Supporting Information for

Preparation of 3-Aryl-2-aminoindoles, 3-Allyl-3-amino-2-iminoindolines, and Tetrahydro-[1,4]diazepino[2,3-b]indoles from 3-Diazoindolin-2-imines

Guorong Sheng, Kai Huang, Shicong Ma, Jing Qian, Ping Lu*, and Yanguang Wang*

Department of Chemistry, Zhejiang University, Hangzhou 310027, P. R. China

CONTENTS

General Information

Melting points were recorded on a SGW X-4. NMR spectra were obtained on a Bruker AVANCE DMX400 spectrometer operating at 400 MHz or 500 MHz or 600 MHz for ^{1}H-NMR, 100 MHz or 125 MHz or 150 MHz for ^{13}C-NMR. Unless otherwise noted, all the NMR spectra were recorded at room temperature. Chemical shifts were quoted in parts per million (ppm) referenced to the appropriate solvent peak or 0.0 ppm for tetramethylsilane. The following abbreviations were used to describe peak splitting patterns when appropriate: s = singlet, d = doublet, t = triplet, m = multiplet. Coupling constants (*J* values) were reported in hertz unit (Hz). Chemical shifts (in ppm) were referenced to tetramethylsilane (δ = 0 ppm) in $CDCl_3$ and DMSO-d_6 as an internal standard or CHD_2COCD_3 (δ = 2.05 ppm) in acetone-d_6 as an internal standard. ^{13}C NMR spectra were obtained by using the same NMR spectrometers and chemical shifts were reported in ppm referenced to the center line of a triplet at 77.0 ppm of $CDCl_3$ or the center line of a heptet at 39.6 ppm of DMSO- d_6 or the center line of a heptet at 30 ppm of CD_3COCD_3. High resolution mass spectra (HRMS) were recorded on Waters GCT Premier (EI) and Agilent Technologies 6224 TOF LC/MS apparatus (ESI). IR spectra were run on a Bruker vector 22 spectrometer. Flash column chromatography was performed employing 300-400 mesh silica gel. Thin layer chromatography (TLC) was performed on silica gel HSGF254.

Substrates **1** were prepared according to the published procedures.[1] [2] Substrates **2, 4, 6** were prepared according to the published procedures.[3]

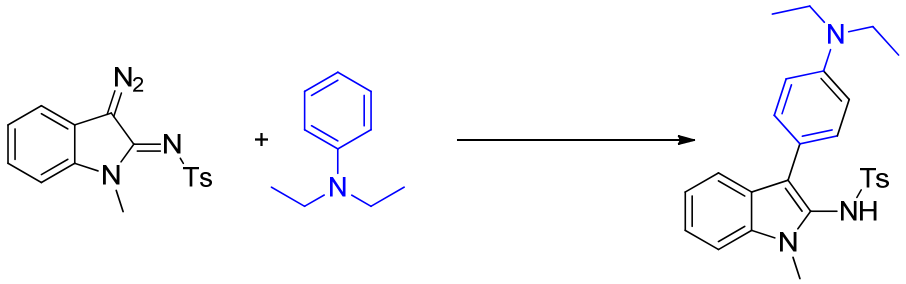
References

[1] Y. P. Xing, G. R. Sheng, J. Wang, P. Lu, and Y.G. Wang, *Org. Lett.* **2014**, *16*, 1244−1247.

[2] G. R. Sheng, K. Huang, Z. H. Chi, H. L. Ding, Y. P. Xing, P. Lu, and Y. G. Wang, *Org. Lett.*, **2014**, *16* , 5096–5099

[3] Akio Saito, Shoko Oda, Haruhiko Fukaya, and Yuji Hanzawa, *J. Org. Chem.* **2009**, *74*, 1517–1524

Table S1 Screening of the reaction conditions for formation of **3a**[a]

