Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

Photo-Induced 1,2-Alkylarylation/Cyclization of Alkenes, Alkyl Halides and *N*-Alkylindoles via an EDA-Complex

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1. General information

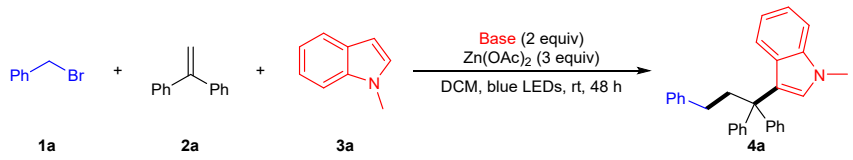
All reactions were carried out under a nitrogen atmosphere in Schlenk tubes. Anhydrous solvent (including DCM, 99.9%, Water< 30 ppm) were purchased from Adamas, and used as received. Commercially available compounds were obtained from Adamas, Bidepharm, Energy Chemical and used as received unless otherwise stated.

^{1}H NMR and proton-decoupled ^{13}C NMR were recorded on Agilent 400-MR DD2 (400 MHz) spectrometers at ambient temperature (^{1}H: 400 MHz, ^{13}C: 101 MHz). ^{1}H NMR, ^{13}C NMR and ^{19}F NMR were recorded on Bruker AVANCE III (600 MHz) spectrometers at ambient temperature (^{1}H: 600 MHz, ^{13}C: 151 MHz, ^{19}F: 564 MHz). Chemical shifts (δ) for ^{1}H and ^{13}C NMR spectra are given in ppm relative to TMS (δ= 0.00 ppm), and the residual solvent signals were used as references for ^{1}H and ^{13}C NMR spectra and the chemical shifts converted to the TMS scale ($CDCl_3$: δH = 7.26 ppm, δC = 77.16 ppm). The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, b = broad.

TLC was performed using commercially prepared 100-400 mesh silica gel plates (GF254), and visualization was effected at 254 nm. High-resolution mass spectra were recorded on a Bruker maXis instrument using ESI technique. The UV-Vis spectrum (UV-Vis) was determined by Shimadzu UV2550. X-ray data was collected with a Bruker Smart Apex II diffractometer with MoKα radiation.

2. Additional reaction optimization tables

Table S1. Screening of bases

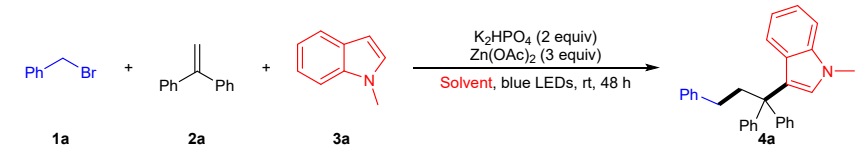


1a **2a** **3a** **4a**

Entry	Base	**4a**/Yield
1	K_2HPO_4	90
2	$NaHCO_3$	80
3	K_3PO_4	79
4	KH_2PO_4	36
5	KO^{t}Bu	61
6	DBU	<10

Reaction conditions: **1a** (0.4 mmol, 2.0 equiv), **2a** (0.6 mmol, 3.0 equiv), **3a** (0.2 mmol), base (0.4 mmol, 2.0 equiv), $Zn(OAc)_2$ (0.6 mmol, 3.0 equiv) in 2 mL DCM under N_2 atmosphere, 30 W blue LEDs, room temperature (rt, about 40 °C), 48 h. DCM = Dichloromethane.

Table S2. Screening of solvents

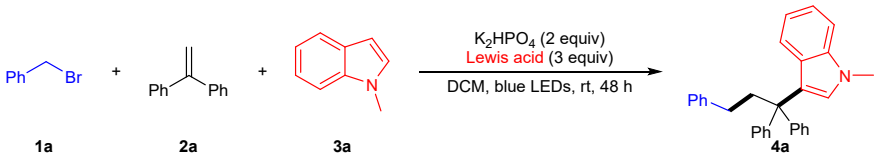


1a 2a 3a 4a

Entry	Solvent	**4a**/Yield
1	DCM	90
2	DCE	88
3	MeCN	39
4	DMF	N.D.

Reaction conditions: **1a** (0.4 mmol, 2.0 equiv), **2a** (0.6 mmol, 3.0 equiv), **3a** (0.2 mmol), K_2HPO_4 (0.4 mmol, 2.0 equiv), $Zn(OAc)_2$ (0.6 mmol, 3.0 equiv) in 2 mL solvent under N_2 atmosphere, 30 W blue LEDs, rt (about 40 °C), 48 h. DCE = Dichloroethane, DMF = *N*,*N*-Dimethylformamide.

Table S3. Screening of lewis acids

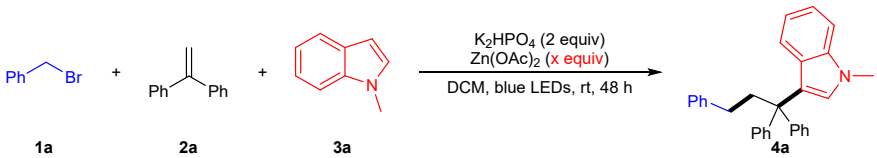


1a 2a 3a 4a

Entry	Lewis acid	**4a**/Yield
1	$Zn(OAc)_2$	90
2	$ZnCl_2$	42
3	$FeCl_3$	24
4	CuCl	trace

Reaction conditions: **1a** (0.4 mmol, 2.0 equiv), **2a** (0.6 mmol, 3.0 equiv), **3a** (0.2 mmol), K_2HPO_4 (0.4 mmol, 2.0 equiv), Lewis acid (0.6 mmol, 3.0 equiv) in 2 mL DCM under N_2 atmosphere, 30 W blue LEDs, rt (about 40 °C), 48 h.

Table S4. Screening of equivs



1a 2a 3a 4a

Entry	$Zn(OAc)_2$ (x equiv)	**4a**/Yield
1	3 equiv	90
2	4 equiv	80
3	2 equiv	82
4	1 equiv	80
5	0.5 equiv	78

Reaction conditions: **1a** (0.4 mmol, 2.0 equiv), **2a** (0.6 mmol, 3.0 equiv), **3a** (0.2 mmol), K_2HPO_4 (0.4 mmol, 2.0 equiv), $Zn(OAc)_2$ (2x mmol, x equiv) in 2 mL DCM under N_2 atmosphere, 30 W blue LEDs, rt (about 40 °C), 48 h.

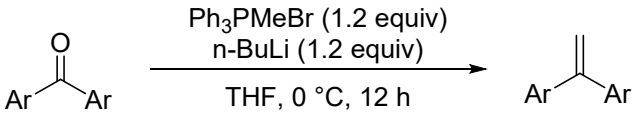
3 Synthesis of starting materials

3.1 Synthesis of alkenes 2

The alkenes **2** in **Table 3** were prepared according to the Wittig reaction.

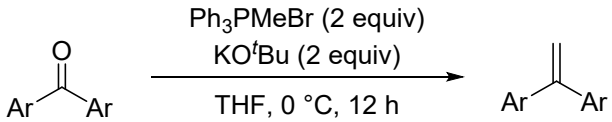
Note：Ketone: *n*-BuLi[1] (**2a**, **2b**, **2c**, **2d**, **2g, 2h, 2k**, **2l, 2m, 2n**) or KO*t*Bu[2] (**2e, 2f**, **2i**, **2j**) as a strong base.

General procedures A:



To a stirred solution of Ph_3PCH_3Br (1.2 equiv) in THF (0.30 M) at 0 °C was added *n*-BuLi (1.2 equiv). The reaction mixture was stirred for 2.5 hours at room temperature. Ketone (20 mmol) in THF (10 mL) was added dropwise to the cooled reaction mixture at 0 °C. The reaction was then stirred at room temperature for 12 h, and then quenched with saturated NH_4Cl (40 mL), diluted with water (30 mL) and extracted with EtOAc (3 x 30 mL). The combined organic extracts were washed with brine (2 x 30 mL), dried over Na_2SO_4 and concentrated under reduced pressure. The product was isolated by flash column chromatography (eluent: PE).

General procedures B:

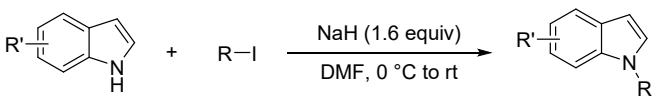


Ph_3PCH_3Br (2.0 equiv) was added to a flame-dried round-bottom flask, evacuated, backfilled with N_2 three times, and suspended in THF (0.30 M). To this vigorously stirring heterogeneous solution was added KO*t*Bu (2.0 equiv), and the reaction was allowed to stirred at room temperature for 15 min until a bright yellow heterogeneous mixture was achieved. The resulting solution was cooled to 0 °C, and the ketone (20 mmol) was added slowly. Upon complete addition, the cooling bath was removed, and the reaction was allowed to stir for 12 h, and then quenched with saturated NH_4Cl (40 mL), diluted with water (30 mL) and extracted with EtOAc (3 x 30 mL). The combinedorganic extracts were washed with brine (2 x 30 mL), dried over Na_2SO_4 and concentrated under reduced pressure. The product was isolated by flash column chromatography (eluent: PE).

3.2 Synthesis of *N*-alkyl indoles 3

The *N*-alkyl indoles **3** in **Table 3** were prepared according to the general procedure.[3]

General Procedure:



To a well-stirred solution of indole derivatives (10 mmol) in DMF (20 mL) at 0 °C was added sodium hydride (60% in mineral oil, 16 mmol, 1.6 equiv). The reaction was warmed to room temperature and allowed to stir for 30 min. After 30 min, the reaction flask was cooled again to 0 °C and alkyl iodides (12 mmol, 1.2 equiv) was

added dropwise. The reaction mixture was warmed to room temperature and allowed to stir untill the reaction completed (monitored by TLC) and then cooled to 0 °C and quenched with saturated aqueous NH_4Cl. The product was extracted with diethyl ether (3 x 20 mL) and dried over anhydrous Na_2SO_4. The organic phase was concentrated in vacuum to obtain the crude mixture which was further purified by column chromatography (eluent: PE/EA = 30 : 1).

4. Experimental procedures and characterization data

General procedure for the synthesis of 4a-4t, 5a-5o and 6a-6m:

An oven-dried Schlenk tube (10 mL) containing a stirring bar was charged with K_2HPO_4 (69.7 mg, 0.4 mmol, 2 equiv) and $Zn(OAc)_2$ (110.1 mg, 0.6 mmol, 3 equiv). The tube was then connected to a vacuum line where it was evacuated and back-filled with N_2 for 3 times. Then DCM (2 mL), benzyl halides (0.4 mmol, 2 equiv), alkenes (0.6 mmol, 3 equiv) and indoles (0.2 mmol, 1 equiv) were added under N_2 flow. Finally, the reaction mixture in sealed tube was placed in water bath and irradiated with a 30 W blue LED lamp (1 ~ 2 cm away, with cooling fan to keep the reaction temperature at 40~45 °C) for 48 hours (wavelength: 460 nm). Then, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (petroleum ether/dichloromethane 30/1 ~ 3/1) to give the pure desired product.

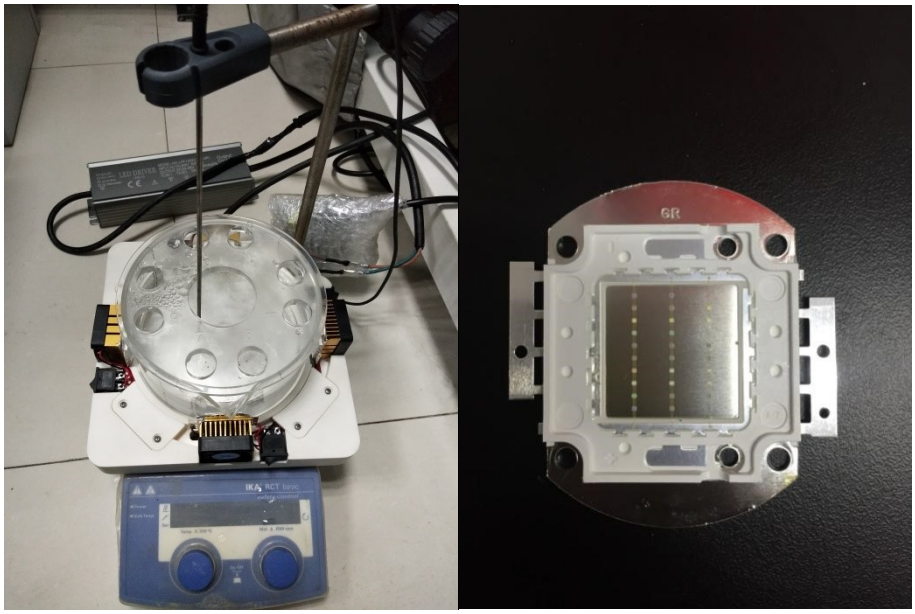
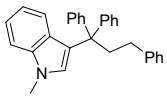


Figure S1. Blue LED Photoreactor

1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (4a)



72.3 mg, 0.180 mmol, 90%;

Pure white solid;

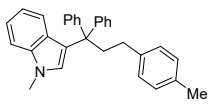
R_f (PE/DCM 10/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 7.4 Hz, 4H), 7.30 – 7.26 (m, 3H), 7.26 – 7.21 (m, 4H), 7.21 – 7.15 (m, 4H), 7.15 – 7.05 (m, 3H), 6.92 (t, *J* = 7.6 Hz, 1H), 6.73 (s, 1H), 3.74 (s, 3H), 3.01 – 2.93 (m, 2H), 2.45 – 2.37 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.15, 142.98, 137.70, 128.99, 128.67, 128.35, 128.27, 127.85, 127.02, 125.79, 125.68, 122.32, 121.30, 120.72, 118.56, 109.21, 52.25, 42.33, 32.79, 32.56;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{27}NNa]^+$: 424.2036, found: 424.2040.

3-(1,1-diphenyl-3-(p-tolyl)propyl)-1-methyl-1*H*-indole (4b)



70.6 mg, 0.170 mmol, 85%;

Pure white solid;

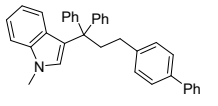
R_f (PE/DCM 5/1): 0.32;

^{1}H NMR (600 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.4 Hz, 4H), 7.30 – 7.22 (m, 6H), 7.18 – 7.13 (m, 4H), 7.05 (d, *J* = 7.8 Hz, 2H), 6.99 (d, *J* = 7.9 Hz, 2H), 6.91 (t, *J* = 7.2 Hz, 1H), 3.73 (s, 3H), 2.97 – 2.92 (m, 2H), 2.39 – 2.35 (m, 2H), 2.29 (s, 3H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.30, 139.99, 137.81, 135.19, 129.13, 129.06, 128.79, 128.24, 127.92, 127.14, 125.86, 122.43, 121.37, 120.90, 118.64, 109.28, 52.36, 42.63, 32.83, 32.17, 21.10;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2195.

3-(3-([1,1'-biphenyl]-4-yl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4c)



69.5 mg, 0.146 mmol, 73%;

Pure white solid;

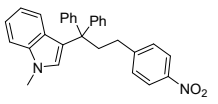
R_f (PE/DCM 6/1): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 7.5 Hz, 2H), 7.52 – 7.34 (m, 8H), 7.33 – 7.24 (m, 6H), 7.22 – 7.07 (m, 6H), 6.93 (t, *J* = 7.5 Hz, 1H), 6.75 (s, 1H), 3.74 (s, 3H), 3.05 – 2.96 (m, 2H), 2.50 – 2.41 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.17, 142.14, 141.13, 138.69, 137.74, 129.07, 128.75, 128.73, 128.70, 127.92, 127.12, 127.02, 125.86, 122.35, 121.36, 120.70, 118.63, 109.28, 52.31, 42.27, 32.82, 32.23;

Exact Mass ESI-MS: calculated m/z for $[C_{36}H_{31}Na]^+$: 500.2349, found: 500.2346.

1-methyl-3-(3-(4-nitrophenyl)-1,1-diphenylpropyl)-1*H*-indole (4d)



61.2 mg, 0.137 mmol, 69%;

Pale yellow solid;

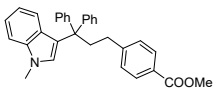
R_f (PE/EA 20/1): 0.24;

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (d, *J* = 8.6 Hz, 2H), 7.41 (d, *J* = 7.5 Hz, 4H), 7.31 – 7.25 (m, 5H), 7.24-7.14 (m, 5H), 7.12 (d, *J* = 8.0 Hz, 1H), 6.93 (t, *J* = 7.5 Hz, 1H), 6.70 (s, 1H), 3.74 (s, 3H), 3.02 – 2.94 (m, 2H), 2.58 – 2.50 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 150.94, 146.80, 146.16, 137.75, 129.21, 129.04, 128.49, 128.04, 126.85, 126.05, 123.57, 122.12, 121.52, 120.19, 118.76, 109.39, 52.31, 41.47, 32.83, 32.74;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}N_2O_2Na]^+$: 469.1886, found: 469.1887.

methyl 4-(3-(1-methyl-1*H*-indol-3-yl)-3,3-diphenylpropyl)benzoate (4e)



89.1 mg, 0.194 mmol, 97%;

Pure white solid;

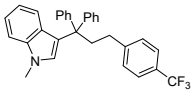
R_f (PE/EA 10/1): 0.27;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 (d, *J* = 8.1 Hz, 2H), 7.42 (d, *J* = 7.5 Hz, 4H), 7.30 – 7.24 (m, 5H), 7.22 – 7.09 (m, 6H), 6.93 (t, *J* = 7.5 Hz, 1H), 6.71 (s, 1H), 3.88 (s, 3H), 3.74 (s, 3H), 3.01 – 2.93 (m, 2H), 2.50 – 2.43 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.15, 148.59, 146.97, 137.72, 129.71, 129.06, 128.59, 128.32, 127.94, 127.67, 126.93, 125.91, 122.23, 121.40, 120.48, 118.65, 109.29, 52.28, 51.99, 41.82, 32.81, 32.75;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NO_2Na]^+$: 482.2091, found: 482.2098.

1-methyl-3-(3-(4-nitrophenyl)-1,1-diphenylpropyl)-1*H*-indole (4f)



82.9 mg, 0.176 mmol, 88%;

Pure white solid;

R_f (PE/DCM 10/1): 0.31;

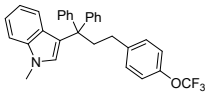
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.46 (d, *J* = 8.0 Hz, 2H), 7.41 (d, *J* = 7.6 Hz, 4H), 7.29 – 7.25 (m, 5H), 7.19 – 7.15 (m, 5H), 7.13 (d, *J* = 8.1 Hz, 1H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.70 (s, 1H), 3.73 (s, 3H), 2.99 – 2.94 (m, 2H), 2.50 – 2.45 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.11 (q, *J* = 1.3 Hz), 146.95, 137.74, 129.10, 128.57, 127.97, 127.85 (q, *J* = 32.3 Hz), 126.92, 125.95, 125.21 (q, *J* = 3.7 Hz), 124.51 (q, *J* = 300.0 Hz), 122.20, 121.44, 120.42, 118.68, 109.32, 52.28, 41.86, 32.80, 32.55;

^{19}F NMR (564 MHz, $CDCl_3$) δ -62.26;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{26}F_3NNa]^+$: 492.1910, found: 492.1919.

3-(1,1-diphenyl-3-(4-(trifluoromethoxy)phenyl)propyl)-1-methyl-1*H*-indole (4g)



86.2 mg, 0.178 mmol, 89%;

Pure white solid;

R_f (PE): 0.40;

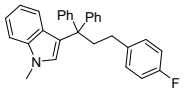
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.4 Hz, 4H), 7.29 – 7.22 (m, 5H), 7.20 – 7.12 (m, 4H), 7.06 (s, 4H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.70 (s, 1H), 3.72 (s, 3H), 2.99 – 2.91 (m, 2H), 2.46 – 2.38 (m, 2H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.35, 147.12, 141.80, 137.84, 129.54, 129.14, 128.69, 128.02, 127.05, 125.99, 122.32, 121.50, 121.00, 120.64, 120.62 (q, *J* = 256.5 Hz), 118.74, 109.37, 52.36, 42.21, 32.82, 32.04;

^{19}F NMR (564 MHz, $CDCl_3$) δ -57.92;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{26}F_3NONa]^+$: 508.1859, found: 508.1858.

3-(3-(4-fluorophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4h)



55.8 mg, 0.133 mmol, 67%;

Pure white solid;

R_f (PE/EA 5/1): 0.25;

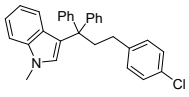
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.5 Hz, 4H), 7.29 – 7.24 (m, 5H), 7.17 (t, *J* = 7.3 Hz, 3H), 7.13 (d, *J* = 8.1 Hz, 1H), 7.05 – 7.00 (m, 2H), 6.94 – 6.89 (m, 3H), 6.70 (s, 1H), 3.73 (s, 3H), 2.96 – 2.91 (m, 2H), 2.41 – 2.36 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 161.41 (d, *J* = 249.5 Hz), 146.06, 142.79, 137.68, 133.51 (d, *J* = 11.4 Hz), 130.78 (d, *J* = 4.3 Hz), 128.37, 128.29, 128.24, 127.74, 127.12, 125.93, 125.73, 123.46 (d, *J* = 3.3 Hz), 122.06, 121.37, 119.30, 118.73, 116.51 (d, *J* = 23.9 Hz), 109.32, 51.24, 41.06 (d, *J* = 4.4 Hz), 32.86, 32.81;

^{19}F NMR (564 MHz, $CDCl_3$) δ -117.96;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}FNNa]^+$: 442.1941, found: 442.1938.

3-(3-(4-chlorophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4i)



82.9 mg, 0.190 mmol, 95%;

Pure white solid;

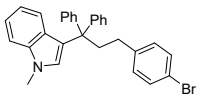
R_f (PE/DCM 5/1): 0.33;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 – 7.36 (m, 4H), 7.29 (d, *J* = 8.9 Hz, 2H), 7.25 (d, *J* = 5.7 Hz, 3H), 7.21 – 7.10 (m, 6H), 7.00 (d, *J* = 8.4 Hz, 2H), 6.93 (d, *J* = 11.1, 4.0 Hz, 1H), 6.70 (s, 1H), 3.74 (s, 3H), 2.99 – 2.89 (m, 2H), 2.42 – 2.34 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.07, 141.43, 137.76, 131.37, 129.65, 129.05, 128.63, 128.43, 127.94, 126.99, 125.91, 122.26, 121.41, 120.59, 118.67, 109.30, 52.29, 42.23, 32.81, 32.03;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}ClNNa]^+$: 458.1646, found: 458.1642.

3-(3-(4-bromophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4j)



70.6 mg, 0.174 mmol, 87%;

Pure white solid;

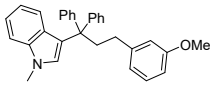
R_f (PE/DCM 5/1): 0.33;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 (d, *J* = 7.6 Hz, 4H), 7.33 (d, *J* = 8.2 Hz, 2H), 7.30 – 7.23 (m, 5H), 7.20 – 7.10 (m, 4H), 6.98 – 6.88 (m, 3H), 6.70 (s, 1H), 3.73 (s, 3H), 2.97 – 2.89 (m, 2H), 2.40 – 2.32 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.11, 142.00, 137.79, 131.44, 130.15, 129.14, 128.68, 128.03, 127.01, 125.99, 122.31, 121.48, 120.58, 119.45, 118.74, 109.40, 52.32, 42.19, 32.86, 32.15;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}BrNNa]^+$: 502.1141, found: 502.1144.

3-(3-(3-methoxyphenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4k)



63.3 mg, 0.146 mmol, 73%;

Pure white solid;

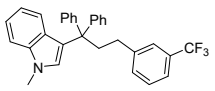
R_f (PE/DCM 5/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 8.2 Hz, 4H), 7.30 – 7.24 (m, 5H), 7.21 – 7.10 (m, 5H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.76 – 6.66 (m, 3H), 6.63 (s, 1H), 3.75 (s, 3H), 3.74 (s, 3H), 3.01 – 2.92 (m, 2H), 2.39 (dd, *J* = 10.5, 6.3 Hz, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.60, 147.15, 144.68, 137.72, 129.32, 129.05, 128.68, 127.89, 127.00, 125.83, 122.32, 121.33, 120.71, 120.66, 118.58, 114.14, 110.85, 109.25, 55.15, 52.26, 42.17, 32.81, 32.63;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NONa]^+$: 454.2141, found: 454.2141.

3-(1,1-diphenyl-3-(4-(trifluoromethyl)phenyl)propyl)-1-methyl-1*H*-indole (4l)



70.0 mg, 0.149 mmol, 75%;

Pure white solid;

R_f (PE/DCM 10/1): 0.25;

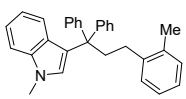
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 – 7.36 (m, 5H), 7.35 – 7.23 (m, 8H), 7.22 – 7.11 (m, 4H), 6.93 (t, *J* = 7.5 Hz, 1H), 6.72 (s, 1H), 3.75 (s, 3H), 3.03 – 2.94 (m, 2H), 2.53 – 2.45 (m, 2H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.02, 143.90, 137.82, 131.75, 130.62 (q, *J* = 31.9 Hz), 129.13, 128.77, 128.68, 128.03, 127.01, 126.01, 124.99 (q, *J* = 3.5 Hz), 124.33 (q, *J* = 272.3 Hz), 122.63 (q, *J* = 3.4 Hz), 122.31, 121.51, 120.54, 118.75, 109.37, 52.39, 42.04, 32.83, 32.56;

^{19}F NMR (564 MHz, $CDCl_3$) δ -62.47;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{26}F_3NNa]^+$: 492.1910, found: 492.1912.

3-(1,1-diphenyl-3-(o-tolyl)propyl)-1-methyl-1*H*-indole (4m)



74.2 mg, 0.168 mmol, 84%;

Pure white solid;

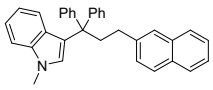
R_f (PE/DCM 10/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 7.7 Hz, 4H), 7.35 – 7.22 (m, 5H), 7.21 – 7.13 (m, 4H), 7.09 (d, *J* = 17.3 Hz, 4H), 6.91 (t, *J* = 6.4 Hz, 1H), 6.79 (s, 1H), 3.75 (s, 3H), 2.94 – 2.84 (m, 2H), 2.43 – 2.34 (m, 2H), 2.02 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.11, 141.18, 137.73, 135.97, 130.17, 128.90, 128.70, 128.23, 128.13, 127.86, 127.01, 125.98, 125.82, 122.44, 121.33, 120.84, 118.53, 109.20, 52.36, 40.97, 32.80, 29.82, 19.15;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2194.

1-methyl-3-(3-(naphthalen-2-yl)-1,1-diphenylpropyl)-1*H*-indole (4n)



56.6 mg, 0.125 mmol, 63%;

Pure white solid;

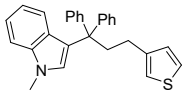
R_f (PE/DCM 30/1): 0.24;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 – 7.68 (m, 3H), 7.53 (s, 1H), 7.46 (d, *J* = 7.5 Hz, 4H), 7.43 – 7.32 (m, 2H), 7.31 – 7.24 (m, 5H), 7.24 – 7.11 (m, 5H), 6.94 (t, *J* = 7.5 Hz, 1H), 6.76 (s, 1H), 3.74 (s, 3H), 3.11 – 3.02 (m, 2H), 2.63 – 2.54 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.21, 140.55, 137.77, 133.68, 131.95, 129.10, 128.74, 127.96, 127.91, 127.65, 127.40, 127.07, 126.10, 125.93, 125.90, 125.11, 122.39, 121.39, 120.75, 118.66, 109.31, 52.38, 42.26, 32.84, 32.80;

Exact Mass ESI-MS: calculated m/z for $[C_{34}H_{29}NNa]^+$: 474.2192, found: 474.2188.

3-(1,1-diphenyl-3-(thiophen-3-yl)propyl)-1-methyl-1*H*-indole (4o)



43.9 mg, 0.108 mmol, 54%;

Pure white solid;

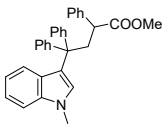
R_f (PE/DCM 10/1): 0.24;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, J = 7.6 Hz, 4H), 7.31 – 7.26 (m, 3H), 7.26 – 7.11 (m, 7H), 6.98 – 6.81 (m, 3H), 6.71 (s, 1H), 3.74 (s, 3H), 3.00 (dd, J = 10.3, 6.6 Hz, 2H), 2.49 – 2.39 (m, 2H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.16, 143.09, 137.76, 129.01, 128.70, 128.25, 127.92, 127.07, 125.87, 125.26, 122.34, 121.36, 120.71, 119.66, 118.63, 109.25, 52.22, 40.97, 32.82, 27.13;

Exact Mass ESI-MS: calculated m/z for $[C_{28}H_{25}NSNa]^+$: 430.1600, found: 430.1595.

methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (X = Br, 4p)



50.2 mg, 0.109 mmol, 55%;

Pure white solid;

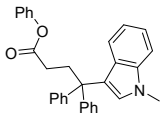
R_f (PE/EA 20/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 – 7.37 (m, 4H), 7.28 (s, 2H), 7.27 – 7.18 (m, 8H), 7.16 – 7.10 (m, 3H), 7.01 (d, *J* = 8.1 Hz, 1H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.74 (s, 1H), 3.72 (s, 3H), 3.68 (d, *J* = 7.2 Hz, 2H), 3.26 (q, *J* = 11.9 Hz, 1H), 2.85 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.52, 146.18, 146.13, 141.22, 137.62, 129.52, 128.62, 128.01, 127.88, 127.06, 126.92, 125.95, 122.59, 121.29, 119.62, 118.51, 108.98, 52.88, 51.39, 49.58, 32.70;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NO_2Na]^+$: 482.2091, found: 482.2082.

phenyl 4-(1-methyl-1*H*-indol-3-yl)-4,4-diphenylbutanoate (4q)



54.1 mg, 0.121 mmol, 61%;

Pure white solid;

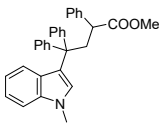
R_f (PE/EA 15/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.6 Hz, 4H), 7.34 – 7.23 (m, 7H), 7.20 – 7.14 (m, 4H), 7.10 (d, *J* = 8.0 Hz, 1H), 6.98 (d, *J* = 7.9 Hz, 2H), 6.91 (t, *J* = 7.6 Hz, 1H), 6.77 (s, 1H), 3.70 (s, 3H), 3.20 – 3.10 (m, 2H), 2.47 – 2.39 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 172.49, 150.68, 146.45, 137.77, 129.35, 128.92, 128.53, 128.06, 126.79, 126.06, 125.71, 122.26, 121.53, 121.48, 119.98, 118.76, 109.31, 51.62, 34.73, 32.78, 31.75;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{27}NO_2Na]^+$: 468.1934, found: 468.1939.

methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (X = Cl, 4r)



79.0 mg, 0.172 mmol, 86%;

Pure white solid;

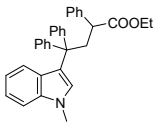
R_f (PE/EA 20/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 – 7.37 (m, 4H), 7.28 (s, 2H), 7.27 – 7.18 (m, 8H), 7.16 – 7.10 (m, 3H), 7.01 (d, *J* = 8.1 Hz, 1H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.74 (s, 1H), 3.72 (s, 3H), 3.68 (d, *J* = 7.2 Hz, 2H), 3.26 (q, *J* = 11.9 Hz, 1H), 2.85 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.52, 146.18, 146.13, 141.22, 137.62, 129.52, 128.62, 128.01, 127.88, 127.06, 126.92, 125.95, 122.59, 121.29, 119.62, 118.51, 108.98, 52.88, 51.39, 49.58, 32.70;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NO_2Na]^+$: 482.2091, found: 482.2082.

ethyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (X = Cl, 4s)



53.6 mg, 0.113 mmol, 57%;

Pale yellow solid;

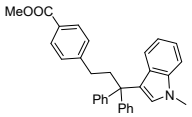
R_f (PE/EA 20/1): 0.31;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 (s, 4H), 7.27 (s, 4H), 7.24 – 7.18 (m, 6H), 7.16 – 7.10 (m, 3H), 7.00 (d, *J* = 7.9 Hz, 1H), 6.87 (t, *J* = 7.4 Hz, 1H), 6.74 (s, 1H), 3.71 (s, 3H), 3.70 – 3.59 (m, 2H), 3.28 – 3.17 (m, 3H), 0.82 (t, *J* = 7.0 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 173.22, 146.27, 146.13, 141.42, 137.60, 129.40, 128.76, 128.56, 128.03, 127.87, 126.97, 125.94, 122.60, 121.28, 119.72, 118.47, 108.95, 60.31, 52.93, 49.72, 43.22, 32.73, 13.60;

Exact Mass ESI-MS: calculated m/z for $[C_{33}H_{31}NO_2Na]^+$: 496.2247, found: 496.2241.

methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (X = Cl, 4t)



44.6 mg, 0.100 mmol, 50%;

Pure white solid;

R_f (PE/DAM 4/1): 0.20;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 (d, *J* = 8.2 Hz, 2H), 7.42 (d, *J* = 7.6 Hz, 4H), 7.30 – 7.24 (m, 5H), 7.22 – 7.07 (m, 6H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.71 (s, 1H), 3.89 (s, 3H), 3.74 (s, 3H), 3.01 – 2.92 (m, 2H), 2.51 – 2.42 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.15, 148.59, 146.96, 137.72, 129.70, 129.06, 128.58, 128.30, 127.92, 127.66, 126.93, 125.90, 122.22, 121.39, 120.48, 118.64, 109.27, 52.28, 51.99, 41.82, 32.81, 32.74;

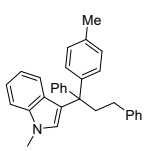
Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NO_2Na]^+$: 482.2091, found: 482.2088.

3-(1,3-diphenyl-1-(p-tolyl)propyl)-1-methyl-1*H*-indole (5a)

71.5 mg, 0.172 mmol, 86%;

Pure white solid;

R_f (PE/DCM 10/1): 0.29;

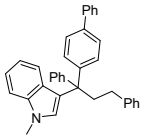


^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 7.7 Hz, 3H), 7.27 – 7.23 (m, 4H), 7.19 – 7.14 (m, 4H), 7.08 (d, 4H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.73 (s, 1H), 3.73 (s, 3H), 2.99 – 2.91 (m, 2H), 2.43 – 2.37 (m, 2H), 2.30 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.40, 144.18, 143.08, 137.73, 135.21, 128.98, 128.65, 128.60, 128.56, 128.36, 128.31, 127.85, 127.06, 125.75, 125.68, 122.39, 121.28, 120.90, 118.53, 109.21, 51.93, 42.37, 32.78, 32.58, 20.98;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2192.

3-(1-([1,1'-biphenyl]-4-yl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5b)



76.8 mg, 0.160 mmol, 80%;

Pure white solid;

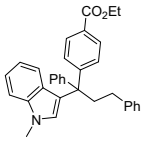
R_f (PE/DCM 5/1): 0.20;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 7.3 Hz, 2H), 7.52 – 7.44 (m, 6H), 7.40 (t, *J* = 7.5 Hz, 2H), 7.32 – 7.23 (m, 6H), 7.22 – 7.15 (m, 4H), 7.12 (d, *J* = 7.4 Hz, 2H), 6.93 (t, *J* = 7.5 Hz, 1H), 6.78 (s, 1H), 3.75 (s, 3H), 3.04 – 2.96 (m, 2H), 2.49 – 2.41 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.04, 146.29, 142.95, 140.77, 138.37, 137.71, 129.04, 129.02, 128.98, 128.69, 128.36, 128.28, 127.90, 127.05, 126.98, 126.92, 126.48, 125.86, 125.70, 122.34, 121.33, 120.62, 118.59, 109.23, 52.05, 42.32, 32.84, 32.56;

Exact Mass ESI-MS: calculated m/z for $[C_{36}H_{31}NNa]^+$: 500.2349, found: 500.2340.

ethyl4-(1-(1-methyl-1*H*-indol-3-yl)-1,3-diphenylpropyl)benzoate (5c)



79.0 mg, 0.166 mmol, 83%;

Pure white solid;

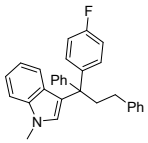
R_f (PE/DCM 10/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.5 Hz, 2H), 7.51 (d, *J* = 8.5 Hz, 2H), 7.45 – 7.39 (m, 2H), 7.30 – 7.23 (m, 4H), 7.23 – 7.14 (m, 4H), 7.13 – 7.07 (m, 3H), 6.92 (t, *J* = 7.5 Hz, 1H), 6.74 (s, 1H), 4.33 (q, *J* = 7.1 Hz, 2H), 3.72 (s, 3H), 3.03 – 2.92 (m, 2H), 2.46 – 2.33 (m, 2H), 1.35 (t, *J* = 7.1 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.61, 152.52, 146.27, 142.66, 137.75, 129.21, 128.96, 128.93, 128.66, 128.43, 128.26, 128.07, 128.03, 126.78, 126.13, 125.82, 122.10, 121.51, 120.02, 118.78, 109.36, 60.80, 52.57, 42.20, 32.84, 32.49, 14.39;

Exact Mass ESI-MS: calculated m/z for $[C_{33}H_{31}NO_2Na]^+$: 496.2247, found: 496.2246.

3-(1-(4-fluorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5d)



60.0 mg, 0.143 mmol, 72%;

Pure white solid;

R_f (PE/DCM 10/1): 0.26;

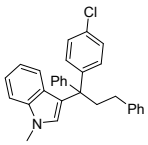
^{1}H NMR (600 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.6 Hz, 2H), 7.37 (dd, *J* = 8.7, 5.4 Hz, 2H), 7.29 – 7.23 (m, 5H), 7.19 – 7.08 (m, 6H), 6.95 – 6.91 (m, 3H), 6.72 (s, 1H), 3.74 (s, 3H), 3.03 – 2.89 (m, 2H), 2.47 – 2.34 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.89, 142.97, 142.77 (d, *J* = 1.4 Hz), 137.72, 130.17 (d, *J* = 8.0 Hz), 128.89, 128.55, 128.39, 128.24, 127.95, 126.83, 125.94, 125.75, 122.16, 121.41, 120.56, 118.68, 114.55 (d, *J* = 20.8 Hz), 109.99, 109.30, 51.78, 42.53, 32.80, 32.53;

^{19}F NMR (564 MHz, $CDCl_3$) δ -117.62;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}FNNa]^+$: 442.1941, found: 442.1934.

3-(1-(4-chlorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5e)



66.5 mg, 0.152 mmol, 76%;

Pure white solid;

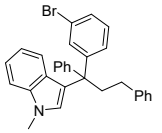
R_f (PE/DCM 20/1): 0.20;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 8.0 Hz, 2H), 7.35 (d, *J* = 7.5 Hz, 2H), 7.33 – 7.24 (m, 5H), 7.24 – 7.16 (m, 5H), 7.15 – 7.06 (m, 3H), 6.94 (t, *J* = 7.5 Hz, 1H), 6.73 (s, 1H), 3.75 (s, 3H), 3.01 – 2.86 (m, 2H), 2.46 – 2.31 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.54, 145.82, 142.68, 137.71, 131.53, 130.07, 128.90, 128.55, 128.40, 128.23, 127.99, 127.97, 126.76, 126.02, 125.78, 122.12, 121.45, 120.18, 118.72, 109.32, 51.91, 32.82, 32.47;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}ClNNa]^+$: 458.1646, found: 458.1655.

3-(1-(3-bromophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5f)



93.0 mg, 0.194 mmol, 97%;

Pure white solid;

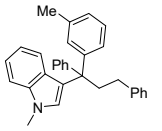
R_f (PE/DCM 10/1): 0.28;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 1.8 Hz, 1H), 7.41 (d, *J* = 7.8 Hz, 2H), 7.37 – 7.33 (m, 1H), 7.31 – 7.16 (m, 9H), 7.14 – 7.07 (m, 4H), 6.94 (t, *J* = 7.5 Hz, 1H), 6.72 (d, *J* = 1.4 Hz, 1H), 3.74 (s, 3H), 2.97 – 2.89 (m, 2H), 2.43 – 2.34 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 149.89, 146.18, 142.64, 137.73, 131.41, 129.41, 128.96, 128.63, 128.41, 128.25, 128.02, 127.52, 126.74, 126.11, 125.80, 122.18, 122.06, 121.47, 119.91, 118.77, 109.33, 52.25, 42.25, 32.83, 32.48;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}BrNNa]^+$: 502.1141, found: 502.1147.

3-(1,3-diphenyl-1-(m-tolyl) propyl)-1-methyl-1*H*-indole (5g)



68.7 mg, 0.165 mmol, 83%;

Pure white solid;

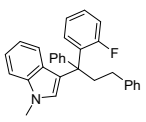
R_f (PE/DCM 30/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 8.3 Hz, 2H), 7.30 – 7.25 (m, 4H), 7.24 – 7.20 (m, 3H), 7.20 – 7.13 (m, 5H), 7.10 (d, *J* = 7.7 Hz, 2H), 6.99 (d, *J* = 7.4 Hz, 1H), 6.92 (dd, *J* = 8.0, 7.1 Hz, 1H), 6.72 (s, 1H), 3.74 (s, 3H), 2.98 – 2.93 (m, 2H), 2.42 – 2.37 (m, 2H), 2.28 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.27, 147.16, 143.12, 137.73, 137.23, 129.24, 129.06, 128.73, 128.39, 128.33, 127.87, 127.71, 127.09, 126.58, 125.96, 125.78, 125.71, 122.40, 121.29, 120.78, 118.56, 109.22, 52.21, 42.36, 32.80, 32.64, 21.85;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2196.

3-(1-(2-fluorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5h)



76.0 mg, 0.181 mmol, 91%;

Pure white solid;

R_f (PE/DCM 5/1): 0.23;

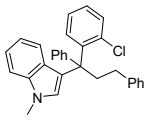
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (t, *J* = 8.0 Hz, 3H), 7.32 – 7.21 (m, 7H), 7.21 – 7.16 (m, 3H), 7.12 (d, *J* = 7.9 Hz, 2H), 7.04 – 6.91 (m, 3H), 6.75 (s, 1H), 3.75 (s, 3H), 3.18 – 3.11 (m, 1H), 3.01 (td, *J* = 13.4, 5.1 Hz, 1H), 2.49 (td, *J* = 13.3, 4.4 Hz, 1H), 2.30 (td, J = 13.0, 6.7 Hz, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 161.38 (d, *J* = 249.4 Hz), 146.04, 142.77, 137.65, 133.48 (d, *J* = 11.2 Hz), 130.75 (d, *J* = 4.6 Hz), 128.55 (d, *J* = 3.1 Hz), 128.42, 128.35, 128.27, 128.22, 127.72, 127.10, 125.80 (d, *J* = 20.2 Hz), 123.44 (d, *J* = 3.2 Hz), 122.04, 121.34, 119.27, 118.70, 116.61, 116.37, 109.30, 51.22 (d, *J* = 2.3 Hz), 41.06, 41.01, 32.82;

^{19}F NMR (564 MHz, $CDCl_3$) δ -104.79;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}FNNa]^+$: 442.1941, found: 442.1940.

3-(1-(2-chlorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5i)



62.6 mg, 0.143 mmol, 72%;

Pure white solid;

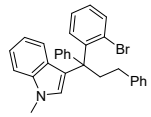
R_f (PE/DCM 5/1): 0.25;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 – 7.47 (m, 1H), 7.44 – 7.30 (m, 3H), 7.30 – 7.21 (m, 6H), 7.17 (ddd, *J* = 15.3, 9.1, 4.2 Hz, 6H), 6.94 (dd, *J* = 8.0, 7.1 Hz, 1H), 6.76 (s, 1H), 3.75 (s, 3H), 3.38 – 3.29 (m, 1H), 3.16 (td, *J* = 13.5, 5.2 Hz, 1H), 2.51 (td, *J* = 13.3, 3.8 Hz, 1H), 2.25 (td, *J* = 13.2, 5.0 Hz, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.10, 142.86, 142.77, 137.64, 134.89, 132.10, 132.00, 128.70, 128.50, 128.41, 128.30, 127.95, 127.64, 127.26, 126.16, 125.78, 125.71, 122.14, 121.35, 119.65, 118.80, 109.35, 53.36, 40.29, 33.03, 32.90;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}ClNNa]^+$: 458.1646, found: 458.1638.

3-(1-(2-bromophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5j)



55.0 mg, 0.114 mmol, 57%;

Pure white solid;

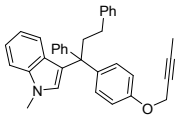
R_f (PE/DCM 10/1): 0.21;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 7.7 Hz, 1H), 7.51 (d, *J* = 7.9 Hz, 1H), 7.40 (d, *J* = 7.6 Hz, 2H), 7.36 – 6.97 (m, 13H), 6.94 (t, *J* = 7.4 Hz, 1H), 6.79 (s, 1H), 3.75 (s, 3H), 3.41 – 3.31 (m, 1H), 3.28 – 3.17 (m, 1H), 2.56 – 2.46 (m, 1H), 2.25 (td, *J* = 13.2, 5.0 Hz, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.10, 144.01, 142.72, 137.60, 135.76, 132.66, 128.68, 128.39, 128.27, 128.07, 127.61, 127.20, 126.64, 125.76, 125.64, 124.64, 122.16, 121.30, 119.76, 118.75, 109.31, 54.06, 40.11, 33.00, 32.87;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}BrNNa]^+$: 502.1141, found: 502.1145.

3-(1,3-diphenyl-1-(4-(prop-2-yn-1-yloxy)phenyl)propyl)-1-methyl-1*H*-indole (5k)



74.9 mg, 0.164 mmol, 82%;

Pure white solid;

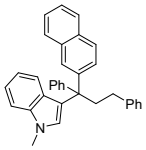
R_f (PE/DCM 3/1): 0.20;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.9 Hz, 2H), 7.33 (d, *J* = 8.7 Hz, 2H), 7.30 – 7.22 (m, 5H), 7.20 – 7.12 (m, 4H), 7.10 (d, *J* = 7.3 Hz, 2H), 6.92 (t, 1H), 6.85 (d, *J* = 8.8 Hz, 2H), 6.72 (s, 1H), 4.60 (d, *J* = 2.3 Hz, 2H), 3.73 (s, 3H), 2.99 – 2.89 (m, 2H), 2.47 – 2.37 (m, 2H), 1.85 (t, *J* = 2.2 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 155.93, 147.48, 143.06, 139.99, 137.77, 129.73, 128.96, 128.65, 128.41, 128.33, 127.90, 127.07, 125.81, 125.73, 122.40, 121.35, 121.06, 118.60, 114.06, 109.26, 83.64, 74.34, 56.48, 51.68, 42.63, 32.81, 32.66, 3.81;

Exact Mass ESI-MS: calculated m/z for $[C_{34}H_{31}NONa]^+$: 492.2298, found: 492.2306.

1-methyl-3-(1-(naphthalen-2-yl)-1,3-diphenylpropyl)-1*H*-indole (5l)



76.5 mg, 0.169 mmol, 85%;

Pure white solid;

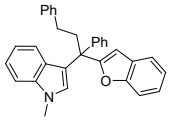
R_f (PE/DCM 5/1): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93 (s, 1H), 7.79 – 7.73 (m, 2H), 7.70 (d, *J* = 8.7 Hz, 1H), 7.54 – 7.45 (m, 3H), 7.43 (dd, *J* = 6.2, 3.3 Hz, 2H), 7.31 – 7.24 (m, 5H), 7.21 – 7.10 (m, 6H), 6.90 (t, *J* = 7.6 Hz, 1H), 6.75 (s, 1H), 3.74 (s, 3H), 3.07 (dd, *J* = 9.9, 7.2 Hz, 2H), 2.46 (td, *J* = 7.0, 3.0 Hz, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.96, 144.66, 143.03, 137.76, 133.21, 131.87, 129.18, 129.17, 128.83, 128.45, 128.36, 128.30, 128.21, 127.97, 127.38, 127.10, 126.22, 125.97, 125.81, 125.79, 125.65, 122.37, 121.41, 120.48, 118.73, 109.31, 52.49, 42.38, 32.83, 32.72;

Exact Mass ESI-MS: calculated m/z for $[C_{34}H_{29}NNa]^+$: 474.2192, found: 474.2192.

3-(1-(benzofuran-2-yl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5m)



38.3 mg, 0.086 mmol, 43%;

Pure white solid;

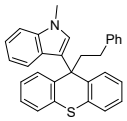
R_f (PE/DCM 5/1): 0.34;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50–7.38 (m, 4H), 7.31 – 7.25 (m, 4H), 7.24 – 7.21 (m, 2H), 7.21 – 7.11 (m, 7H), 6.94 – 6.89 (m, 2H), 6.48 (d, *J* = 0.7 Hz, 1H), 3.77 (s, 3H), 3.04 – 2.91 (m, 2H), 2.70 – 2.59 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 163.15, 154.69, 144.60, 142.80, 137.56, 128.45, 128.39, 128.31, 128.22, 128.02, 126.77, 126.53, 125.77, 123.49, 122.54, 122.04, 121.43, 120.72, 118.79, 118.51, 111.23, 109.24, 104.60, 104.56, 49.61, 41.94, 32.85, 32.82, 32.30;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{27}NONa]^+$: 464.1985, found: 464.1977.

1-methyl-3-(9-phenethyl-9H-thioxanthen-9-yl)-1*H*-indole (5n)



44.5 mg, 0.103 mmol, 52%;

Pure white solid;

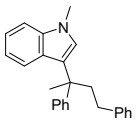
R_f (PE/DCM 5/1): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 – 7.29 (m, 4H), 7.21 (t, *J* = 7.3 Hz, 2H), 7.16 – 7.09 (m, 4H), 7.04 (d, *J* = 7.0 Hz, 2H), 6.94 – 6.86 (m, 4H), 6.75 (t, *J* = 7.2 Hz, 1H), 6.64 (d, *J* = 8.0 Hz, 1H), 3.92 (s, 3H), 2.60 – 2.51 (m, 2H), 2.47 – 2.39 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 142.42, 138.93, 137.94, 136.86, 136.72, 131.66, 130.76, 130.28, 129.90, 128.18, 127.20, 126.90, 126.36, 125.79, 125.54, 124.47, 121.64, 119.76, 49.85, 49.42, 33.08, 31.59;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{25}NSNa]^+$: 454.1600, found: 454.1613.

3-(2,4-diphenylbutan-2-yl)-1-methyl-1*H*-indole (5o)



35.7 mg, 0.105 mmol, 53%;

Pure white solid;

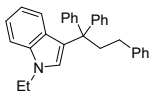
R_f (PE/DCM 20/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 – 7.32 (m, 2H), 7.27 – 7.20 (m, 5H), 7.17–7.11 (m, 3H), 7.08 – 7.01 (m, 3H), 6.96 (s, 1H), 6.88 – 6.83 (m, 1H), 3.75 (s, 3H), 2.60 – 2.52 (m, 1H), 2.45 – 2.36 (m, 3H), 1.79 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.80, 143.19, 137.76, 128.42, 128.30, 128.00, 127.01, 126.48, 126.31, 125.64, 125.59, 123.05, 121.36, 121.25, 118.43, 109.11, 44.01, 42.50, 32.75, 31.38, 27.70;

Exact Mass ESI-MS: calculated m/z for $[C_{25}H_{25}NNa]^+$: 362.1879, found: 362.1886.

1-ethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6a)



64.8 mg, 0.156 mmol, 78%;

Pure white solid;

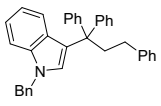
R_f (PE/DCM 5/1):0.33;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 7.4 Hz, 4H), 7.32 (d, *J* = 8.2 Hz, 1H), 7.29 – 7.25 (m, 5H), 7.25 – 7.22 (m, 2H), 7.20 – 7.13 (m, 4H), 7.12 – 7.08 (m, 2H), 6.90 (t, *J* = 7.4 Hz, 1H), 6.80 (s, 1H), 4.13 (q, *J* = 7.3 Hz, 2H), 3.01 – 2.93 (m, 2H), 2.43 – 2.36 (m, 2H), 1.43 (t, *J* = 7.2 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.20, 143.06, 136.79, 128.71, 128.38, 128.32, 127.88, 127.29, 127.23, 125.81, 125.71, 122.46, 121.17, 120.82, 118.51, 109.31, 52.38, 42.36, 40.91, 32.59, 15.57;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2193.

benzyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6b)



59.8 mg, 0.125 mmol, 63%;

Pure white solid;

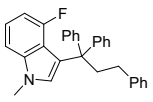
R_f (PE/DCM 5/1): 0.29;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (d, *J* = 8.1 Hz, 4H), 7.30 – 7.20 (m, 10H), 7.20 – 7.13 (m, 4H), 7.11 (d, *J* = 7.3 Hz, 1H), 7.07 (d, *J* = 6.9 Hz, 4H), 6.91 (t, *J* = 7.5 Hz, 1H), 6.87 (s, 1H), 5.29 (s, 2H), 3.02 – 2.93 (m, 2H), 2.45 – 2.36 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.02, 142.93, 137.72, 137.38, 128.76, 128.62, 128.55, 128.35, 128.25, 127.88, 127.49, 127.31, 126.43, 125.82, 125.68, 122.41, 121.56, 121.30, 118.86, 109.78, 52.31, 49.94, 42.22, 32.55;

Exact Mass ESI-MS: calculated m/z for $[C_{36}H_{31}NNa]^+$: 500.2349, found: 500.2346.

4-fluoro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6c)



55.0 mg, 0.131 mmol, 66%;

Pure white solid;

R_f (PE/DCM 5/1): 0.23;

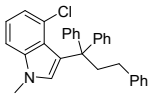
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.1 Hz, 4H), 7.24 (q, *J* = 6.9, 6.5 Hz, 6H), 7.19 – 7.04 (m, 7H), 6.67 (dd, *J* = 11.5, 7.4 Hz, 1H), 6.52 (s, 1H), 3.70 (s, 3H), 3.09 – 3.00 (m, 2H), 2.48 – 2.38 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 156.42 (d, *J* = 249.0 Hz), 148.23, 142.95, 140.73 (d, *J* = 11.7 Hz), 130.08 (d, *J* = 5.8 Hz), 128.38, 128.34, 128.27, 127.79, 125.68, 122.28 (d, *J* = 8.2 Hz), 119.85 (d, *J* = 3.9 Hz), 115.92 (d, *J* = 19.9 Hz), 105.41 (d, *J* = 3.6 Hz), 105.26, 105.03, 51.97, 41.82, 33.16, 33.11;

^{19}F NMR (564 MHz, $CDCl_3$) δ -112.09;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}FNNa]^+$: 442.1941, found: 442.1944.

4-chloro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6d)



52.4 mg, 0.120 mmol, 60%;

Pure white solid;

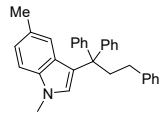
R_f (PE/DCM 5/1): 0.29;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 (d, *J* = 7.6 Hz, 4H), 7.26 – 7.22 (m, 7H), 7.21 – 7.11 (m, 6H), 7.09 (t, *J* = 7.7 Hz, 1H), 6.37 (s, 1H), 3.69 (s, 3H), 3.34 – 3.26 (m, 2H), 2.49 – 2.39 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 149.68, 142.97, 139.72, 132.47, 128.40, 128.33, 127.77, 126.50, 125.64, 125.58, 124.64, 122.05, 121.63, 120.05, 108.12, 51.79, 34.06, 33.15, 33.12;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}ClNNa]^+$: 458.1646, found: 458.1641.

1,5-dimethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6e)



52.6 mg, 0.126 mmol, 63%;

Pure white solid;

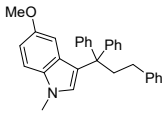
R_f (PE/DCM 10/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.8 Hz, 4H), 7.28 – 7.22 (m, 6H), 7.20 – 7.13 (m, 4H), 7.11 (d, *J* = 7.4 Hz, 2H), 7.00 (d, *J* = 8.3 Hz, 1H), 6.93 (s, 1H), 6.65 (s, 1H), 3.70 (s, 3H), 2.99 – 2.93 (m, 2H), 2.45 – 2.39 (m, 2H), 2.29 (s, 3H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 147.41, 143.14, 136.25, 129.25, 128.77, 128.38, 128.34, 127.86, 127.66, 127.35, 125.79, 125.70, 123.01, 122.00, 120.08, 108.90, 52.36, 42.35, 32.83, 32.64, 21.64;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2192.

5-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6f)



82.2 mg, 0.190 mmol, 95%;

Pure white solid;

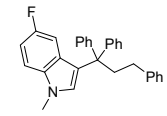
R_f (PE/DCM 5/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 7.9 Hz, 4H), 7.29 – 7.22 (m, 6H), 7.22 – 7.14 (m, 4H), 7.11 (d, *J* = 7.3 Hz, 2H), 6.83 (dd, *J* = 8.8, 2.2 Hz, 1H), 6.74 (s, 1H), 6.51 (d, *J* = 2.2 Hz, 1H), 3.71 (s, 3H), 3.57 (s, 3H), 3.00 – 2.89 (m, 2H), 2.48 – 2.39 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 153.06, 147.08, 143.05, 133.13, 129.54, 128.73, 128.41, 128.32, 127.90, 127.41, 125.85, 125.75, 120.17, 111.39, 109.86, 104.52, 55.80, 52.23, 42.42, 33.01, 32.62;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NONa]^+$: 454.2141, found: 454.2149.

5-fluoro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6g)



52.6 mg, 0.125 mmol, 63%;

Pure white solid;

R_f (PE/DCM 5/1): 0.25;

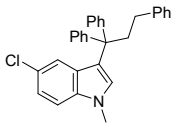
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 8.1 Hz, 4H), 7.29 – 7.23 (m, 6H), 7.22 – 7.14 (m, 4H), 7.11 (d, *J* = 7.6 Hz, 2H), 6.91 (t, *J* = 9.0 Hz, 1H), 6.80 (s, 1H), 6.76 (d, *J* = 10.6 Hz, 1H), 3.73 (s, 3H), 2.97 – 2.89 (m, 2H), 2.43 – 2.36 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 157.01 (d, *J* = 233.4 Hz), 146.67, 142.78, 134.34, 130.42, 128.58, 128.39, 128.24, 127.96, 127.16 (d, *J* = 9.8 Hz), 125.94, 125.76, 120.74 (d, *J* = 4.9 Hz), 109.79 (d, *J* = 9.9 Hz) 109.75 (d, *J* = 26.4 Hz), 107.03 (d, *J* = 24.0 Hz), 52.11, 42.22, 33.08, 32.49;

^{19}F NMR (564 MHz, $CDCl_3$) δ -125.11;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}FNNa]^+$: 442.1941, found: 442.1951.

5-chloro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6h)



47.3mg, 0.108 mmol, 54%;

Pure white solid;

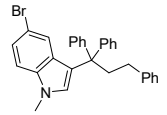
R_f (PE/DCM 5/1): 0.28;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 7.8 Hz, 3H), 7.32-7.22 (m, 7H), 7.22 – 7.15 (m, 4H), 7.15 – 7.06 (m, 4H), 6.76 (s, 1H), 3.72 (s, 3H), 2.98 – 2.88 (m, 2H), 2.44 – 2.33 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.69, 142.72, 136.11, 130.20, 128.57, 128.40, 128.24, 127.98, 127.93, 125.99, 125.77, 124.44, 121.72, 121.40, 120.53, 110.28, 52.14, 42.27, 32.98, 32.50;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}ClNNa]^+$: 458.1646, found: 458.1645.

5-bromo-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6i)



52.3 mg, 0.108 mmol, 54%;

Pure white solid;

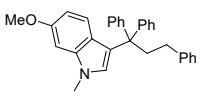
R_f (PE/DCM 5/1): 0.27;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.1 Hz, 4H), 7.30 – 7.23 (m, 8H), 7.22 – 7.14 (m, 4H), 7.11 (d, *J* = 7.7 Hz, 2H), 6.74 (s, 1H), 3.72 (s, 3H), 2.99 – 2.87 (m, 2H), 2.44 – 2.33 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.69, 142.69, 136.35, 130.09, 130.04, 128.55, 128.38, 128.23, 127.96, 125.98, 125.75, 124.43, 124.26, 120.50, 112.14, 110.72, 52.15, 42.30, 32.98, 32.52;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{26}BrNNa]^+$: 502.1141, found: 502.1140.

6-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6j)



59.6 mg, 0.138 mmol, 69%;

Pure white solid;

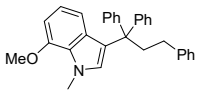
R_f (PE/DCM 5/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.9 Hz, 4H), 7.28 – 7.22 (m, 6H), 7.17 (t, *J* = 7.2 Hz, 3H), 7.10 (d, *J* = 7.6 Hz, 2H), 7.00 (d, *J* = 8.8 Hz, 1H), 6.73 (s, 1H), 6.64 – 6.55 (m, 2H), 3.85 (s, 3H), 3.68 (s, 3H), 2.98 – 2.89 (m, 2H), 2.46 – 2.37 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 155.95, 147.21, 143.04, 138.46, 128.68, 128.38, 128.31, 127.92, 127.87, 125.81, 125.71, 122.94, 121.43, 120.81, 108.40, 92.63, 55.60, 52.23, 42.44, 32.83, 32.58;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NONa]^+$: 454.2141, found: 454.2145.

