.3 (d, *J* = 23.2 Hz), 113.2, 109.4, 102.9, 76.3 (d, *J* = 2.0 Hz),

31.6.

1-(2-Fluorophenyl)-1-(1-methyl-1H-indol-2-yl)prop-2-en-1-ol (1i)



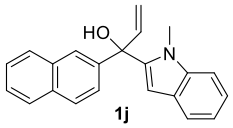
1i

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 222.2 mg of yellow liquid in 79% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58-7.56 (m, 1H), 7.33-7.28 (m, 2H), 7.24-7.20 (m, 1H), 7.18-7.04 (m, 4H), 6.58 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.37 (s, 1H), 5.39-5.21 (m, 2H), 3.62 (s, 3H), 3.16-3.13 (m, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 160.7 (d, *J* = 246.4 Hz), 141.0, 140.7, 138.9, 130.8 (d, *J* = 9.1 Hz), 129.9 (d, *J*= 9.1 Hz), 128.7 (d, *J* = 3.0 Hz), 126.7, 124.3 (d, *J* = 3.0 Hz), 122.2, 121.1, 119.7, 116.6 (d, *J* = 22.2 Hz), 115.2, 109.3, 102.8, 76.1, 31.2.

1-(1-Methyl-1*H*-indol-2-yl)-1-(naphthalen-2-yl)prop-2-en-1-ol (1j)



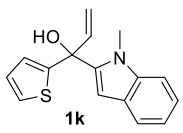
1j

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 222.5 mg of yellow liquid in 71% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.76 (m, 4H), 7.63-7.61 (m, 1H), 7.48-7.43 (m,3H), 7.24-7.20 (m, 2H), 7.14-7.10 (m, 1H), 6.63 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.57 (s, 1H), 5.32-5.28 (m, 2H), 3.46 (s, 3H), 2.51 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.1, 142.2, 140.8, 138.9, 133.3, 132.8, 128.4, 128.2, 127.7, 126.7, 126.3, 126.2, 124.7, 124.5, 122.3, 121.0, 119.8, 113.8, 109.4, 102.9, 31.7.

1-(1-Methyl-1*H*-indol-2-yl)-1-(thiophen-2-yl)prop-2-en-1-ol (1k)



1k

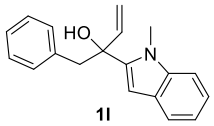
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed

using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 164.3 mg of brown liquid in 61% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (d, *J* = 7.6 Hz, 1H), 7.30-7.27 (m, 2H), 7.25-7.20 (m, 1H), 7.12-7.08 (m, 1H), 6.95-6.93 (m, 1H), 6.79-6.78 (m, 1H), 6.56 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 6.44 (s, 1H), 5.35-5.26 (m, 2H), 3.63 (s, 3H), 2.60 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.5, 142.1, 141.6, 139.0, 126.9, 126.6, 125.6, 125.4, 122.4, 121.1, 119.7, 114.7, 109.4, 102.6, 75.4, 31.8.

2-(1-Methyl-1*H*-indol-2-yl)-1-phenylbut-3-en-2-ol (1l)



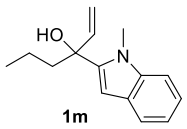
1l

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 230.2 mg of white liquid in 83% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60-7.58 (m, 1H), 7.32-7.25 (m, 4H), 7.24-7.17 (m, 3H), 7.12-7.08 (m, 1H), 6.53 (s, 1H), 6.07 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 5.20-5.01 (m, 2H), 3.84 (s, 3H), 3.49-3.39 (m, 2H), 2.02 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.1, 141.8, 138.8, 135.3, 131.3, 128.3, 127.2, 127.0, 121.9, 120.8, 119.6, 114.6, 109.2, 100.7, 74.6, 47.3, 32.2.

3-(1-Methyl-1*H*-indol-2-yl)hex-1-en-3-ol (1m)



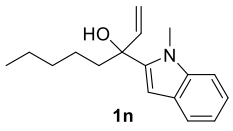
1m

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 176.6 mg of brown liquid in 77% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57-7.55 (m, 1H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.23-7.18 (m, 1H), 7.10-7.06 (m, 1H), 6.44 (s, 1H), 6.10 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 5.23-5.17 (m, 2H), 3.81 (s, 3H), 2.09-2.03 (m, 2H), 1.87 (s, 1H), 1.50-1.38 (m, 2H), 0.97 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.6, 142.1, 138.7, 126.9, 121.8, 120.7, 119.5, 114.0, 109.2, 100.3, 74.9, 43.6, 32.0, 16.9, 14.5.

3-(1-Methyl-1*H*-indol-2-yl)oct-1-en-3-ol (1n)

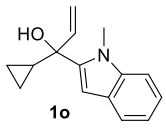


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 221.3 mg of brown liquid in 86% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 7.6 Hz, 1H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.23-7.17 (m, 1H), 7.10-7.06 (m, 1H), 6.43 (s, 1H), 6.10 (dd, *J* = 17.6 Hz, 10.8 Hz, 1H), 5.23-5.17 (m, 2H), 3.81 (s, 3H), 2.09-2.02 (m, 2H), 1.89 (s, 1H), 1.47-1.31 (m, 6H), 0.92-0.89 (m, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.6, 142.2, 138.7, 126.9, 121.8, 120.7, 119.5, 114.0, 109.2, 100.3, 74.9, 41.3, 32.3, 32.0, 23.3, 22.8, 14.2.

1-Cyclopropyl-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1o)

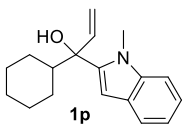


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 161.4 mg of yellow liquid in 71% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 7.6 Hz, 1H), 7.27 (d, *J* = 8.4 Hz, 1H), 7.22-7.18 (m, 1H), 7.10-7.06 (m, 1H), 6.68 (s, 1H), 5.87 (dd, *J* = 17.6 Hz, 10.8 Hz, 1H), 5.21-5.07 (m, 2H), 3.77 (s, 3H), 1.83 (s, 1H), 1.59-1.52 (m, 1H), 0.67-0.47 (m, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.7, 139.8, 138.7, 126.9, 121.8, 120.7, 119.5, 115.4, 109.2, 101.0, 74.1, 32.0, 21.1, 2.0, 0.8.

1-Cyclohexyl-1-(1-methyl-1*H*-indol-2-yl)prop-2-en-1-ol (1p)

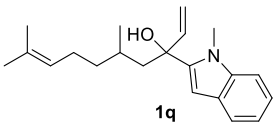


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 218.2 mg of brown liquid in 81% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 7.6 Hz, 1H), 7.29 (d, *J* = 8.4 Hz, 1H), 7.21-7.16 (m, 1H), 7.09-7.05 (m, 1H), 6.37 (s, 1H), 6.28 (dd, *J* = 17.6 Hz, 10.8 Hz, 1H), 5.30-5.26 (m, 2H), 3.90 (s, 3H), 2.11-2.04 (m, 1H), 1.94 (s, 1H), 1.82-1.65 (m, 3H), 1.55-1.54 (m, 1H), 1.35-0.99 (m, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.1, 140.6, 138.7, 126.9, 121.7, 120.6, 119.6, 114.0, 109.2, 101.7, 77.8, 46.4, 32.4, 28.4, 27.4, 26.9, 26.6.

5,9-Dimethyl-3-(1-methyl-1*H*-indol-2-yl)deca-1,8-dien-3-ol (1q)



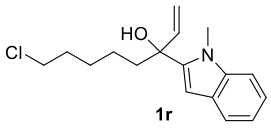
1q

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 246.1 mg of yellow liquid in 79% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.0 Hz, 1H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.23-7.17 (m, 1H), 7.10-7.05 (m, 1H), 6.44 (s, 1H), 6.23-6.11 (m, 1H), 5.29-5.21 (m, 2H), 5.10-5.03 (m, 1H), 3.83 (s, 3H), 2.03-1.91 (m, 4H), 1.86 (s, 1H), 1.66 (d, *J* = 4.8 Hz, 3H), 1.57 (d, *J* = 4.8 Hz, 3H), 1.49-1.29 (m, 2H), 1.26-1.18 (m, 1H), 0.99-0.91 (m, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.2, 142.6, 138.7, 131.6, 126.9, 124.8, 121.8, 120.7, 119.6, 114.1, 109.2, 100.4, 75.4, 48.0, 39.0, 32.0, 28.4, 25.8, 25.6, 21.9, 17.8.

8-Chloro-3-(1-methyl-1*H*-indol-2-yl)oct-1-en-3-ol (1r)



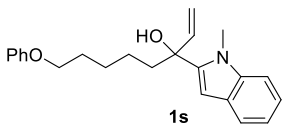
1r

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 218.9 mg of yellow liquid in 75% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57-7.55 (m, 1H), 7.29-7.26 (m, 1H), 7.22-7.18 (m, 1H), 7.10-7.06 (m, 1H), 6.42 (s, 1H), 6.09 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 5.24-5.18 (m, 2H), 3.80 (s, 3H), 3.52 (t, *J* = 6.8 Hz, 2H), 2.11-2.03 (m, 2H), 1.87 (s, 1H), 1.82-1.75 (m, 2H), 1.52-1.40 (m, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.4, 141.9, 138.7, 126.8, 121.9, 120.7, 119.6, 114.3, 109.2, 100.3, 74.7, 45.1, 41.1, 32.6, 32.0, 27.3, 22.9.

3-(1-methyl-1H-indol-2-yl)-8-phenoxyoct-1-en-3-ol (1s)

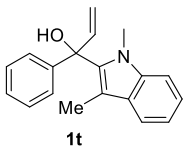


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 241.1 mg of yellow liquid in 69% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 7.6 Hz, 1H), 7.30-7.27 (m, 2H), 7.25-7.18 (m, 2H), 7.10-7.06 (m, 1H), 6.95-6.86 (m, 3H), 6.44 (s, 1H), 6.11 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 5.25-5.19 (m, 2H), 3.95 (t, *J* = 6.4 Hz, 2H), 3.82 (s, 3H), 2.15-2.07 (m, 2H), 1.86 (s, 1H), 1.83-1.77 (m, 2H), 1.62-1.48 (m, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.2, 142.5, 142.0, 138.7, 129.6, 126.9, 121.9, 120.7, 120.7, 119.6, 114.7, 114.2, 109.2, 100.4, 74.8, 67.9, 41.2, 32.0, 29.4, 26.6, 23.4.

1-(1,3-Dimethyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1t)

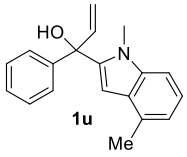


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 208.0 mg of yellow liquid in 75% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60-7.58 (m, 1H), 7.33-7.30 (m, 4H), 7.26-7.24 (m, 1H), 7.22-7.19 (m, 2H), 7.13-7.09 (m, 1H), 6.59 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 5.26-5.19 (m, 2H), 3.42 (s, 3H), 2.43 (s, 1H), 2.36 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 144.4, 144.1, 137.6, 136.3, 128.5, 127.4, 126.3, 122.4, 119.0, 118.9, 112.8, 109.7, 109.0, 78.0, 32.2, 11.1.

1-(1,4-Dimethyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1u)

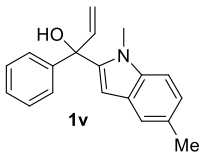


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 144.2 of brown liquid in 52% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.31 (m, 4H), 7.27-7.23 (m, 1H), 7.15-7.08 (m, 2H), 6.91 (d, *J* = 6.8 Hz, 1H), 6.58 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.52 (s, 1H), 5.30-5.26 (m, 2H), 3.44 (s, 3H), 2.55 (s, 3H), 1.26 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 143.3, 141.7, 138.6, 130.5, 128.4, 127.4, 126.5, 126.2, 122.4, 119.9, 113.4, 106.9, 101.2, 76.6, 31.8, 18.8.

1-(1,5-dimethyl-1H-indol-2-yl)-1-phenylprop-2-en-1-ol (1v)

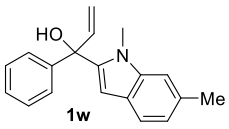


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 191.4 mg of brown liquid in 69% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 (s, 1H), 7.34-7.29 (m, 4H), 7.25-7.22 (m, 1H), 7.13 (d, *J* = 8.4 Hz, 1H), 7.05-7.02 (m, 1H), 6.54 (dd, *J* = 17.2 Hz, 10.8 Hz, 1H), 6.41 (s, 1H), 5.27-5.22 (m, 2H), 3.42 (s, 3H), 2.44 (s, 3H), 2.39 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 143.3, 142.3, 137.2, 128.9, 128.4, 127.4, 126.9, 126.1, 123.8, 120.6, 113.4, 109.0, 102.2, 76.6, 31.6, 21.5.

1-(1,6-Dimethyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1w)

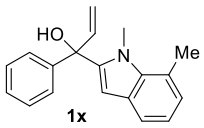


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 180.3 mg of brown liquid in 65% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 8.0 Hz, 1H), 7.34-7.28 (m, 4H), 7.27-7.25 (m, 1H), 7.04 (s, 1H), 6.96-6.93 (m, 1H), 6.54 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.45 (s, 1H), 5.28-5.23 (m, 2H), 3.42 (s, 3H), 2.48 (s, 3H), 2.36 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 143.3, 141.7, 139.2, 132.1, 128.4, 127.4, 126.1, 124.5, 121.5, 120.6, 113.4, 109.3, 102.6, 76.6, 31.6, 22.1.

1-(1,7-Dimethyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1x)

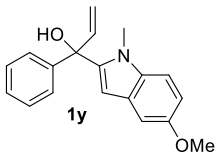


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 138.7 mg of yellow liquid in 50% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.2 Hz, 1H), 7.34-7.28 (m, 4H), 7.27-7.23 (m, 1H), 6.96-6.88 (m, 2H), 6.52 (dd, *J* = 17.2 Hz, 10.4 Hz, 1H), 6.48 (s, 1H), 5.25-5.21 (m, 2H), 3.72 (s, 3H), 2.69 (s, 3H), 2.40 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 142.3, 137.6, 128.4, 127.6, 127.3, 126.1, 125.5, 121.4, 119.8, 119.2, 113.2, 103.5, 76.7, 34.9, 20.7.

1-(5-Methoxy-1-methyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1y)

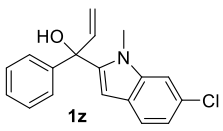


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 202.4 mg of brown liquid in 69% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35-7.29 (m, 4H), 7.27-7.25 (m, 1H), 7.13 (d, *J* = 8.8 Hz, 1H), 7.07-7.04 (m, 1H), 6.88-6.86 (m, 1H), 6.53 (dd, *J* = 16.8 Hz, 10.4 Hz, 1H), 6.41 (s, 1H), 5.28-5.23 (m, 2H), 3.83 (s, 3H), 3.43 (s, 3H), 2.49 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 154.3, 143.5, 143.2, 142.8, 134.2, 128.4, 127.4, 126.9, 126.2, 113.5, 112.5, 110.1, 102.8, 102.4, 76.7, 56.1, 31.8.

1-(6-Chloro-1-methyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1z)

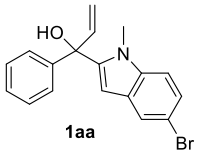


The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 175.7 mg of brown liquid in 59% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 8.4 Hz, 1H), 7.35-7.28 (m, 5H), 7.27-7.23 (m, 1H), 7.07-7.04 (m, 1H), 6.51 (dd, *J* = 16.8 Hz, 10.4 Hz, 1H), 6.44 (s, 1H), 5.29-5.22 (m, 2H), 3.41 (s, 3H), 2.43 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.2, 143.1, 142.9, 139.3, 128.5, 128.2, 127.6, 126.1, 125.2, 121.8, 120.4, 113.9, 109.4, 102.8, 76.6, 31.8.

1-(5-Bromo-1-methyl-1*H*-indol-2-yl)-1-phenylprop-2-en-1-ol (1aa)



1aa

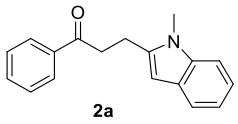
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 208.8 mg of brown liquid in 61% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.0 Hz, 1H), 7.35-7.30 (m, 4H), 7.28-7.26 (m, 1H), 7.24-7.20 (m, 1H), 7.12-7.08 (m, 1H), 6.56 (dd, *J* = 16.8 Hz, 10.4 Hz, 1H), 6.50 (s, 1H), 5.29-5.26 (m, 2H), 3.47 (s, 3H), 2.39 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 143.2, 142.3, 138.9, 128.5, 127.5, 126.7, 126.2, 122.2, 121.0, 119.7, 113.6, 109.3, 102.8, 76.7, 31.7.

The products 2:

3-(1-Methyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2a)[3]



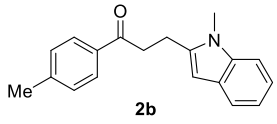
2a

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 24.7 mg of yellow solid in 94% yield, melting point 110-112 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.01 (d, *J* = 7.2 Hz, 2H), 7.60-7.57 (m, 1H), 7.53 (d, *J* = 7.8 Hz, 1H), 7.50-7.47 (m, 2H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.18-7.15 (m, 1H), 7.08-7.05 (m, 1H), 6.29 (s, 1H), 3.73 (s, 3H), 3.45 (t, *J* = 7.8 Hz, 2H), 3.21 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.7, 140.1, 137.6, 136.9, 133.4, 128.9, 128.2, 128.0, 121.0, 120.0, 119.5, 109.0, 98.7, 37.6, 29.7, 21.2.

3-(1-Methyl-1*H*-indol-2-yl)-1-(*p*-tolyl) propan-1-one (2b)[3]



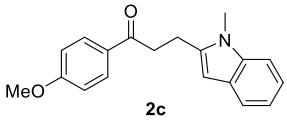
2b

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 24.7 mg of yellow solid in 89% yield, melting point 101-103 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.4 Hz, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.28 (d, *J* = 8.4 Hz, 3H), 7.18-7.15 (m, 1H), 7.08-7.05 (m, 1H), 6.29 (s, 1H), 3.72 (s, 3H), 3.42 (t, *J* = 7.8 Hz, 2H), 3.20 (t, *J* = 7.8 Hz, 2H), 2.42 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.4, 144.2, 140.2, 137.7, 134.5, 129.5, 128.3, 128.0, 121.0, 120.0, 119.5, 109.0, 98.8, 37.5, 29.6, 21.8, 21.3.

1-(4-Methoxyphenyl)-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2c)[3]



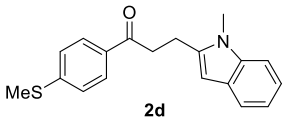
2c

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.50 in hexane:ethyl acetate = 15:1) resulting in 24.0 mg of yellow solid in 82% yield, melting point 97-99 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.00-7.98 (m, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.27 (d, *J* = 8.4 Hz, 1H), 7.17-7.15 (m, 1H), 7.07-7.05 (m, 1H), 6.96-6.94 (m, 2H), 6.28 (s, 1H), 3.87 (s, 3H), 3.72 (s, 3H), 3.40-3.37 (m, 2H), 3.20-3.18 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.3, 163.8, 140.3, 137.7, 130.5, 130.1, 128.0, 121.0, 120.0, 119.5, 114.0, 109.0, 98.8, 55.6, 37.3, 29.6, 21.4.

3-(1-Methyl-1*H*-indol-2-yl)-1-(4-(methylthio)phenyl)propan-1-one (2d)



2d

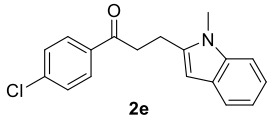
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 20.7 mg of yellow solid in 67% yield, melting point 116-118 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.4 Hz, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.29-7.27 (m, 3H), 7.17-7.15 (m, 1H), 7.08-7.05 (m, 1H), 6.28 (s, 1H), 3.72 (s, 3H), 3.39 (t, *J* = 7.8 Hz, 2H), 3.19 (t, *J* = 7.8 Hz, 2H), 2.53 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.7, 146.3, 140.1, 137.7, 133.3, 128.6, 128.0, 125.4, 121.0, 120.0, 119.6, 109.0, 98.8, 37.4, 29.6, 21.3, 15.0.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NOS$ $[M+H]^+$:310.1260; Found:310.1259.

1-(4-Chlorophenyl)-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2e)[1]



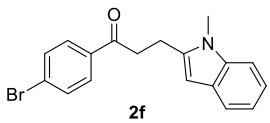
2e

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 20.5 mg of yellow solid in 69% yield, melting point 107-109 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.4 Hz, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.28 (d, *J* = 7.8 Hz, 1H), 7.17 (t, *J* = 7.8 Hz, 1H), 7.07 (t, *J* = 7.8 Hz, 1H), 6.27 (s, 1H), 3.72 (s, 3H), 3.41 (t, *J* = 7.8 Hz, 2H), 3.20 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.5, 139.9, 139.8, 137.7, 135.3, 129.6, 129.2, 128.0, 121.1, 120.0, 119.6, 109.0, 98.8, 37.6, 29.7, 21.2.

1-(4-Bromophenyl)-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2f)



2f

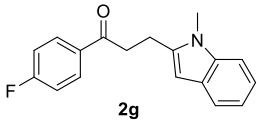
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.50 in hexane:ethyl acetate = 15:1) resulting in 29.1 mg of yellow solid in 85% yield, melting point 112-114 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.4 Hz, 2H), 7.62 (d, *J* = 8.4 Hz, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.27 (d, *J* = 8.4 Hz, 1H), 7.17 (t, *J* = 7.2 Hz, 1H), 7.07 (t, *J* = 7.2 Hz, 1H), 6.27 (s, 1H), 3.72 (s, 3H), 3.40 (t, *J* = 7.8 Hz, 2H), 3.20 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.7, 139.8, 137.7, 135.7, 132.2, 129.7, 128.6, 128.0, 121.1, 120.0, 119.6, 109.0, 98.8, 37.6, 29.7, 21.2.

HRMS(ESI): m/z Calcd. for $C_{18}H_{16}BrNNaO$ $[M+Na]^+$:364.0307; Found:364.0307.

3-(1-Methyl-1*H*-indol-2-yl)-1-(*p*-tolyl) propan-1-one (2g)



2g

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 19.1 mg of yellow solid in 68% yield, melting point 72-74 ^{o}C.

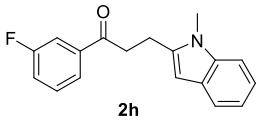
^{1}H NMR (600 MHz, $CDCl_3$) δ 8.04-8.02 (m, 2H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.18-7.13 (m, 3H), 7.07 (t, *J* = 7.2 Hz, 1H), 6.28 (s, 1H), 3.72 (s, 3H), 3.41 (t, *J* = 7.8 Hz, 2H), 3.20 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.1, 166.0 (d, *J* = 255.2 Hz), 139.9, 137.6, 133.4 (d, *J* = 3.0 Hz), 130.8 (d, *J* = 9.2 Hz), 128.0, 121.1, 120.0, 119.6, 116.0 (d, *J* = 21.1 Hz), 109.0, 98.8, 37.5, 29.6, 21.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -104.83.

HRMS(ESI): m/z Calcd. for $C_{18}H_{17}FNO$ $[M+H]^+$:282.1289; Found:282.1288.

1-(3-Fluorophenyl)-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2h)



2h

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.50 in hexane:ethyl acetate = 15:1) resulting in 20.5 mg of yellow solid in 73% yield, melting point 86-88 ^{o}C.

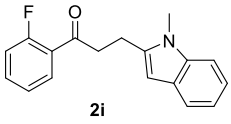
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.8 Hz, 1H), 7.70-7.67 (m, 1H), 7.52 (d, *J* = 7.8 Hz, 1H), 7.48-7.44 (m, 1H), 7.30-7.27 (m, 2H), 7.17 (t, *J* = 7.2 Hz, 1H), 7.07 (t, *J* = 7.2 Hz, 1H), 6.28 (s, 1H), 3.73 (s, 3H), 3.43 (t, *J* = 7.8 Hz, 2H), 3.21 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.4 (d, *J* = 2.4 Hz), 163.1 (d, *J* = 248.5 Hz), 139.8, 139.1 (d, *J* = 6.0 Hz), 137.7, 130.5 (d, *J* = 7.7 Hz), 128.0, 123.9 (d, *J* =3.2 Hz), 121.1, 120.4 (d, *J* = 21.4 Hz), 120.0, 119.6, 115.0 (d, *J* = 22.5 Hz), 109.0, 98.9, 37.8, 29.7, 21.1.

^{19}F NMR (565 MHz, $CDCl_3$) δ -111.60.

HRMS(ESI): m/z Calcd. for $C_{18}H_{17}FNO$ $[M+H]^+$:282.1289; Found:282.1289.

1-(2-Fluorophenyl)-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2i)



2i

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 26.4 mg of yellow solid in 94% yield, melting point 81-83 ^{o}C.

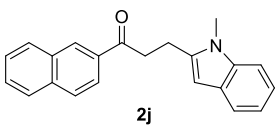
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.91-7.88 (m, 1H), 7.55-7.51 (m, 2H), 7.28-7.24 (m, 2H), 7.17-7.14 (m, 2H), 7.06 (t, *J* = 7.8 Hz, 1H), 6.27 (s, 1H), 3.72 (s, 3H), 3.47-3.44 (m, 2H), 3.20 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 197.1 (d, *J* = 4.2 Hz), 162.2 (d, *J* = 254.4 Hz), 140.0, 137.7, 134.8 (d, *J* = 9.1 Hz), 130.9 (d, *J* = 2.6 Hz), 128.0, 125.7 (d, *J* = 13.1 Hz), 124.7 (d, *J* = 3.3 Hz), 121.0, 120.0, 119.5, 116.9 (d, *J* = 23.8 Hz), 108.9, 98.9, 42.5 (d, *J* = 8.0 Hz), 29.6, 21.1 (d, *J* = 2.3 Hz).

^{19}F NMR (565 MHz, $CDCl_3$) δ -109.17.

HRMS(ESI): m/z Calcd. for $C_{18}H_{17}FNO$ $[M+H]^+$:282.1289; Found:282.1288.

3-(1-Methyl-1*H*-indol-2-yl)-1-(naphthalen-2-yl)propan-1-one (2j)



2j

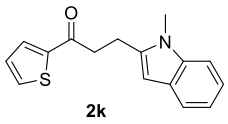
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.30 in hexane:ethyl acetate = 15:1) resulting in 27.6 mg of yellow solid in 88% yield, melting point 114-116 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.51 (s, 1H), 8.07 (d, *J* = 7.8 Hz, 1H), 7.96 (d, *J* = 7.8 Hz, 1H), 7.92-7.87 (m, 2H), 7.61 (t, *J* = 7.8 Hz, 1H), 7.57-7.53 (m, 2H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.17 (t, *J* = 7.8 Hz, 1H), 7.07 (t, *J* = 7.8 Hz, 1H), 6.34 (s, 1H), 3.74 (s, 3H), 3.58 (t, *J* = 7.8 Hz, 2H), 3.26 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.7, 140.1, 137.7, 135.9, 134.3, 132.7, 129.9, 129.7, 128.7, 128.7, 128.0, 128.0, 127.0, 123.9, 121.0, 120.0, 119.6, 109.0, 98.9, 37.7, 29.7, 21.4.

HRMS(ESI): m/z Calcd. for $C_{22}H_{20}NO$ $[M+H]^+$:314.1539; Found:314.1539.

3-(1-Methyl-1*H*-indol-2-yl)-1-(thiophen-2-yl) propan-1-one (2k)



2k

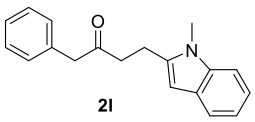
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (40:1) (R*f* = 0.30 in hexane:ethyl acetate = 15:1) resulting in 13.5 mg of yellow solid in 50% yield, melting point 65-67 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.77 (d, *J* = 3.0 Hz, 1H), 7.65 (d, *J* = 4.8 Hz, 1H), 7.53 (d, *J* = 7.8 Hz, 1H), 7.28 (d, *J* = 8.4 Hz, 1H), 7.18-7.14 (m, 2H), 7.07 (t, *J* = 7.2 Hz, 1H), 6.29 (s, 1H), 3.72 (s, 3H), 3.38 (t, *J* = 7.8 Hz, 2H), 3.21 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 191.6, 144.1, 139.8, 137.7, 133.9, 132.0, 128.3, 128.0, 121.1, 120.0, 119.6, 109.0, 98.9, 38.4, 29.7, 21.4.

HRMS(ESI): m/z Calcd. for $C_{16}H_{16}NOS$ $[M+H]^+$:270.0947; Found:270.0947.

4-(1-Methyl-1*H*-indol-2-yl)-1-phenylbutan-2-one (2l)



2l

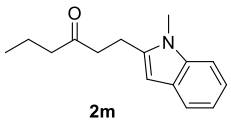
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.30 in hexane:ethyl acetate = 15:1) resulting in 24.1 mg of yellow solid in 87% yield, melting point 74-76 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.48 (d, *J* = 7.8 Hz, 1H), 7.32 (t, *J* = 7.2 Hz, 2H), 7.27 (d, *J* = 7.2 Hz, 1H), 7.23 (d, *J* = 7.8 Hz, 1H), 7.20 (d, *J* = 7.2 Hz, 2H), 7.14 (t, *J* = 7.2 Hz, 1H), 7.05 (t, *J* = 7.2 Hz, 1H), 6.11 (s, 1H), 3.73 (s, 2H), 3.61 (s, 3H), 2.99 (t, *J* = 7.8 Hz, 2H), 2.90 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 206.9, 139.7, 137.6, 134.1, 129.5, 129.0, 127.9, 127.3, 121.0, 120.0, 119.5, 108.9, 98.8, 50.6, 40.6, 29.5, 20.9.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NO$ $[M+H]^+$:278.1539; Found:278.1538.

1-(1-Methyl-1*H*-indol-2-yl)hexan-3-one (2m)



2m

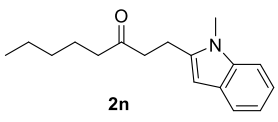
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 21.1 mg of yellow solid in 92% yield, melting point 94-96 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.8 Hz, 1H), 7.27-7.25 (m, 1H), 7.17-7.14 (m, 1H), 7.07-7.04 (m, 1H), 6.20 (s, 1H), 3.68 (s, 3H), 3.02 (t, *J* = 7.8 Hz, 2H), 2.86 (t, *J* = 7.8 Hz, 2H), 2.45 (t, *J* = 7.2 Hz, 2H), 1.66-1.62 (m, 2H), 0.93 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 209.6, 140.0, 137.6, 128.0, 121.0, 120.0, 119.5, 108.9, 98.7, 45.1, 41.4, 29.6, 20.8, 17.5, 13.9.

HRMS(ESI): m/z Calcd. for $C_{15}H_{20}NO$ $[M+H]^+$:230.1540; Found:230.1539.

1-(1-Methyl-1*H*-indol-2-yl)octan-3-one (2n)



2n

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 20.6 mg of yellow solid in 80% yield, melting point 79-81 ^{o}C.

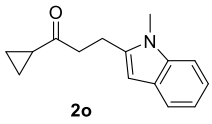
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.8 Hz, 1H), 7.27-7.25 (m, 1H), 7.16 (t, *J* = 7.2 Hz, 1H), 7.06 (t, *J* = 7.2 Hz, 1H), 6.20 (s, 1H), 3.68 (s, 3H), 3.02 (t, *J* = 7.8 Hz, 2H),

2.87 (t, *J* = 7.8 Hz, 2H), 2.46 (t, *J* = 7.2 Hz, 2H), 1.63-1.58 (m, 2H), 1.35-1.27 (m, 4H), 0.89 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 209.8, 140.0, 137.6, 128.0, 121.0, 120.0, 119.5, 108.9, 98.7, 43.2, 41.4, 31.6, 29.6, 23.7, 22.6, 20.8, 14.0.

HRMS(ESI): m/z Calcd. for $C_{17}H_{24}NO$ $[M+H]^+$:258.1852; Found:258.1853.

1-Cyclopropyl-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2o)



2o

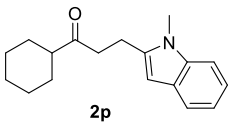
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 16.6 mg of yellow solid in 73% yield, melting point 57-59 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.8 Hz, 1H), 7.27-7.25 (m, 1H), 7.16 (t, *J* = 7.8 Hz, 1H), 7.06 (t, *J* = 7.8 Hz, 1H), 6.24 (s, 1H), 3.68 (s, 3H), 3.04 (s, 4H), 2.00-1.96 (m, 1H), 1.08-1.06 (m, 2H), 0.93-0.88 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 209.4, 140.1, 137.6, 128.0, 121.0, 120.0, 119.5, 108.9, 98.7, 42.1, 29.6, 21.0, 20.8, 11.0.

HRMS(ESI): m/z Calcd. for $C_{15}H_{18}NO$ $[M+H]^+$:228.1383; Found:228.1383.

1-Cyclohexyl-3-(1-methyl-1*H*-indol-2-yl)propan-1-one (2p)



2p

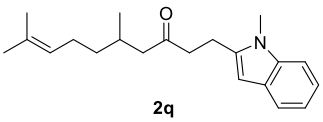
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (40:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 14.0 mg of yellow solid in 52% yield, melting point 88-90 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.8 Hz, 1H), 7.27 (s, 1H), 7.15 (t, *J* = 7.2 Hz, 1H), 7.06 (t, *J* = 7.2 Hz, 1H), 6.20 (s, 1H), 3.68 (s, 3H), 3.01 (t, *J* = 7.8 Hz, 2H), 2.91 (t, *J* = 7.8 Hz, 2H), 2.42-2.37 (m, 1H), 1.89-1.86 (m, 2H), 1.81-1.78 (m, 2H), 1.39-1.30 (m, 6H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 212.6, 140.3, 137.6, 128.0, 120.9, 120.0, 119.5, 108.9, 98.6, 51.2, 39.4, 29.6, 28.7, 26.0, 25.8, 20.8.

HRMS(ESI): m/z Calcd. for $C_{18}H_{23}NNaO$ $[M+Na]^+$:292.1672; Found:292.1573.

5,9-Dimethyl-1-(1-methyl-1*H*-indol-2-yl)dec-8-en-3-one (2q)



2q

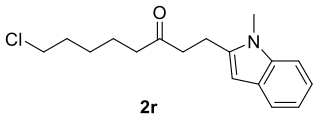
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 15:1) resulting in 30.2 mg of yellow solid in 97% yield, melting point 59-61 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.8 Hz, 1H), 7.27-7.25 (m, 1H), 7.17-7.14 (m, 1H), 7.06 (t, *J* = 7.8 Hz, 1H), 6.20 (s, 1H), 5.10-5.06 (m, 1H), 3.68 (s, 3H), 3.03-3.00 (m, 2H), 2.87-2.83 (m, 2H), 2.48-2.44 (m, 1H), 2.30-2.26 (m, 1H), 2.07-1.93 (m, 4H), 1.68 (s, 3H), 1.60 (s, 3H), 1.34-1.30 (m, 1H), 0.91 (d, *J* = 6.6 Hz, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 209.4, 140.0, 137.6, 131.7, 128.0, 124.4, 121.0, 120.0, 119.5, 108.9, 98.7, 50.6, 42.0, 37.2, 29.6, 29.2, 25.8, 25.6, 20.8, 19.9, 17.8.

HRMS(ESI): m/z Calcd. for $C_{21}H_{30}NO$ $[M+H]^+$:312.2322; Found:312.2322.

8-Chloro-1-(1-methyl-1*H*-indol-2-yl)octan-3-one (2r)



2r

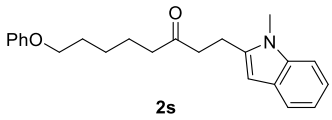
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (40:1) (R*f* = 0.50 in hexane:ethyl acetate = 20:1) resulting in 24.8 mg of yellow solid in 85% yield, melting point 55-57 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.8 Hz, 1H), 7.26-7.25 (m, 1H), 7.15 (t, *J* = 7.2 Hz, 1H), 7.06 (t, *J* = 7.2 Hz, 1H), 6.20 (s, 1H), 3.68 (s, 3H), 3.51 (t, *J* = 6.6 Hz, 2H), 3.02 (t, *J* = 7.8 Hz, 2H), 2.86 (t, *J* = 7.8 Hz, 2H), 2.48 (t, *J* = 7.2 Hz, 2H), 1.79-1.74 (m, 2H), 1.65-1.60 (m, 2H), 1.46-1.41 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 208.2, 138.9, 136.6, 126.9, 120.0, 119.0, 118.5, 107.9, 97.7, 43.9, 41.9, 40.5, 31.5, 28.6, 25.6, 22.1, 19.8.

HRMS(ESI): m/z Calcd. for $C_{17}H_{23}ClNO$ $[M+H]^+$:292.1463; Found:292.1463.

1-(1-Methyl-1*H*-indol-2-yl)-8-phenoxyoctan-3-one (2s)



2s

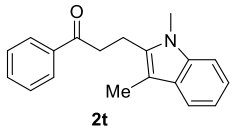
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (40:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 25.8 mg of yellow solid in 74% yield, melting point 73-75 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.8 Hz, 1H), 7.27-7.26 (m, 3H), 7.15 (t, *J* = 7.8 Hz, 1H), 7.06 (t, *J* = 7.8 Hz, 1H), 6.92 (t, *J* = 7.2 Hz, 1H), 6.87 (d, *J* = 8.4 Hz, 2H), 6.20 (s, 1H), 3.93 (t, *J* = 6.6 Hz, 2H), 3.67 (s, 3H), 3.02 (t, *J* = 7.8 Hz, 2H), 2.87 (t, *J* = 7.8 Hz, 2H), 2.49 (t, *J* = 7.2 Hz, 2H), 1.80-1.76 (m, 2H), 1.70-1.65 (m, 2H), 1.50-1.44 (m, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 209.4, 159.2, 139.9, 137.6, 129.6, 128.0, 121.0, 120.7, 120.0, 119.5, 114.7, 108.9, 98.7, 67.7, 43.0, 41.5, 29.6, 29.3, 25.9, 23.7, 20.8.

HRMS(ESI): m/z Calcd. for $C_{23}H_{28}NO_2$ $[M+H]^+$:350.2115; Found:350.2115.

3-(1,3-Dimethyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2t)



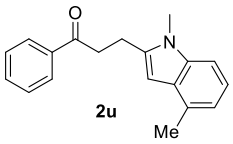
2t

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 20.5 mg of yellow solid in 74% yield, melting point 85-87 ^{o}C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, *J* = 7.6 Hz, 2H), 7.56 (t, *J* = 7.2Hz, 1H), 7.51-7.43 (m, 3H), 7.25-7.24 (m, 1H), 7.17 (t, *J* = 7.2 Hz, 1H), 7.09 (t, *J* = 7.2 Hz, 1H), 3.70 (s, 3H), 3.23 (s, 4H), 2.29 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 198.9, 136.9, 136.8, 135.6, 133.4, 128.8, 128.5, 128.2, 121.1, 119.0, 118.3, 108.8, 107.0, 38.7, 29.8, 19.1, 8.9.

3-(1,4-Dimethyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2u)



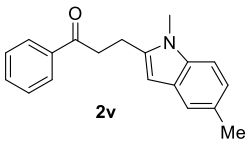
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 21.4 mg of yellow solid in 77% yield, melting point 74-76 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.02 (d, *J* = 7.8 Hz, 2H), 7.58 (t, *J* = 7.2 Hz, 1H), 7.49 (t, *J* = 7.2 Hz, 2H), 7.12 (d, *J* = 8.4 Hz, 1H), 7.08 (t, *J* = 7.8 Hz, 1H), 6.87 (d, *J* = 7,2 Hz, 1H), 6.30 (s, 1H), 3.72 (s, 3H), 3.46 (t, *J* = 7.8 Hz, 2H), 3.21 (t, *J* = 7.8 Hz, 2H), 2.51 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.8, 139.5, 137.4, 137.0, 133.4, 129.4, 128.9, 128.2, 127.8, 121.2, 119.8, 106.6, 97.3, 37.8, 29.8, 21.3, 18.8.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NO$ $[M+H]^+$:278.1539; Found:278.1540.

3-(1,5-Dimethyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2v)



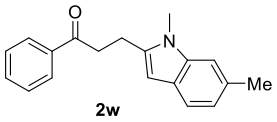
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 20.8 mg of yellow solid in 75% yield, melting point 104-106 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.00 (d, *J* = 7.8 Hz, 2H), 7.58 (t, *J* = 7.8 Hz, 1H), 7.48 (t, *J* = 7.8 Hz, 2H), 7.31 (s, 1H), 7.16 (d, *J* = 8.4 Hz, 1H), 6.98 (d, *J* = 7.8 Hz, 1H), 6.20 (s, 1H), 3.69 (s, 3H), 3.43 (t, *J* = 7.8 Hz, 2H), 3.18 (t, *J* = 7.8 Hz, 2H), 2.42 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.8, 140.1, 137.0, 136.1, 133.4, 128.8, 128.7, 128.2, 128.2, 122.5, 119.8, 108.6, 98.3, 37.7, 29.7, 21.5, 21.3.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NO$ $[M+H]^+$:278.1539; Found:278.1540.

3-(1,6-Dimethyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2w)



2w

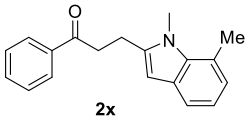
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 19.4 mg of yellow solid in 70% yield, melting point 89-91 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.01 (d, *J* = 7.8 Hz, 2H), 7.58 (d, *J* = 7.8 Hz, 1H), 7.48 (t, *J* = 7.8 Hz, 2H), 7.40 (d, *J* = 7.8 Hz, 1H), 7.07 (s, 1H), 6.90 (d, *J* = 8.4 Hz, 1H), 6.23 (s, 1H), 3.69 (s, 3H), 3.43 (t, *J* = 7.8 Hz, 2H), 3.18 (t, *J* = 7.8 Hz, 2H), 2.48 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.8, 139.4, 138.1, 137.0, 133.4, 130.7, 128.8, 128.2, 125.8, 121.2, 119.6, 109.1, 98.6, 37.7, 29.6, 22.0, 21.3.

HRMS(ESI): m/z Calcd. for $C_{19}H_{19}NNaO$ $[M+Na]^+$:300.1359; Found:300.1359.

3-(1,7-Dimethyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2x)



2x

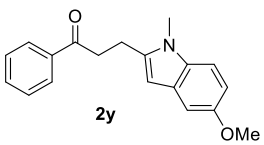
The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 25.2 mg of yellow solid in 91% yield, melting point 84-86 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.01 (d, *J* = 7.8 Hz, 2H), 7.58 (t, *J* = 7.2 Hz, 1H), 7.48 (t, *J* = 7.2 Hz, 2H), 7.35 (d, *J* = 7.8 Hz, 1H), 6.92 (t, *J* = 7.8 Hz, 1H), 6.85 (d, *J* = 7.2 Hz, 1H), 6.26 (s, 1H), 3.98 (s, 3H), 3.43 (t, *J* = 7.8 Hz, 2H), 3.16 (t, *J* = 7.8 Hz, 2H), 2.77 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.8, 140.4, 137.0, 136.6, 133.4, 128.8, 128.8, 128.2, 124.3, 120.7, 119.6, 118.2, 99.5, 37.6, 32.7, 21.6, 20.5.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NO$ $[M+H]^+$:278.1539; Found:278.1540.