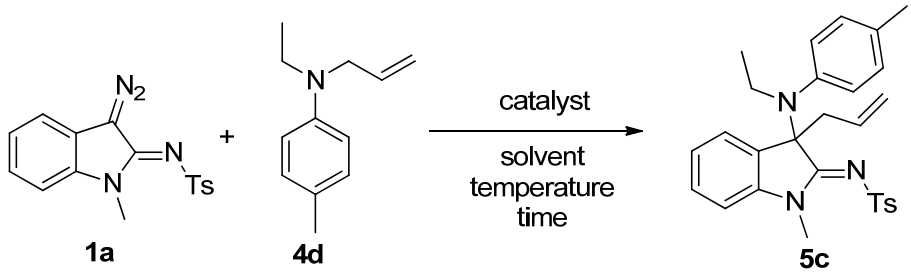


1a **2a** **3a**

Entry	Catalyst	Solvent	T (^{o}C)	1a:2a	Yiled (%)[b]
1	$Rh_2(Oct)_4$	$PhCH_3$	110	1:1.2	78
2	$Rh_2(OAc)_4$	$PhCH_3$	110	1:1.2	66
3	$Rh_2(Oct)_4$	$CHCl_3$	110	1:1.2	50
4	$Rh_2(Oct)_4$	DCE	110	1:1.2	45
5	$Rh_2(Oct)_4$	$PhCH_3$	120	1:1.2	67
6	$Rh_2(Oct)_4$	$PhCH_3$	100	1:1.2	74
7	$Rh_2(Oct)_4$	$PhCH_3$	110[c]	1:1.2	67
8	$Rh_2(Oct)_4$	$PhCH_3$	110[d]	1:1.2	53
9	$Rh_2(Oct)_4$	$PhCH_3$	110	1:1.5	78
10	$Rh_2(Oct)_4$	$PhCH_3$	110	1:1	56

[a] **1a** (0.2 mmol), **2a** (0.24 mmol), cat (2 mol%), solvent (1 mL), N_2, 1 h. [b] Isolated yields after column chromatograph (petroleum : ethyl acetate = 6 : 1). [c] air. [d] oxygen.

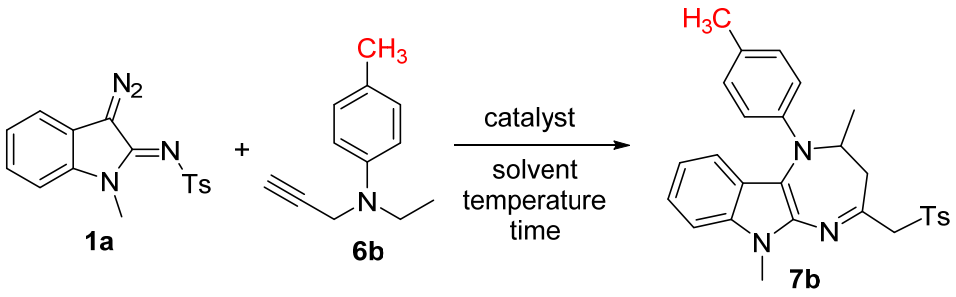
Table S2 Screening of the reaction conditions for the formation of **5c**[a]



Entry	Catalyst	Solvent	T (^{o}C)	Time (h)	Yiled (%) [b]
1	$Rh_2(Oct)_4$	$PhCH_3$	100	6	81
2	$Rh_2(OAc)_4$	$PhCH_3$	100	6	76
3	Rh_2(S-DOSP)$_4$	$PhCH_3$	100	6	72
4	Rh_2(R-DOSP)$_4$	$PhCH_3$	100	6	73
5	Rh_2(S-PTAD)$_4$	$PhCH_3$	100	6	34
6	$Rh_2(Oct)_4$	DCE	100	6	85
7	$Rh_2(Oct)_4$	$CHCl_3$	100	6	60
8	$Rh_2(Oct)_4$	DCE	80	6	83
9	$Rh_2(Oct)_4$	DCE	60	6	87
10	$Rh_2(Oct)_4$	DCE	40	6	72
11	$Rh_2(Oct)_4$	DCE	60	4	75
12	$Rh_2(Oct)_4$	DCE	60	8	69
13[c]	$Rh_2(Oct)_4$	DCE	60	6	81
14[d]	$Rh_2(Oct)_4$	DCE	60	6	87

[a] **1a** (0.2 mmol), **4d** (0.24 mmol), cat (2 mol%), solvent (1 mL), N_2, 1h. [b] Isolated yields after column chromatograph (petroleum : ethyl acetate = 6 : 1). [c] **4d** (0.2 mmol). [d] **4d** (0.3 mmol).