7-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6k)



76.1 mg, 0.176 mmol, 88%;

Pure white solid;

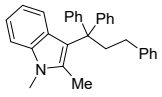
R_f (PE/DCM 5/1): 0.27;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.4 Hz, 4H), 7.27 – 7.22 (m, 6H), 7.16 (t, *J* = 6.5 Hz, 3H), 7.11 (d, *J* = 7.0 Hz, 2H), 6.78 (t, *J* = 7.9 Hz, 1H), 6.70 (d, *J* = 7.7 Hz, 1H), 6.59 (s, 1H), 6.55 (d, *J* = 7.5 Hz, 1H), 3.99 (s, 3H), 3.90 (s, 3H), 2.99 – 2.90 (m, 2H), 2.44 – 2.35 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.71, 147.20, 143.07, 130.25, 129.33, 128.68, 128.35, 128.31, 127.85, 127.41, 125.75, 125.67, 120.48, 118.89, 115.22, 101.99, 55.27, 52.18, 42.21, 36.67, 32.60;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NONa]^+$: 454.2141, found: 454.2131.

1,2-dimethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6l)



69.6 mg, 0.167 mmol, 84%;

Pure white solid;

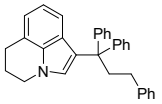
R_f (PE/DCM 5/1): 0.27;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.8 Hz, 4H), 7.27 – 7.20 (m, 7H), 7.13 (t, *J* = 7.2 Hz, 3H), 7.08 (t, *J* = 5.8 Hz, 3H), 6.77 (t, *J* = 7.6 Hz, 1H), 6.51 (d, *J* = 8.1 Hz, 1H), 3.63 (s, 3H), 3.08 – 3.01 (m, 2H), 2.46 – 2.39 (m, 2H), 1.79 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.49, 143.05, 136.85, 134.96, 128.32, 128.20, 128.09, 128.07, 127.89, 125.66, 122.10, 122.01, 120.12, 118.23, 115.95, 108.40, 52.50, 40.94, 32.53, 29.43, 13.47;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{29}NNa]^+$: 438.2192, found: 438.2196.

1-(1,1,3-triphenylpropyl)-5,6-dihydro-4*H*-pyrrolo[3,2,1-ij]quinoline (6m)



65.0 mg, 0.152 mmol, 76%;

Pure white solid;

R_f (PE/DCM 6/1): 0.26;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (d, *J* = 8.0 Hz, 4H), 7.29 – 7.22 (m, 6H), 7.21 – 7.09 (m, 5H), 6.95 (d, *J* = 7.5 Hz, 1H), 6.90 – 6.78 (m, 2H), 6.76 (s, 1H), 4.09 (t, *J* = 5.5 Hz, 2H), 3.03 – 2.89 (m, 4H), 2.49 – 2.39 (m, 2H), 2.27 – 2.19 (m, 2H);

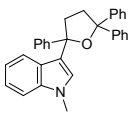
^{13}C NMR (101 MHz, $CDCl_3$) δ 147.37, 143.07, 135.05, 128.74, 128.33, 128.30, 127.80, 126.06, 125.73, 125.65, 124.71, 121.56, 121.14, 119.88, 118.86, 118.29, 52.43, 44.00, 42.59, 32.52, 24.78, 22.80;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NNa]^+$: 450.2192, found: 450.2195.

General procedure for the synthesis of 8a-8n:

The 2-bromoacetophenones (0.4 mmol, if solid), $KHCO_3$ (40.0 mg, 0.4 mmol, 2 equiv) and $Zn(OAc)_2$ (73.4 mg, 0.4 mmol, 2 equiv) was added to an oven-dried Schlenk tube (10 mL). The Schlenk tube was then connected to a vacuum line where it was evacuated and back-filled with N_2 for 3 times. Then anhydrous DCM (1 mL), alkenes (0.6 mmol, 3 equiv) and indoles (0.2 mmol) were added via syringe under N_2 atmosphere. Finally, the reaction mixture in sealed tube was placed at a distance of 1 ~ 2 cm from a 30 W blue LED (wavelength: 460 nm) and stirred at room temperature (40~45 °C) for 24 h. Then, the mixture was quenched with 1 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (petroleum ether/AcOEt 30/1 ~ 7/1) to give the pure desired product.

4-(1-methyl-1*H*-indol-3-yl)-1,4,4-triphenylbutan-1-one (8a)



62.5 mg, 0.145 mmol, 73%;

Pure white solid;

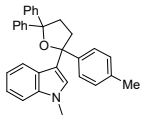
R_f(PE/DCM 3/1): 0.20;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 – 7.43 (m, 5H), 7.39 (d, *J* = 7.2 Hz, 2H), 7.30 – 7.20 (m, 4H), 7.20 – 7.08 (m, 7H), 6.96 (t, *J* = 7.4 Hz, 1H), 6.89 (s, 1H), 3.67 (s, 3H), 2.82 – 2.65 (m, 3H), 2.62 – 2.54 (m, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.98, 147.61, 147.20, 137.63, 128.02, 127.79, 127.68, 126.46, 126.44, 126.34, 126.19, 126.15, 126.10, 125.99, 121.35, 121.29, 121.20, 118.87, 109.04, 89.21, 86.98, 37.49, 32.72;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{27}NONa]^+$: 452.1985, found: 452.1980.

3-(5,5-diphenyl-2-(p-tolyl)tetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8b)



58.8 mg, 0.132 mmol, 66%;

Pure white solid;

R_f (PE/EA 30/1): 0.28;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (d, *J* = 7.5 Hz, 3H), 7.39 (d, *J* = 7.6 Hz, 2H), 7.33 (d, *J* = 7.8 Hz, 2H), 7.25 (t, *J* = 7.2 Hz, 2H), 7.20 – 7.08 (m, 6H), 7.00 – 6.91 (m, 3H), 6.85 (s, 1H), 3.60 (s, 3H), 2.81 – 2.63 (m, 3H), 2.59 – 2.53 (m, 1H), 2.23 (s, 3H);

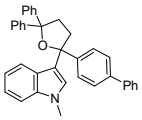
^{13}C NMR (101 MHz, $CDCl_3$) δ 148.08, 147.76, 144.23, 137.66, 135.77, 128.41, 128.01, 127.79, 126.49, 126.41, 126.30, 126.18, 126.14, 126.03, 121.36, 121.33, 118.84, 109.04, 89.13, 86.98, 37.58, 37.47, 32.70, 21.02;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NONa]^+$: 466.2141, found: 466.2159.

3-(2-([1,1'-biphenyl]-4-yl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8c)

61.8 mg, 0.122 mmol, 61%;

Pure white solid;



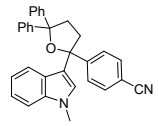
R_f (PE/EA 20/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 – 7.45 (m, 7H), 7.40 (d, *J* = 6.9 Hz, 4H), 7.35 (t, *J* = 7.6 Hz, 2H), 7.28 (t, *J* = 7.6 Hz, 3H), 7.23 – 7.08 (m, 6H), 6.97 (t, *J* = 7.3 Hz, 1H), 6.91 (s, 1H), 3.64 (s, 3H), 2.85 – 2.70 (m, 3H), 2.61 (dd, *J* = 10.7, 5.8 Hz, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.98, 147.61, 146.35, 140.99, 139.01, 137.66, 128.65, 128.06, 127.81, 126.99, 126.78, 126.49, 126.43, 126.21, 126.16, 126.14, 126.00, 121.43, 121.36, 121.10, 118.92, 109.10, 89.29, 86.92, 37.59, 37.57, 32.71;

Exact Mass ESI-MS: calculated m/z for $[C_{37}H_{31}NONa]^+$: 528.2298 found: 528.2300.

3-(2-(1-methyl-1*H*-indol-3-yl)-5,5-diphenyltetrahydrofuran-2-yl)benzonitrile (8d)



50.4 mg, 0.110 mmol, 55%;

Pure white solid;

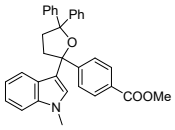
R_f (PE/EA 10/1):0.30;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 8.5 Hz, 2H), 7.49 (d, *J* = 8.1 Hz, 2H), 7.44 (d, *J* = 8.6 Hz, 2H), 7.35 – 7.27 (m, 4H), 7.26 – 7.16 (m, 4H), 7.15 – 7.06 (m, 3H), 7.00 (t, *J* = 7.5 Hz, 1H), 6.95 (s, 1H), 3.71 (s, 3H), 2.86 – 2.64 (m, 3H), 2.56 – 2.48 (m, 1H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 153.01, 147.44, 146.92, 137.70, 131.72, 128.24, 127.86, 126.99, 126.82, 126.36, 126.18, 125.98, 125.91, 125.82, 121.81, 120.93, 119.92, 119.29, 119.11, 110.11, 109.30, 89.79, 86.60, 37.65, 37.30, 32.82;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{26}N_2ONa]^+$: 477.1937, found: 477.1947.

methyl 4-(2-(1-methyl-1*H*-indol-3-yl)-5,5-diphenyltetrahydrofuran-2-yl)benzoate (8e)



61.6 mg, 0.126 mmol, 63%;

Pure white solid;

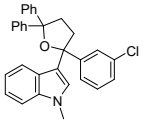
R_f (PE/EA 7/1): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.4 Hz, 2H), 7.66 – 7.40 (m, 5H), 7.37 (d, *J* = 6.9 Hz, 2H), 7.31 – 7.08 (m, 8H), 6.96 (t, *J* = 7.4 Hz, 1H), 6.93 (s, 1H), 3.84 (s, 3H), 3.69 (s, 3H), 2.85 – 2.64 (m, 3H), 2.57 (dt, *J* = 11.2, 5.7 Hz, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.08, 152.64, 147.68, 147.20, 137.63, 129.13, 128.15, 128.09, 127.80, 126.61, 126.30, 126.26, 126.01, 125.97, 125.89, 121.56, 121.06, 120.39, 119.05, 109.13, 89.48, 86.78, 51.95, 51.90, 37.42, 32.77;

Exact Mass ESI-MS: calculated m/z for $[C_{33}H_{29}NO_3Na]^+$: 510.2040, found: 510.2049.

3-(2-(3-chlorophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8f)



68.6 mg, 0.148 mmol, 74%;

Pure white solid;

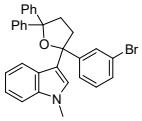
R_f (PE/EA 15/1): 0.35;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 – 7.46 (m, 3H), 7.44 – 7.32 (m, 4H), 7.31 – 7.07 (m, 10H), 6.99 (t, *J* = 7.5 Hz, 1H), 6.90 (s, 1H), 3.68 (s, 3H), 2.82 – 2.66 (m, 3H), 2.57 – 2.51 (m, 1H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 149.59, 147.72, 147.24, 137.67, 133.63, 128.95, 128.10, 127.81, 126.75, 126.68, 126.62, 126.51, 126.30, 125.99, 125.91, 124.41, 121.55, 121.16, 121.12, 120.53, 119.07, 109.16, 89.48, 86.62, 37.54, 37.42, 32.77;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{26}ClNONa]^+$: 486.1595, found: 486.1652.

3-(2-(3-bromophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8g)



70.6 mg, 0.138 mmol, 69%;

Pure white solid;

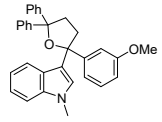
R_f (PE/EA 25/1): 0.23;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (s, 1H), 7.53 – 7.47 (m, 3H), 7.38 (t, *J* = 8.6 Hz, 3H), 7.30 (t, *J* = 7.6 Hz, 2H), 7.25 – 7.08 (m, 7H), 7.05 – 6.97 (m, 2H), 6.90 (s, 1H), 3.69 (s, 3H), 2.82 – 2.67 (m, 3H), 2.54 (dt, *J* = 10.8, 5.5 Hz, 1H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 149.85, 147.74, 147.24, 137.70, 129.65, 129.45, 129.30, 128.14, 127.84, 126.67, 126.34, 126.30, 126.09, 126.01, 125.94, 124.88, 122.04, 121.59, 121.17, 120.51, 119.10, 109.17, 89.51, 86.60, 37.58, 37.44, 32.78;

Exact Mass ESI-MS: calculated m/z for $[C_{31}H_{26}NBrNONa]^+$: 530.1090, found: 530.1123.

3-(2-(3-methoxyphenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8h)



41.2 mg, 0.090 mmol, 45%;

Pure white solid;

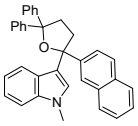
R_f (PE/EA 15/1): 0.28;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 – 7.50 (m, 3H), 7.37 (d, *J* = 7.0 Hz, 2H), 7.29 (t, *J* = 7.6 Hz, 2H), 7.23 (s, 1H), 7.20 – 7.03 (m, 7H), 6.97 (t, *J* = 7.5 Hz, 1H), 6.94 – 6.87 (m, 2H), 6.64 (dd, *J* = 8.1, 1.7 Hz, 1H), 3.70 (s, 3H), 3.48 (s, 3H), 2.83 – 2.68 (m, 3H), 2.59 – 2.53 (m, 1H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 159.04, 149.33, 148.10, 147.75, 137.67, 128.66, 128.14, 127.81, 126.54, 126.40, 126.32, 126.27, 126.19, 125.98, 121.51, 121.46, 120.92, 118.96, 118.72, 112.45, 111.66, 109.07, 89.32, 87.15, 54.88, 37.86, 37.49, 32.76;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NO_2Na]^+$: 482.2091, found: 482.2097.

1-methyl-3-(2-(naphthalen-2-yl)-5,5-diphenyltetrahydrofuran-2-yl)-1*H*-indole (8i)



61.8 mg, 0.128 mmol, 64%;

Pure white solid;

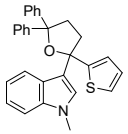
R_f (PE/EA 20/1): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (s, 1H), 7.74 – 7.69 (m, 1H), 7.63 (d, *J* = 8.7 Hz, 1H), 7.60 – 7.55 (m, 1H), 7.55 – 7.48 (m, 3H), 7.43 (d, *J* = 7.2 Hz, 2H), 7.40 – 7.32 (m, 2H), 7.28 (t, *J* = 7.6 Hz, 2H), 7.26 – 7.08 (m, 7H), 6.96 (s, 1H), 6.91 (t, *J* = 7.5 Hz, 1H), 3.69 (s, 3H), 2.90 – 2.83 (m, 1H), 2.80 – 2.62 (m, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.01, 147.62, 144.50, 137.67, 132.88, 132.27, 128.31, 128.03, 127.83, 127.67, 127.37, 126.61, 126.53, 126.24, 126.22, 126.19, 126.05, 125.65, 125.45, 124.58, 121.42, 121.28, 120.77, 118.94, 109.05, 89.33, 87.19, 37.49, 37.20, 32.76;

Exact Mass ESI-MS: calculated m/z for $[C_{35}H_{29}NONa]^+$: 502.2141, found: 502.2143.

3-(5,5-diphenyl-2-(thiophen-2-yl)tetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8j)



46.2 mg, 0.106 mmol, 53%;

Pure white solid;

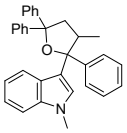
R_f (PE/EA 25/1): 0.29;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 7.3 Hz, 2H), 7.48 – 7.41 (m, 3H), 7.31 – 7.26 (m, 2H), 7.23 (s, 1H), 7.21 – 7.09 (m, 6H), 6.99 (t, *J* = 7.4 Hz, 1H), 6.87 – 6.79 (m, 3H), 3.64 (s, 3H), 2.86 – 2.76 (m, 3H), 2.74 – 2.66 (m, 1H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 152.18, 147.64, 147.58, 137.63, 127.96, 127.93, 127.11, 126.47, 126.40, 126.23, 126.11, 126.01, 125.95, 124.56, 124.54, 121.45, 120.98, 120.66, 119.02, 109.19, 89.34, 84.65, 38.94, 37.85, 32.74.

Exact Mass ESI-MS: calculated m/z for $[C_{29}H_{25}NOSNa]^+$: 458.1549, found: 458.1563.

1-methyl-3-(4-methyl-2,5,5-triphenyltetrahydrofuran-2-yl)-1*H*-indole (8k)



41.1 mg, 0.092 mmol, 46%;

Pure white solid;

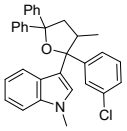
R_f (PE/EA 20/1): 0.24;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (dd, *J* = 8.2, 1.1 Hz, 2H), 7.39 – 7.33 (m, 3H), 7.30 (d, *J* = 8.2 Hz, 1H), 7.27 – 7.22 (m, 4H), 7.20 – 7.16 (m, 1H), 7.10 – 7.07 (m, 4H), 7.03 – 6.97 (m, 4H), 6.96 – 6.92 (m, 1H), 3.78 (s, 3H), 3.09 – 3.02 (m, 1H), 2.80 (dd, *J* = 11.8, 5.5 Hz, 1H), 2.49 (t, *J* = 12.2 Hz, 1H), 0.85 (d, *J* = 6.8 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.51, 147.39, 144.33, 137.70, 128.19, 127.80, 127.53, 127.51, 127.04, 126.57, 126.23, 126.04, 125.85, 125.67, 125.48, 122.48, 121.55, 120.74, 118.92, 108.78, 88.49, 87.41, 45.03, 40.62, 32.81, 15.91;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{29}NONa]^+$: 466.2141, found: 466.2147.

3-(2-(3-chlorophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8l)



72.0 mg, 0.150 mmol, 75%;

Pure white solid;

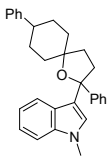
R_f (PE/EA 30/1): 0.30;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 7.2 Hz, 2H), 7.44 – 7.34 (m, 3H), 7.32 – 7.19 (m, 6H), 7.12 – 7.05 (m, 2H), 6.99 (s, 6H), 3.79 (s, 3H), 3.05 (d, *J* = 6.5 Hz, 1H), 2.79 (d, *J* = 6.4 Hz, 1H), 2.50 – 2.42 (m, 1H), 0.88 (d, *J* = 6.3 Hz, 3H);

^{13}C NMR (151 MHz, $CDCl_3$) δ 148.25, 147.06, 146.76, 137.75, 133.21, 128.35, 128.28, 128.01, 127.60, 127.28, 126.78, 126.50, 126.07, 126.04, 125.97, 125.64, 125.47, 122.32, 121.75, 120.06, 119.13, 108.92, 88.28, 87.65, 45.07, 40.73, 32.86, 15.92;

Exact Mass ESI-MS: calculated m/z for $[C_{32}H_{28}ClNONa]^+$: 500.1752, found: 500.1759.

3-(2,8-diphenyl-1-oxaspiro[4.5]decan-2-yl)-1-methyl-1*H*-indole (8m)



68.3 mg, 0.162 mmol, 81%;

Pure white solid;

R_f (PE/EA 20/1): 0.24;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, *J* = 8.0 Hz, 1H), 7.56 (d, *J* = 7.3 Hz, 2H), 7.31 – 7.28 (m, 2H), 7.27 – 7.23 (m, 3H), 7.22 – 7.15 (m, 5H), 7.02 (t, *J* = 7.4 Hz, 1H), 6.82 (s, 1H), 3.72 (s, 3H), 2.90 (dd, *J* = 12.8, 6.9 Hz, 1H), 2.59 (ddd, *J* = 22.0, 13.2, 5.4 Hz, 3H), 2.08 (dd, *J* = 13.2, 6.1 Hz, 1H), 2.03 – 1.98 (m, 1H), 1.88 (dd, *J* = 15.5, 8.2 Hz, 6H);

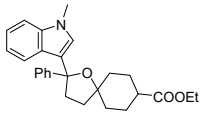
^{13}C NMR (101 MHz, $CDCl_3$) δ 147.68, 146.84, 137.72, 128.33, 127.76, 126. 88, 126.86, 126.78, 126.48, 126.26, 125.99, 121.40, 121.30, 118.89, 109.12, 85.09, 84.27, 43.48, 39.27, 39.06, 38.79, 34.56, 32.74, 32.70, 32.51;

Exact Mass ESI-MS: calculated m/z for $[C_{30}H_{31}NONa]^+$: 444.2298, found: 444.2300.

ethyl 2-(1-methyl-1*H*-indol-3-yl)-2-phenyl-1-oxaspiro[4.5]decane-8-carboxylate (8n)

52.0 mg, 0.124 mmol, 62%;

Colourless oil;



R_f (PE/EA 10/1): 0.27;

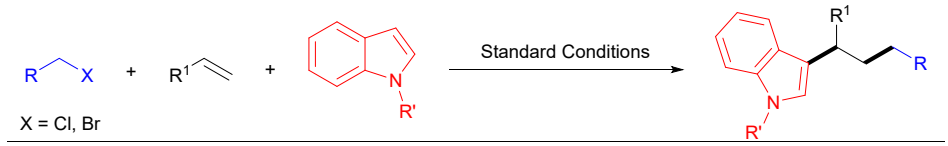
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.0 Hz, 1H), 7.57 – 7.46 (m, 2H), 7.31 – 7.20 (m, 3H), 7.20 – 7.06 (m, 2H), 7.03 – 6.96 (m, 1H), 6.80 (s, 1H), 4.10 (q, *J* = 7.1 Hz, 2H), 3.70 (s, 3H), 2.88 – 2.80 (m, 1H), 2.55 (dt, *J* = 12.7, 7.3 Hz, 1H), 2.33 (tt, *J* = 10.5, 3.8 Hz, 1H), 2.05 – 1.85 (m, 4H), 1.77 – 1.68 (m, 3H), 1.64 – 1.44 (m, 3H), 1.23 (t, *J* = 7.1 Hz, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 175.81, 147.66, 137.68, 127.73, 126.54, 126.50, 126.42, 126.24, 126.06, 121.39, 121.27, 118.85, 109.07, 85.25, 83.54, 60.18, 41.89, 38.66, 37.56, 37.35, 35.12, 26.93, 26.85, 14.24,14.22;

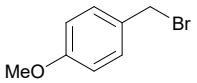
Exact Mass ESI-MS: calculated m/z for $[C_{27}H_{31}NO_3Na]^+$: 440.2196, found: 440.2199.

5. Some unsuccessful substrates

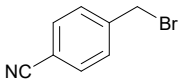
1,2-Alkylarylation of alkenes, alkyl halides and *N*-alkylindoles



Benzyl halides



trace

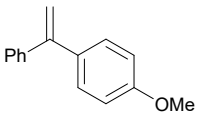


trace

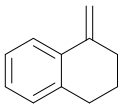
N.D.

17%

Alkenes

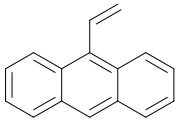


trace



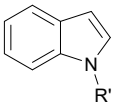
trace

18%

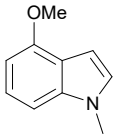


N.D.

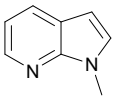
Heteroaromatic hydrocarbon



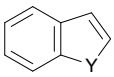
R' = Ac, trace
R' = Bz, N.D.



32%

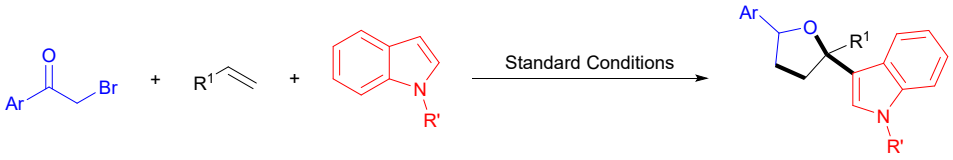


N.D.



Y = O, N.D.
Y = S, N.D.

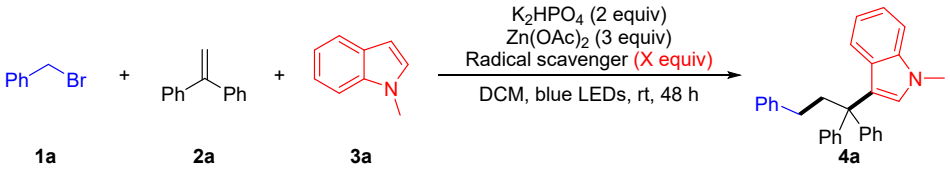
1,2-Alkylarylation cyclization of alkenes, alkyl halides and *N*-alkylindoles



trace	32%	trace	20%
29%	trace	trace	trace
trace	trace	trace	trace
trace		trace	N.D.

6. Mechanistic studies

6.1. Radical inhibition experiments

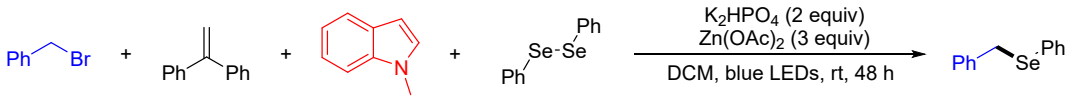


1a **2a** **3a** **4a**

Radical scavenger	**4a**/Yield(%)
None	90
TEMPO (4 equiv)	0
PhSe-SePh (4 equiv)	0

An oven-dried Schlenk tube (10 mL) containing a stirring bar was charged with K_2HPO_4 (69.7 mg, 0.4 mmol, 2 equiv), $Zn(OAc)_2$ (110.1 mg, 0.6 mmol, 3 equiv) and the radical scavenger (0.8 mmol, 3 equiv). The Schlenk tube was then connected to a vacuum line where it was evacuated and back-filled with N_2 for 3 times. Then anhydrous DCM (2 mL), benzyl bromide (48 μL, 0.4 mmol, 2 equiv), 1,1-diphenylethylene (106 μL, 0.6 mmol, 3 equiv) and 1-methylindole (26 μL, 0.2 mmol) were added via syringe under N_2 atmosphere. Finally, the reaction mixture in sealed tube was placed at a distance of 1 ~ 2 cm from a 30 W blue LED (wavelength: 460 nm) and stirred at room temperature for 48 h. Then, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (petroleum ether/dichloromethane 5/1) to give the pure desired product.

NMR analysis of the diphenyl diselenide adduct:

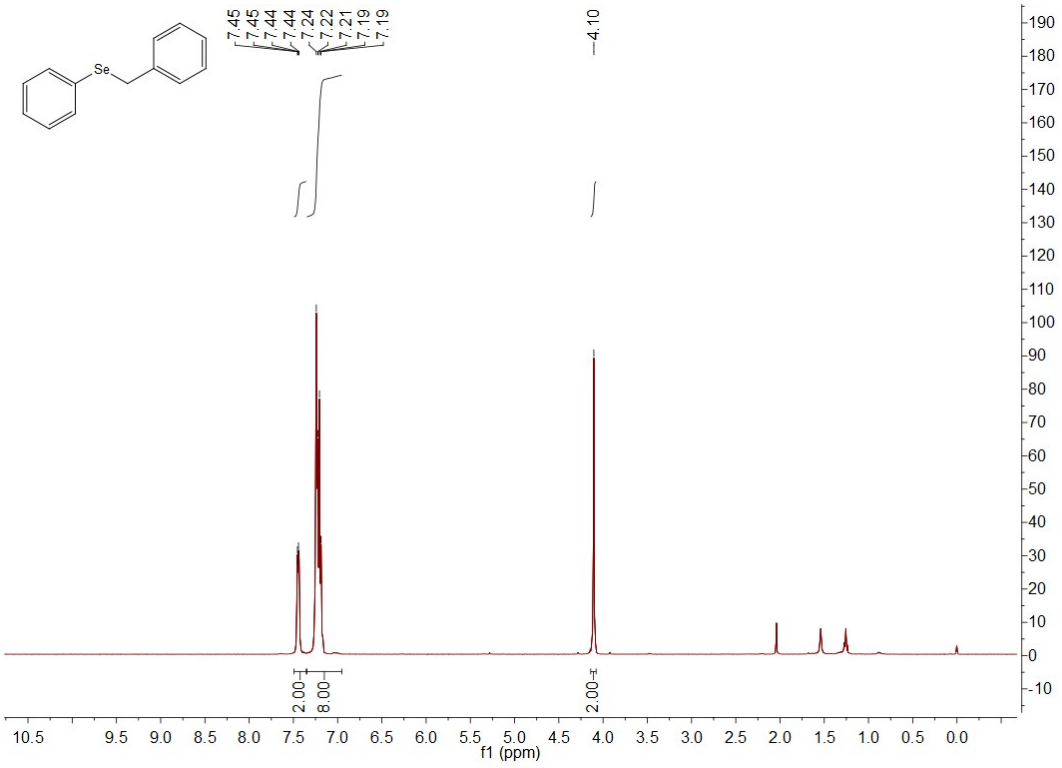


1a **2a** **3a** 4 equiv 30.6 mg, 31%

An oven-dried Schlenk tube (10 mL) containing a stirring bar was charged with K_2HPO_4 (69.7 mg, 0.4 mmol, 2 equiv), $Zn(OAc)_2$ (110.1 mg, 0.6 mmol, 3 equiv) and diphenyl diselenide (249.7 mg, 0.8 mmol, 4 equiv). The Schlenk tube was then connected to a vacuum line where it was evacuated and back-filled with N_2 for 3 times. Then anhydrous DCM (2 mL), benzyl bromide (48 μL, 0.4 mmol, 2 equiv), 1,1-diphenylethylene (106 μL, 0.6 mmol, 3 equiv) and 1-methylindole (26 μL, 0.2 mmol) were added via syringe under N_2 atmosphere. Finally, the reaction mixture in sealed tube was placed at a distance of 1 ~ 2 cm from a 30 W blue LED (wavelength: 460 nm) and stirred at room temperature for 48 h. Then, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The obtained residue was purified by silica gel flash column chromatography to give the pure product in 31% yield. The obtained product was confirmed to be benzyl(phenyl)selane by ^1H NMR. The formation of the benzyl(phenyl)selane indicating the generation of the benzylic radical from substrate **1a**.

benzyl(phenyl)selane[4]

^1H NMR (400 MHz, $CDCl_3$) δ 7.49 – 7.35 (m, 2H), 7.35 – 6.95 (m, 8H), 4.10 (s, 2H).



6.2. UV/vis monitoring studies

Benzyl bromide **1a**: Benzyl bromide **1a** (96 μL, 0.8 mmol, 2 equiv) was dissolved in DCM (4 mL).

1,1-Diphenylethylene **2a**: 1,1-Diphenylethylene **2a** (212 μL, 1.2 mmol, 3 equiv) was dissolved in DCM (4 mL).

The mixture of **1a** and **2a**: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.8 mmol, 2 equiv), **2a** (212 μL, 1.2 mmol, 3 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **1a**, **2a** and $Zn(OAc)_2$: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.8 mmol, 2 equiv), **2a** (212 μL, 1.2 mmol, 3 equiv) and $Zn(OAc)_2$ (220.2 mg, 1.2 mmol, 3 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **1a**, **2a** and K_2HPO_4: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.8 mmol, 2 equiv), **2a** (212 μL, 1.2 mmol, 3 equiv) and K_2HPO_4 (139.4 mg, 0.8 mmol, 2 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

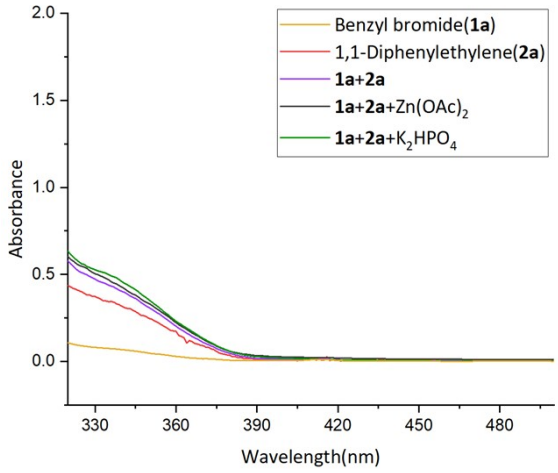


Figure S2. Comparison of the UV/Vis absorption spectra of **1a**, **2a**,**1a**+**2a**, **1a**+**2a**+$Zn(OAc)_2$, **1a**+**2a**+K_2HPO_4.

Benzyl bromide **1a**: Benzyl bromide **1a** (96 μL, 0.8 mmol, 2 equiv) was dissolved in DCM (4 mL).

1-Methylindole **3a**: 1-methylindole **3a** (52 μL, 0.4 mmol) was dissolved in DCM (4 mL).

The mixture of **1a** and **3a**: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.8 mmol, 2 equiv), **3a** (52 μL, 0.4 mmol) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **1a**, **3a** and $Zn(OAc)_2$: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.4 mmol, 2 equiv), **3a** (52 μL, 0.4 mmol) and $Zn(OAc)_2$ (220.2 mg, 1.2 mmol, 3 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **1a**, **3a** and K_2HPO_4: Under nitrogen atmosphere, a mixture of **1a** (96 μL, 0.8 mmol, 2 equiv), **3a** (52 μL, 0.4 mmol) and K_2HPO_4 (139.4 mg, 0.8 mmol, 2 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

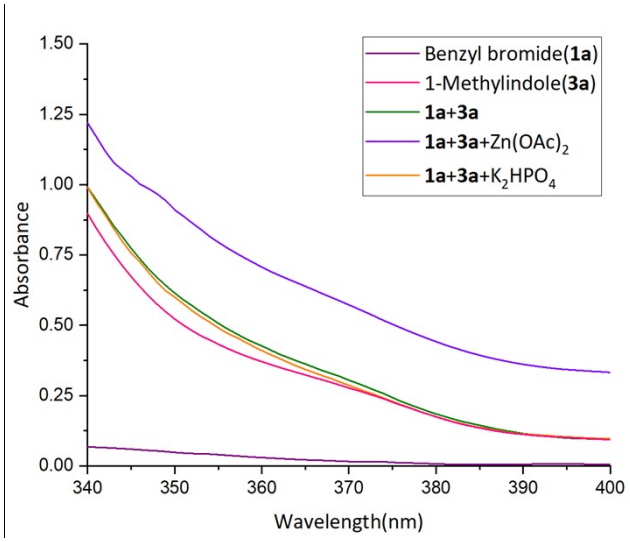


Figure S3. Comparison of the UV/Vis absorption spectra of **1a**, **3a**,**1a**+**3a**, **1a**+**3a**+$Zn(OAc)_2$, **1a**+**3a**+K_2HPO_4.

1,1-Diphenylethylene **2a**: 1,1-Diphenylethylene **2a** (212 μL, 1.2 mmol, 3 equiv) was dissolved in DCM (4 mL).

1-Methylindole **3a**: 1-methylindole **3a** (52 μL, 0.4 mmol) was dissolved in DCM (4 mL).

The mixture of **2a** and **3a**: Under nitrogen atmosphere, a mixture of **2a** (212 μL, 1.2 mmol, 3 equiv), **3a** (52 μL, 0.4 mmol) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **2a**, **3a** and $Zn(OAc)_2$: Under nitrogen atmosphere, a mixture of **2a** (212 μL, 1.2 mmol, 3 equiv), **3a** (52 μL, 0.4 mmol) and $Zn(OAc)_2$ (220.2 mg, 1.2 mmol, 3 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

The mixture of **2a**, **3a** and K_2HPO_4: Under nitrogen atmosphere, a mixture of **2a** (212 μL, 1.2 mmol, 3 equiv), **3a** (52 μL, 0.4 mmol) and K_2HPO_4 (139.4 mg, 0.8 mmol, 2 equiv) in DCM (4 mL) was stirred at room temperature for 30 minutes.

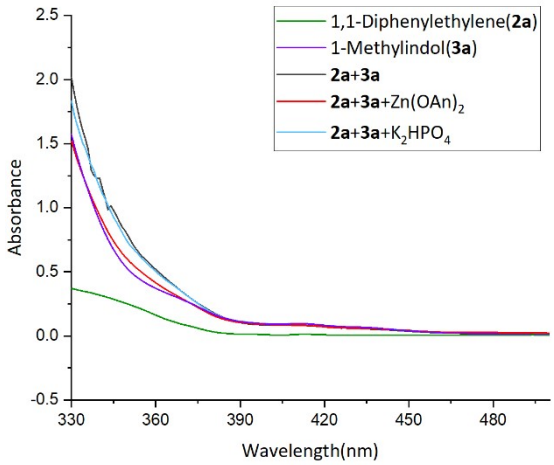


Figure S4. Comparison of the UV/Vis absorption spectra of **2a**, **3a**,**2a**+**3a**, **2a**+**3a**+$Zn(OAc)_2$, **2a**+**3a**+K_2HPO_4.

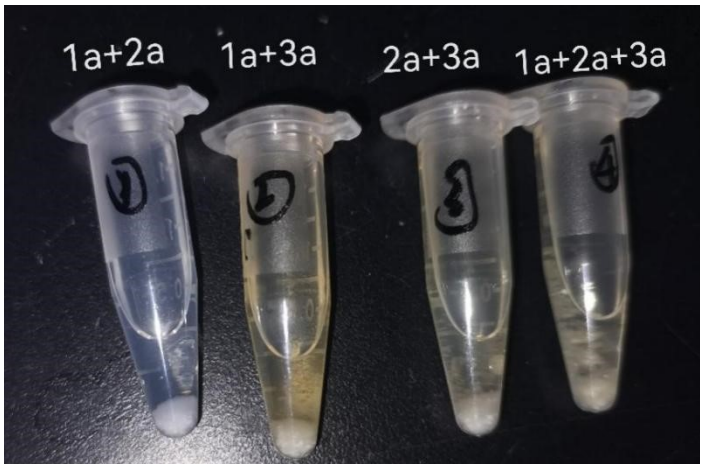
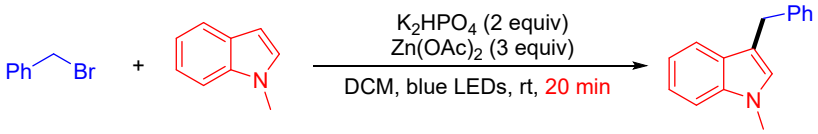


Figure S5. Photographs of (1) mixture of benzyl bromide **1a**, 1,1-diphenylethylene **2a**, K_2HPO_4, and $Zn(OAc)_2$ after ca. 10 minutes of photoirradiation (Ex = 455 nm); (2) mixture of benzyl bromide **1a**, 1-methylindole **3a**, K_2HPO_4, and $Zn(OAc)_2$ after ca. 10 minutes of photoirradiation (Ex = 455 nm); (3) mixture of **2a**, **3a**, K_2HPO_4, and $Zn(OAc)_2$ after ca. 10 minutes of photoirradiation (Ex = 455 nm); (4) mixture of **1a**, **2a**, **3a**, K_2HPO_4 and $Zn(OAc)_2$ after ca. 10 minutes of photoirradiation (Ex = 455 nm). All solutions are prepared and illuminated under air atmosphere.

From the UV/Vis spectra of **1a**, **2a**, **3a**, we found 1-methylindole **3a** at high concentrations (0.1 M) exhibits weak absorption in the visible light region, which explained why the reaction has 46% yield of **4a** when without $Zn(OAc)_2$. In addition, the UV/Vis spectra of **1a**+**3a**+ $Zn(OAc)_2$ has a significant red shift in the visible light region. This result also suggest this reaction was driven by the photochemical activity of electron donor–acceptor (EDA) complexes, formed by association of benzyl bromide **1a** and 1-methylindole **3a** under the assistance of $Zn(OAc)_2$.

6.3. Control experiments

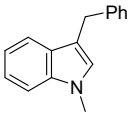
6.3.1. the reaction of 1a and 3a



1a **3a** **9**, 9%

To an oven-dried Schlenk tube (10 mL) equipped with a magnetic stir bar was added K_2HPO_4 (69.7 mg, 0.4 mmol, 2 equiv) and $Zn(OAc)_2$ (110.1 mg, 0.6 mmol, 3 equiv), then the Schlenk tube was charged with N_2 three times. Anhydrous DCM (2 mL), benzyl bromide (48 μL, 0.4 mmol, 2 equiv) and 1-methylindole (26 μL, 0.2 mmol) were added via syringe under N_2 atmosphere and stirred at room temperature for 20 min. The reaction mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The characteristic peaks of newly generated substance was confirmed to be 3-benzyl-1-methyl-1*H*-indolecan by ^{1}H NMR and then the residue was further purified by silica gel flash column chromatography to obtain the pure product with 9% yield.

3-benzyl-1-methyl-1*H*-indole (9)[5]



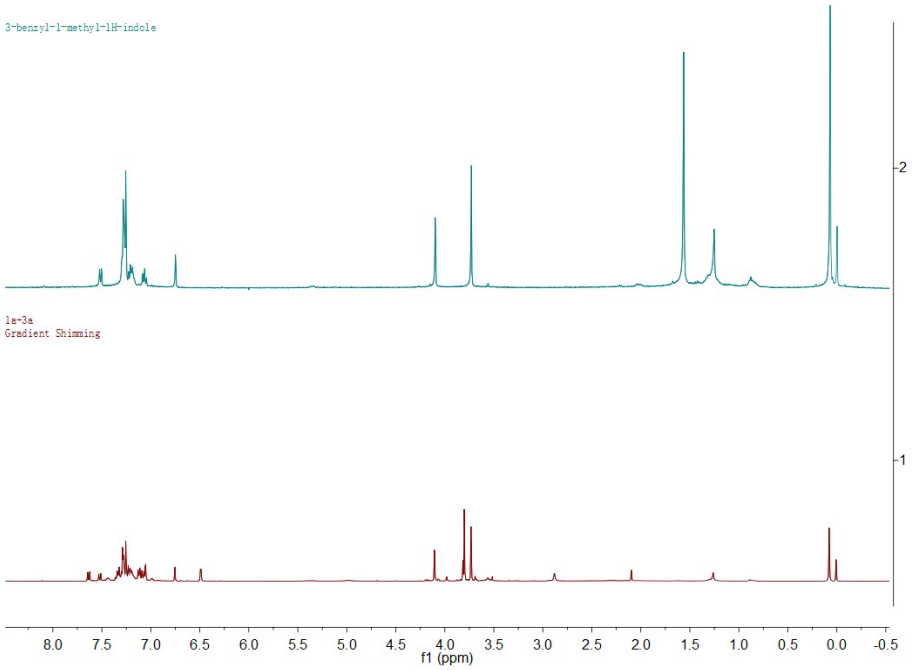
4.0 mg, 0.018 mmol, 9%;

Pure white solid;

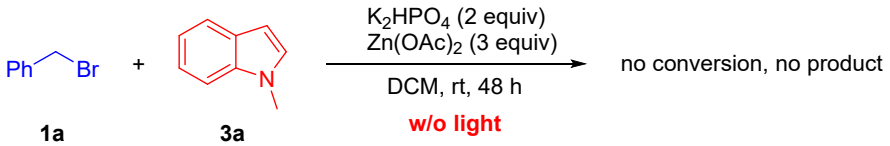
R_f (PE): 0.22;

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (d, *J* = 7.9 Hz, 1H), 7.29 – 7.20 (m, 5H), 7.20 – 7.12 (m, 2H), 7.07 – 7.02 (m, 1H), 6.67 (s, 1H), 4.06 (s, 2H), 3.60 (s, 3H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 141.58, 137.30, 128.84, 128.47, 127.99, 127.25, 125.98, 121.71, 119.35, 118.92, 114.39, 109.29, 32.63, 31.68.



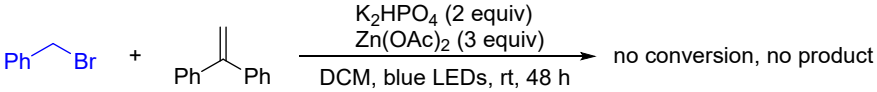
6.3.2. the reaction of 1a and 3a without light



1a **3a**

To an oven-dried Schlenk tube (10 mL) equipped with a magnetic stir bar was added K_2HPO_4 (69.7 mg, 0.4 mmol, 2 equiv) and $Zn(OAc)_2$ (110.1 mg, 0.6 mmol, 3 equiv), then the Schlenk tube was charged with N_2 three times. Anhydrous DCM (2 mL), benzyl bromide (48 μL, 0.4 mmol, 2 equiv) and 1-methylindole (26 μL, 0.2 mmol) were added via syringe under N_2 atmosphere and stirred at room temperature for 48 h without light. After the reaction was finished, the reaction mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. This reaction has no conversion and no product, which confirmed by ^{1}H NMR.

6.3.3. the reaction of 1a and 2a



1a **2a**

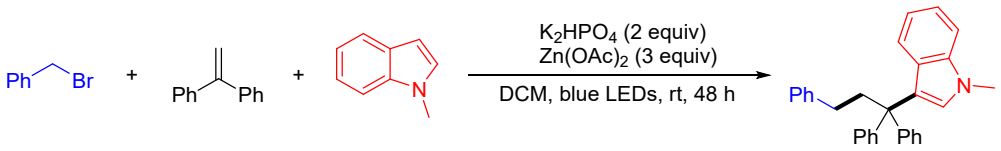
To an oven-dried Schlenk tube (10 mL) equipped with a magnetic stir bar was added K_2HPO_4 (69.7 mg, 0.4 mmol) and $Zn(OAc)_2$ (110.1 mg, 0.6 mmol), then the Schlenk tube was charged with N_2 three times. Anhydrous DCM (2 mL), benzyl bromide (48 μL, 0.4 mmol) and 1,1-diphenylethylene (106 μL, 0.6 mmol) were added via syringe under N_2 atmosphere and stirred at room temperature for 48 h. After the reaction was finished, the

reaction mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. This reaction has no conversion and no product, which confirmed by ^{1}H NMR.

First, when the reaction between **1a** and **3a** under the standard reaction conditions for 20 min, the cross-coupling product 3-benzyl-1-methyl-1*H*-indole (**9**) was generated in 9% yield. However, no product **9** was observed in this reaction without blue light. These two reactions provide significant evidence for the interaction between **1a** and **3a** via the SET process under blue light irradiation. Second, not any product could be detected when the reaction of **1a** and **2a** were conducted under the standard reaction conditions, which excluding the process of photo promoted homolytic fragmentation of alkyl halides.

7. The application of the reaction

7.1. Synthesis of 4a in gram scale

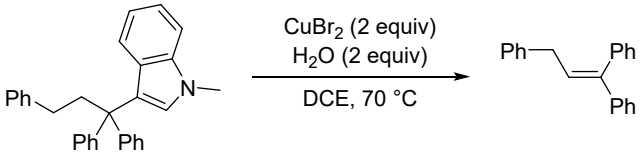


1a, 8 mmol **2a**, 12 mmol **3a**, 4 mmol **4a**, 1.0 g, 63%

Following the general procedure, the reaction with **1a** (1.0 mL, 8 mmol, 2 equiv), **2a** (2.1 mL, 12 mmol, 3 equiv), **3a** (0.5 mL, 4 mmol), K_2HPO_4 (1.4 g, 8 mmol, 2 equiv), $Zn(OAc)_2$ (2.2 g, 12 mmol, 3 equiv) and DCM (30 mL) under N_2 for 48 h at at room temperature (about 40 °C) afforded **4a** as white solid (1.0 g, 63% yield).

7.2. Derivatization reaction of 4a

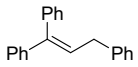
Synthesis of the prop-1-ene-1,1,3-triyltribenzene 10



4a **10**, 86%

A 10 mL Schlenk tube were charged with **4a** (85 mg, 0.2 mmol) and $CuBr_2$ (89 mg, 0.4 mmol, 2 equiv) with H_2O (80.0 μL, 0.4 mmol, 2 equiv) in DCE (2.0 mL). Then, the system reacts at 70 ℃ for overnight. When the reaction was finished, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (PE) to afford the pure desired product with 86% yield.

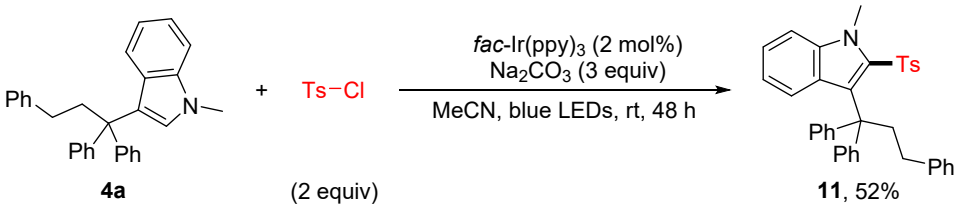
prop-1-ene-1,1,3-triyltribenzene (10) [6]



^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 – 7.12 (m, 15H), 6.27 (t, *J* = 7.6 Hz, 1H), 3.47 (d, *J* = 7.6 Hz, 2H);

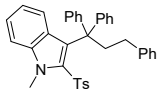
^{13}C NMR (101 MHz, $CDCl_3$) δ 142.49, 140.97, 139.84, 129.96, 128.44, 128.33, 128.14, 127.37, 127.09, 126.03, 35.97.

Synthesis of the 1-methyl-2-tosyl-3-(1,1,3-triphenylpropyl)-1*H*-indole 11



A 10 mL Schlenk tube were charged with **4a** (85 mg, 0.2 mmol), Tosyl chloride (76 μL, 0.4 mmol, 2 equiv), *fac*-Ir(ppy)$_3$ (3 mg, 0.004 mmol, 2 mol%) and Na_2CO_3 (64 mg, 0.6 mmol, 3 equiv) in MeCN (2.0 mL). Then, the system reacts at room temperature for overnight. When the reaction was finished, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (PE/EA = 5:1) to afford the pure desired product with 52% yield.

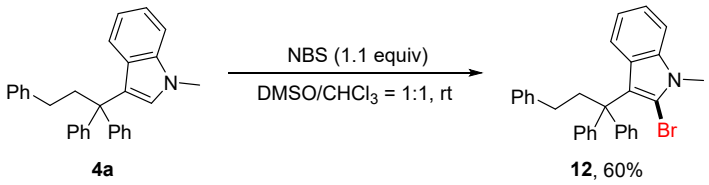
1-methyl-2-tosyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (11)



^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.84 (d, *J* = 8.1 Hz, 2H), 7.38 – 7.32 (m, 5H), 7.28 – 7.21 (m, 7H), 7.17 (dd, *J* = 16.8, 8.4 Hz, 5H), 7.05 (d, *J* = 7.4 Hz, 2H), 6.97 (s, 1H), 3.81 (s, 3H), 2.96 – 2.90 (m, 2H), 2.37 (s, 3H), 2.34 (m, *J* = 5.6 Hz, 2H);

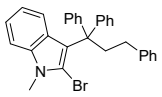
^{13}C NMR (151 MHz, $CDCl_3$) δ 146.42, 143.59, 142.50, 139.71, 136.64, 134.19, 132.78, 130.21, 129.80, 128.57, 128.44, 128.22, 128.09, 127.61, 126.15, 125.87, 122.96, 121.91, 117.38, 109.85, 52.19, 42.37, 33.22, 32.46, 21.58.

Synthesis of the 2-bromo-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole 12



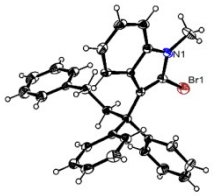
A 10 mL Schlenk tube were charged with **4a** (85 mg, 0.2 mmol) and NBS (39 mg, 0.22 mmol) in DMSO (1.0 mL) and DCE (1.0 mL). Then, the system reacts at room temperature for overnight. When the reaction was finished, the mixture was quenched with 2 mL of H_2O, extracted with AcOEt, then concentrated in vacuo. The residue was purified by silica gel flash chromatography (PE/DCM = 10:1) to afford the pure desired product with 60% yield.

2-bromo-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (12)



^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 – 7.45 (m, 4H), 7.28 – 7.21 (m, 7H), 7.19 – 7.08 (m, 6H), 6.81 – 6.76 (m, 1H), 6.47 (d, *J* = 8.2 Hz, 1H), 3.74 (s, 3H), 3.20 – 3.12 (m, 2H), 2.48 – 2.40 (m, 2H);

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.94, 142.77, 136.97, 128.60, 128.53, 128.33, 127.97, 127.67, 125.89, 125.69, 122.35, 121.47, 118.94, 118.00, 114.90, 109.19, 52.81, 40.41, 32.42, 31.62;



(CCDC: 2272373)

8. References

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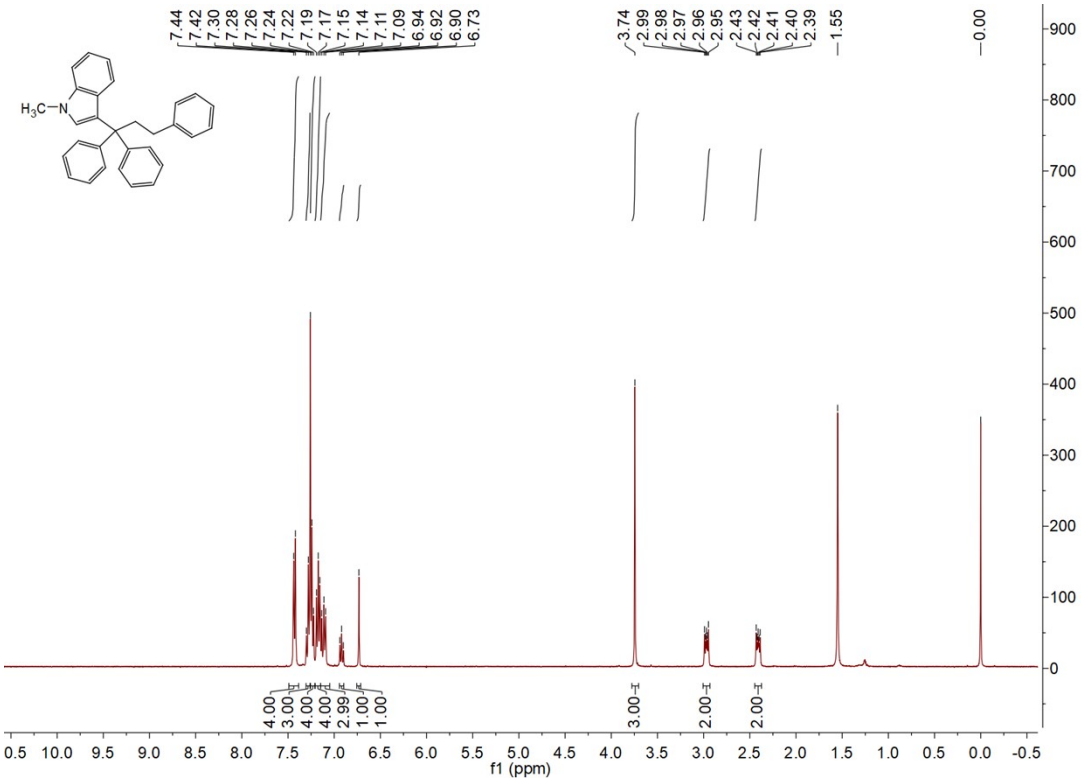
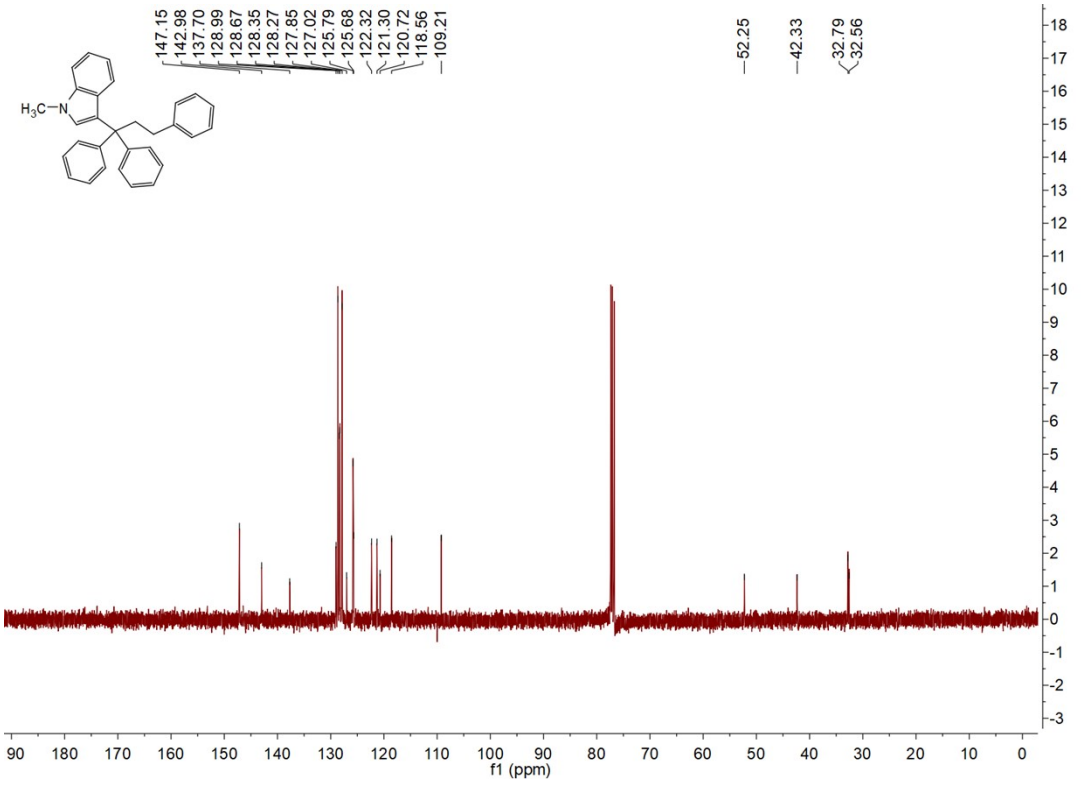
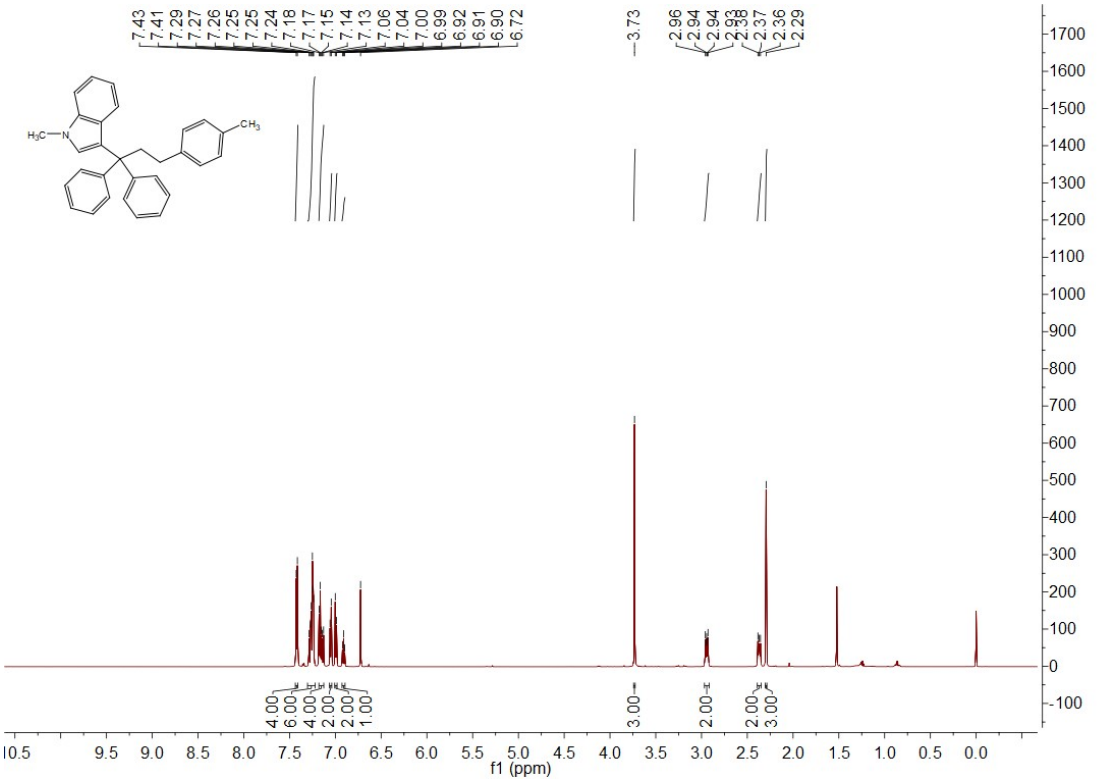
9. NMR spectra