3-(5-Methoxy-1-methyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (**2y**)



2y

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography

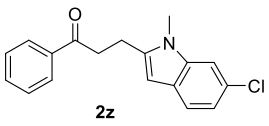
was performed using hexanes and ethyl acetate (20:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 25.8 mg of yellow solid in 88% yield, melting point 112-114 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.00 (d, *J* = 7.8 Hz, 2H), 7.58 (t, *J* = 7.2 Hz, 1H), 7.48 (t, *J* = 7.2 Hz, 2H), 7.16 (d, *J* = 9.0 Hz, 1H), 7.01 (d, *J* = 2.4 Hz, 1H), 6.83-6.82 (m, 1H), 6.21 (s, 1H), 3.83 (s, 3H), 3.69 (s, 3H), 3.42 (t, *J* = 7.8 Hz, 2H), 3.18 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.7, 154.3, 140.7, 137.0, 133.4, 133.1, 128.8, 128.3, 128.2, 110.9, 109.6, 102.4, 98.5, 56.2, 37.7, 29.8, 21.3.

HRMS(ESI): m/z Calcd. for $C_{19}H_{20}NO_2$ $[M+H]^+$:294.1489; Found:294.1489.

3-(6-Chloro-1-methyl-1*H*-indol-2-yl)-1-phenylpropan-1-one (2z)



2z

The title compound was prepared according to the general procedure as described, silica gel flash column chromatography was performed using hexanes and ethyl acetate (30:1) (R*f* = 0.40 in hexane:ethyl acetate = 10:1) resulting in 24.1 mg of yellow solid in 81% yield, melting point 86-88 ^{o}C.

^{1}H NMR (600 MHz, $CDCl_3$) δ 8.00 (d, *J* = 7.2 Hz, 2H), 7.58 (t, *J* = 7.8 Hz, 1H), 7.49 (t, *J* = 7.8 Hz, 2H), 7.40 (d, *J* = 8.4 Hz, 1H), 7.26 (s, 1H), 7.03-7.02 (m, 1H), 6.25 (s, 1H), 3.69 (s, 3H), 3.44 (t, *J* = 7.8 Hz, 2H), 3.19 (t, *J* = 7.8 Hz, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 198.5, 141.0, 138.1, 136.9, 133.5, 128.9, 128.2, 127.0, 126.5, 120.8, 120.1, 109.1, 99.0, 37.4, 29.8, 21.2.

HRMS(ESI): m/z Calcd. for $C_{18}H_{17}ClNO$ $[M+H]^+$:298.0993; Found:298.0993.

IV References

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2. W.-R. Zhu, Q. Su, X.-Y. Deng, J.-S. Liu, T. Zhong, S.-S. Meng, J.-T. Yi, J. Weng

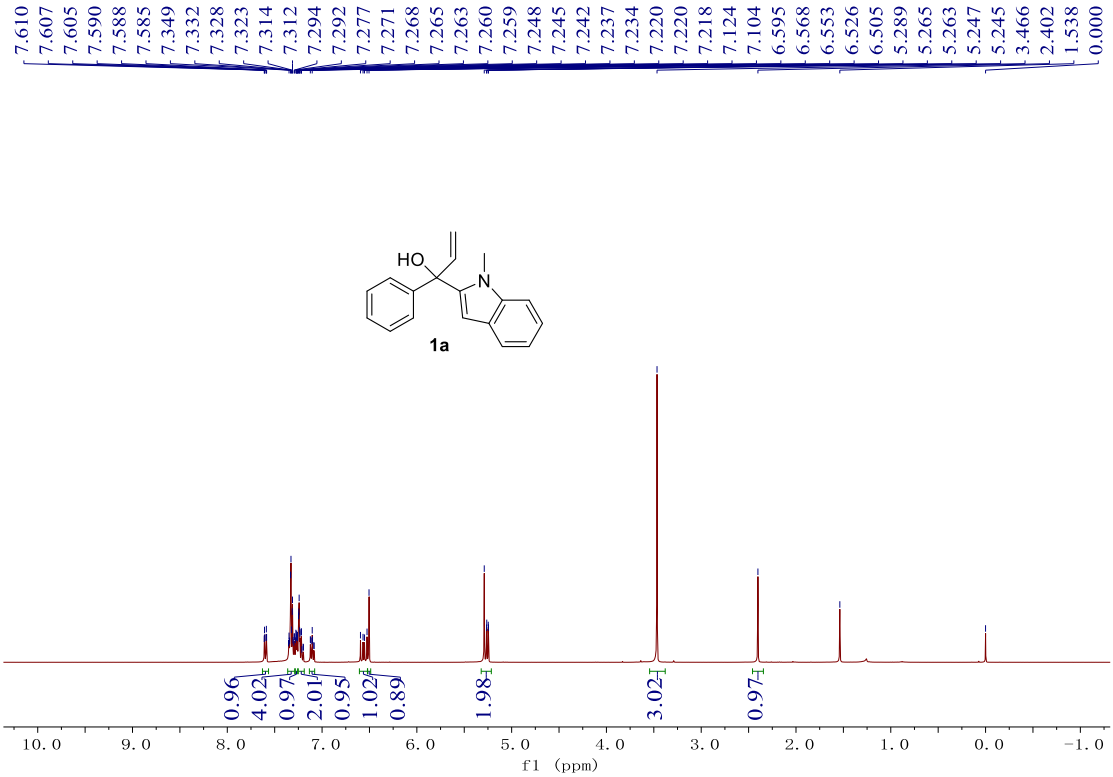
and G. Lu, Organocatalytic Enantioselective SN_1-type Dehydrative Nucleophilic Substitution: Access to Bis(Indolyl)Methanes Bearing Quaternary Carbon Stereocenters, *Chem. Sci.*, 2022, **13**, 170-177.

3. L. Song, D. Ni, S. Jia, R. Pi, S. Dong, F. Yang, J. Tang and S. Liu, C(sp^2)-H Bond Multiple Functionalization in Air for Construction of Tetrahydrocarbazoles with Continuous Quaternary Carbons and Polycyclic Diversification, *Org. Lett.*, 2020, **22**, 1846-1851.

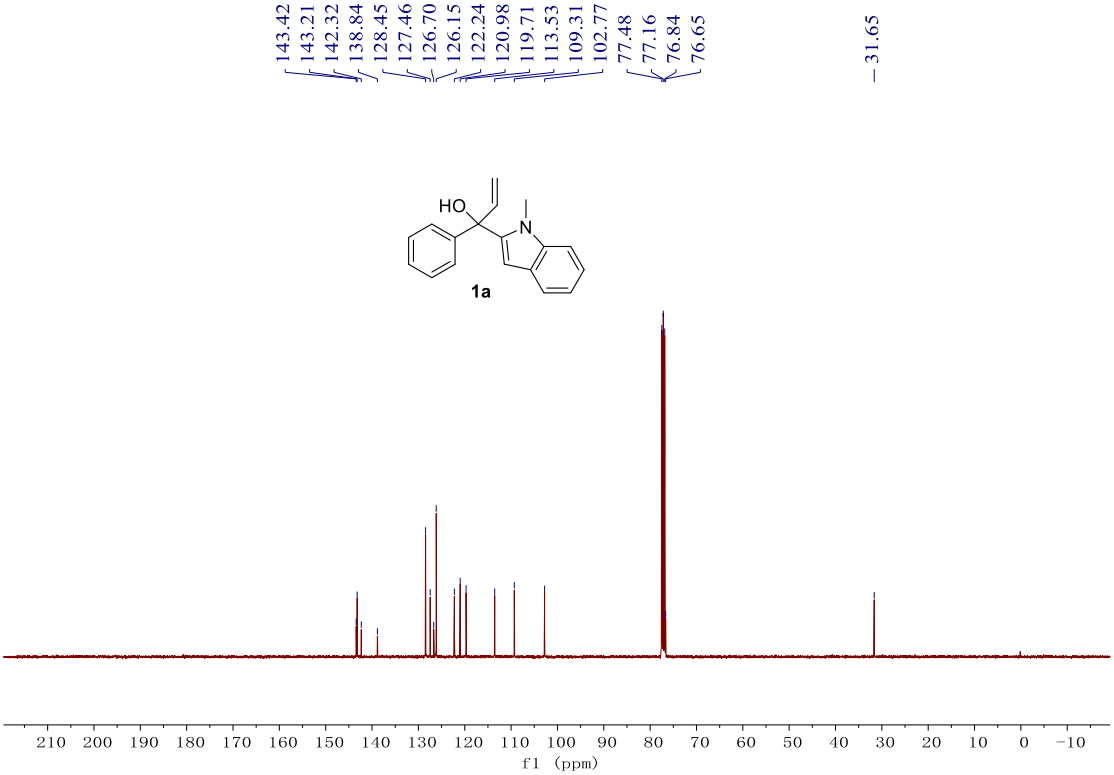
V NMR spectra

Allyl alcohols 1:

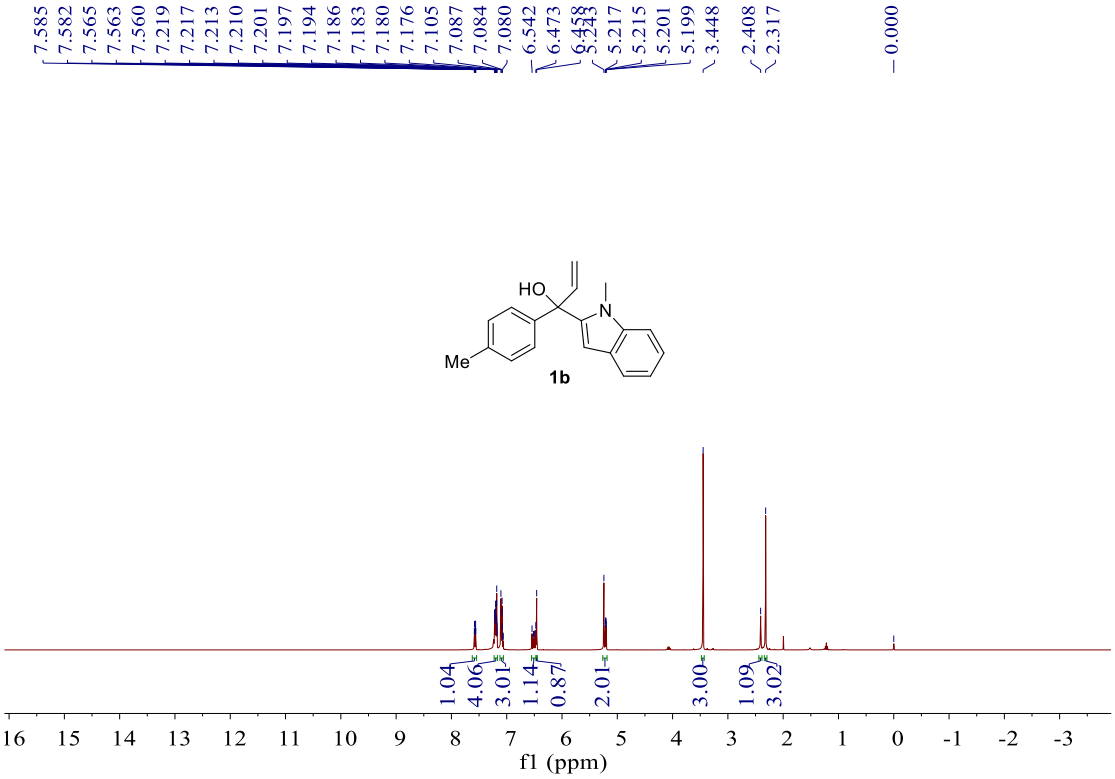
^{1}H NMR (400 MHz, $CDCl_3$) for **1a**



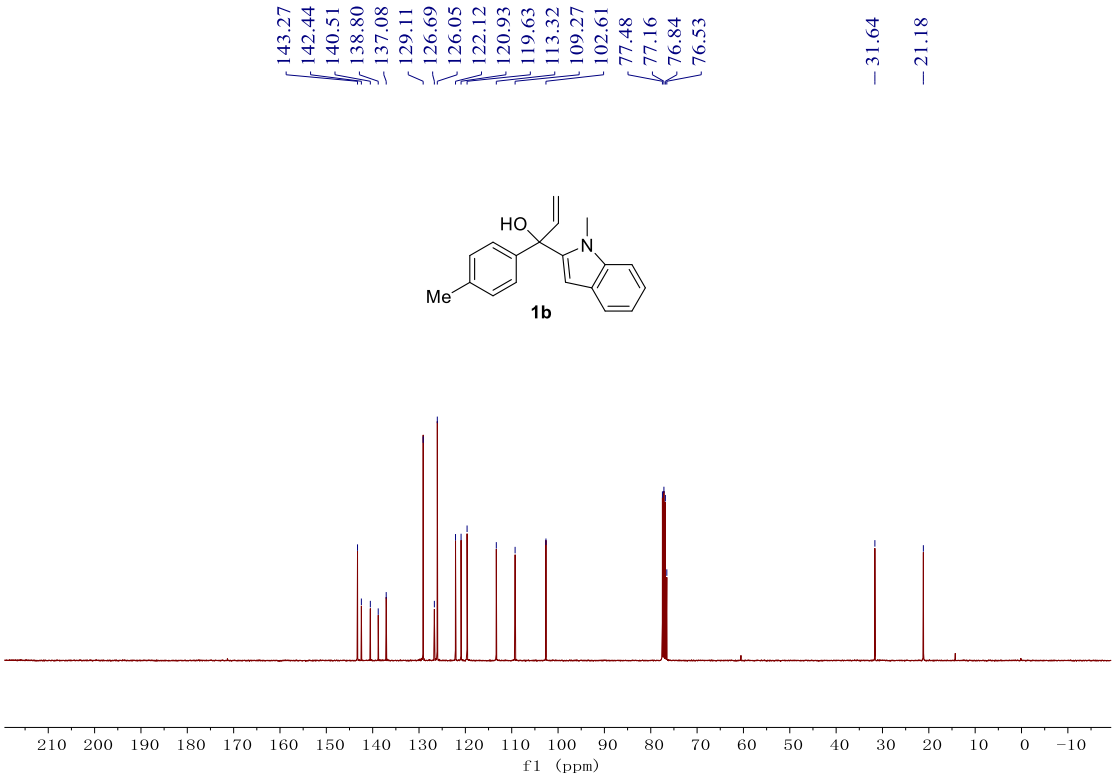
^{13}C NMR (101 MHz, $CDCl_3$) for **1a**



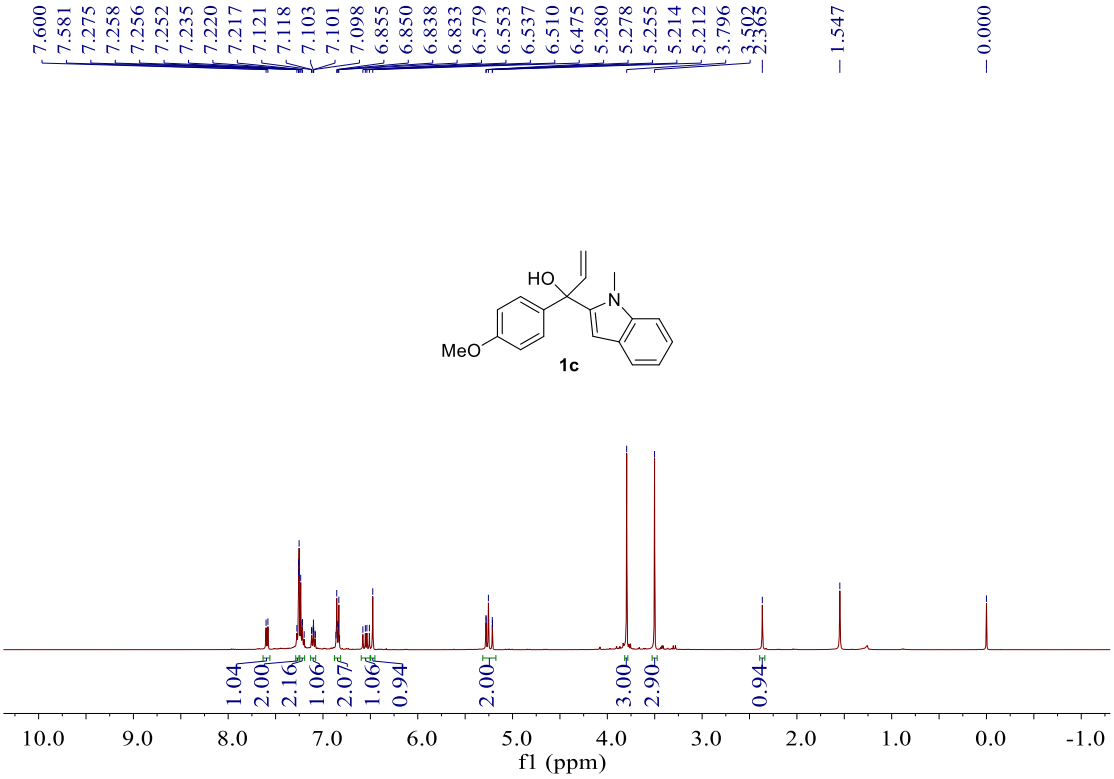
^{1}H NMR (400 MHz, $CDCl_3$) for **1b**



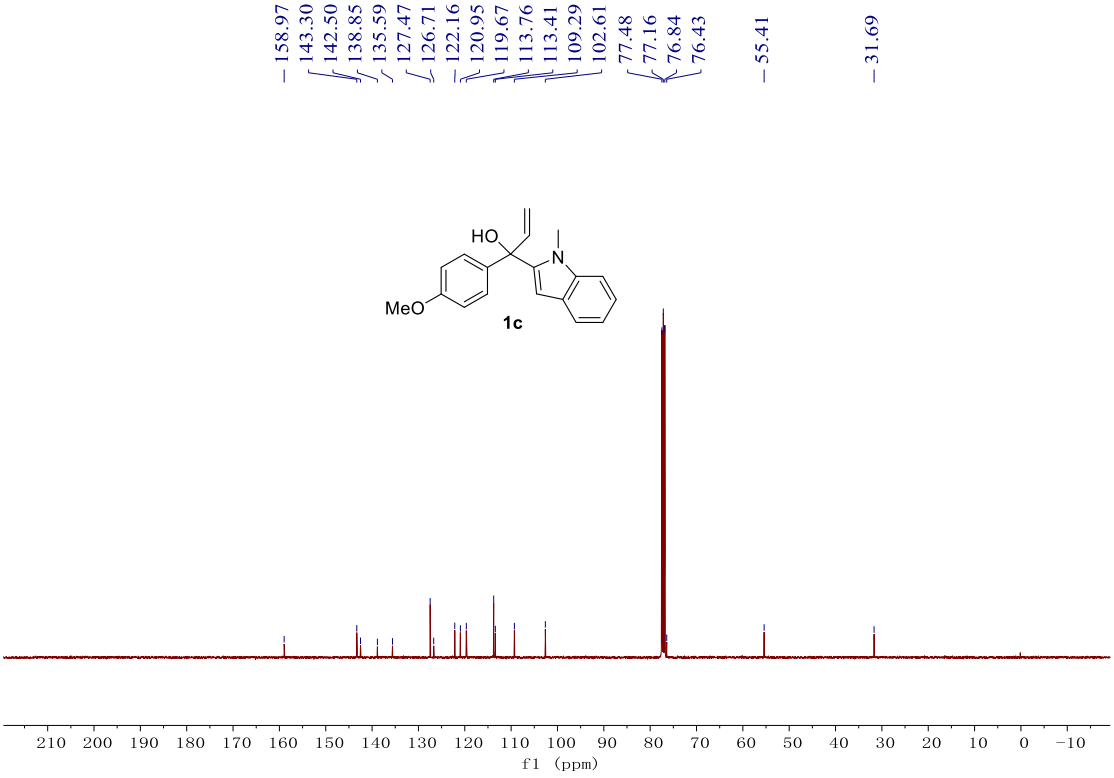
^{13}C NMR (101 MHz, $CDCl_3$) for **1b**



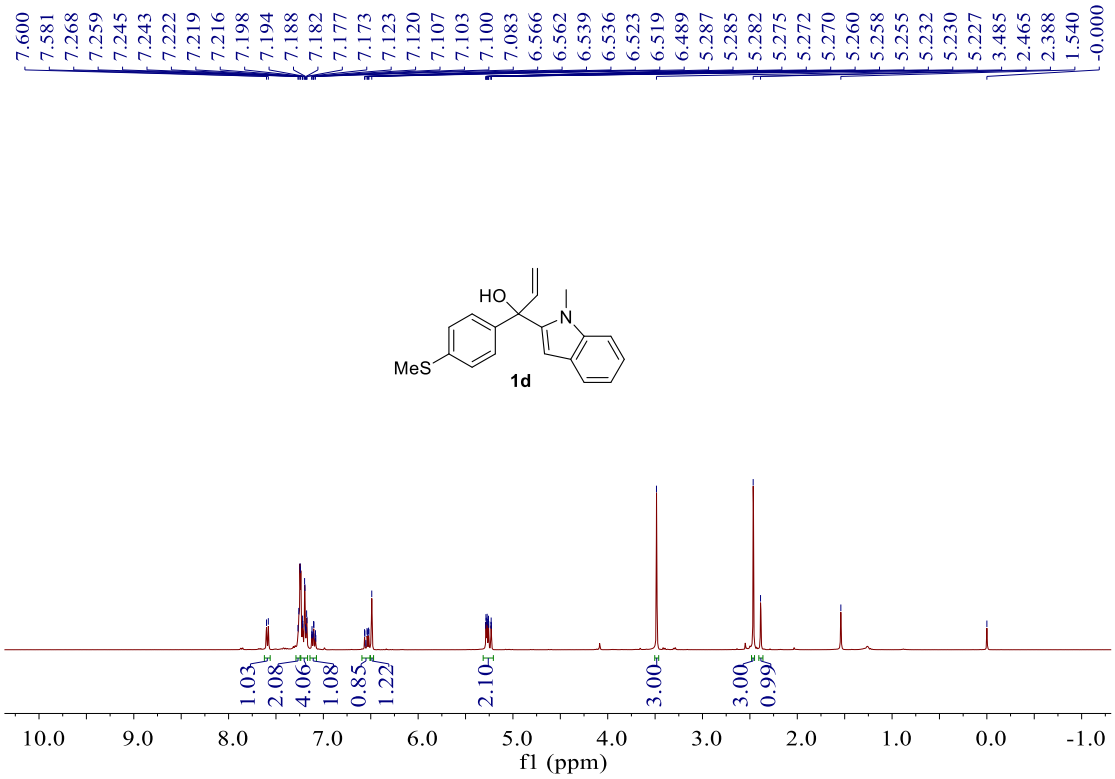
^{1}H NMR (400 MHz, $CDCl_3$) for **1c**



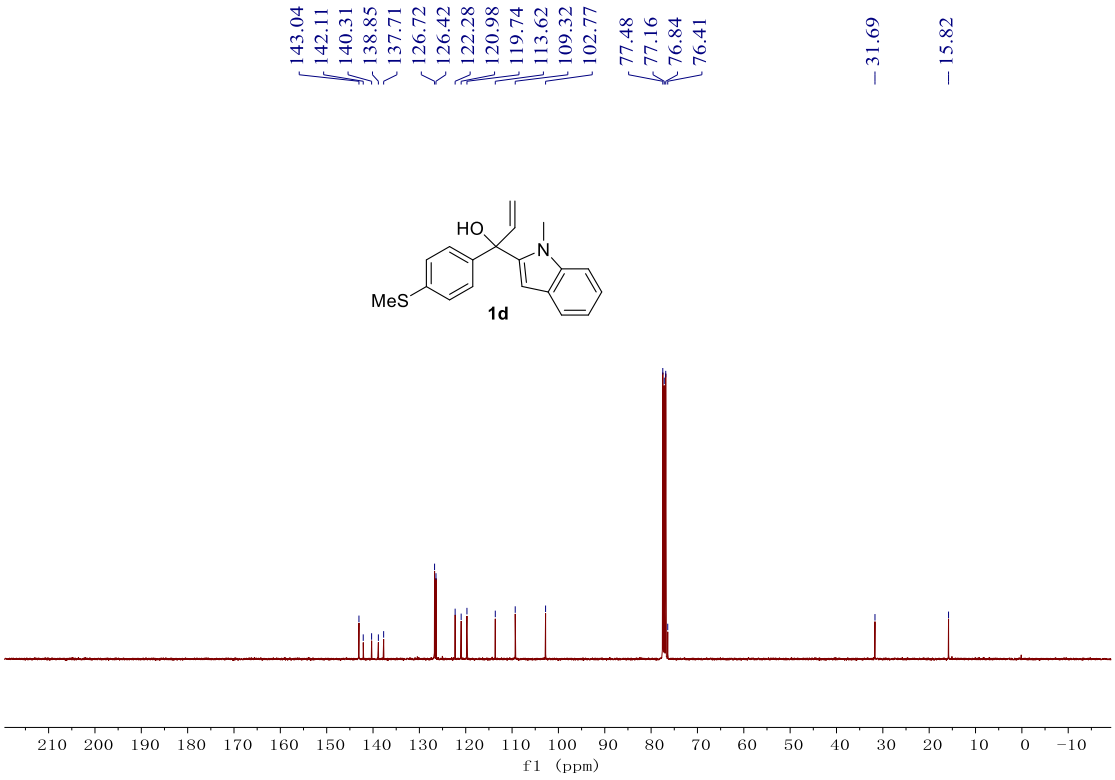
^{13}C NMR (101 MHz, $CDCl_3$) for **1c**



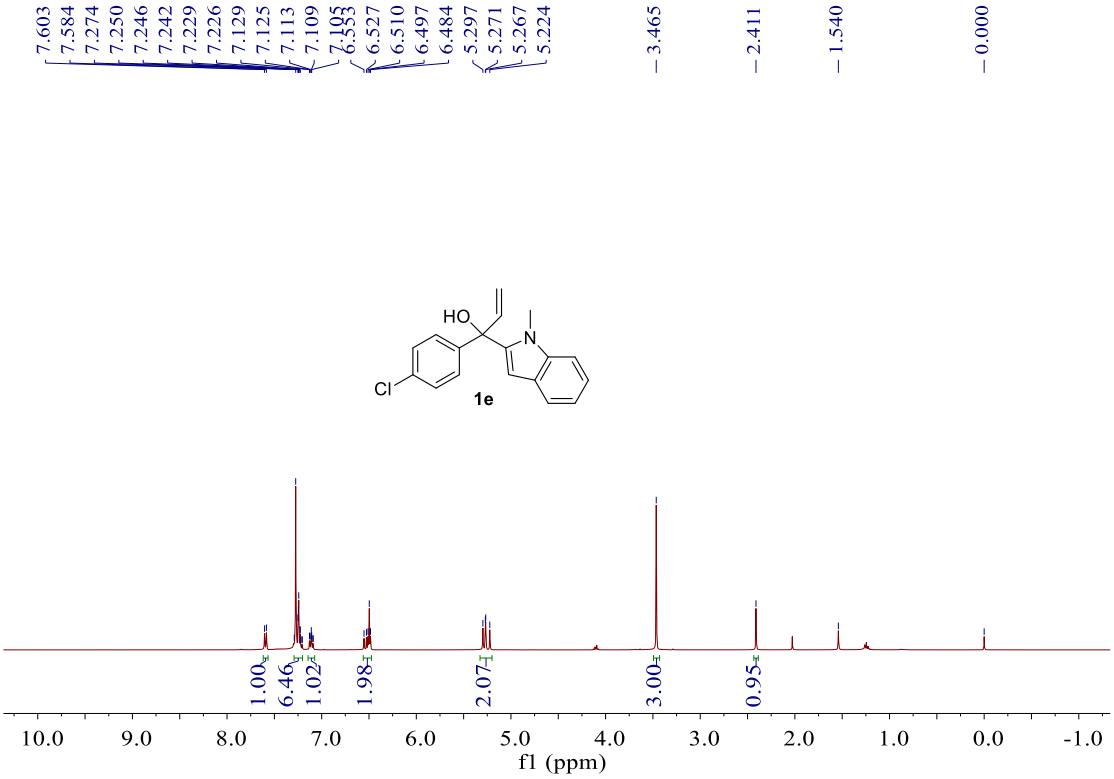
^{1}H NMR (400 MHz, $CDCl_3$) for **1d**



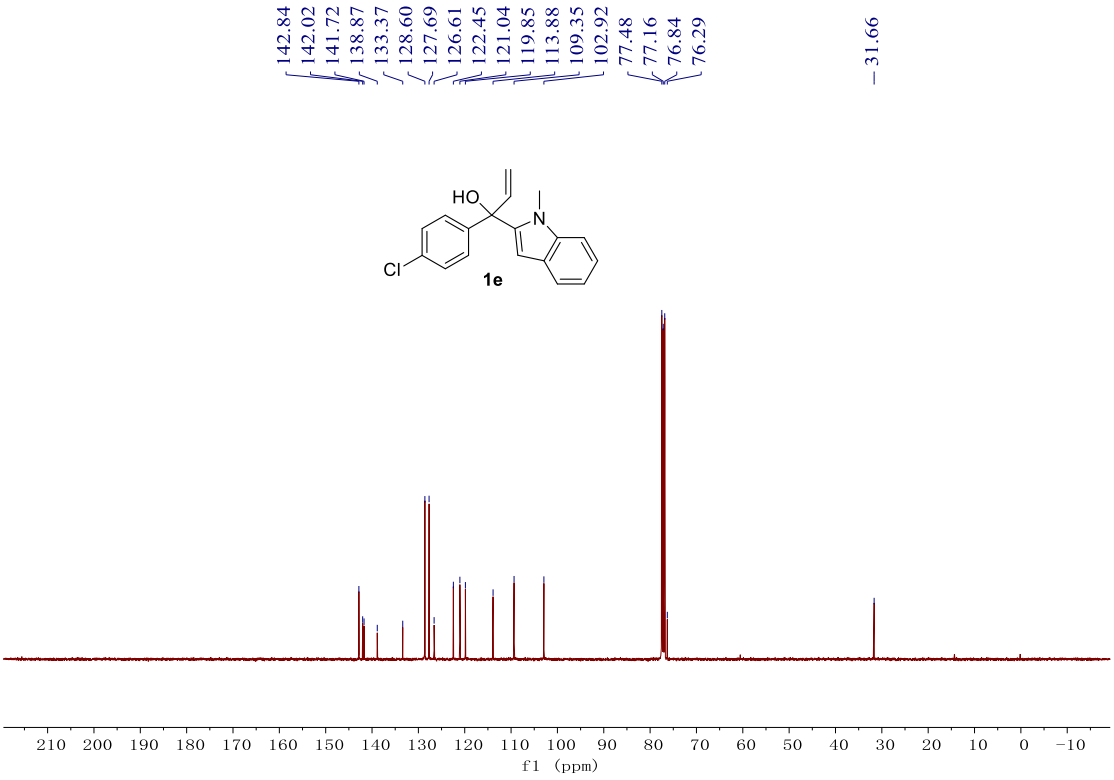
^{13}C NMR (101 MHz, $CDCl_3$) for **1d**



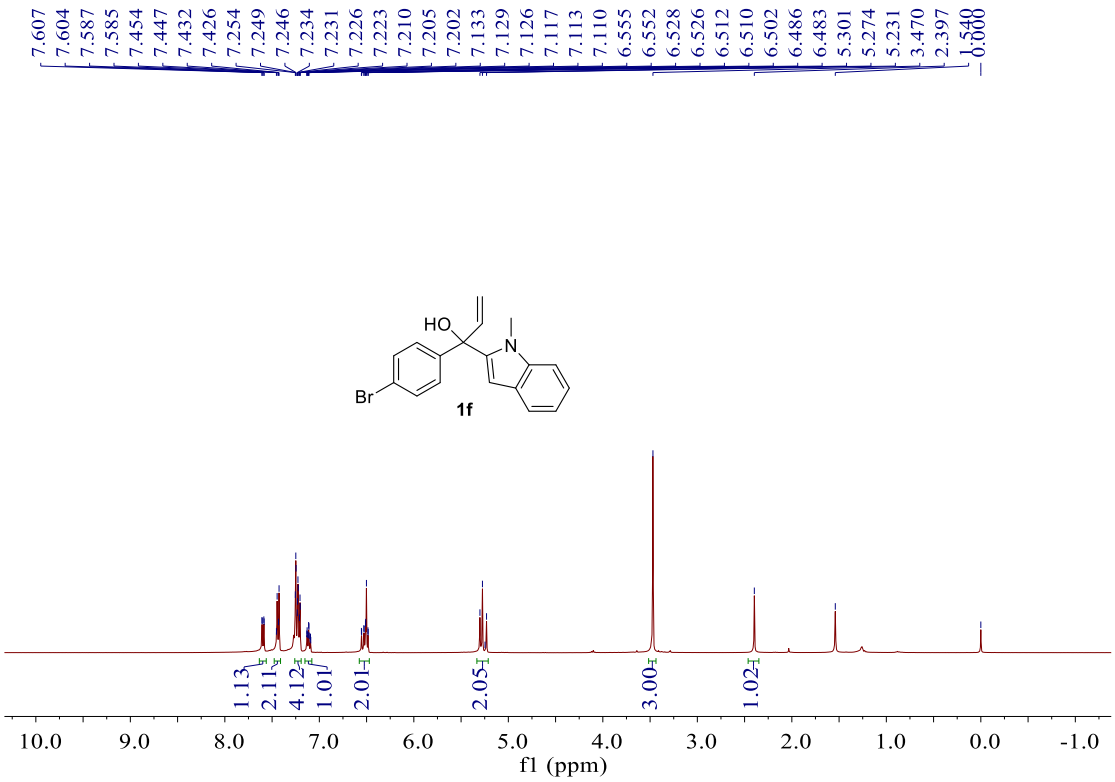
^{1}H NMR (400 MHz, $CDCl_3$) for **1e**



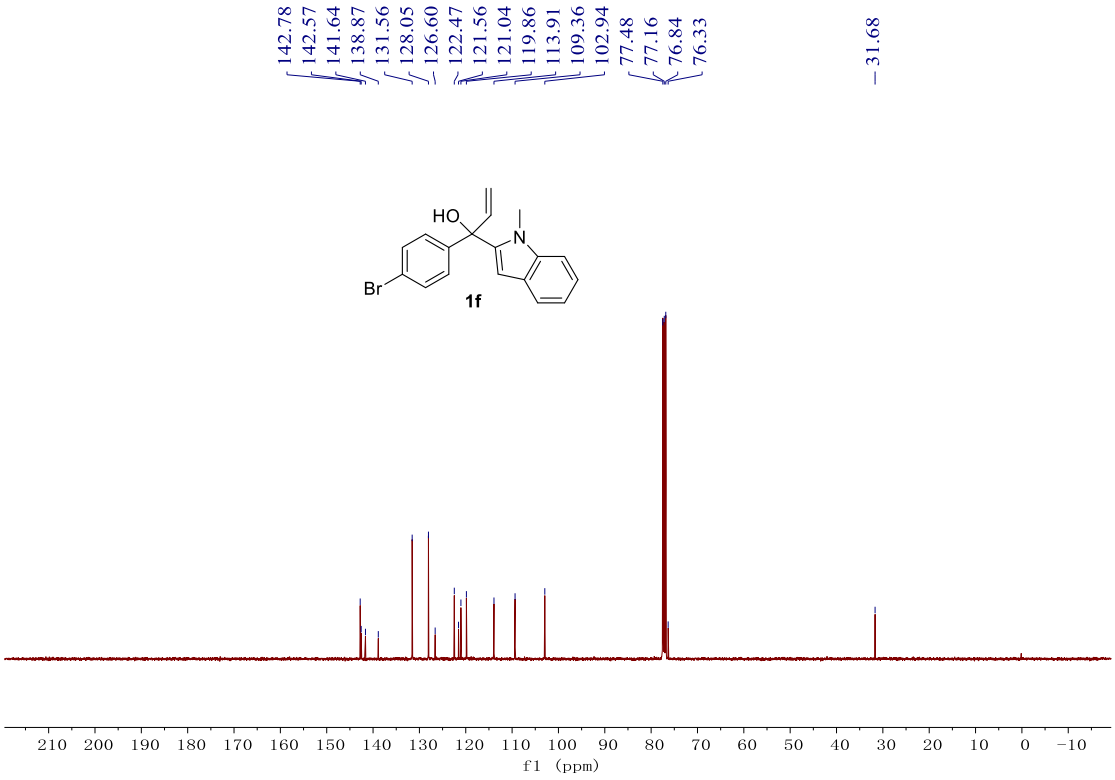
^{13}C NMR (101 MHz, $CDCl_3$) for **1e**



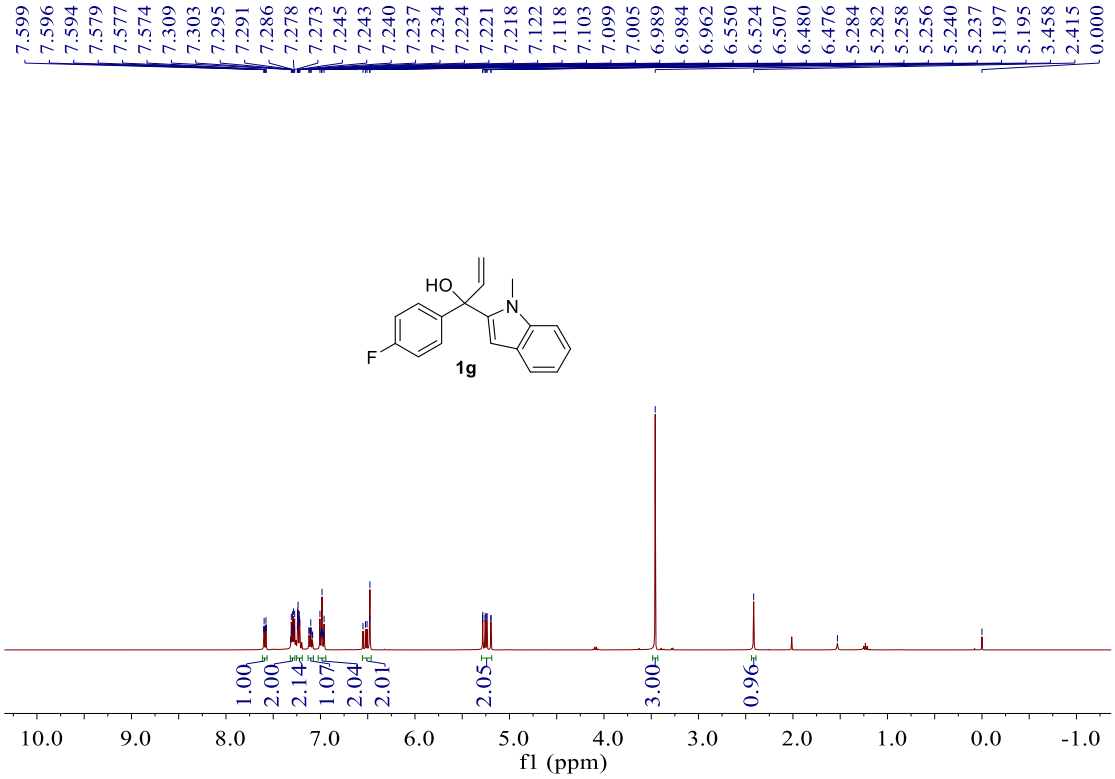
^{1}H NMR (400 MHz, $CDCl_3$) for **1f**



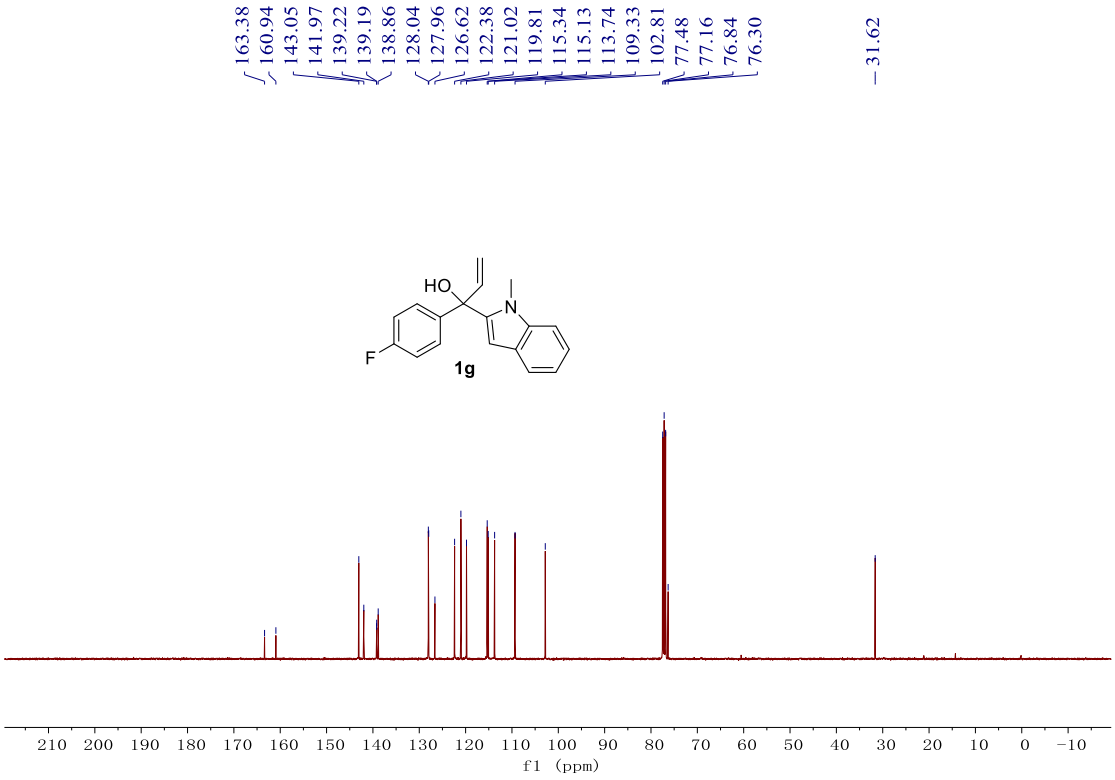
^{13}C NMR (101 MHz, $CDCl_3$) for **1f**