Table S3 Screening of the reaction conditions for electrophilic cyclization of alkyne[a]



Entry	Catalyst	Solvent	T (^{o}C)	Time (h)	Yiled(%) [b]
1	$Rh_2(Oct)_4$	$PhCH_3$	90	2	43
2	$Rh_2(Oct)_4$+AgOTf	$PhCH_3$	90	2	13
3	$Rh_2(Oct)_4$+CuCl	$PhCH_3$	90	2	47
4	$Rh_2(Oct)_4$+CuBr	$PhCH_3$	90	2	43
5	$Rh_2(Oct)_4$+CuI	$PhCH_3$	90	2	64
6	$Rh_2(Oct)_4$+$Yb(OTf)_3$	$PhCH_3$	90	2	52
7	$Rh_2(Oct)_4$+$In(OTf)_3$	$PhCH_3$	90	2	63
8	$Rh_2(Oct)_4$+$Zn(OTf)_2$	$PhCH_3$	90	2	59
9	$Rh_2(Oct)_4$+$AgOCOCH_3$	$PhCH_3$	90	2	41
10	$Rh_2(Oct)_4$+$Cu(OTf)_2$	$PhCH_3$	90	2	38
11	$Rh_2(Oct)_4$+CuOTf	$PhCH_3$	90	2	40
12	$Rh_2(Oct)_4$+$Au(PPh_3)_3Cl$	$PhCH_3$	90	2	64
13	$Rh_2(Oct)_4$+CuI[c]	$PhCH_3$	90	2	57
14	$Rh_2(Oct)_4$+CuI[d]	$PhCH_3$	90	2	51
15	$Rh_2(Oac)_4$+CuI	$PhCH_3$	90	2	55
16	Rh_2(S-DOSP)$_4$+CuI	$PhCH_3$	90	2	13
17	Rh_2(R-DOSP)$_4$+CuI	$PhCH_3$	90	2	15
18	Rh_2(S-PTAD)$_4$+CuI	$PhCH_3$	90	2	trace
19	$Rh_2(Oct)_4$+CuI	CH_3Cl_3	90	2	49
20	$Rh_2(Oct)_4$+CuI	DCE	90	2	32
21	$Rh_2(Oct)_4$+CuI	$PhCH_3$	80	2	53
22	$Rh_2(Oct)_4$+CuI	$PhCH_3$	100	2	60
23	$Rh_2(Oct)_4$+CuI	$PhCH_3$	90	1	40
24	$Rh_2(Oct)_4$+CuI	$PhCH_3$	90	3	55

[a] **1a** (0.2 mmol), **6b** (0.24 mmol), cat (2 mol%) + additive (2 mol%), solvent (2 mL), N_2. [b] Isolated yields after column chromatograph (petroleum : ethyl acetate = 6 : 1). [c] CuI (5 mol%). [d] CuI (10 mol%).

General Procedures

1.General procedure for the preparation of compounds 3

To an oven-dried Schlenk tube equipped with a magnetic stirring bar were added sequentially **1** (0.2 mmol, 1.0 equiv), $Rh_2(oct)_4$ (0.004 mmol), amine **2** (0.24 mmol) and toluene (2 mL) under N_2 atmosphere. The reaction vessel was placed in an oil bath preheated to 110 °C. The resulting solution was heated at this temperature for 1 hour. After cooled to room temperature, the reaction solution was concentrated in vacuo, and the crude product was purified through silica gel column (petroleum ether / EtOAc = 6:1).