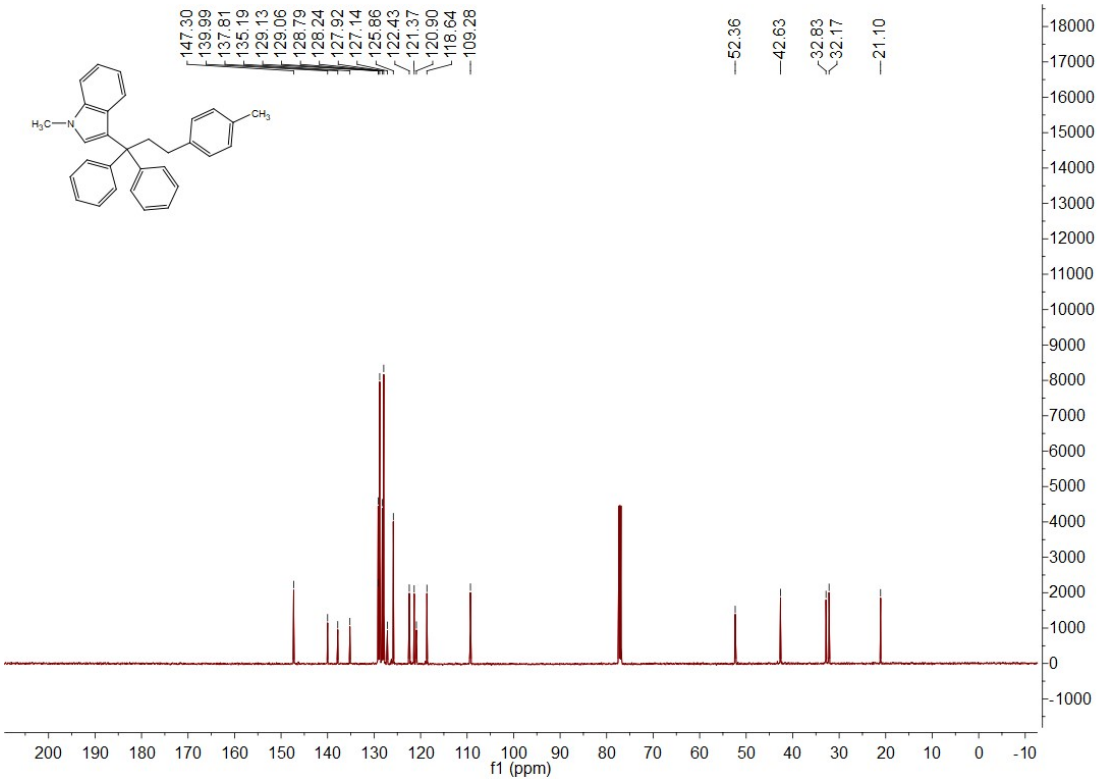
1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (4a)



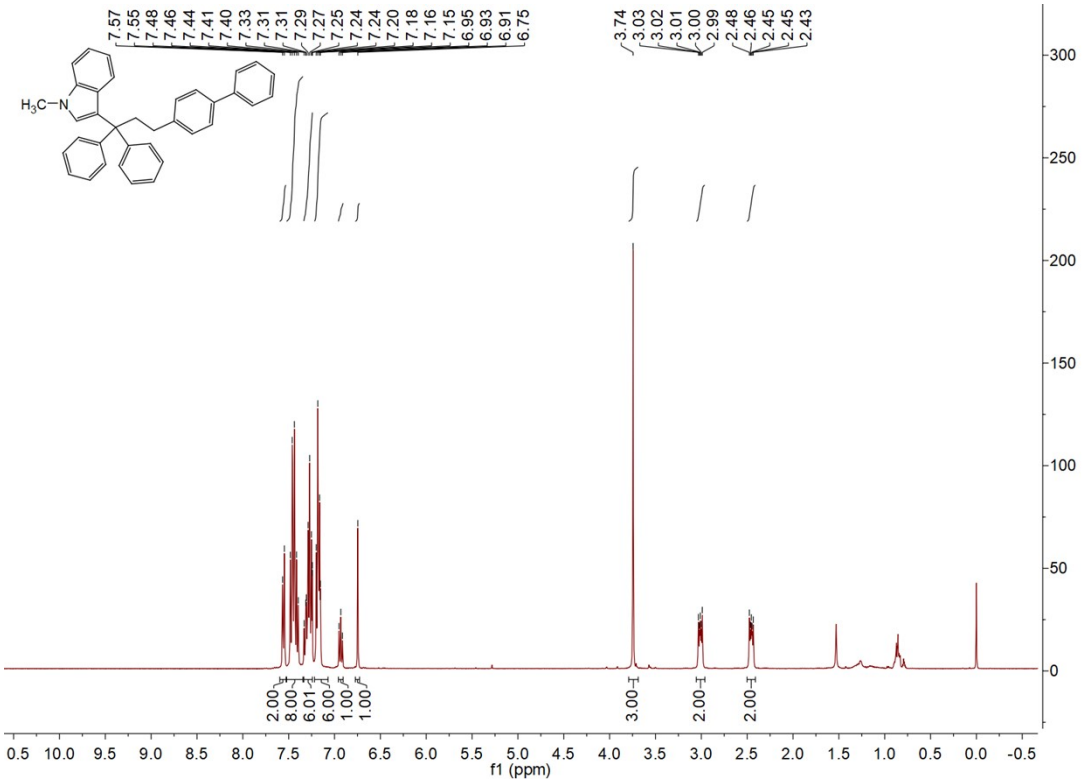


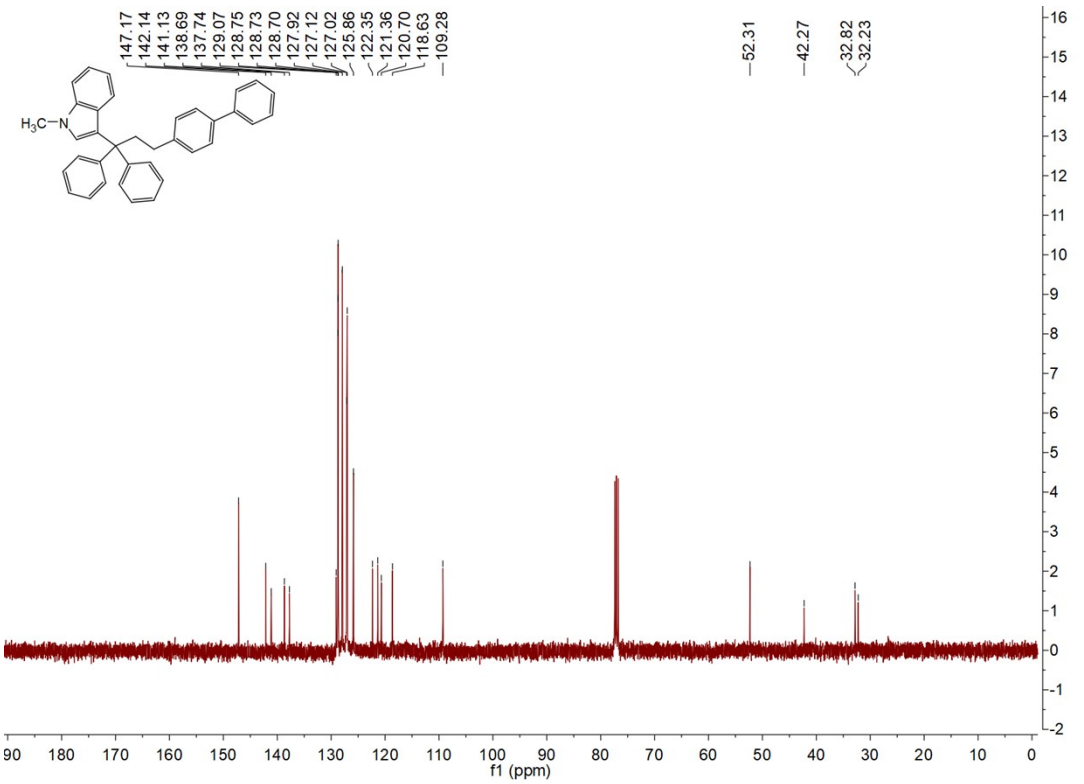
3-(1,1-diphenyl-3-(p-tolyl)propyl)-1-methyl-1*H*-indole (4b)



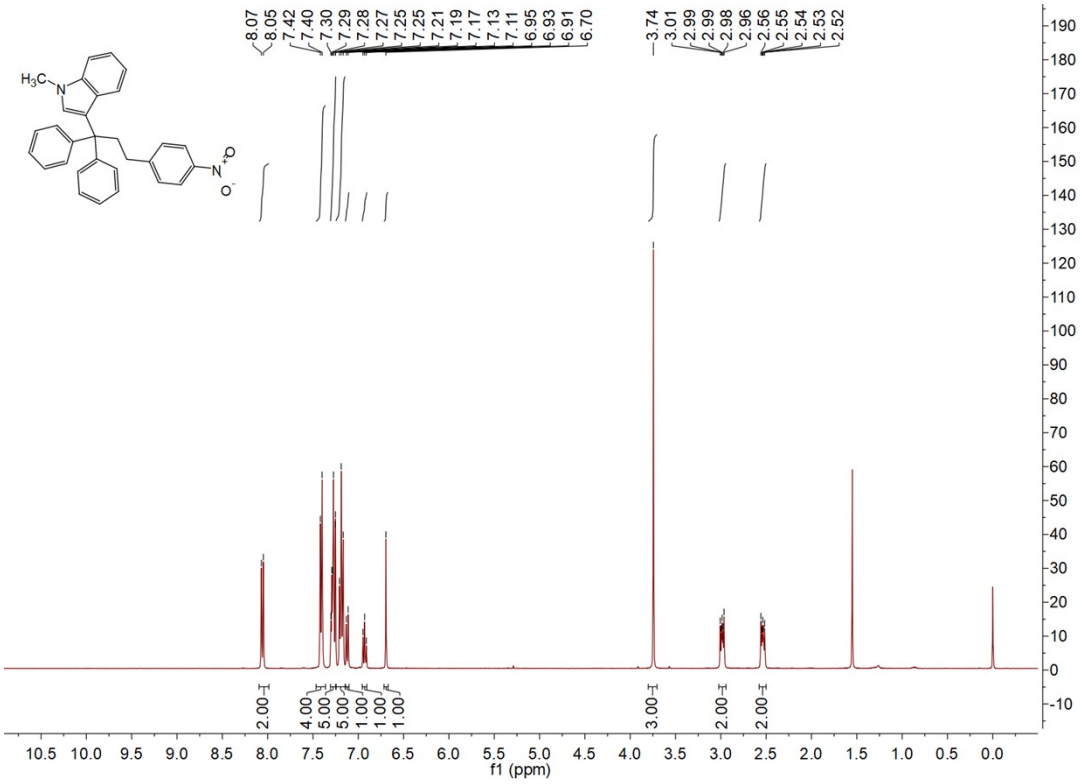


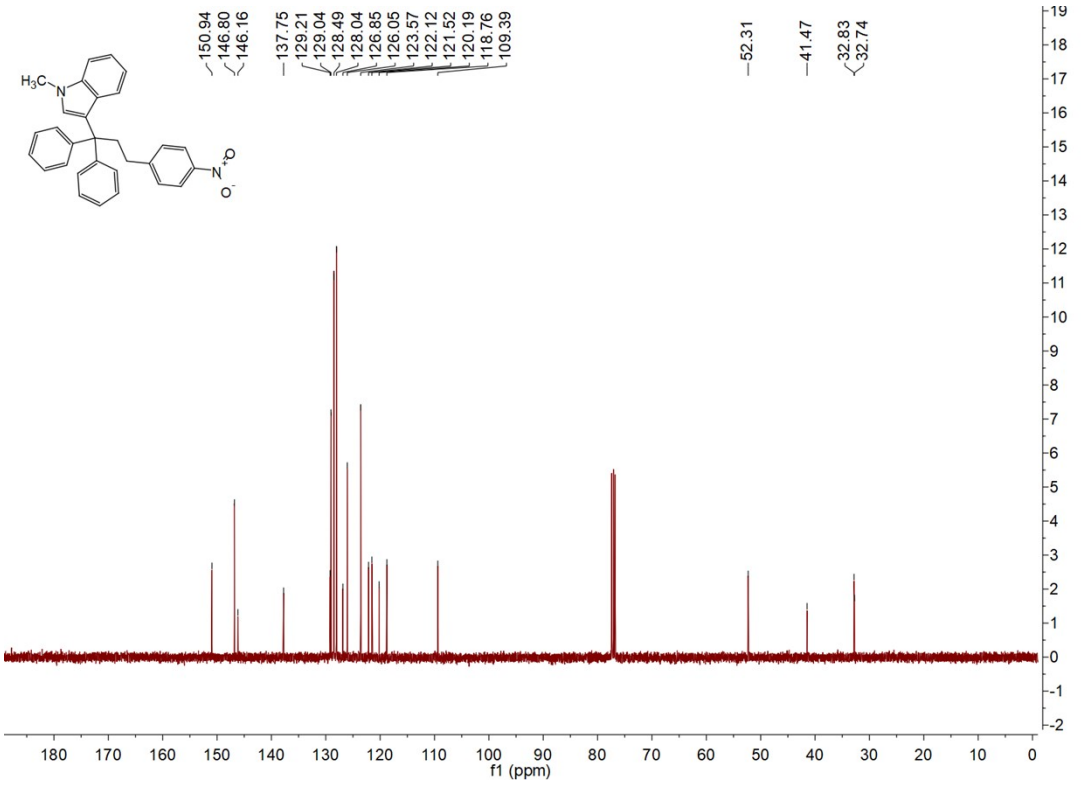
3-(3-([1,1'-biphenyl]-4-yl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4c)



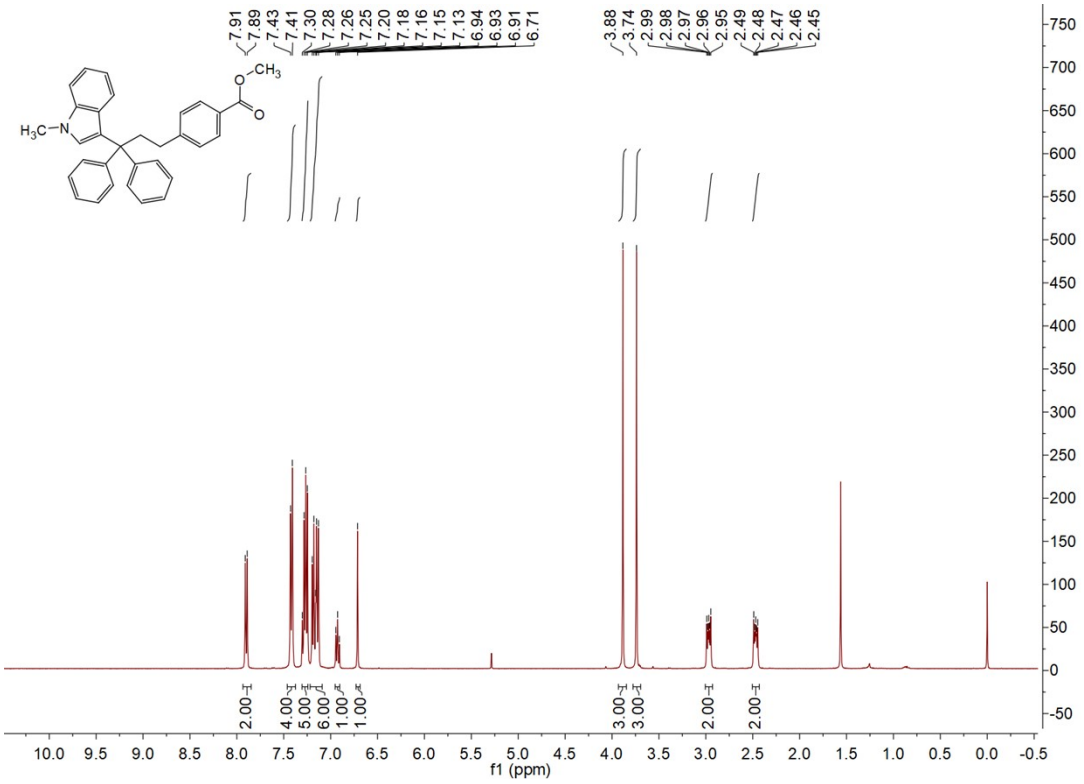


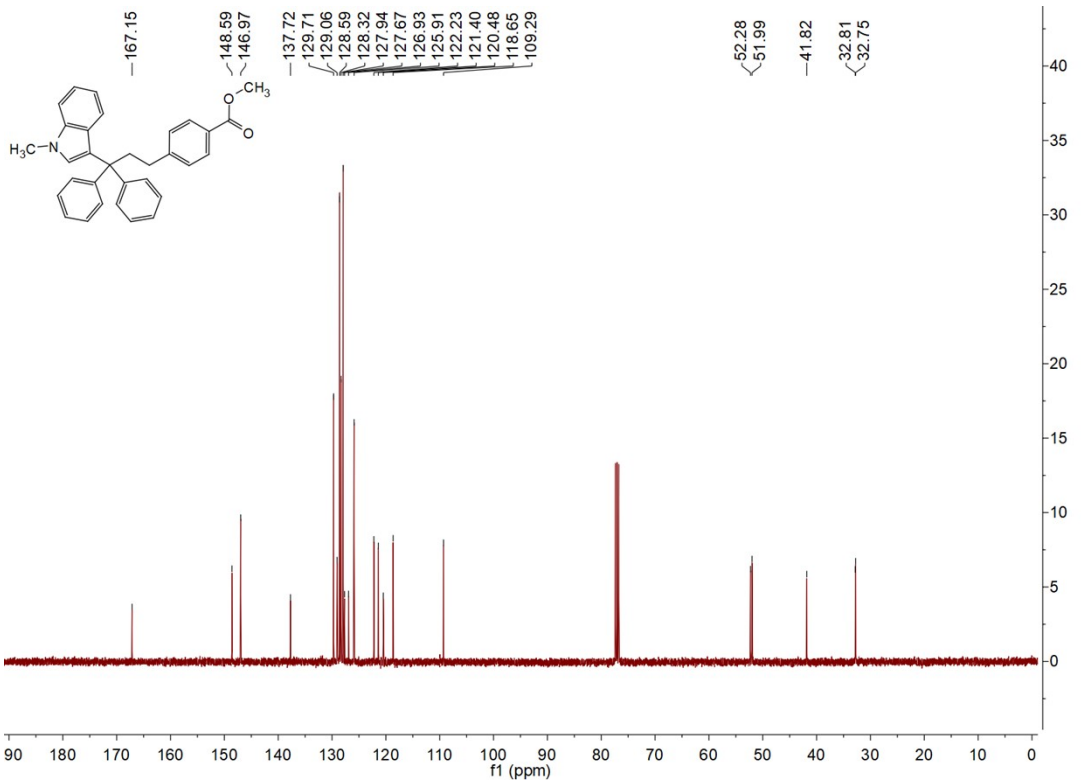
1-methyl-3-(3-(4-nitrophenyl)-1,1-diphenylpropyl)-1*H*-indole (4d)



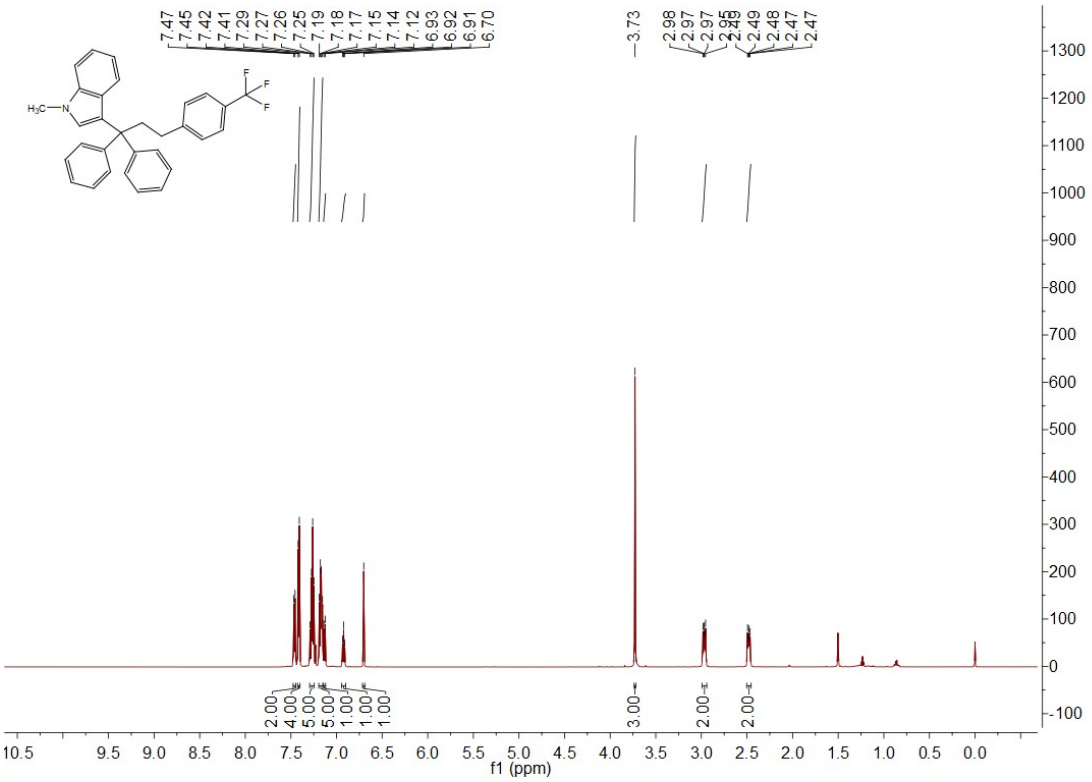


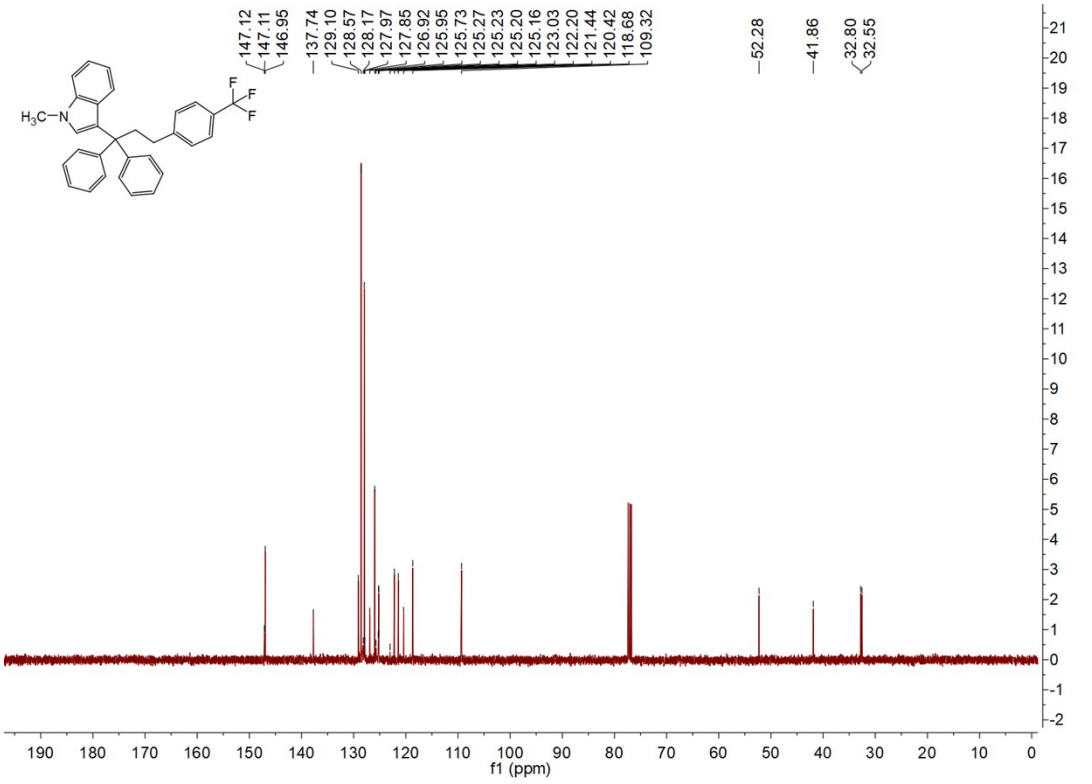
methyl 4-(3-(1-methyl-1*H*-indol-3-yl)-3,3-diphenylpropyl)benzoate (4e)

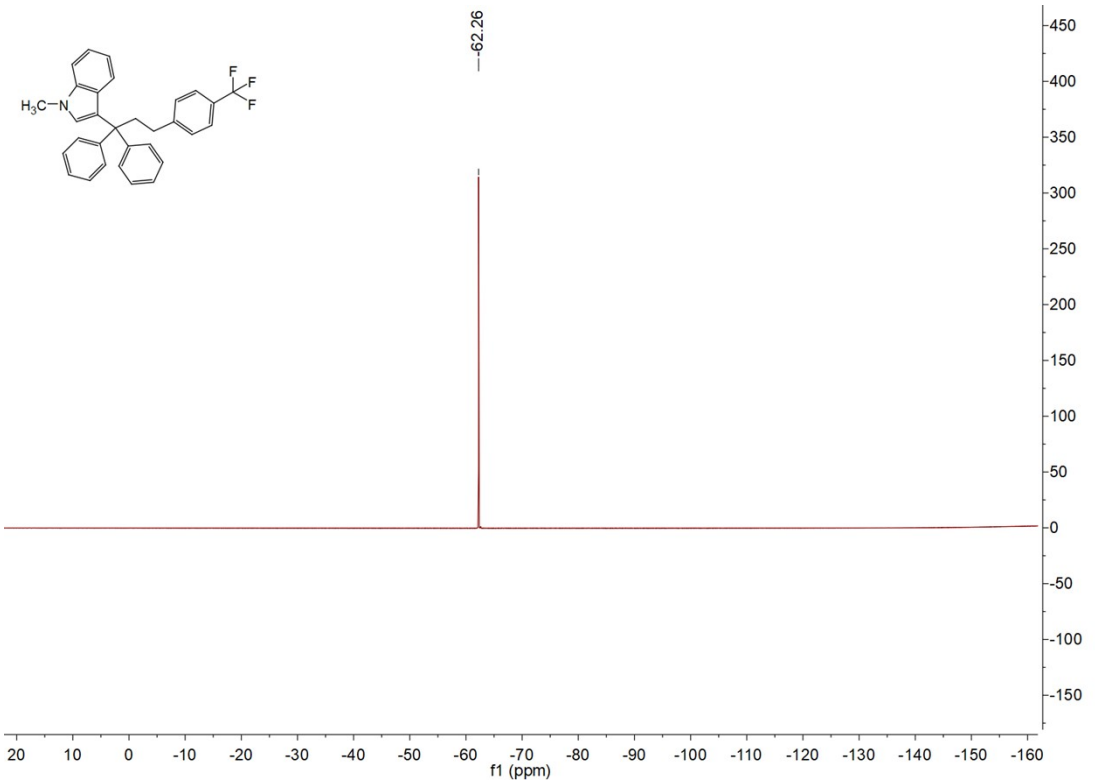




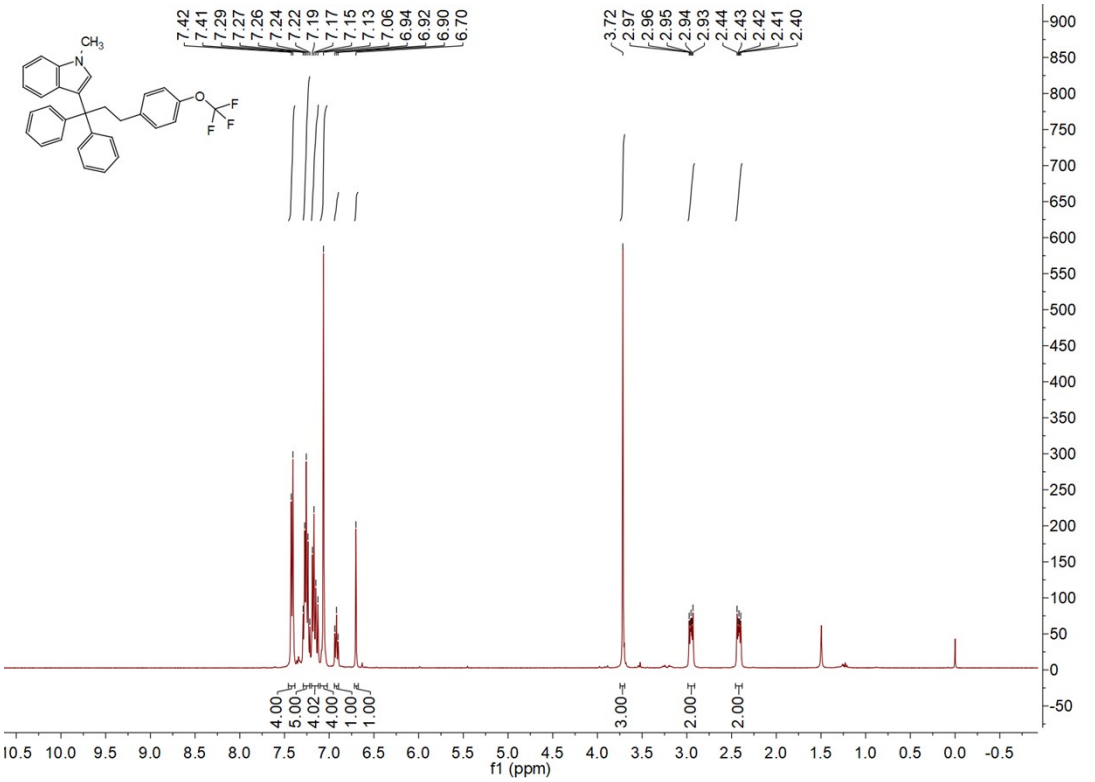
1-methyl-3-(3-(4-nitrophenyl)-1,1-diphenylpropyl)-1*H*-indole (4f)

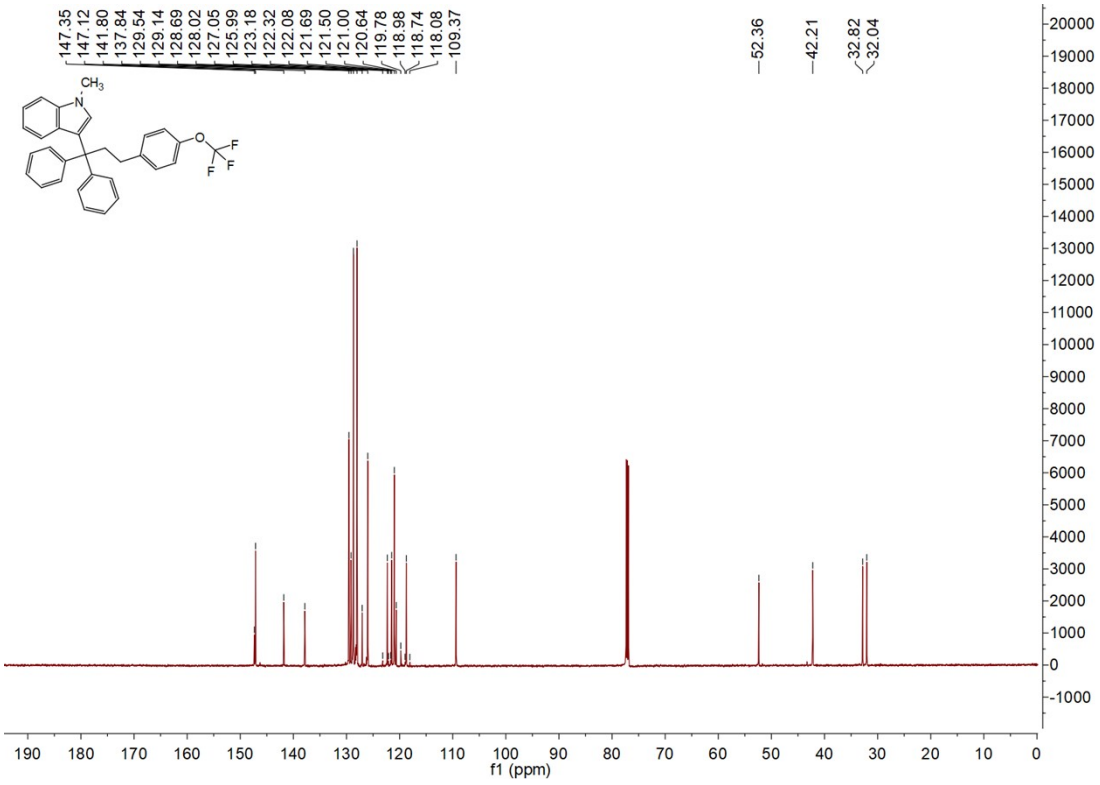






3-(1,1-diphenyl-3-(4-(trifluoromethoxy)phenyl)propyl)-1-methyl-1*H*-indole (4g)

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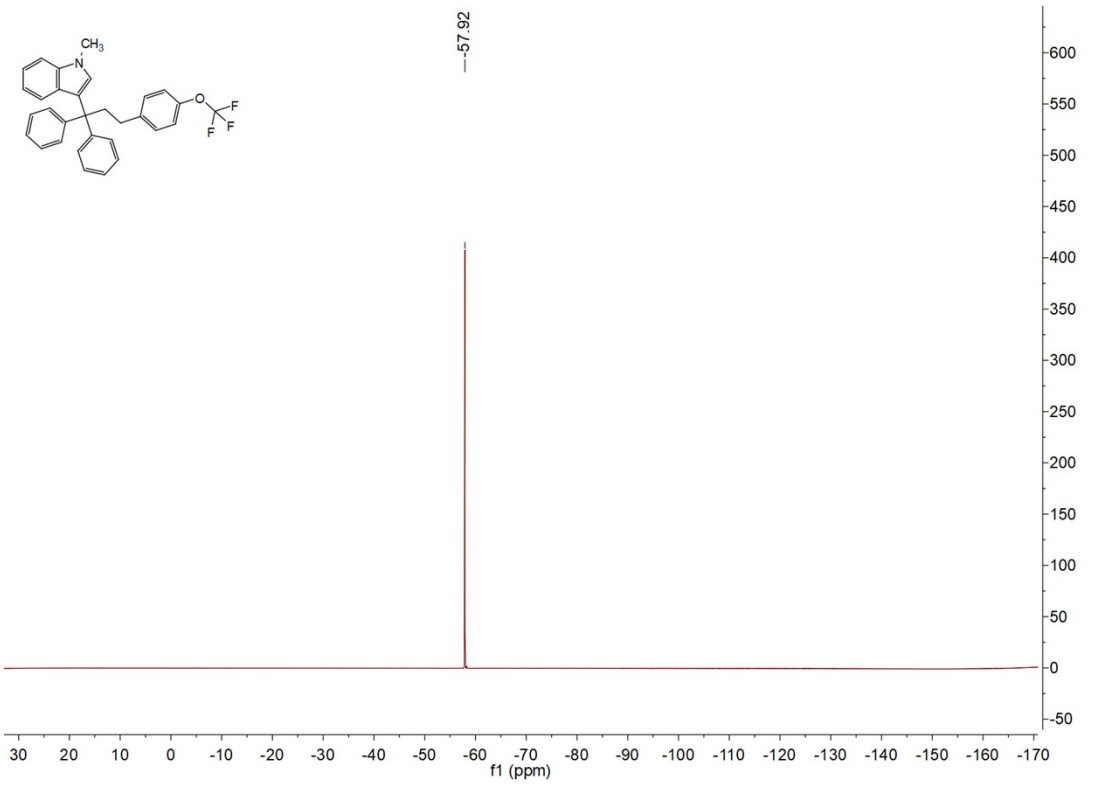
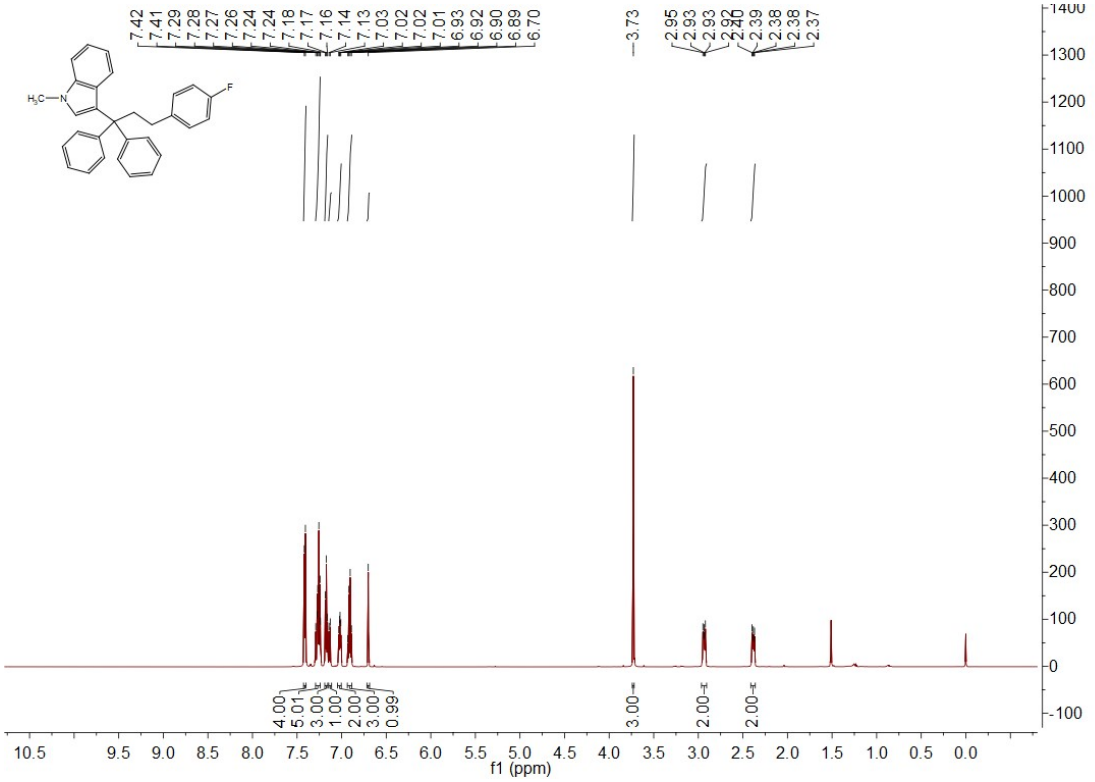
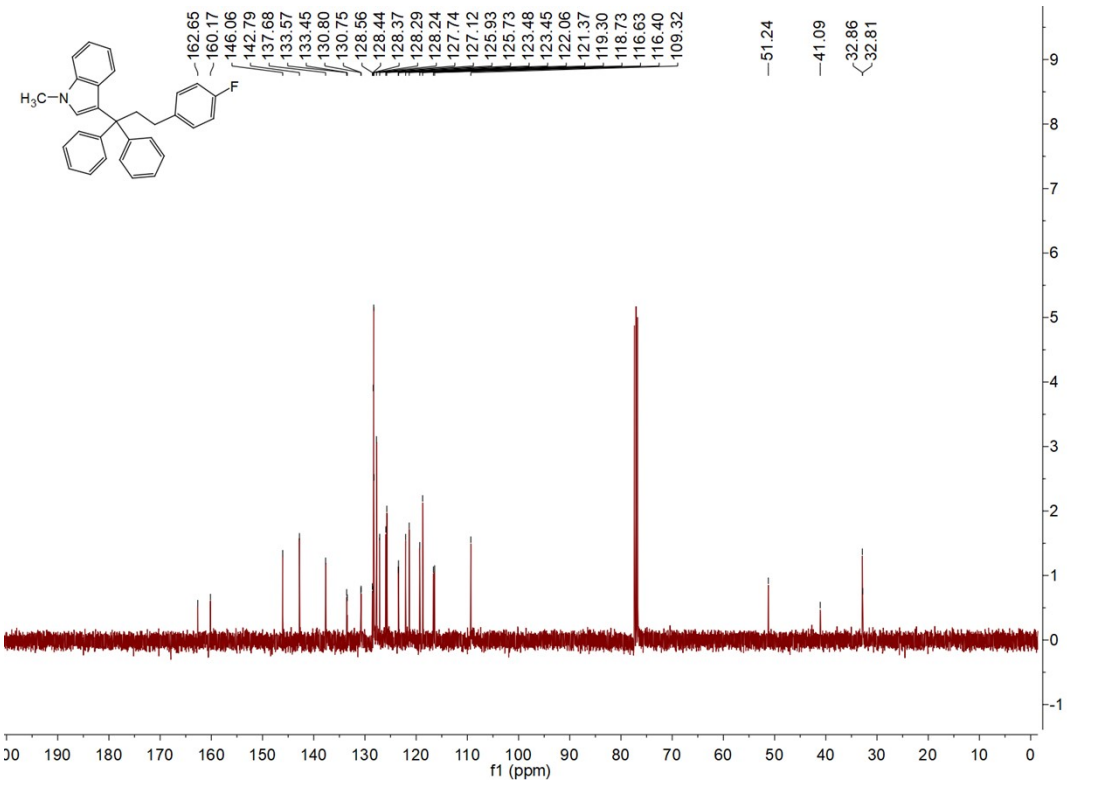
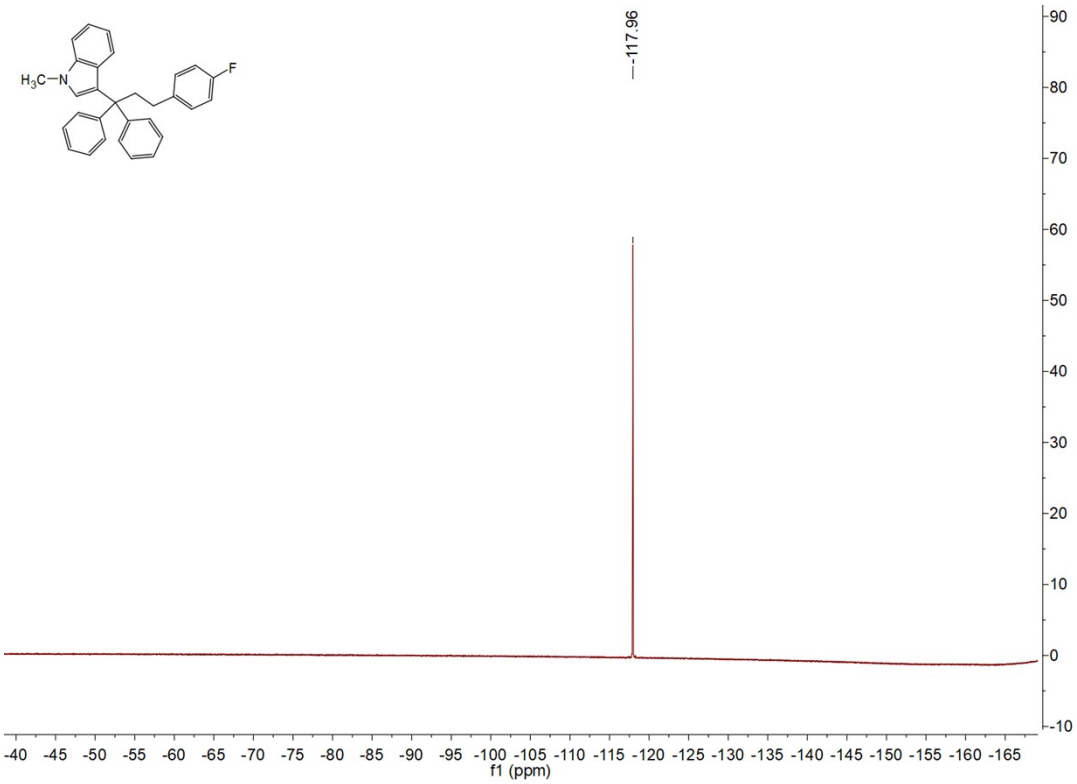
147.12
141.80
137.84
129.54
129.14
128.69
128.02
127.05
125.99
123.18
122.32
122.08
121.69
121.50
121.00
120.64
119.78
118.98
118.74
118.08
109.37
52.36
42.21
32.82
32.04
CH3
N
O
F
F
F
f1 (ppm)


-57.92
CH3
N
O
F
F
F
f1 (ppm)

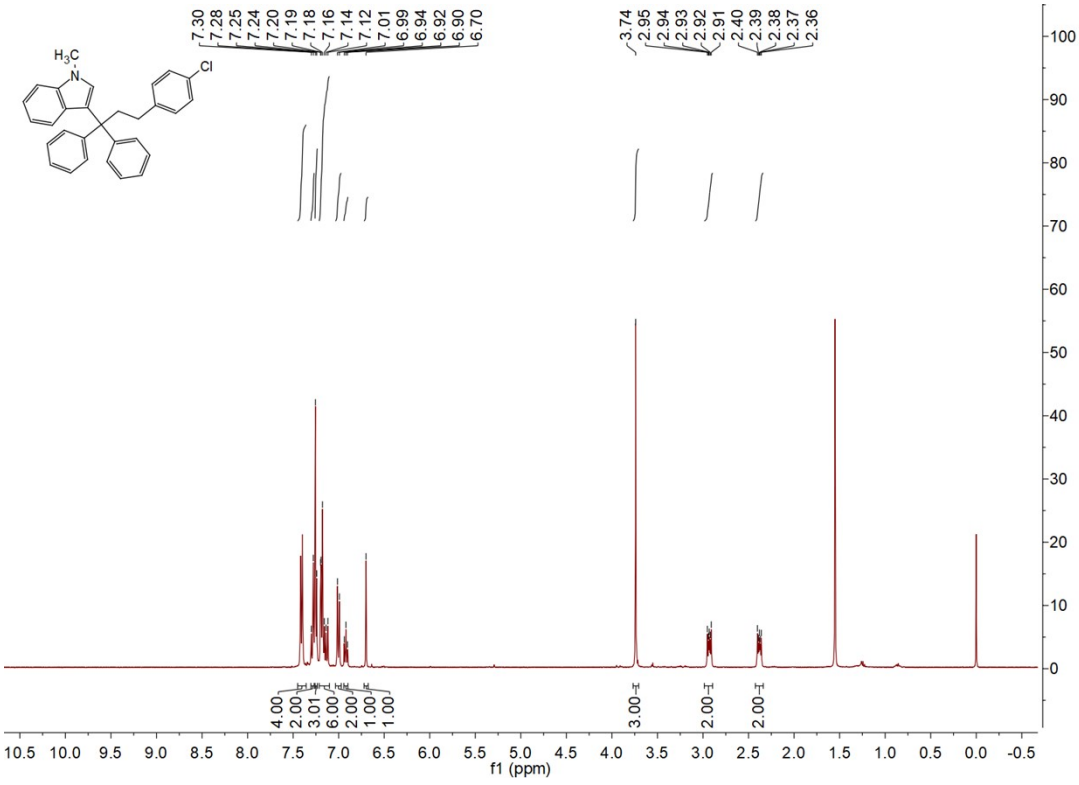
3-(3-(4-fluorophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4h)

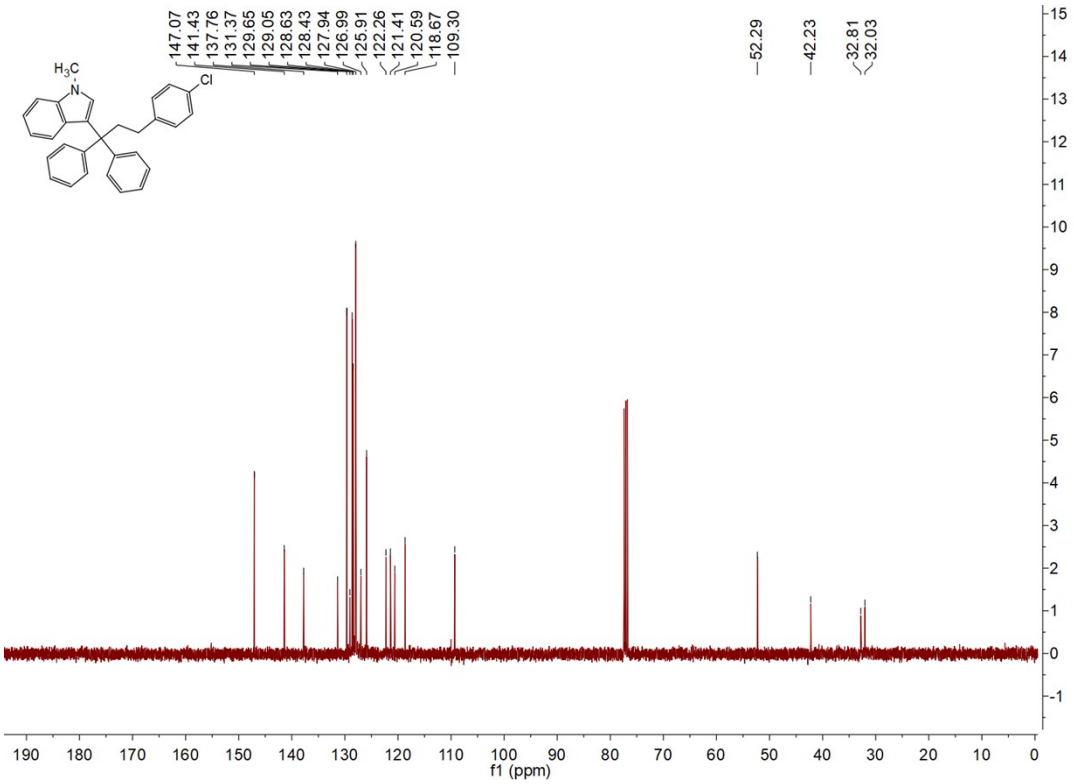




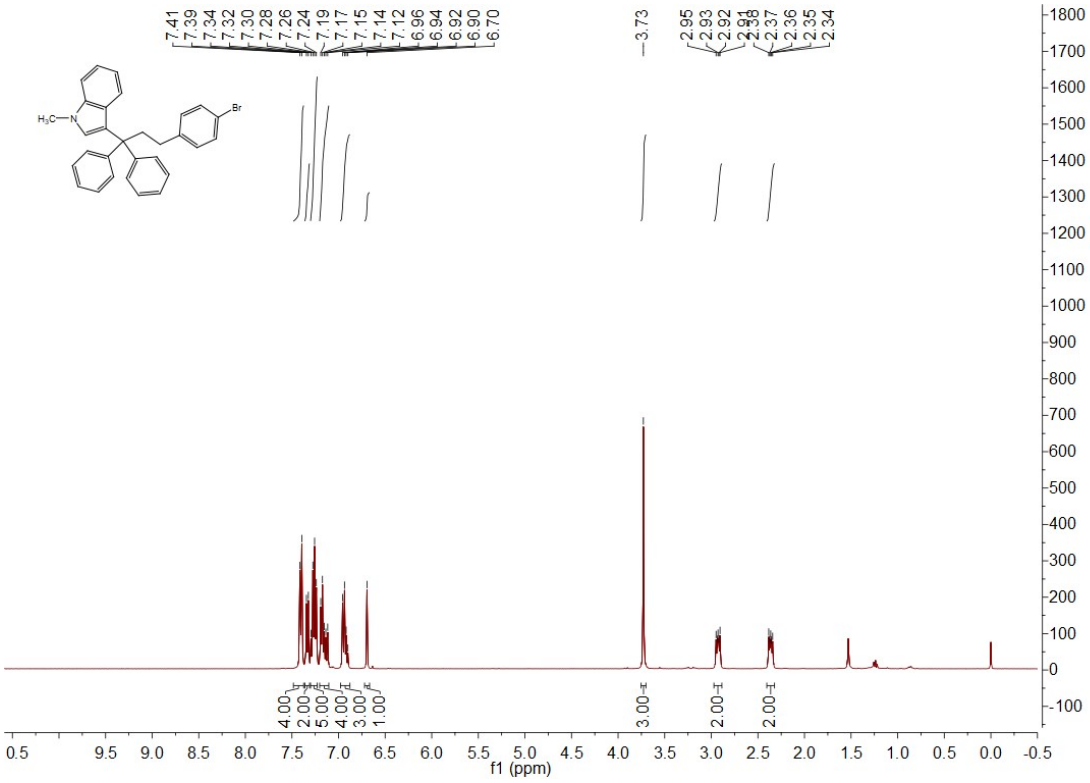


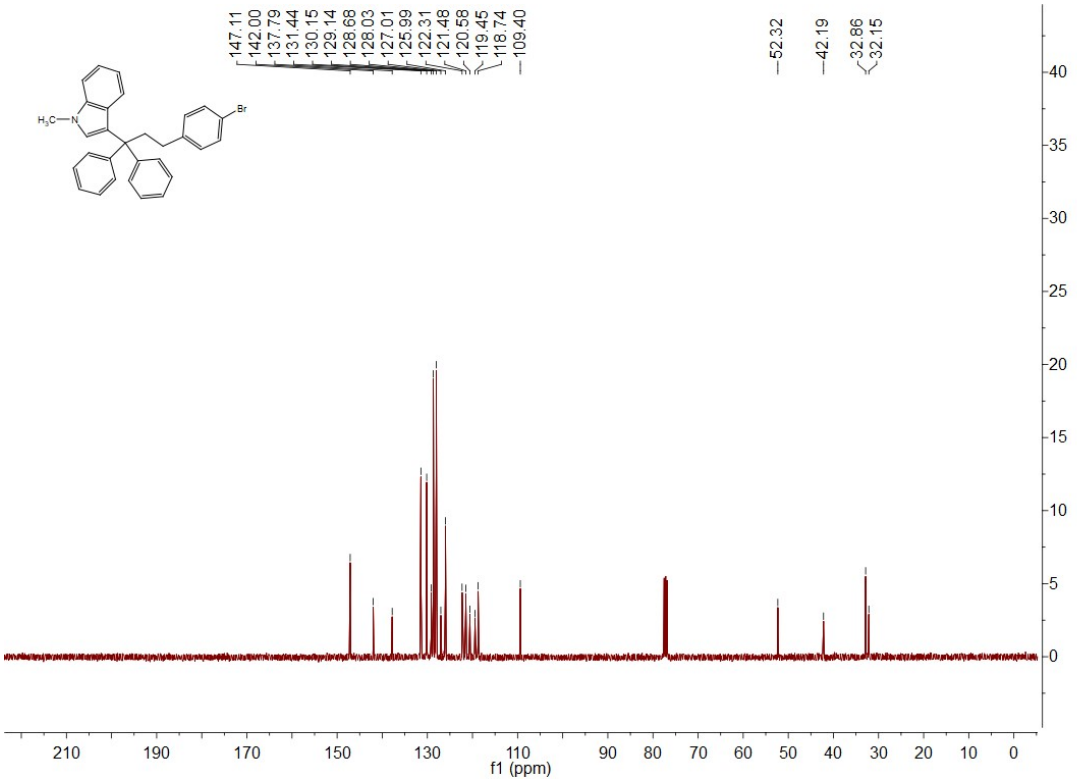
3-(3-(4-chlorophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4i)



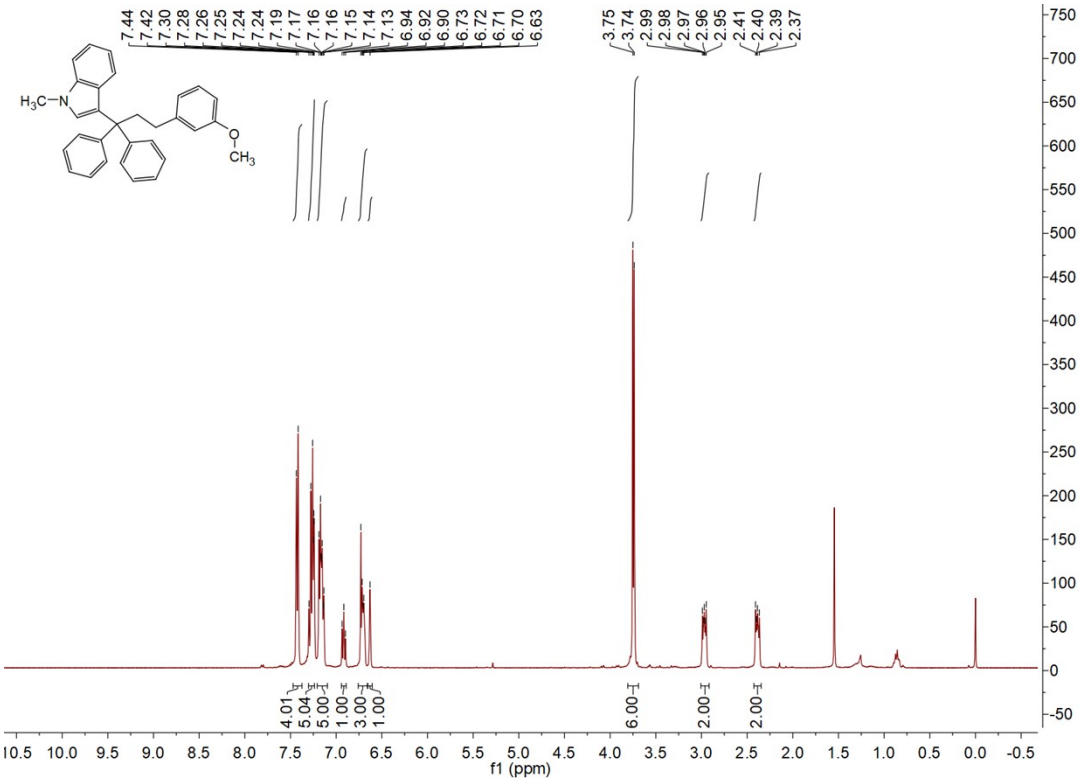


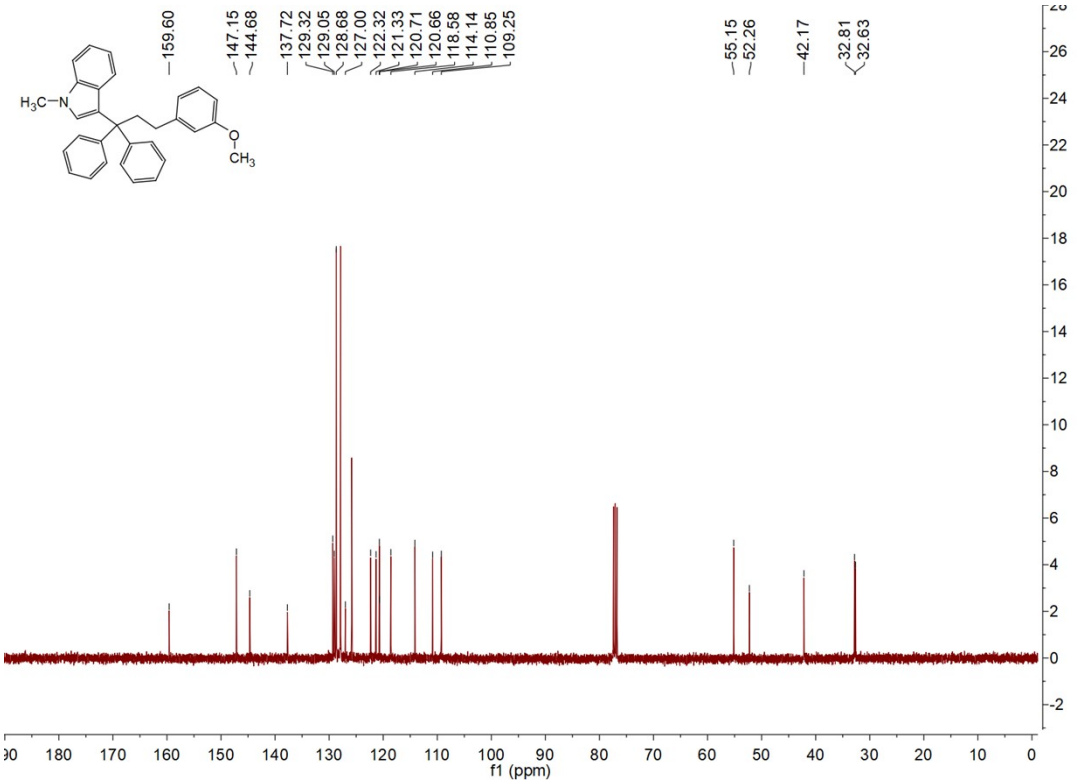
3-(3-(4-bromophenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4j)