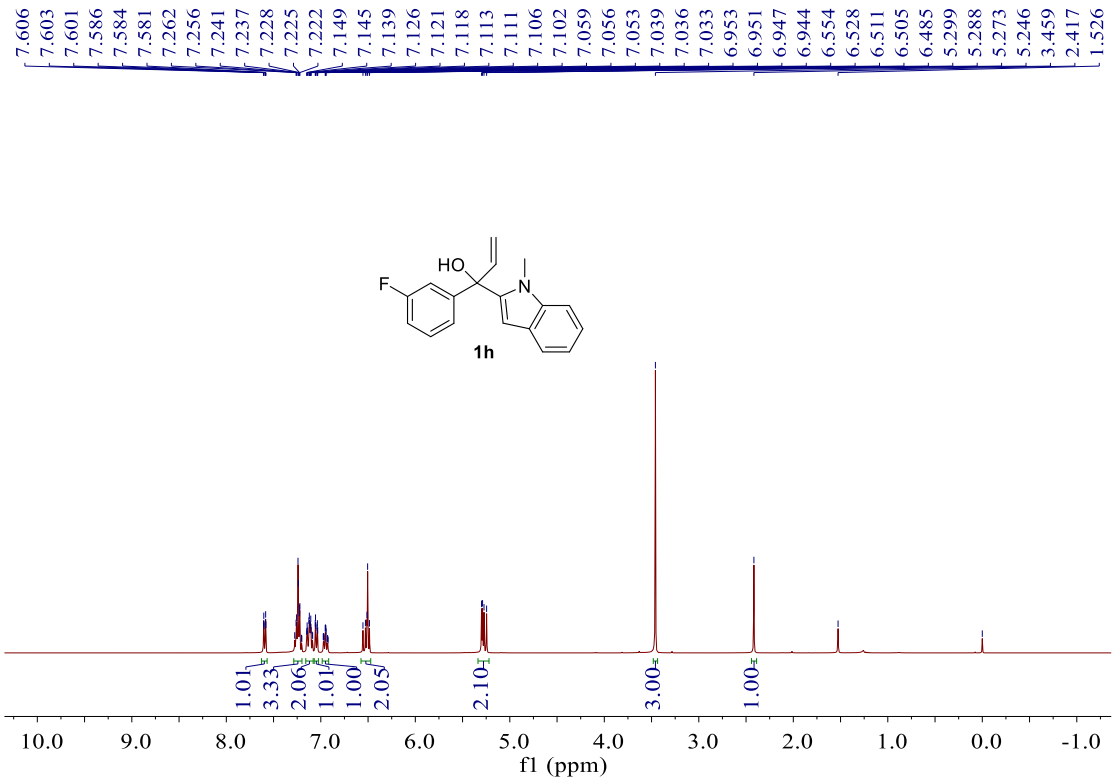
^{1}H NMR (400 MHz, $CDCl_3$) for **1g**



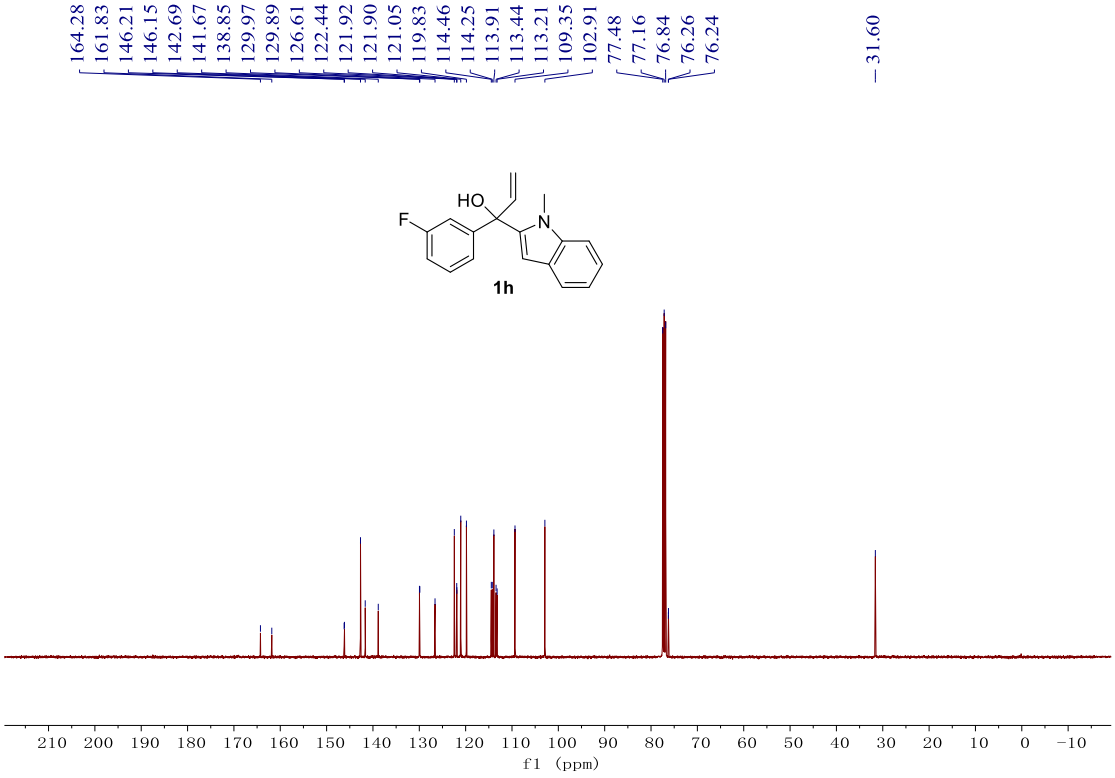
^{13}C NMR (101 MHz, $CDCl_3$) for **1g**



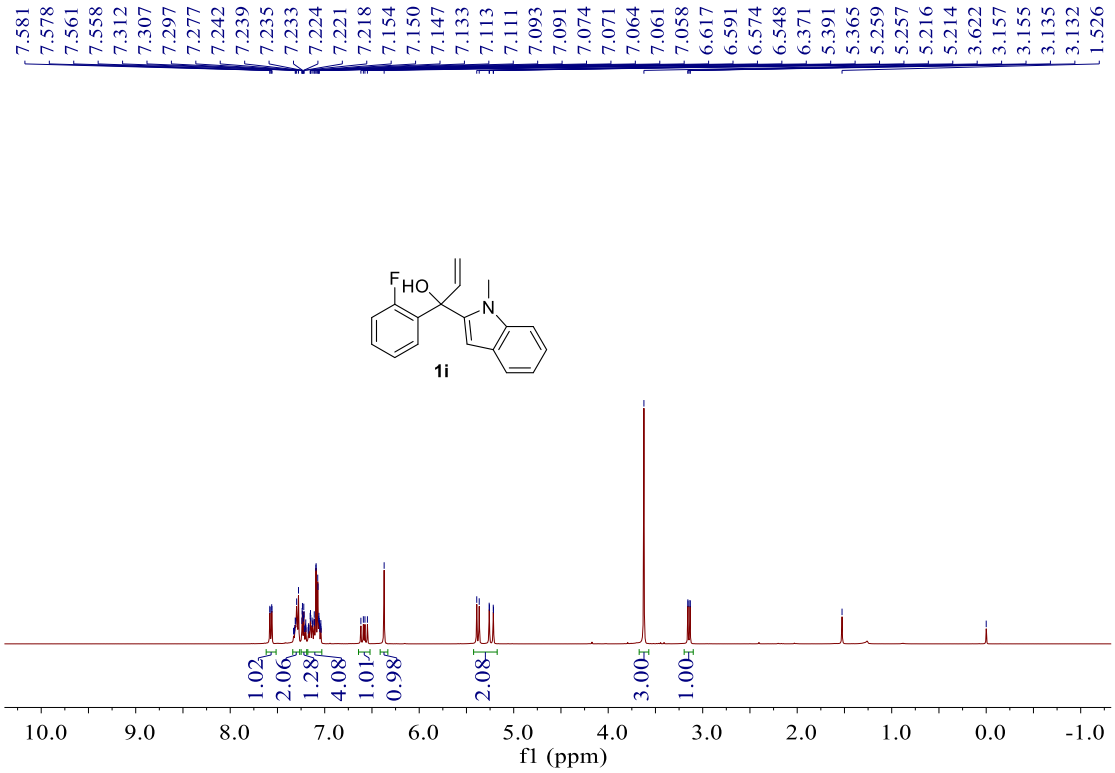
^{1}H NMR (400 MHz, $CDCl_3$) for **1h**



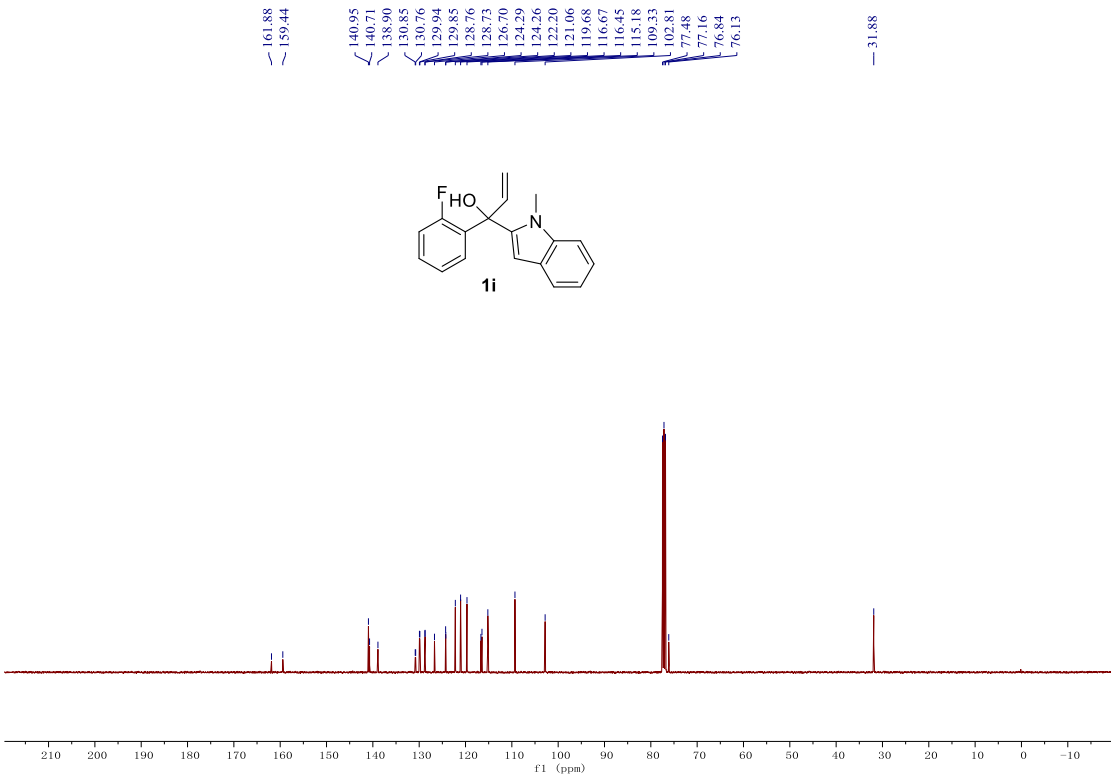
^{13}C NMR (101 MHz, $CDCl_3$) for **1h**



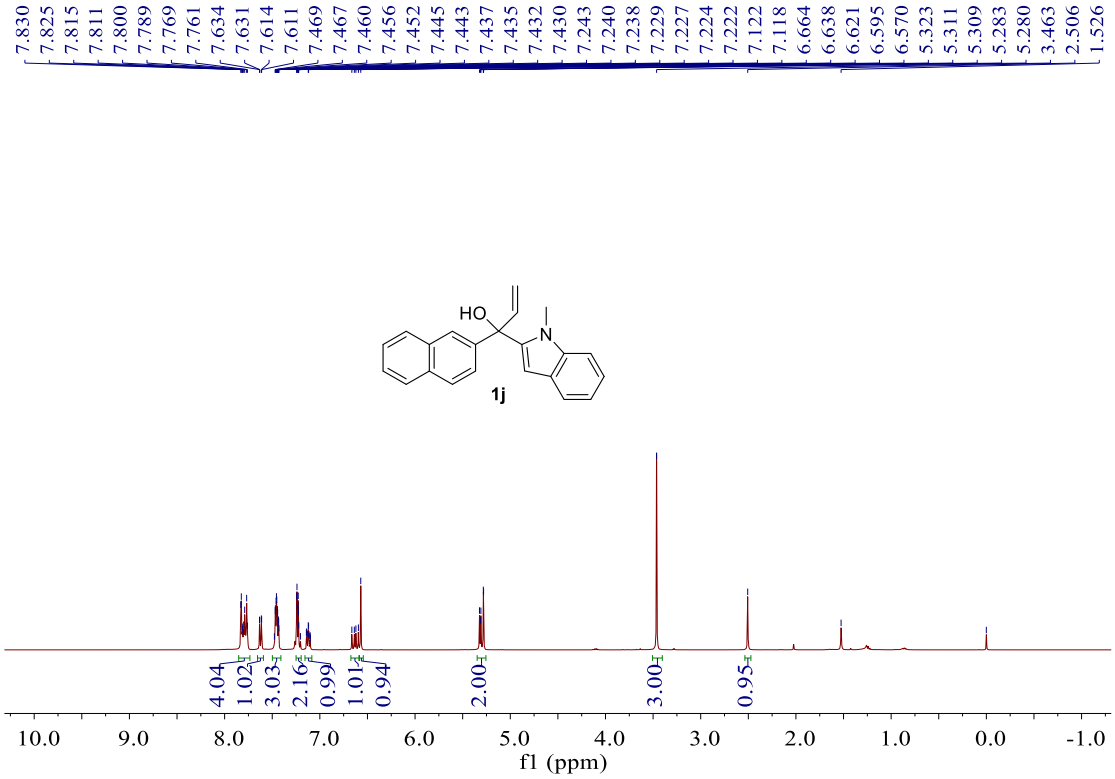
^{1}H NMR (400 MHz, $CDCl_3$) for **1i**



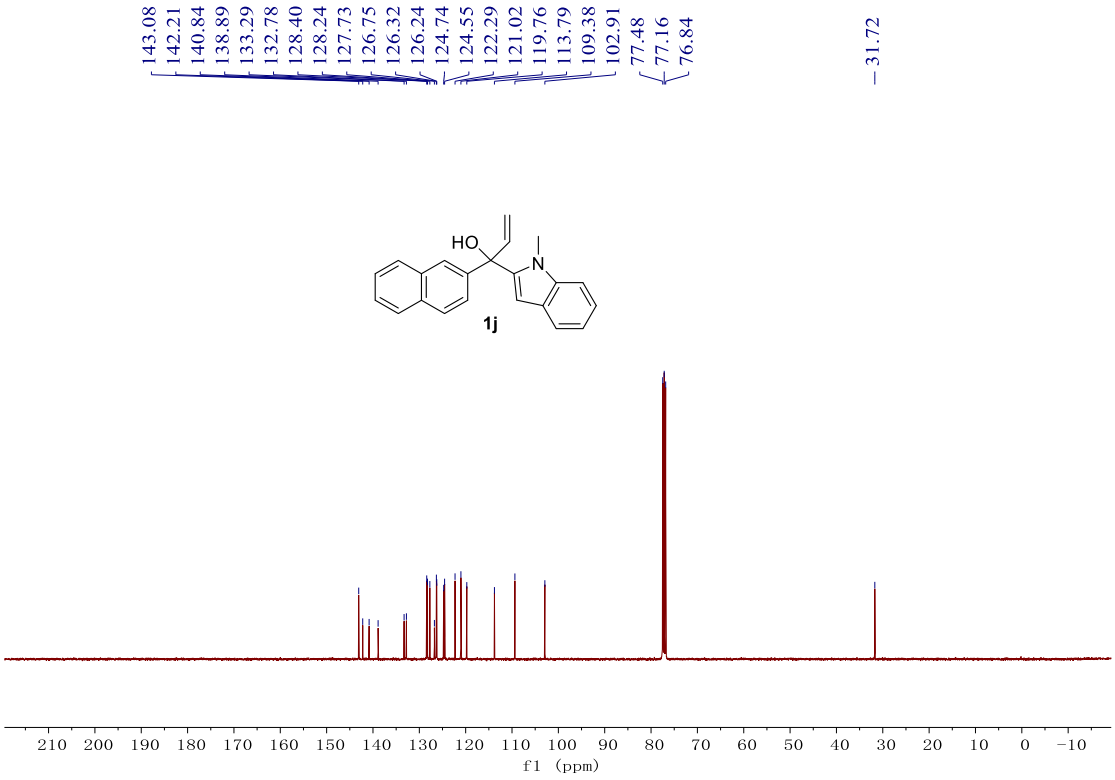
^{13}C NMR (101 MHz, $CDCl_3$) for **1i**



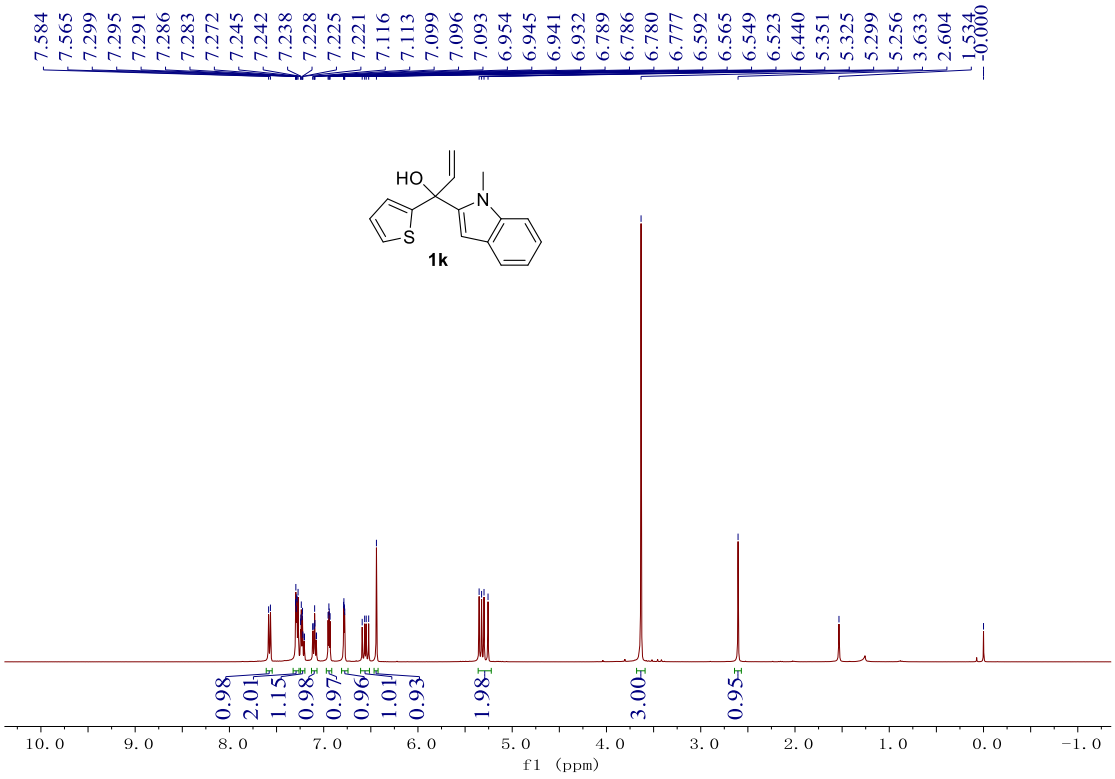
^{1}H NMR (400 MHz, $CDCl_3$) for **1j**



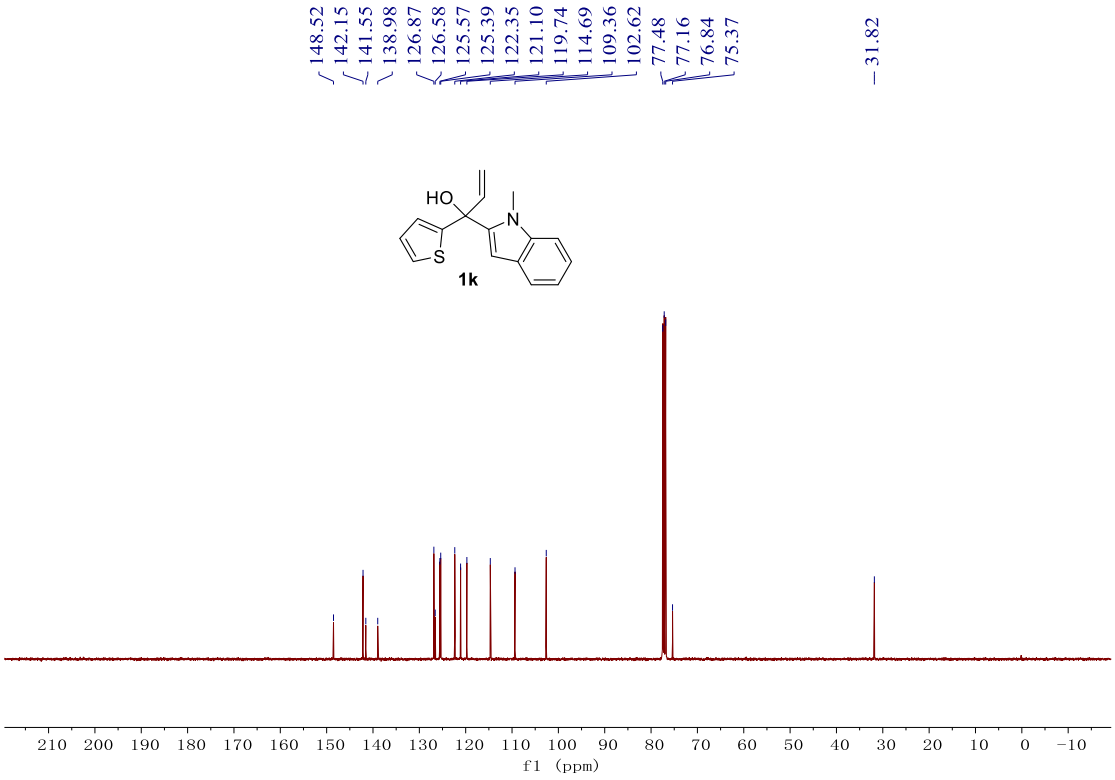
^{13}C NMR (101 MHz, $CDCl_3$) for **1j**



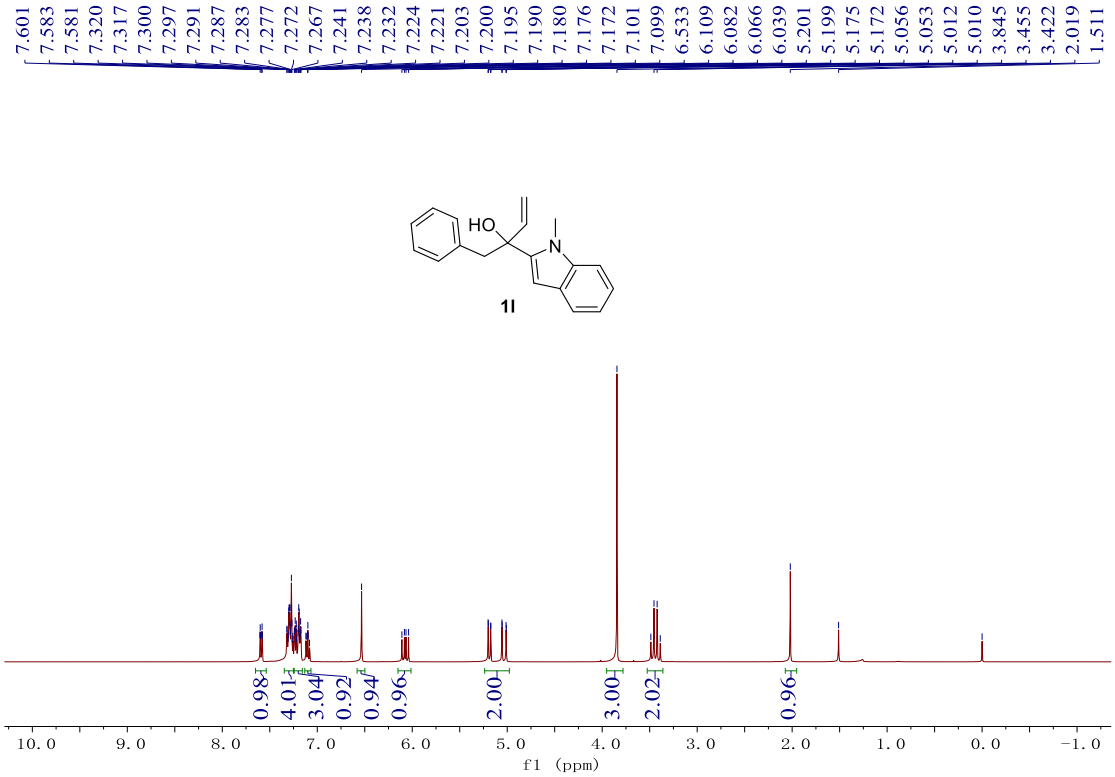
^{1}H NMR (400 MHz, $CDCl_3$) for **1k**



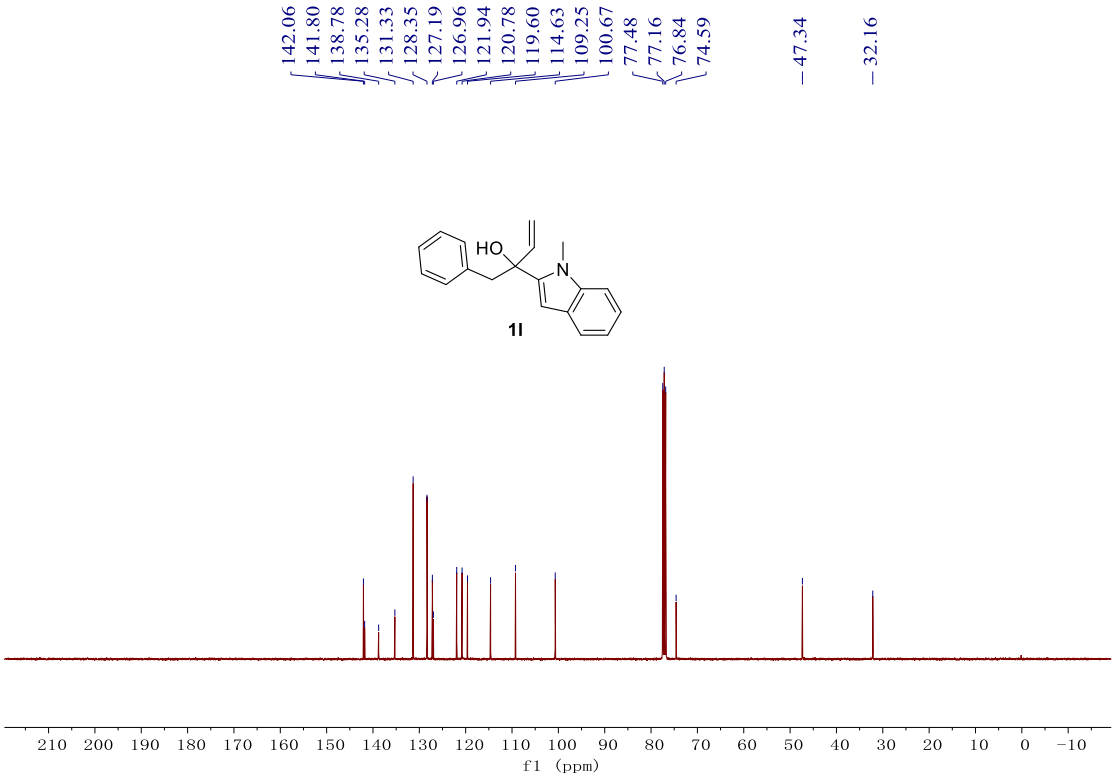
^{13}C NMR (101 MHz, $CDCl_3$) for **1k**



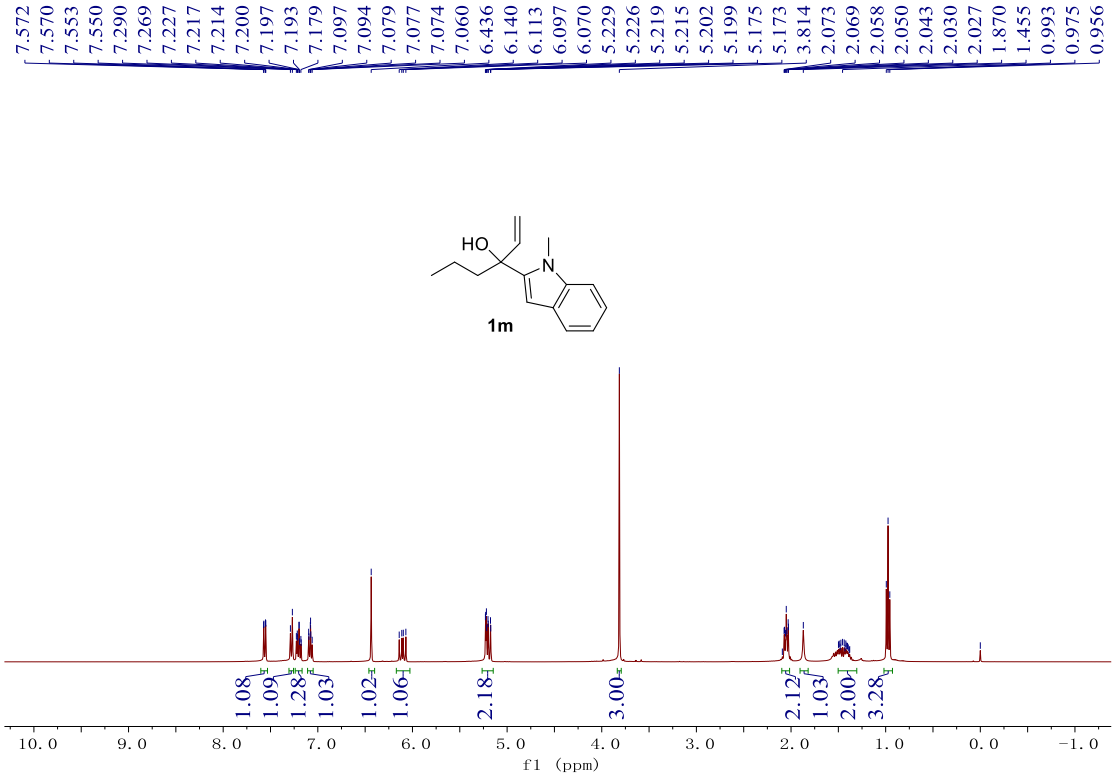
^{1}H NMR (400 MHz, $CDCl_3$) for **1l**



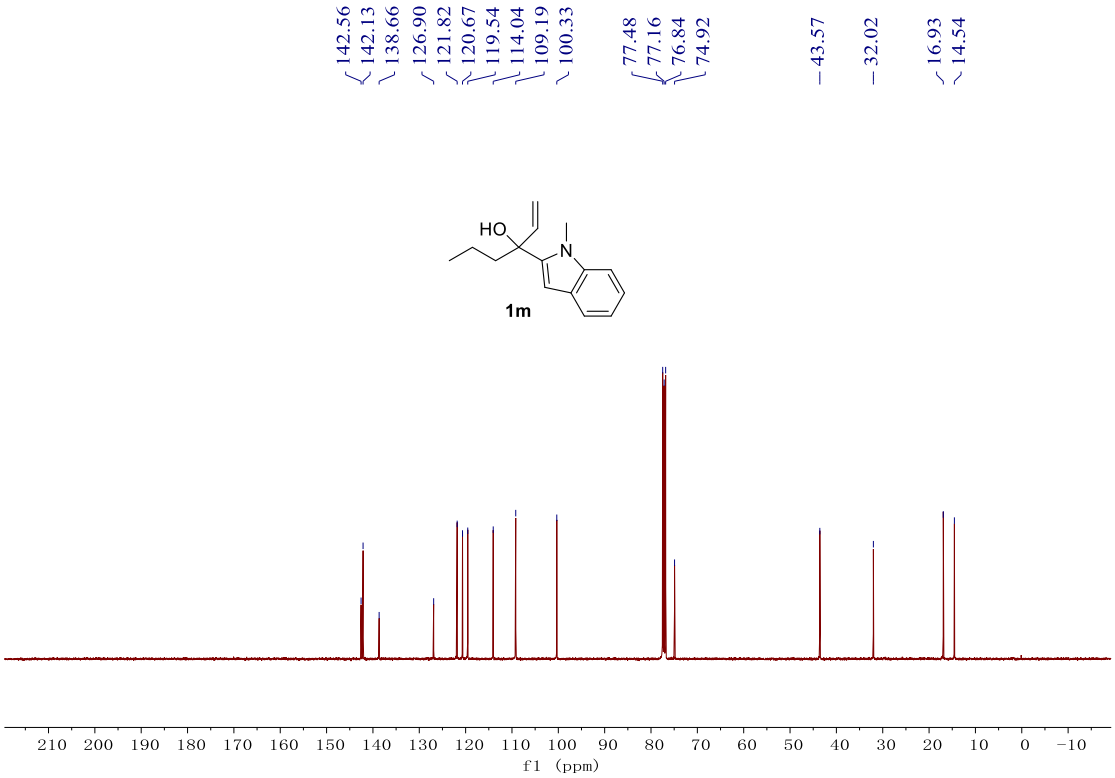
^{13}C NMR (101 MHz, $CDCl_3$) for **1l**



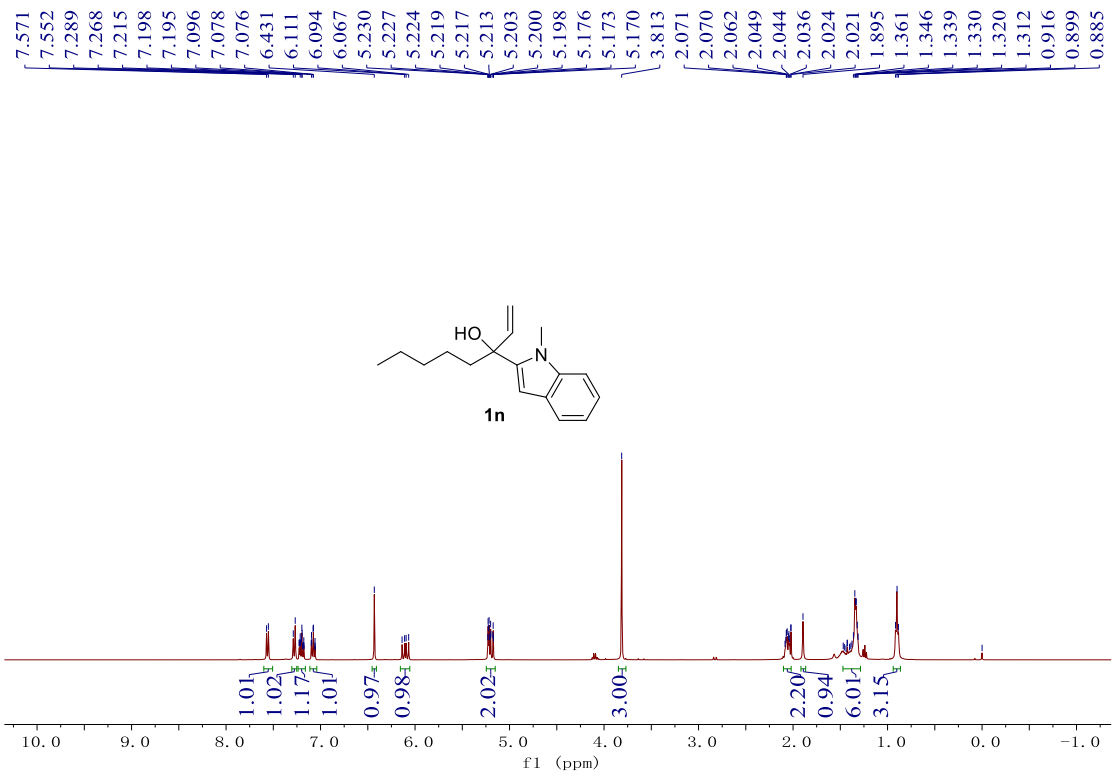
^{1}H NMR (400 MHz, $CDCl_3$) for **1m**



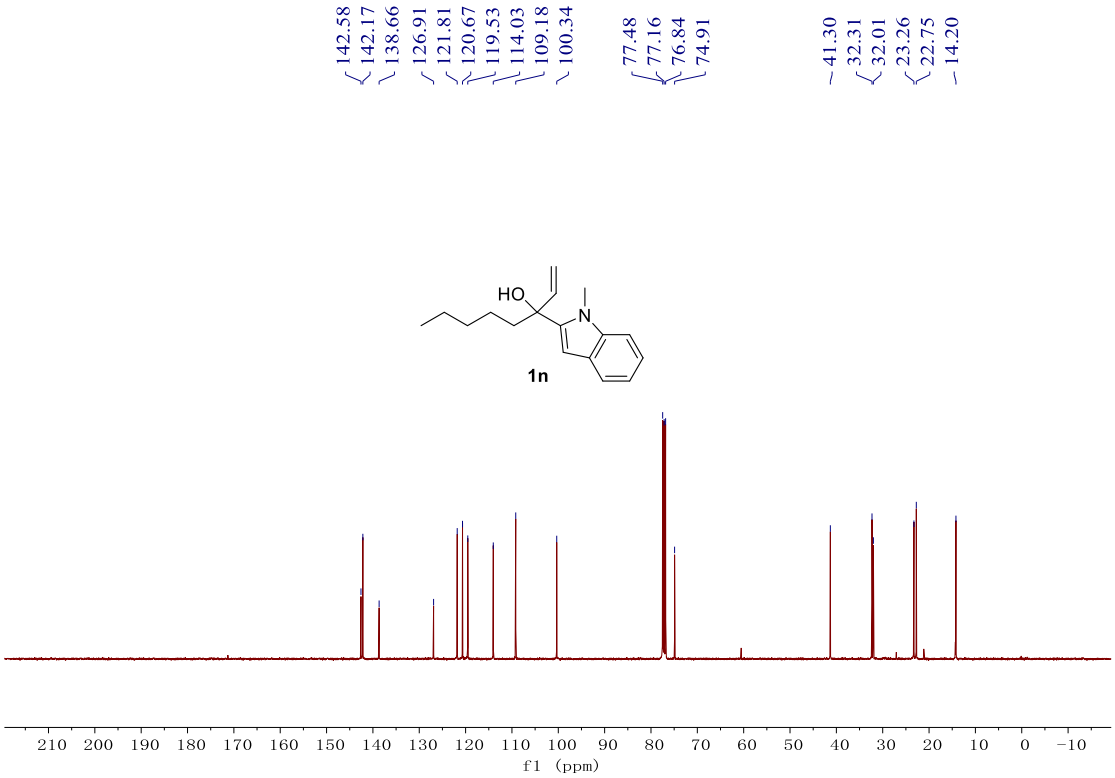
^{13}C NMR (101 MHz, $CDCl_3$) for **1m**



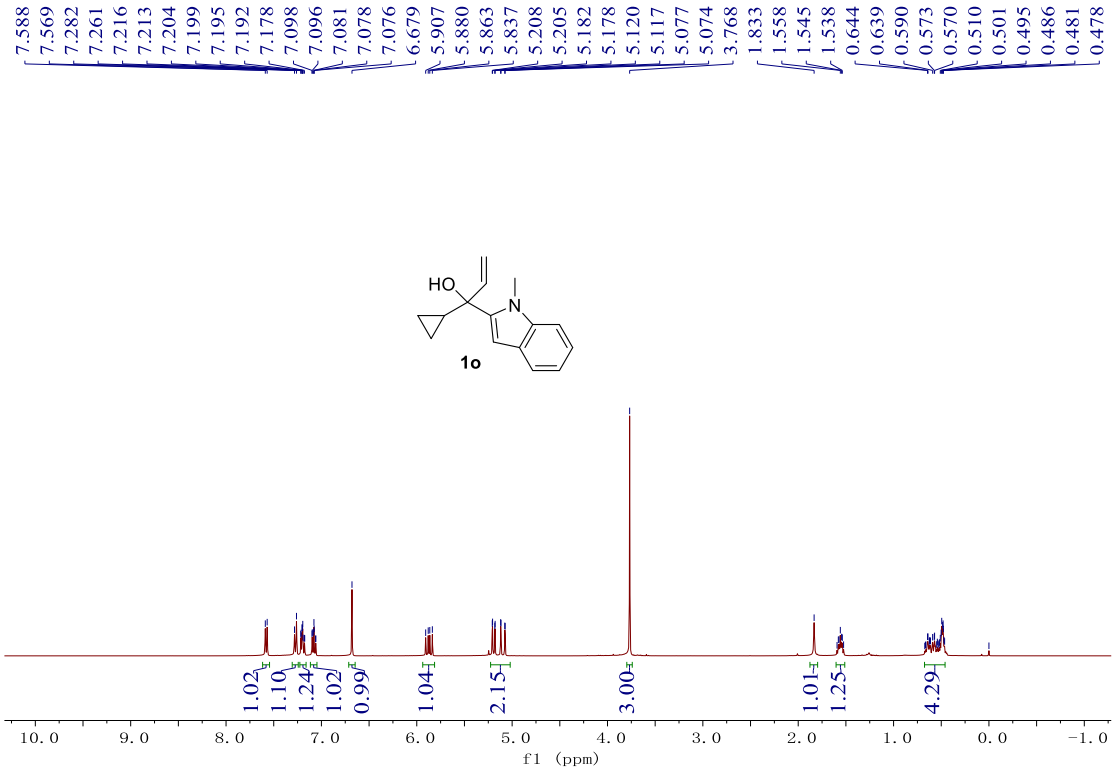
^{1}H NMR (400 MHz, $CDCl_3$) for **1n**



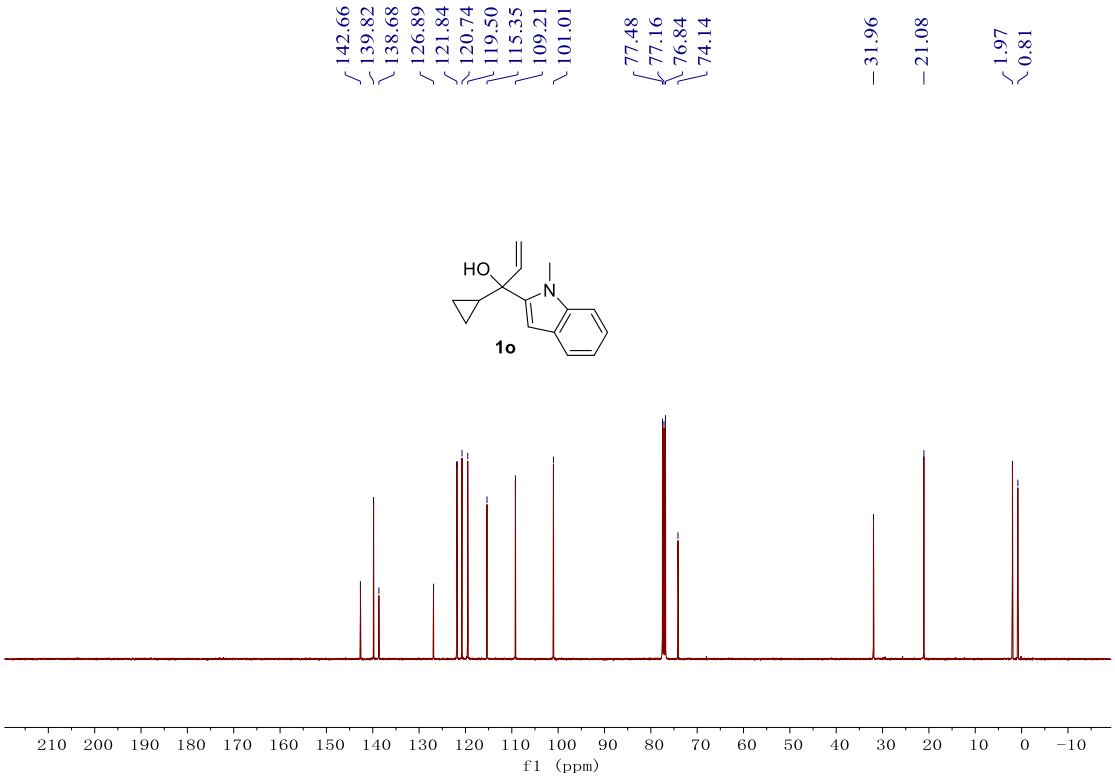
^{13}C NMR (101 MHz, $CDCl_3$) for **1n**