2.General procedure for the preparation of compounds 5

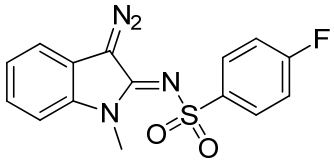
To an oven-dried Schlenk tube equipped with a magnetic stirring bar were added sequentially **1** (0.2 mmol, 1.0 equiv), $Rh_2(oct)_4$ (0.004 mmol), amine **4** (0.24 mmol) and DCE (2 mL) under N_2 atmosphere. The reaction vessel was placed in an oil bath preheated to 60 °C. The resulting solution was heated at this temperature for 6 hour. After cooled to room temperature, the reaction solution was concentrated in vacuo, and the crude product was purified through silica gel column (petroleum ether / EtOAc = 6:1).

3. General procedure for the preparation of compounds 7

To an oven-dried Schlenk tube equipped with a magnetic stirring bar were added sequentially **1** (0.2 mmol, 1.0 equiv), $Rh_2(oct)_4$ (0.004 mmol), CuI (0.004 mmol), amine **6** (0.24 mmol) and $PhCH_3$ (2 mL) under N_2 atmosphere. The reaction vessel was placed in an oil bath preheated to 90 °C. The resulting solution was heated at this temperature for 2 hour. After cooled to room temperature, the reaction solution was concentrated in vacuo, and the crude product was purified through silica gel column (petroleum ether / EtOAc = 6:1).

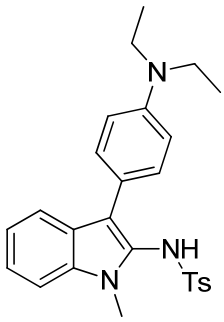
Analysis Data of Products

(Z)-N-(3-diazo-1-methylindolin-2-ylidene)-4-fluorobenzenesulfonamide (1e)



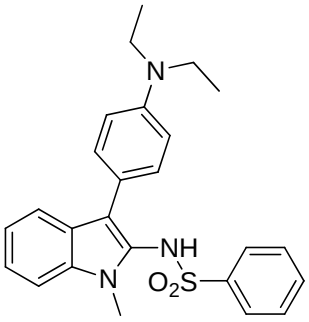
yellow solid; Yield: 56% ; M.p. 141-142^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 – 7.93 (m, 2H), 7.34 – 7.20 (m, 3H), 7.19 – 7.13 (m, 2H), 7.10 (d, J = 7.9 Hz, 1H), 3.45 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.5 (d, J_{C-F} = 253.0 Hz), 155.2 , 139.1 (d, J_{C-F} = 3.2 Hz), 134.1, 128.9 (d, J_{C-F} = 9.2 Hz), 126.0, 123.1, 118.8, 116.9, 115.8 (d, J_{C-F} = 22.4 Hz), 109.8, 29.0; IR (neat, cm^{-1}) 2113, 1534, 1492, 1382, 1270, 1140, 1085, 1010, 793, 741; Elemental Analysis: calcd for C:54.54; H:3.36; N:16.96; Found: C:54.76; H:3.53; N:16.95.

N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide (3a)



White solid; Yield: 78% ; M.p. 181-182^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.94 (s, 1H), 7.54 (d, J = 8.0 Hz, 1H), 7.43 (d, J = 8.3 Hz, 1H), 7.29 (d, J = 8.3 Hz, 2H), 7.26 – 7.20 (m, 1H), 7.08 – 6.99 (m, 3H), 6.94 (d, J = 8.0 Hz, 2H), 6.55 – 6.47 (m, 2H), 3.83 (s, 3H), 3.41 (q, J = 7.0 Hz, 4H), 2.30 (s, 3H), 1.20 (t, J = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.1, 143.8, 138.5, 136.1, 130.7, 129.8, 128.0, 127.3, 126.6, 123.4, 121.2, 120.7, 120.5, 114.8, 112.4, 110.7, 45.0, 29.9, 21.8, 13.3; IR (neat, cm^{-1}) 3262, 2970, 1611, 1570, 1516, 1372, 1329, 1159, 1087, 811, 734, 673; HRMS (EI): calcd for: 447.1980, Found: 447.1986.