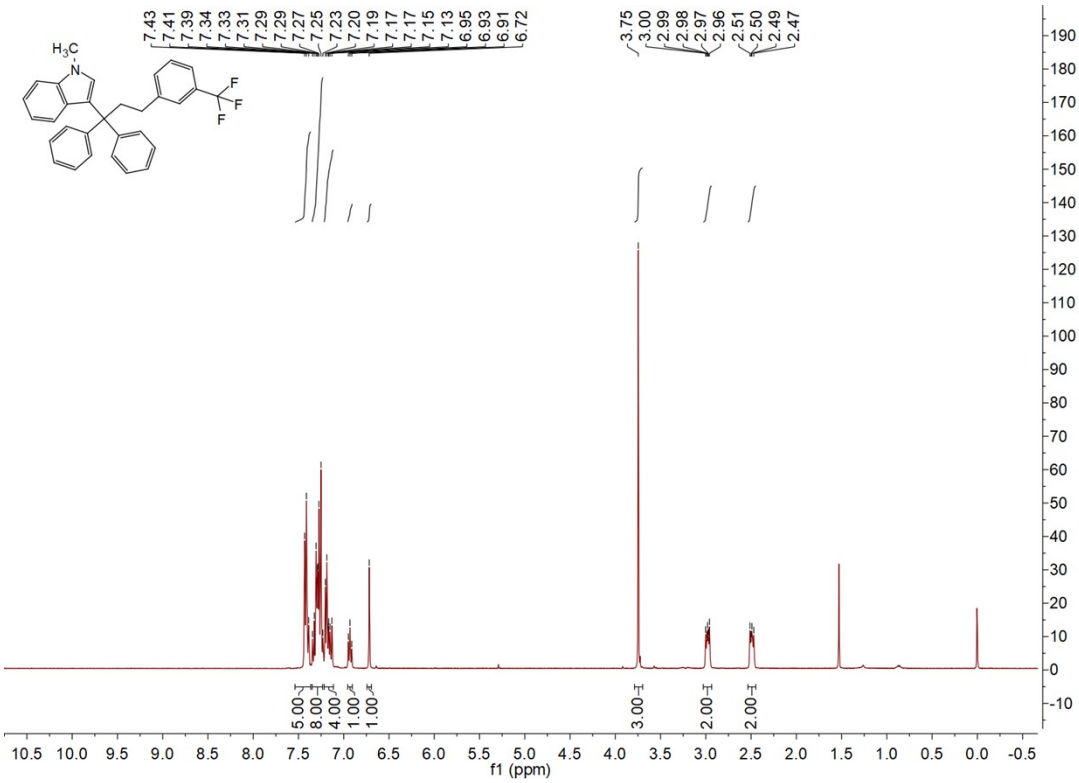


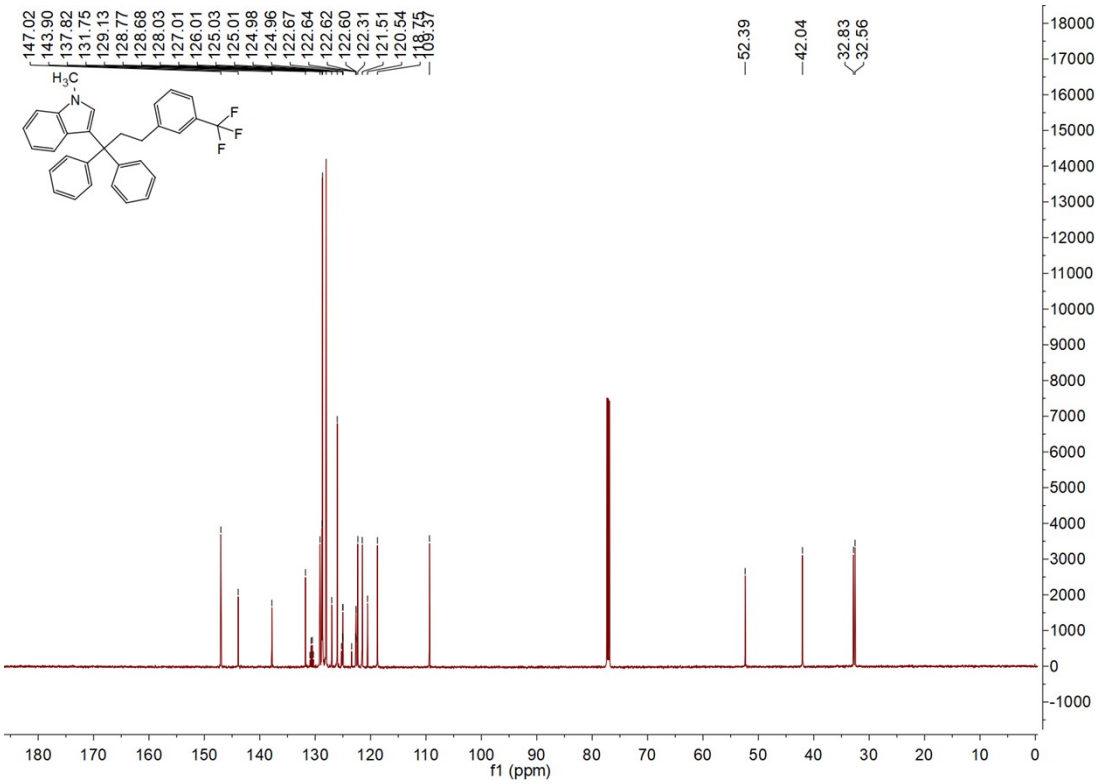
3-(3-(3-methoxyphenyl)-1,1-diphenylpropyl)-1-methyl-1*H*-indole (4k)





3-(1,1-diphenyl-3-(4-(trifluoromethyl)phenyl)propyl)-1-methyl-1*H*-indole (4l)

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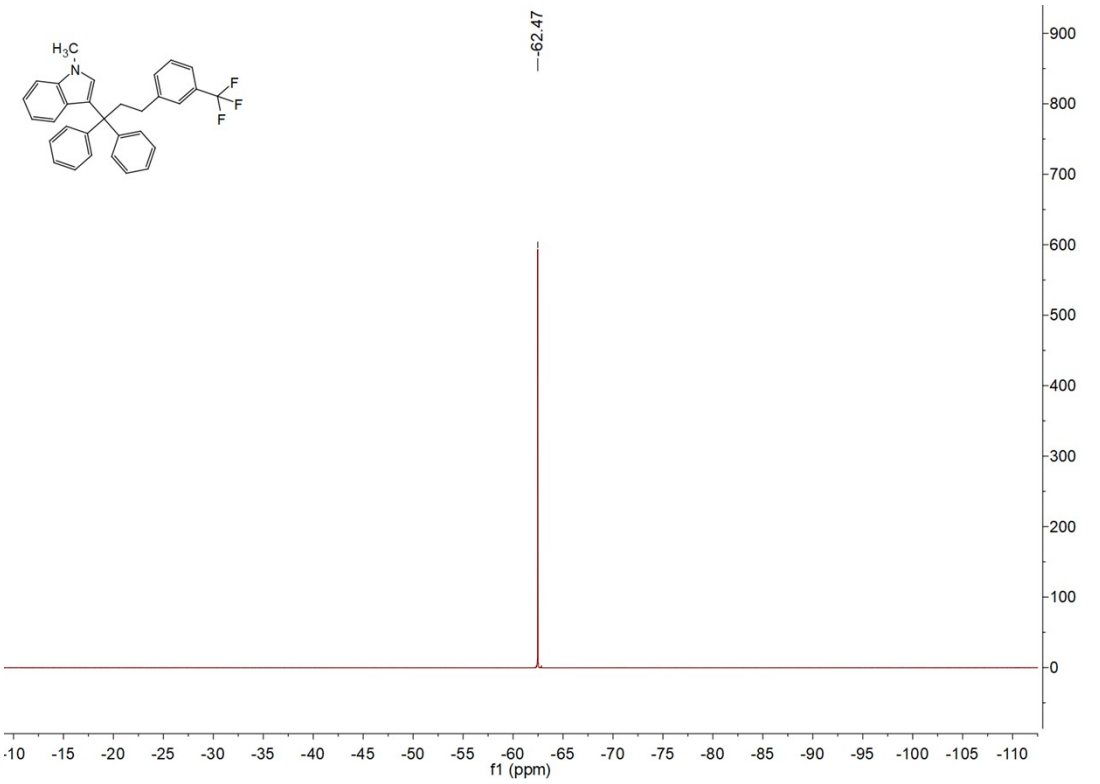
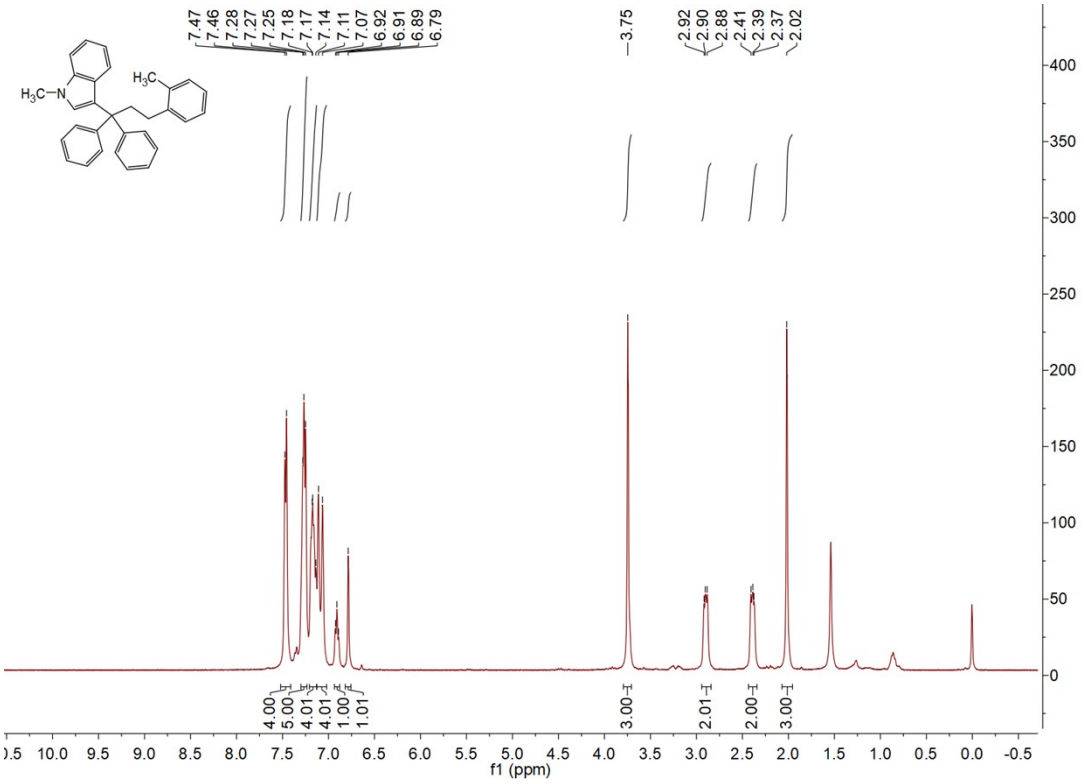
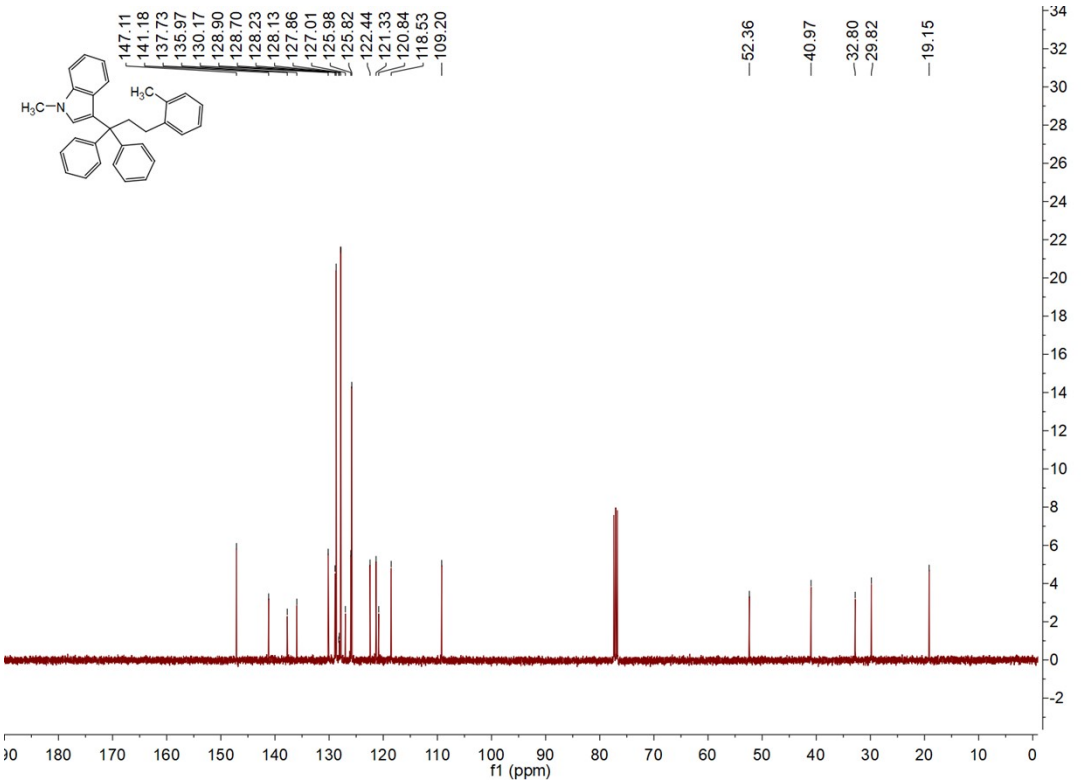
143.90
137.82
131.75
129.13
128.77
128.68
128.03
127.01
126.01
125.03
125.01
124.98
124.96
122.67
122.64
122.62
122.60
122.31
121.51
120.54
118.75
109.37
52.39
42.04
32.83
32.56
H3C
N
F
F
F
f1 (ppm)

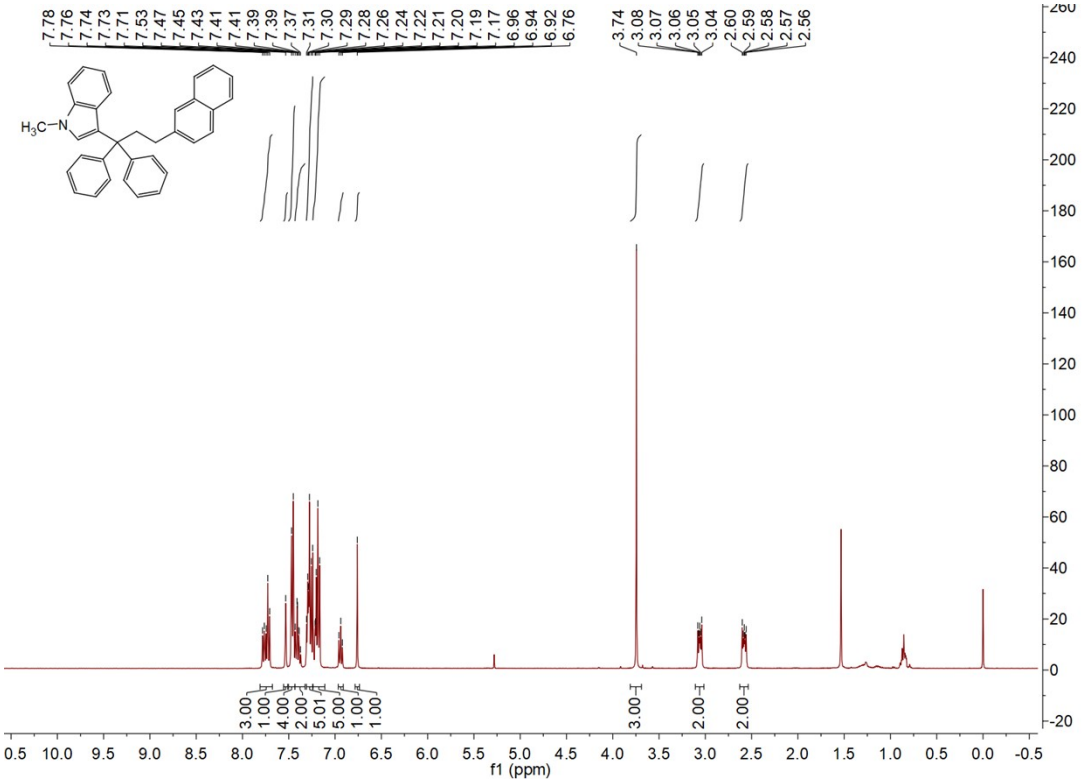

62.47
H3C
N
F
F
F
f1 (ppm)

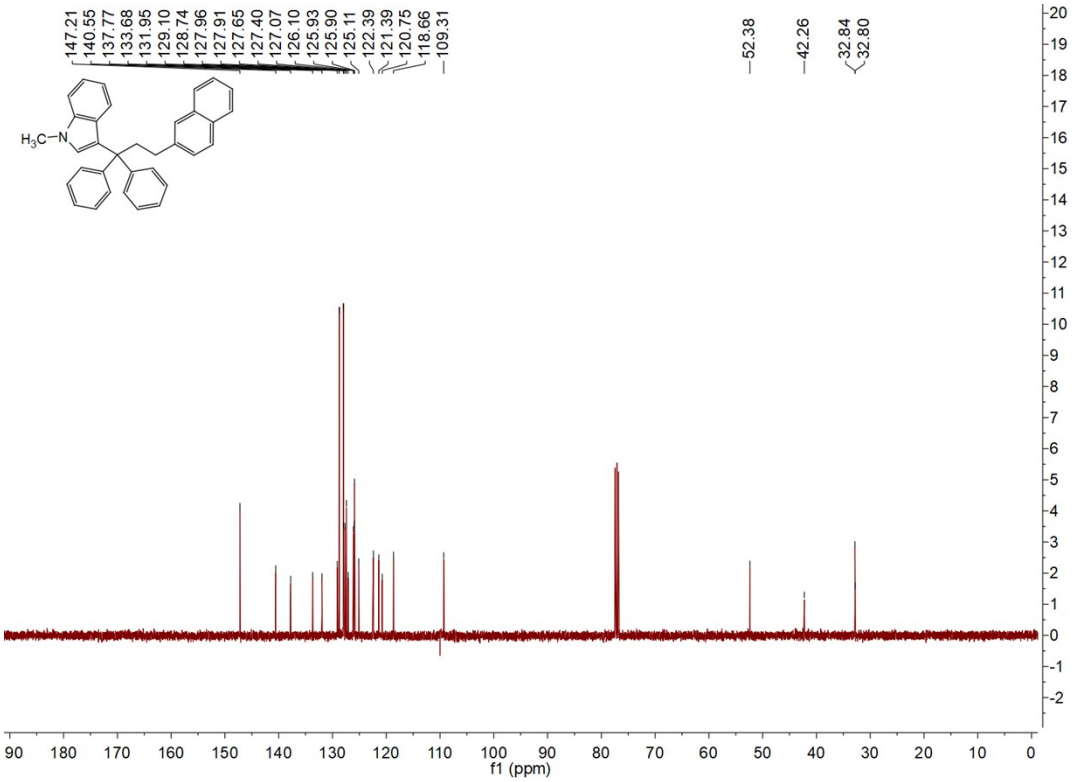
3-(1,1-diphenyl-3-(o-tolyl)propyl)-1-methyl-1*H*-indole (4m)



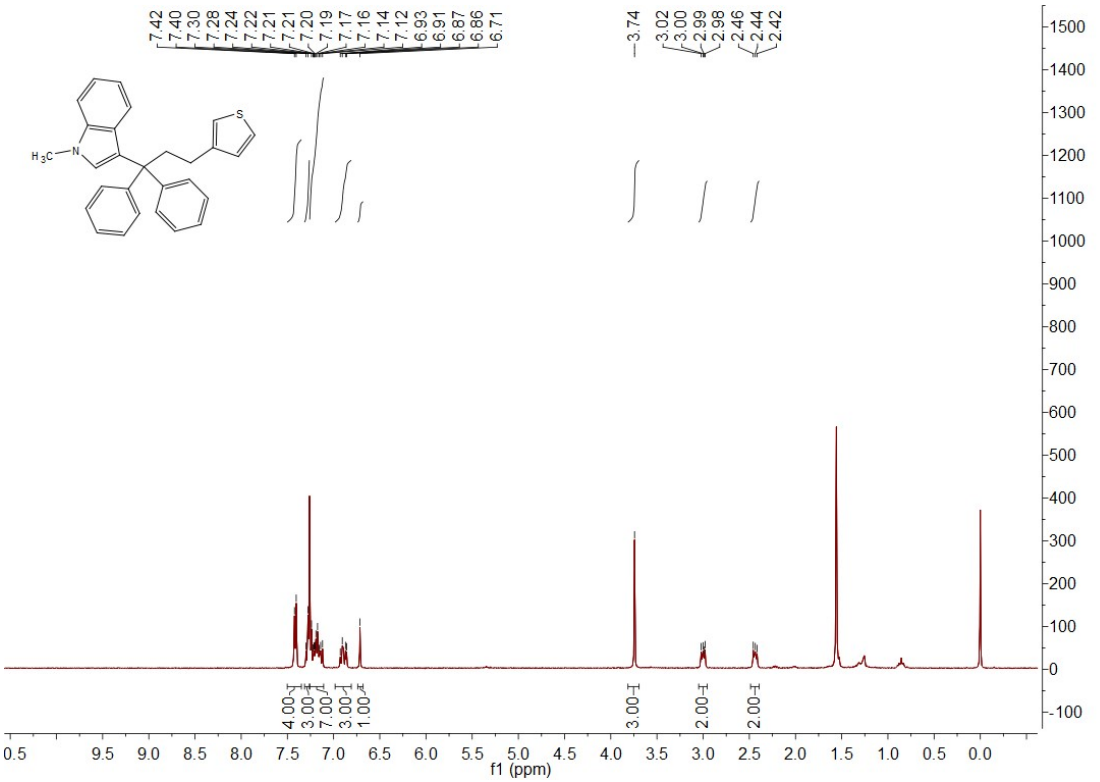


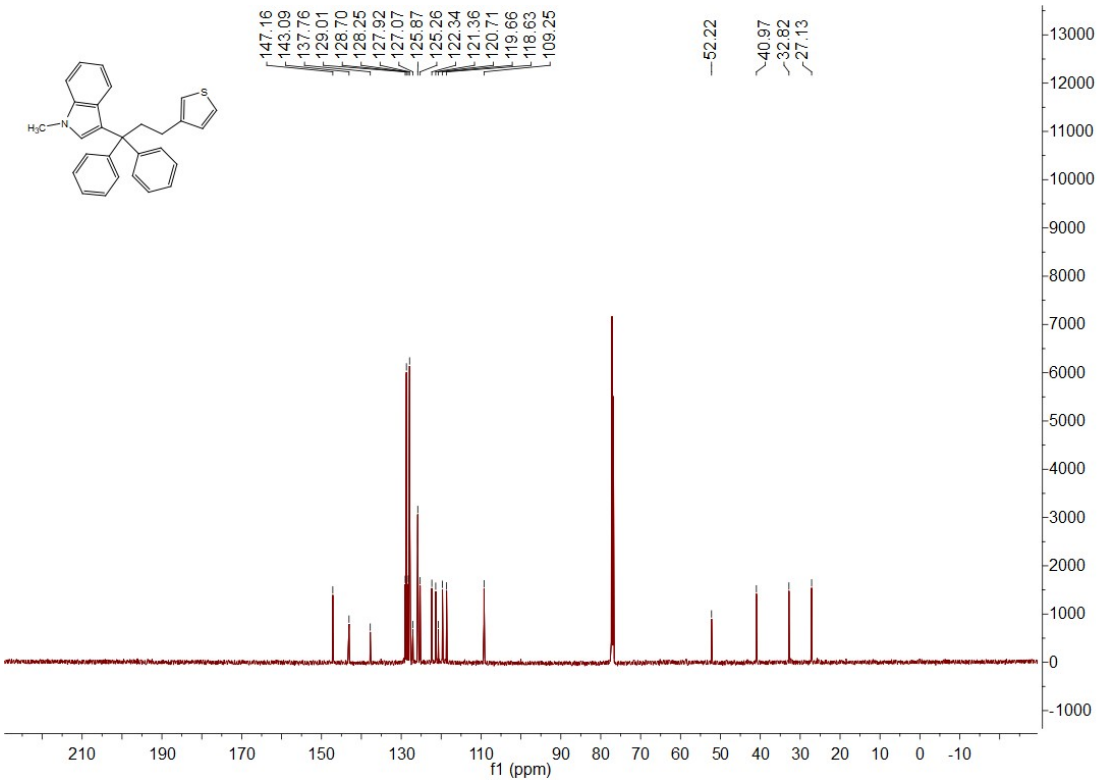
1-methyl-3-(3-(naphthalen-2-yl)-1,1-diphenylpropyl)-1*H*-indole (4n)



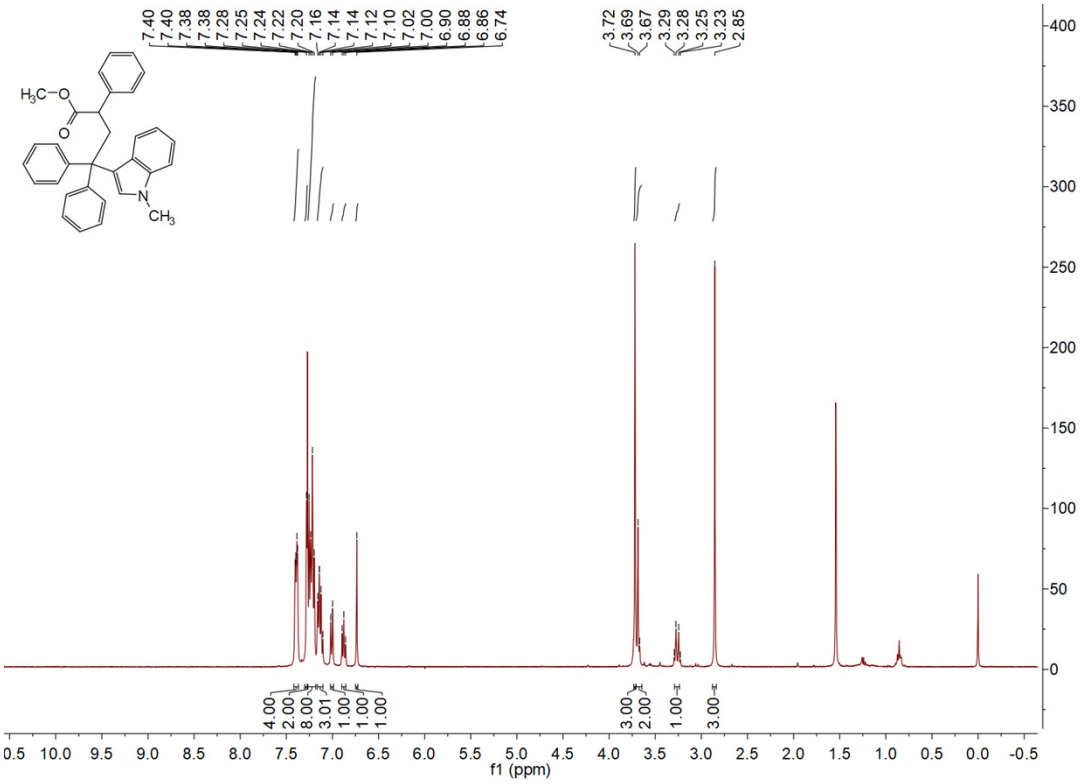


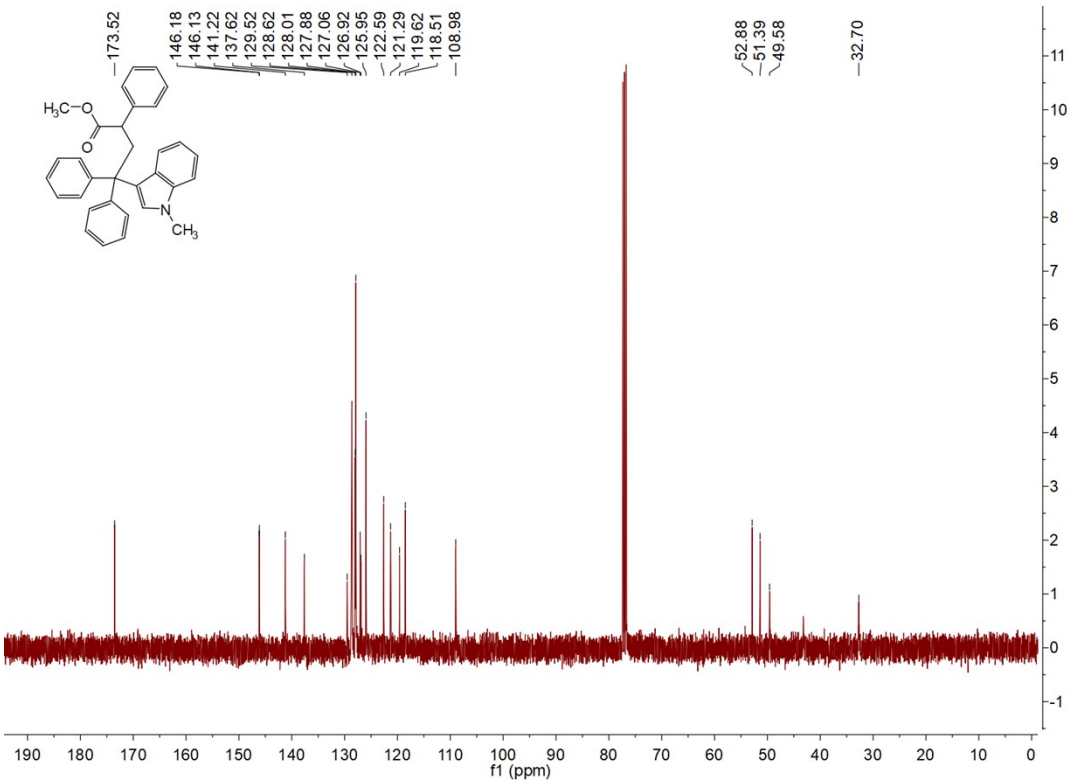
3-(1,1-diphenyl-3-(thiophen-3-yl)propyl)-1-methyl-1*H*-indole (4o)



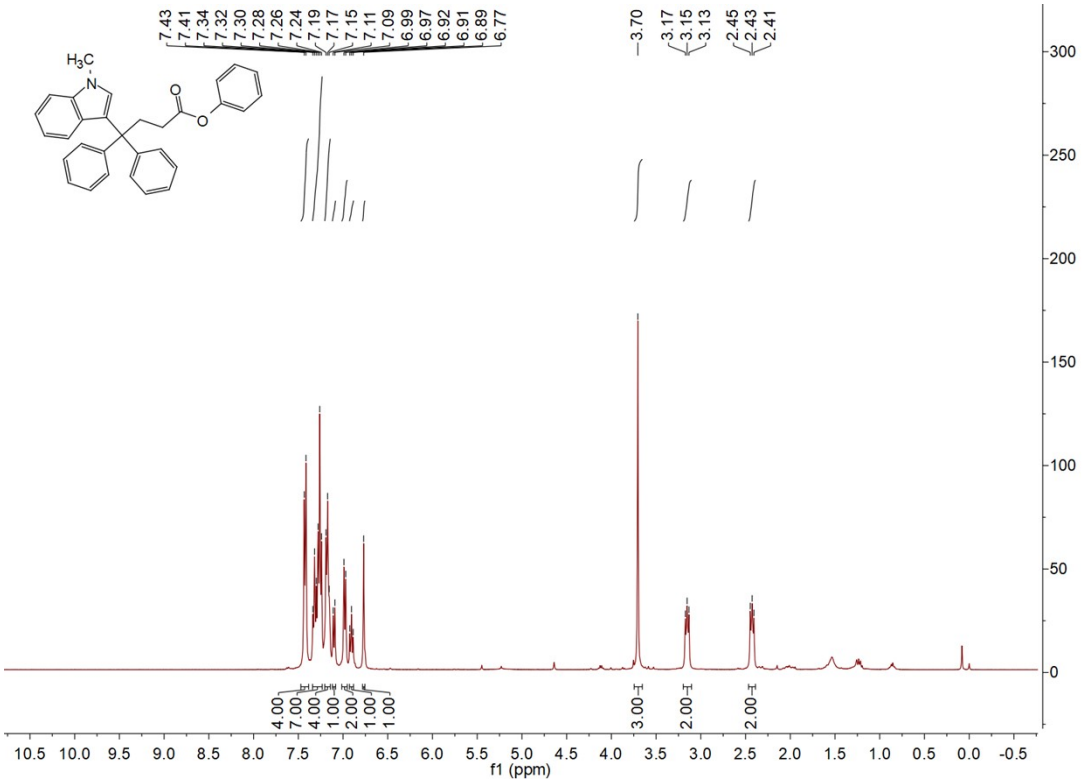


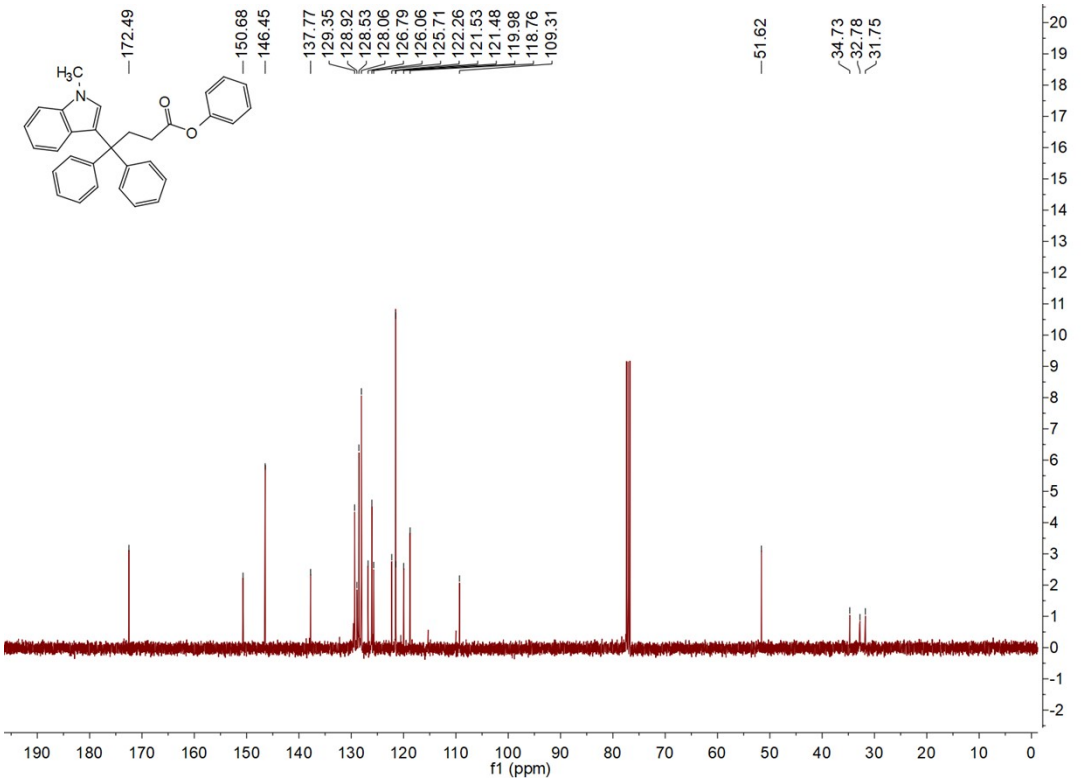
methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (4p)





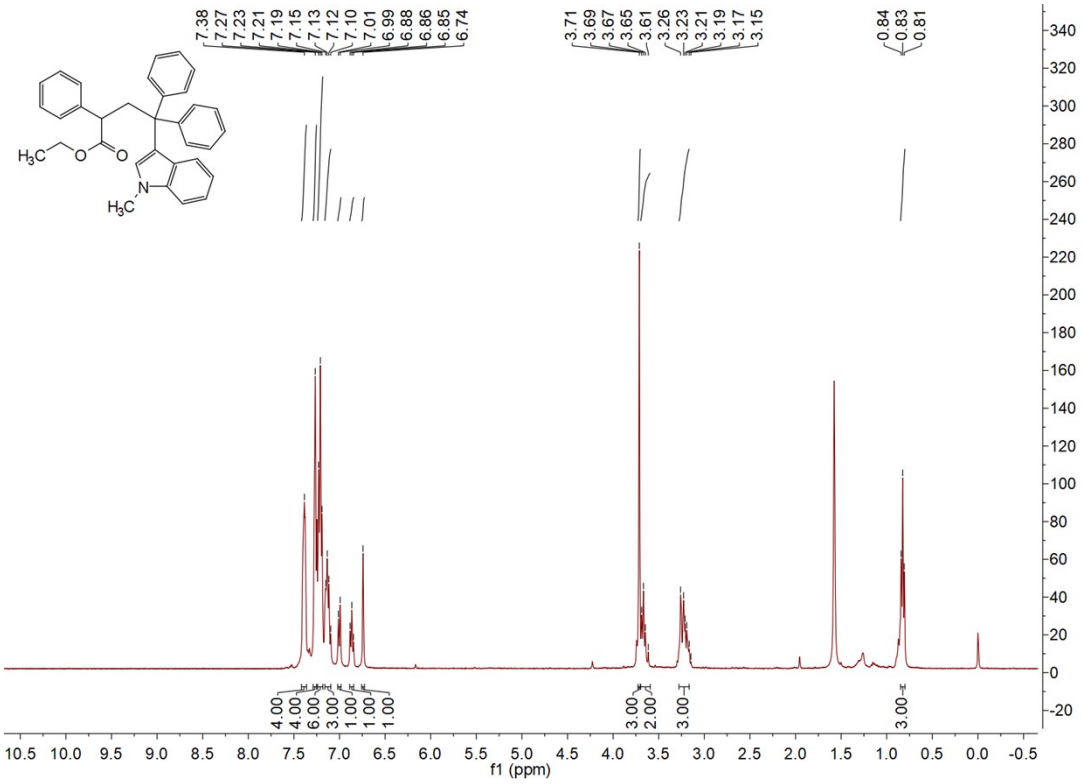
phenyl 4-(1-methyl-1*H*-indol-3-yl)-4,4-diphenylbutanoate (4q)

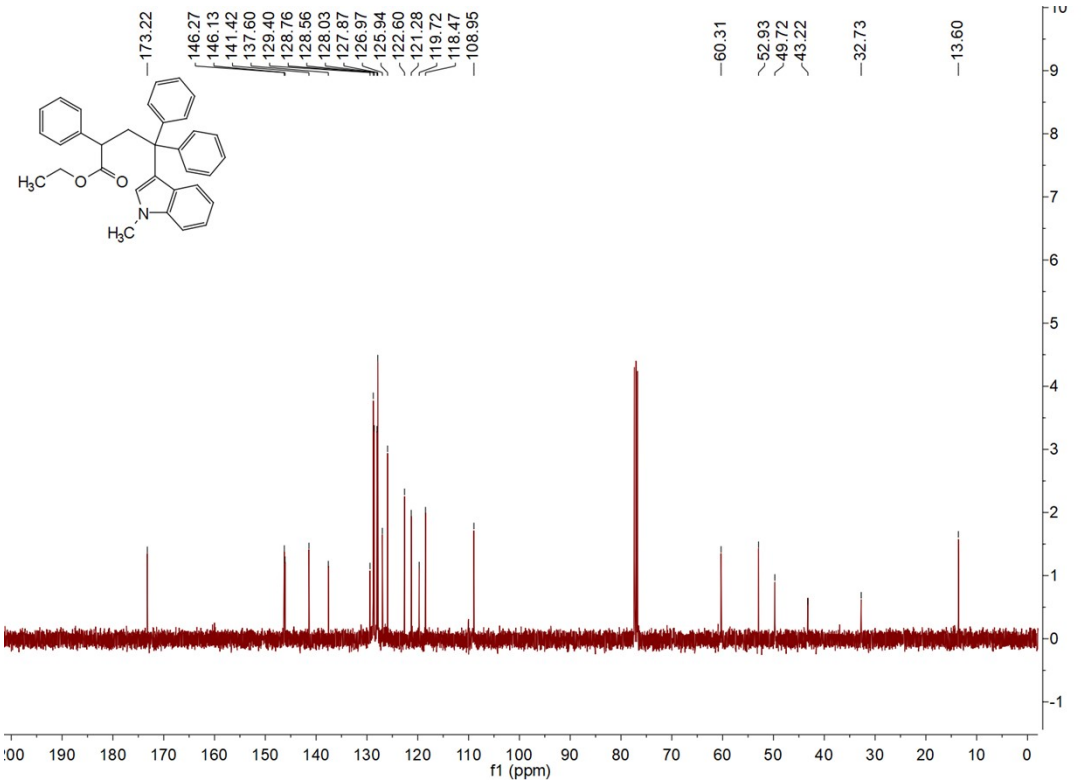




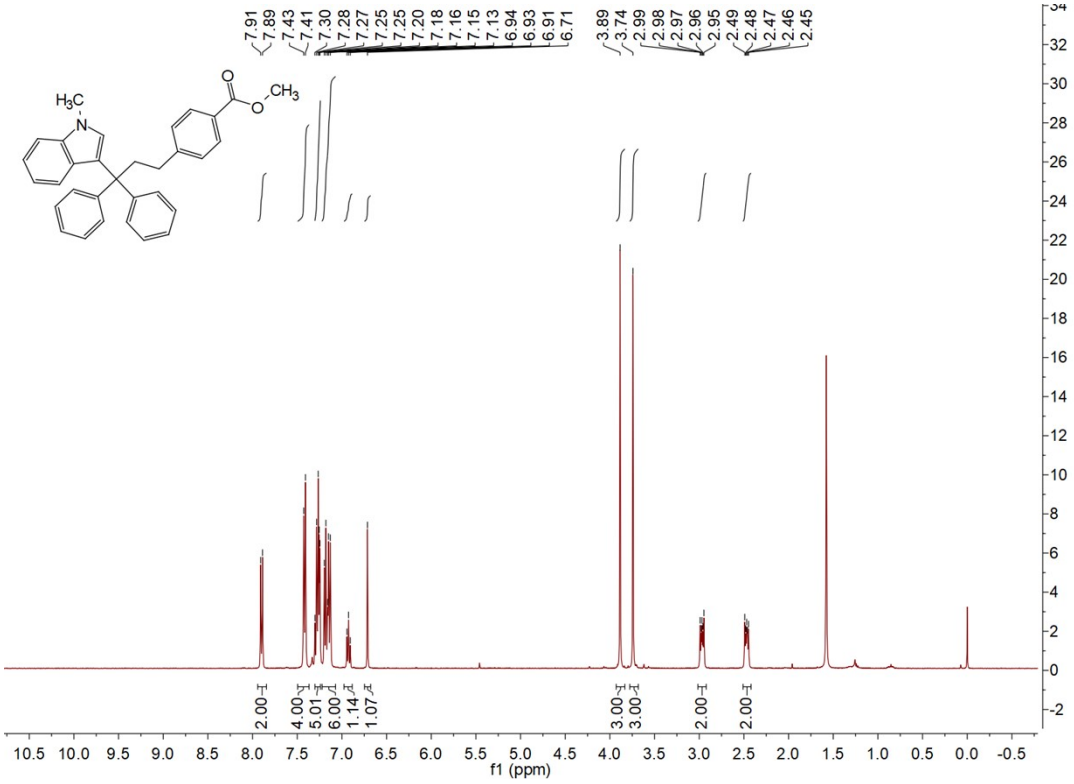
methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (4r)

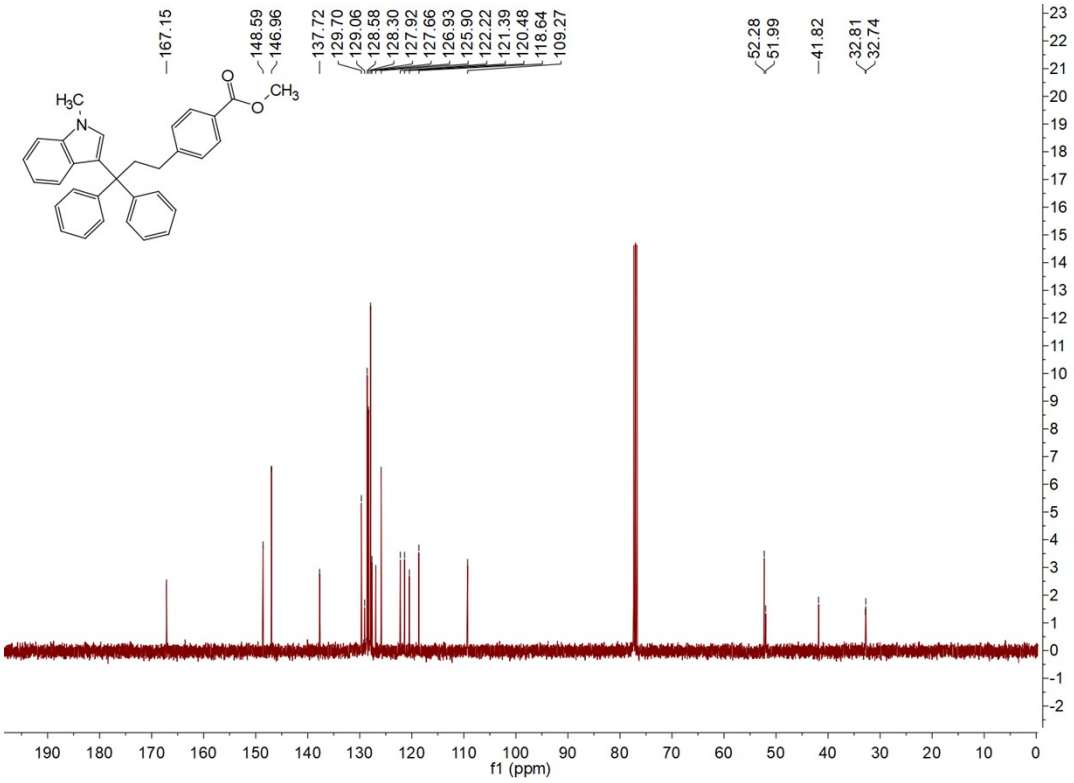
ethyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (4s)



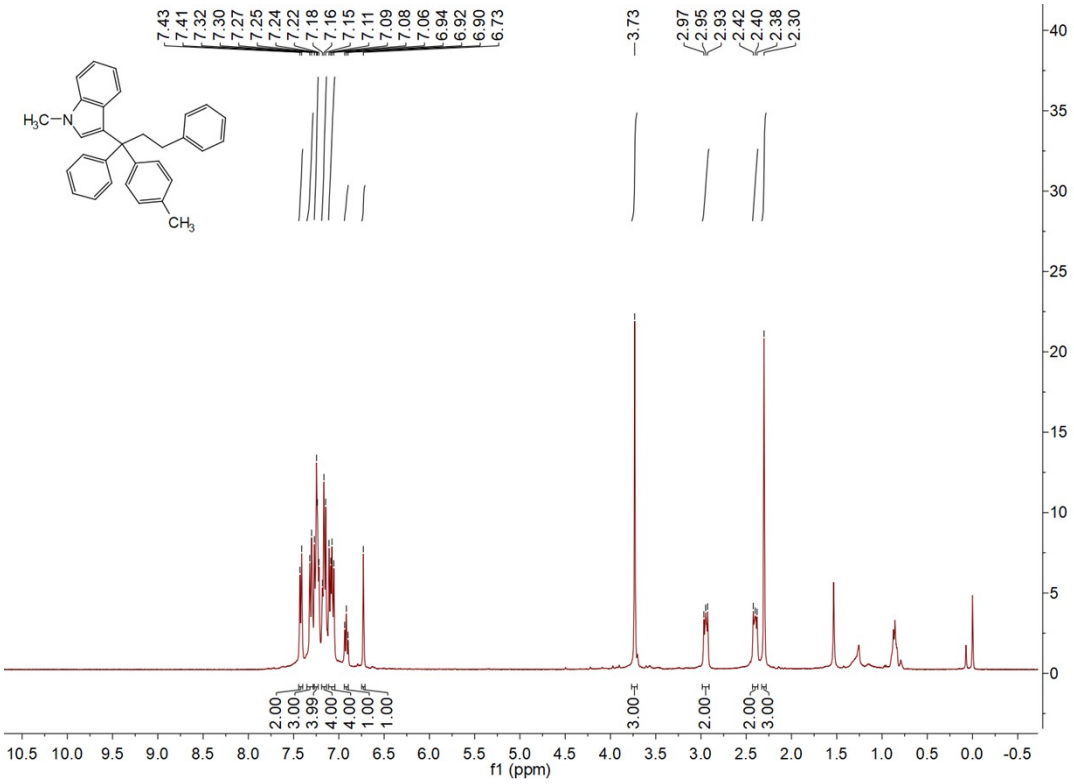


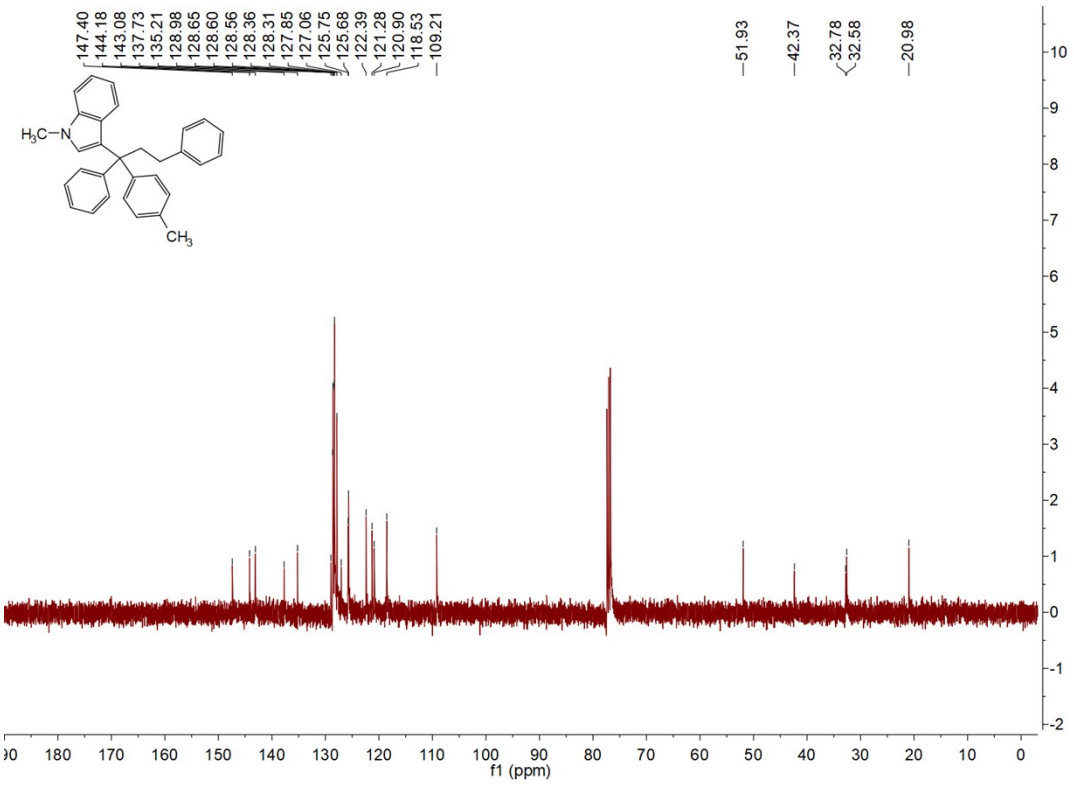
methyl 4-(1-methyl-1*H*-indol-3-yl)-2,4,4-triphenylbutanoate (4t)



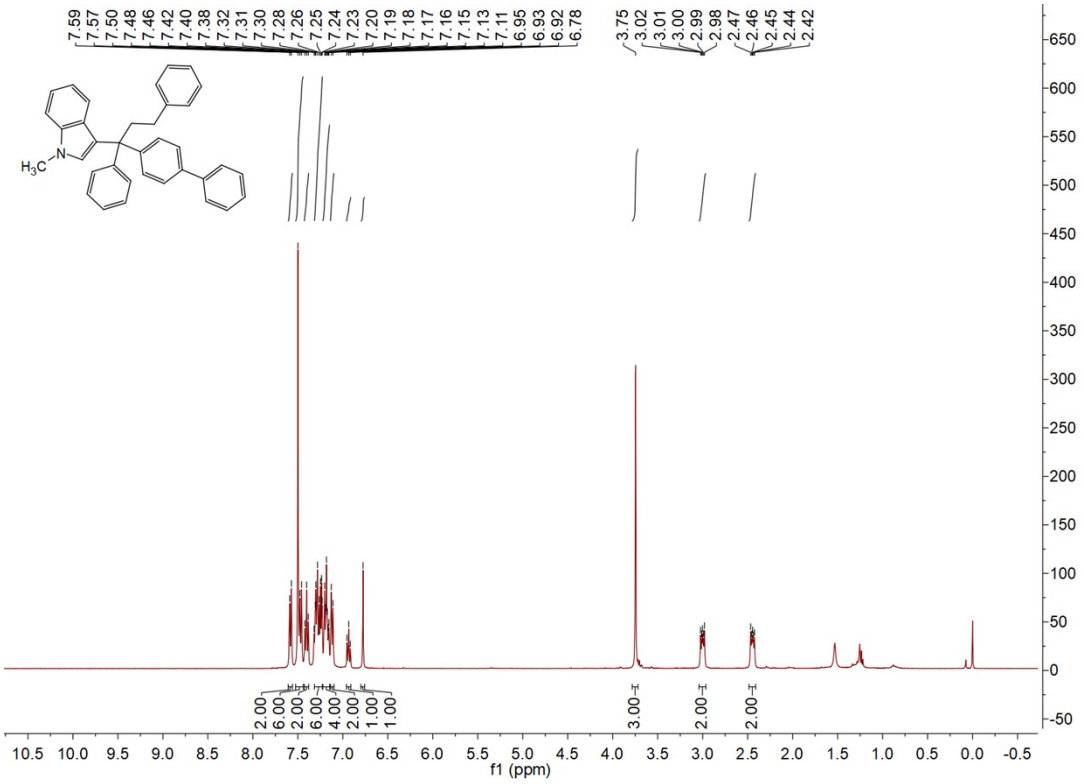


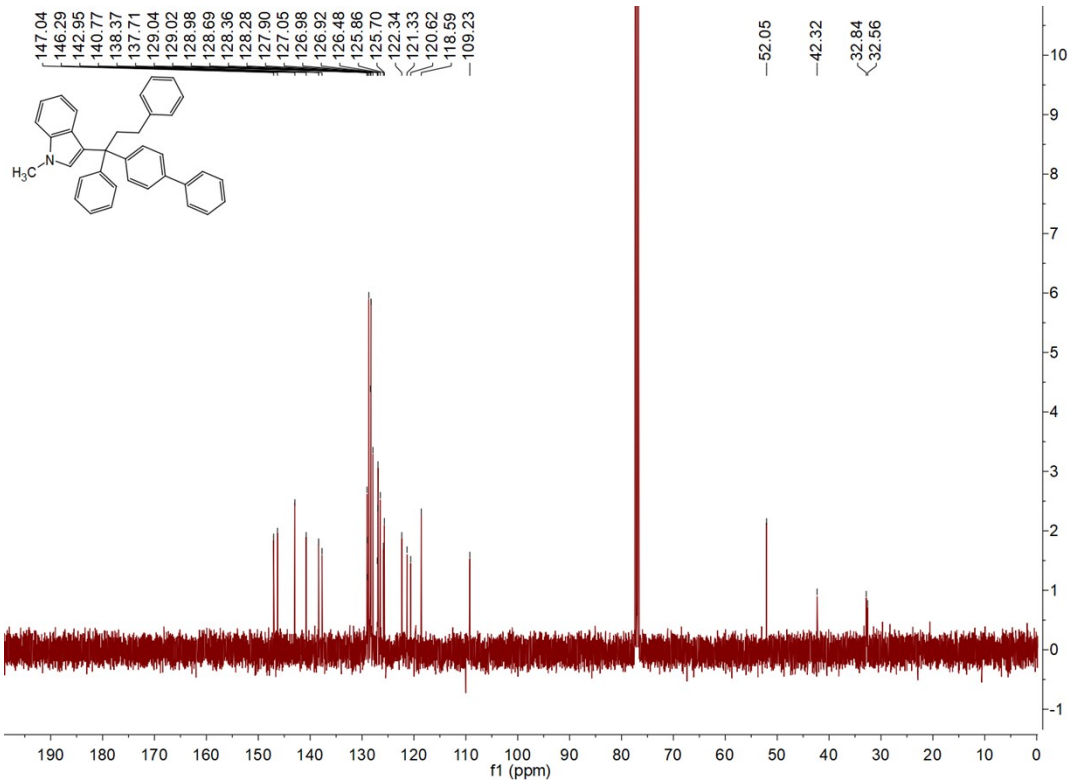
3-(1,3-diphenyl-1-(p-tolyl)propyl)-1-methyl-1*H*-indole (5a)



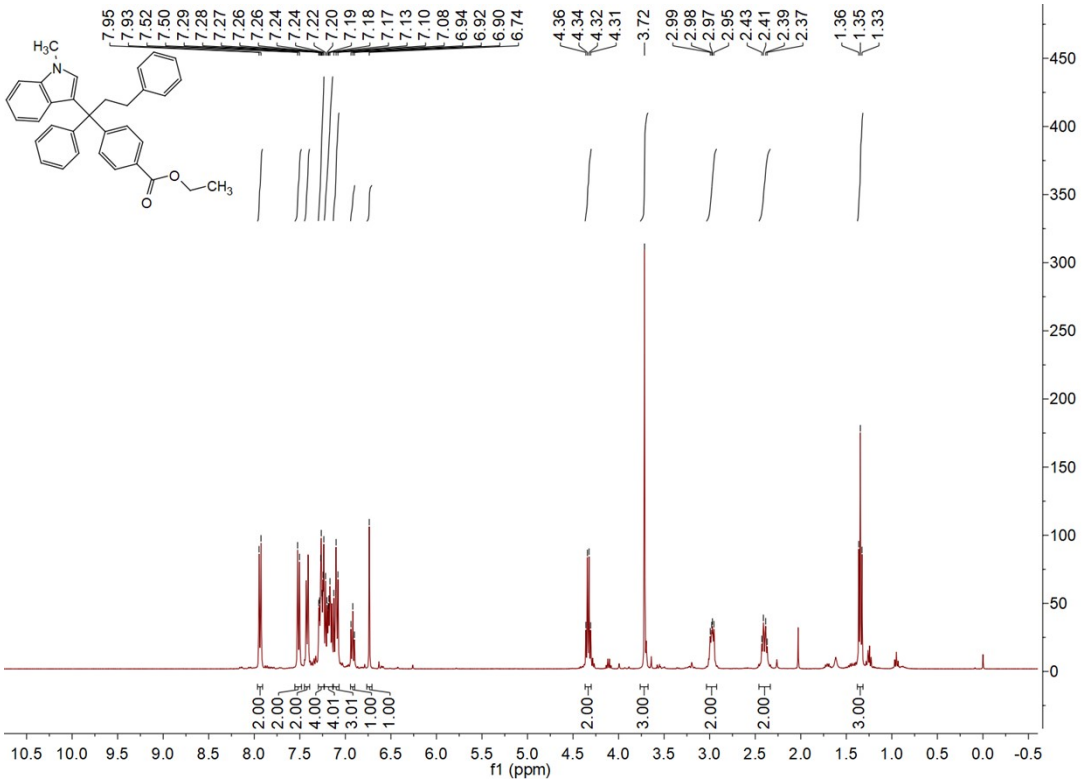


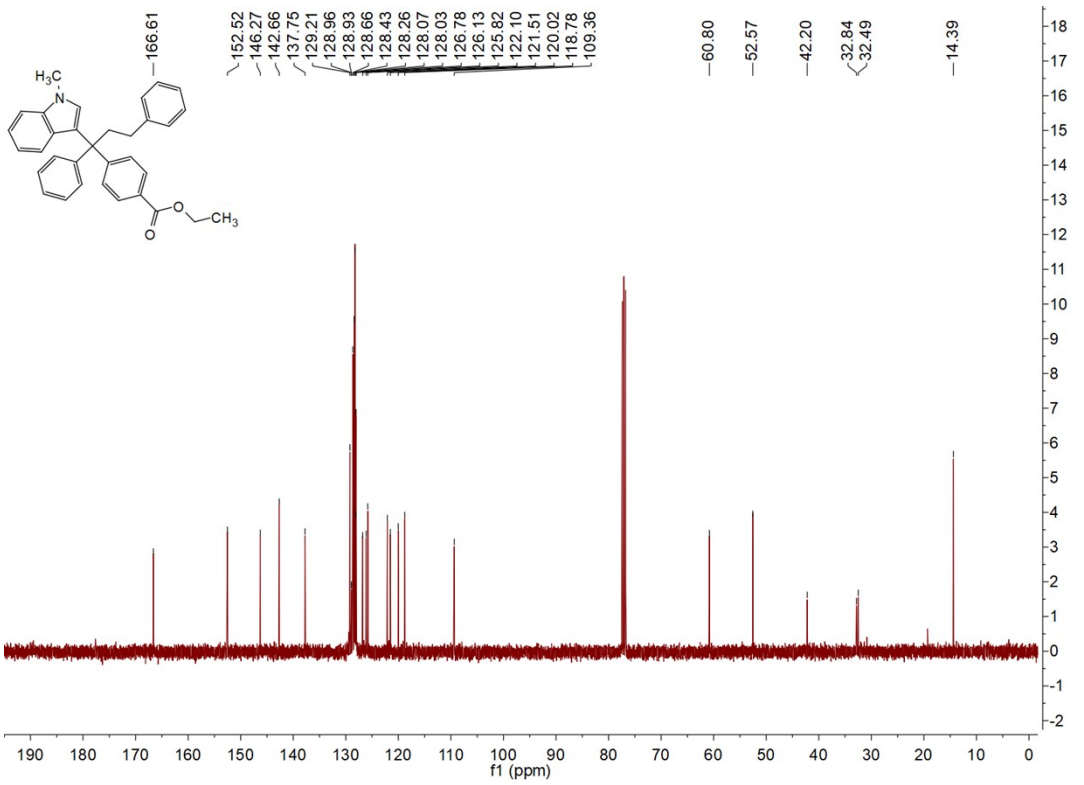
3-(1-([1,1'-biphenyl]-4-yl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5b)