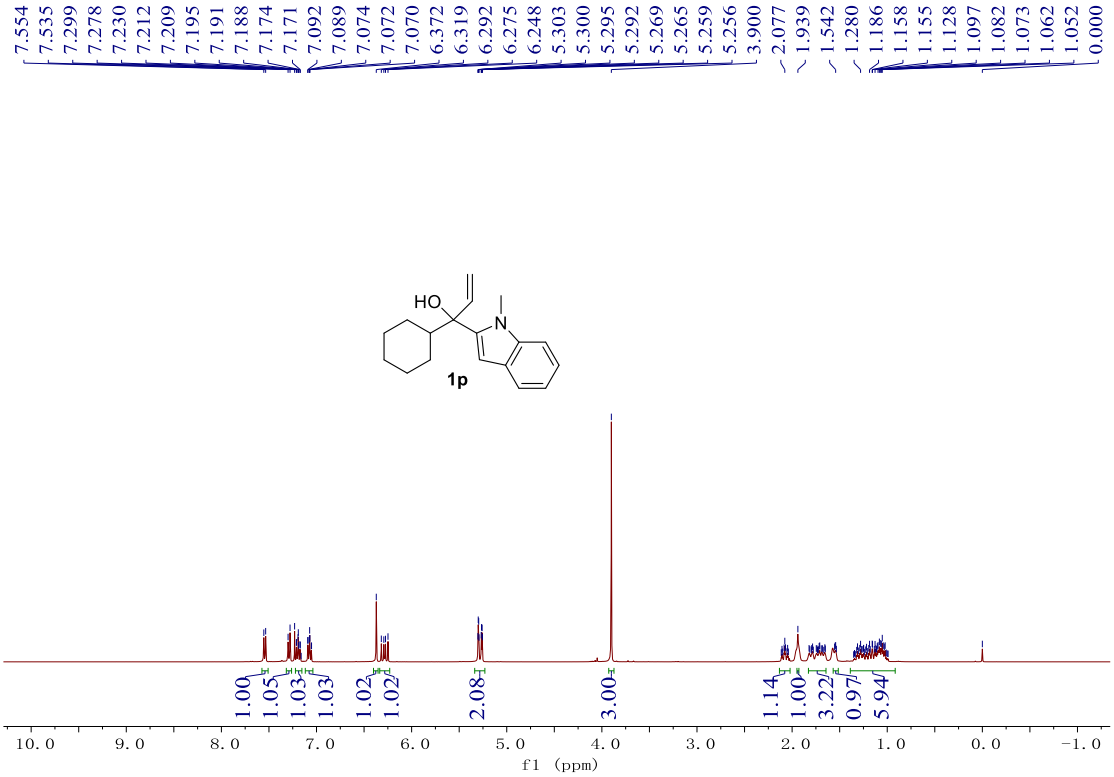
^{1}H NMR (400 MHz, $CDCl_3$) for **1o**



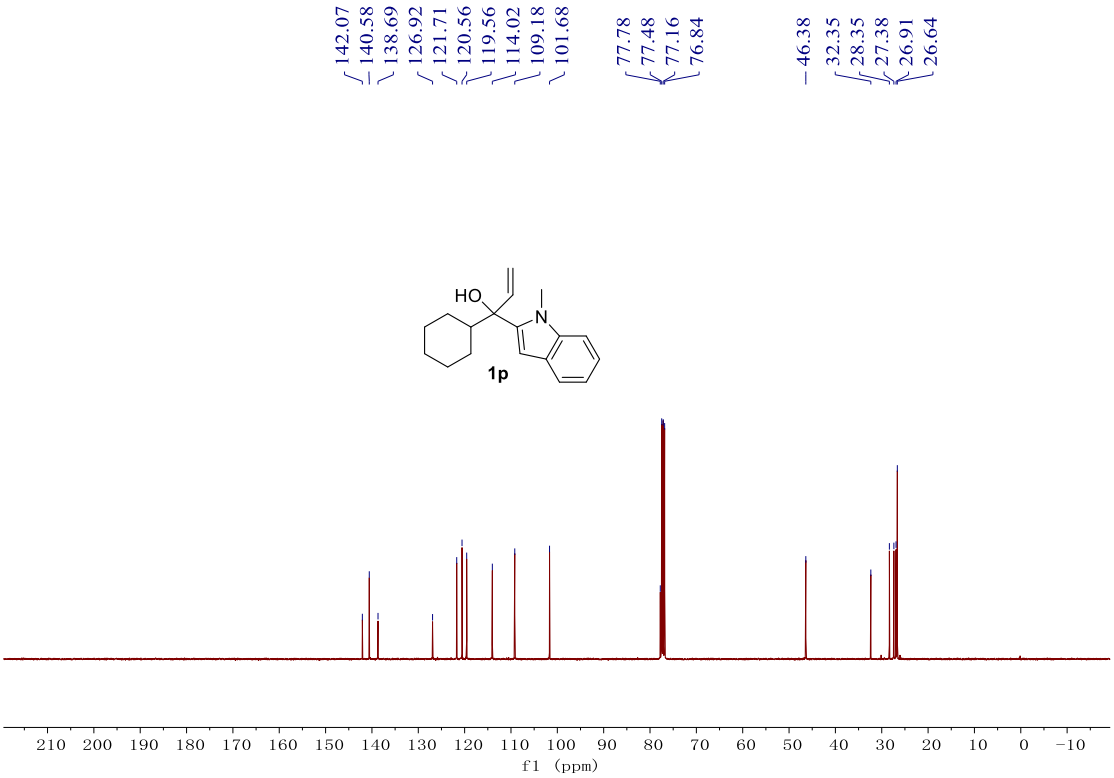
^{13}C NMR (101 MHz, $CDCl_3$) for **1o**



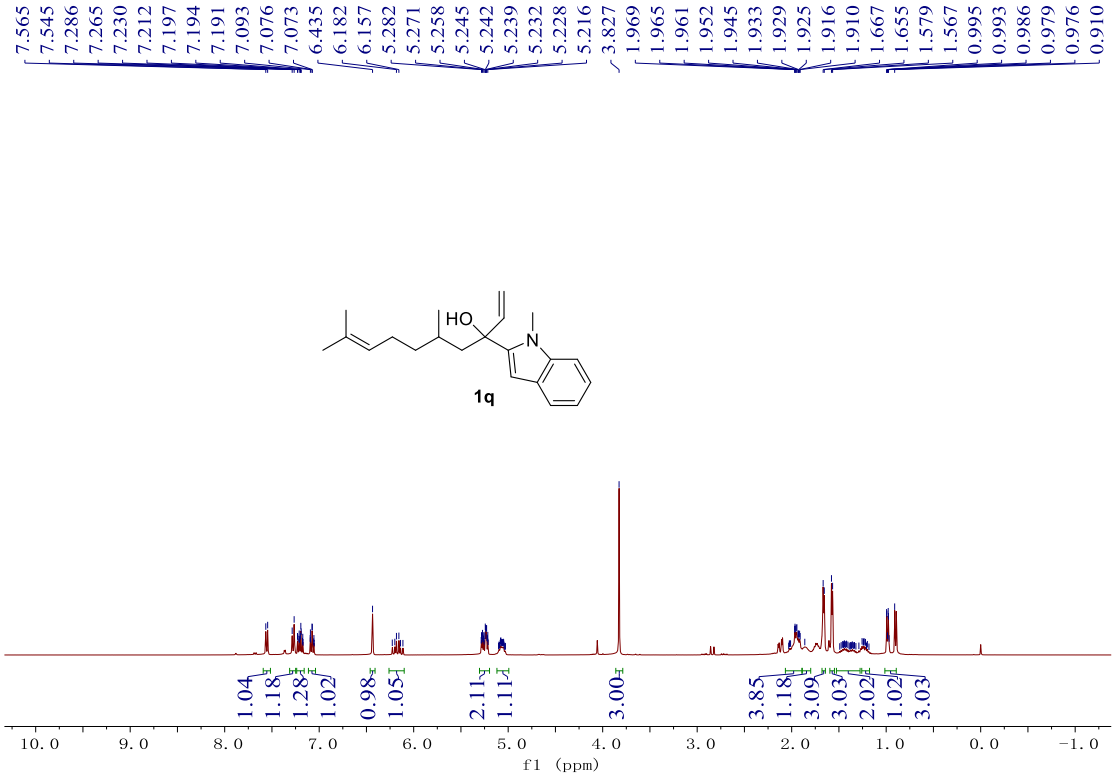
^{1}H NMR (400 MHz, $CDCl_3$) for **1p**



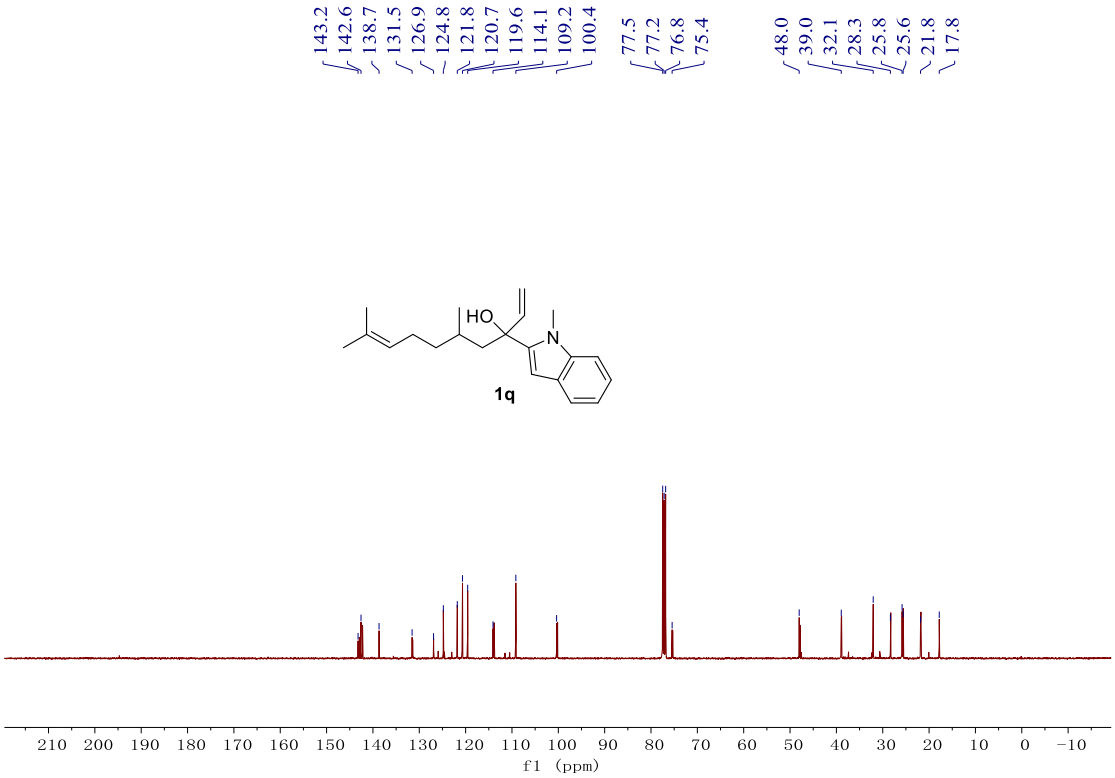
^{13}C NMR (101 MHz, $CDCl_3$) for **1p**



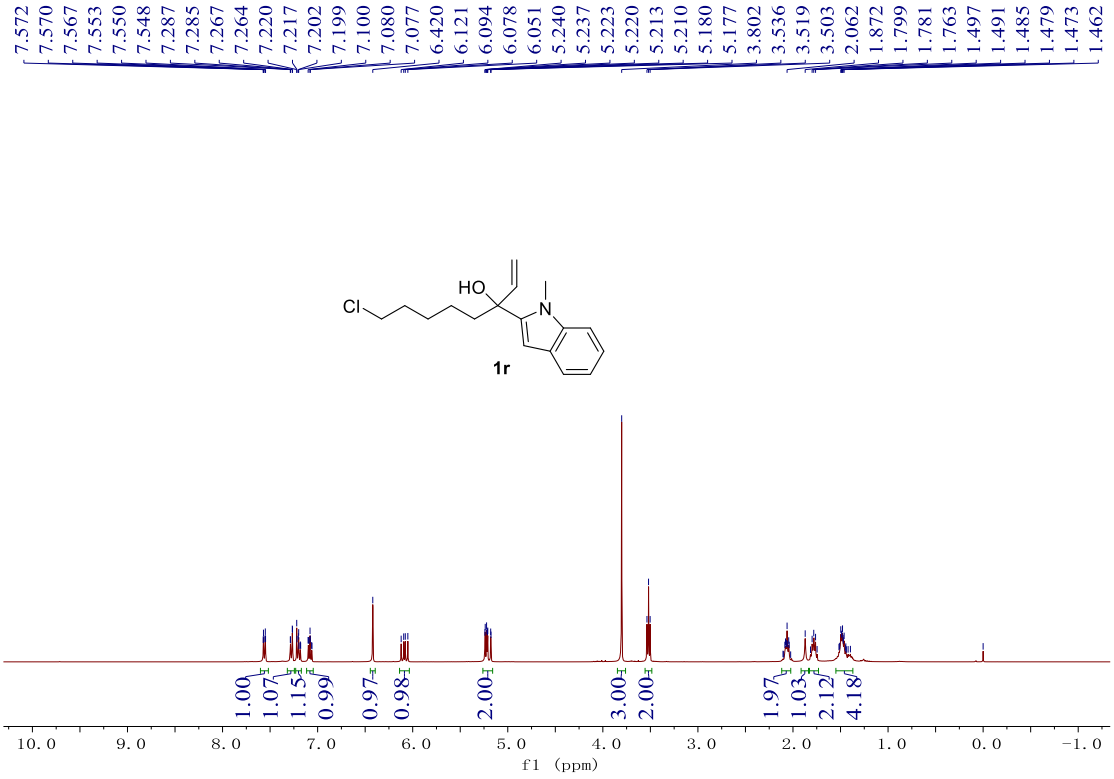
^{1}H NMR (400 MHz, $CDCl_3$) for **1q**



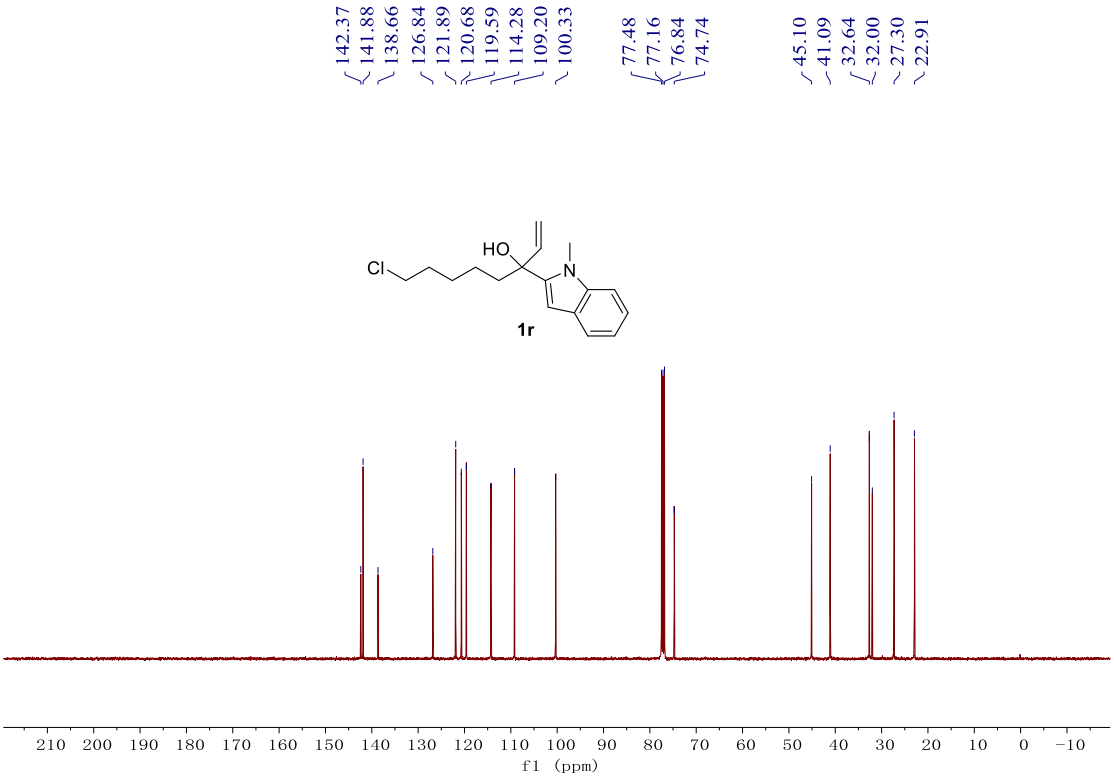
^{13}C NMR (101 MHz, $CDCl_3$) for **1q**



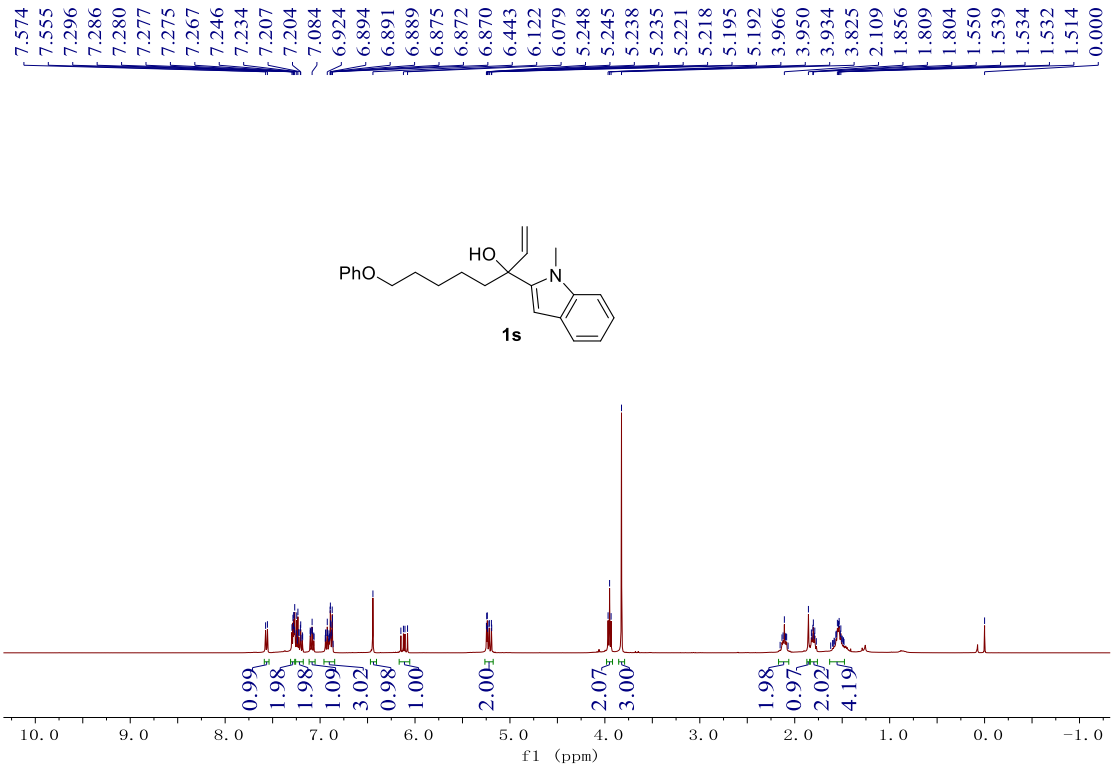
^{1}H NMR (400 MHz, $CDCl_3$) for **1r**



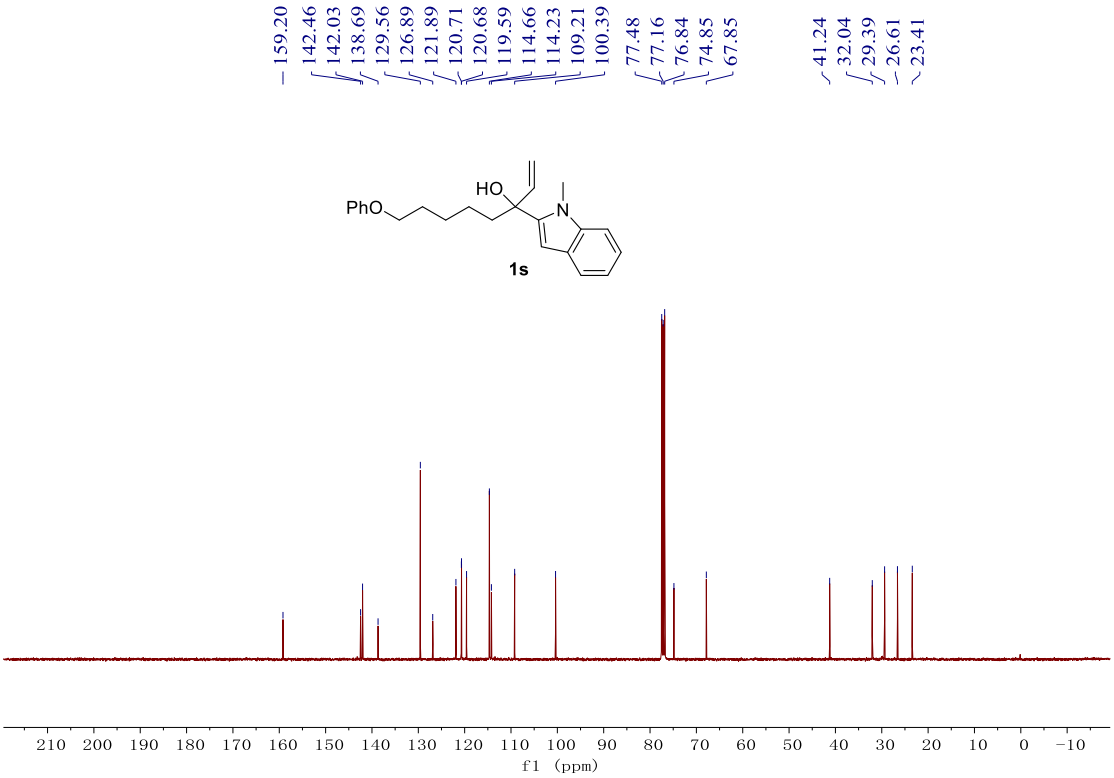
^{13}C NMR (101 MHz, $CDCl_3$) for **1r**



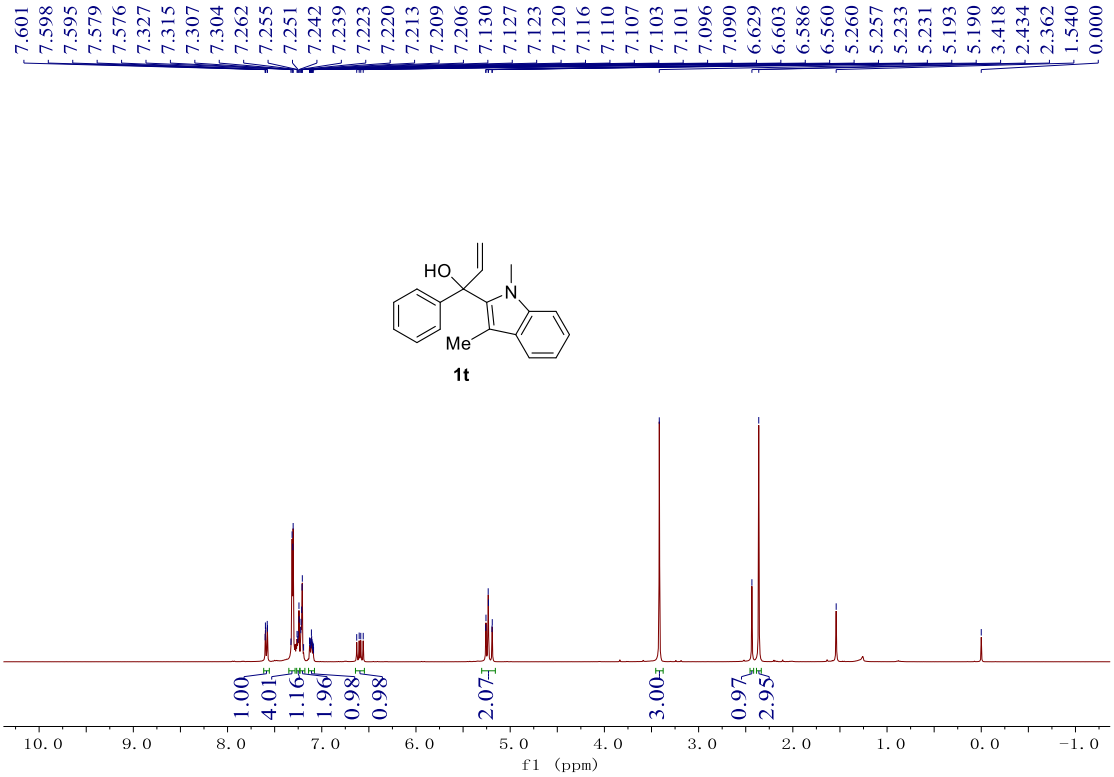
^{1}H NMR (400 MHz, $CDCl_3$) for **1s**



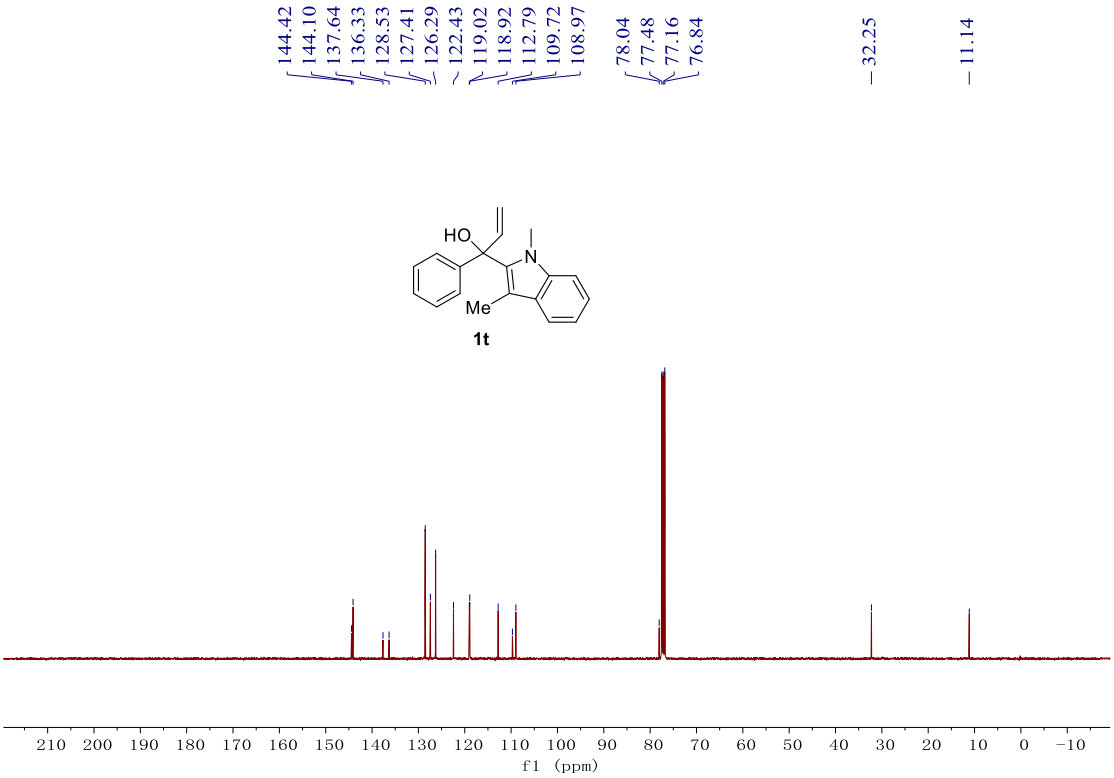
^{13}C NMR (101 MHz, $CDCl_3$) for **1s**



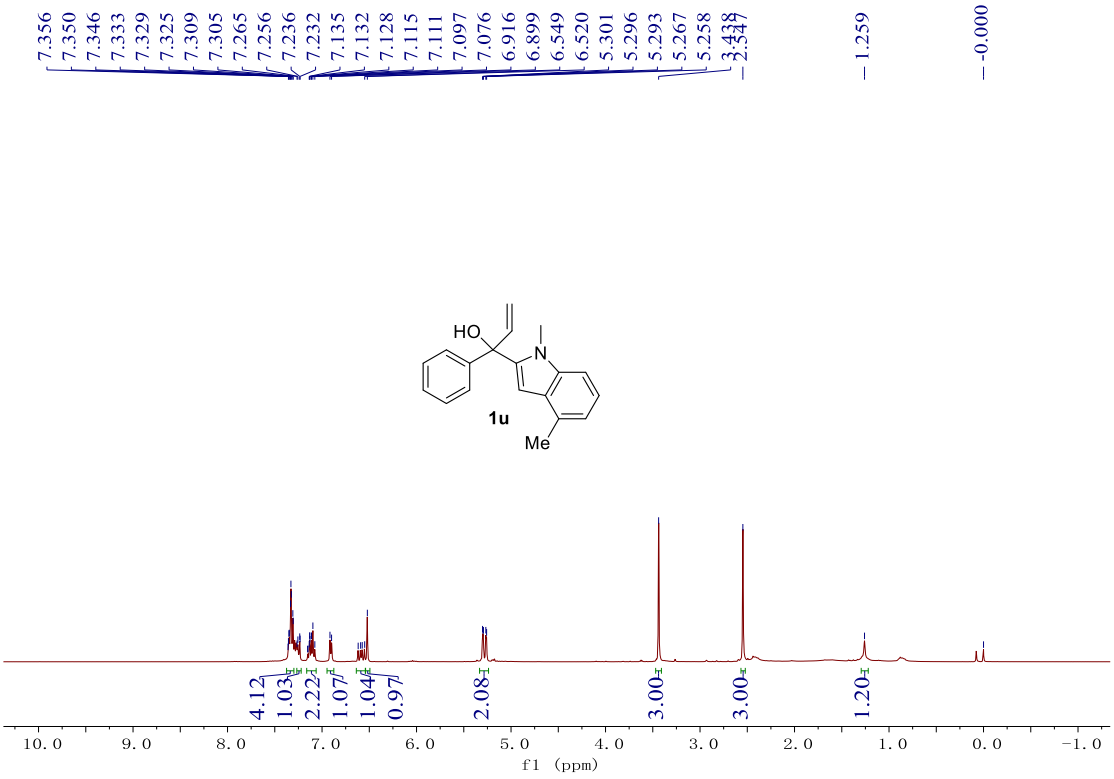
^{1}H NMR (400 MHz, $CDCl_3$) for **1t**



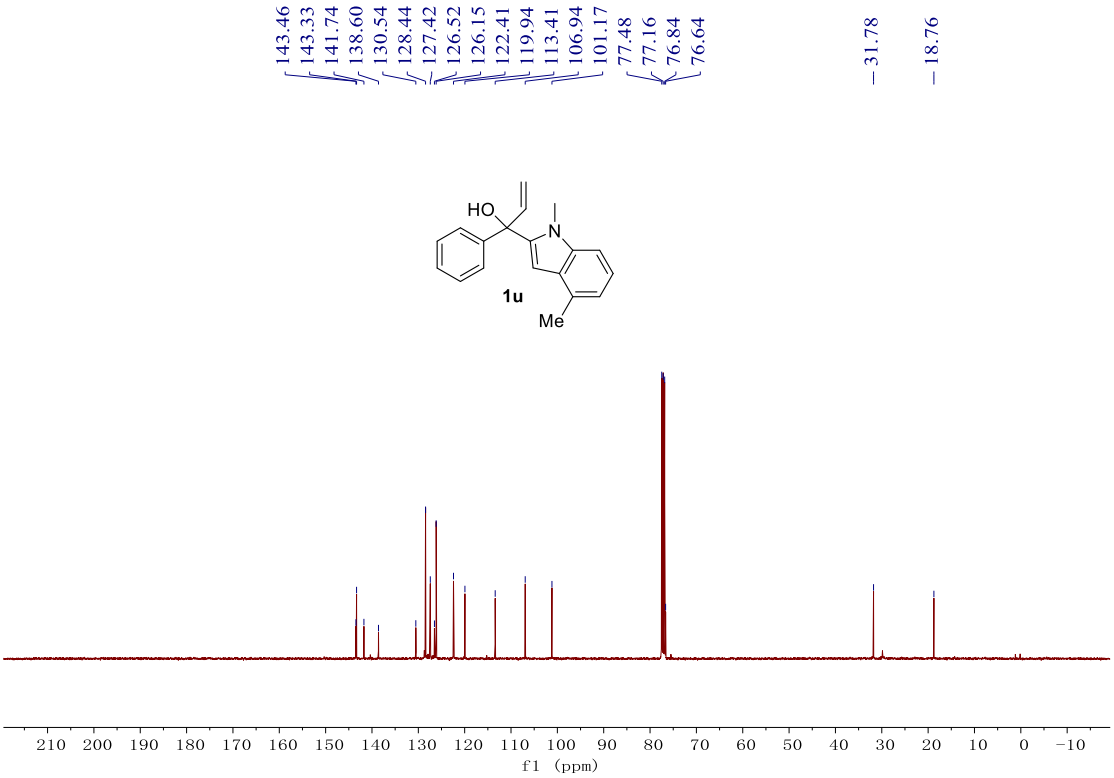
^{13}C NMR (101 MHz, $CDCl_3$) for **1t**



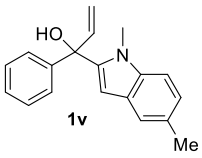
^{1}H NMR (400 MHz, $CDCl_3$) for **1u**

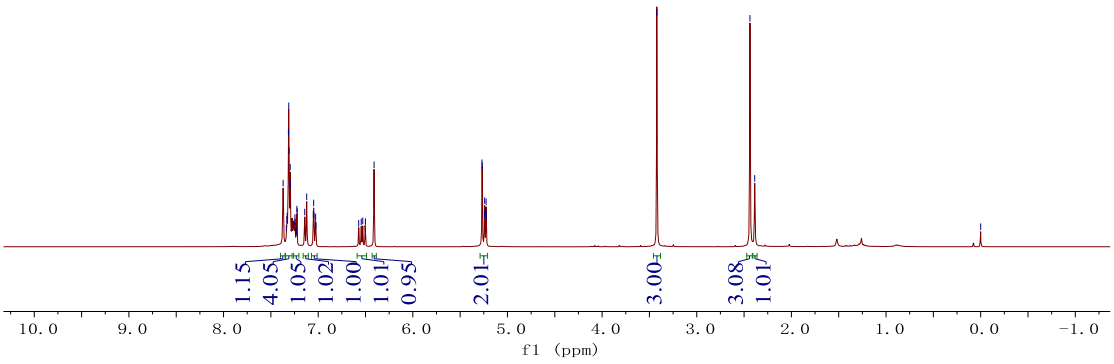


^{13}C NMR (101 MHz, $CDCl_3$) for **1u**

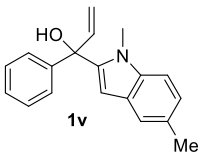


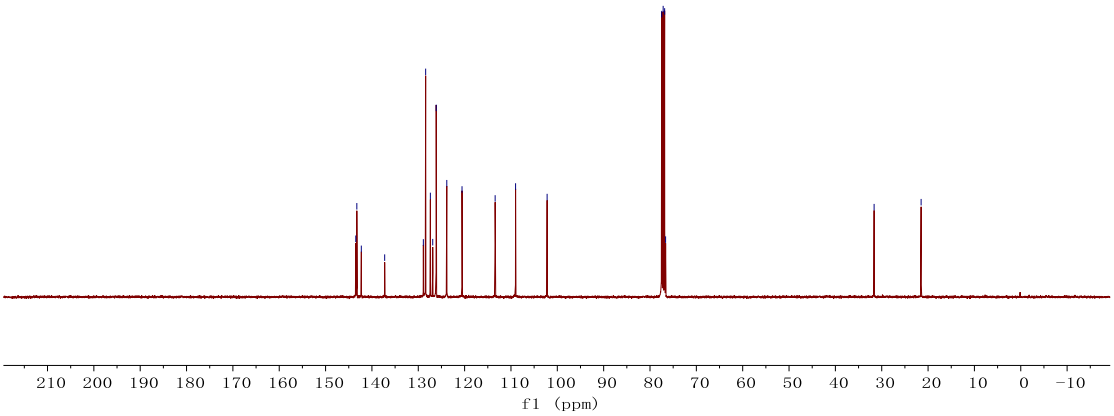
^{1}H NMR (400 MHz, $CDCl_3$) for **1v**



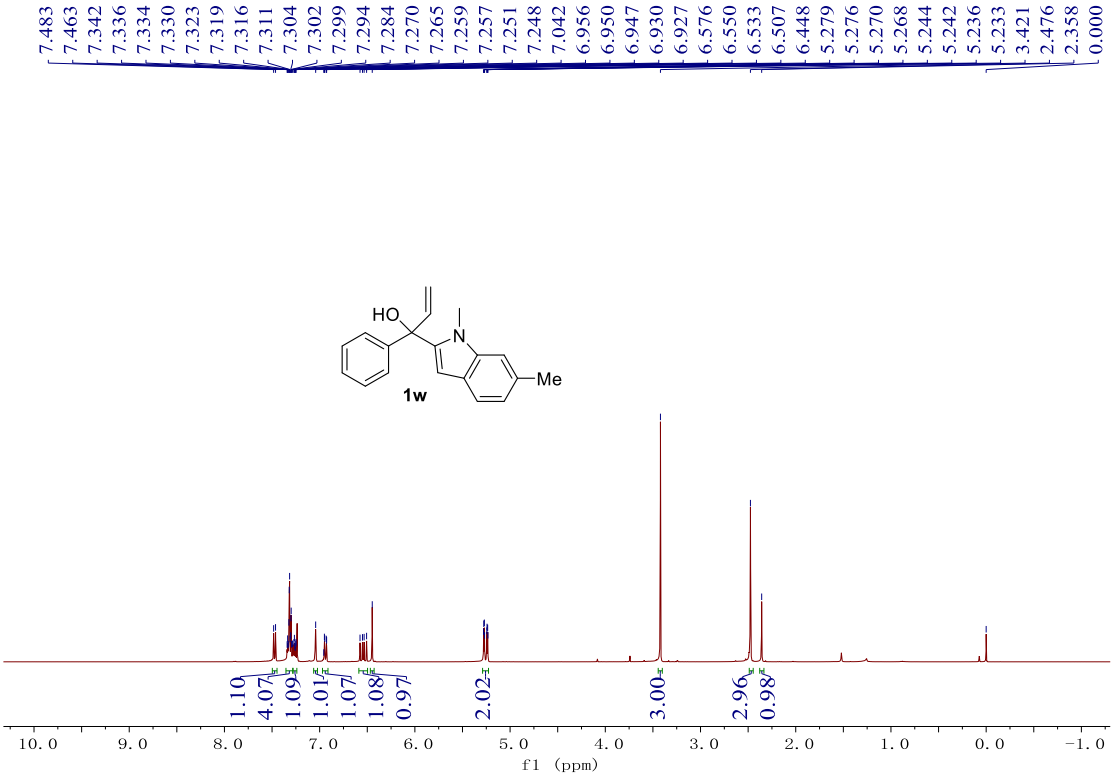


^{13}C NMR (101 MHz, $CDCl_3$) for **1v**

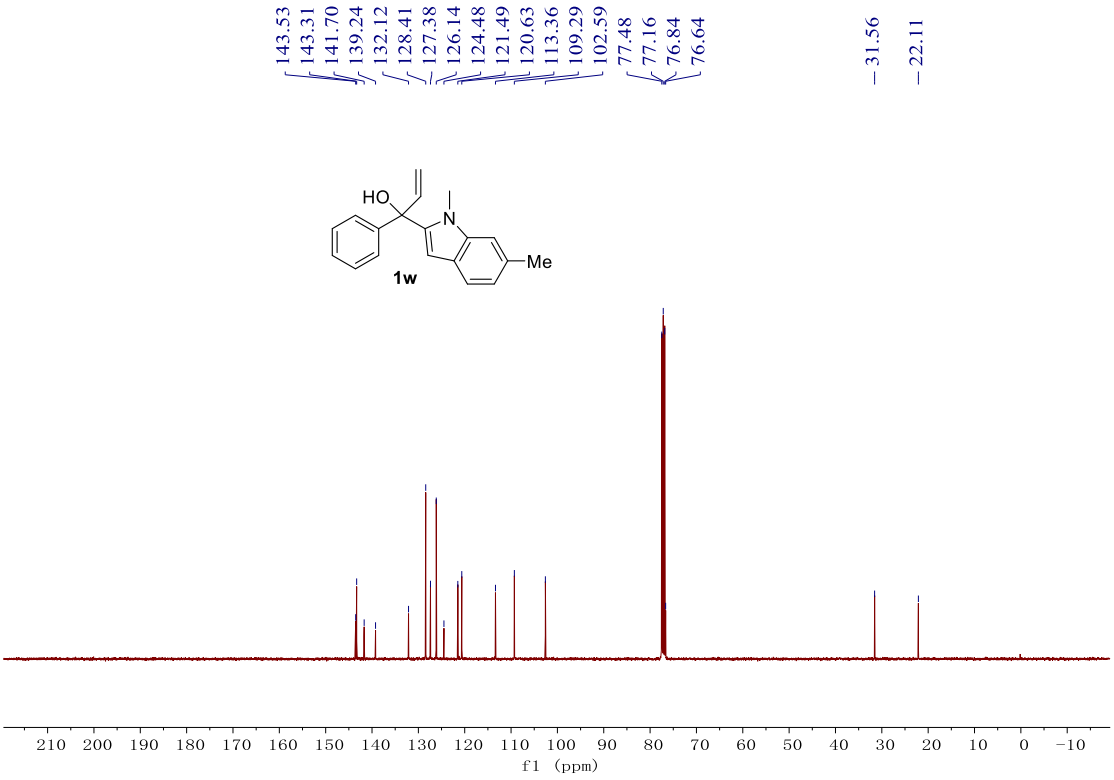




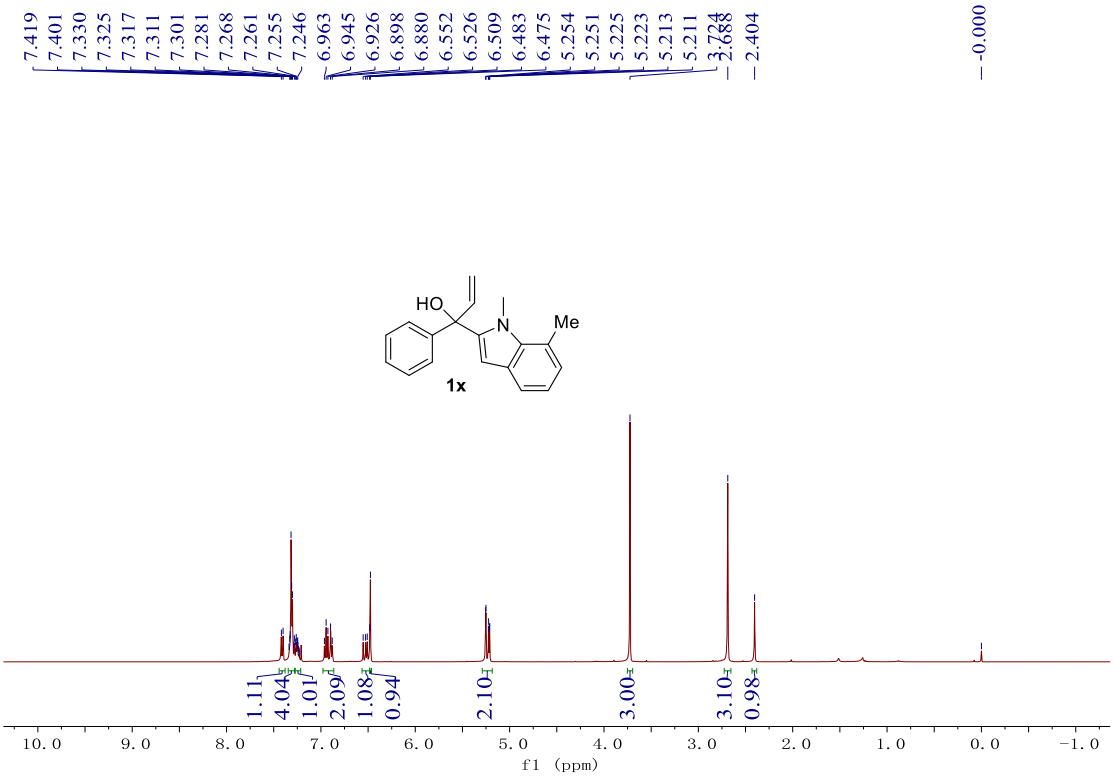
^{1}H NMR (400 MHz, $CDCl_3$) for **1w**