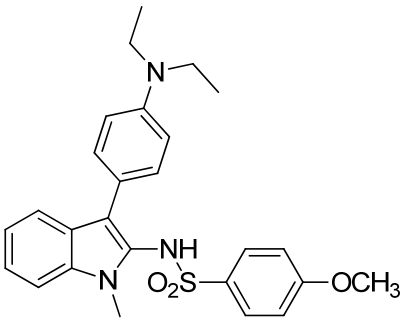
N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)benzenesulfonamide (3b)



White solid; Yield: 89% ; M.p. 84-85^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.04 (s, 1H), 7.54 (d, J = 8.0 Hz, 1H), 7.48 – 7.41 (m, 3H), 7.40 – 7.35 (m, 1H), 7.27 – 7.21 (m, 1H), 7.20 – 6.13 (m, 2H), 7.09 – 7.00 (m, 3H), 6.51 – 6.44 (m, 2H), 3.82 (s, 3H), 3.40 (q, J = 7.0 Hz, 4H), 1.19 (t, J = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.1, 141.6, 136.1, 133.2, 130.7, 129.3, 127.9, 127.2, 126.6, 123.5, 121.0, 120.7, 120.5, 114.9, 112.6, 110.7, 45.0, 29.9, 13.3; IR (neat, cm^{-1}) 3272, 2970, 1613, 1516, 1372, 1328, 1161, 1091, 820, 734, 686. HRMS (EI): calcd for: 433.1824, Found: 433.1824.

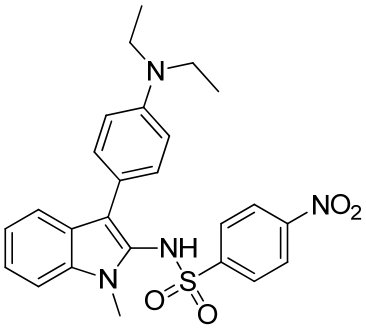
N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-methoxybenzenesulfonamide (3c)

White solid; Yield: 65% ; M.p. 79-80^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.87 (s, 1H), 7.54 (d, J = 8.0 Hz, 1H), 7.43 (d, J = 8.3 Hz, 1H), 7.35 – 7.28 (m, 2H), 7.27 – 7.20 (m, 1H), 7.09 – 7.00 (m, 3H), 6.67 – 6.59 (m, 2H), 6.55 –



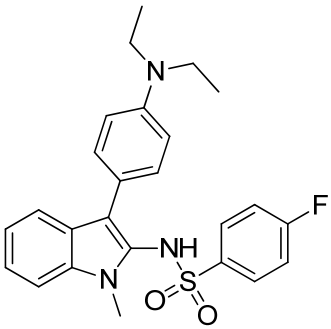
6.47 (m, 2H), 3.84 (s, 3H), 3.81 (s, 3H), 3.40 (q, J = 7.0 Hz, 4H), 1.20 (t, J = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 163.7, 147.1, 136.1, 132.8, 130.7, 130.0, 127.4, 126.7, 123.4, 121.2, 120.7, 120.5, 114.7, 114.4, 112.5, 110.7, 56.0, 45.0, 29.9, 13.2; IR (neat, cm^{-1}) 3264, 2970, 1573, 1516, 1374, 1328, 1260, 1156, 1090, 827, 678. HRMS (EI): calcd for: 463.1930, Found: 463.1927.

N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-nitrobenzenesulfonamide (3d)



purple solid; Yield: 78% ; M.p. 160-170^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.47 (s, 1H), 8.01 – 7.92 (m, 2H), 7.70 – 7.61 (m, 2H), 7.56 (d, J = 7.3 Hz, 1H), 7.46 (d, J = 7.4 Hz, 1H), 7.27 (s, 1H), 7.15 – 6.95 (m, 3H), 6.40 (d, J = 8.0 Hz, 2H), 3.89 (s, 3H), 3.30 (d, J = 5.8 Hz, 4H), 1.15 (t, J = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 150.6, 147.2, 146.9, 136.2, 130.8, 129.5, 126.3, 126.2, 124.5, 123.8, 120.8, 120.7, 120.6, 115.1, 112.1, 110.9, 44.8, 30.2, 13.1; IR (neat, cm^{-1}) 3286, 2971, 1611, 1524, 1348, 1263, 1165, 1089, 850, 818, 738. Elemental Analysis: calcd for C:62.74; H:5.48; N:11.71; Found: C:62.31; H:5.73; N:11.15.