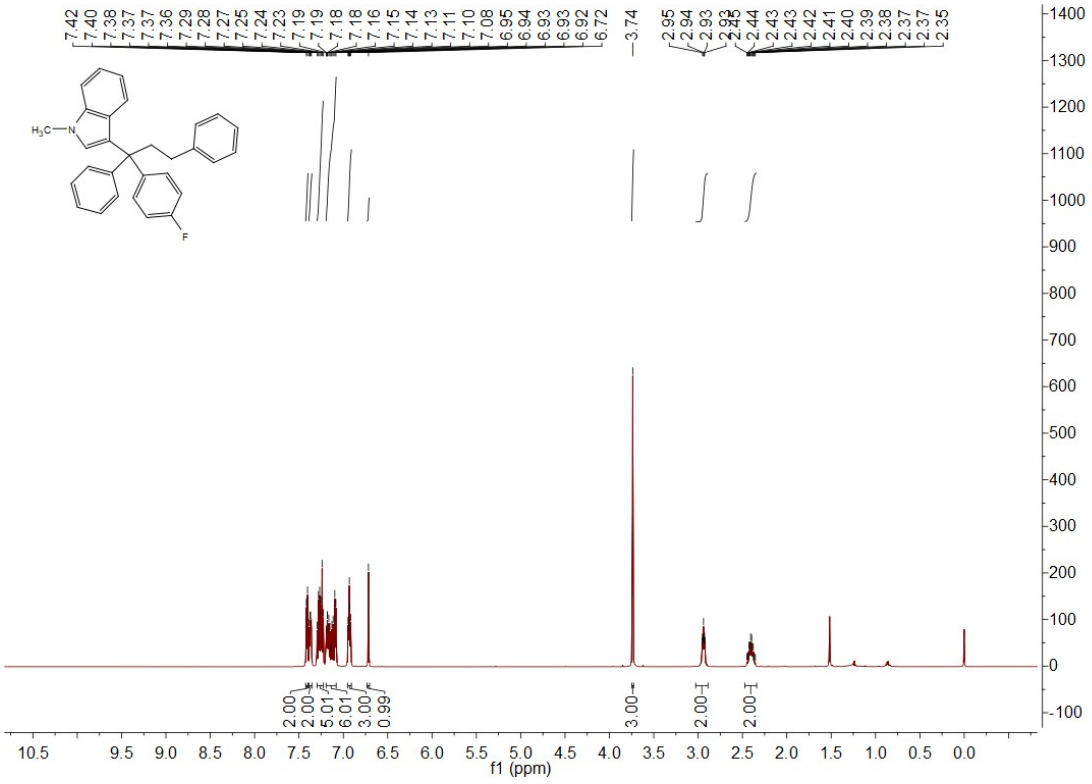


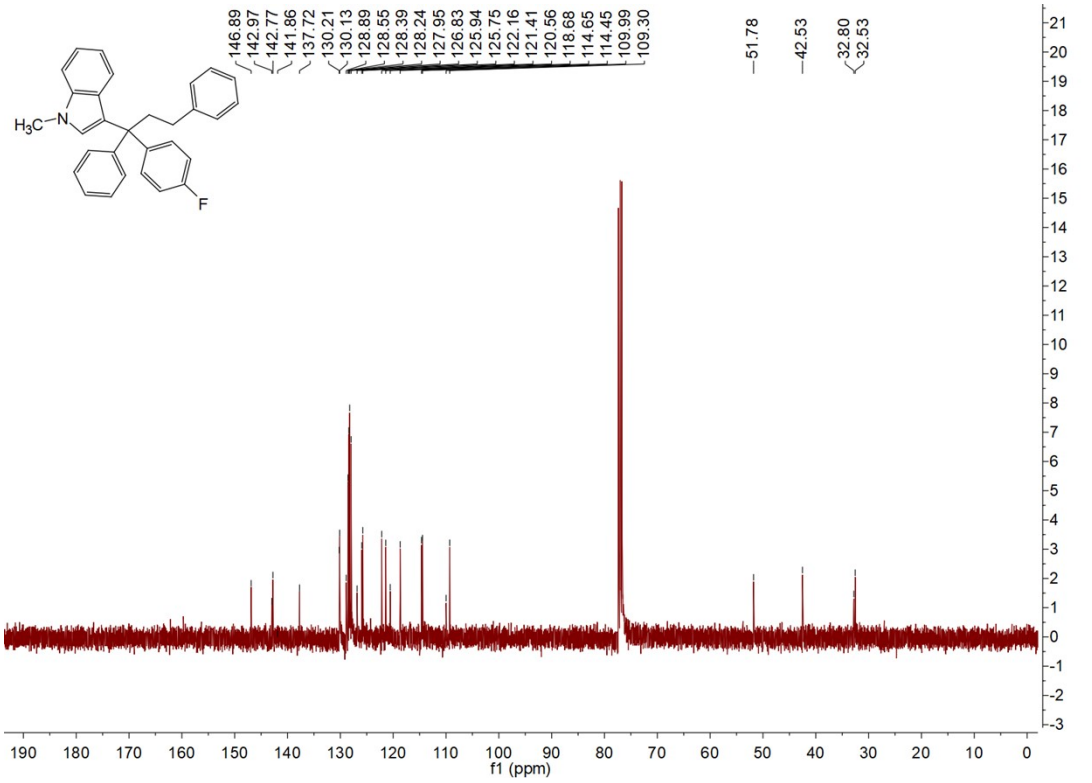
ethyl4-(1-(1-methyl-1*H*-indol-3-yl)-1,3-diphenylpropyl)benzoate (5c)

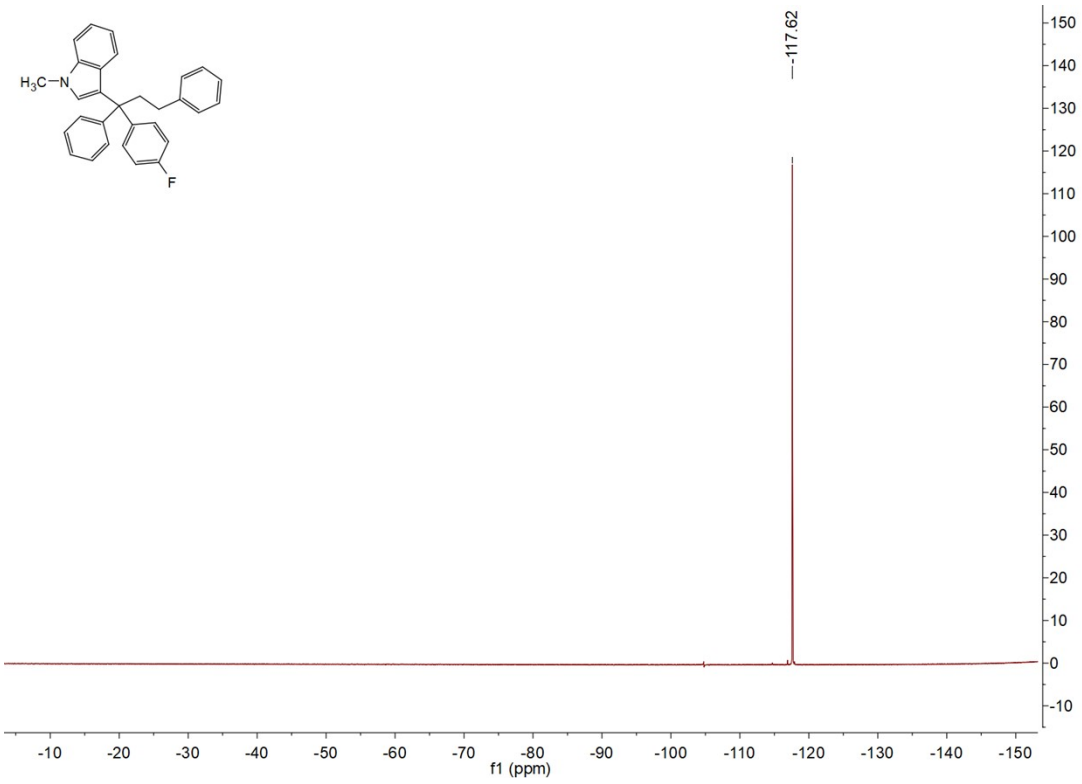




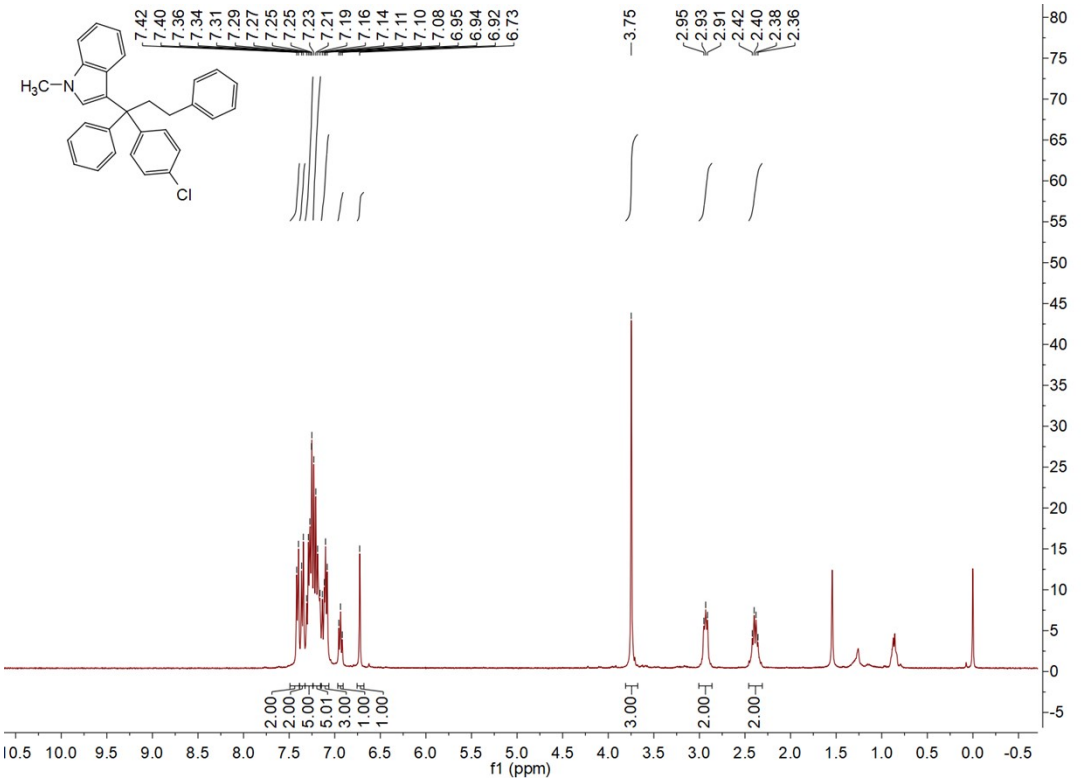
3-(1-(4-fluorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5d)

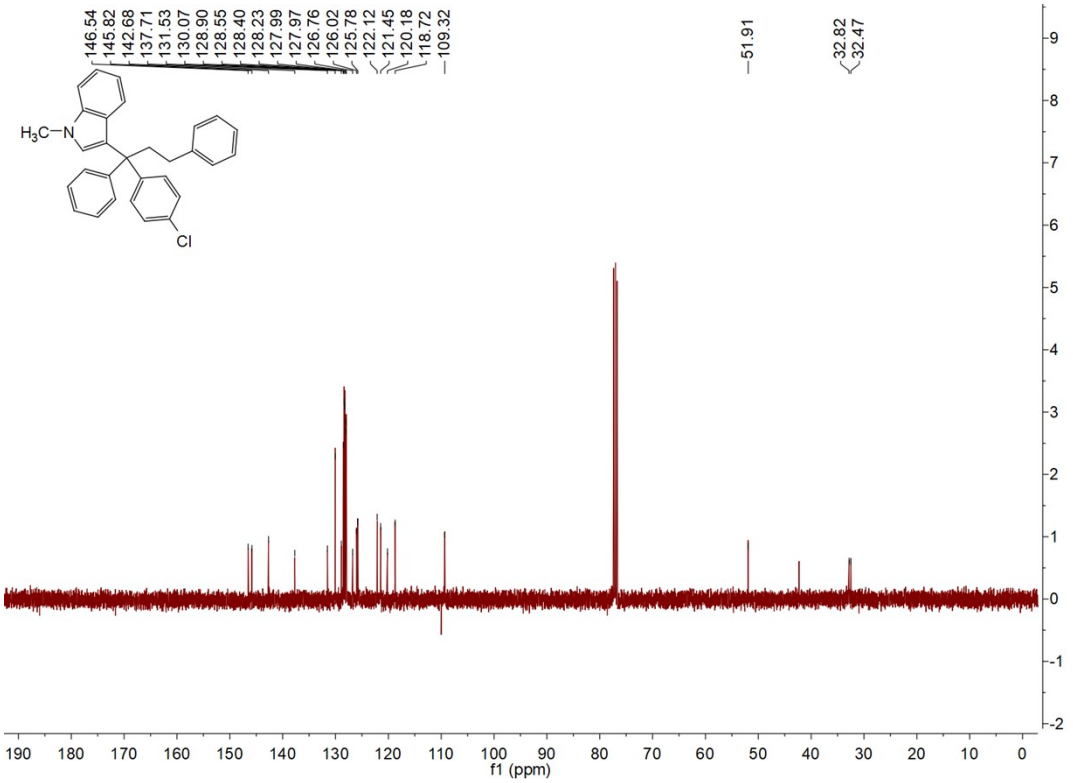




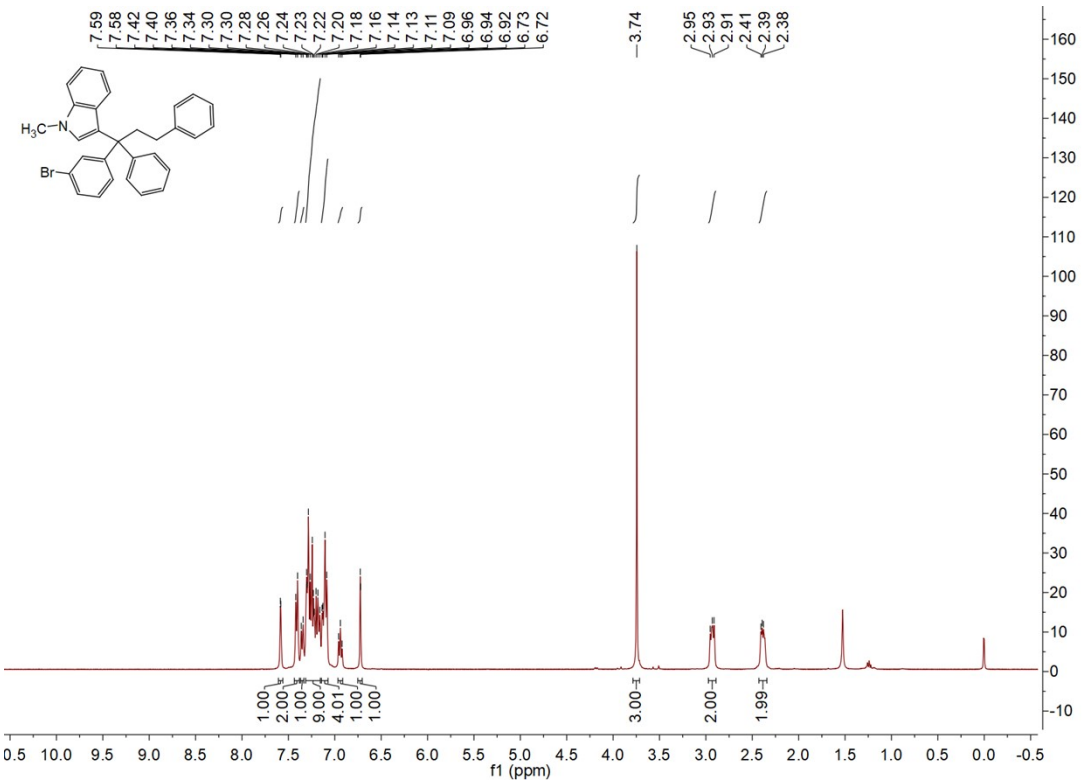


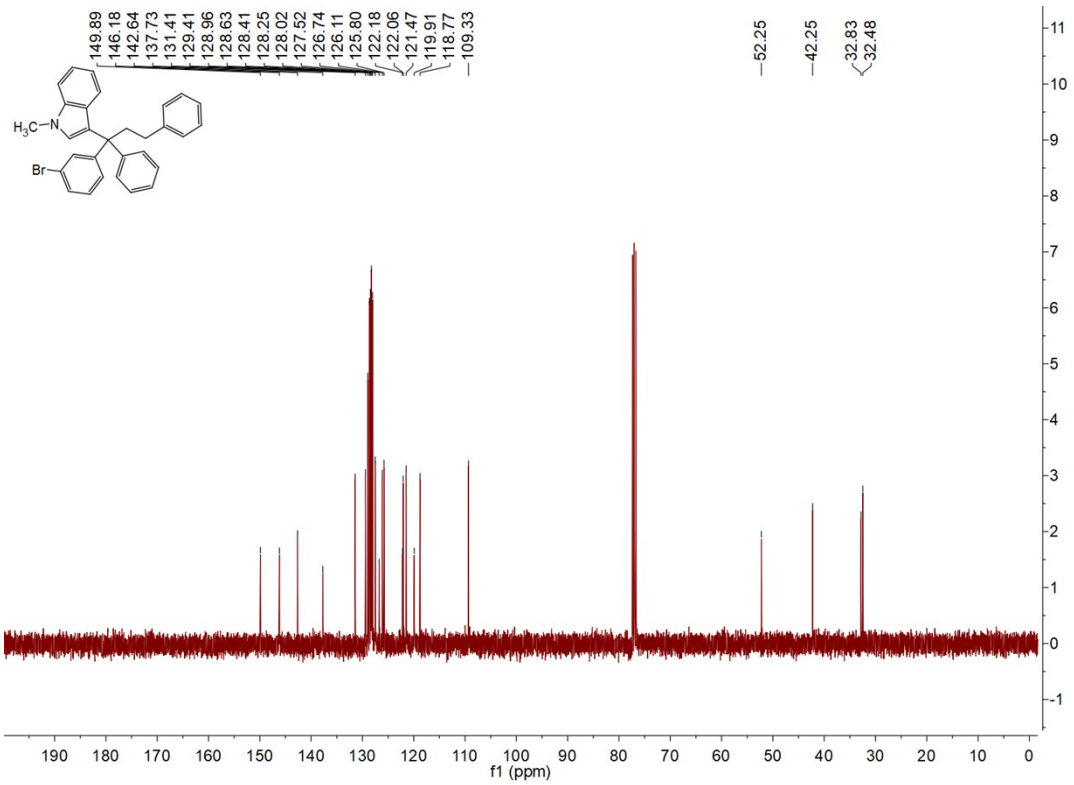
3-(1-(4-chlorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5e)



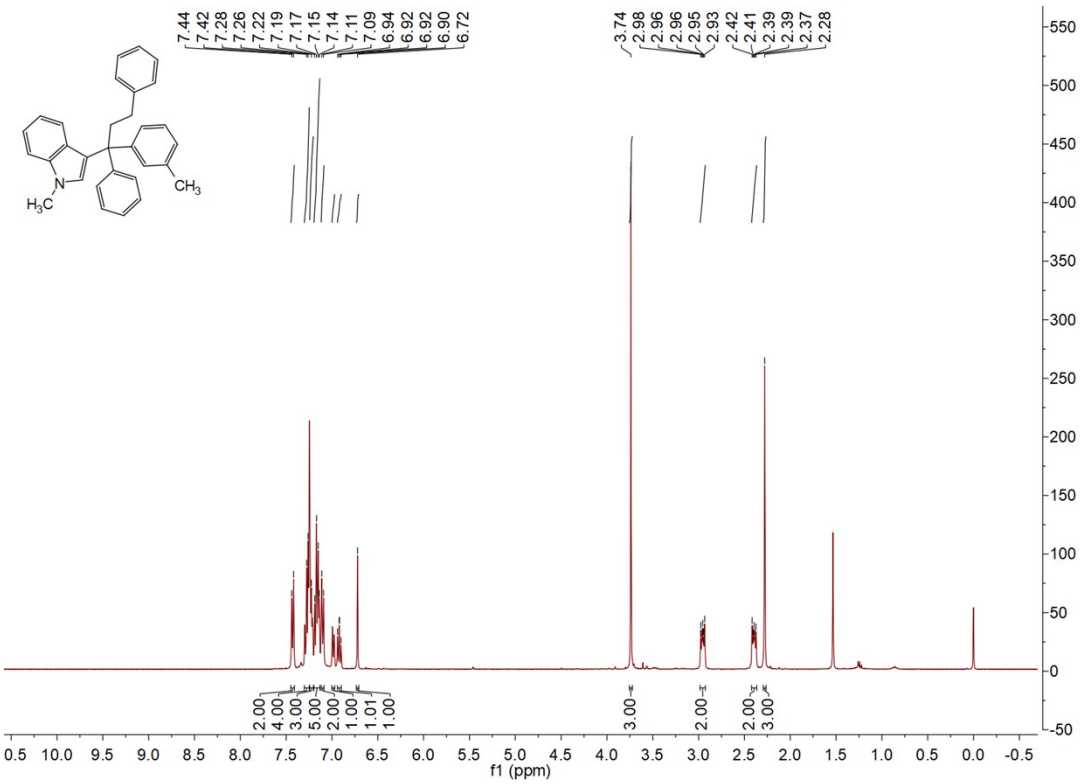


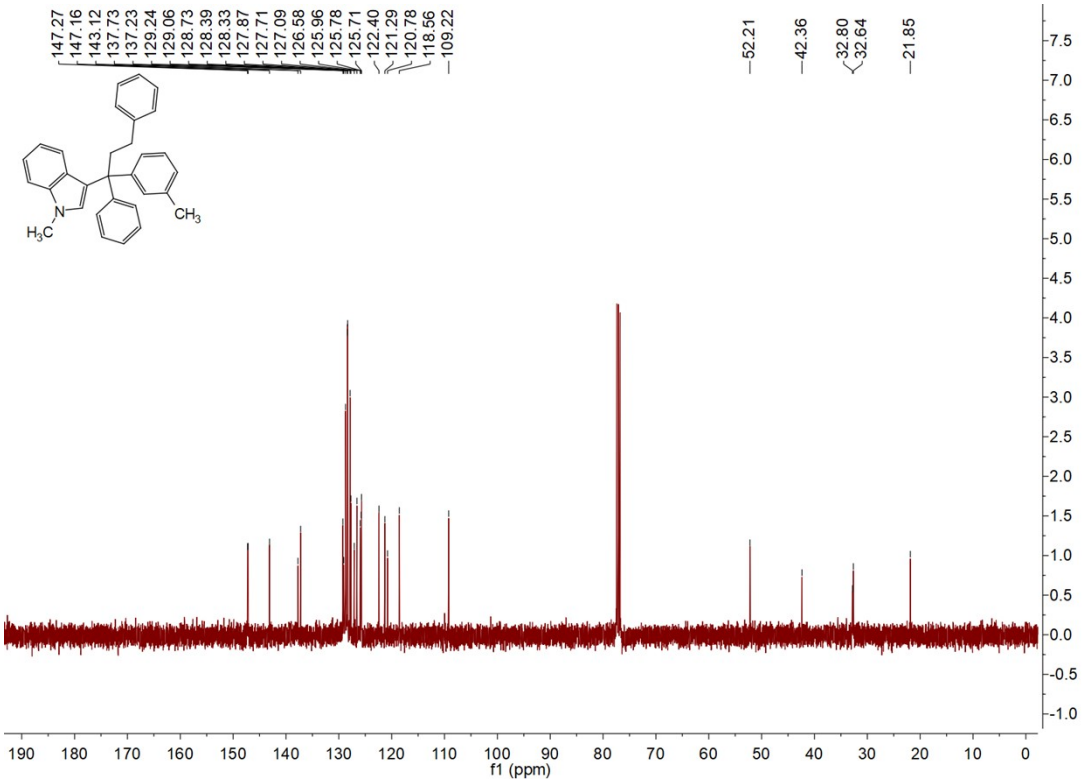
3-(1-(3-bromophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5f)



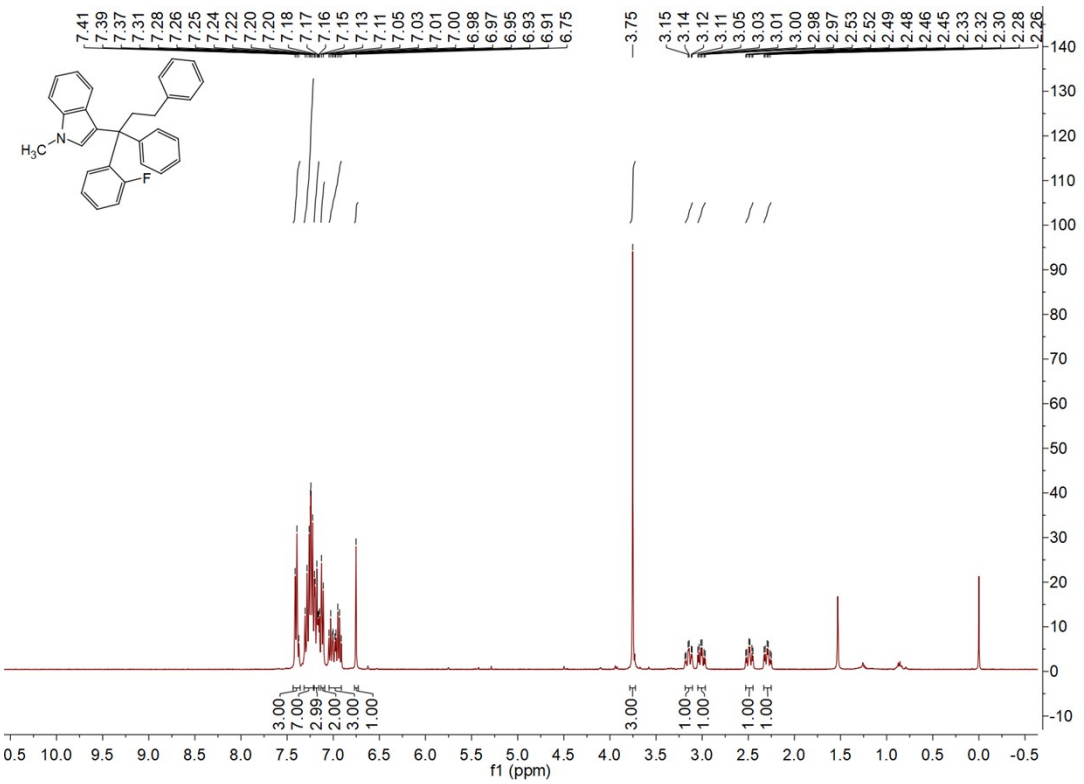


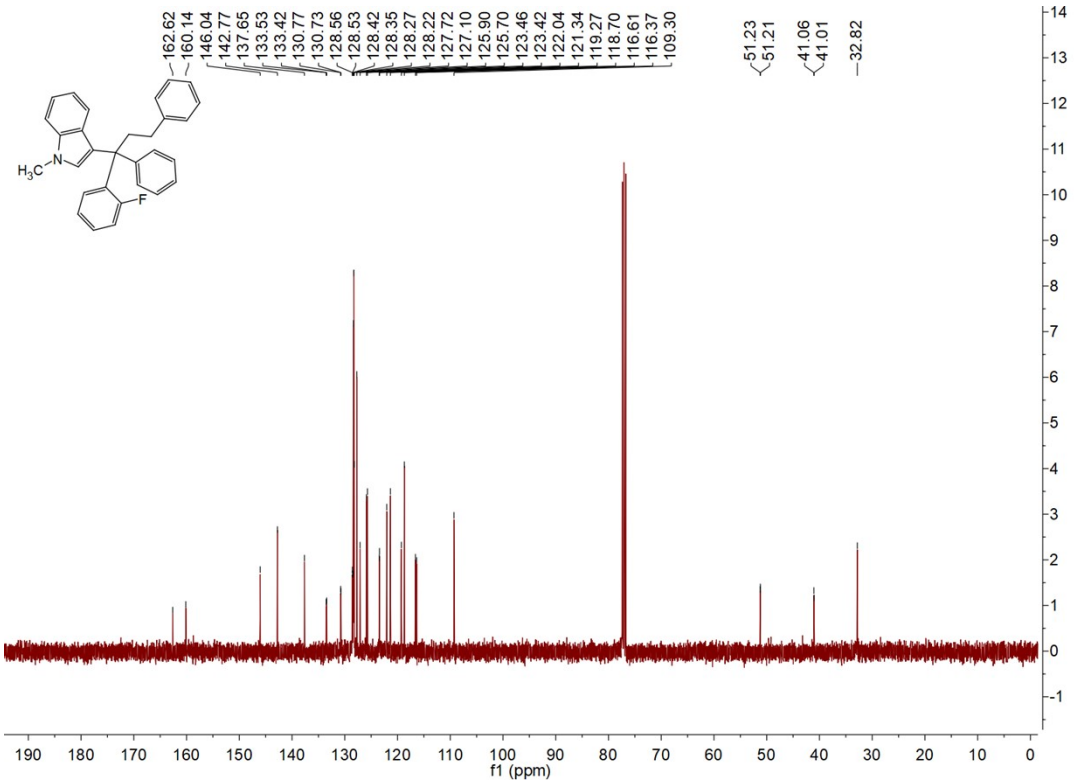
3-(1,3-diphenyl-1-(m-tolyl) propyl)-1-methyl-1*H*-indole (5g)

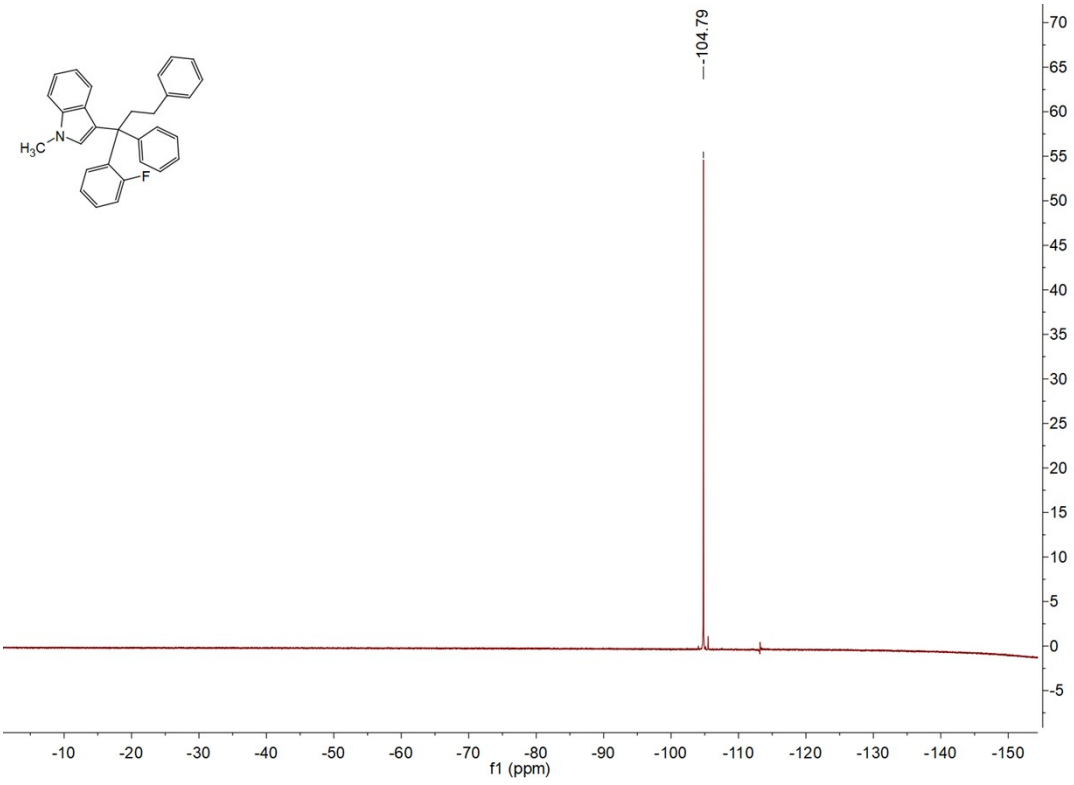




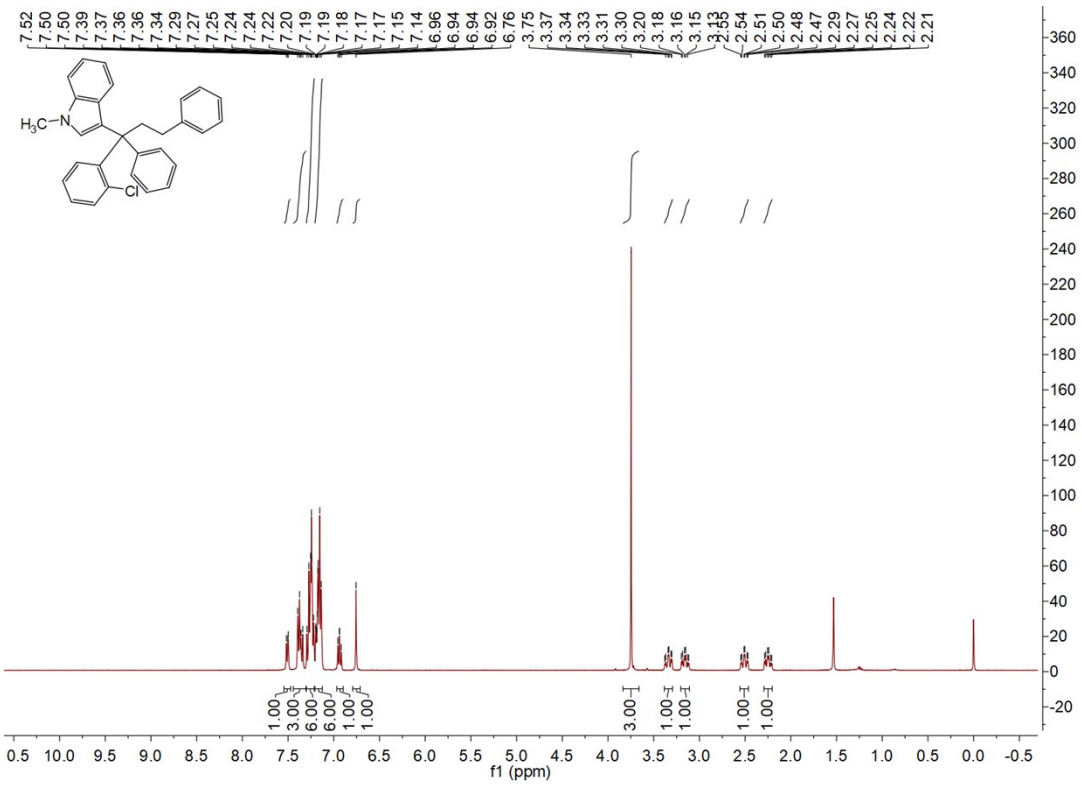
3-(1-(2-fluorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5h)

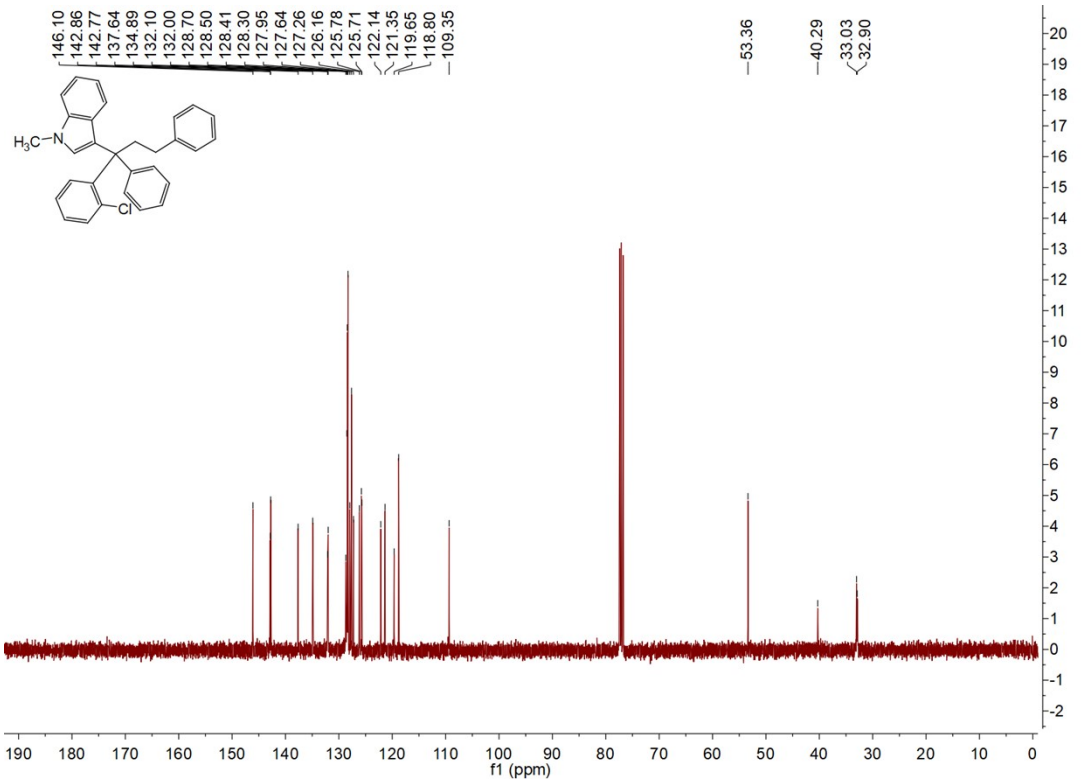




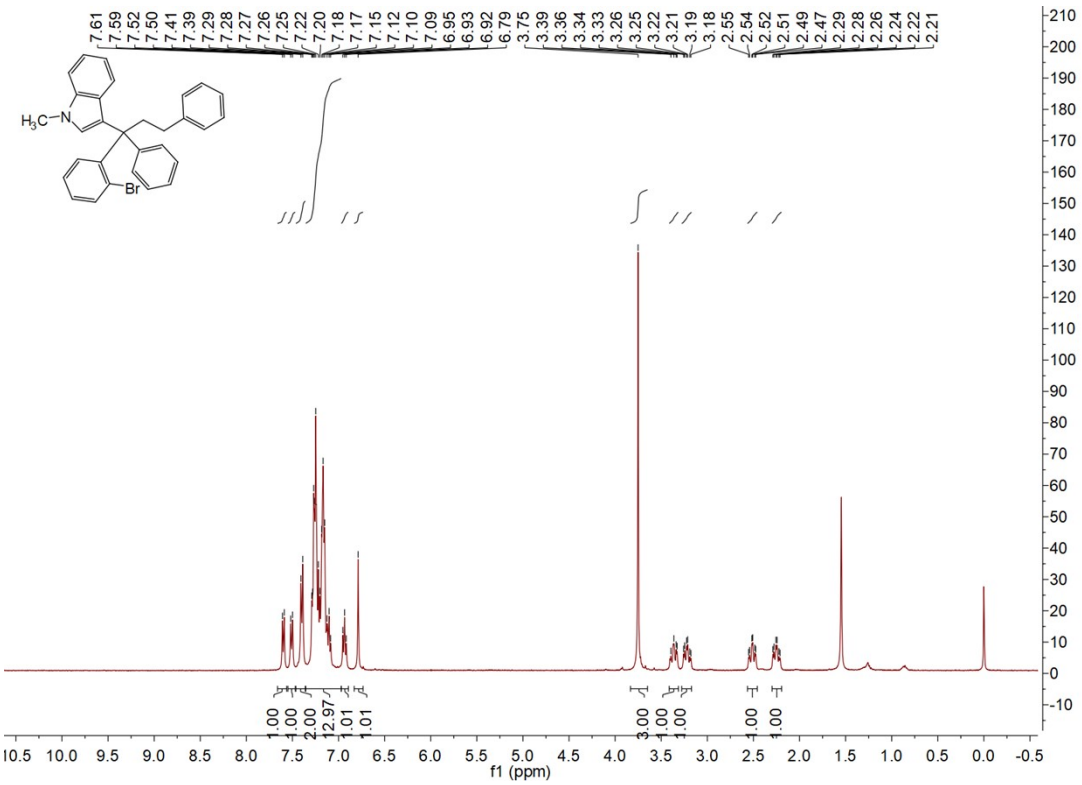


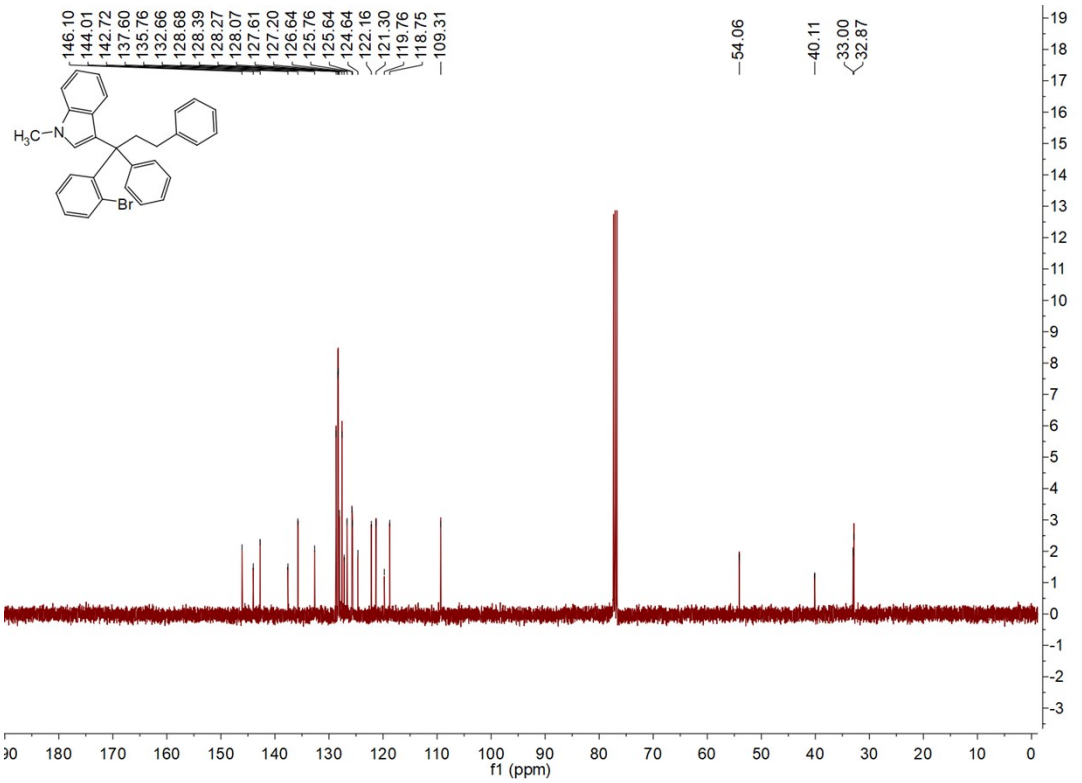
3-(1-(2-chlorophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5i)



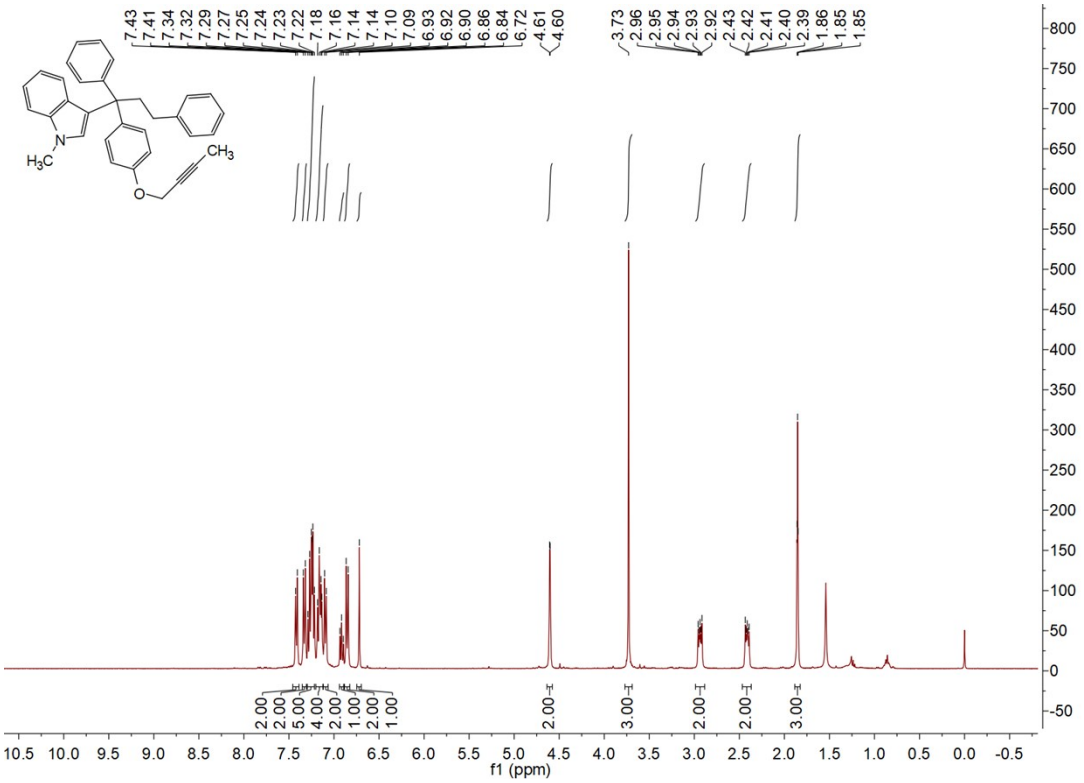


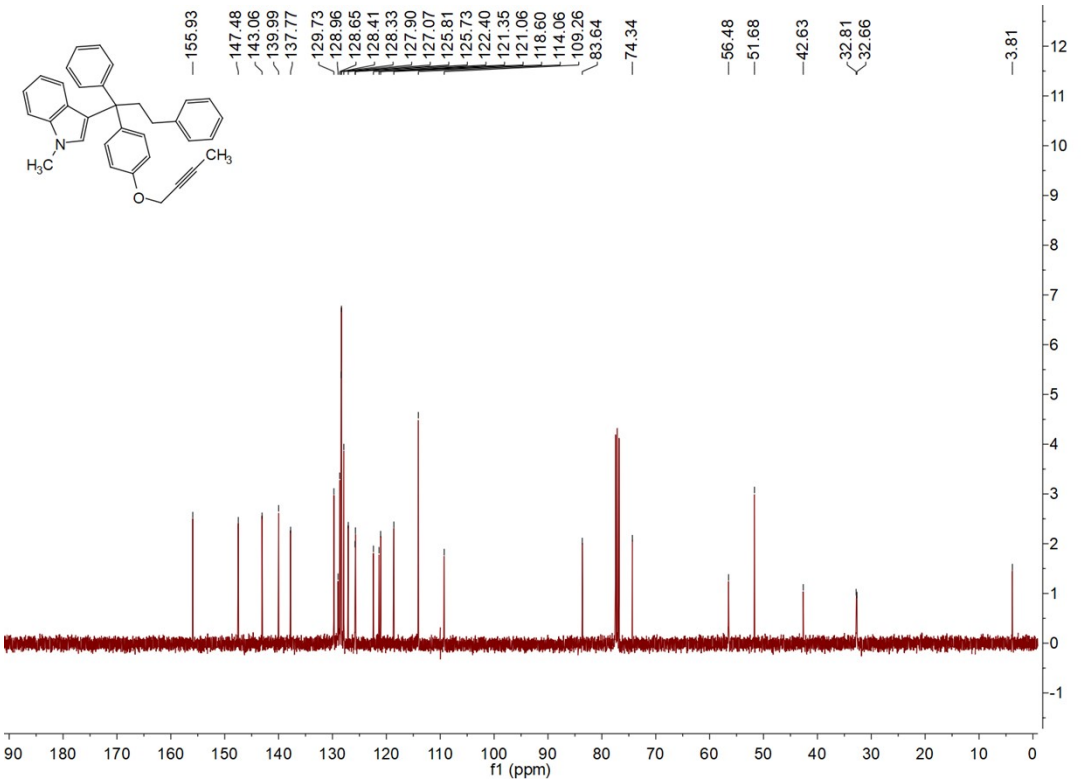
3-(1-(2-bromophenyl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5j)



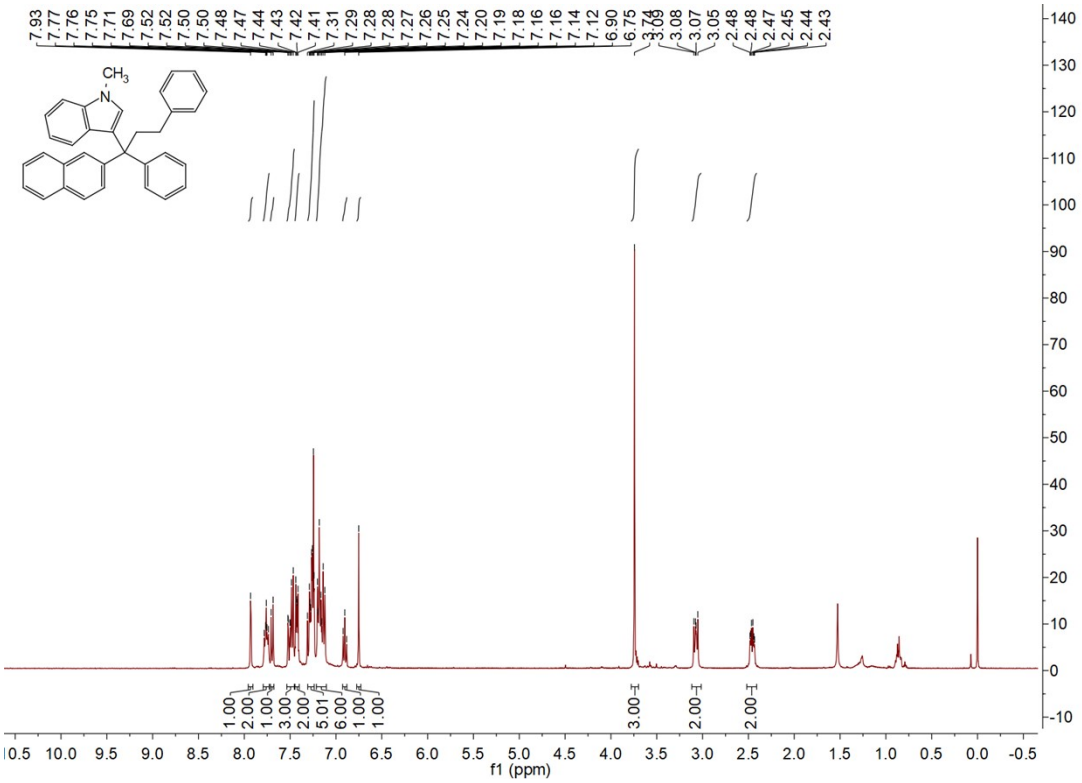


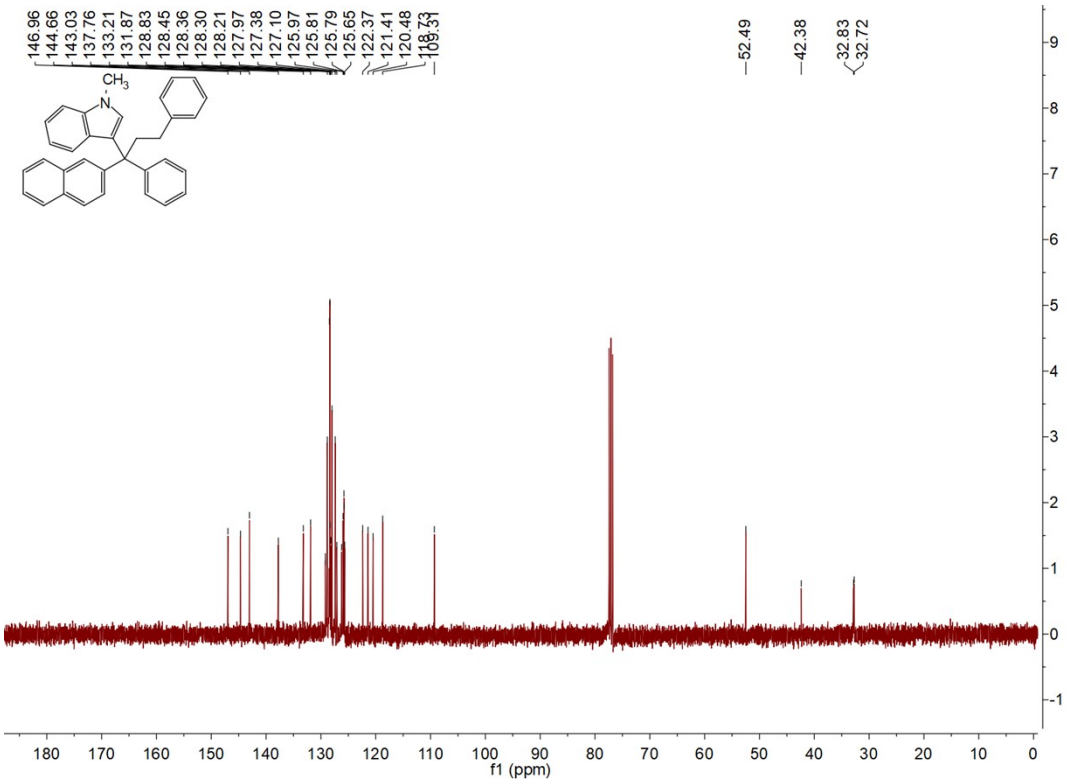
3-(1,3-diphenyl-1-(4-(prop-2-yn-1-yloxy)phenyl)propyl)-1-methyl-1*H*-indole (5k)



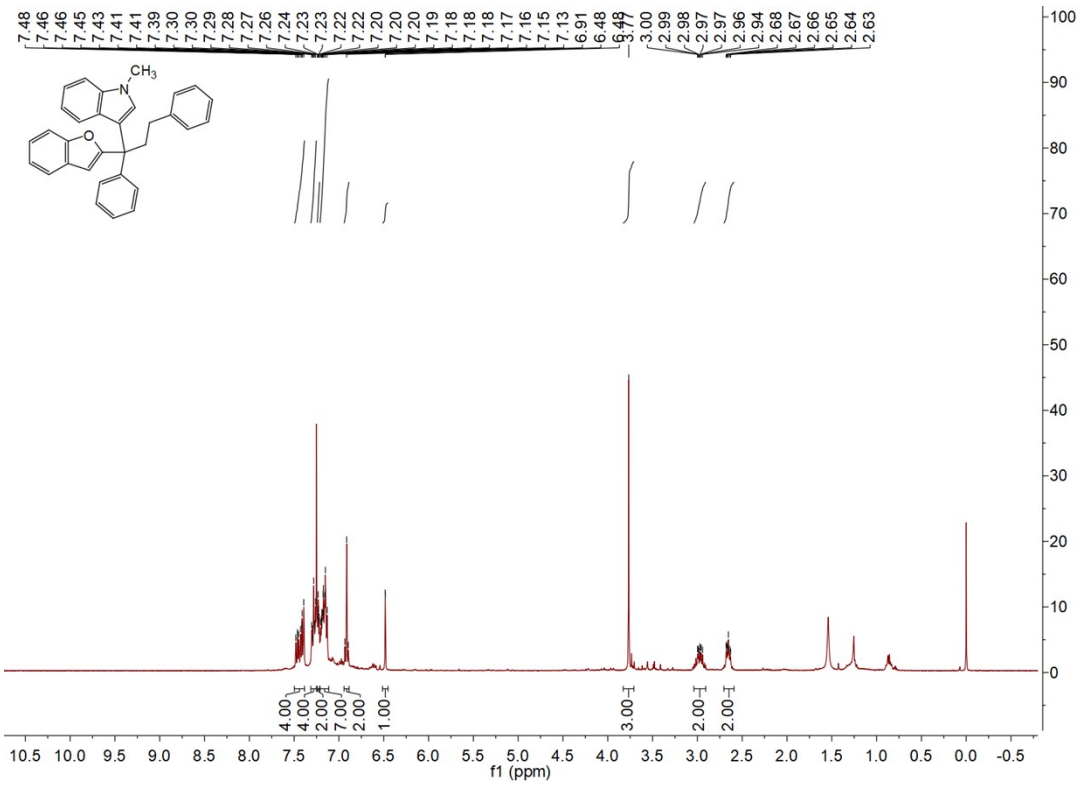


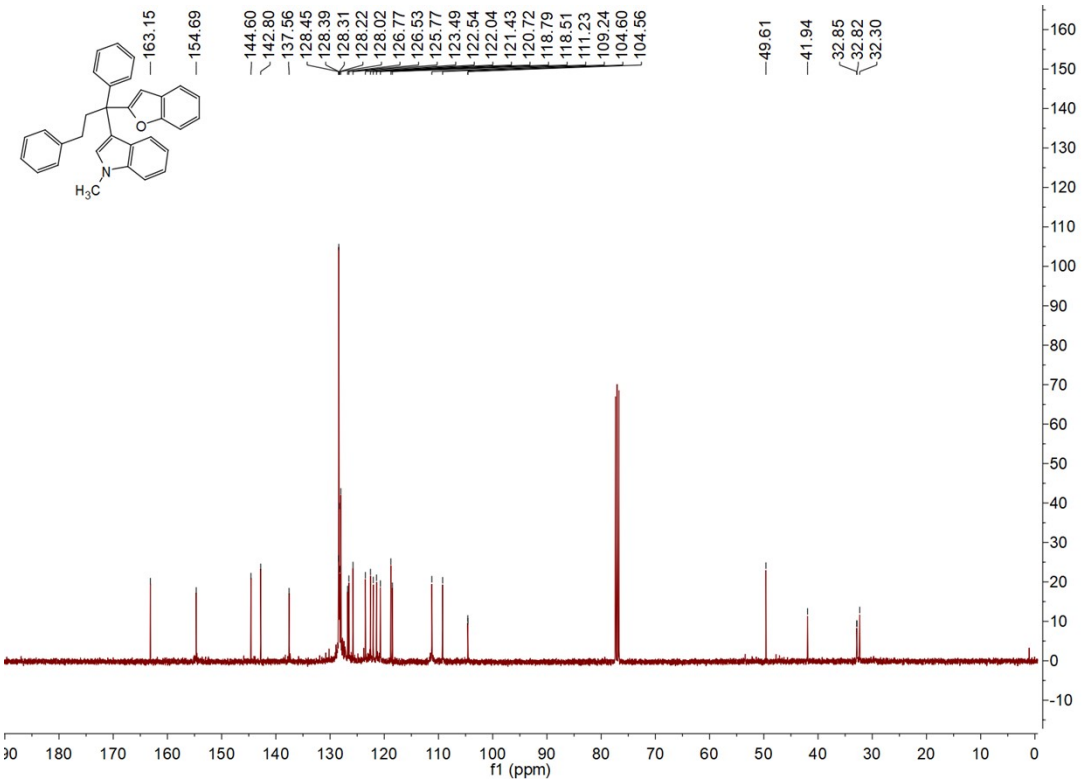
1-methyl-3-(1-(naphthalen-2-yl)-1,3-diphenylpropyl)-1*H*-indole (5l)