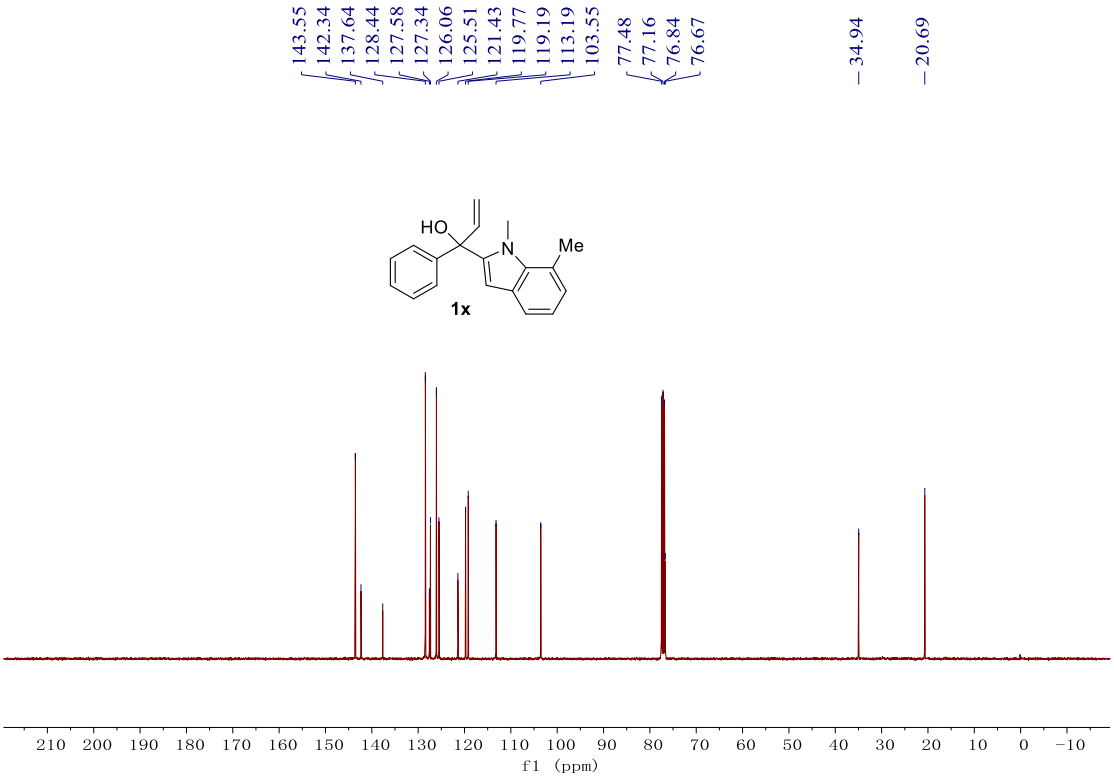
^{13}C NMR (101 MHz, $CDCl_3$) for **1w**



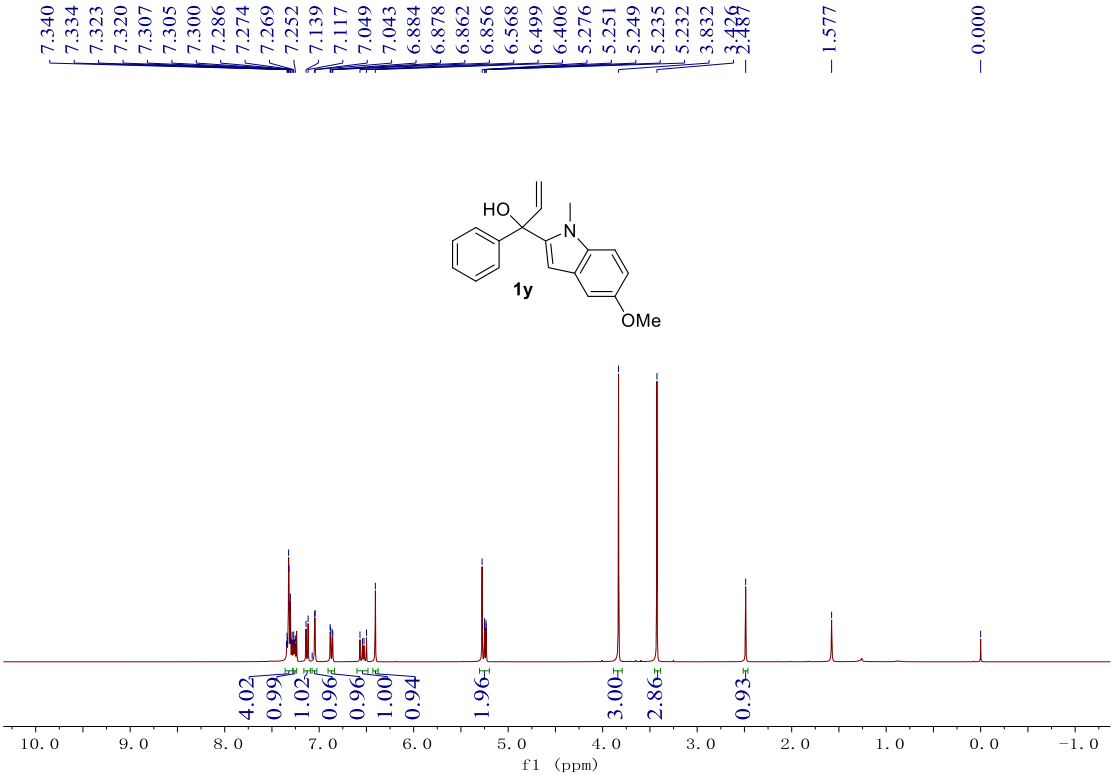
^{1}H NMR (400 MHz, $CDCl_3$) for **1x**



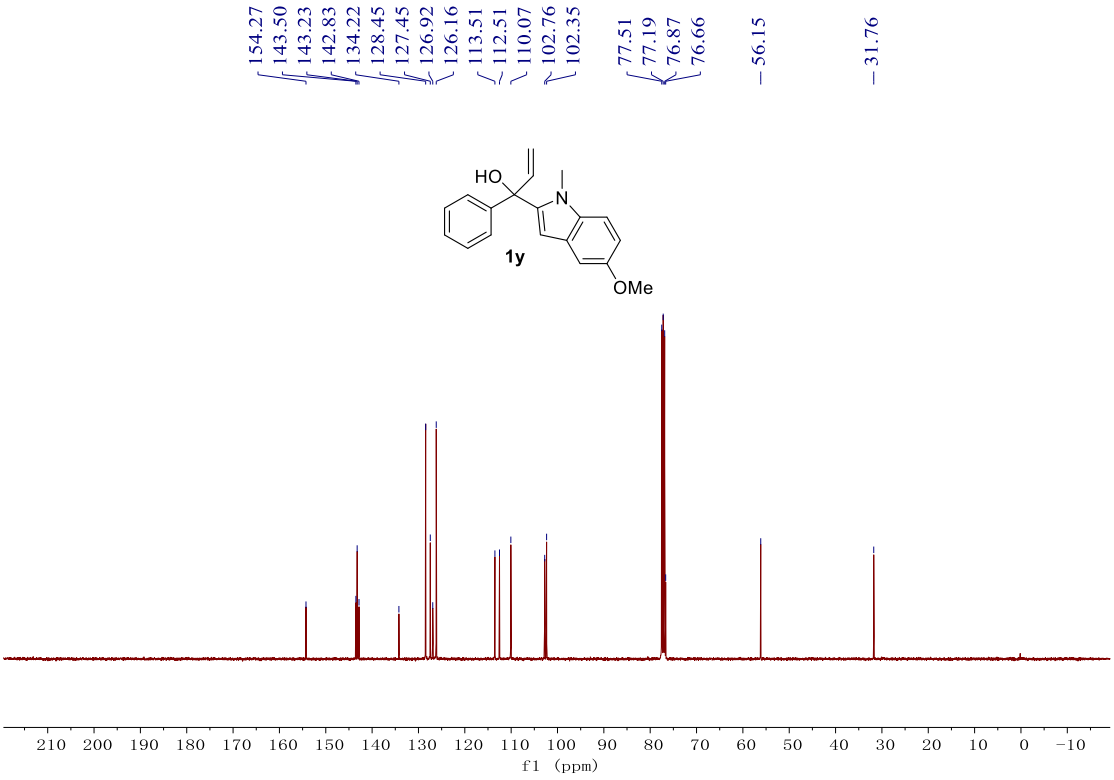
^{13}C NMR (101 MHz, $CDCl_3$) for **1x**



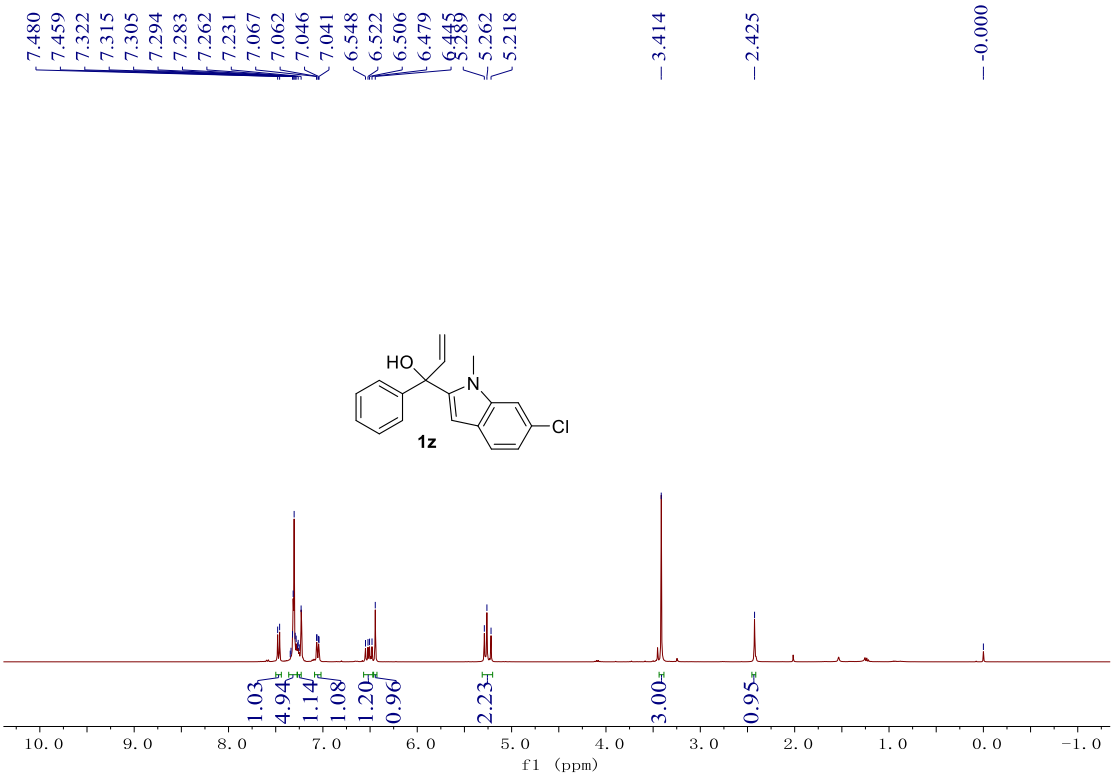
^{1}H NMR (400 MHz, $CDCl_3$) for **1y**



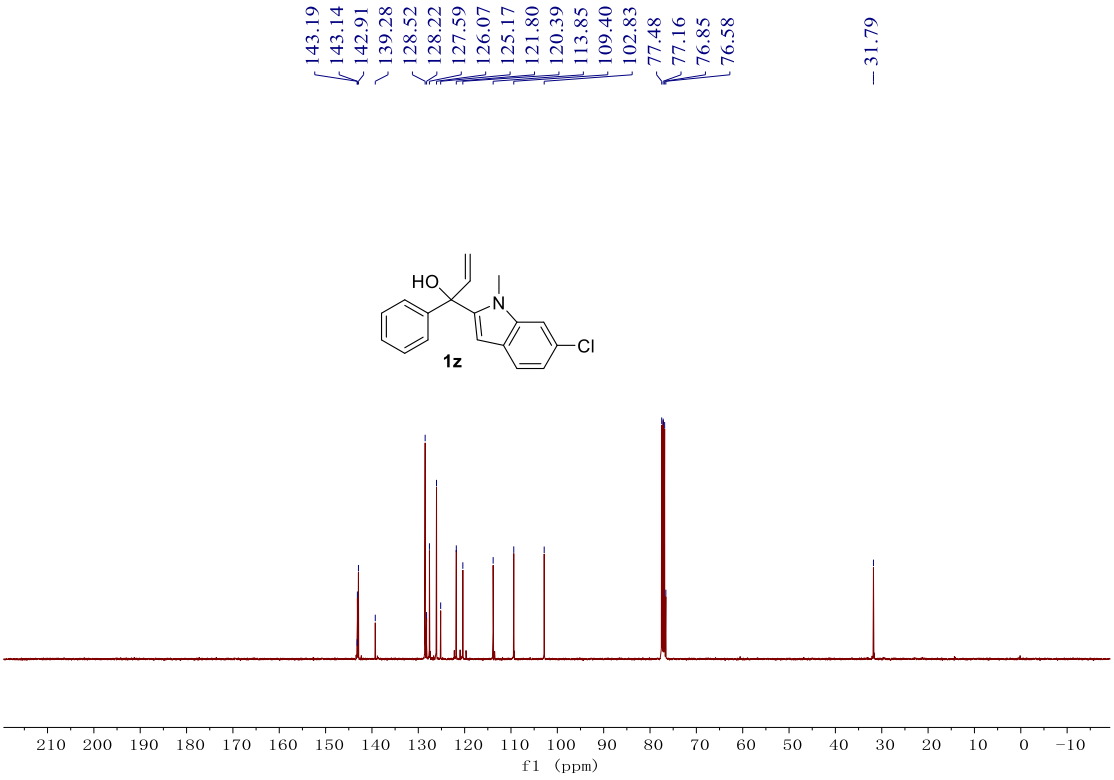
^{13}C NMR (101 MHz, $CDCl_3$) for **1y**



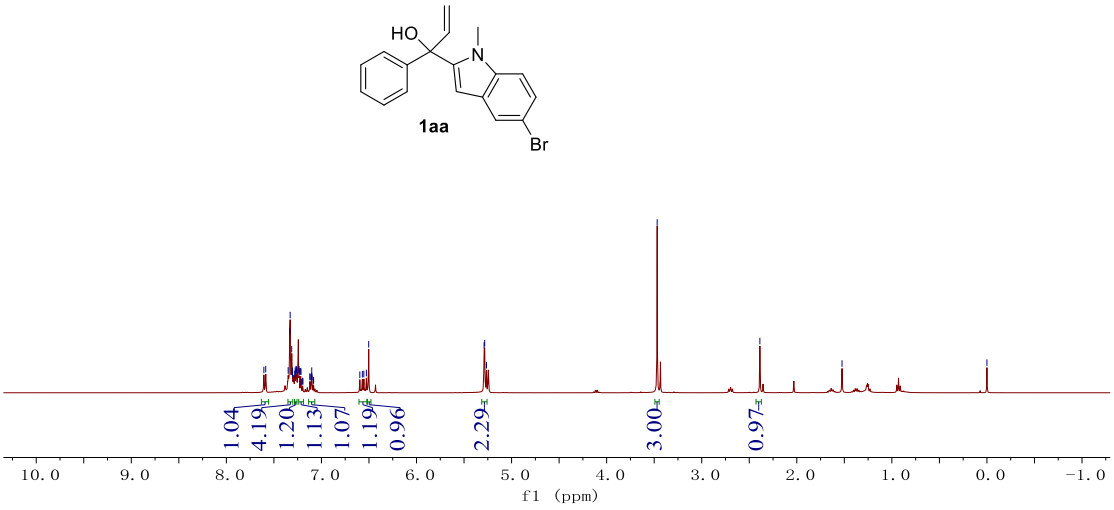
^{1}H NMR (400 MHz, $CDCl_3$) for **1z**



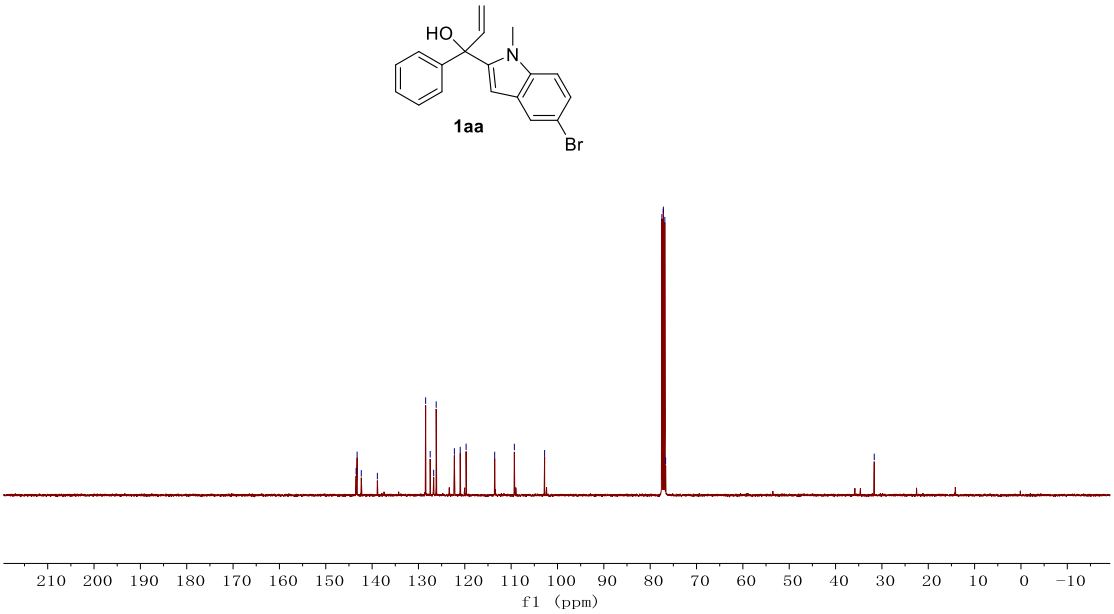
^{13}C NMR (101 MHz, $CDCl_3$) for **1z**



^{1}H NMR (400 MHz, $CDCl_3$) for **1aa**

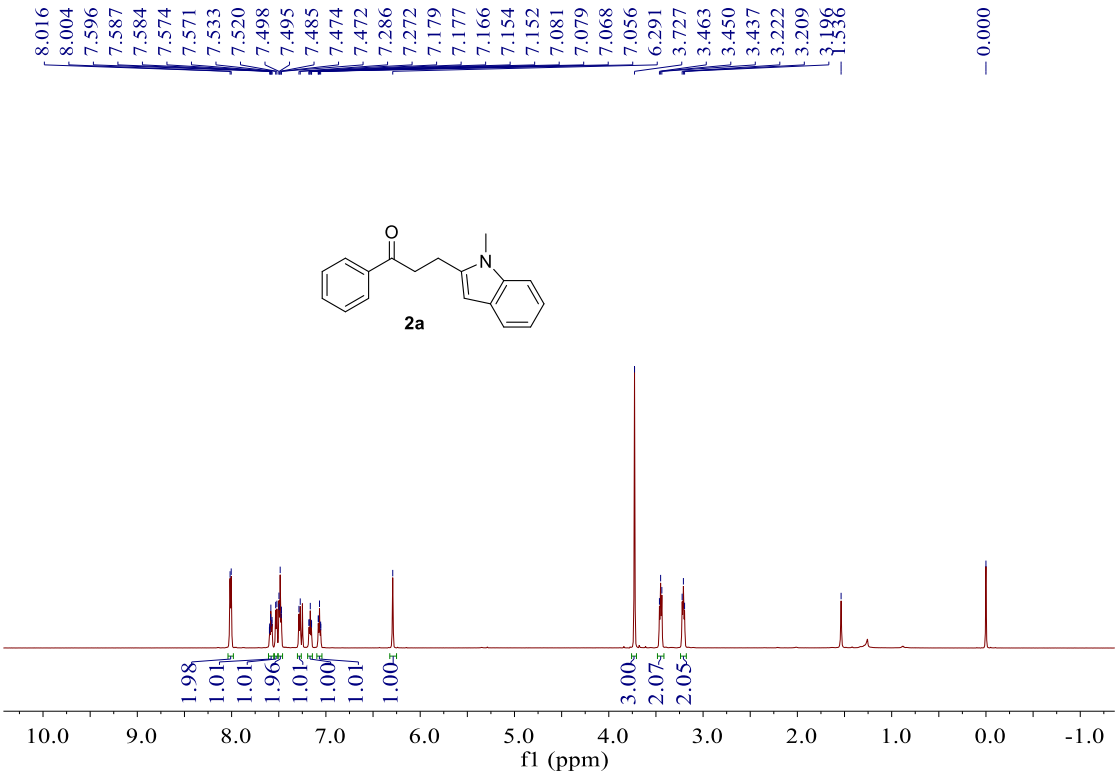


^{13}C NMR (101 MHz, $CDCl_3$) for **1aa**

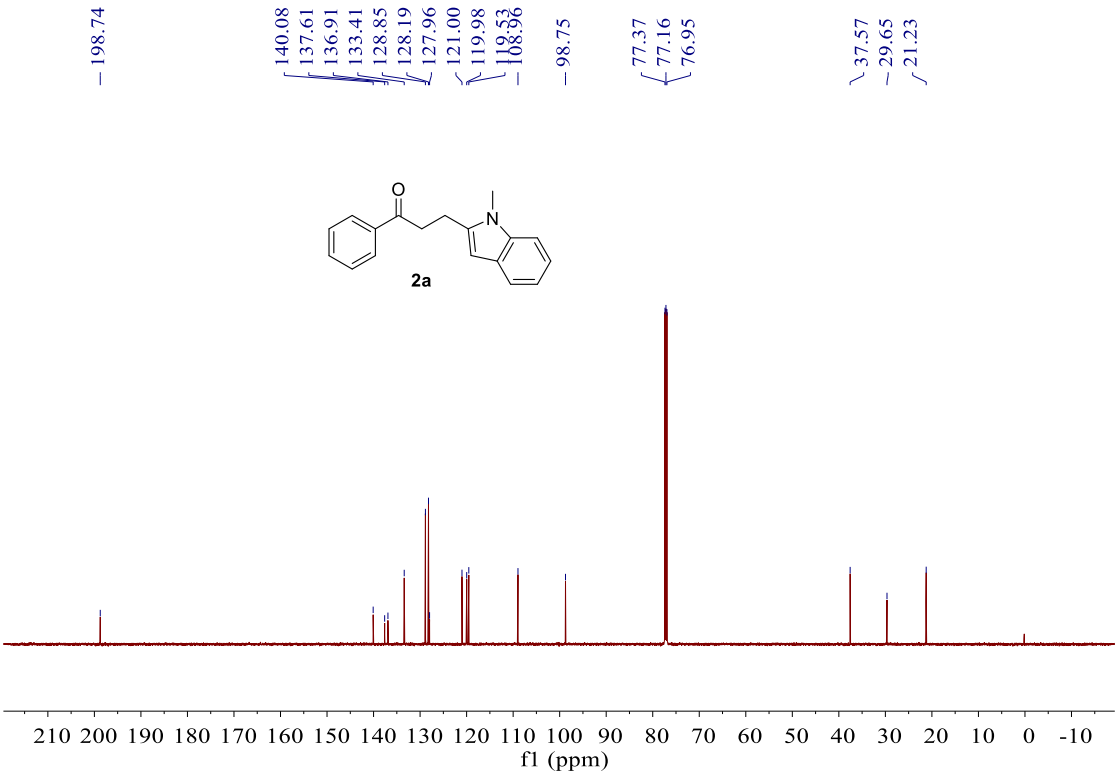


The products 2:

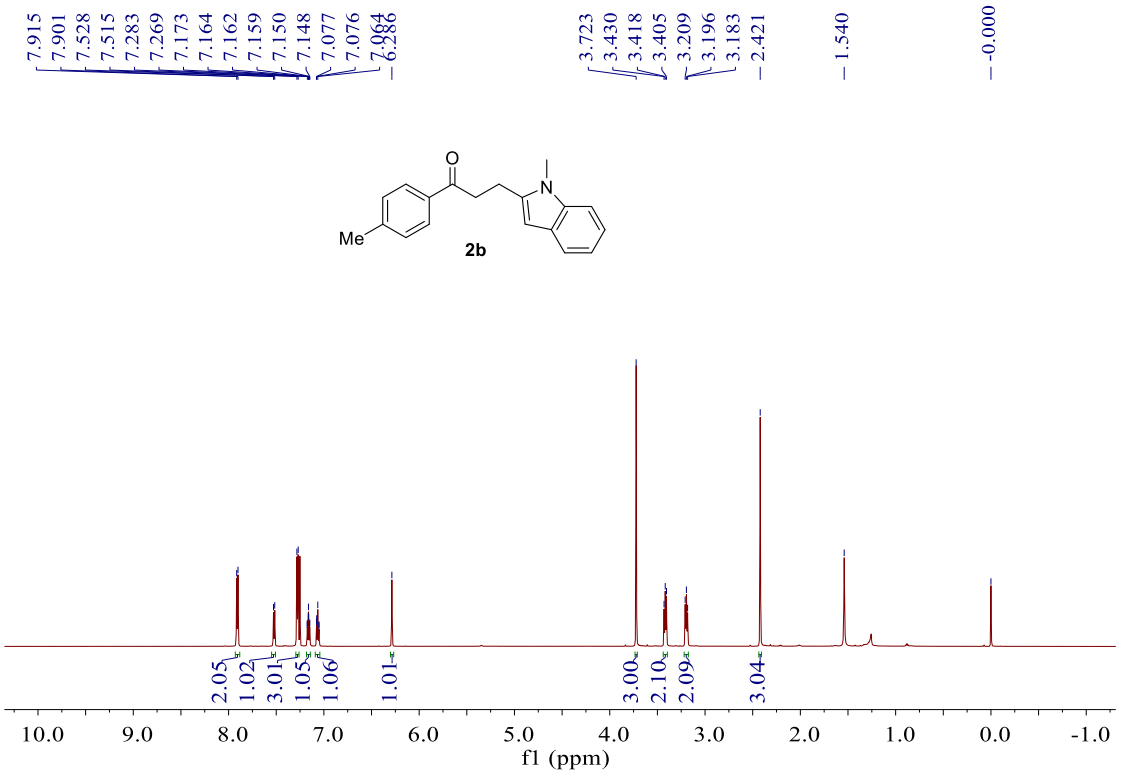
^{1}H NMR (600 MHz, $CDCl_3$) for **2a**



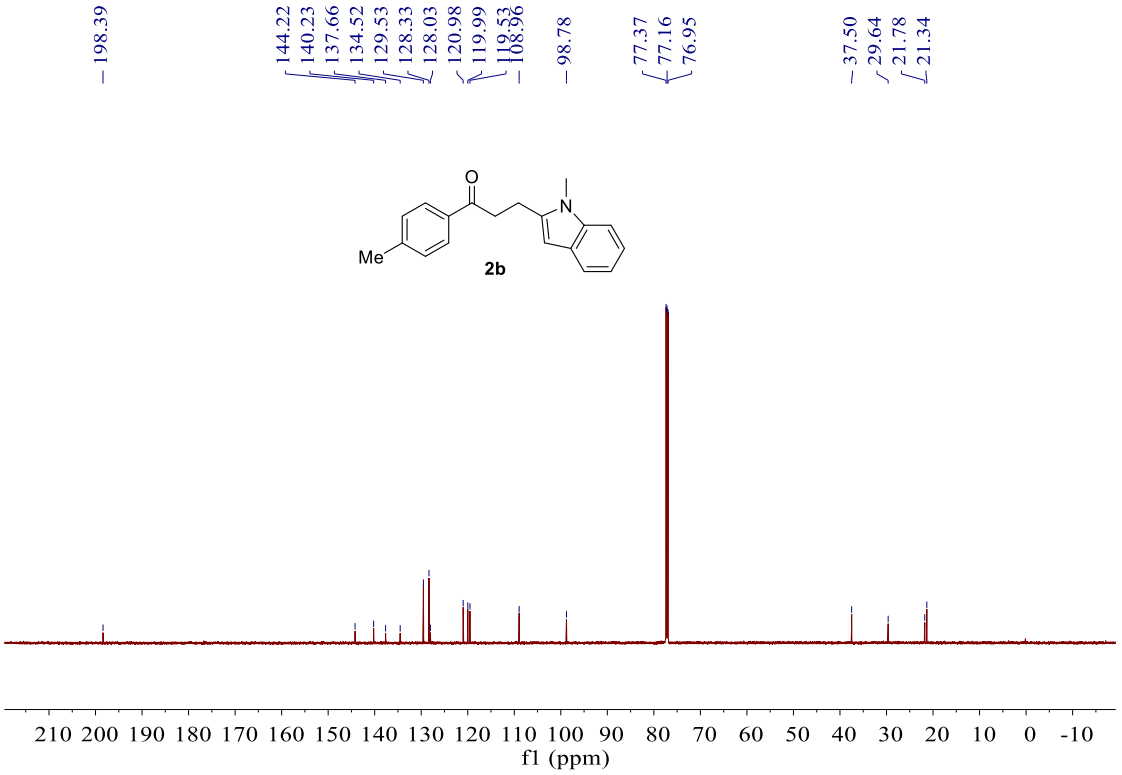
^{13}C NMR (151 MHz, $CDCl_3$) for **2a**



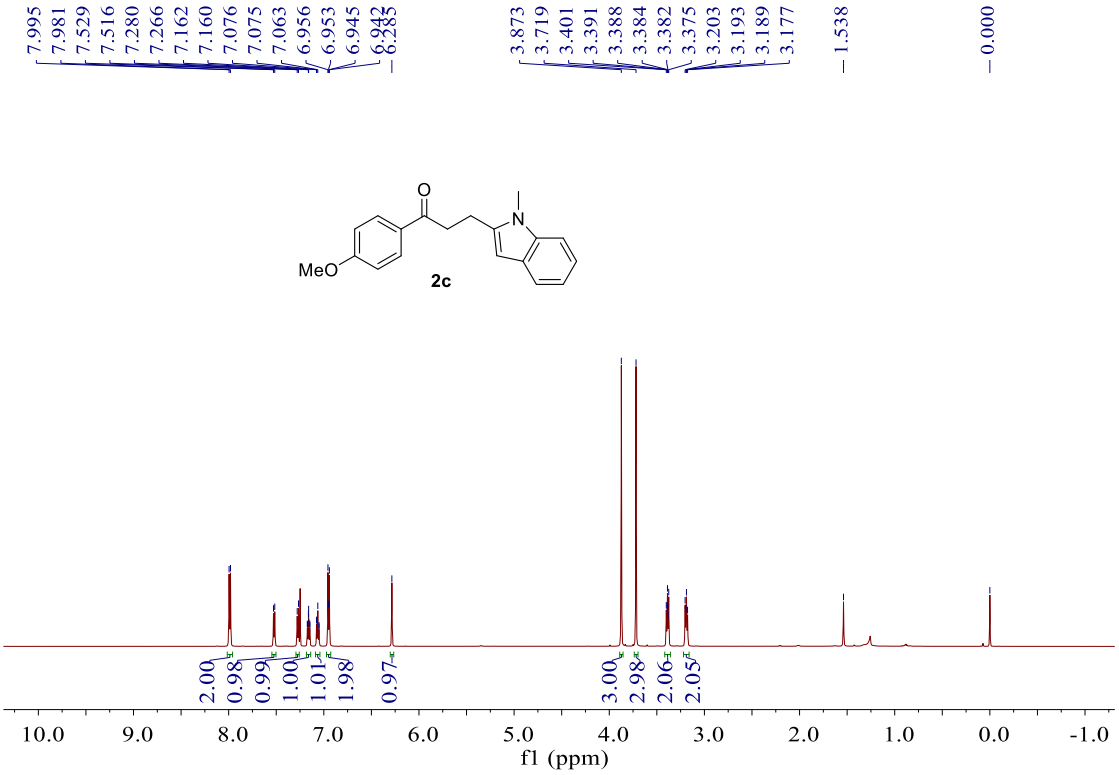
^{1}H NMR (600 MHz, $CDCl_3$) for **2b**



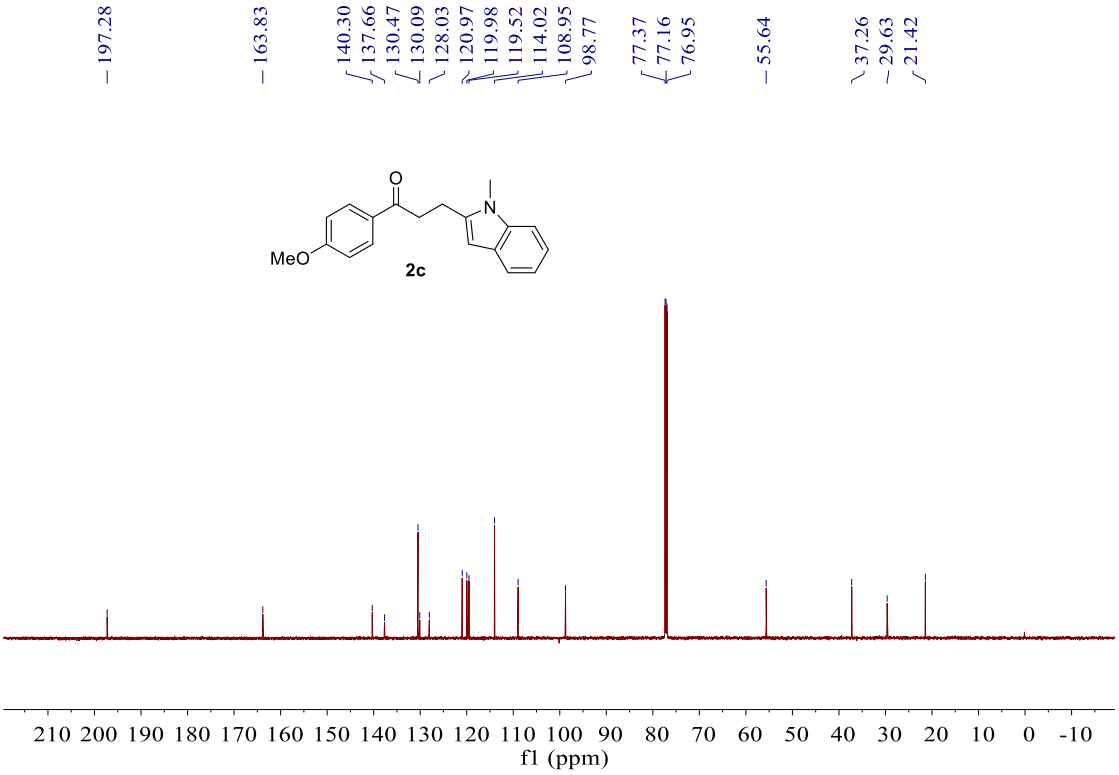
^{13}C NMR (151 MHz, $CDCl_3$) for **2b**



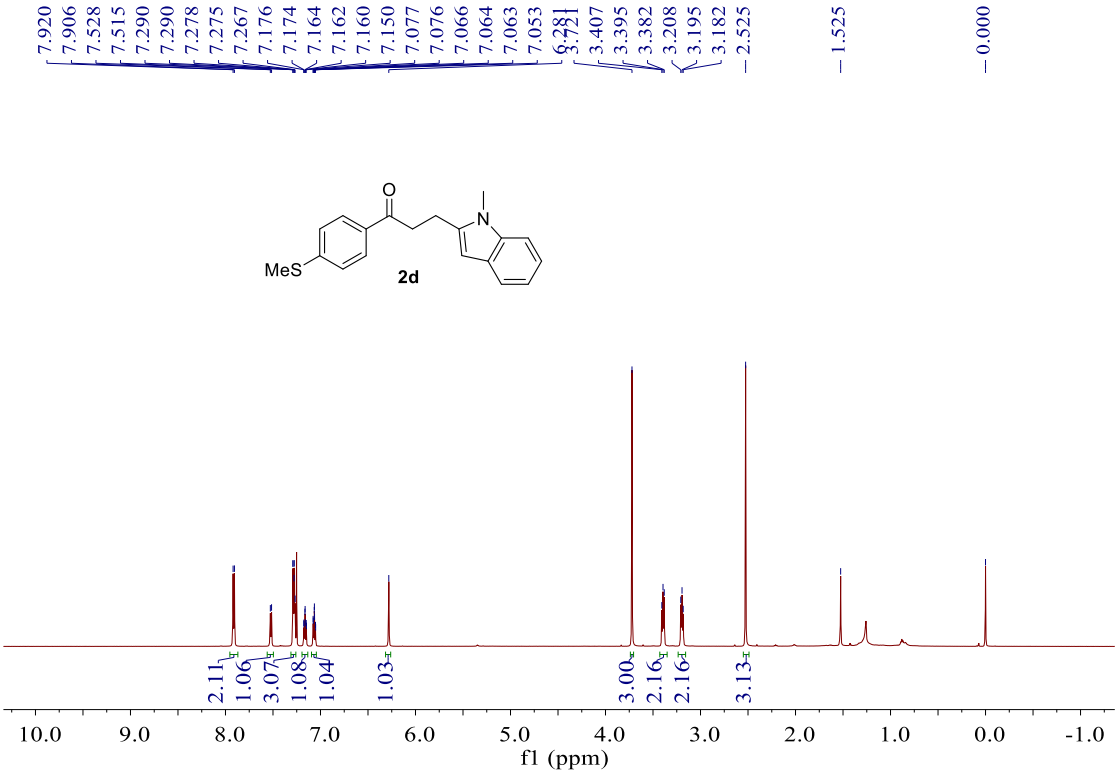
^{1}H NMR (600 MHz, $CDCl_3$) for **2c**



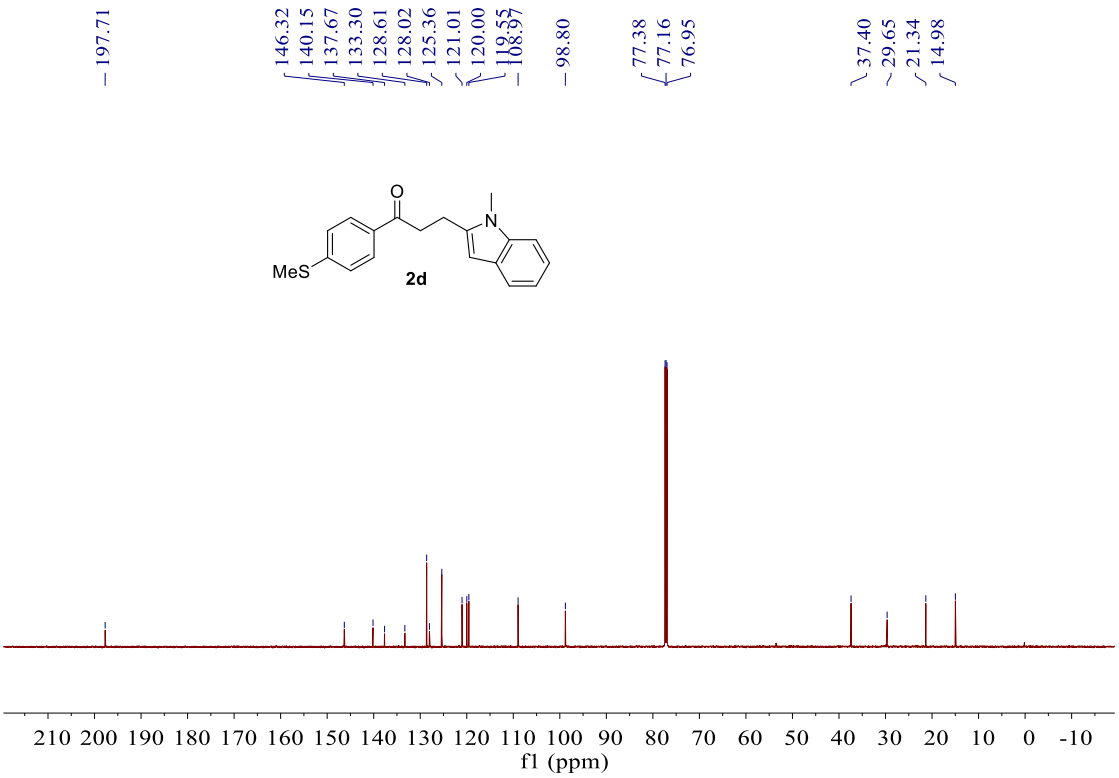
^{13}C NMR (151 MHz, $CDCl_3$) for **2c**