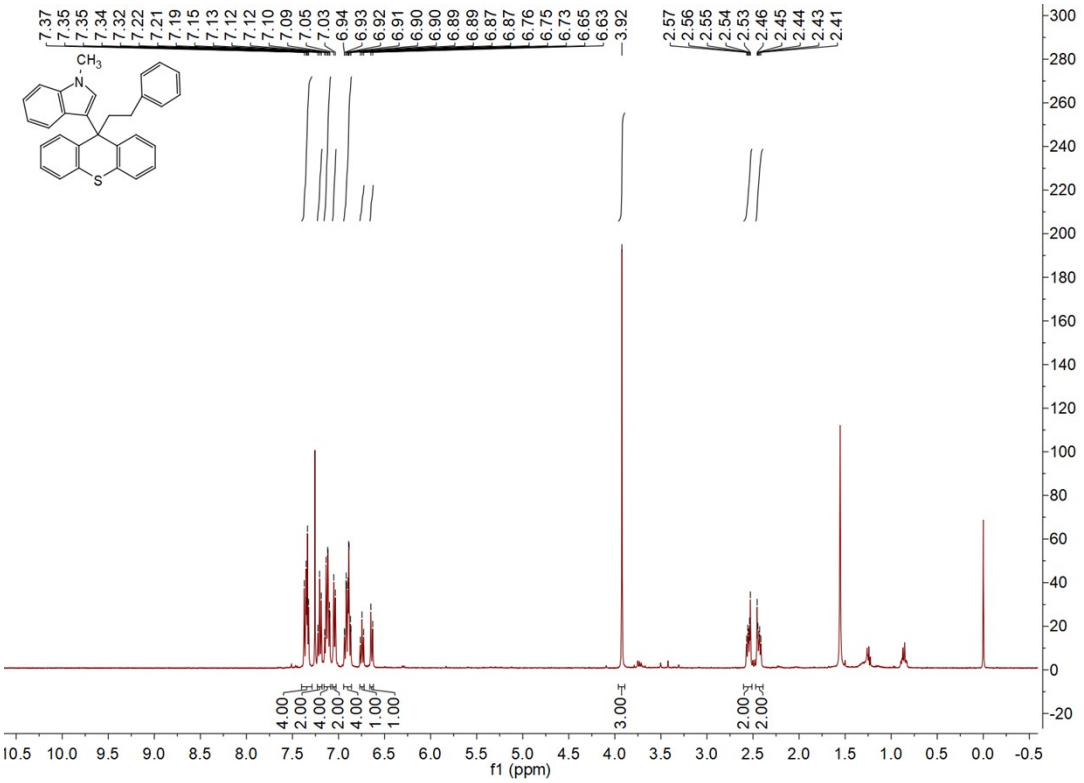


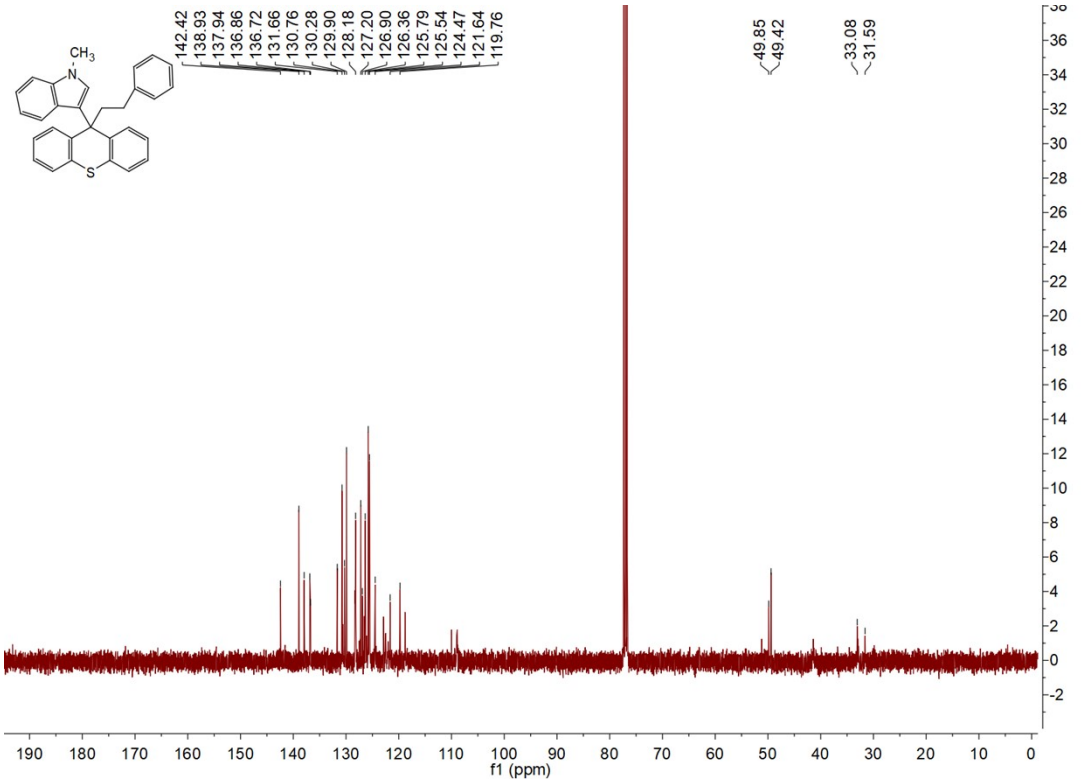
3-(1-(benzofuran-2-yl)-1,3-diphenylpropyl)-1-methyl-1*H*-indole (5m)



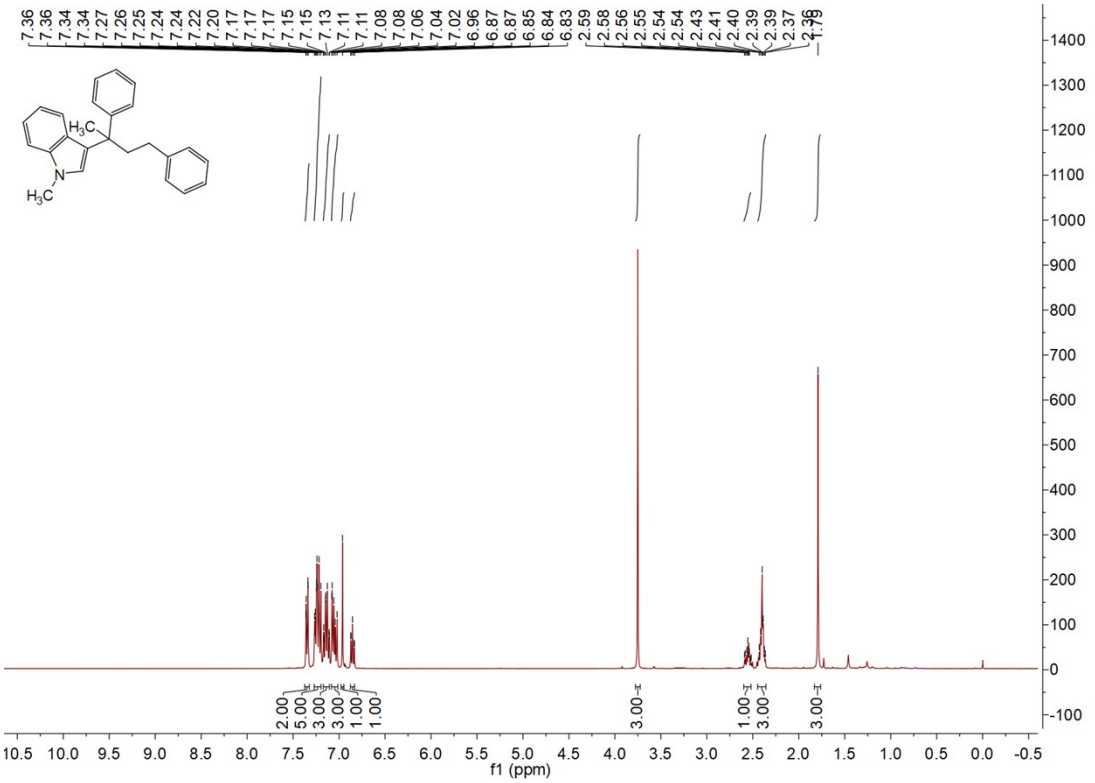


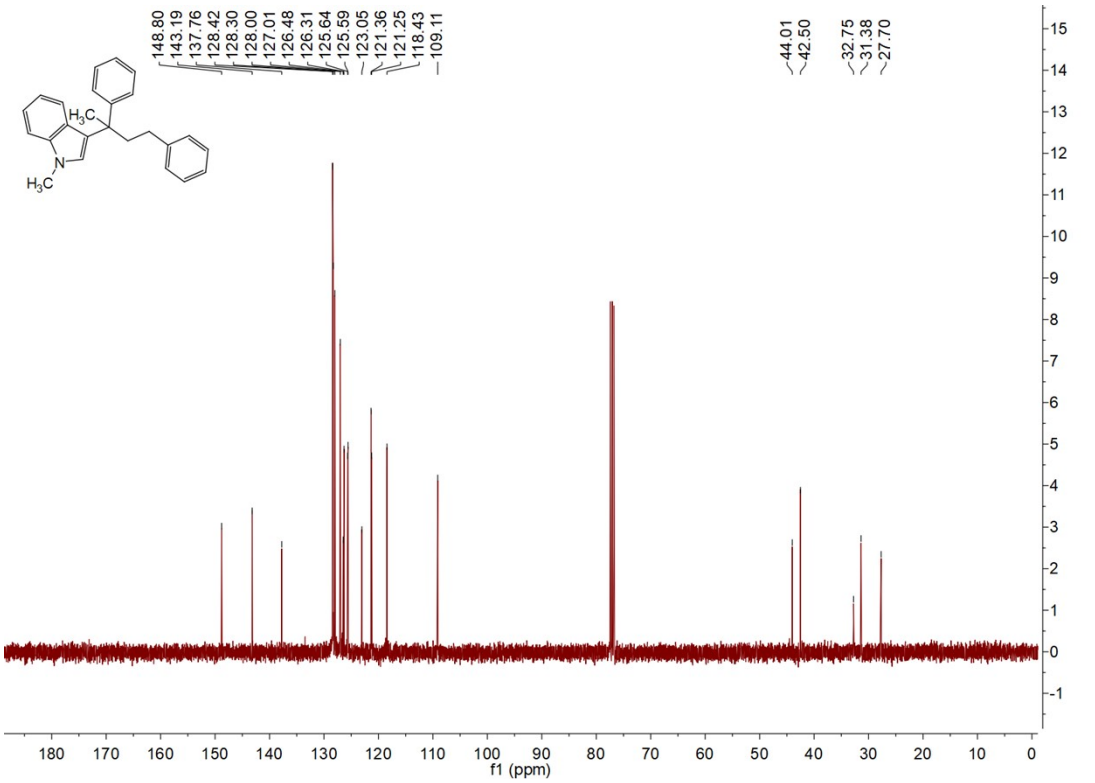
1-methyl-3-(9-phenethyl-9H-thioxanthen-9-yl)-1*H*-indole (5n)



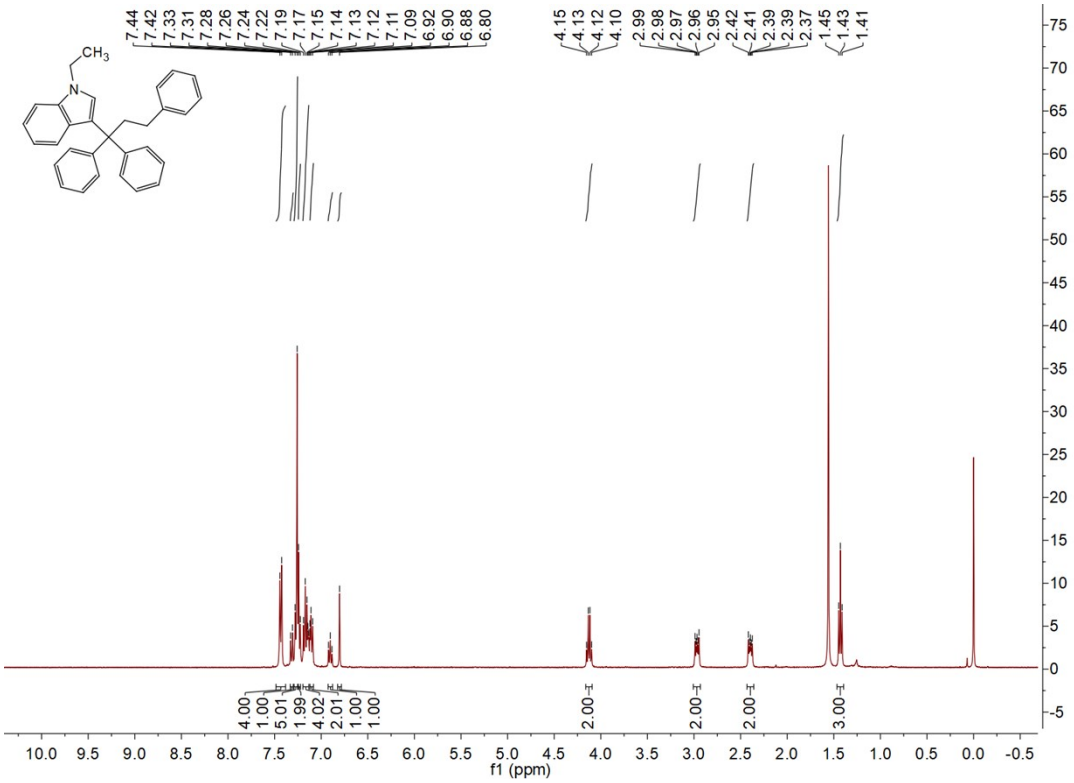


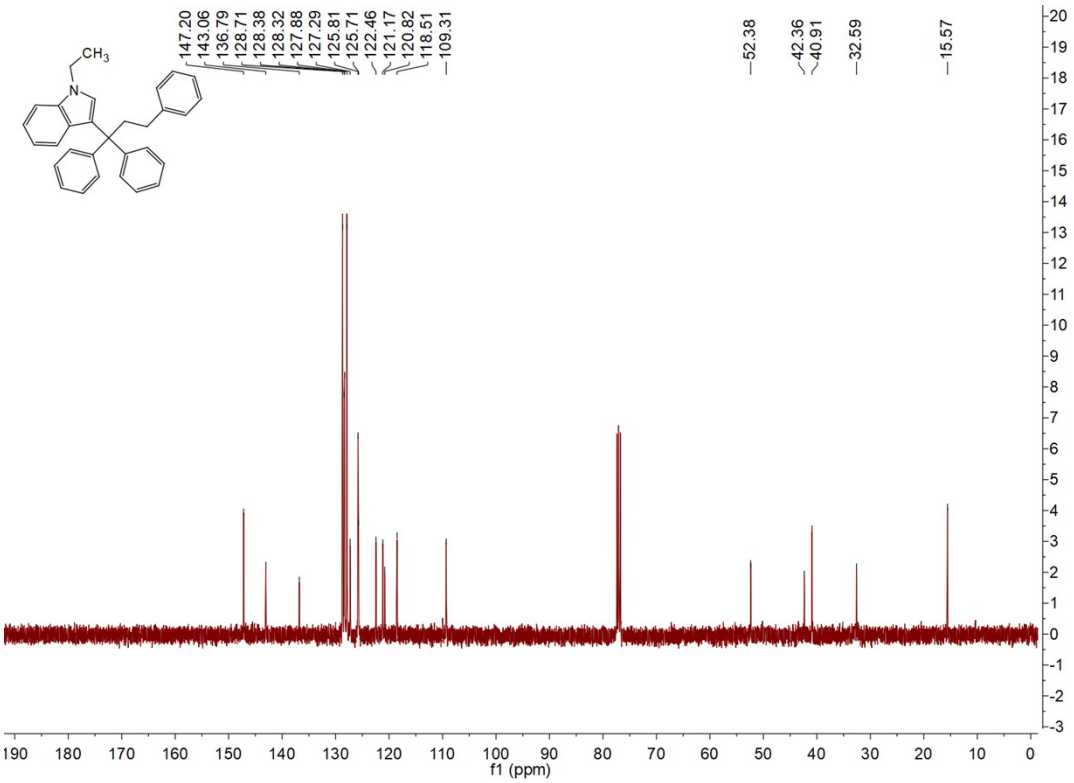
3-(2,4-diphenylbutan-2-yl)-1-methyl-1*H*-indole (5o)



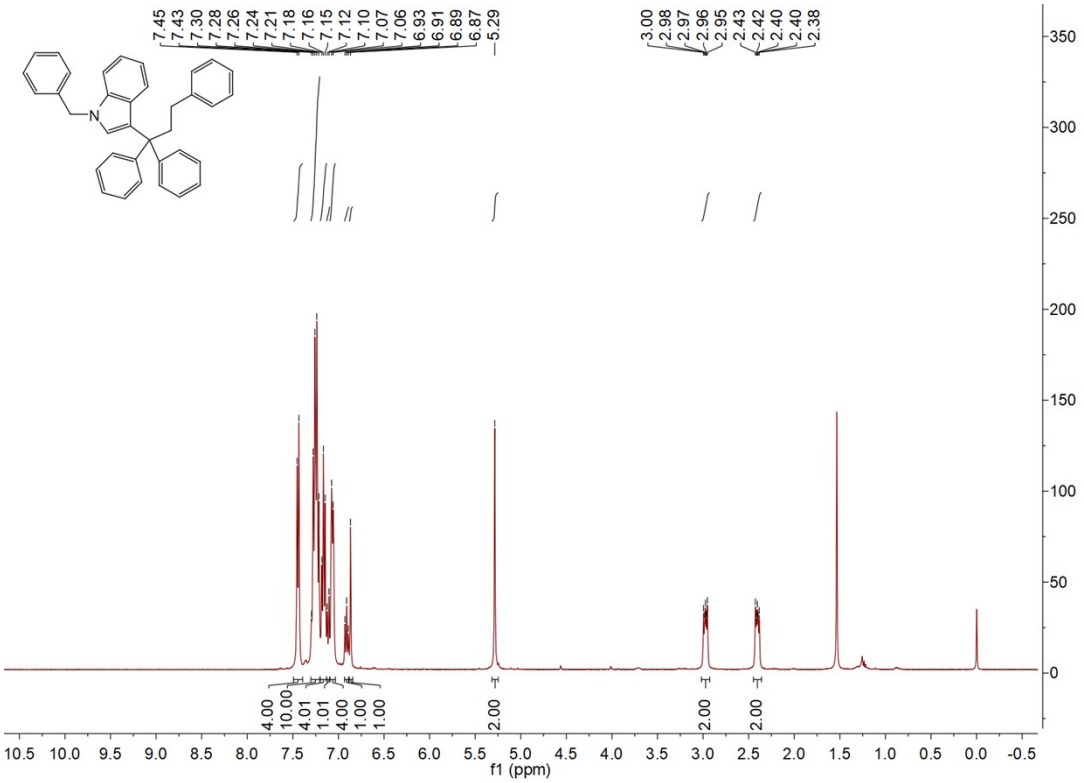


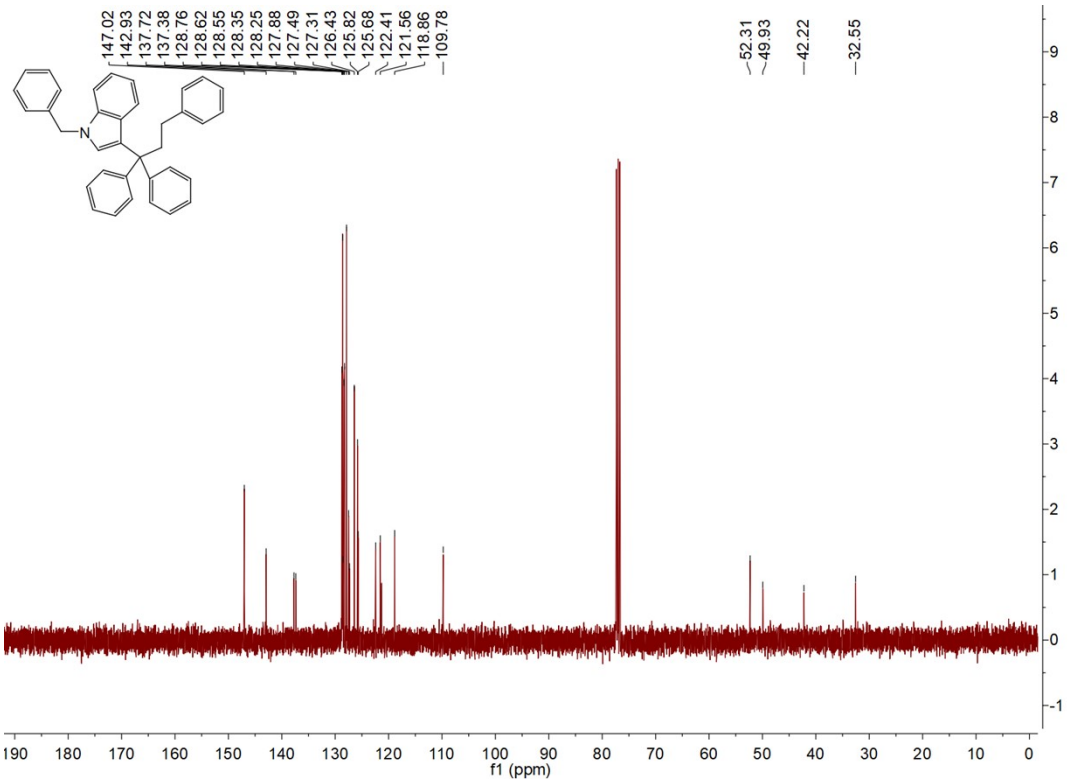
1-ethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6a)



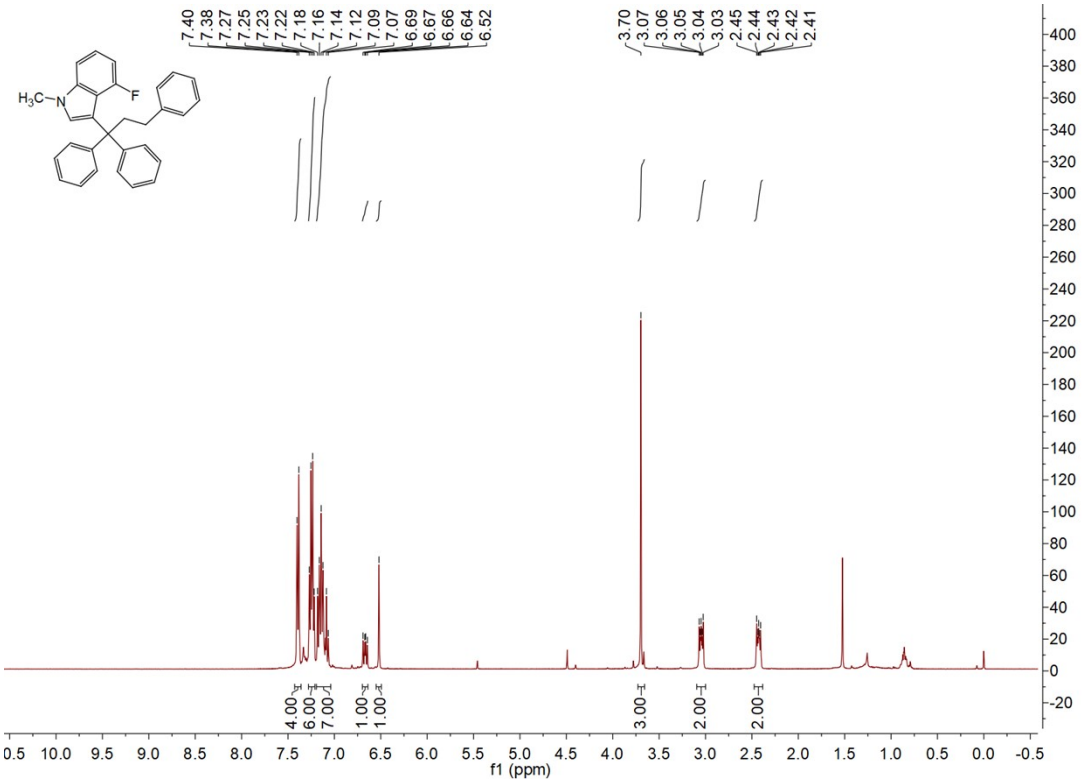


benzyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6b)





4-fluoro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6c)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2.44
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2.42
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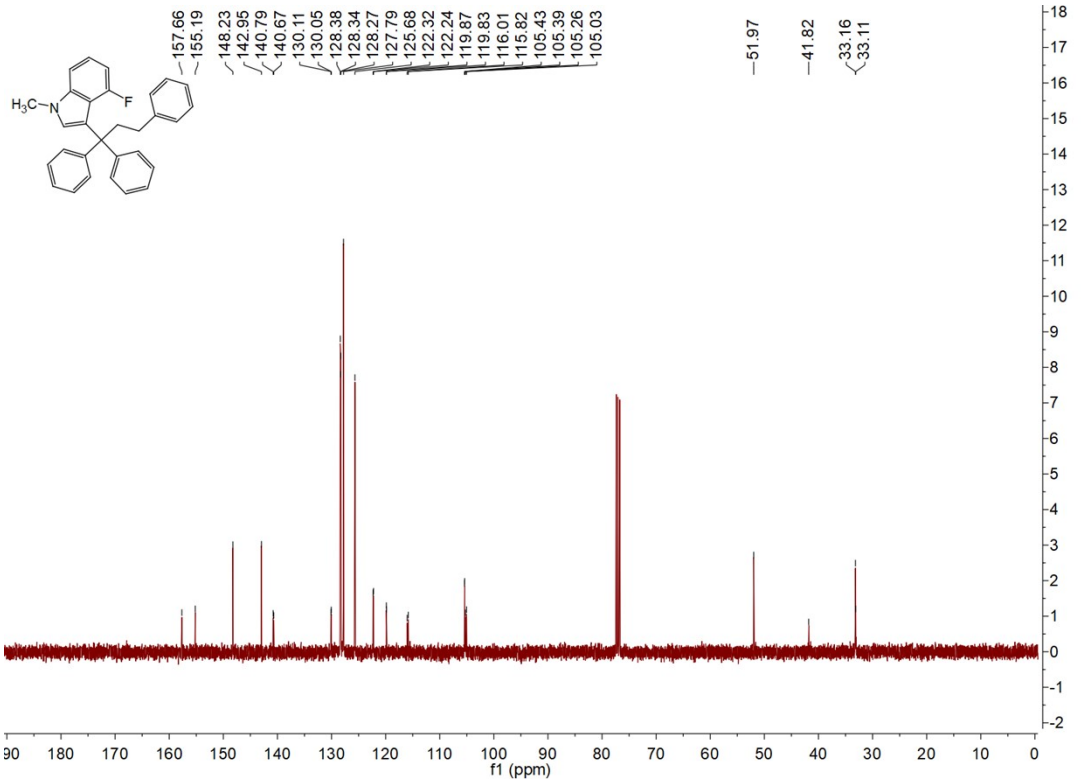
7.00
1.00
1.00
3.00
2.00
2.00
f1 (ppm)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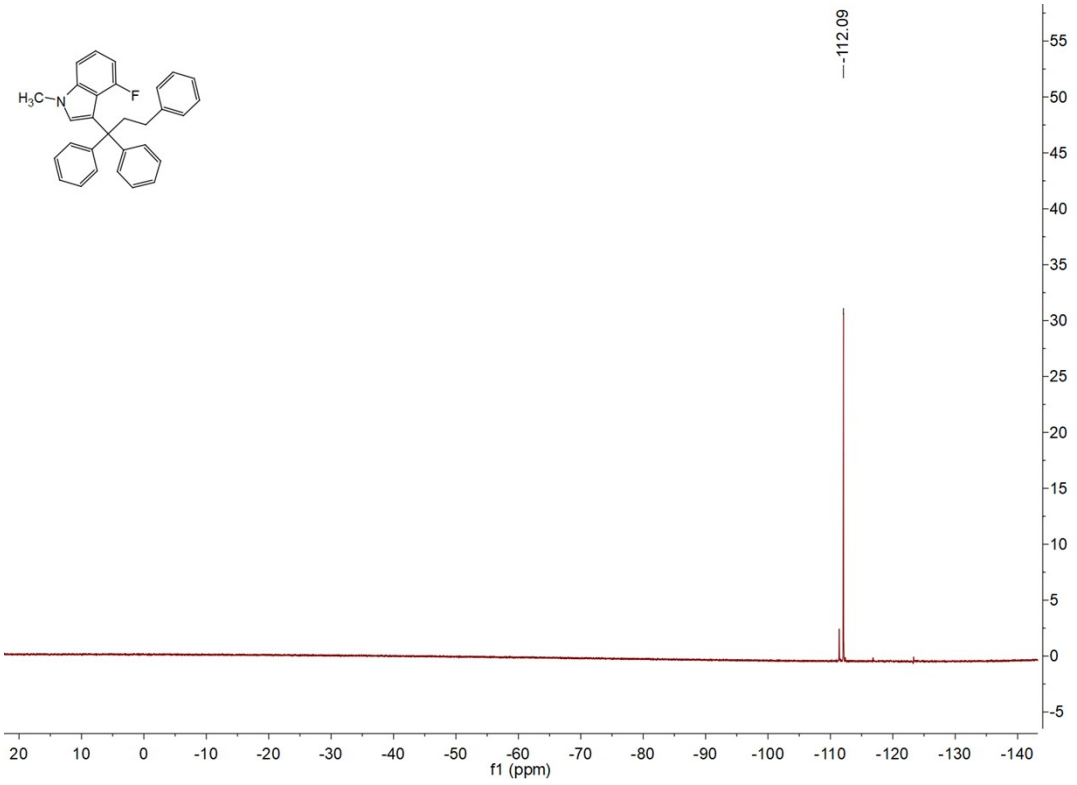
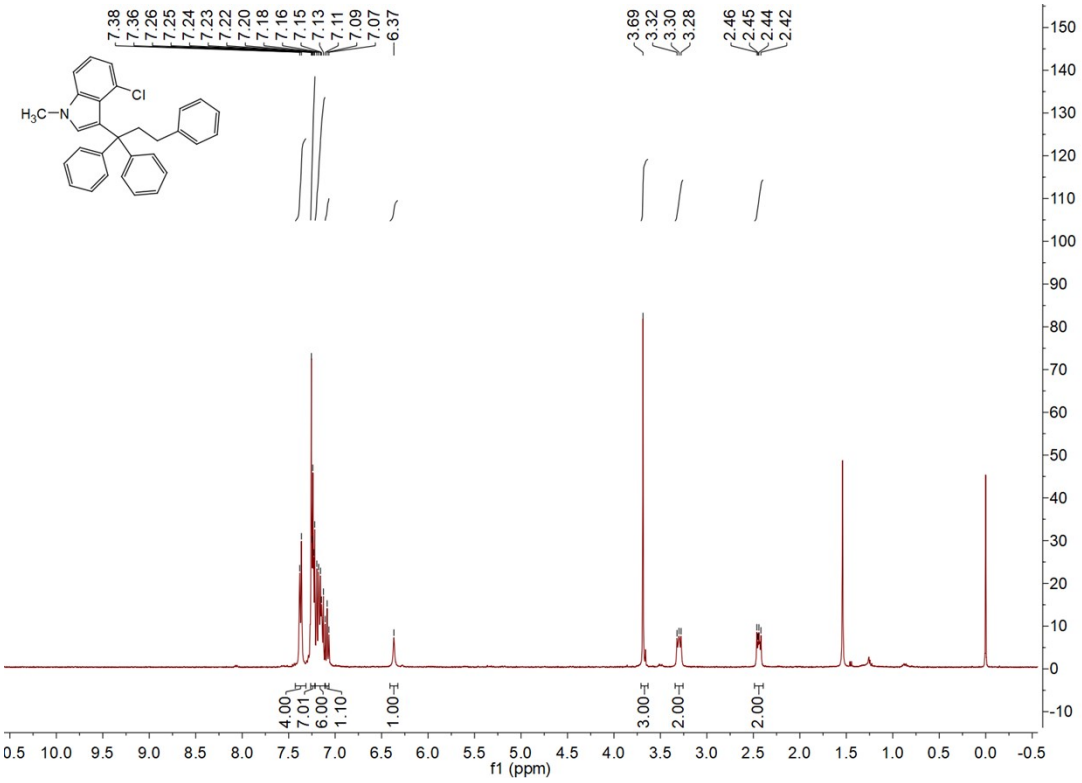
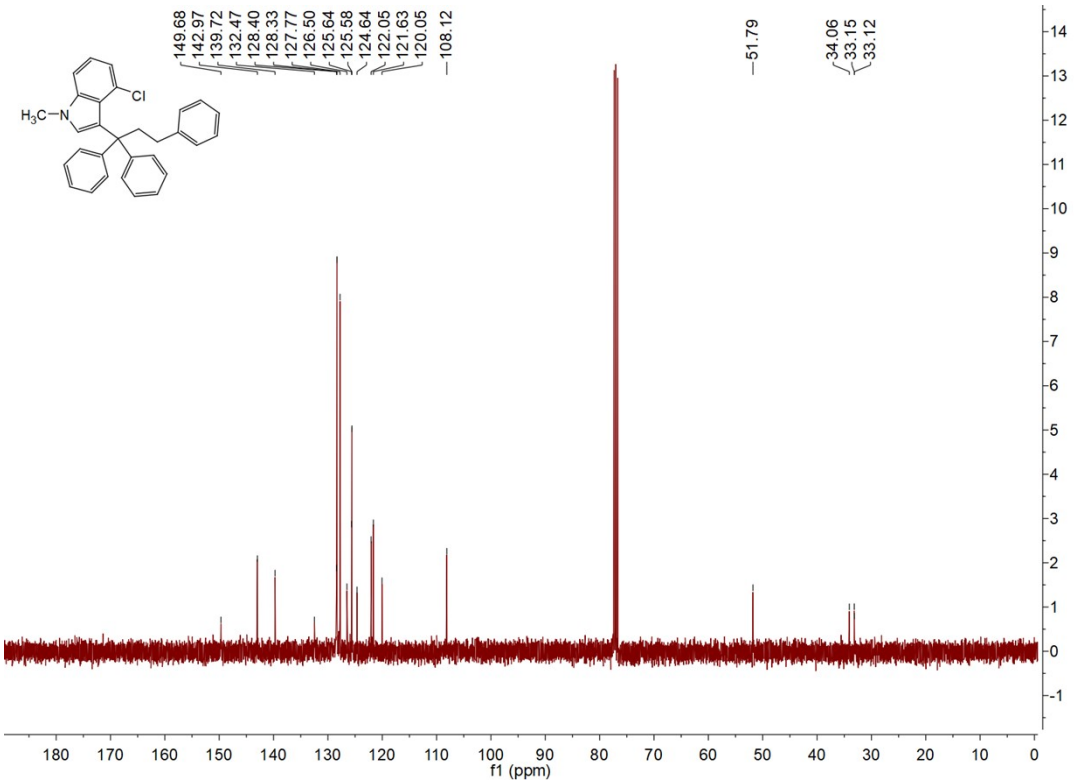
H3C
N
F
f1 (ppm)

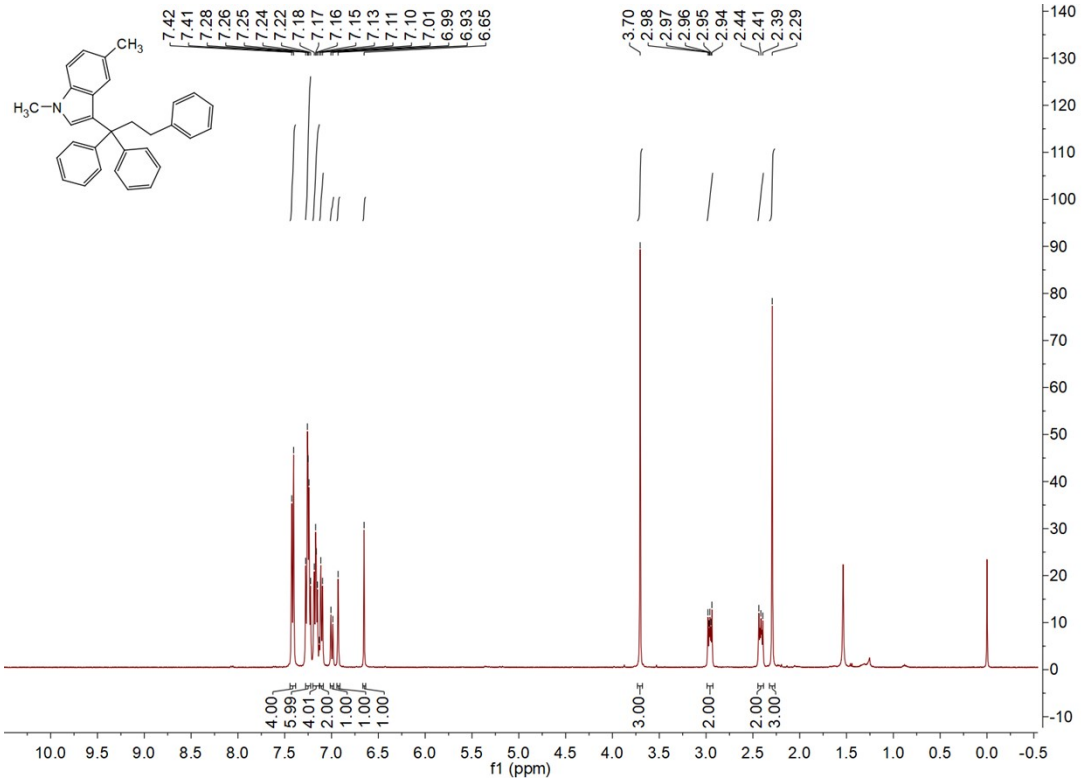


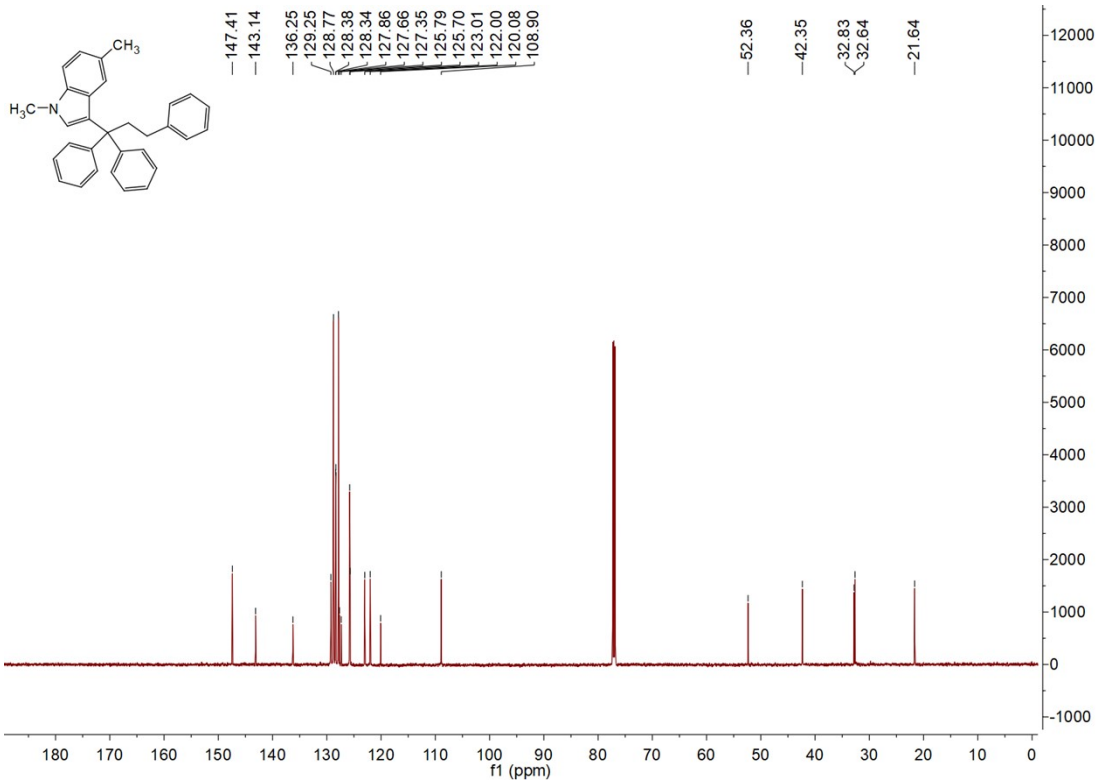
4-chloro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6d)



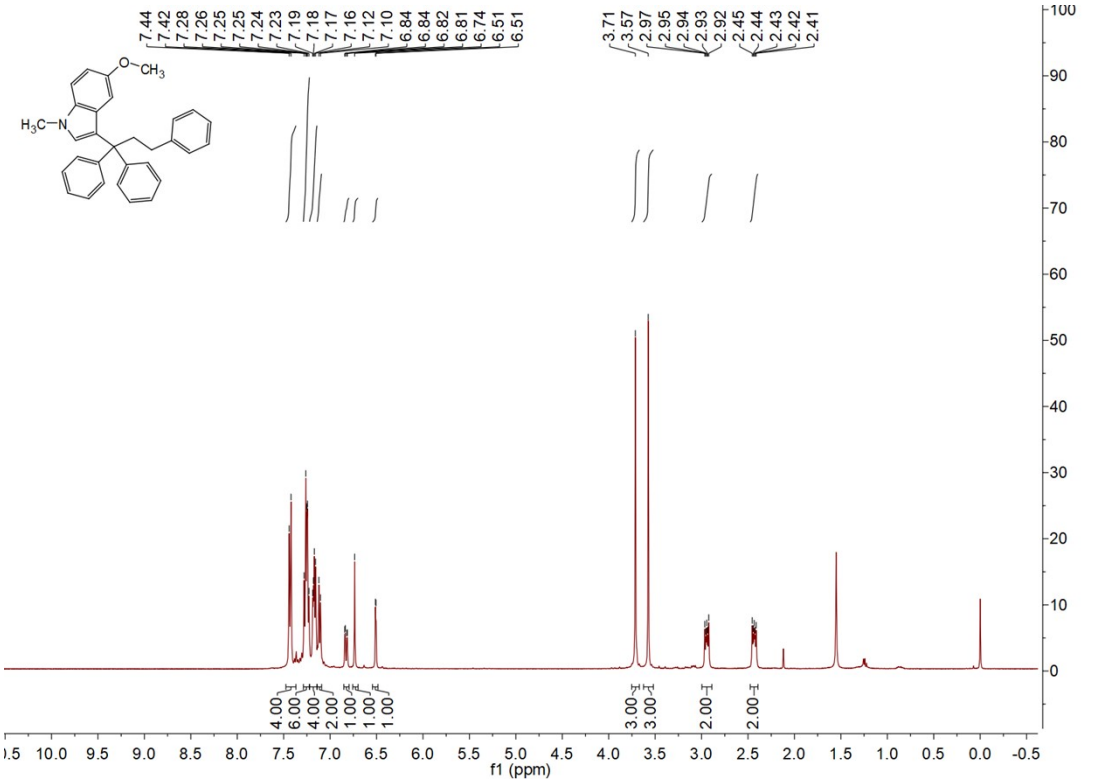


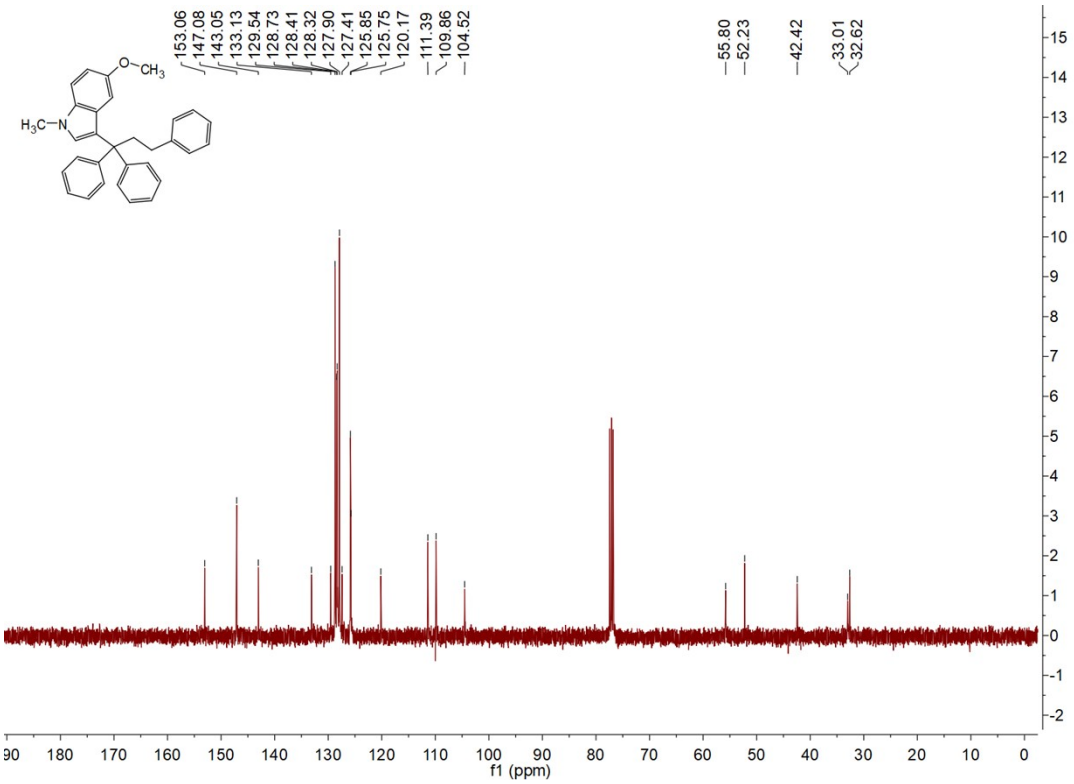
1,5-dimethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6e)



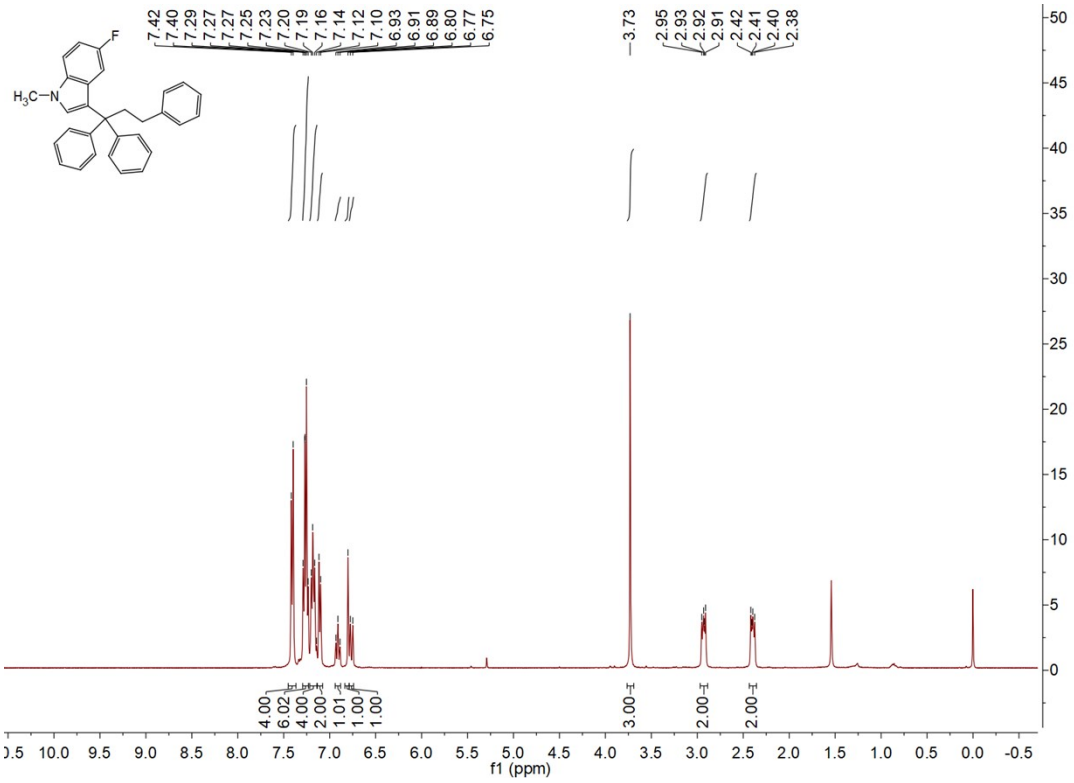


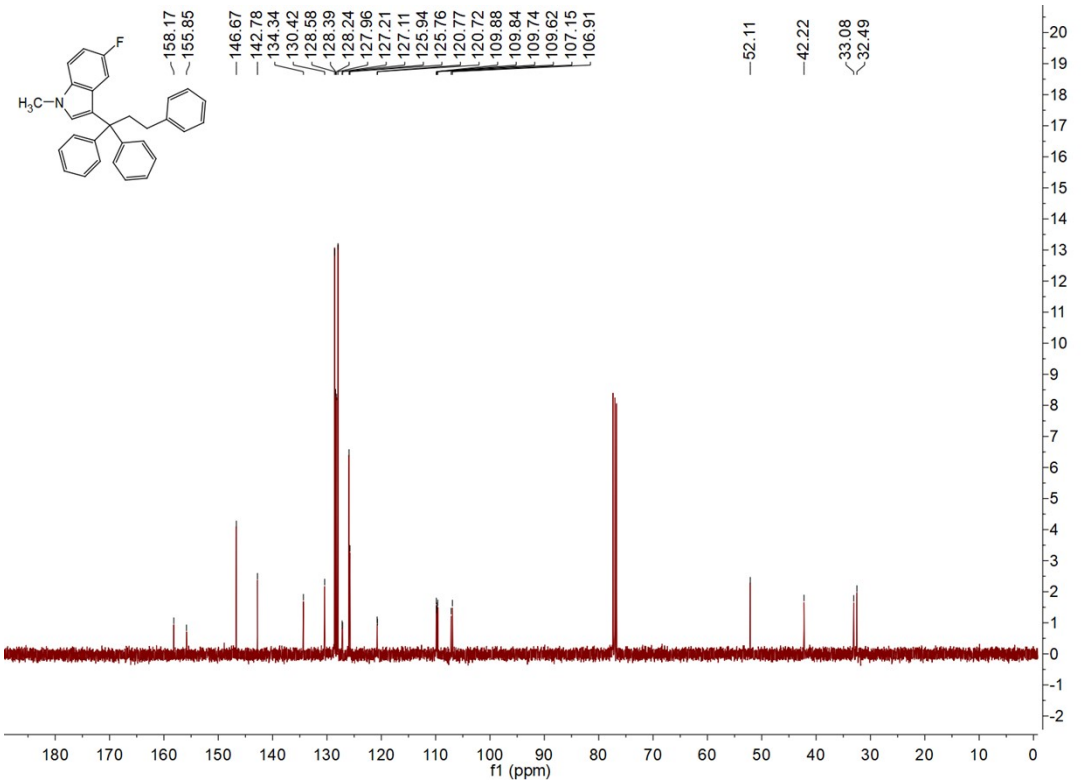
5-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6f)

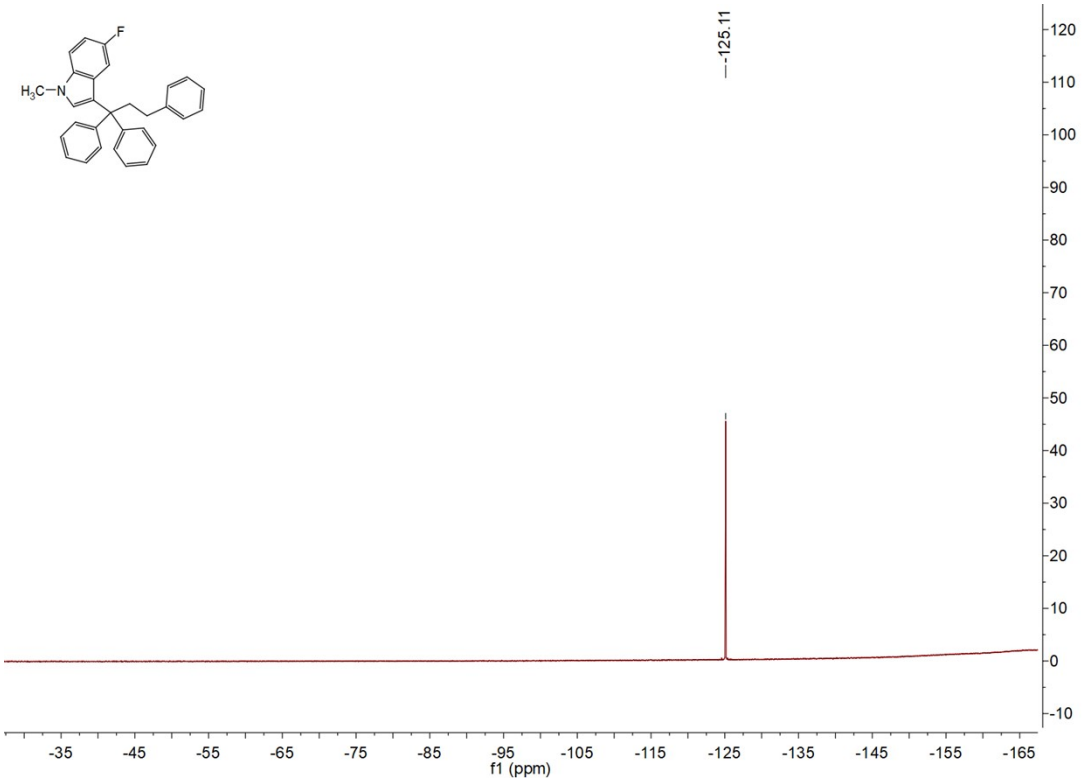




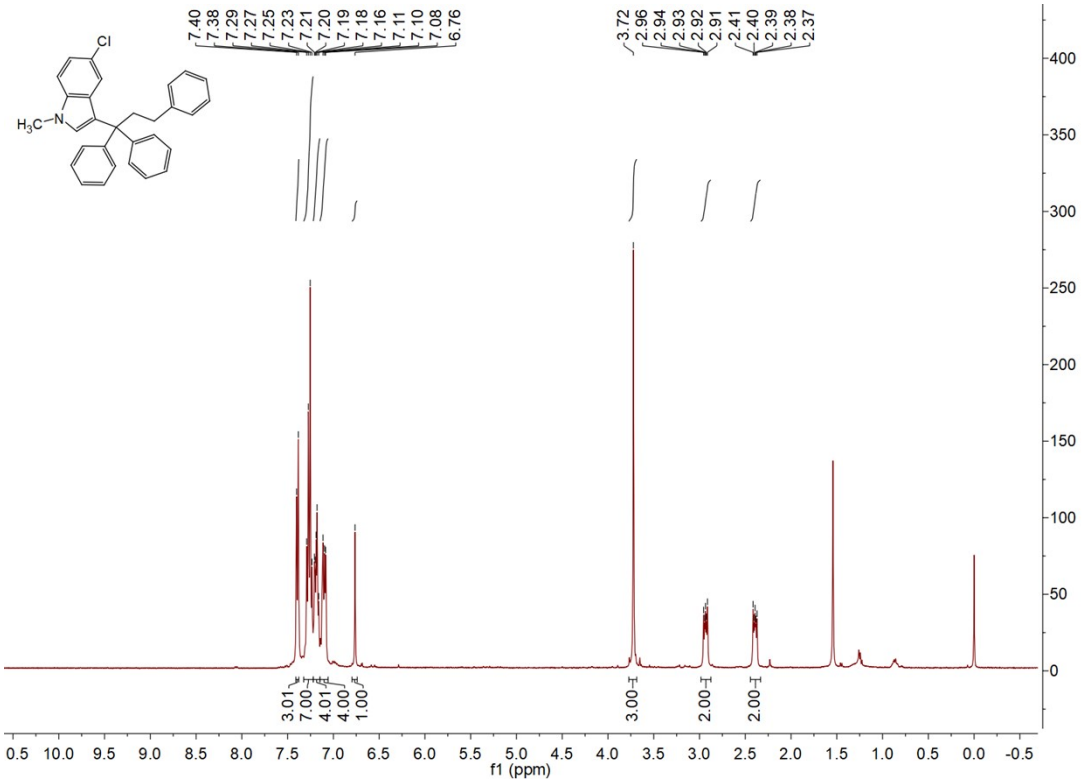
5-fluoro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6g)

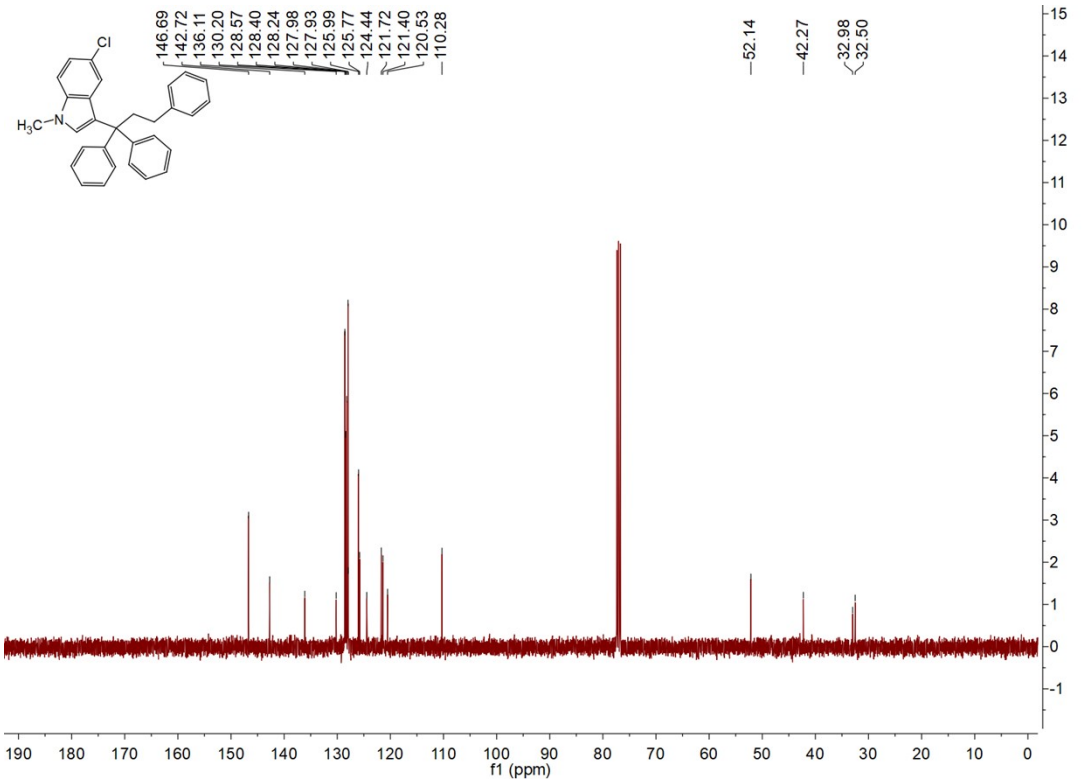




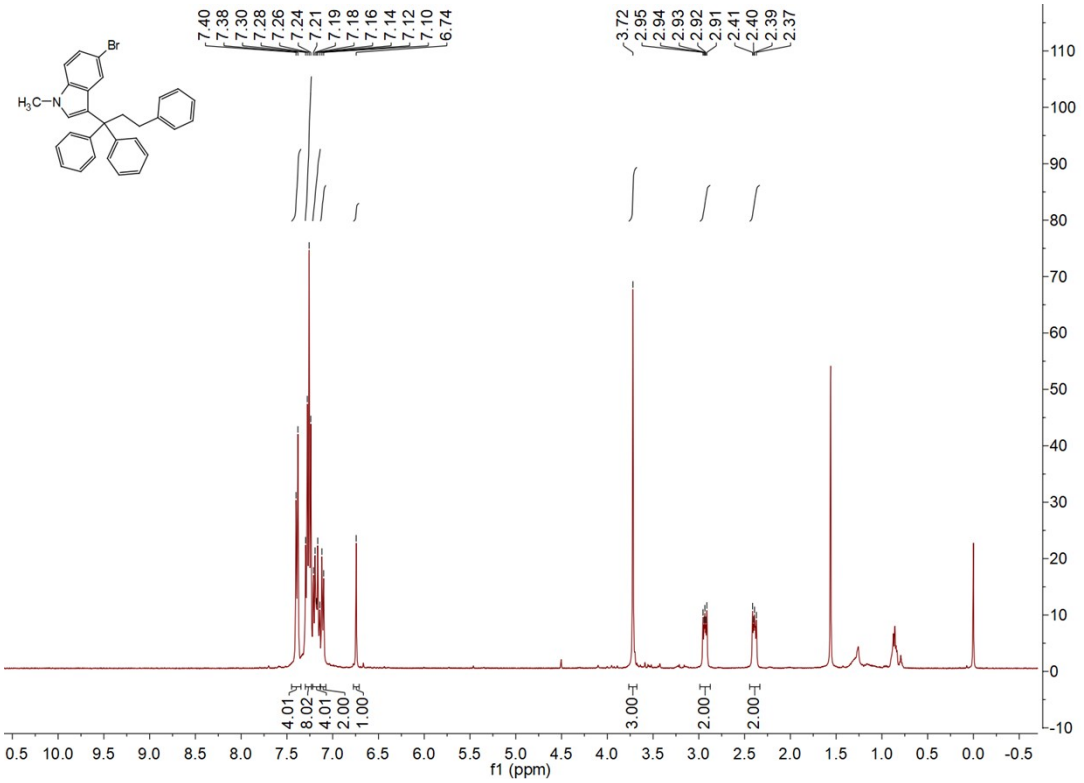


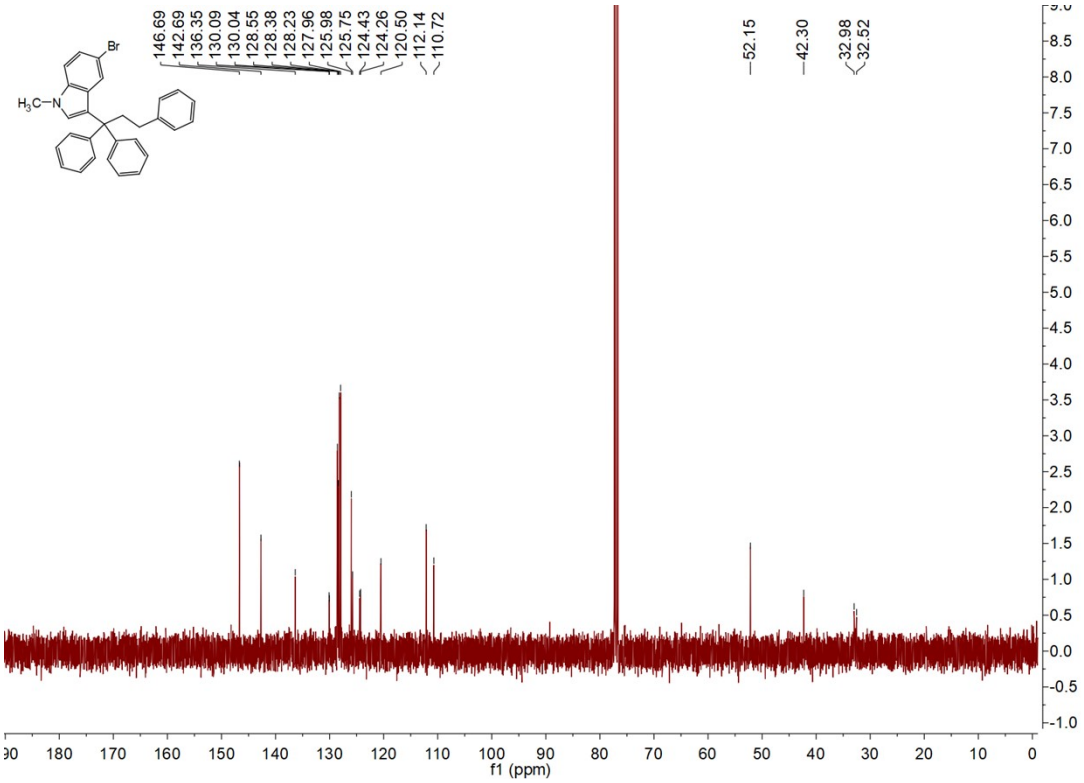
5-chloro-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6h)