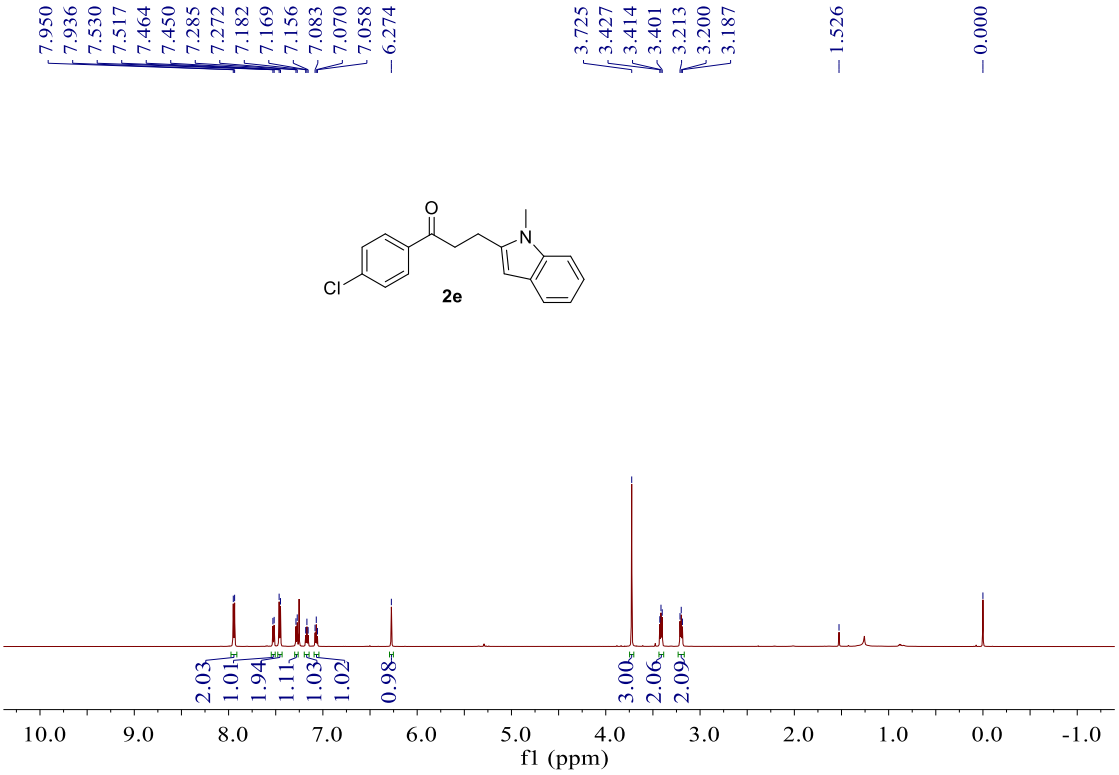
^{1}H NMR (600 MHz, $CDCl_3$) for **2d**



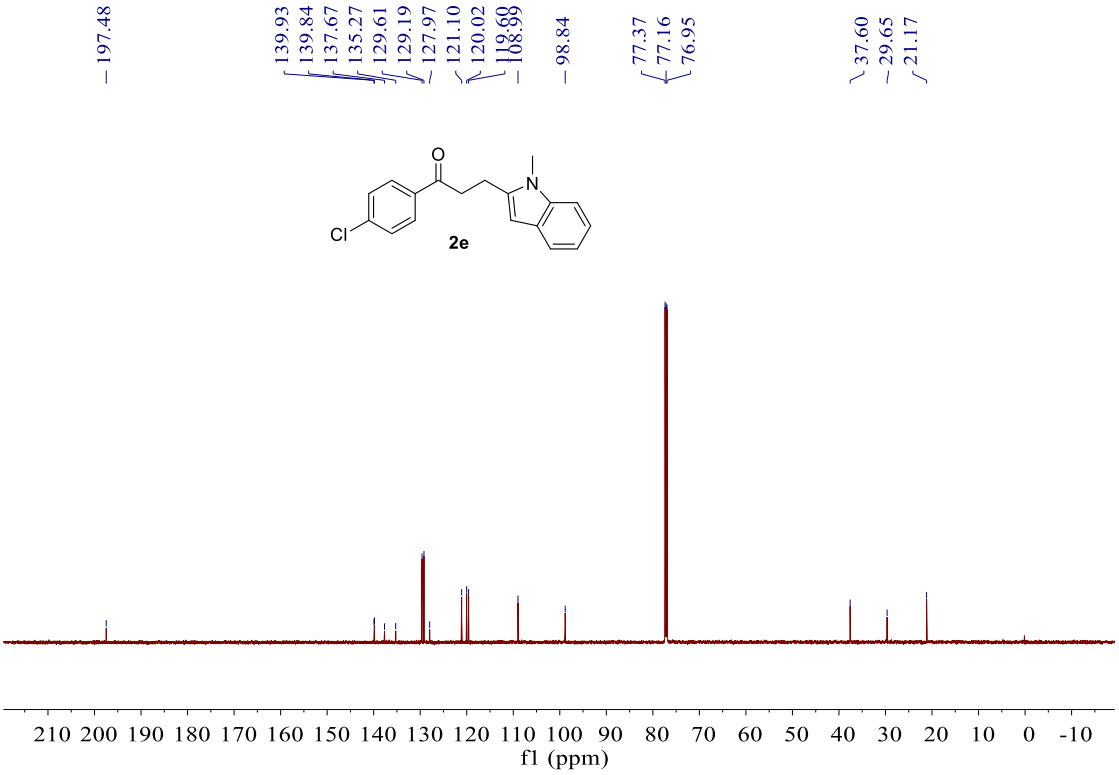
^{13}C NMR (151 MHz, $CDCl_3$) for **2d**



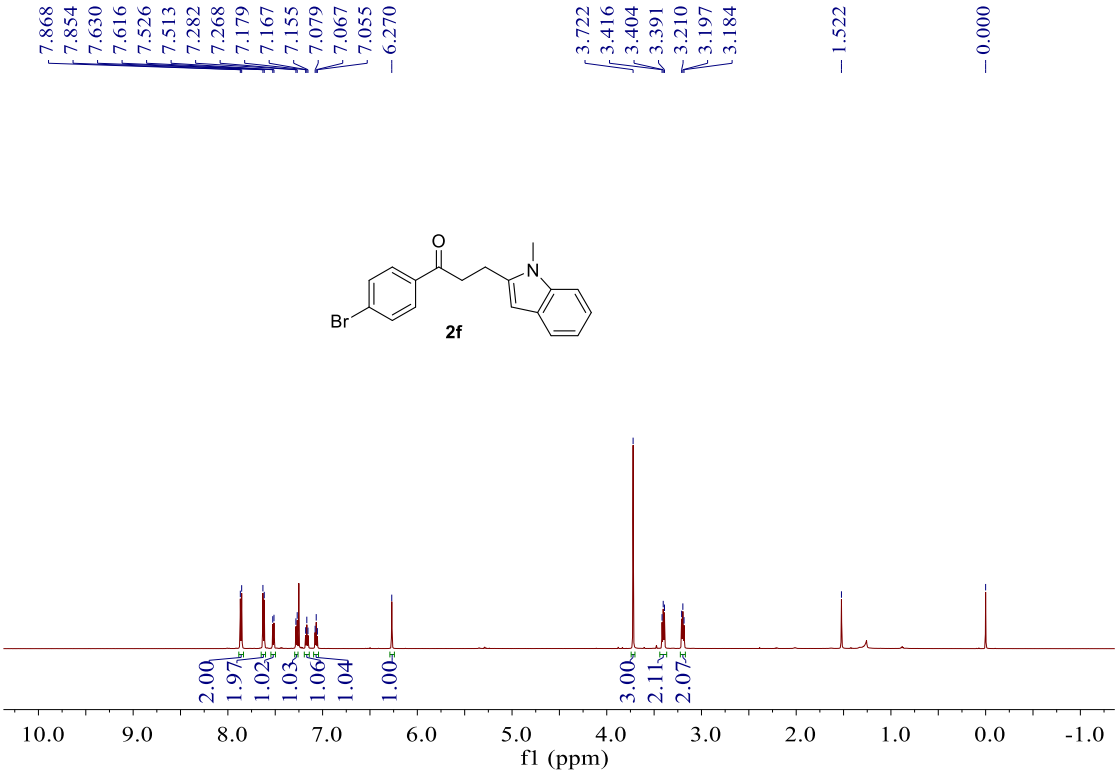
^{1}H NMR (600 MHz, $CDCl_3$) for **2e**



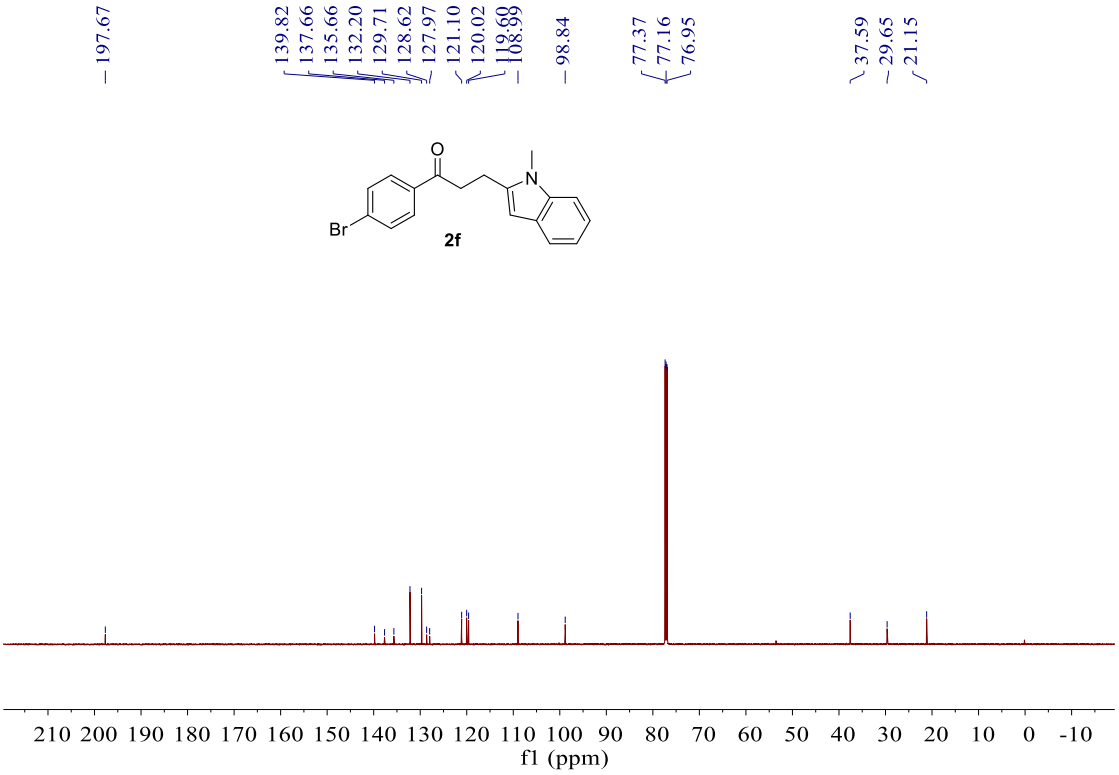
^{13}C NMR (151 MHz, $CDCl_3$) for **2e**



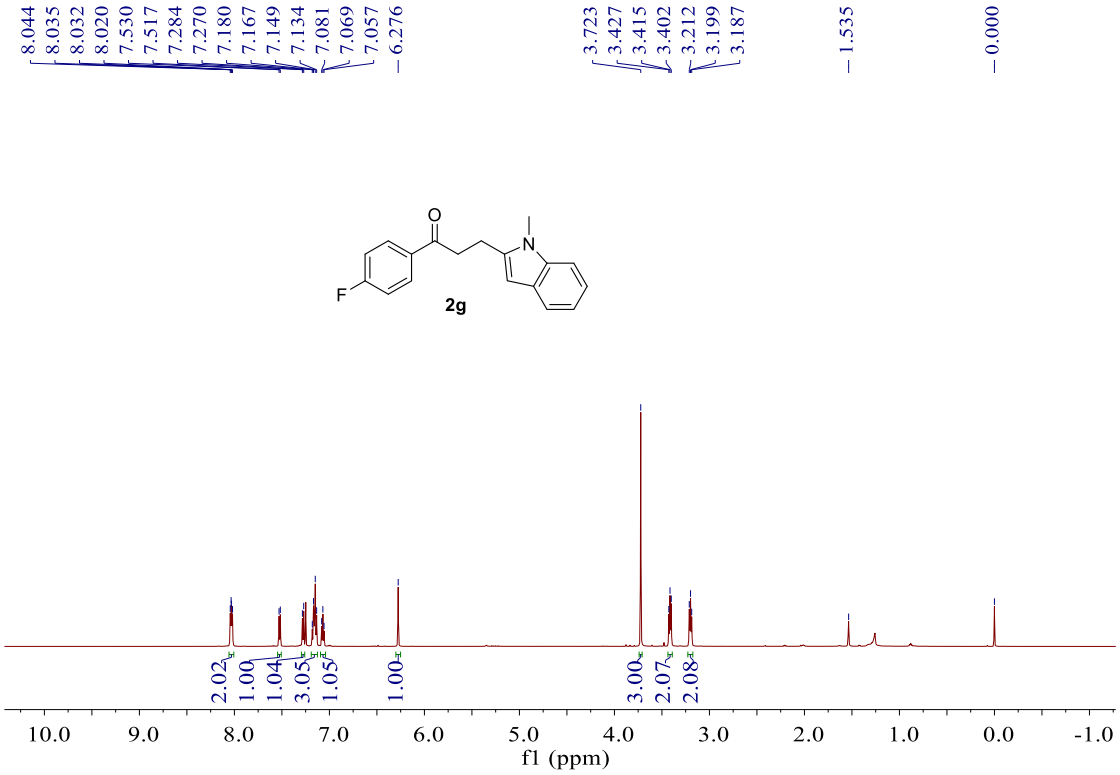
^{1}H NMR (600 MHz, $CDCl_3$) for **2f**



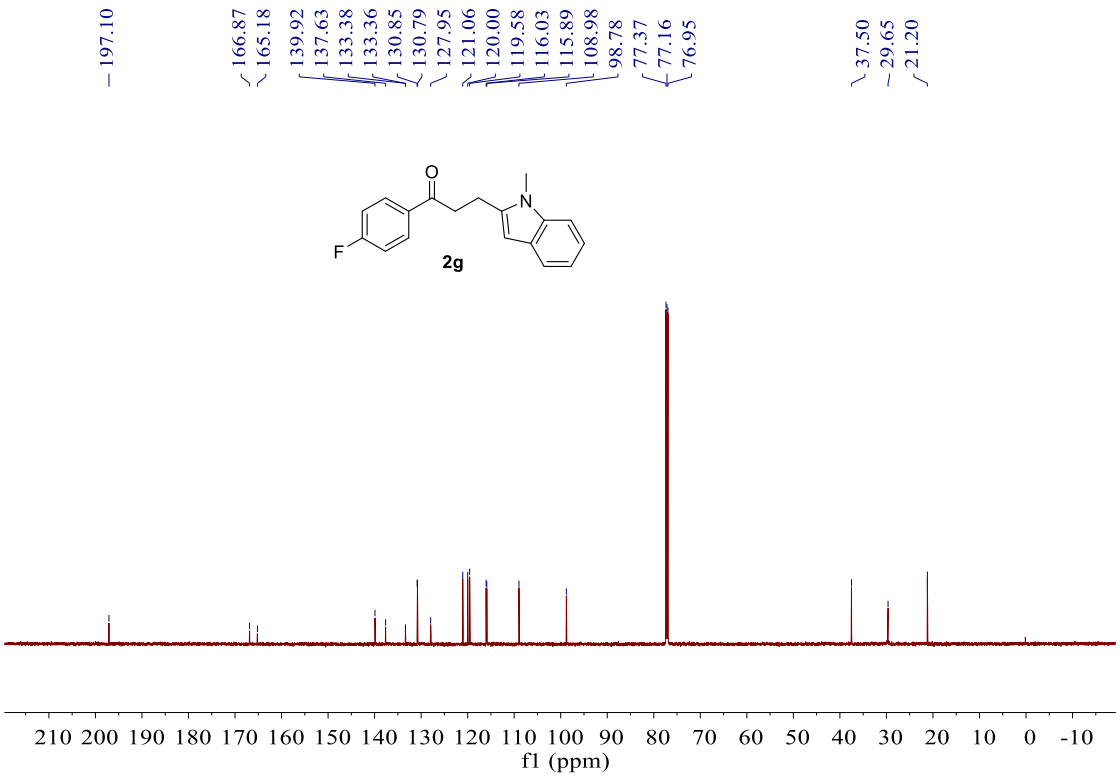
^{13}C NMR (151 MHz, $CDCl_3$) for **2f**



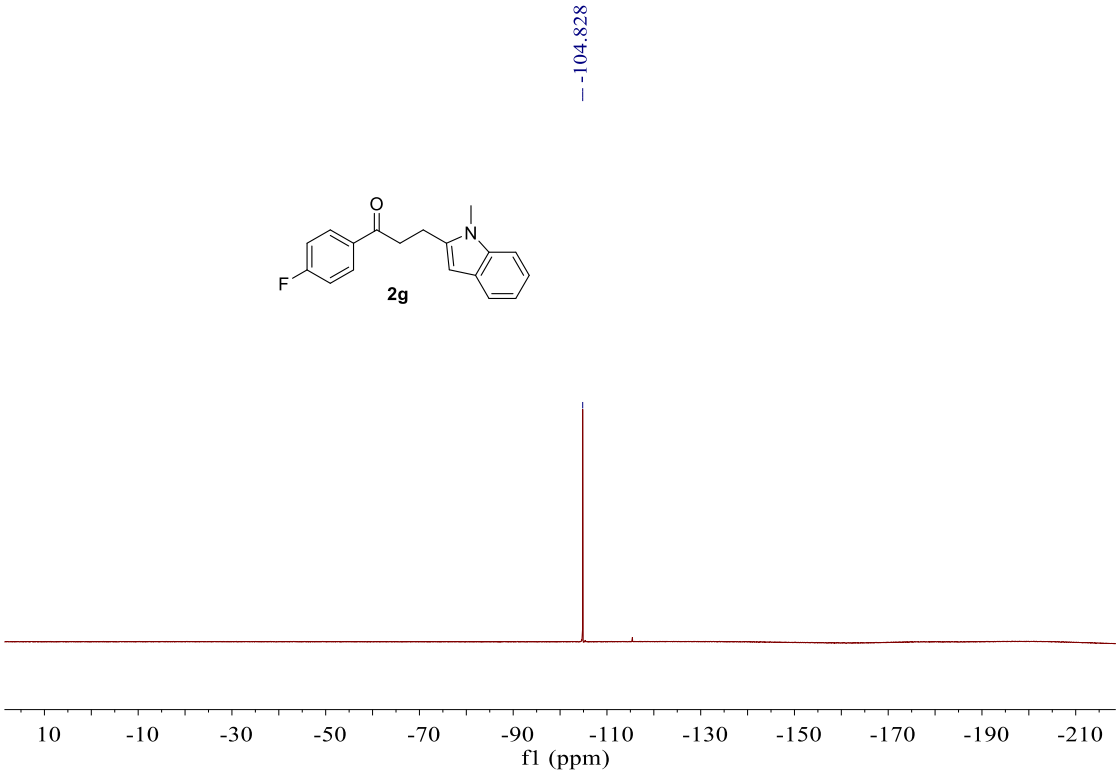
^{1}H NMR (600 MHz, $CDCl_3$) for **2g**



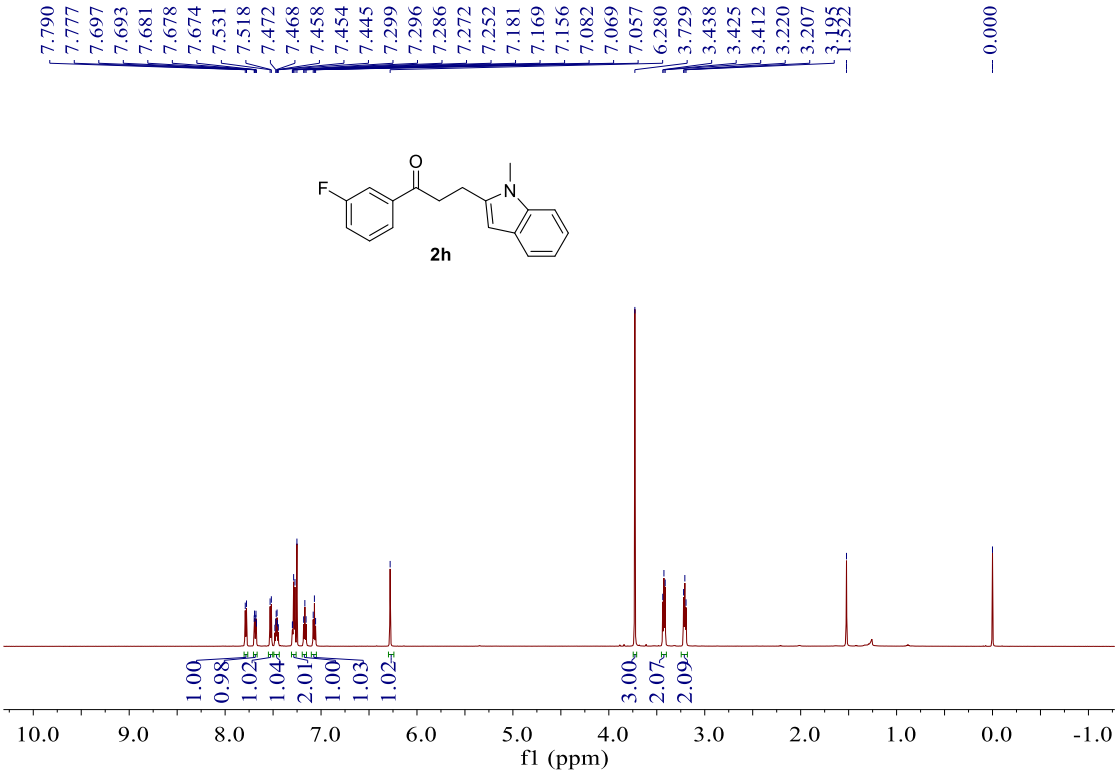
^{13}C NMR (151 MHz, $CDCl_3$) for **2g**



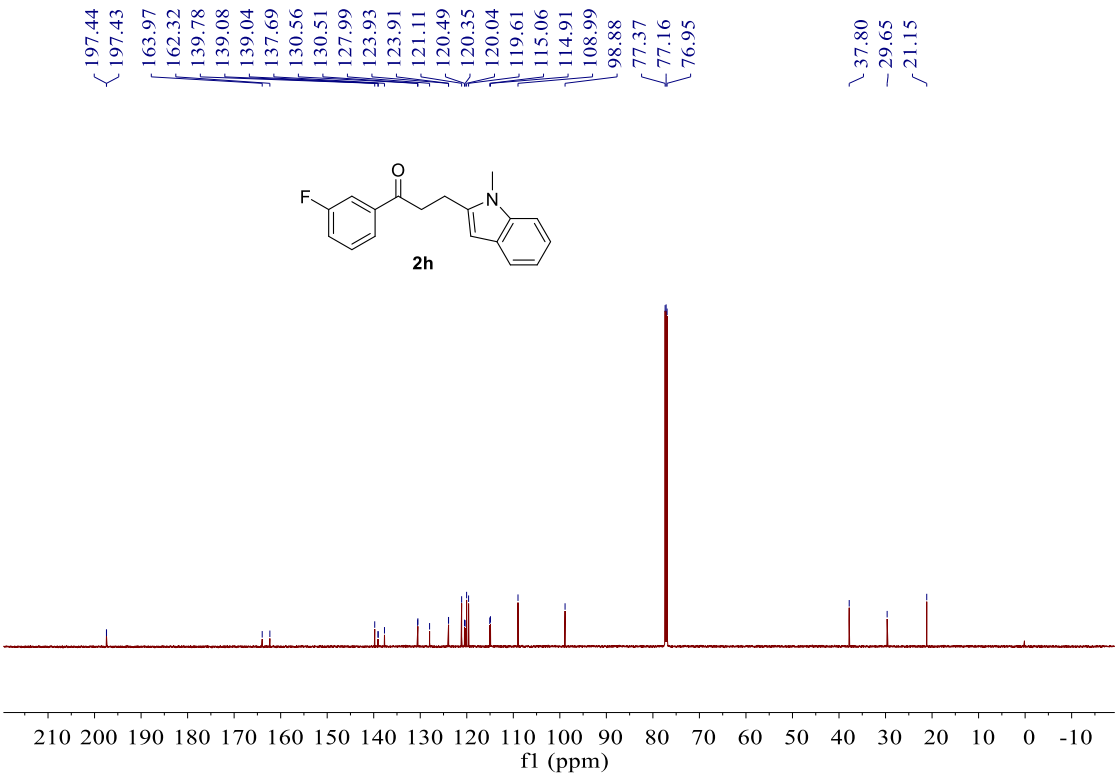
^{19}F NMR (565 MHz, $CDCl_3$) for **2g**



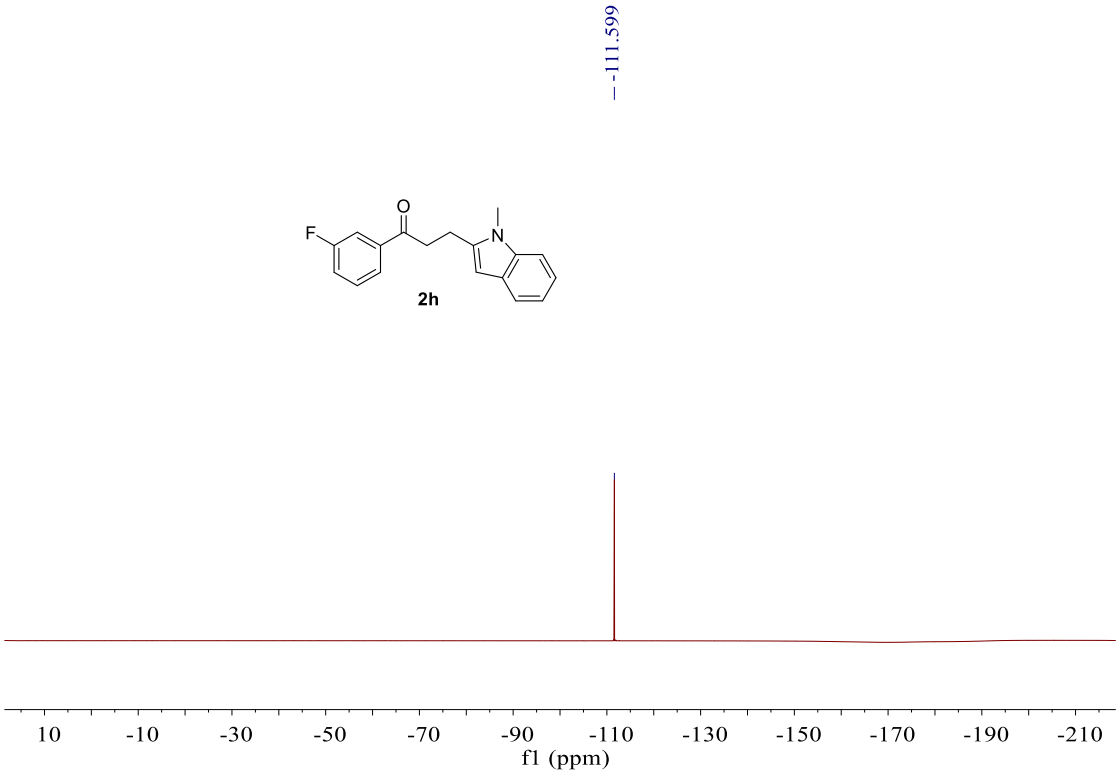
^{1}H NMR (600 MHz, $CDCl_3$) for **2h**



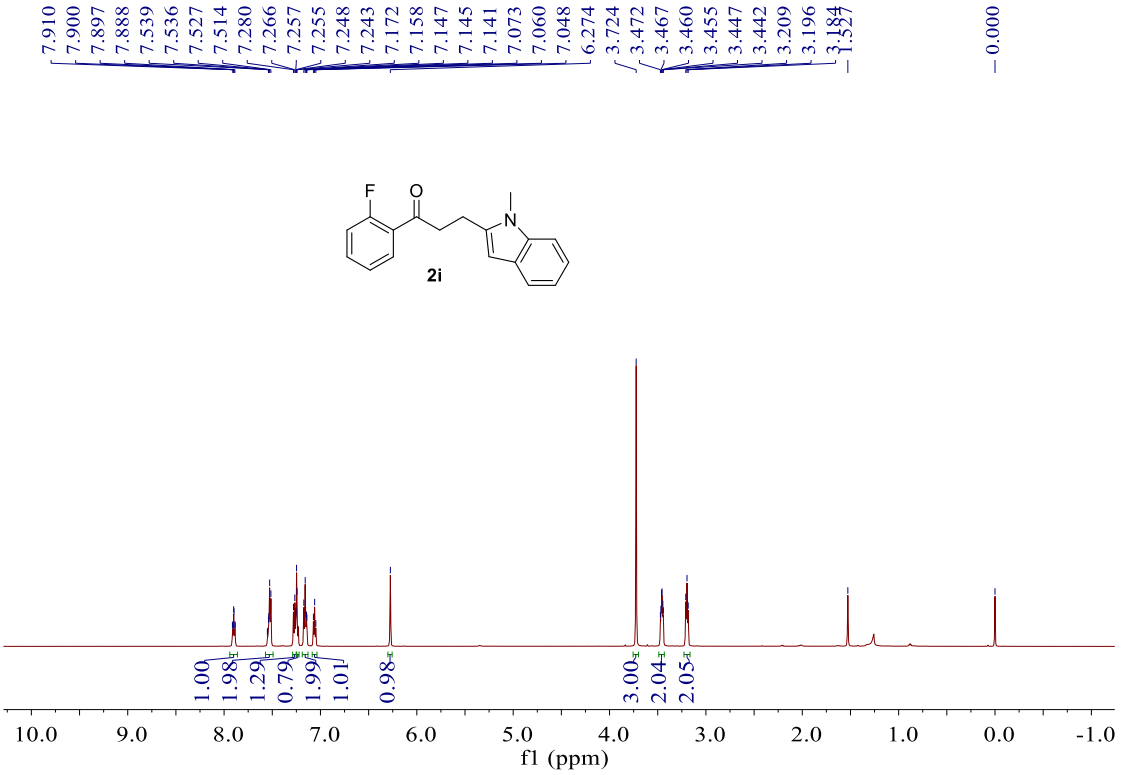
^{13}C NMR (151 MHz, $CDCl_3$) for **2h**



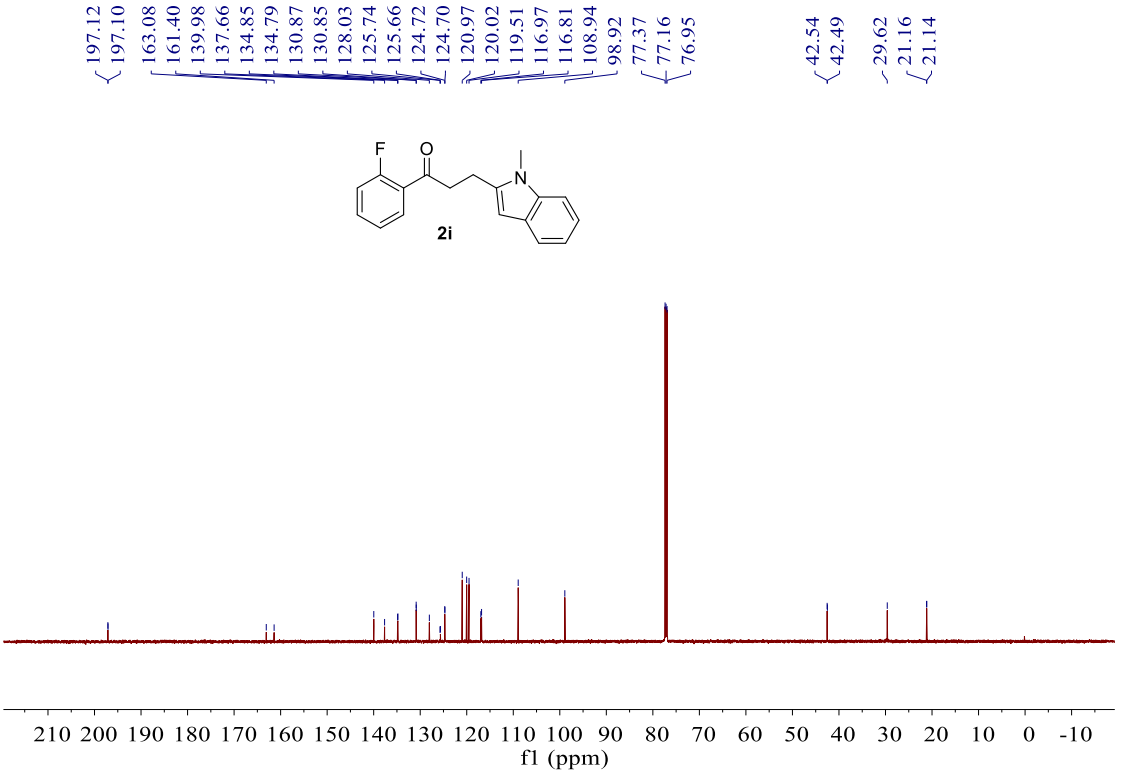
^{19}F NMR (565 MHz, $CDCl_3$) for **2h**



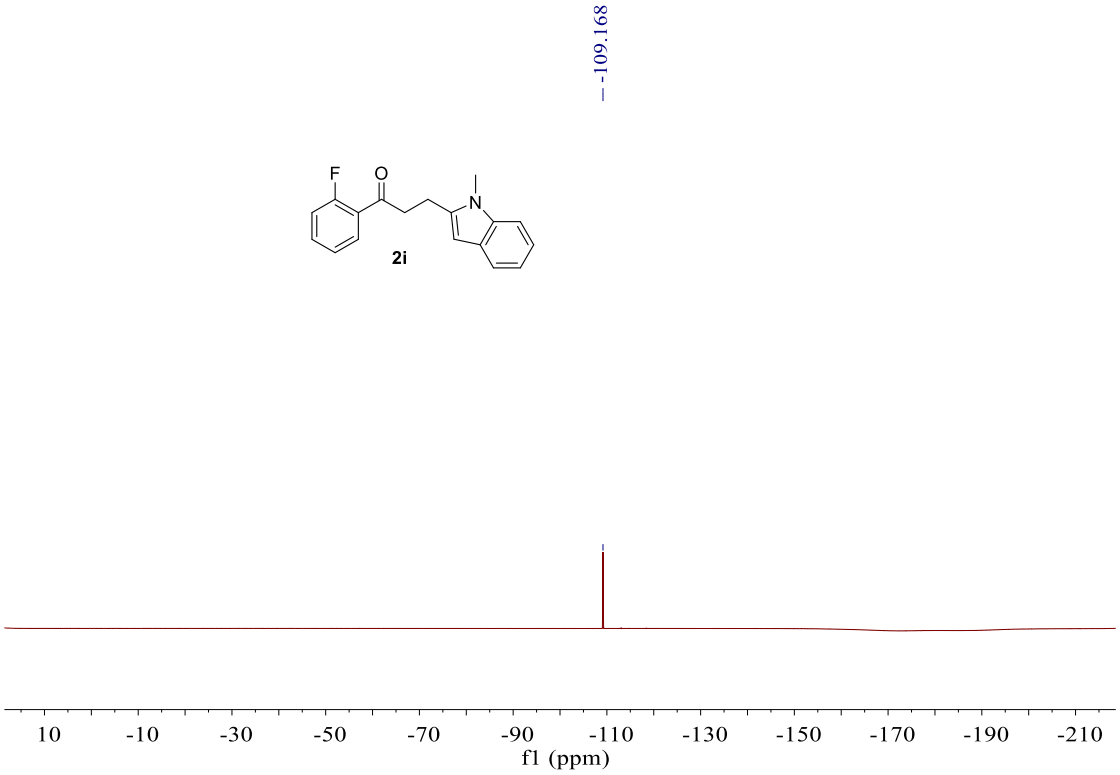
^{1}H NMR (600 MHz, $CDCl_3$) for **2i**



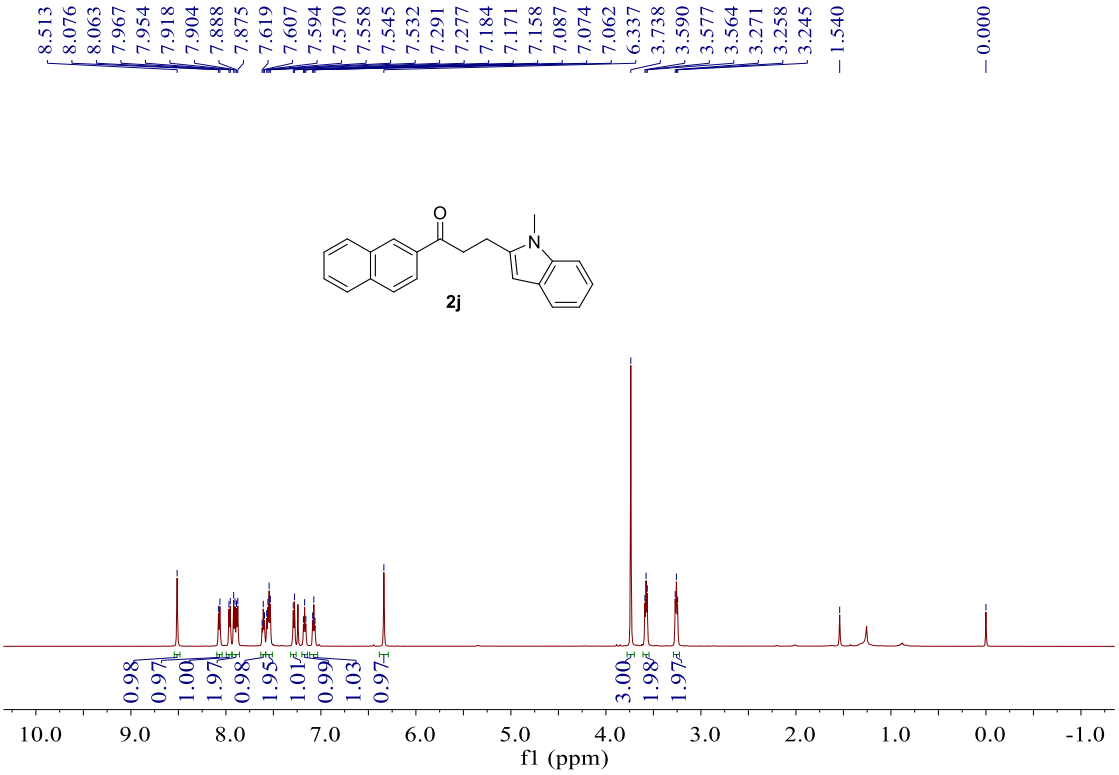
^{13}C NMR (151 MHz, $CDCl_3$) for **2i**



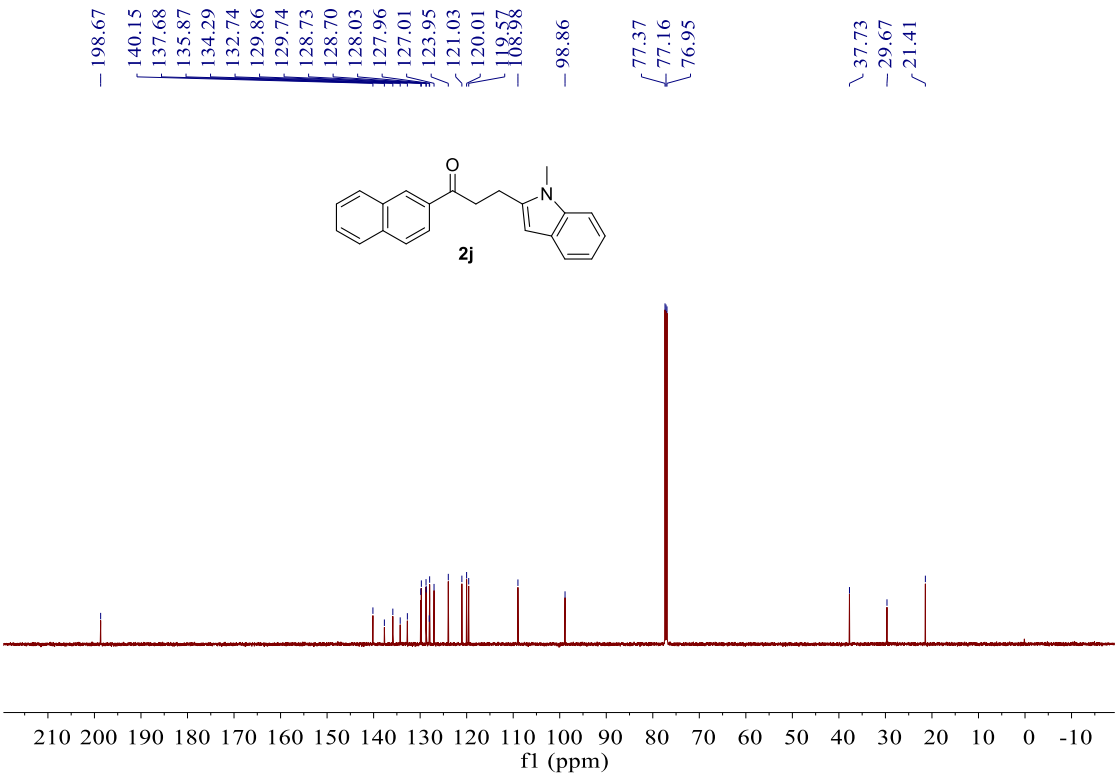
^{19}F NMR (565 MHz, $CDCl_3$) for **2i**



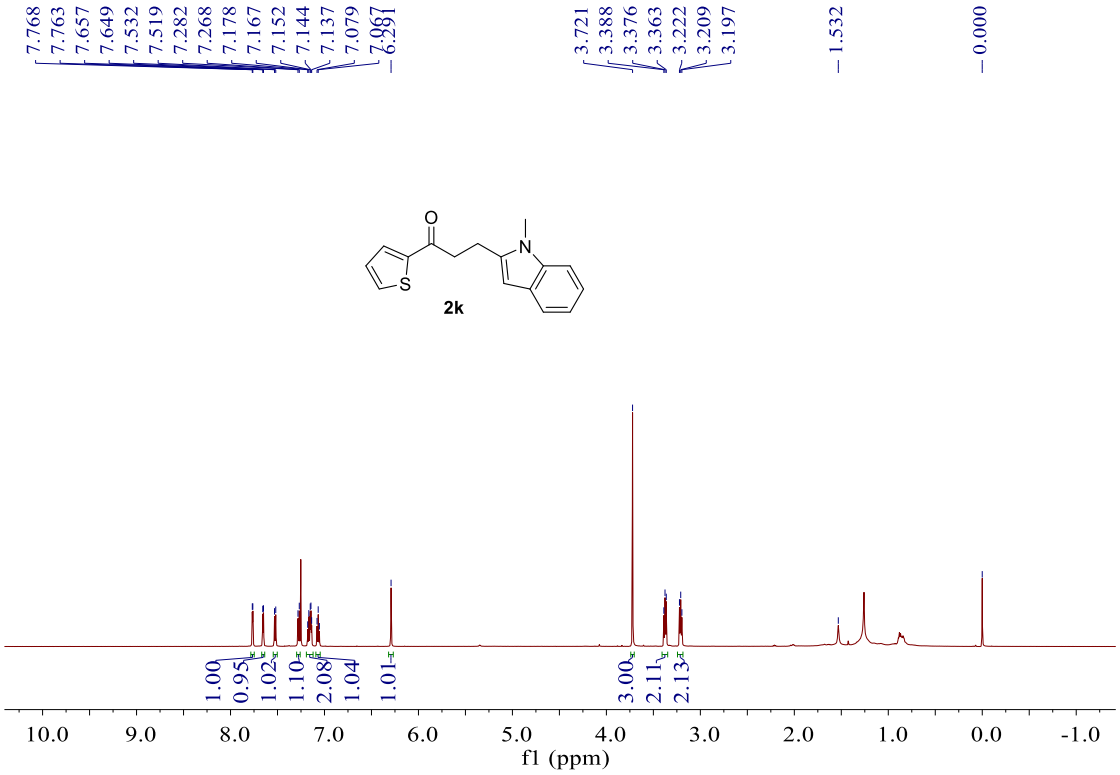
^{1}H NMR (600 MHz, $CDCl_3$) for **2j**



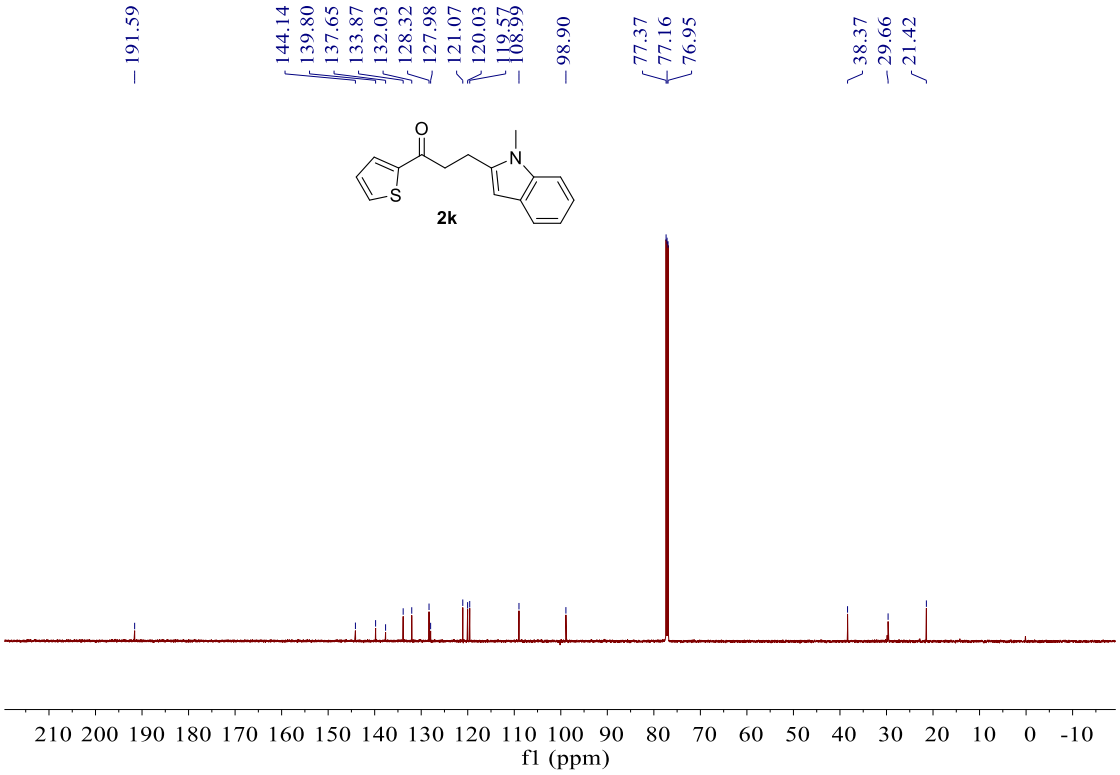
^{13}C NMR (151 MHz, $CDCl_3$) for **2j**



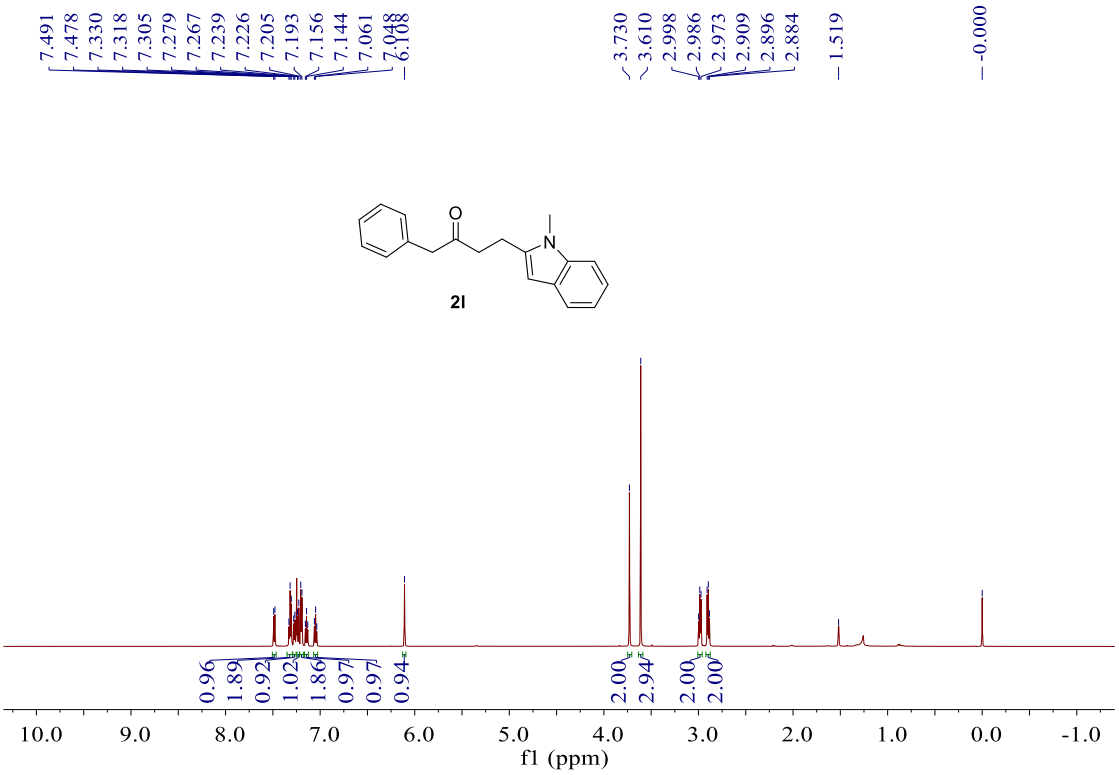
^{1}H NMR (600 MHz, $CDCl_3$) for **2k**



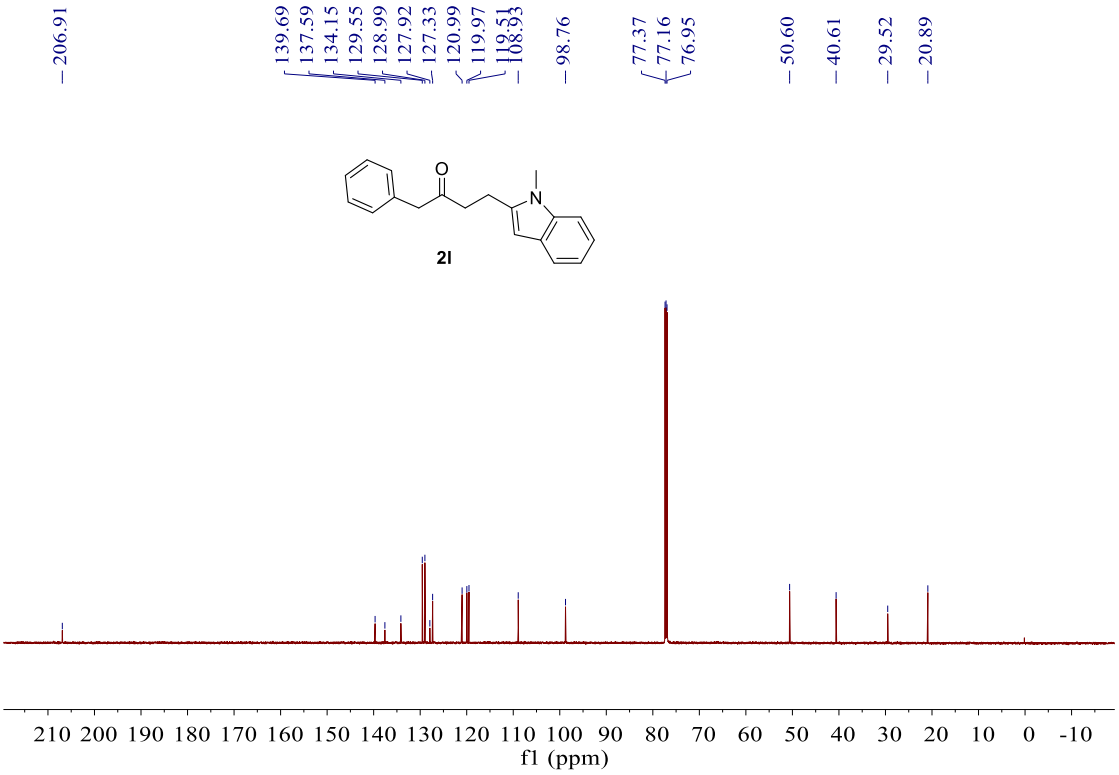
^{13}C NMR (151 MHz, $CDCl_3$) for **2k**



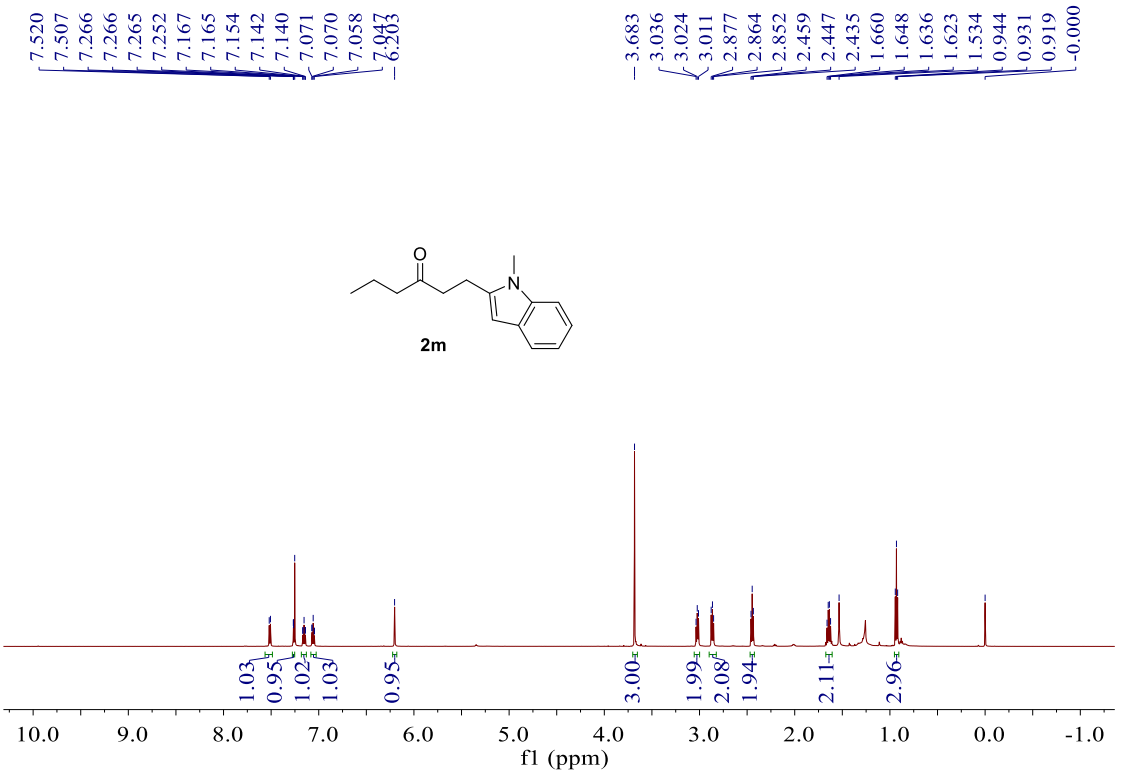
^{1}H NMR (600 MHz, $CDCl_3$) for **2l**



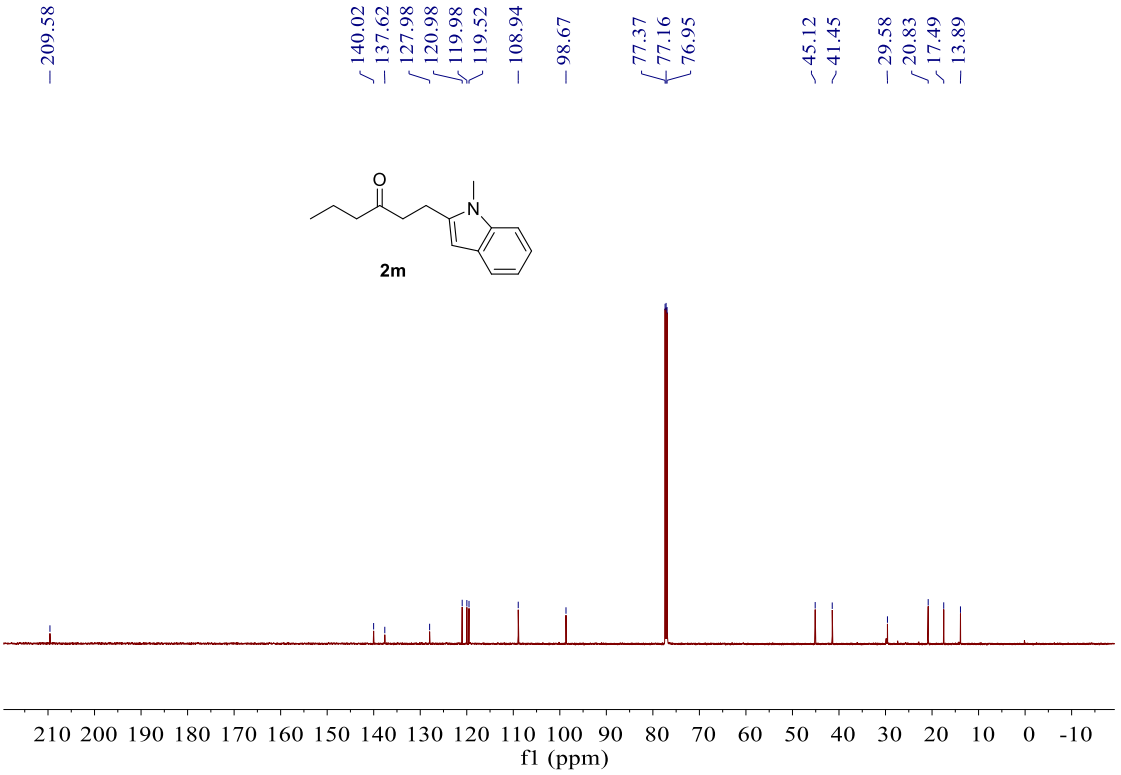
^{13}C NMR (151 MHz, $CDCl_3$) for **2l**



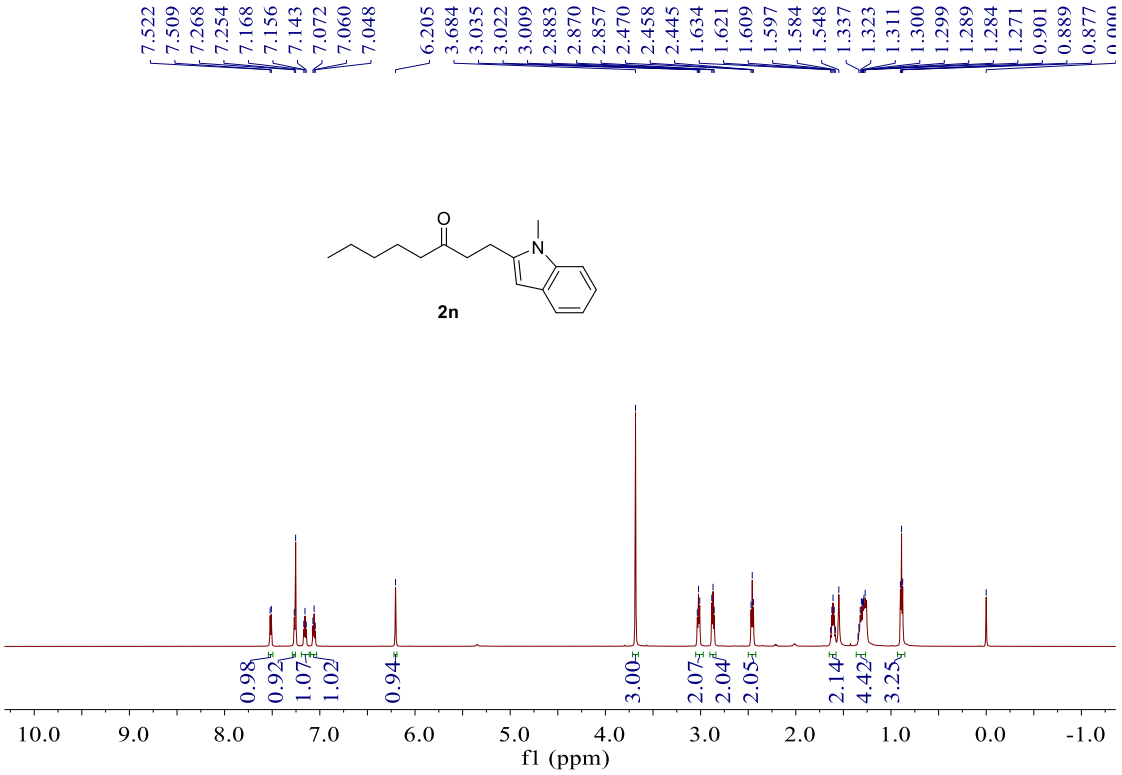
^{1}H NMR (600 MHz, $CDCl_3$) for **2m**



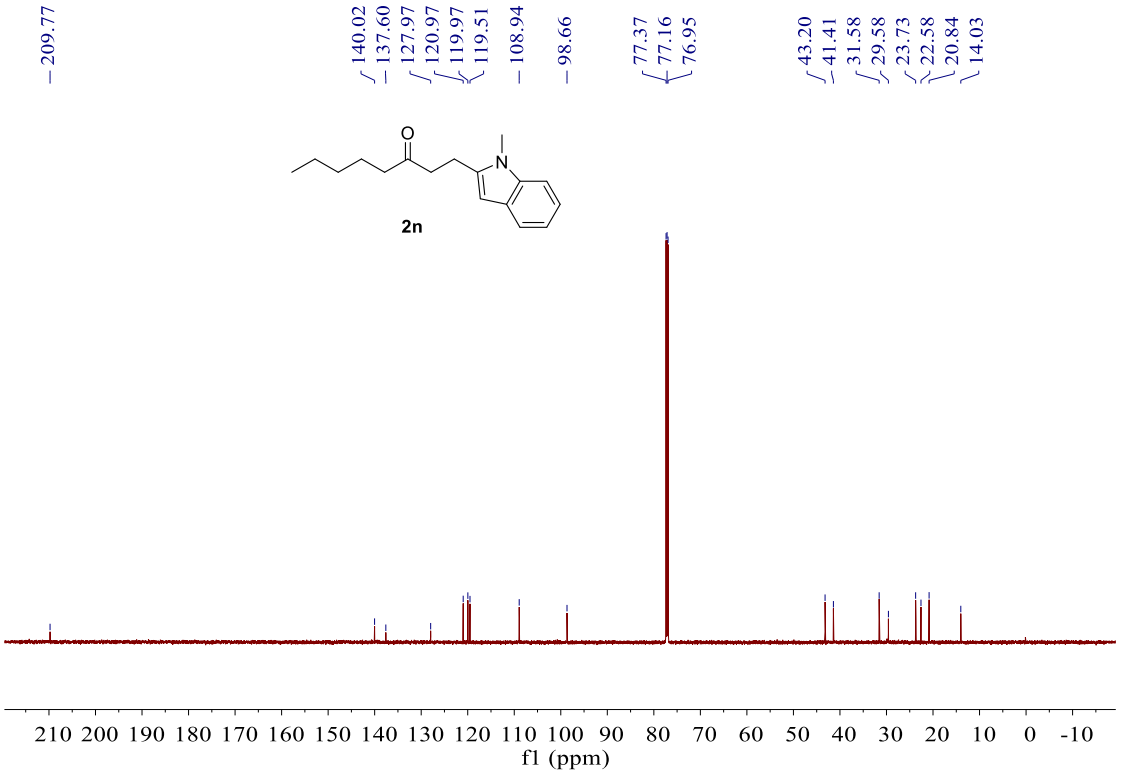
^{13}C NMR (151 MHz, $CDCl_3$) for **2m**



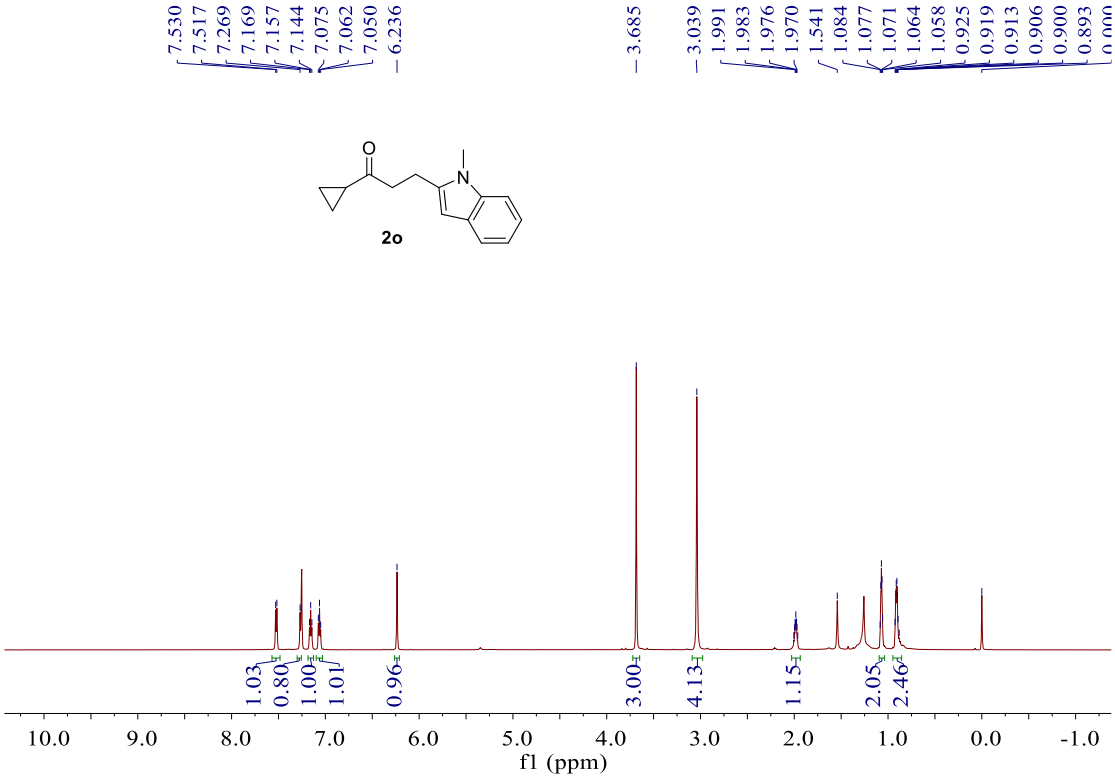
^{1}H NMR (600 MHz, $CDCl_3$) for **2n**



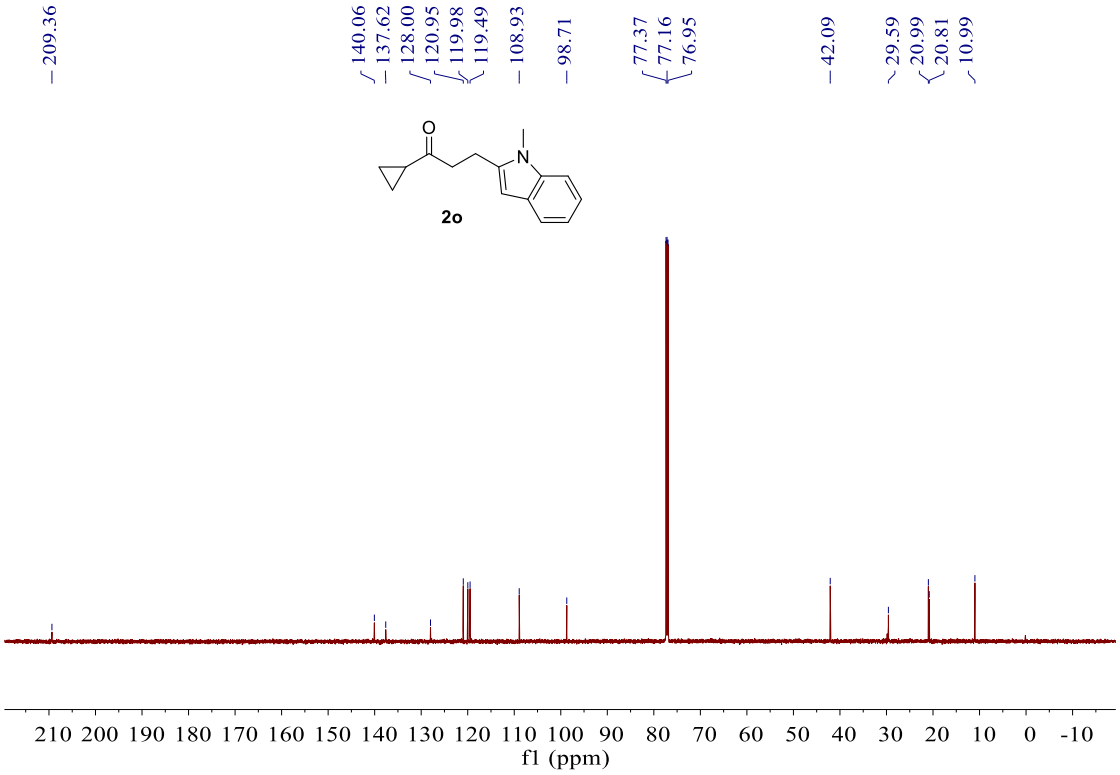
^{13}C NMR (151 MHz, $CDCl_3$) for **2n**



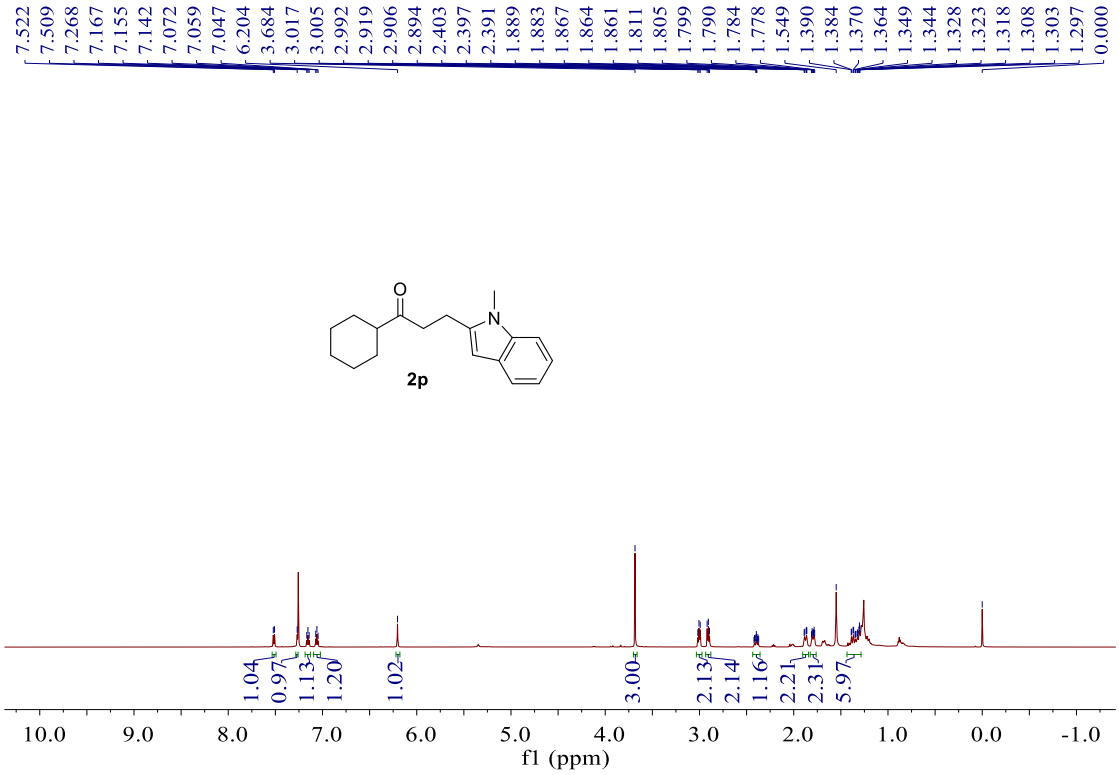
^{1}H NMR (600 MHz, $CDCl_3$) for **2o**



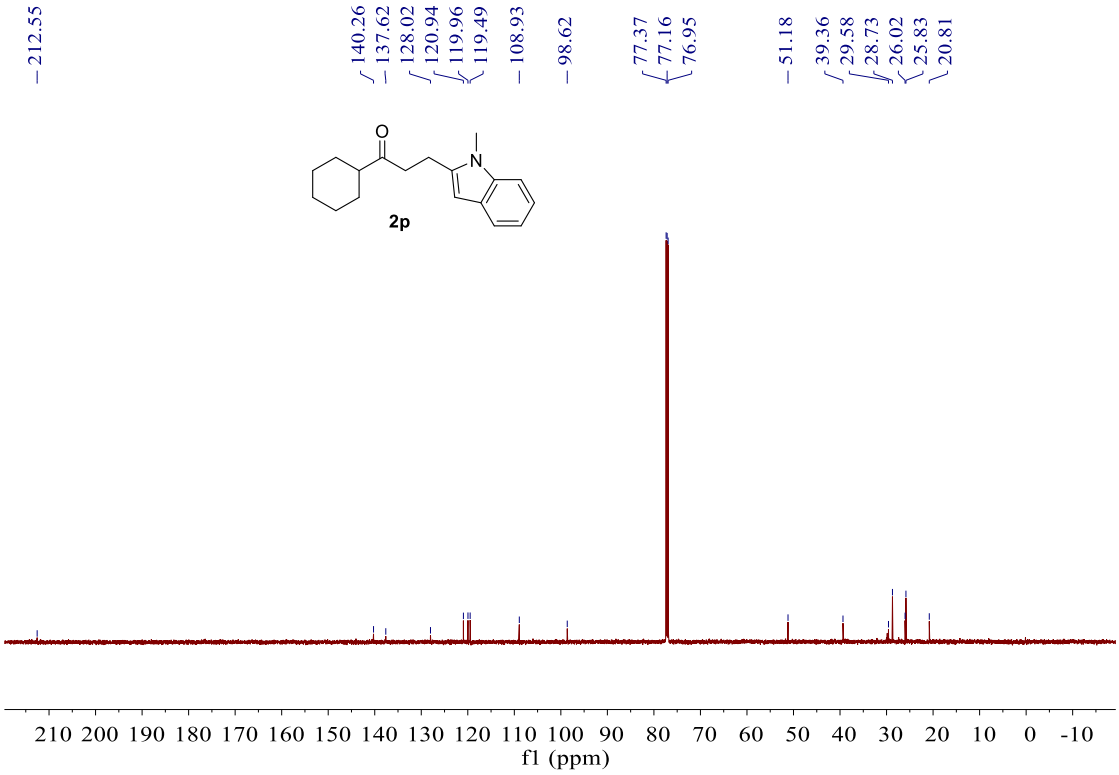
^{13}C NMR (151 MHz, $CDCl_3$) for **2o**



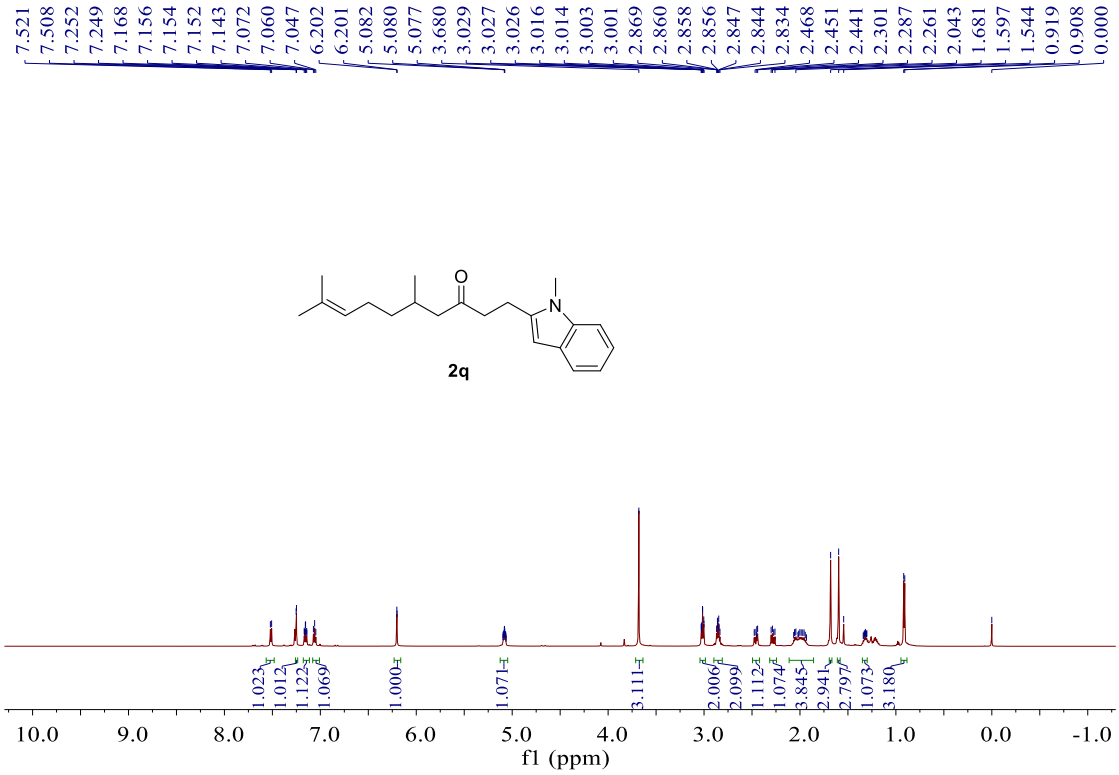
^{1}H NMR (600 MHz, $CDCl_3$) for **2p**



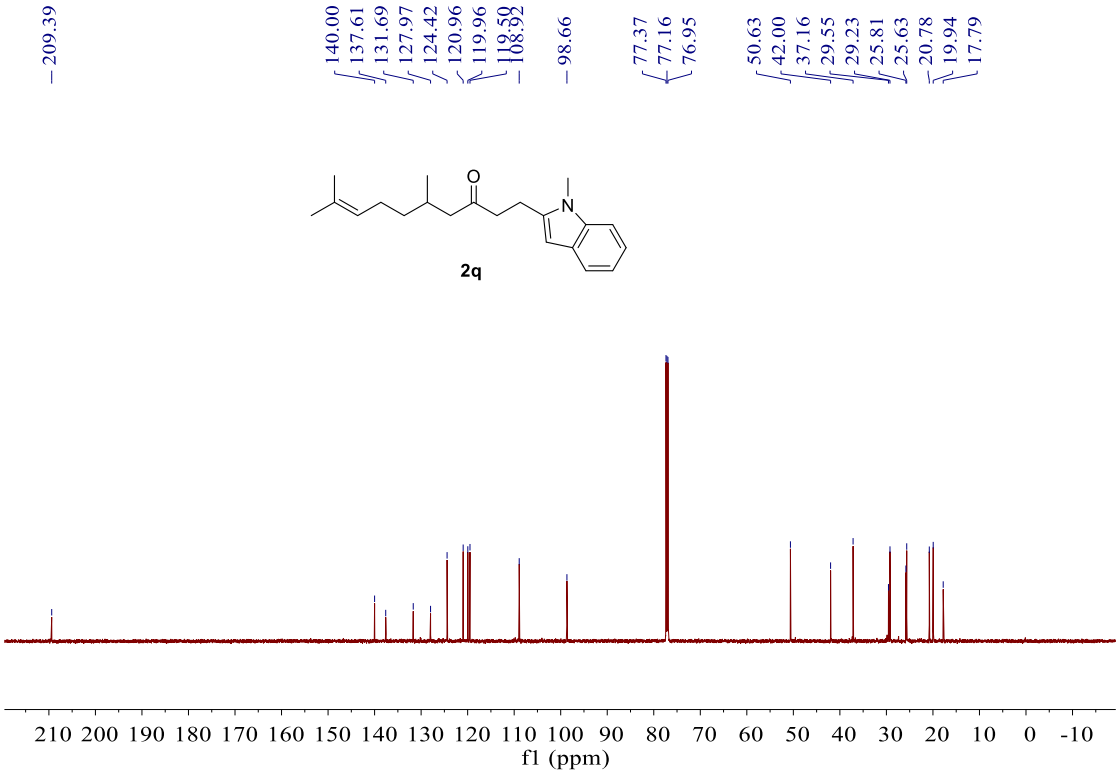
^{13}C NMR (151 MHz, $CDCl_3$) for **2p**



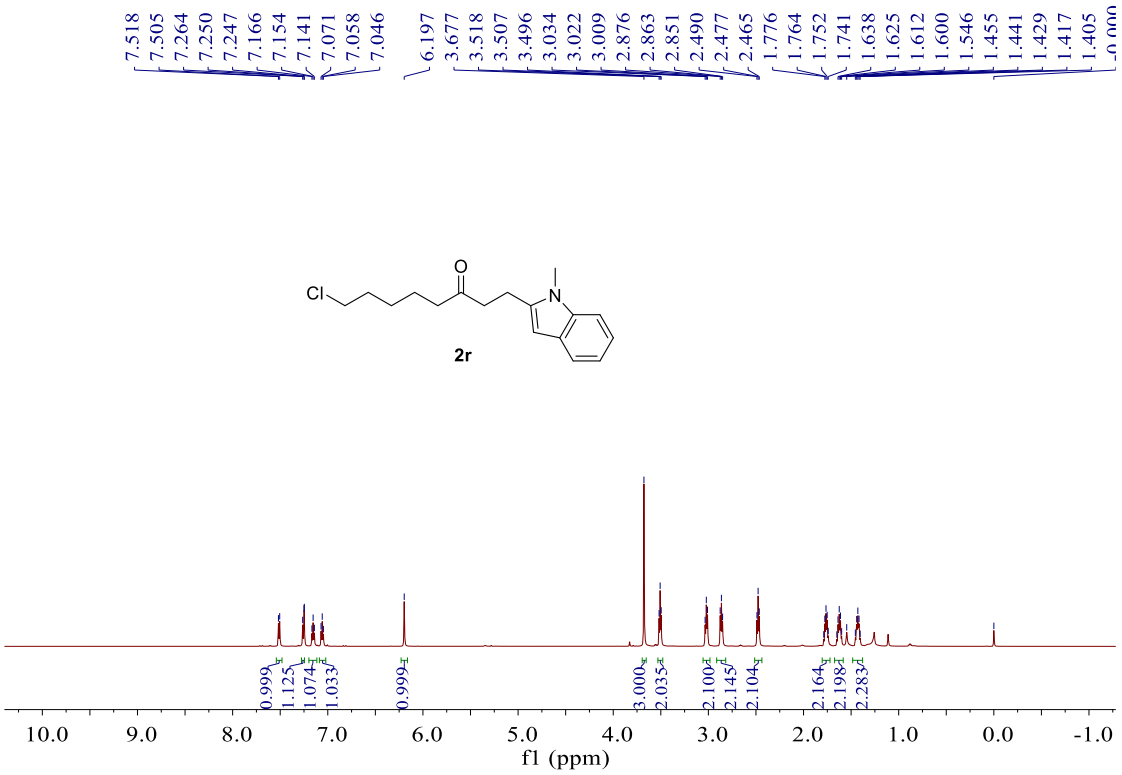
^{1}H NMR (600 MHz, $CDCl_3$) for **2q**



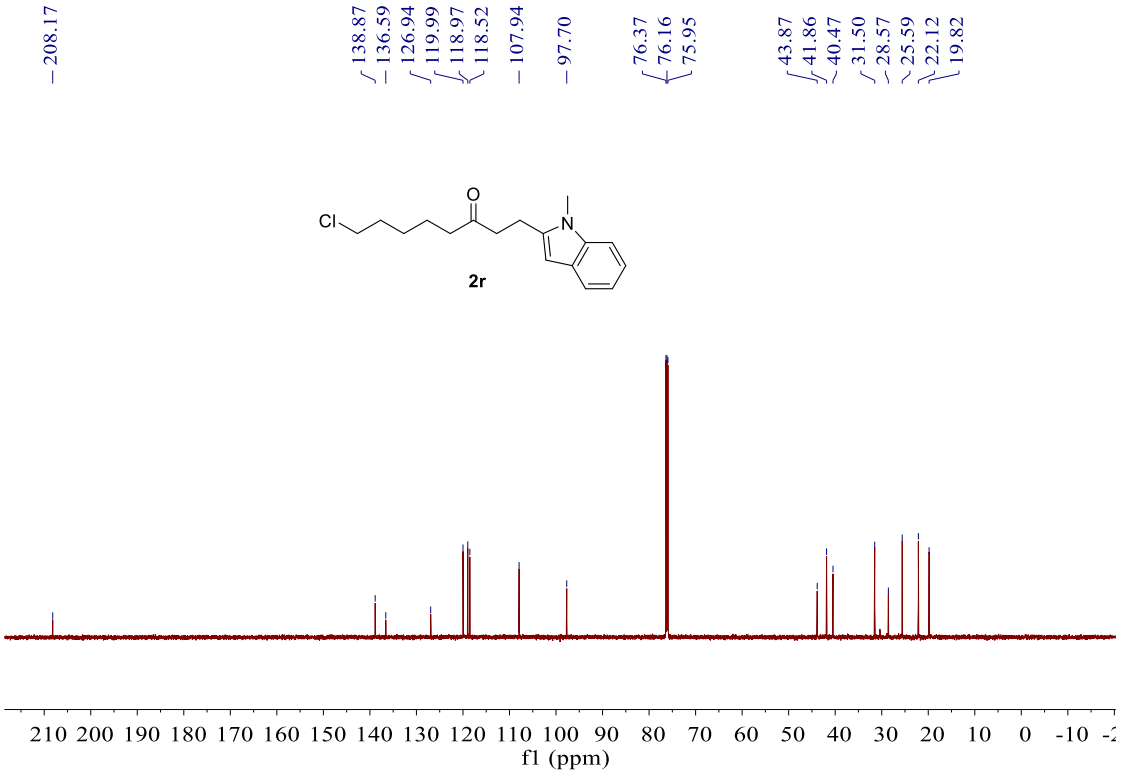
^{13}C NMR (151 MHz, $CDCl_3$) for **2q**