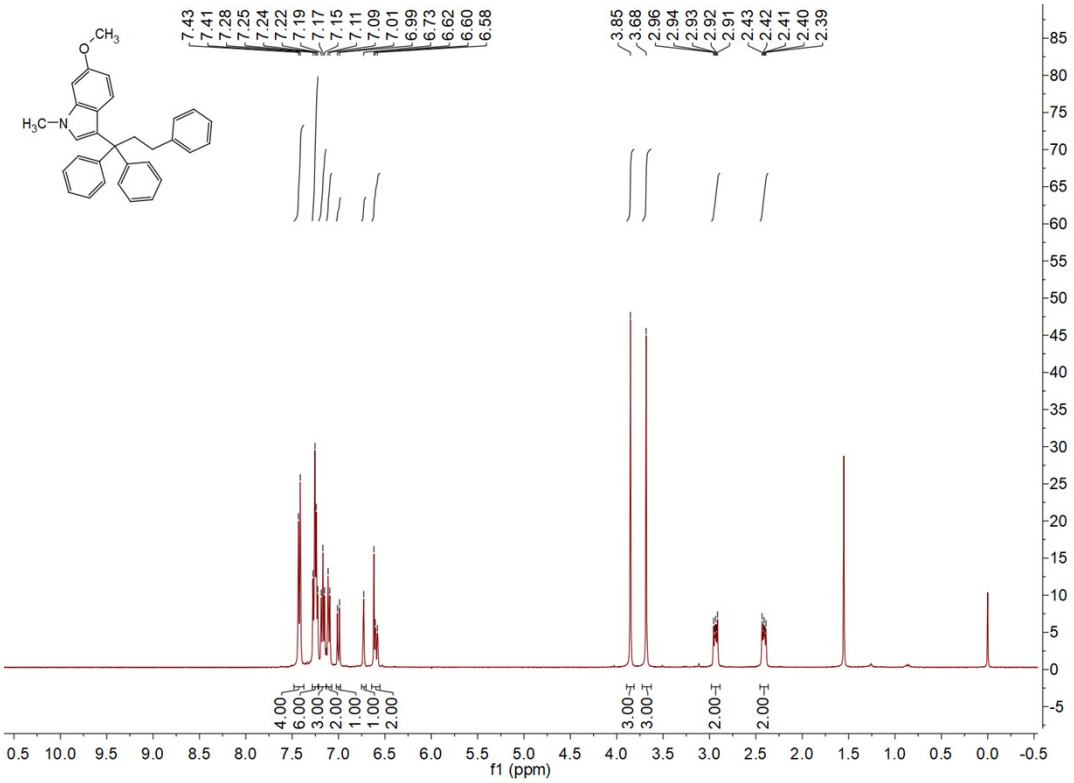


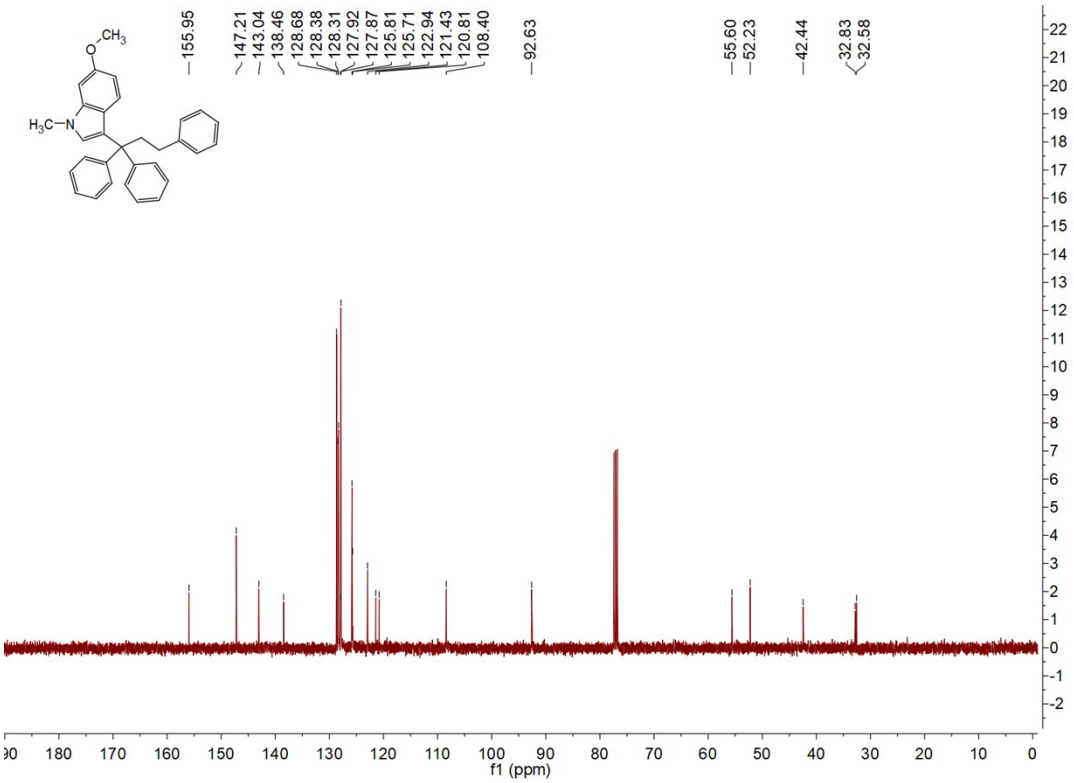
5-bromo-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6i)



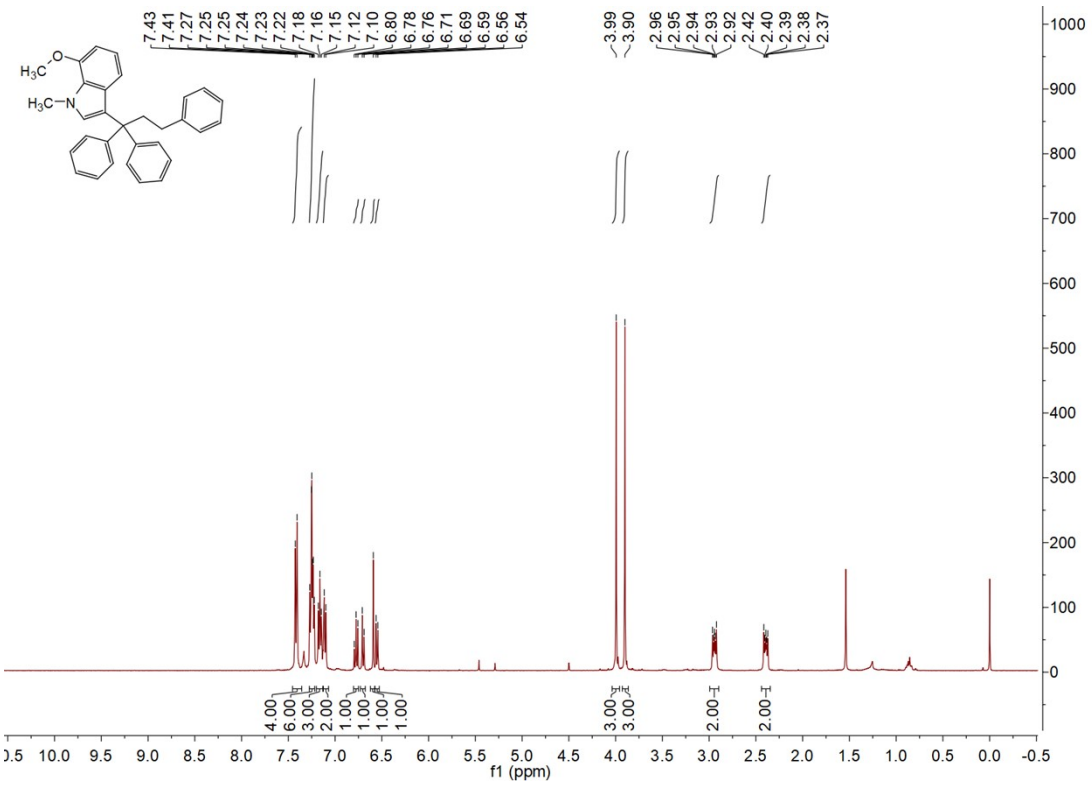


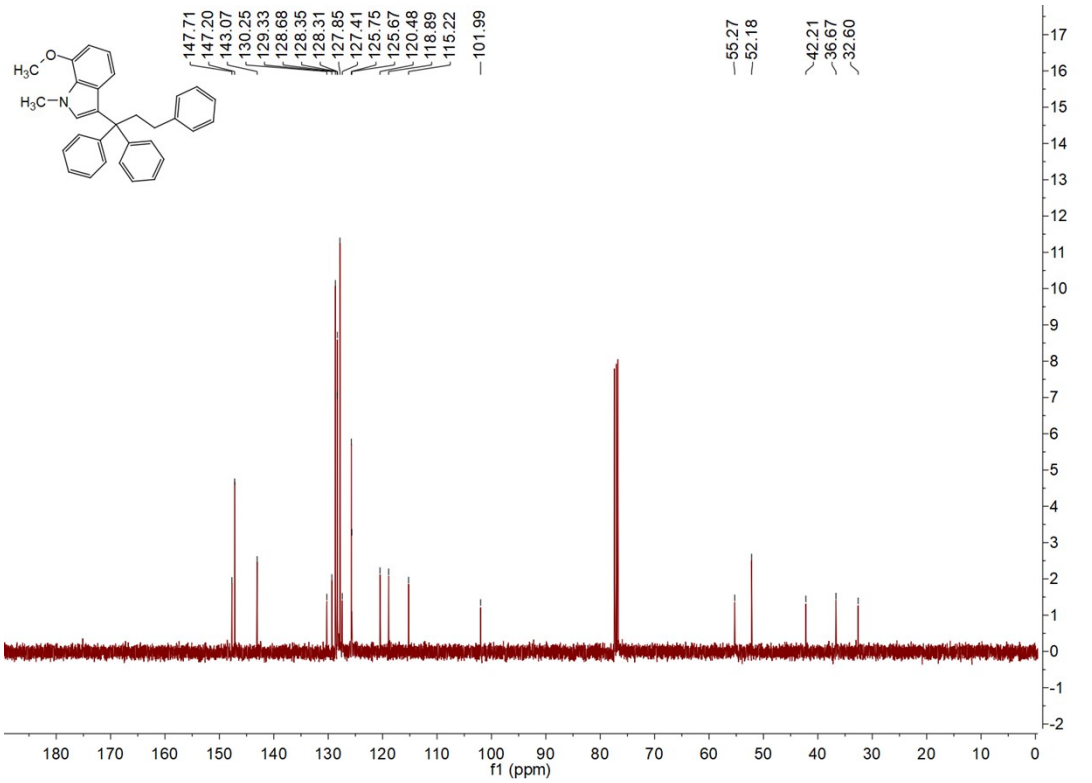
6-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6j)



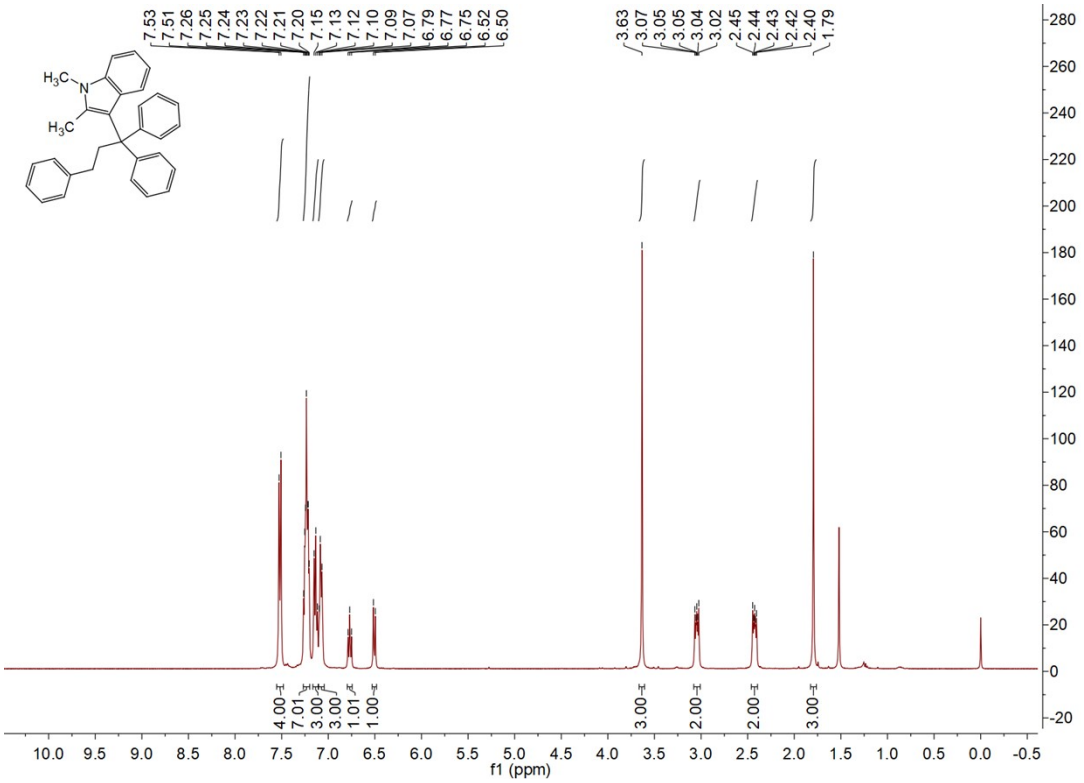


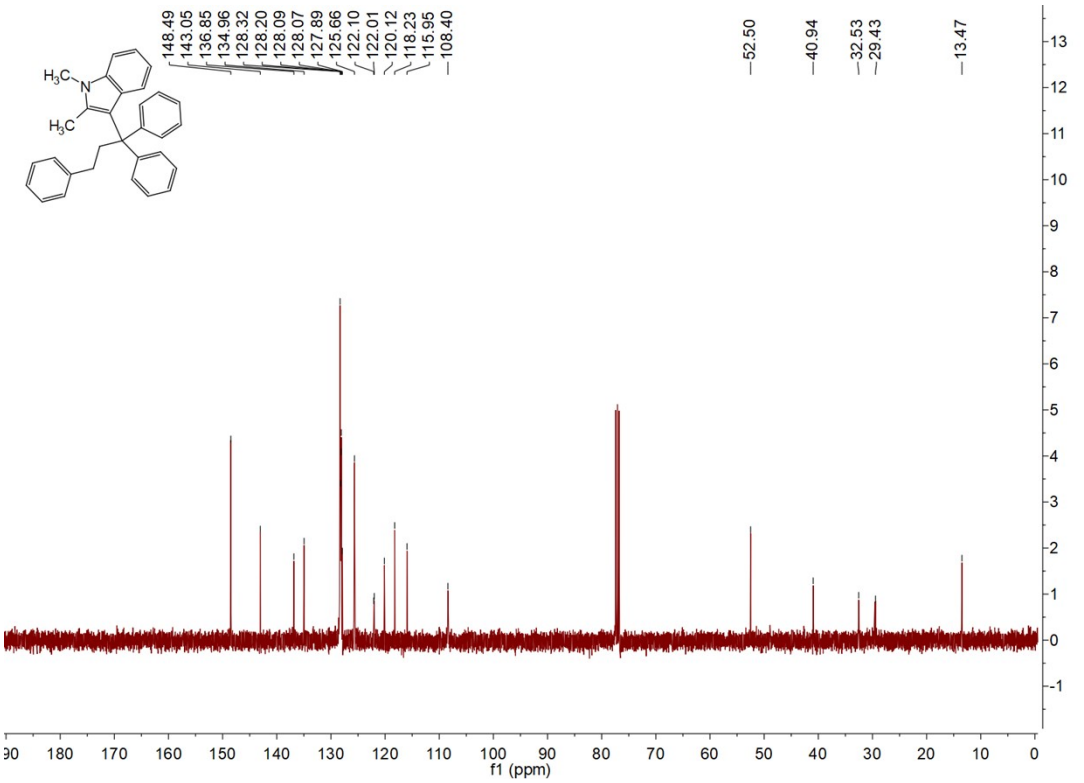
7-methoxy-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6k)



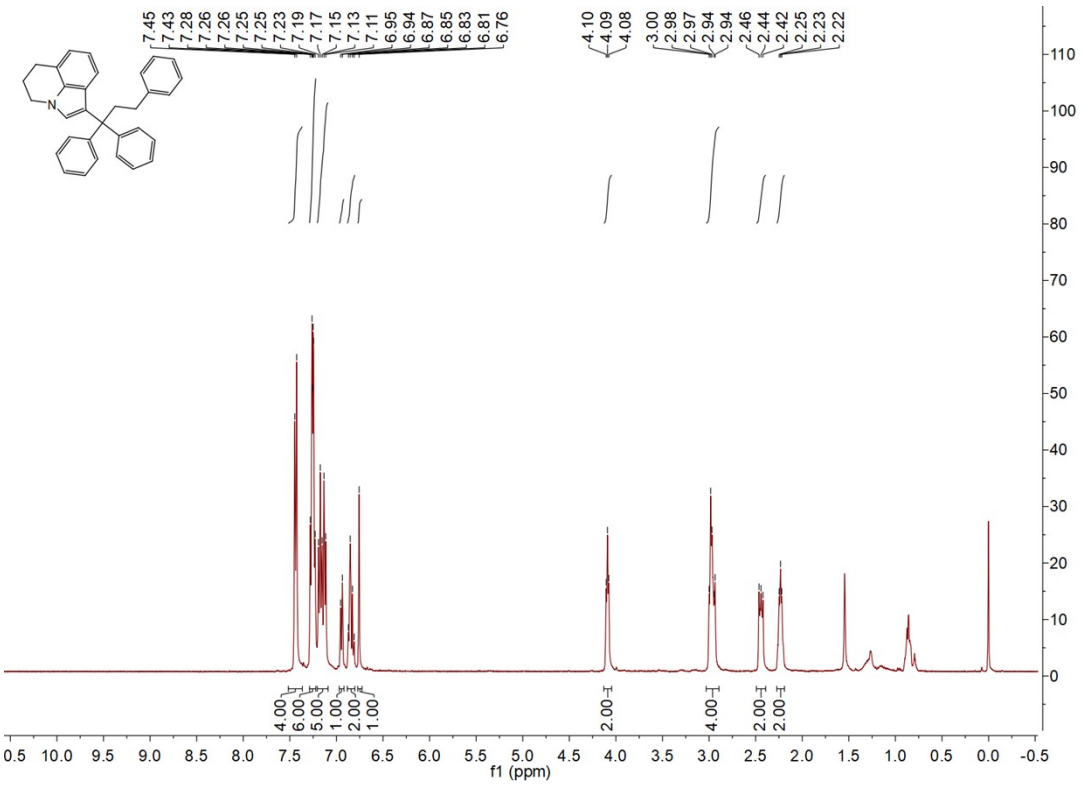


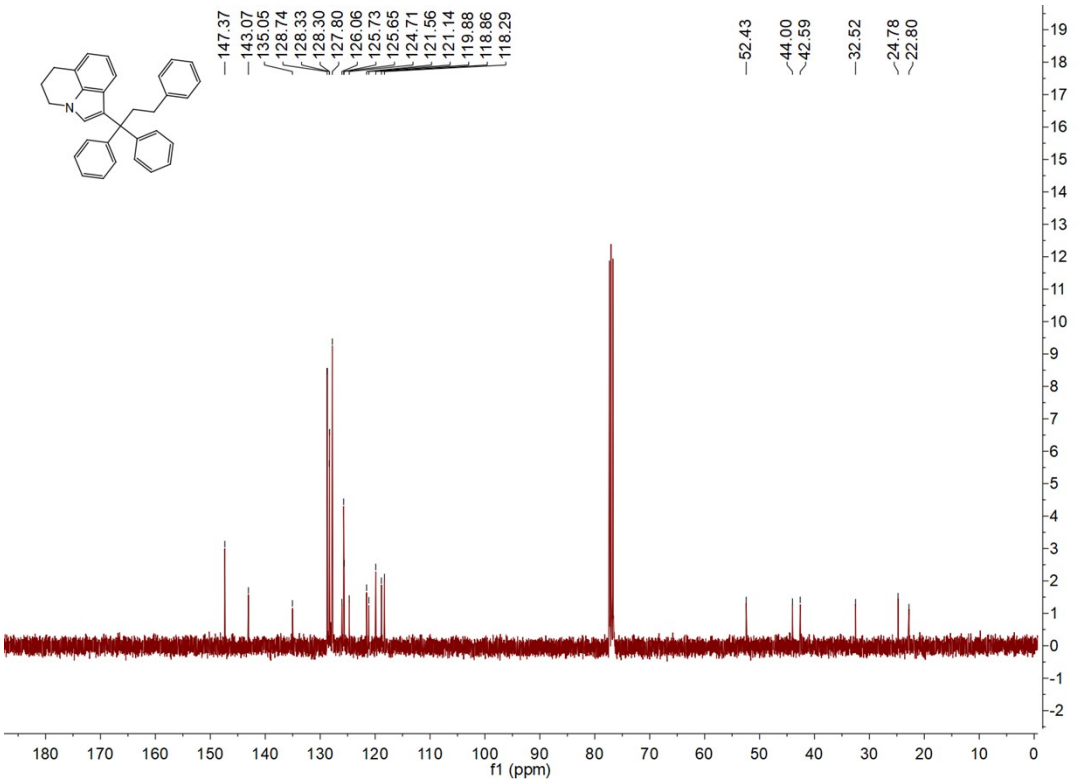
1,2-dimethyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (6l)



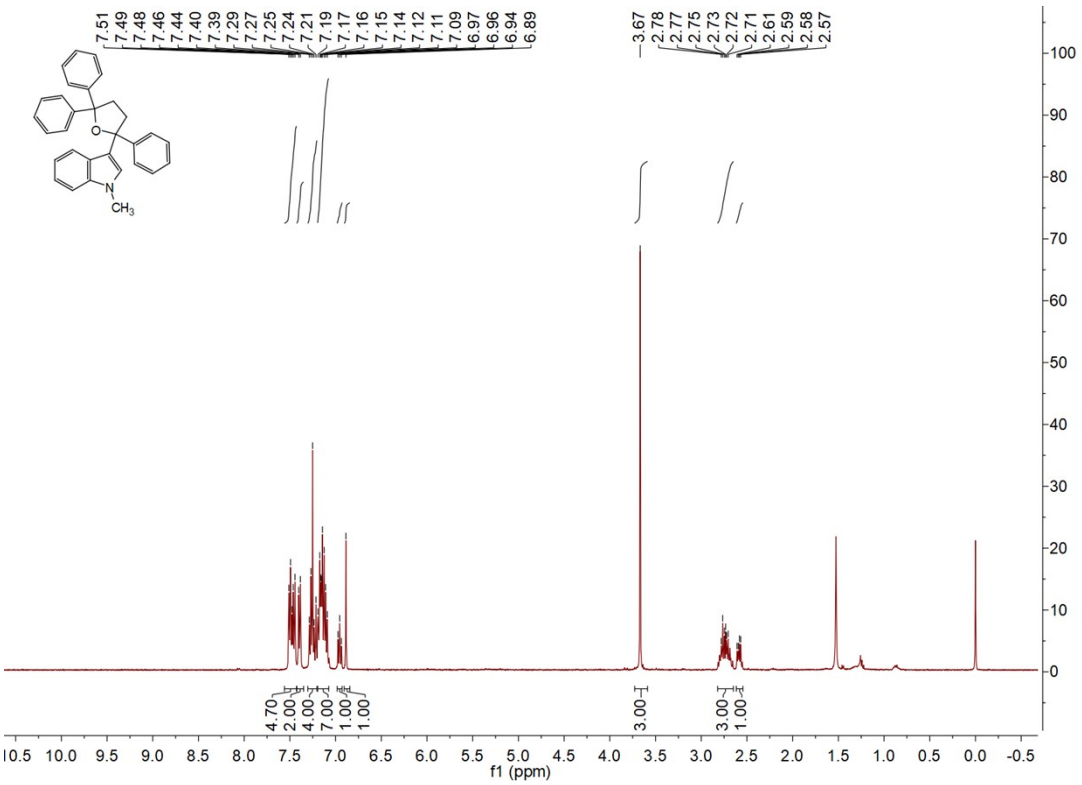


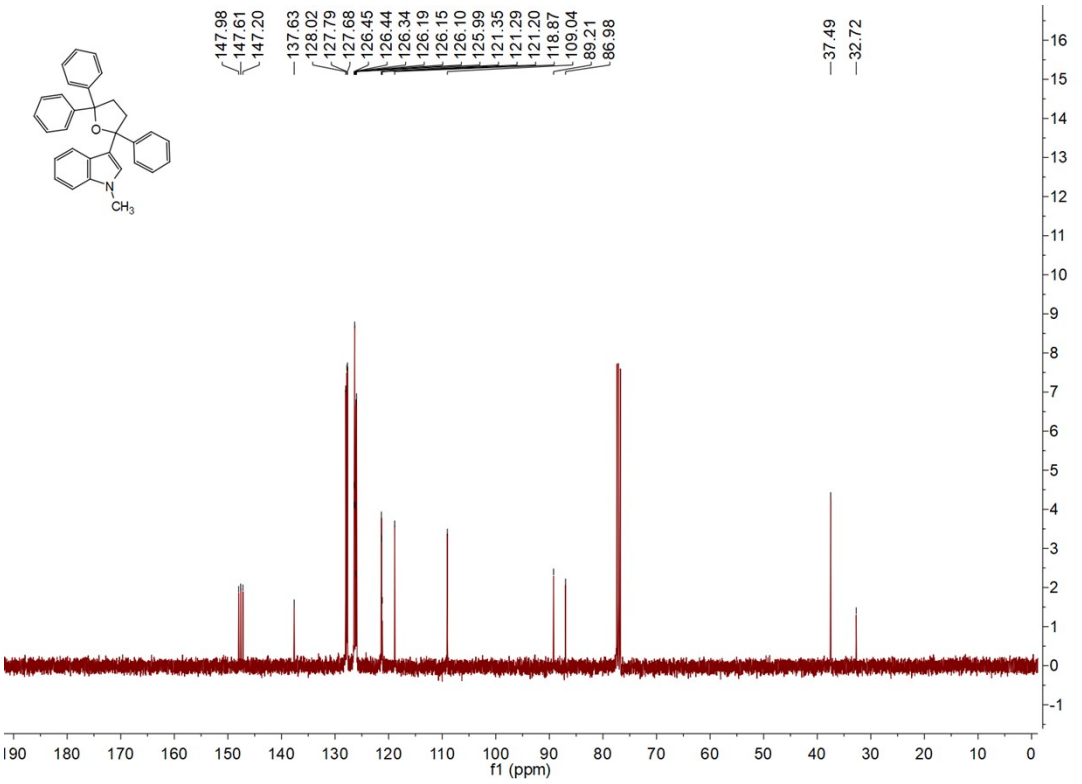
1-(1,1,3-triphenylpropyl)-5,6-dihydro-4*H*-pyrrolo[3,2,1-ij]quinoline (6m)



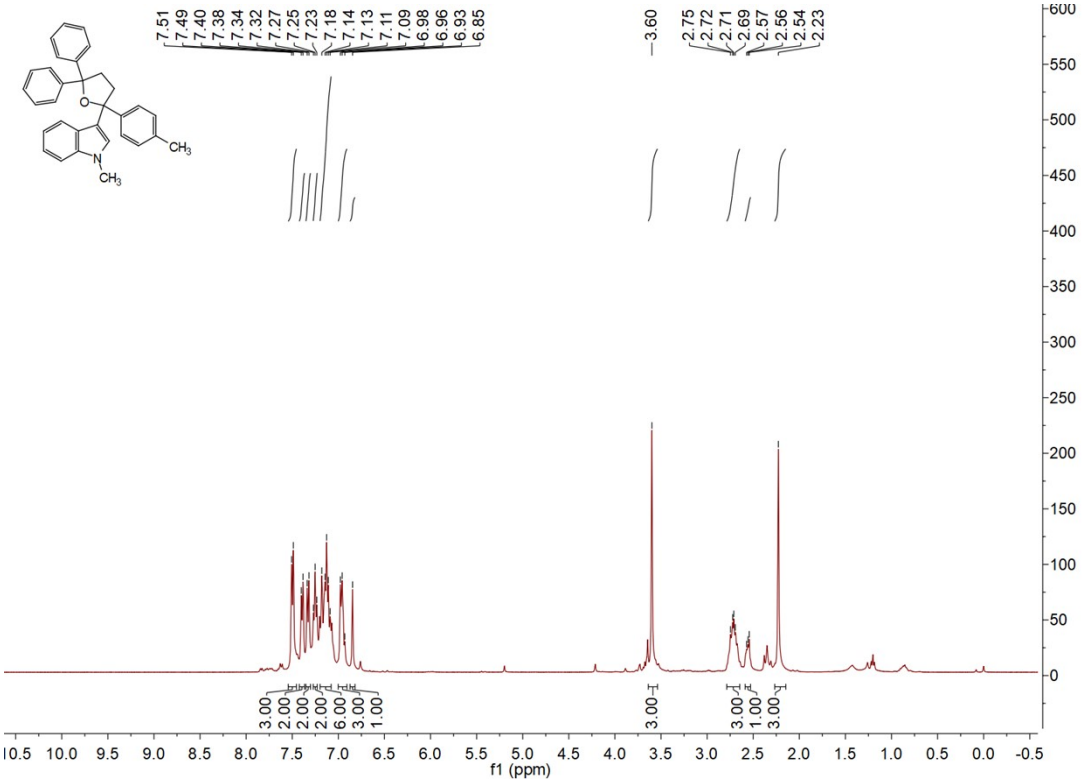


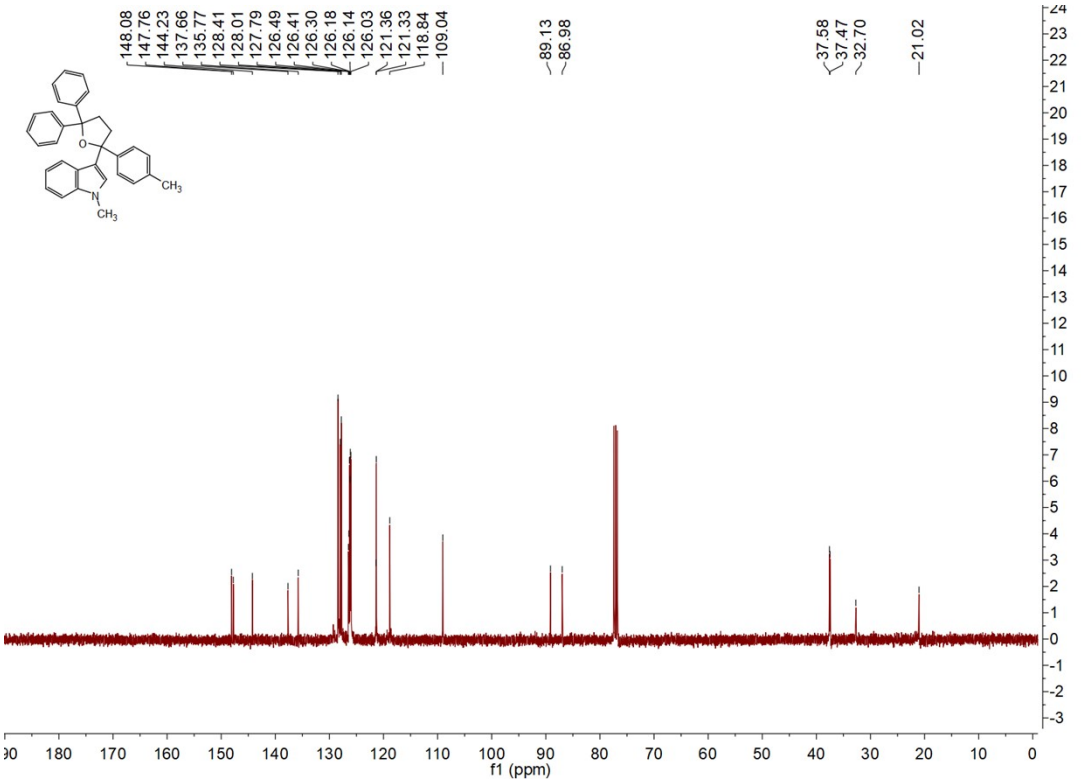
4-(1-methyl-1*H*-indol-3-yl)-1,4,4-triphenylbutan-1-one (8a)



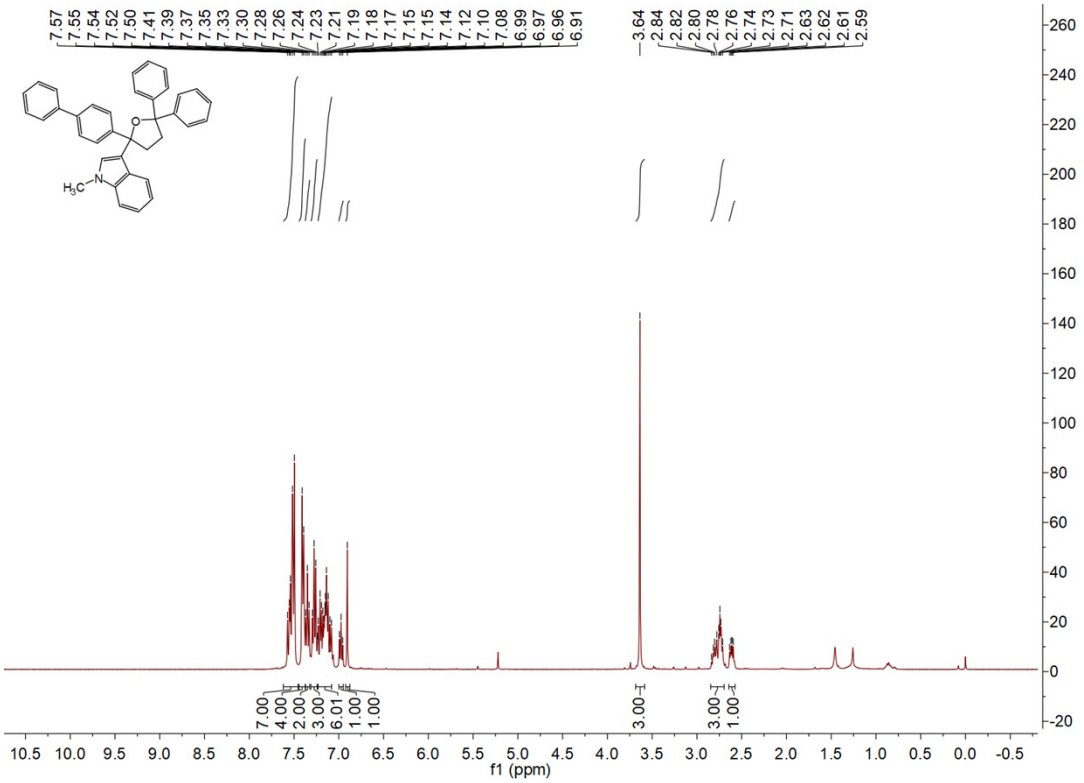


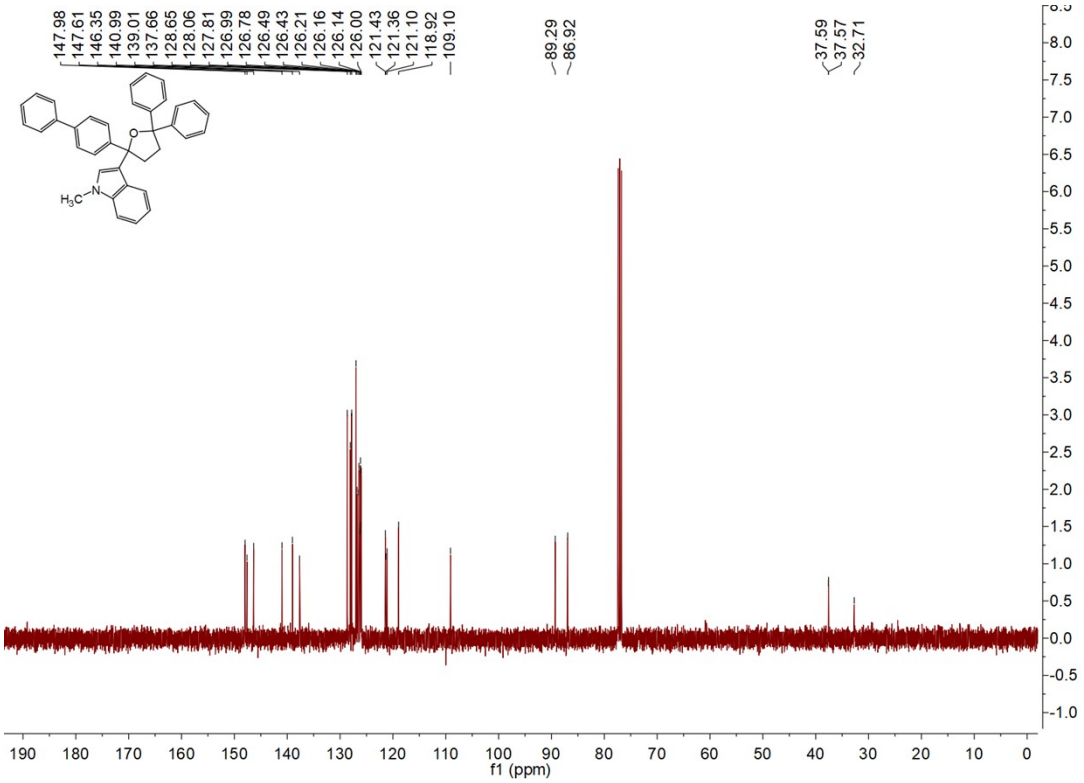
3-(5,5-diphenyl-2-(p-tolyl)tetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8b)



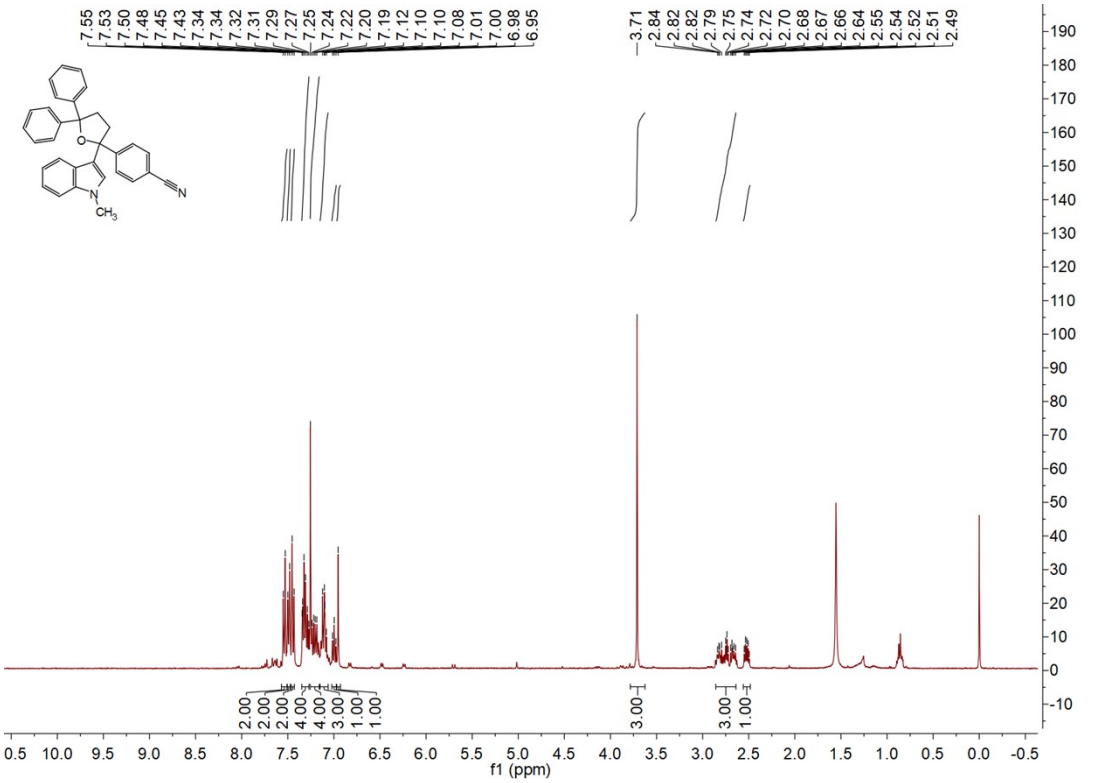


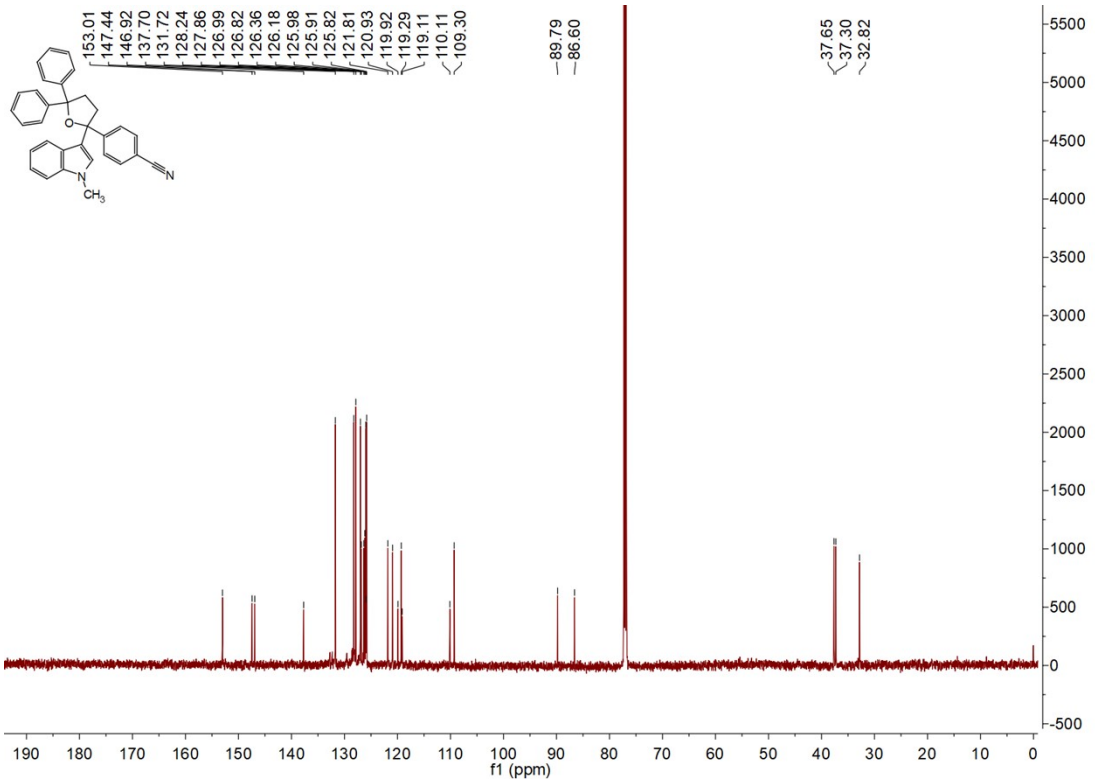
3-(2-([1,1'-biphenyl]-4-yl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8c)



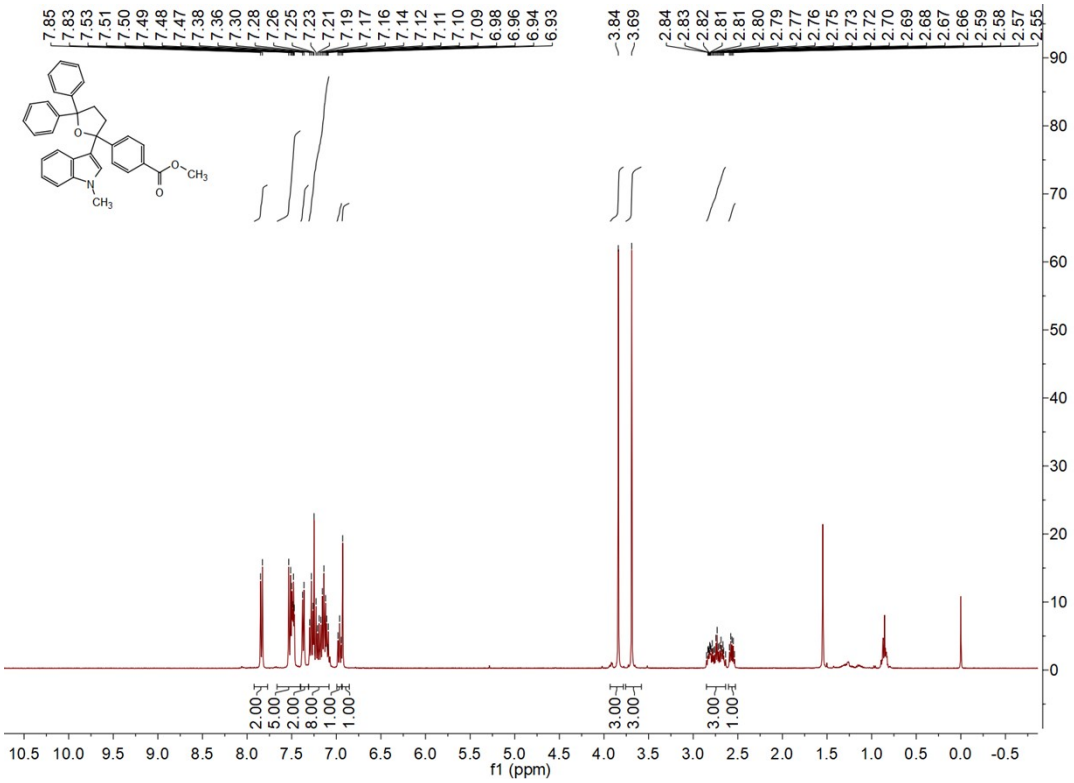


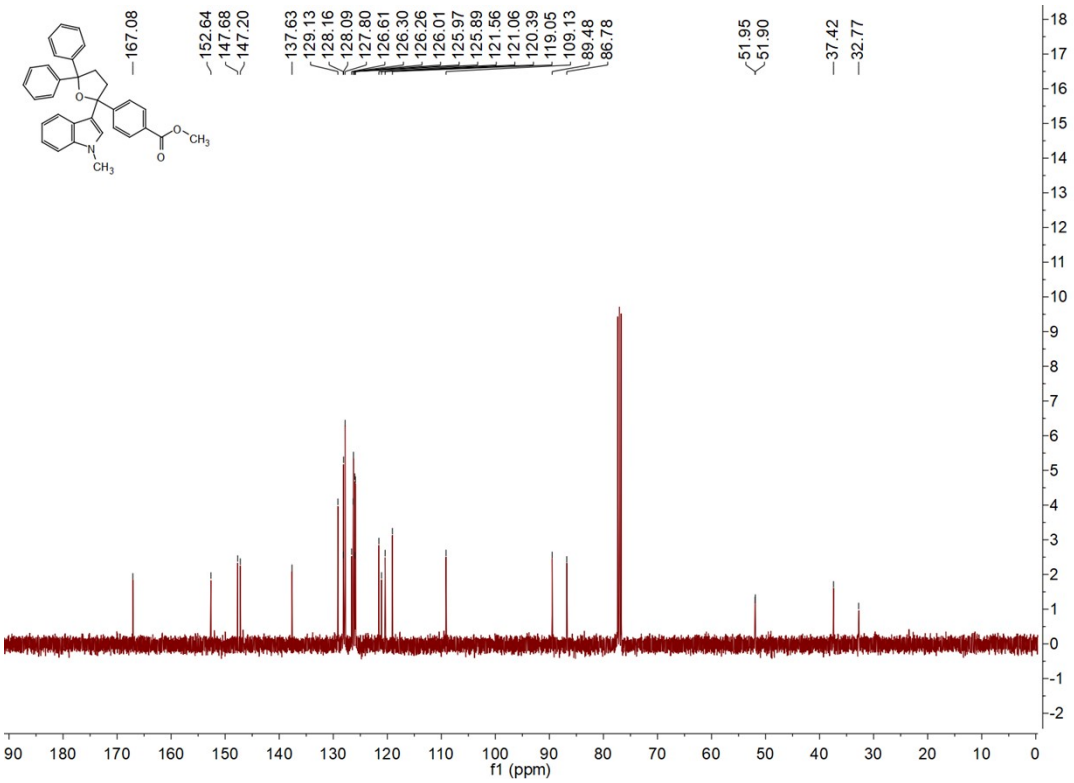
3-(2-(1-methyl-1*H*-indol-3-yl)-5,5-diphenyltetrahydrofuran-2-yl)benzonitrile (8d)



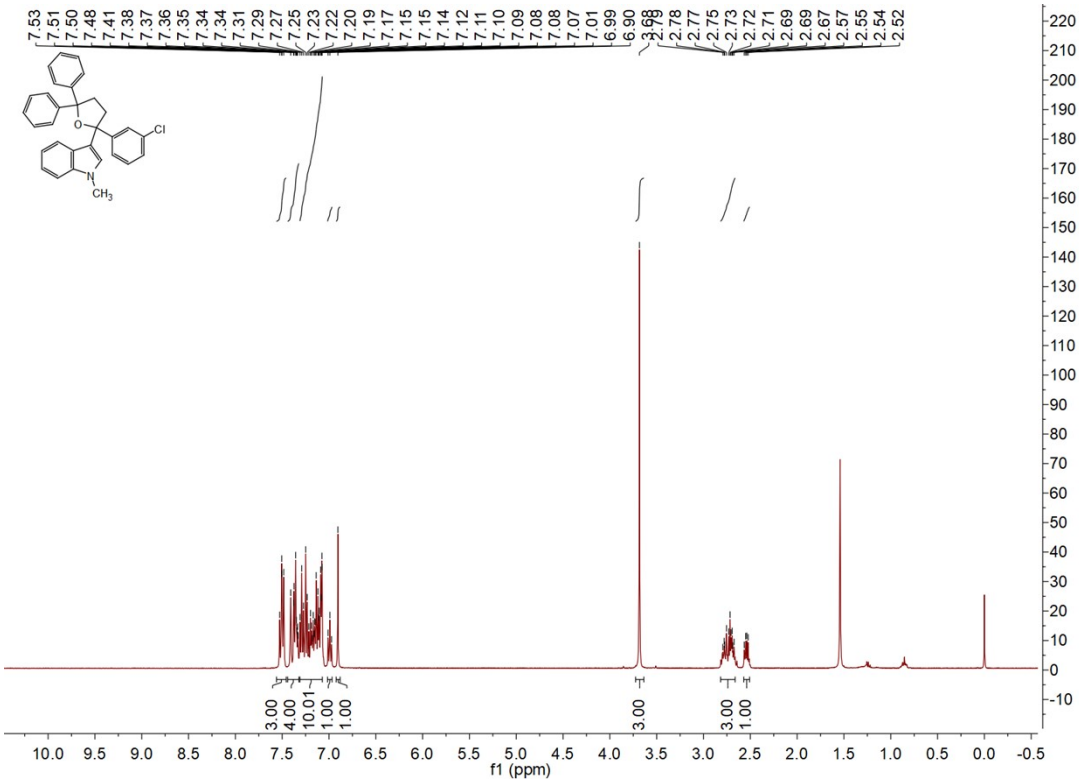


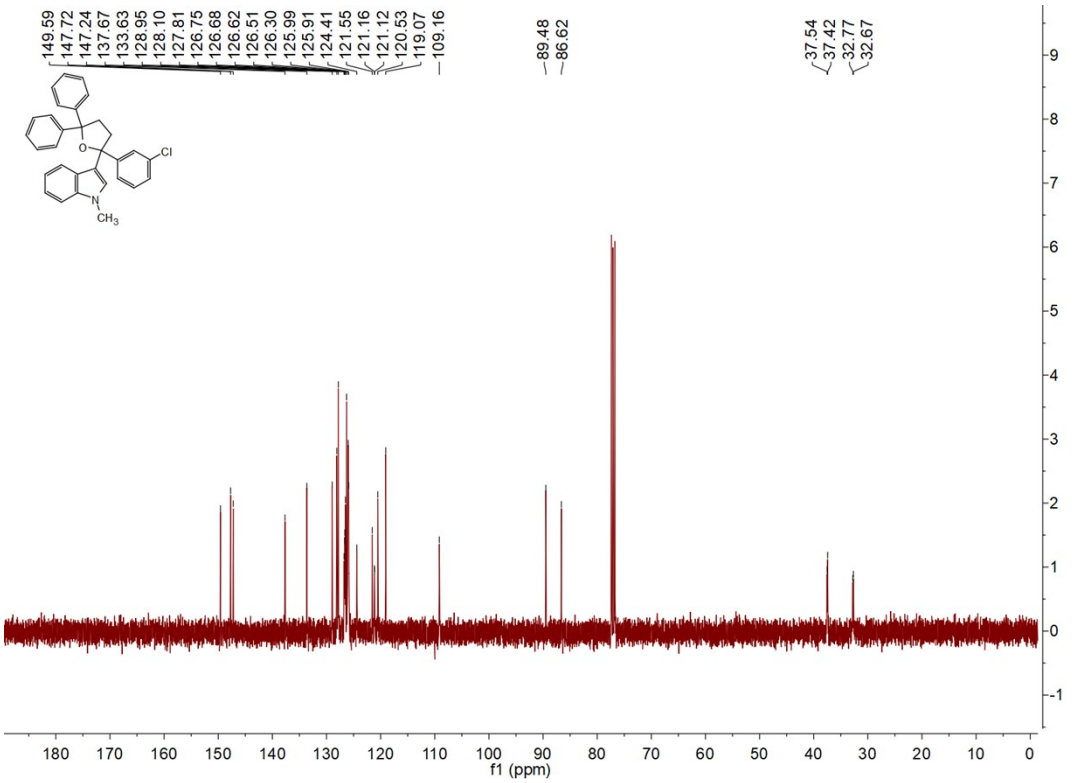
methyl 4-(2-(1-methyl-1*H*-indol-3-yl)-5,5-diphenyltetrahydrofuran-2-yl)benzoate (8e)



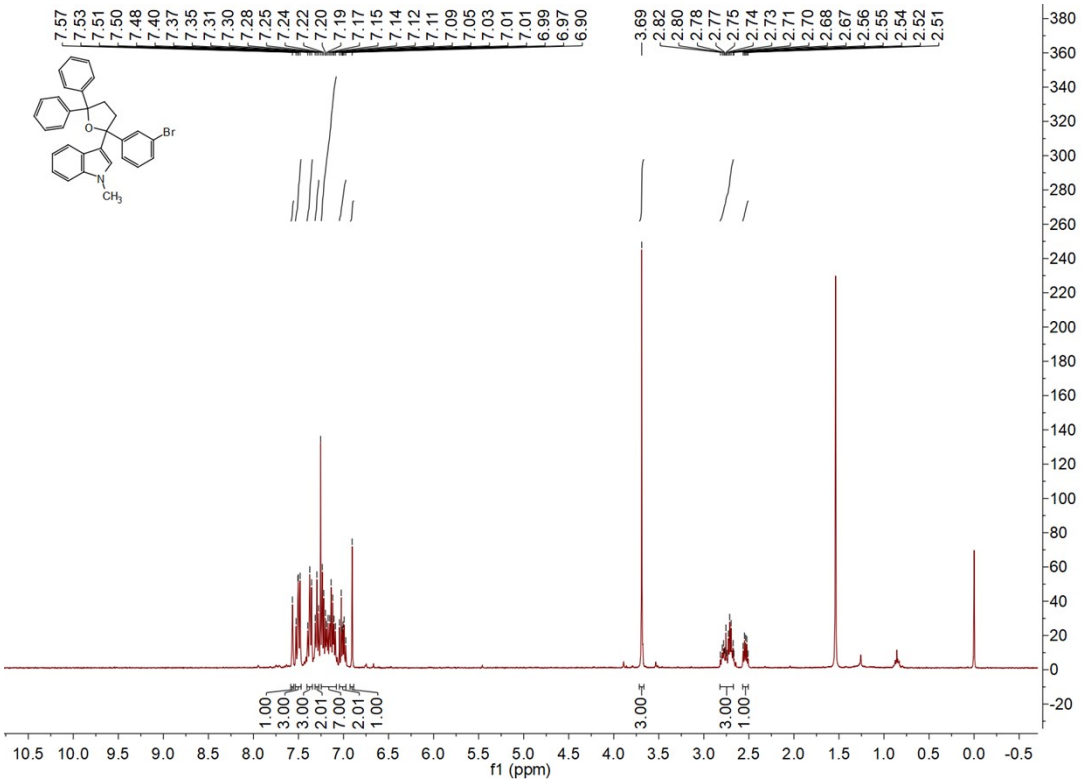


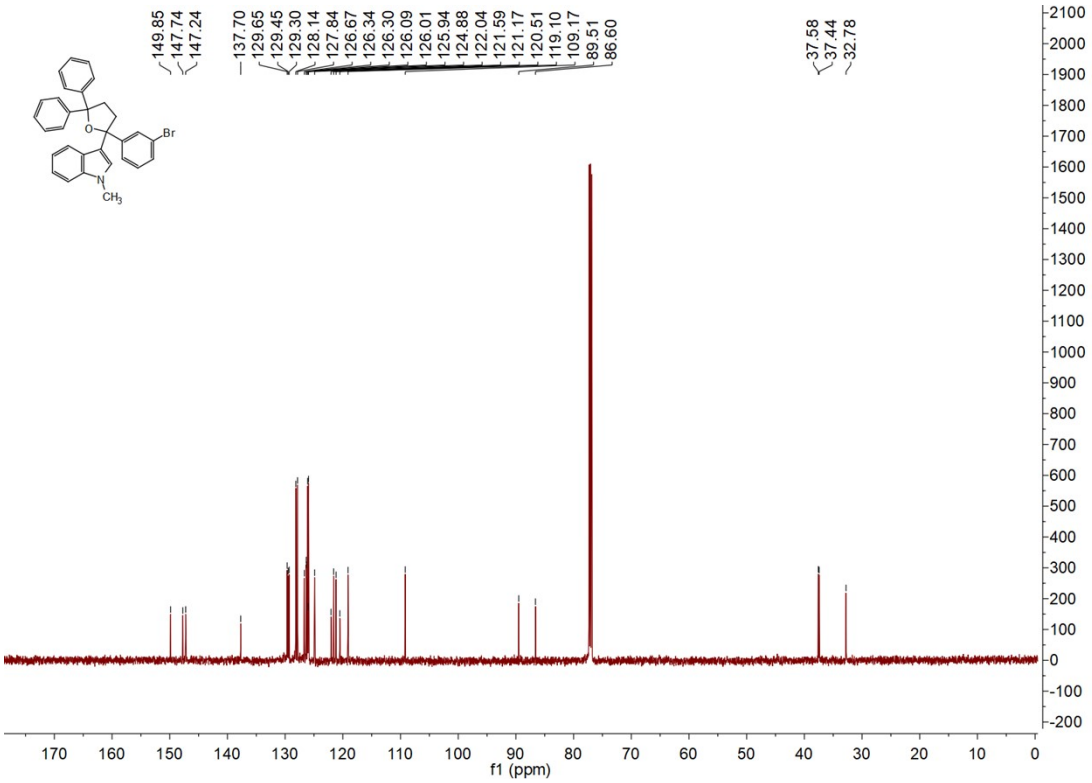
3-(2-(3-chlorophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8f)