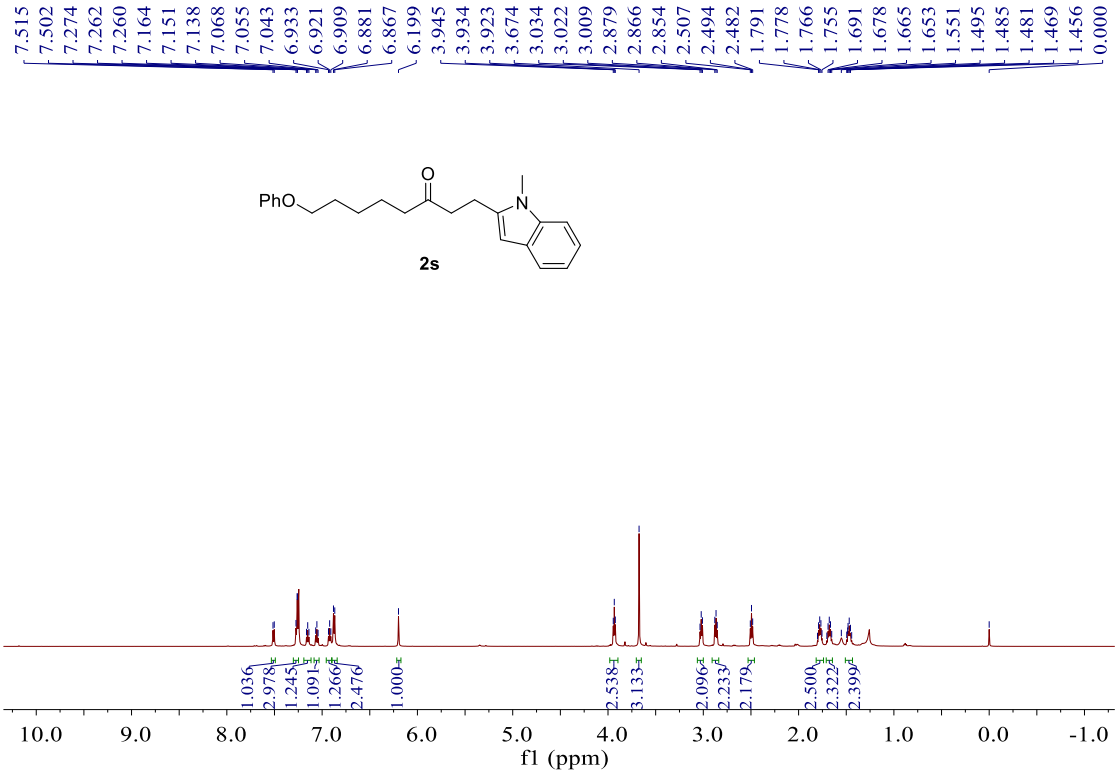
^{1}H NMR (600 MHz, $CDCl_3$) for **2r**



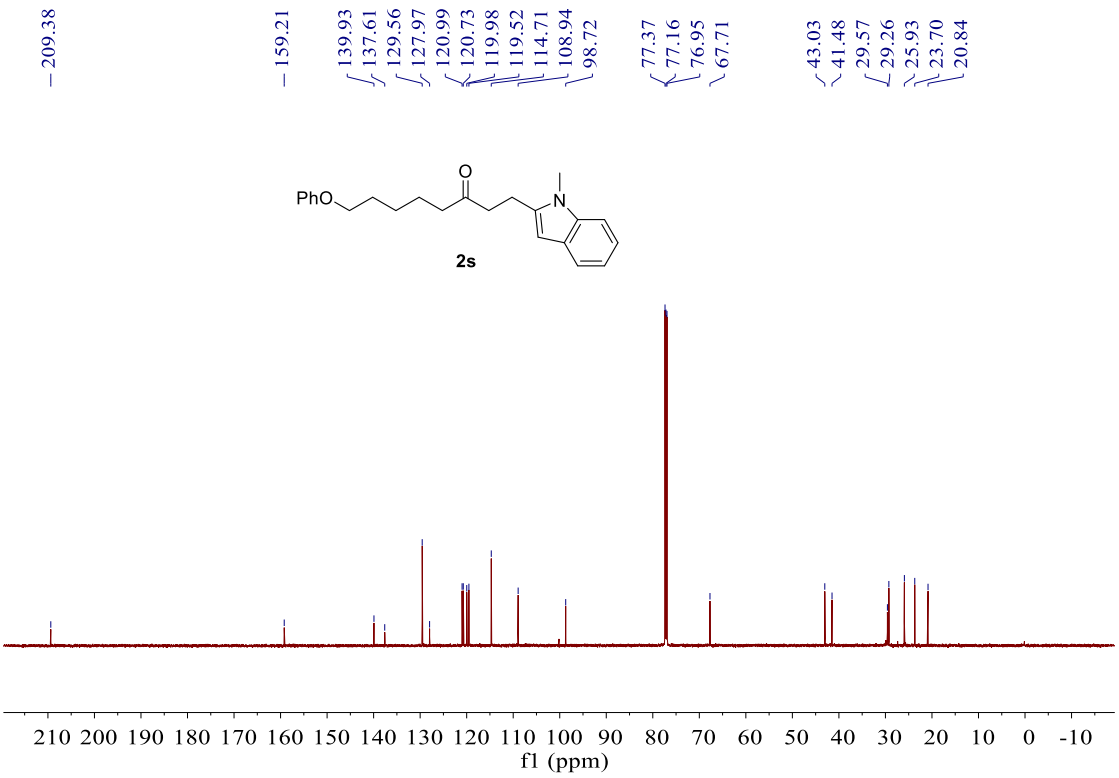
^{13}C NMR (151 MHz, $CDCl_3$) for **2r**



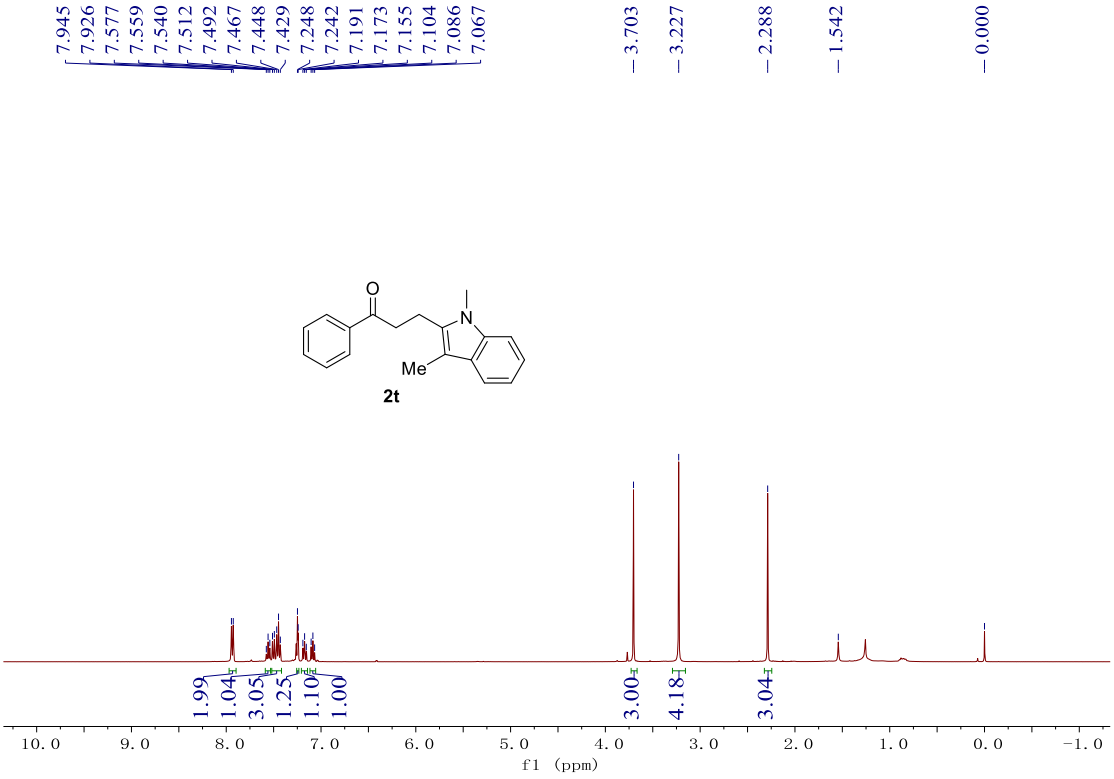
^{1}H NMR (600 MHz, $CDCl_3$) for **2s**



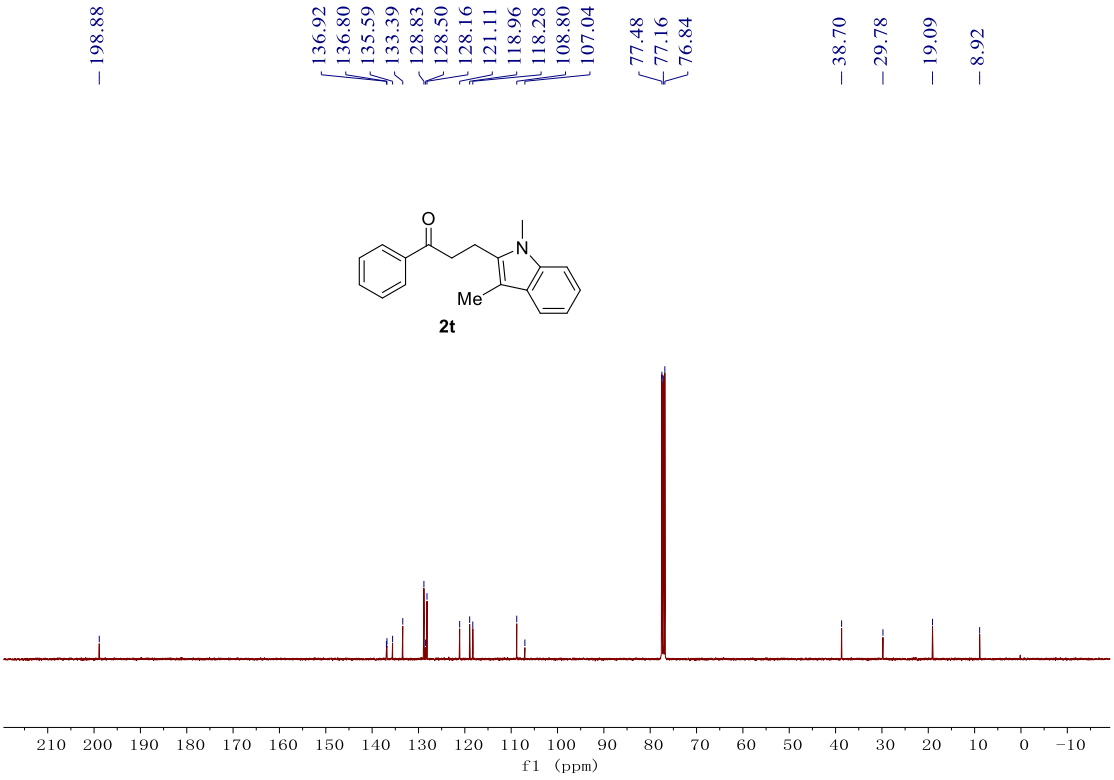
^{13}C NMR (151 MHz, $CDCl_3$) for **2s**



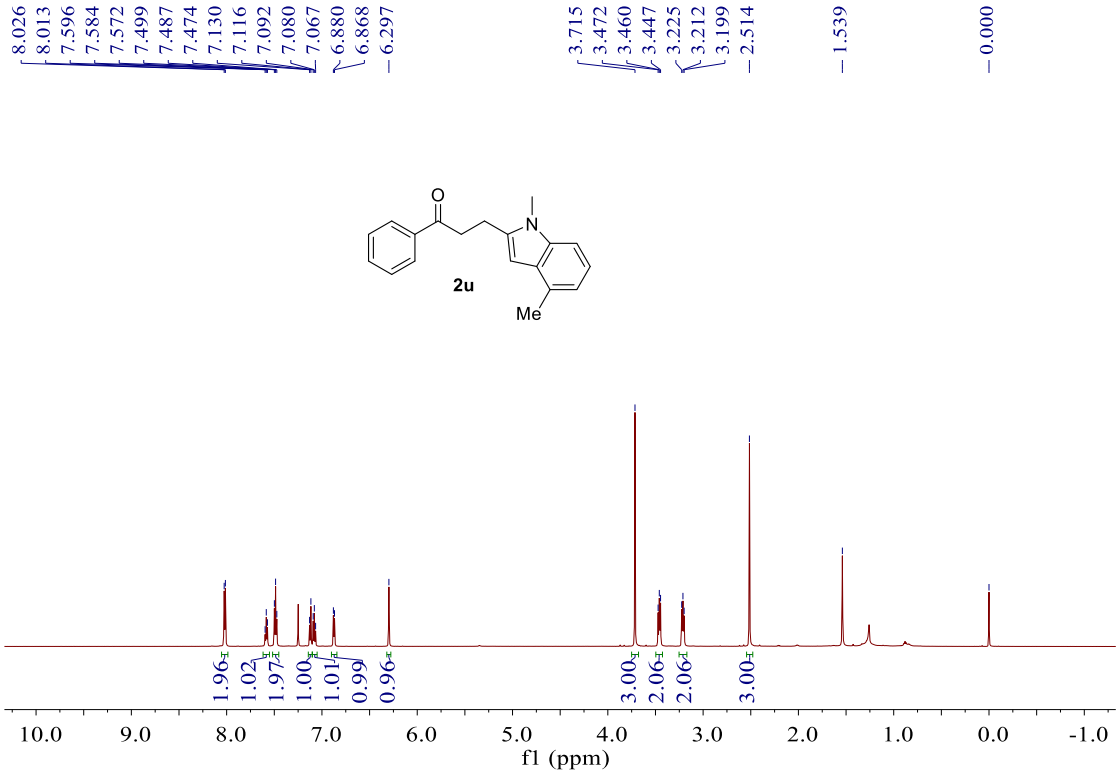
^{1}H NMR (400 MHz, $CDCl_3$) for **2t**



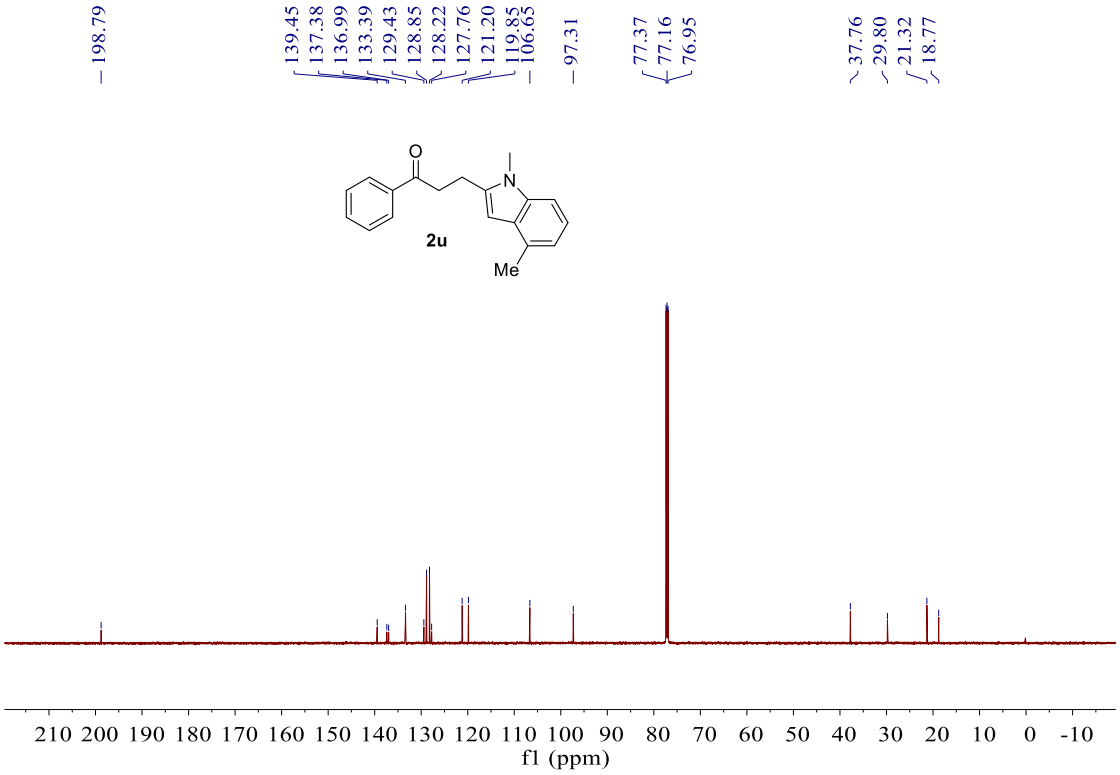
^{13}C NMR (101 MHz, $CDCl_3$) for **2t**



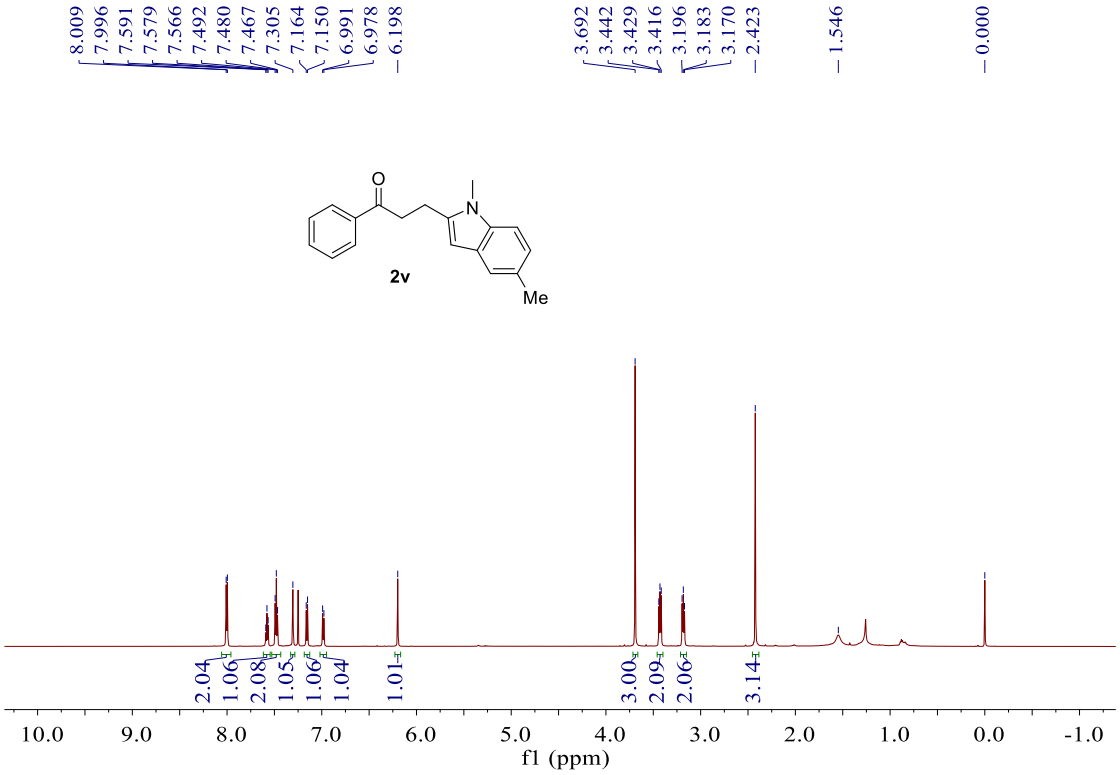
^{1}H NMR (600 MHz, $CDCl_3$) for **2u**



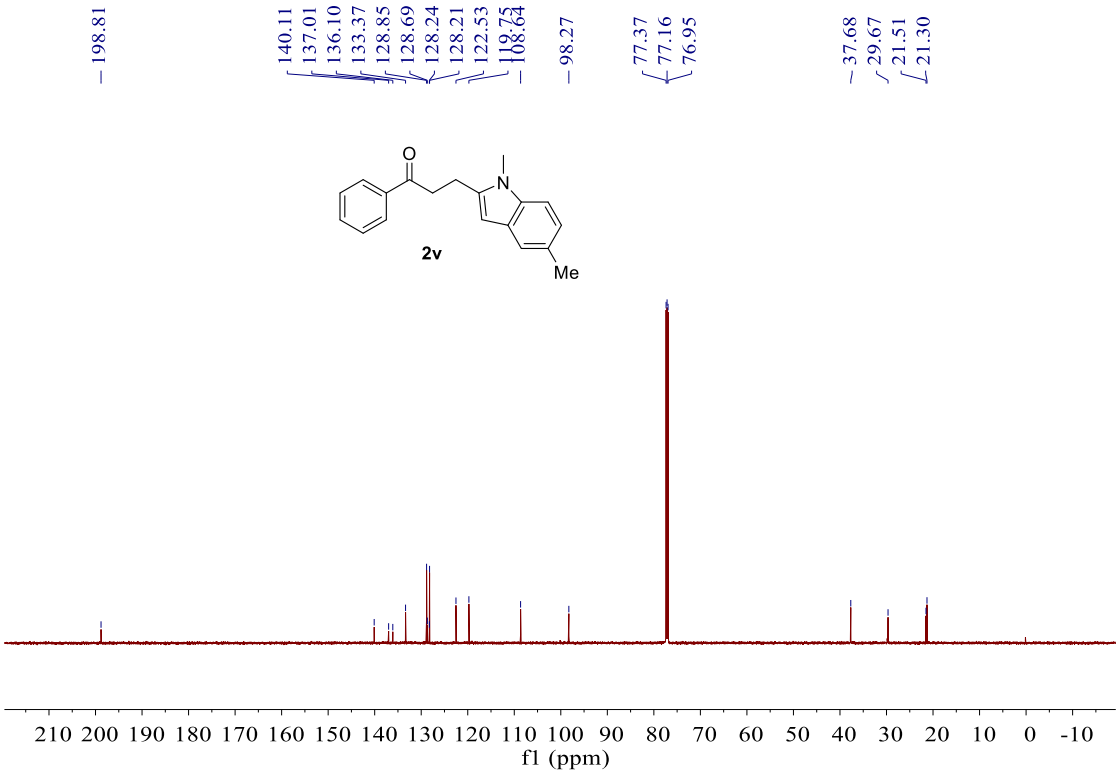
^{13}C NMR (151 MHz, $CDCl_3$) for **2u**



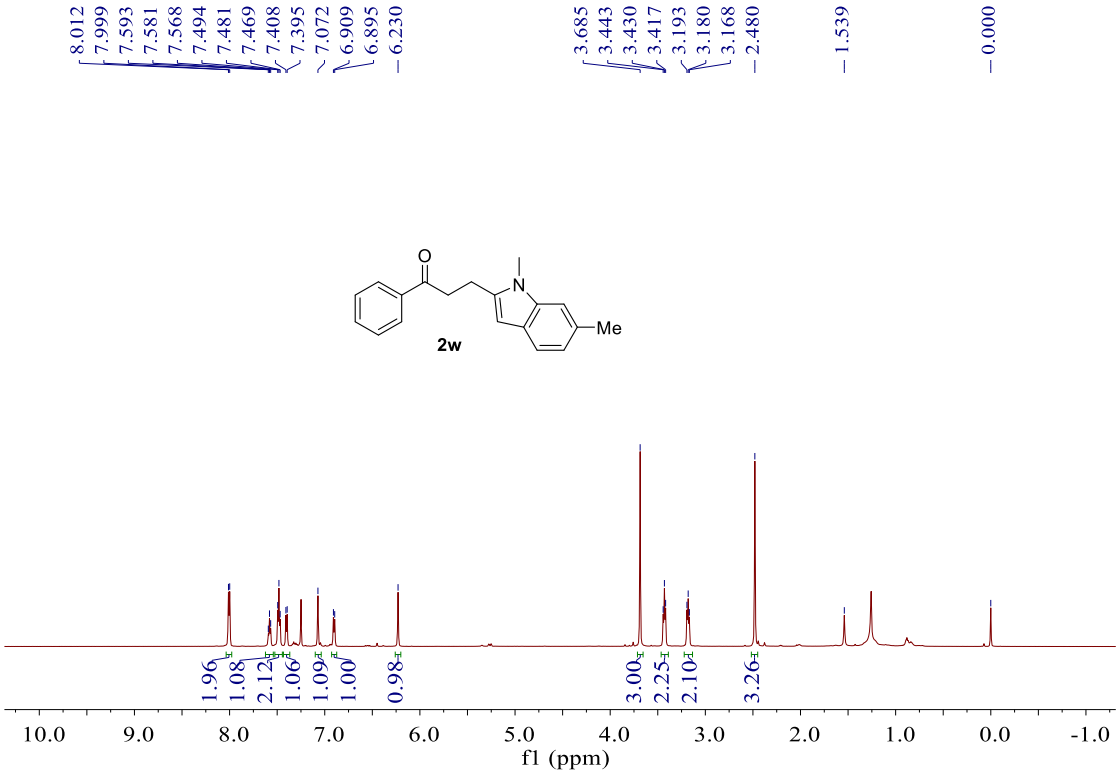
^{1}H NMR (600 MHz, $CDCl_3$) for **2v**



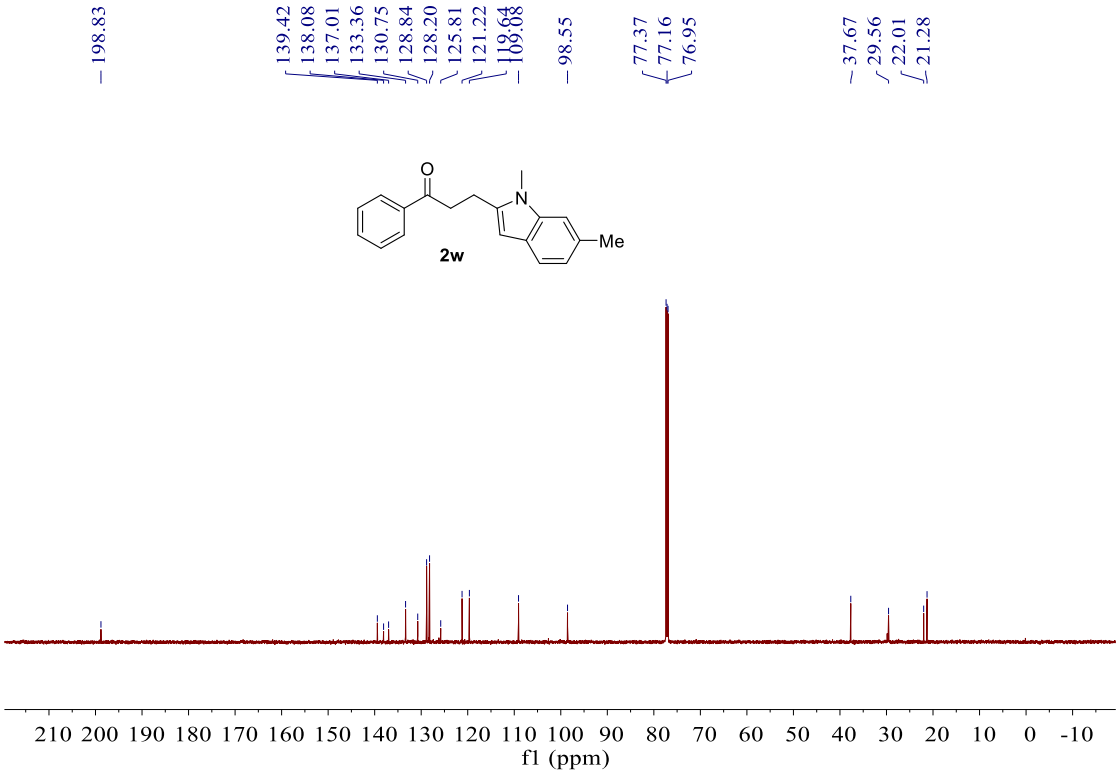
^{13}C NMR (151 MHz, $CDCl_3$) for **2v**



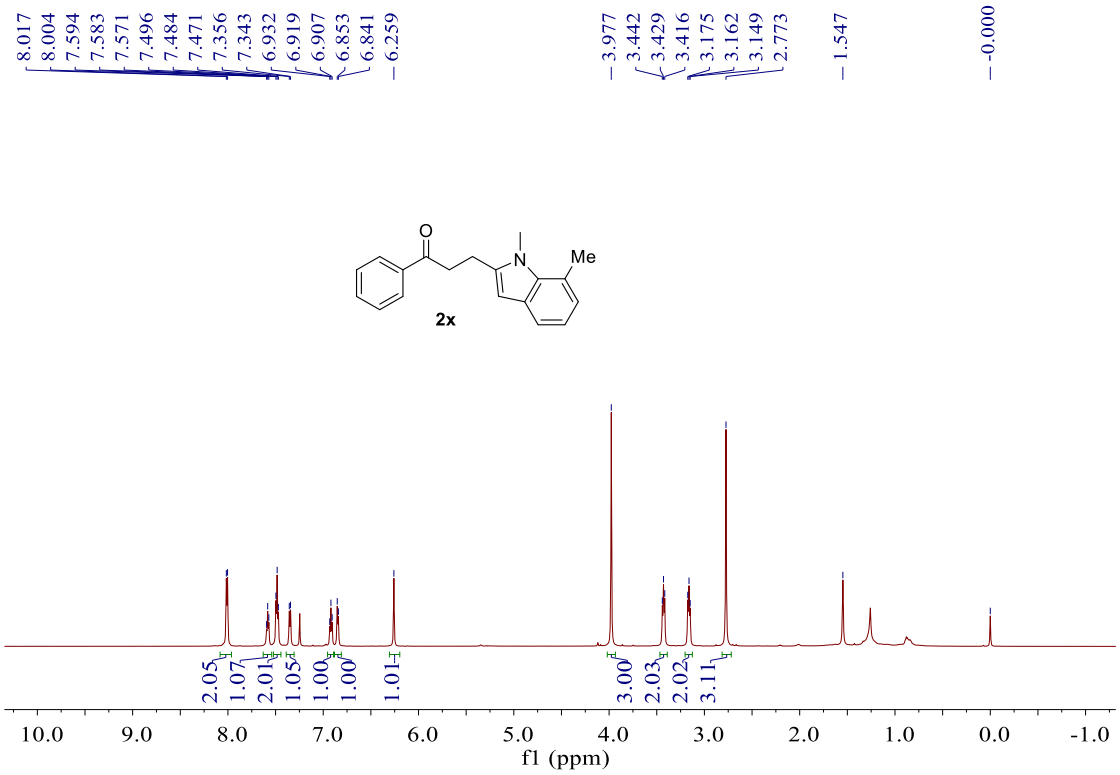
^{1}H NMR (600 MHz, $CDCl_3$) for **2w**



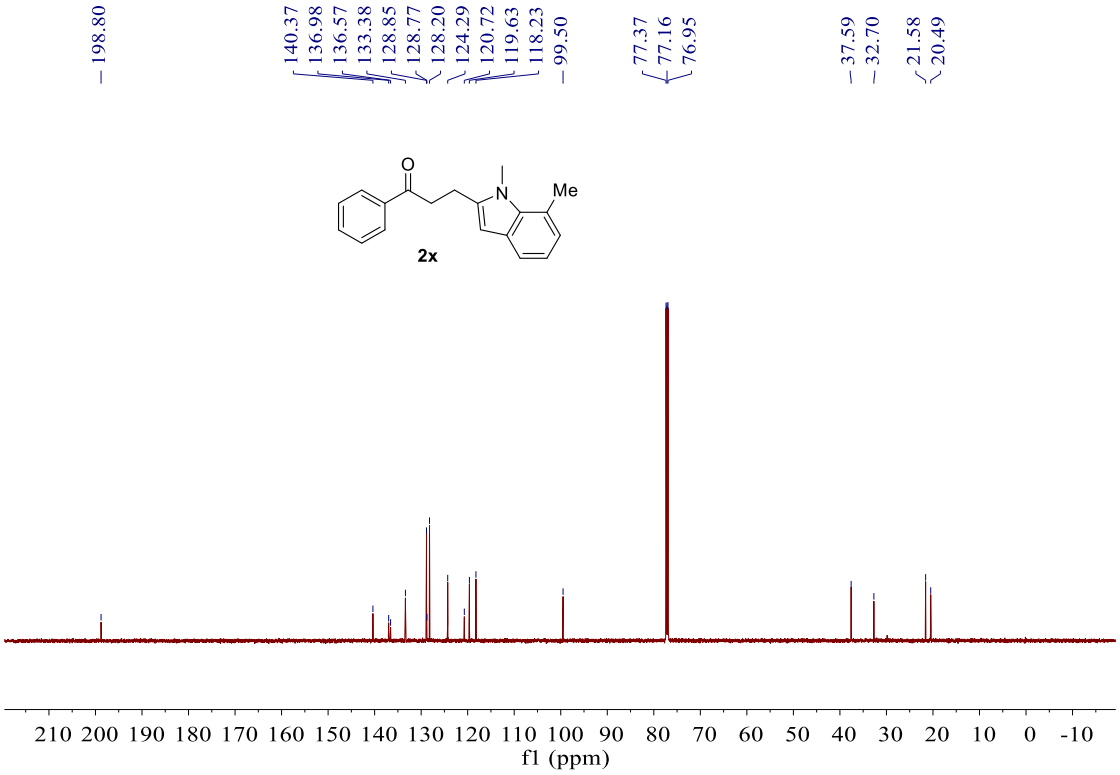
^{13}C NMR (151 MHz, $CDCl_3$) for **2w**



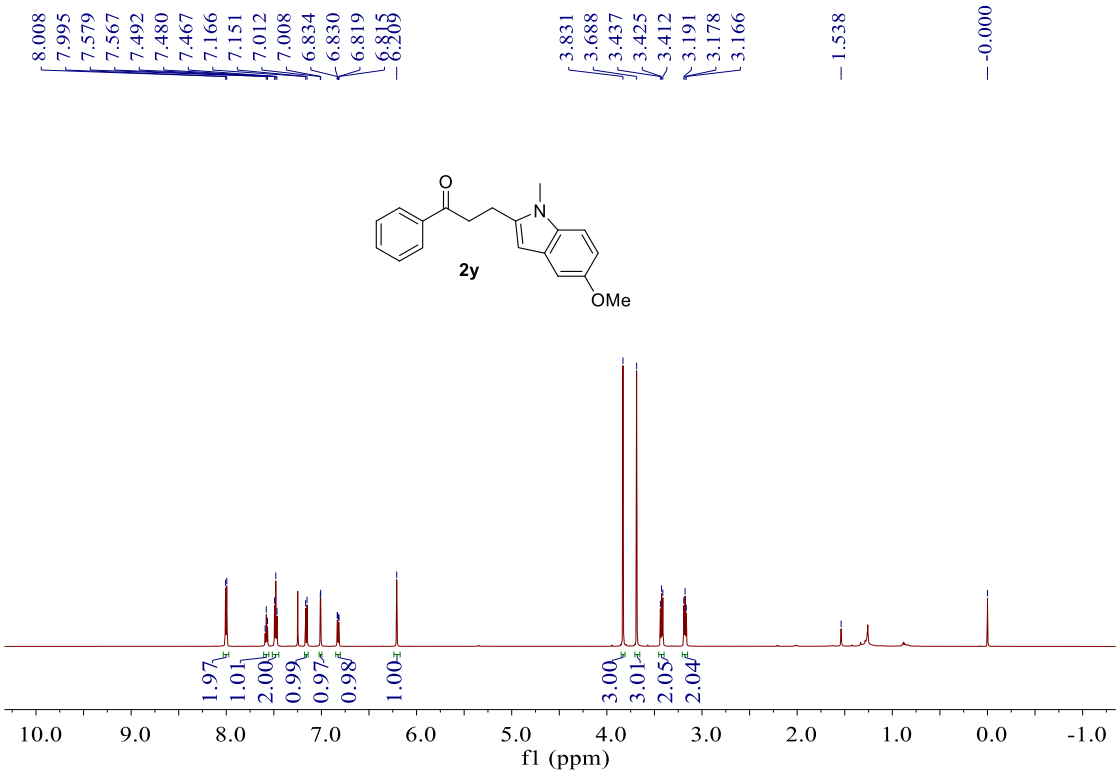
^{1}H NMR (600 MHz, $CDCl_3$) for **2x**



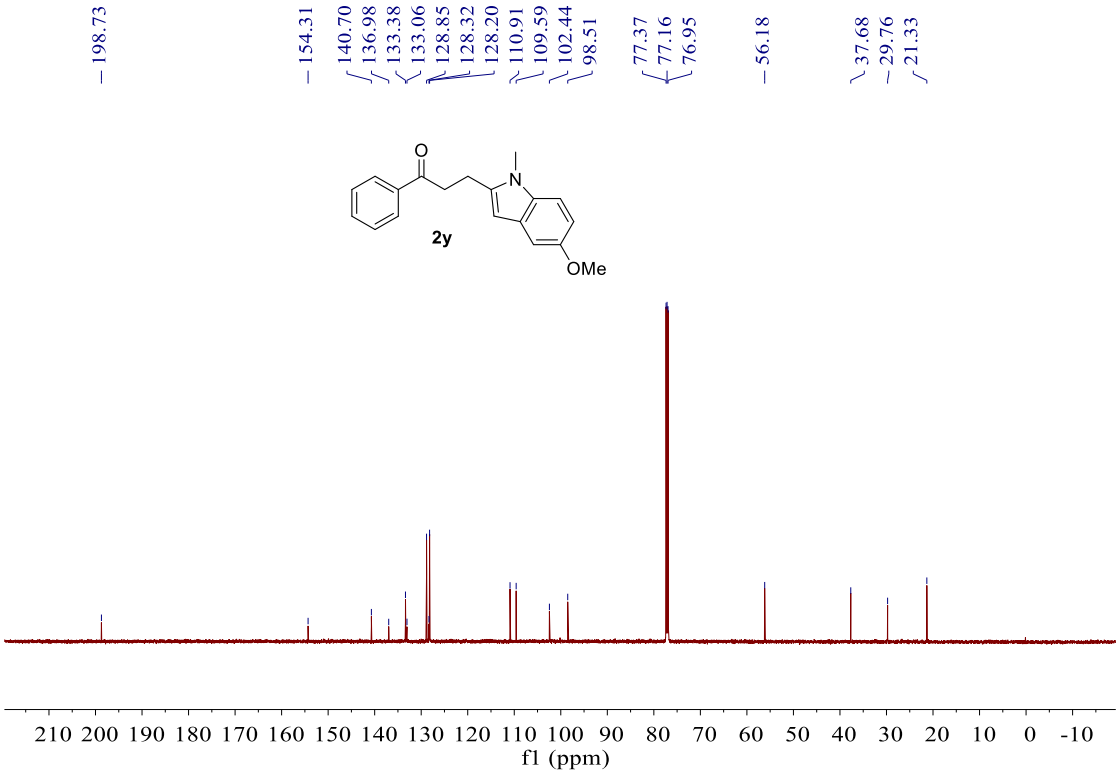
^{13}C NMR (151 MHz, $CDCl_3$) for **2x**



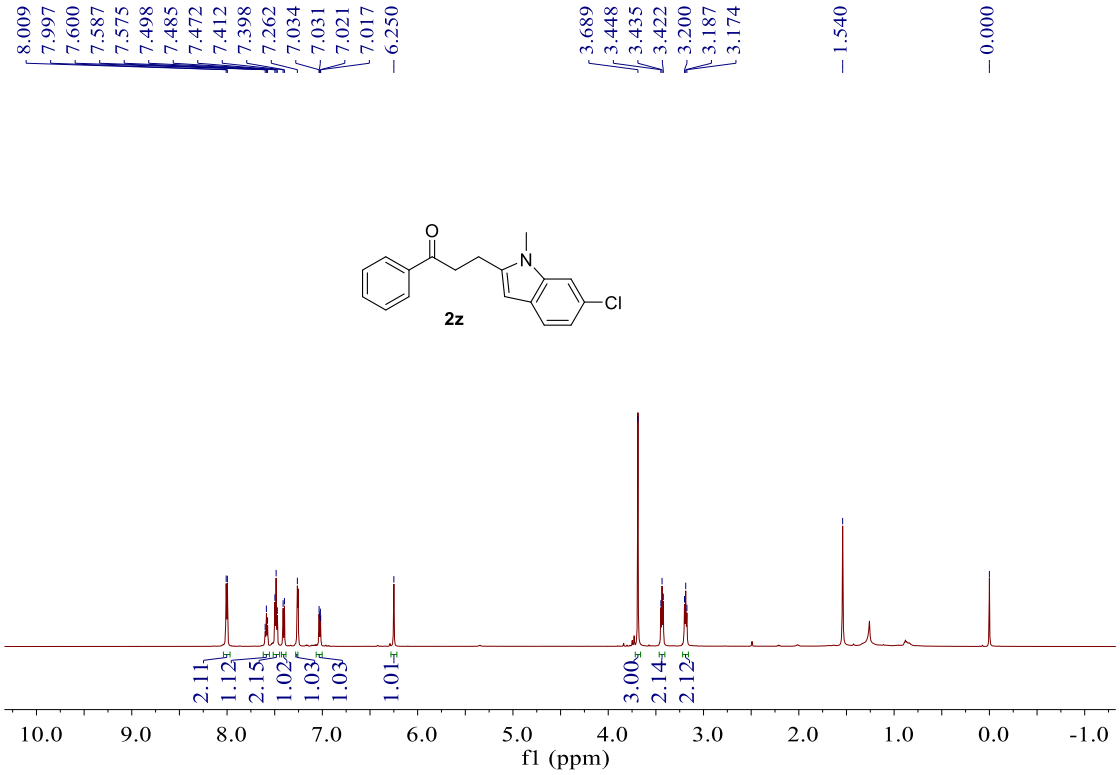
^{1}H NMR (600 MHz, $CDCl_3$) for **2y**



^{13}C NMR (151 MHz, $CDCl_3$) for **2y**



^{1}H NMR (600 MHz, $CDCl_3$) for **2z**



^{13}C NMR (151 MHz, $CDCl_3$) for **2z**