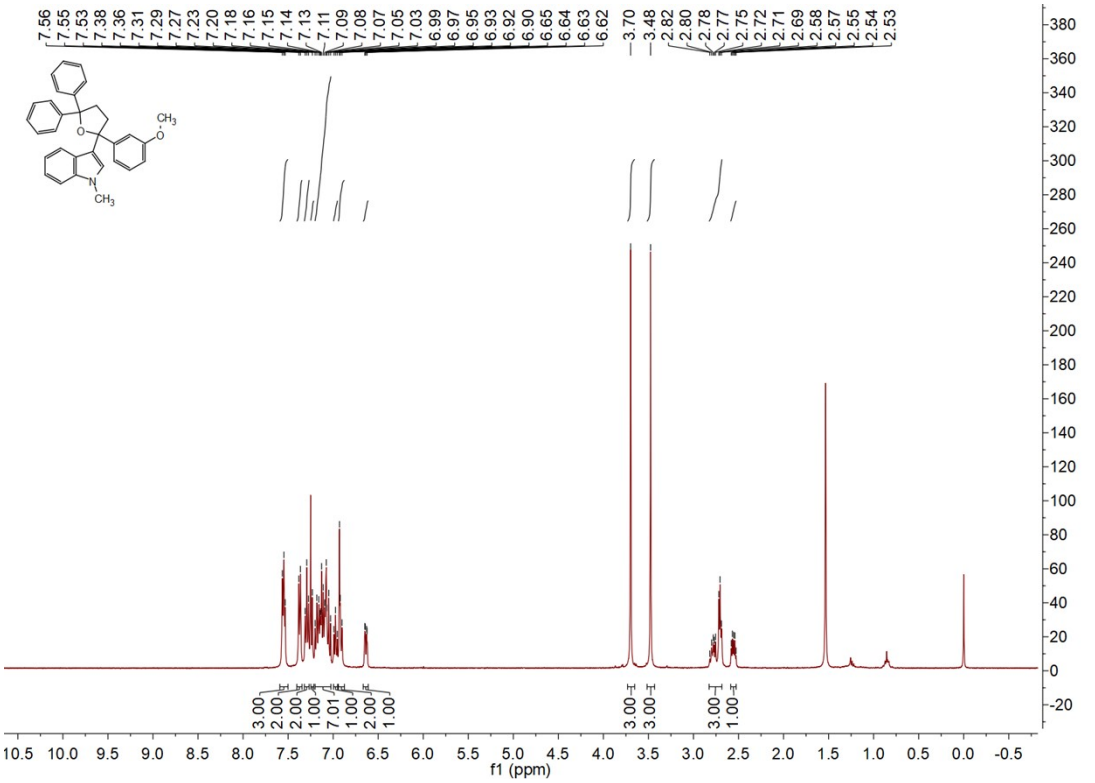


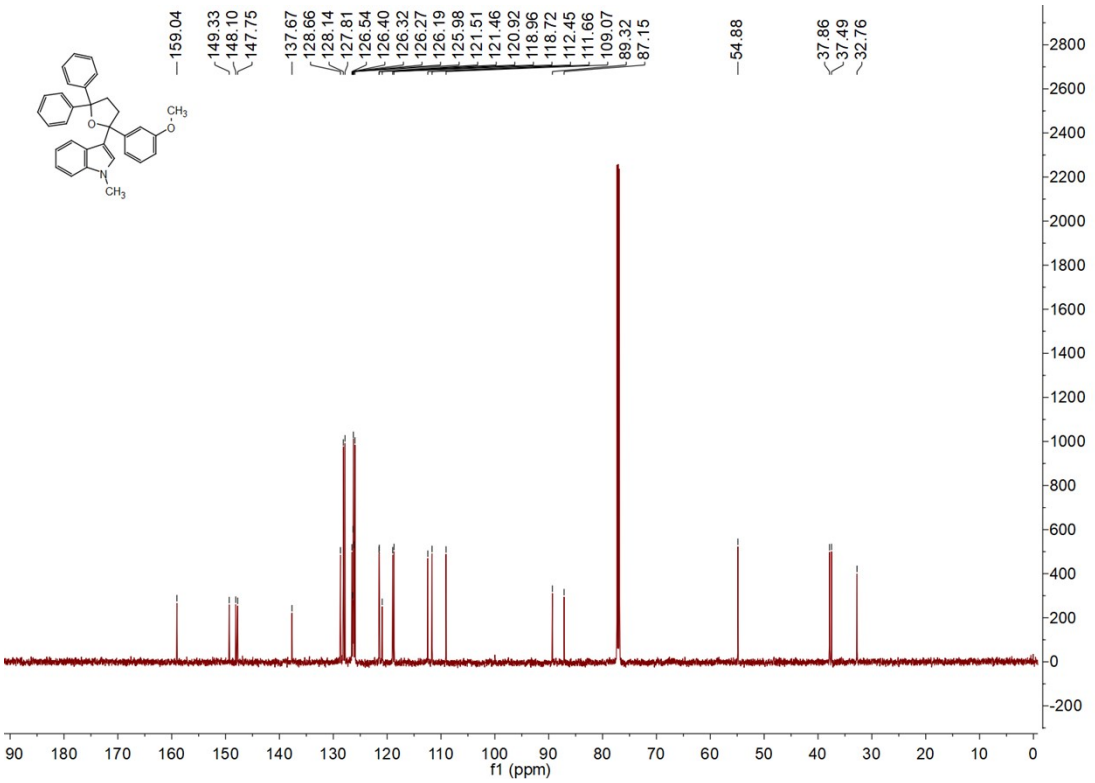
3-(2-(3-bromophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8g)



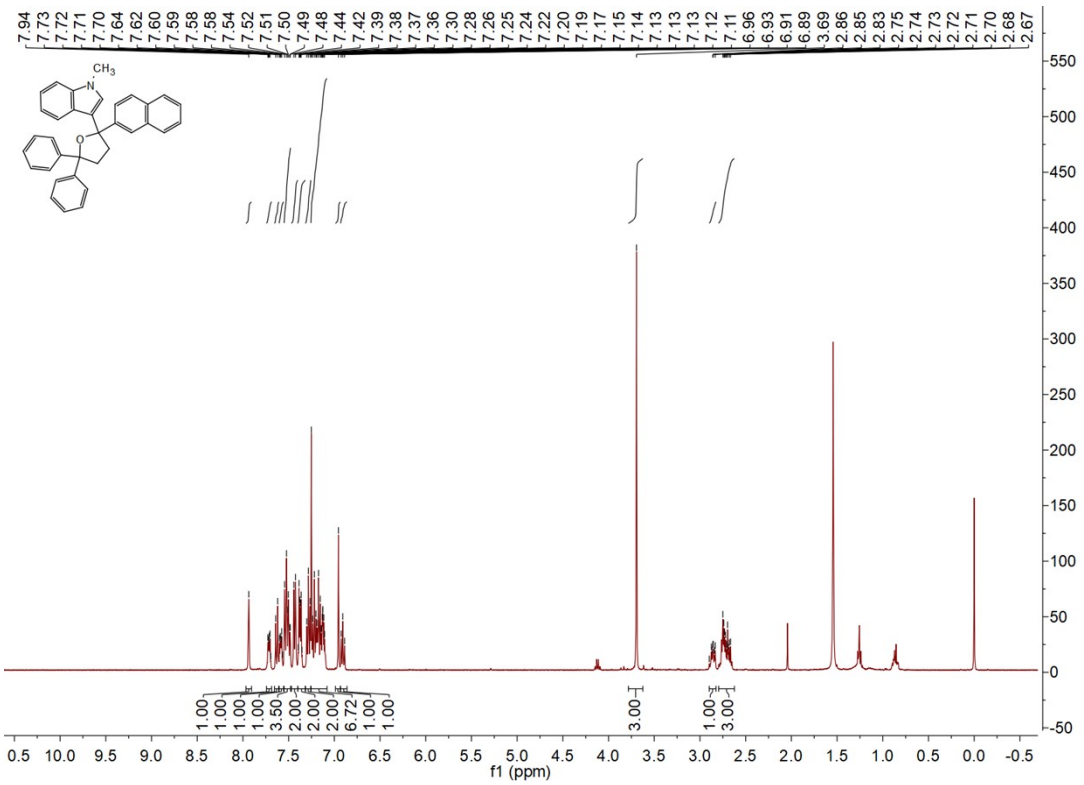


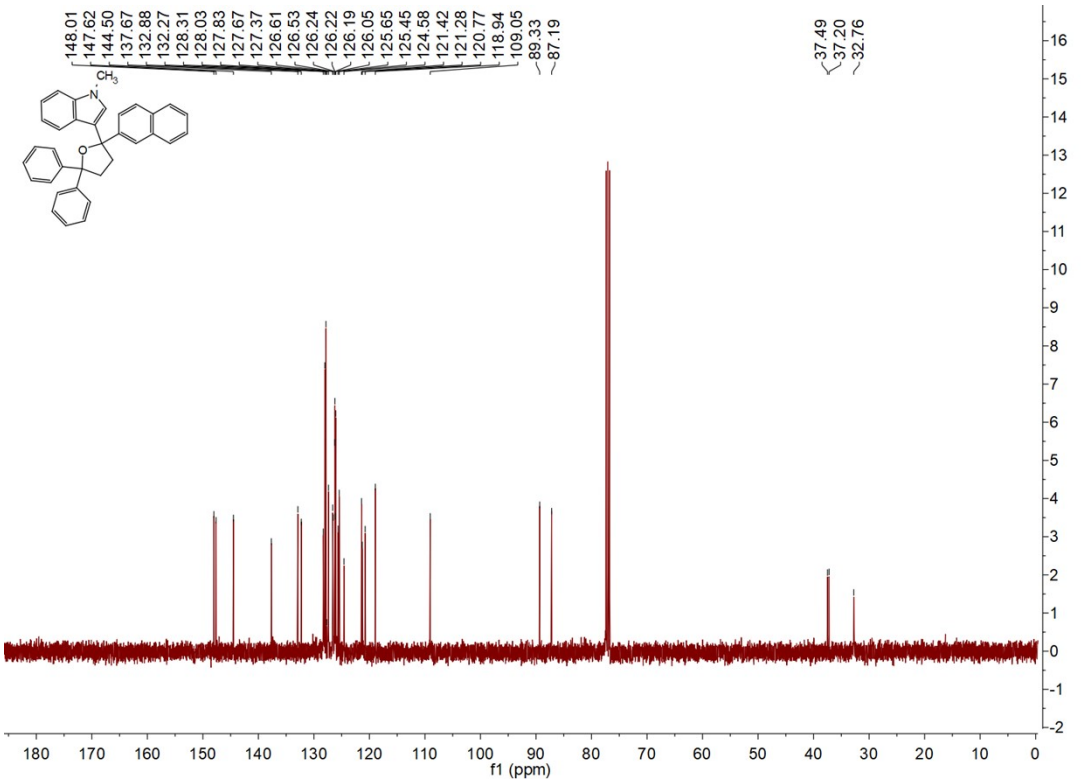
3-(2-(3-methoxyphenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8h)



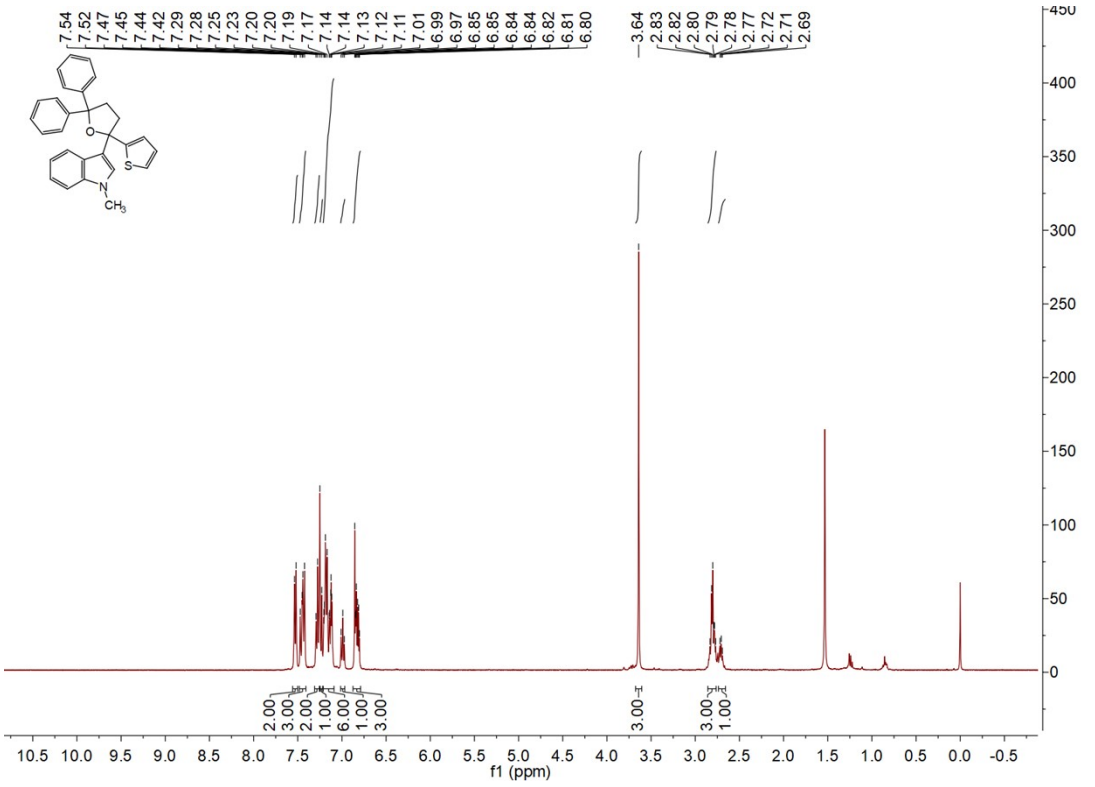


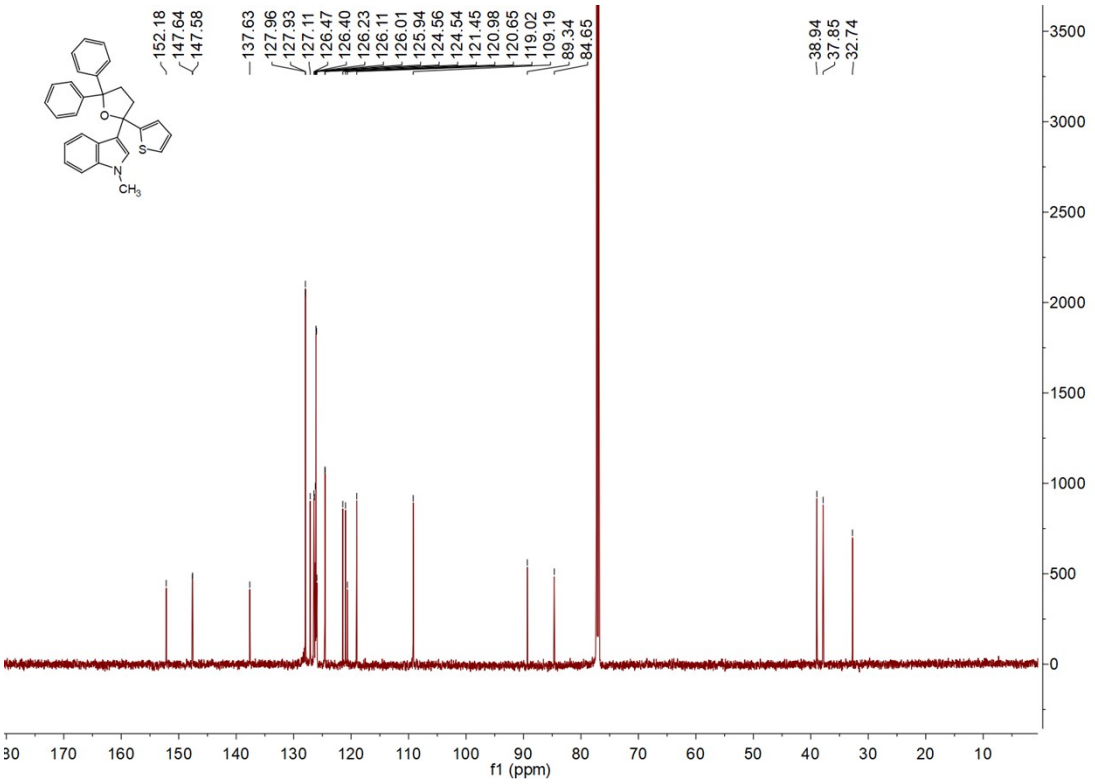
1-methyl-3-(2-(naphthalen-2-yl)-5,5-diphenyltetrahydrofuran-2-yl)-1*H*-indole (8i)



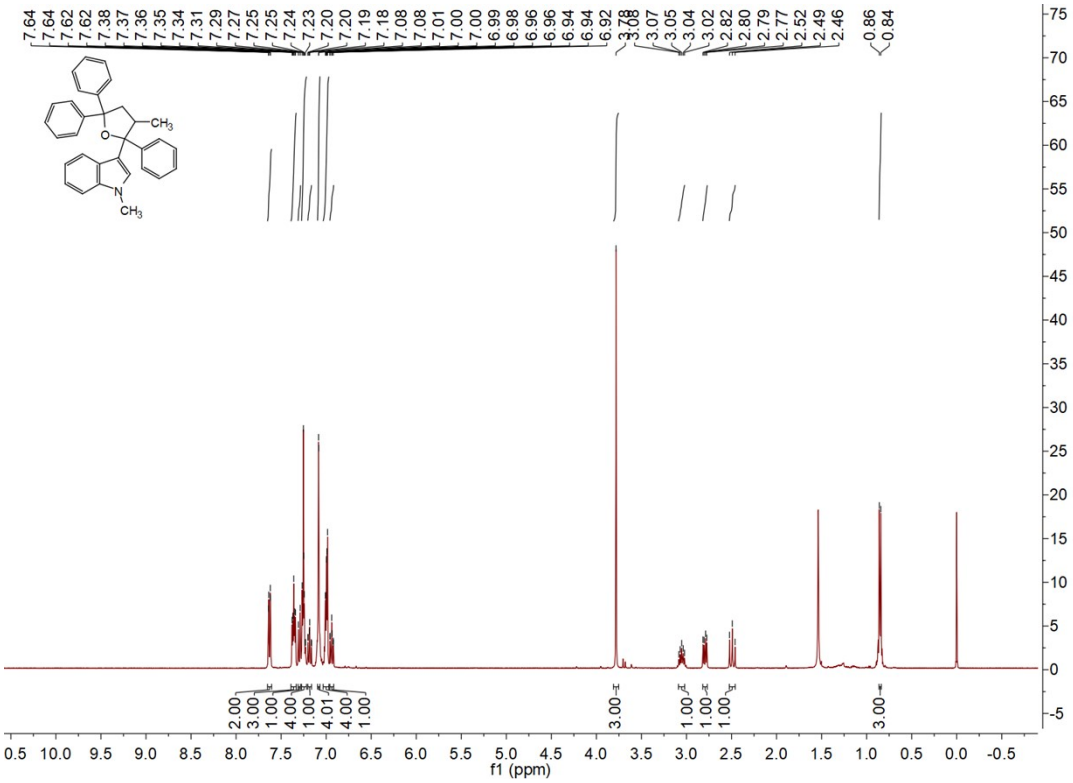


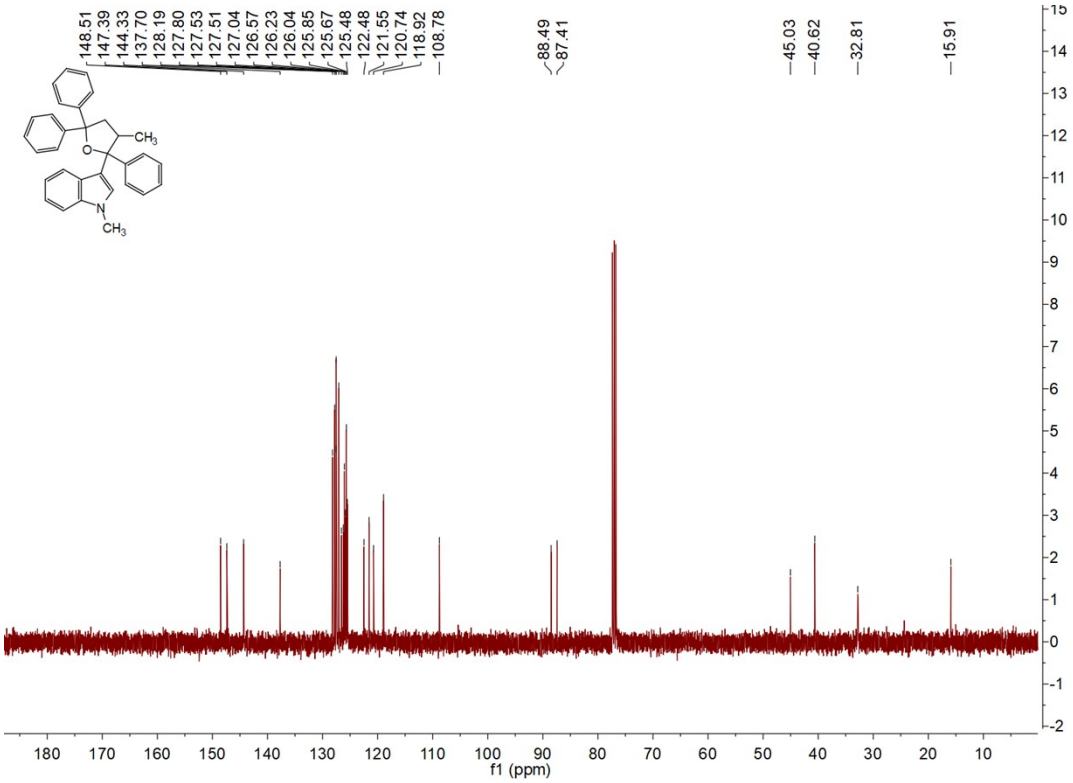
3-(5,5-diphenyl-2-(thiophen-2-yl)tetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8j)



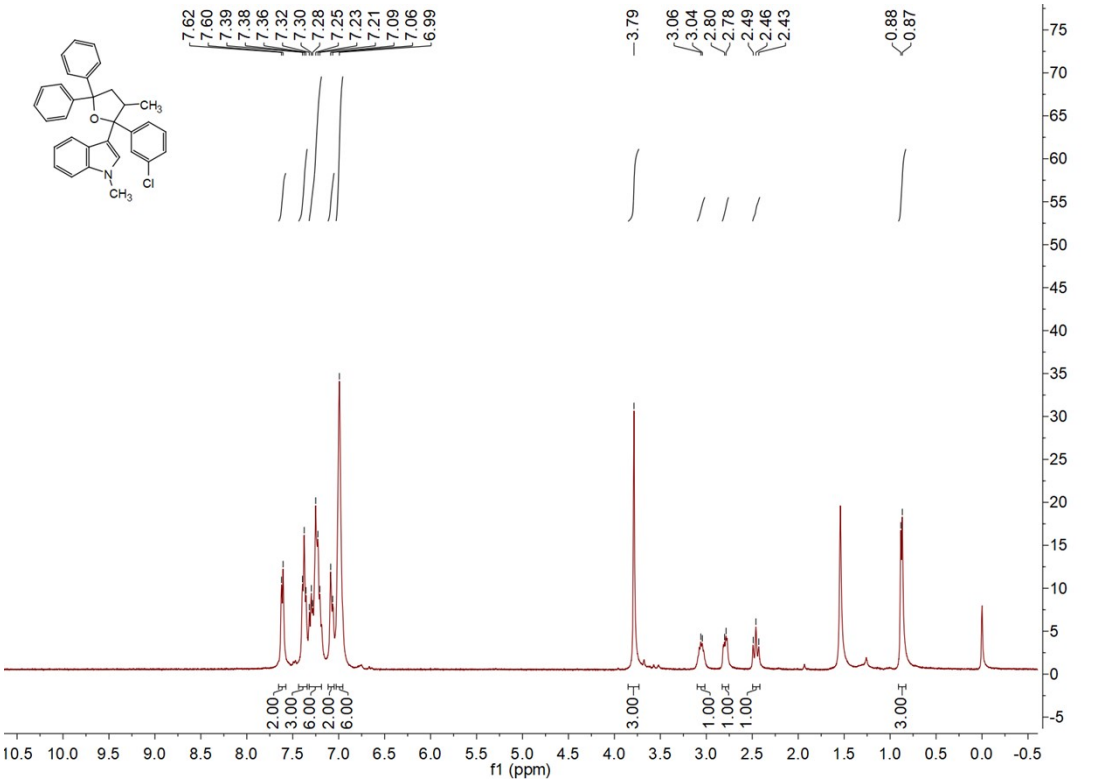


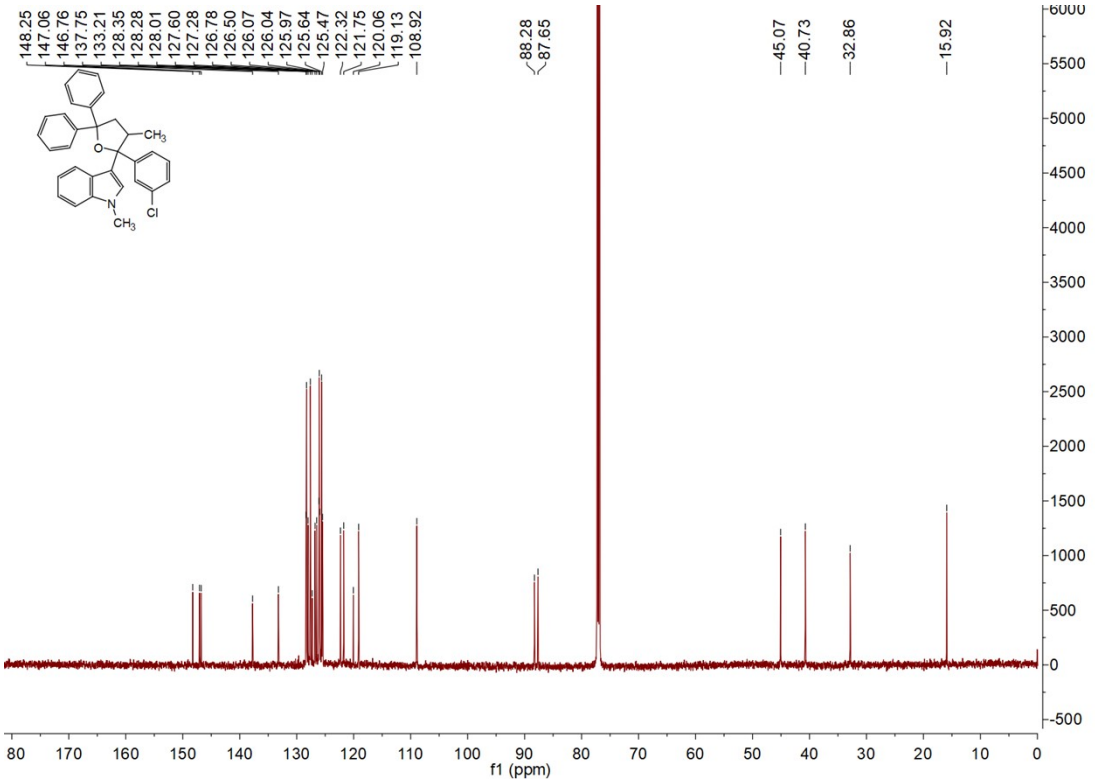
1-methyl-3-(4-methyl-2,5,5-triphenyltetrahydrofuran-2-yl)-1*H*-indole (8k)



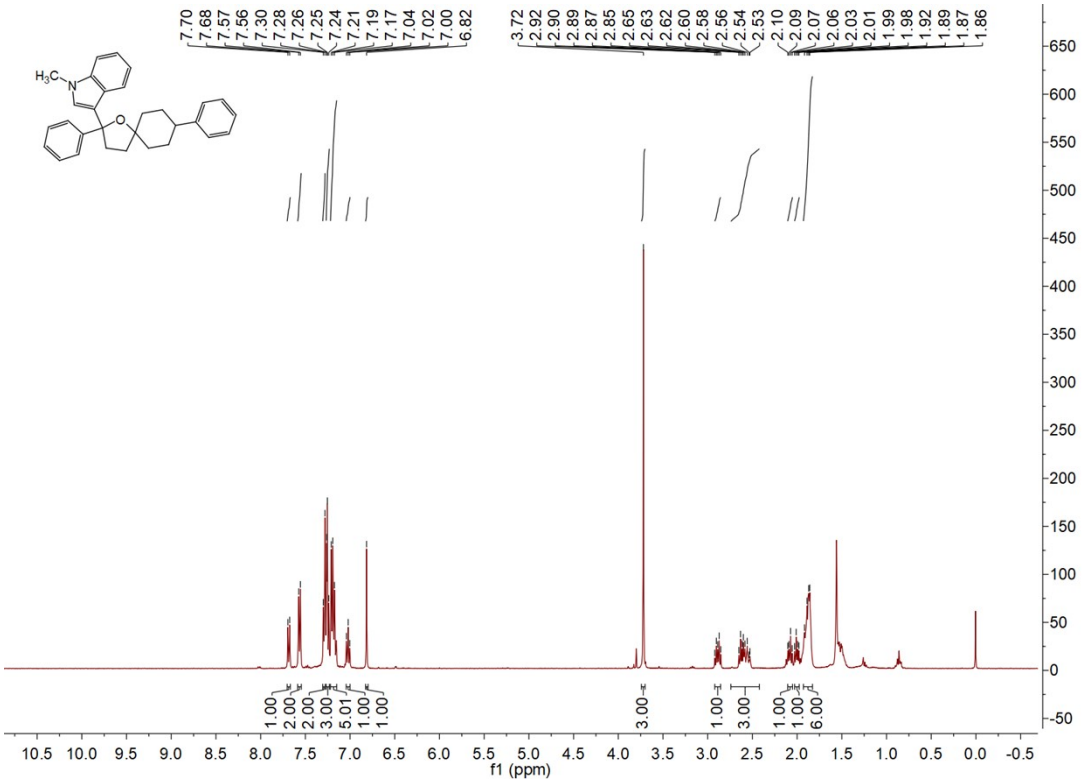


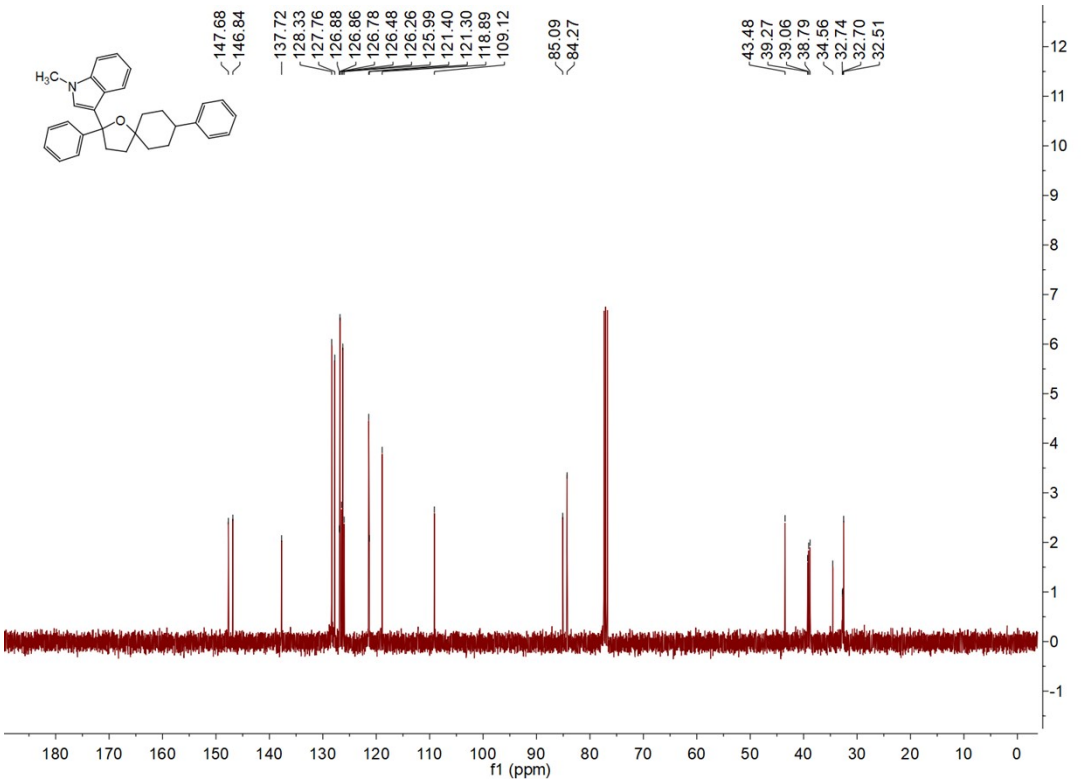
3-(2-(3-chlorophenyl)-5,5-diphenyltetrahydrofuran-2-yl)-1-methyl-1*H*-indole (8l)



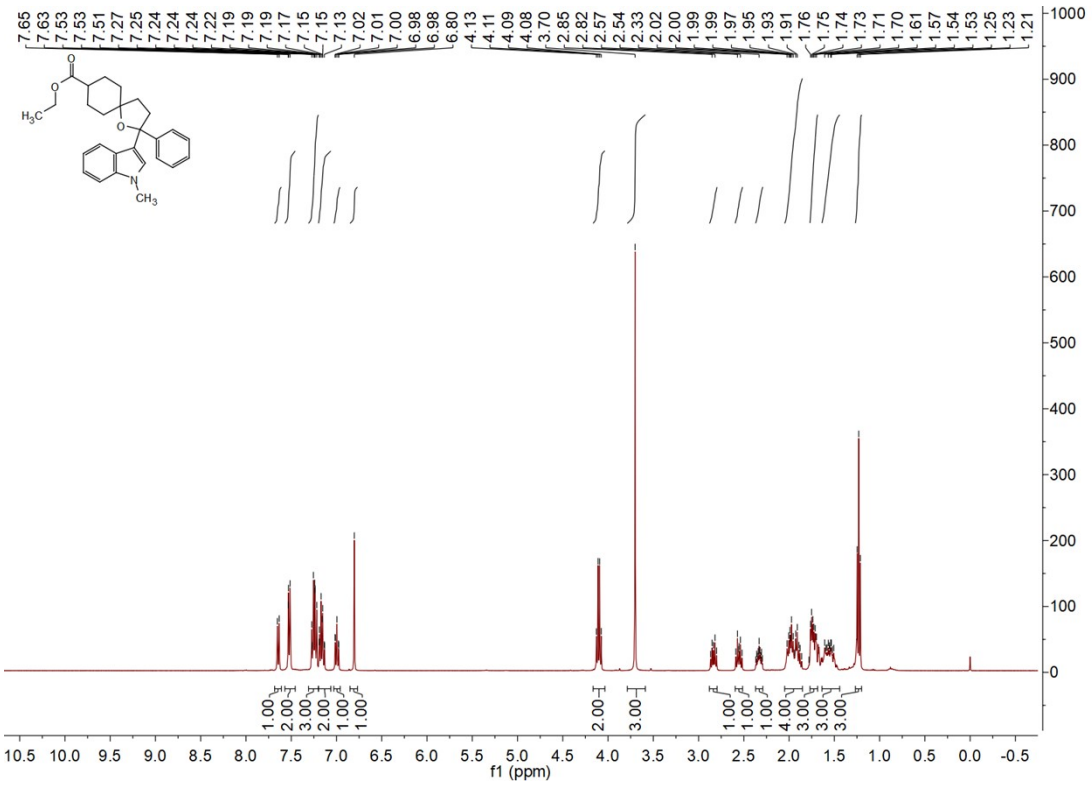


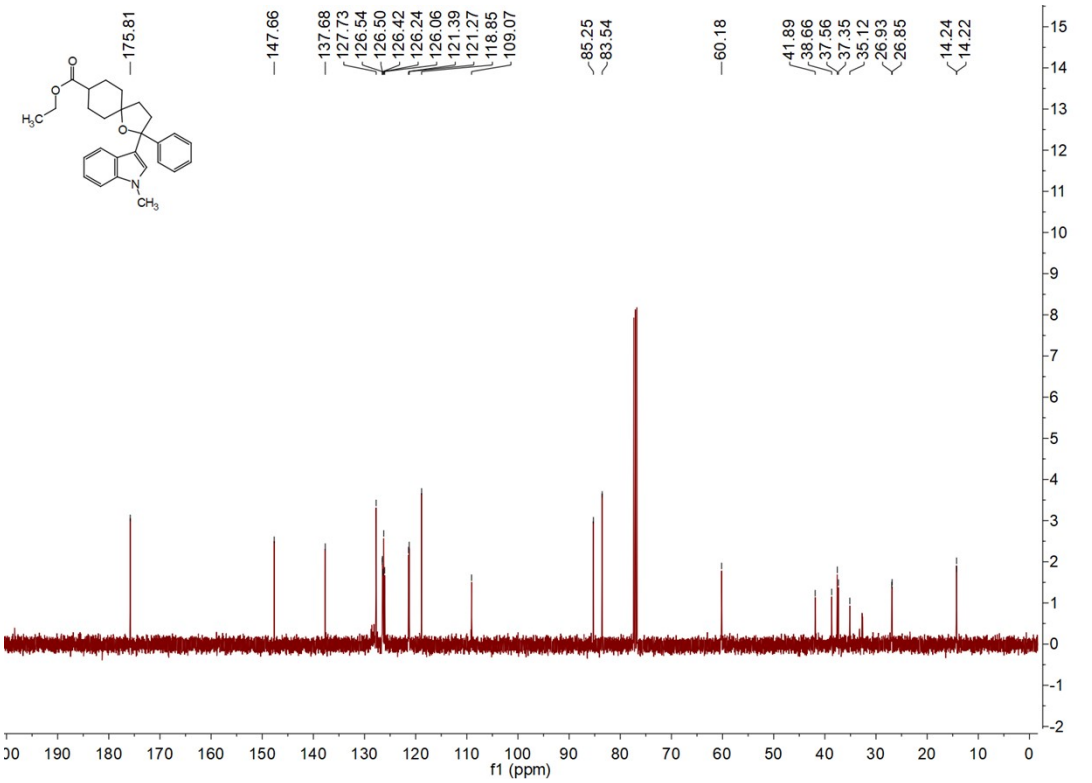
3-(2,8-diphenyl-1-oxaspiro[4.5]decan-2-yl)-1-methyl-1*H*-indole (8m)



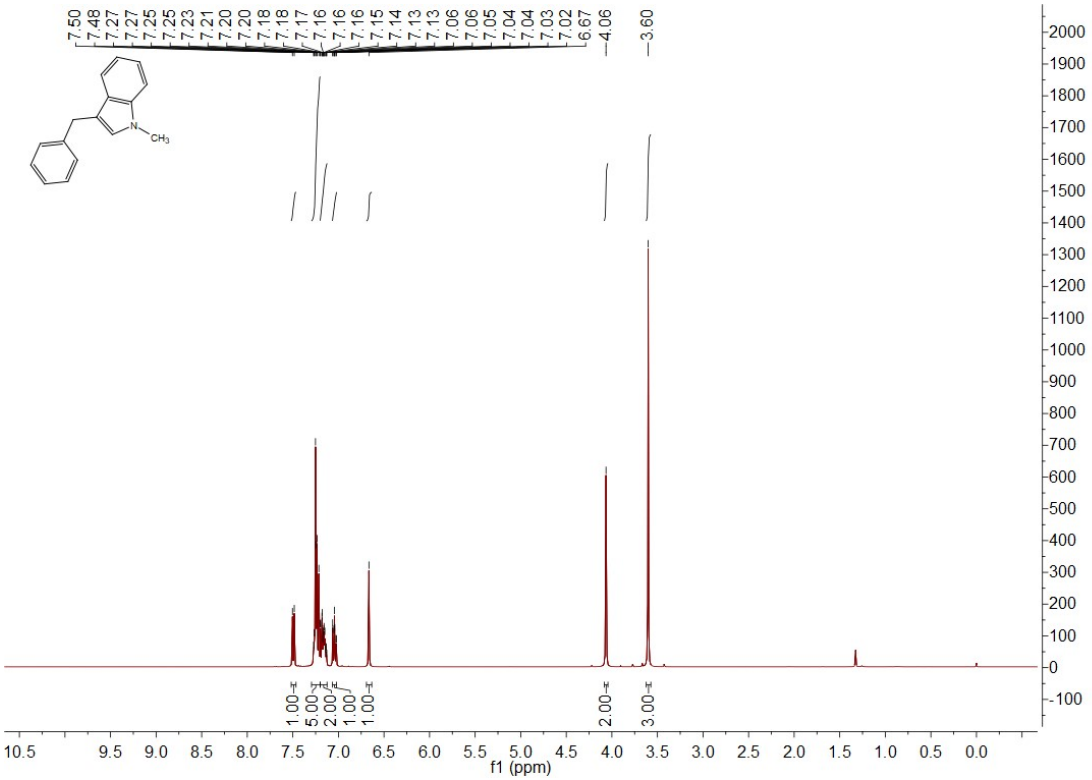


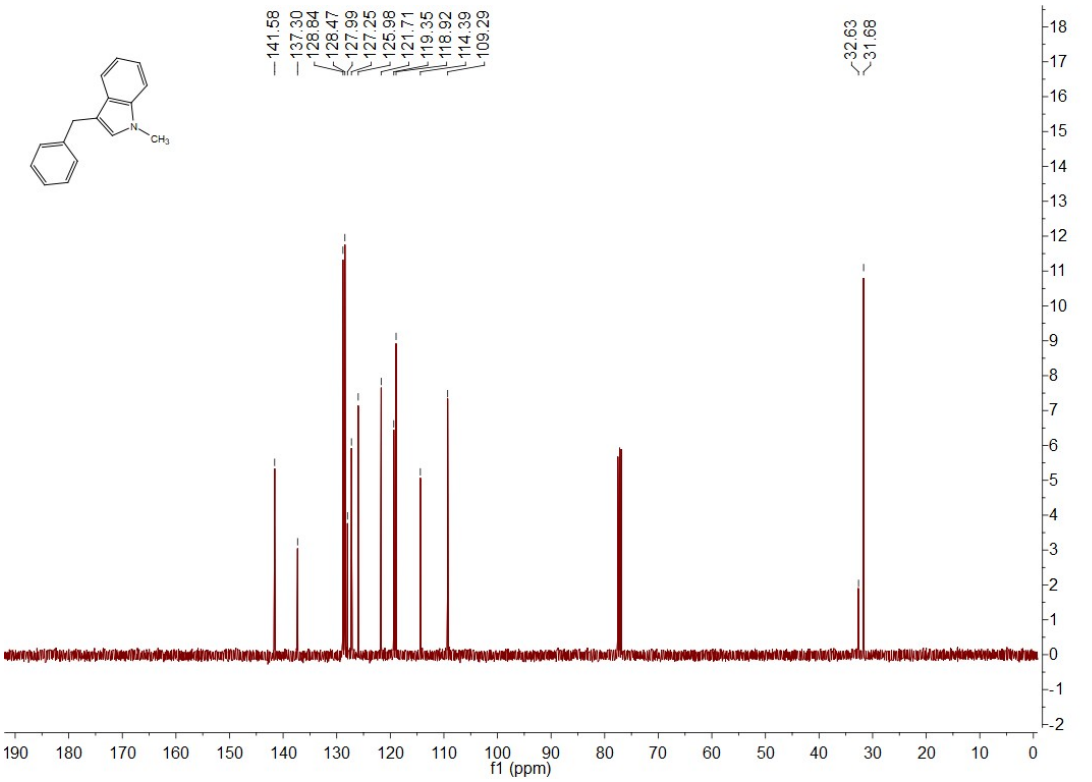
ethyl 2-(1-methyl-1*H*-indol-3-yl)-2-phenyl-1-oxaspiro[4.5]decane-8-carboxylate (8n)



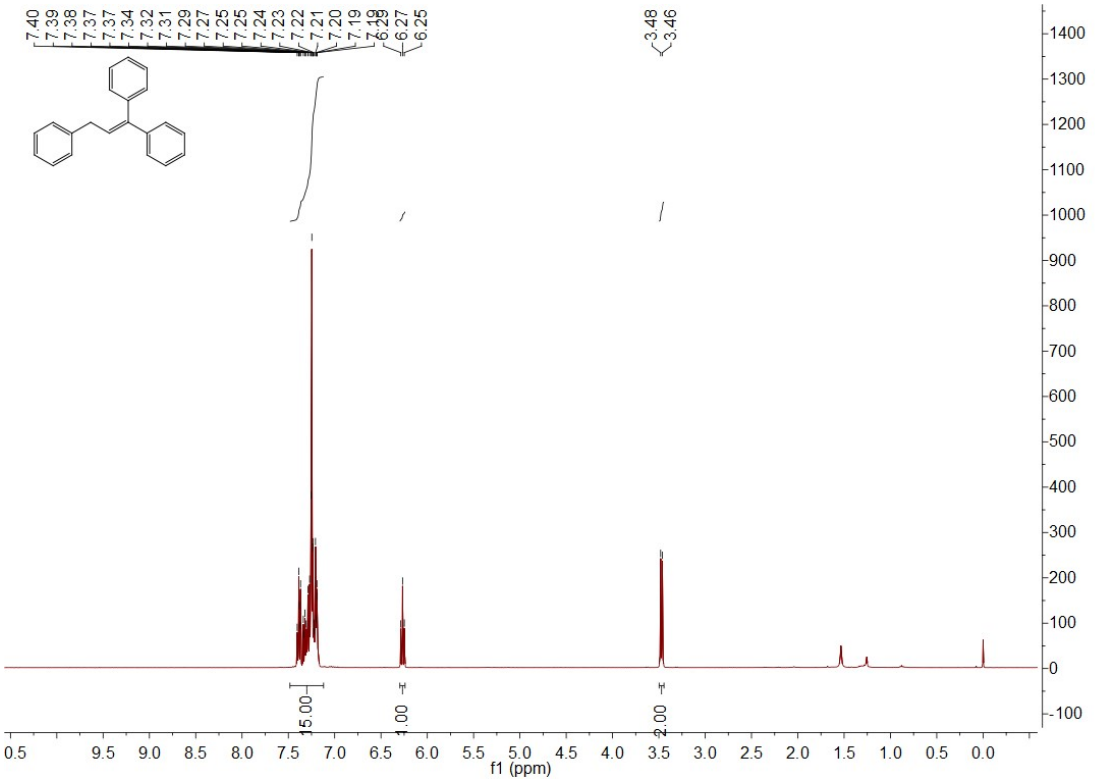


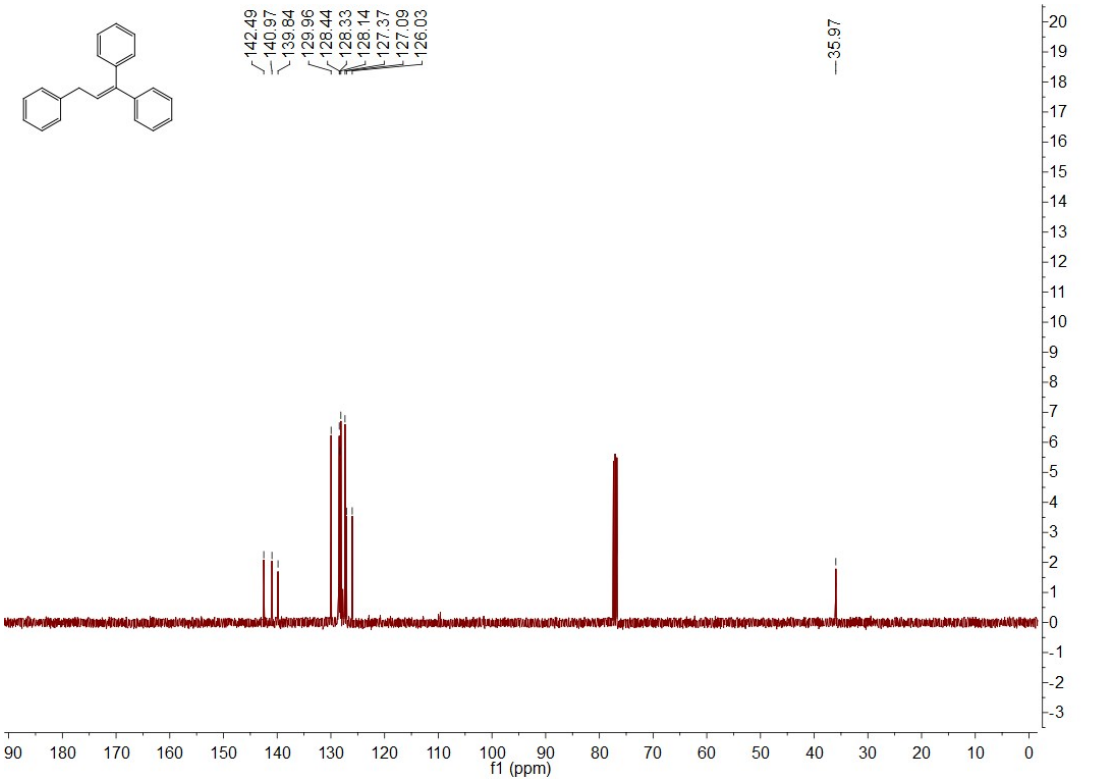
3-benzyl-1-methyl-1*H*-indole (9)



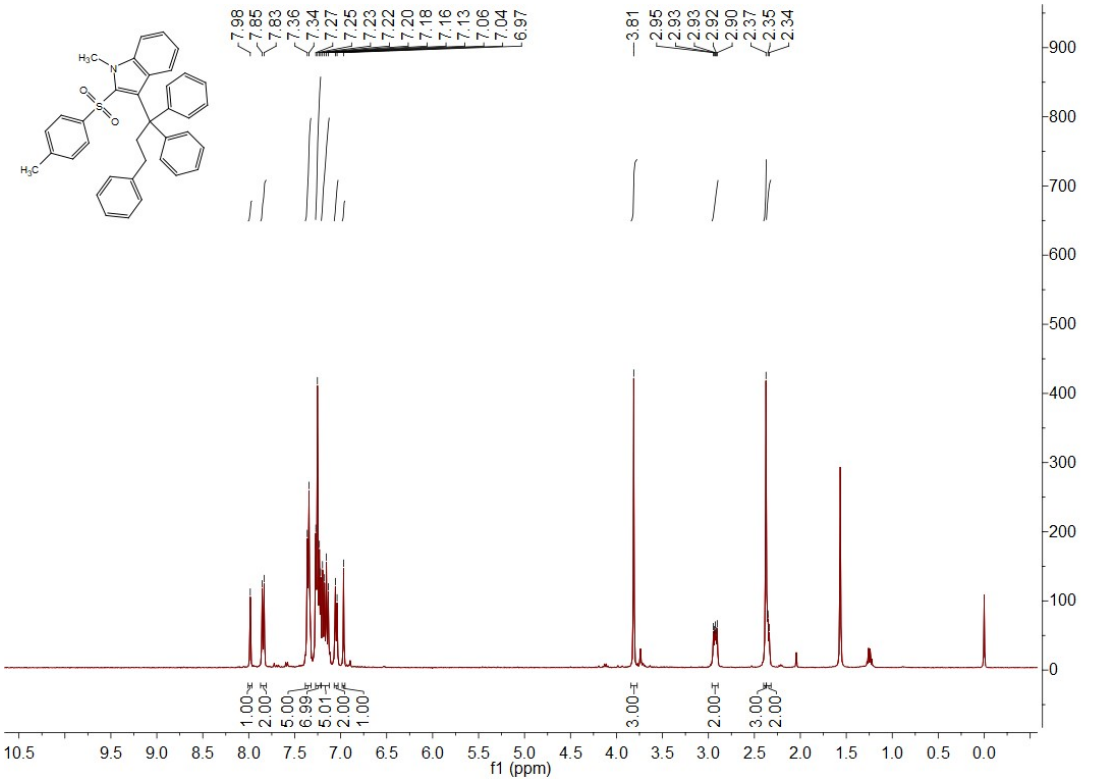


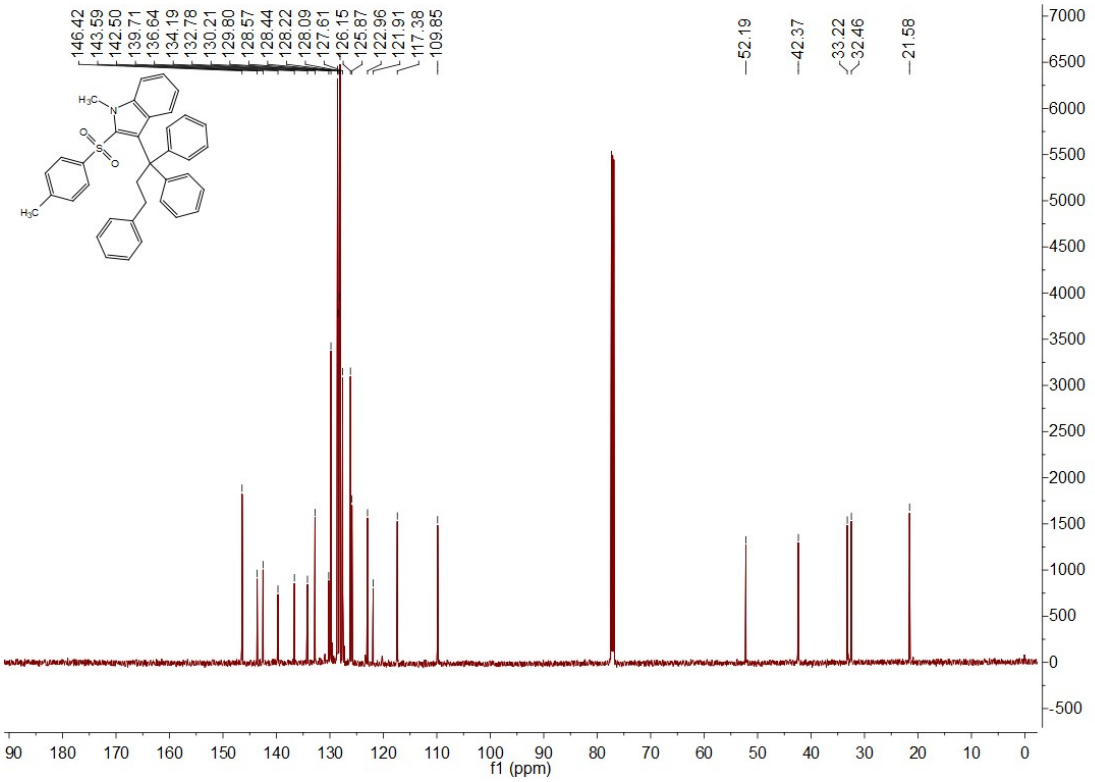
prop-1-ene-1,1,3-triyltribenzene (10)



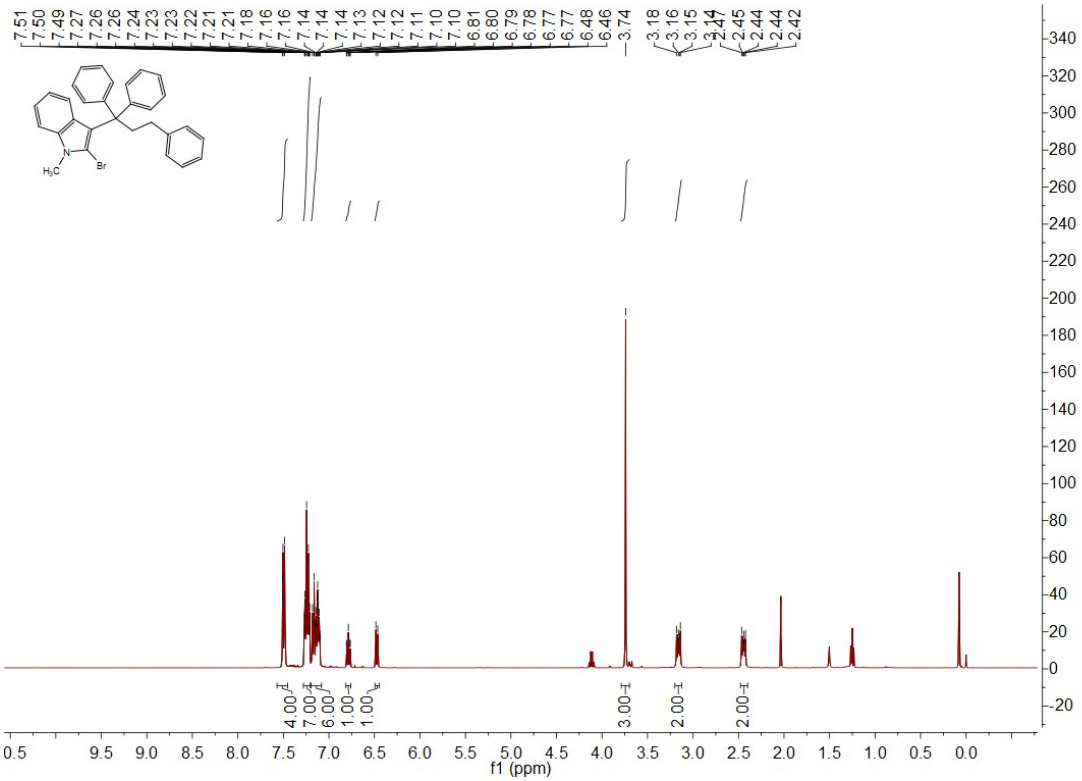


1-methyl-2-tosyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (11)





2-bromo-1-methyl-3-(1,1,3-triphenylpropyl)-1*H*-indole (12)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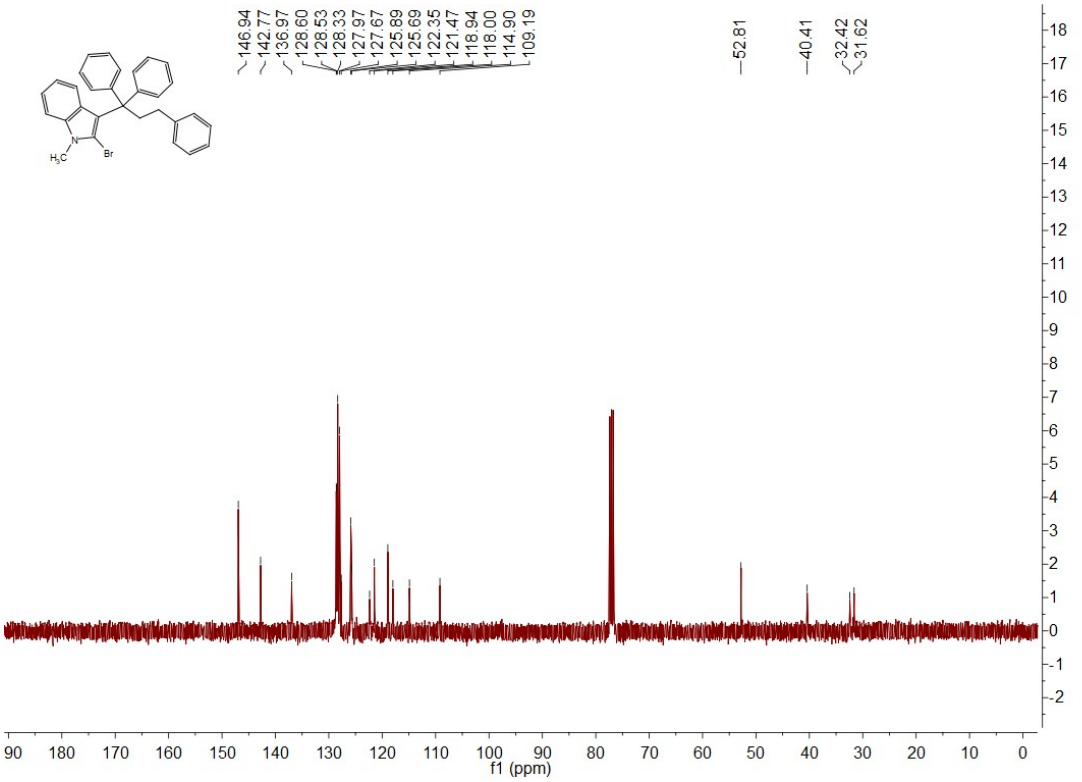
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f1 (ppm)