N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-fluorobenzenesulfonamide (3e)

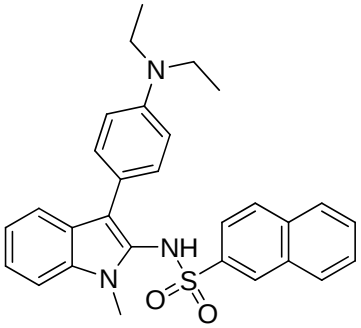


White solid; Yield: 67% ; M.p. 187-188^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.12 (s, 1H), 7.54 (d, J = 8.0 Hz, 1H), 7.45-7.41 (m, 3H), 7.28 – 7.22 (m, 1H), 7.08 – 7.01 (m, 3H), 6.89 – 6.80 (m, 2H), 6.54 – 6.47 (m, 2H), 3.86 (s, 3H), 3.41 (q, J = 7.0 Hz, 4H), 1.21 (t, J = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 165.7 (d, $J_{C\text{-}F}$ = 251.3 Hz), 147.2, 137.4 (d, $J_{C\text{-}F}$ = 2.9 Hz), 136.1, 130.8 (d, $J_{C\text{-}F}$ = 9.7 Hz), 130.7, 126.9, 126.5, 123.6, 120.9, 120.7, 120.6, 116.3 (d, $J_{C\text{-}F}$ = 22.8 Hz), 114.9, 112.3, 110.8, 45.0, 29.9, 13.2; IR (neat, cm^{-1}) 3283, 2973, 1613, 1516, 1264, 1159, 1091, 833, 753, 677. HRMS (EI): calcd for: 451.1730, Found: 451.1733.

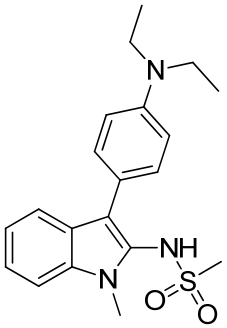
N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)naphthalene-2-sulfonamide (3f)

yellow solid; Yield: 72% ; M.p. 94-95^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.16 (s, 1H), 8.00 (s, 1H), 7.84 (d, J = 8.6 Hz, 2H), 7.65-7.60 (m, 2H), 7.57-7.52 (m, 1H), 7.51 – 7.40 (m, 3H), 7.24 (t, J = 7.6 Hz, 1H), 7.03 (t, J = 7.4 Hz,

1H), 6.86 (d, *J* = 8.7 Hz, 2H), 6.09 (d, *J* = 8.7 Hz, 2H), 3.89 (s, 3H), 3.16 (q, *J* = 7.0 Hz, 4H), 1.07 (t, *J* = 7.0 Hz, 6H)； ^{13}C NMR (100 MHz, Acetone) δ 146.8, 138.6, 136.1, 135.8, 132.9, 130.4, 130.2, 129.5, 129.3, 129.2, 128.7, 127.9, 127.1, 126.6, 123.51, 123.49, 120.7, 120.6, 120.5, 115.0, 111.9, 110.8, 44.8, 29.9, 13.3; IR (neat, cm^{-1}) 3376, 2970, 1710, 1564, 1517, 1357, 1270, 1154, 1122, 1072, 781, 750, 672. Elemental Analysis: calcd for C: 72.02; H: 6.04; N: 8.69; Found: C: 71.34; H: 6.41; N: 8.07.

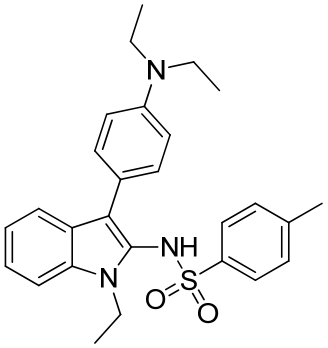


N-(3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)methanesulfonamide(3g)



White solid; Yield: 88% ; M.p. 176-177^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.73 (s, 1H), 7.68 (d, *J* = 8.0 Hz, 1H), 7.56 – 7.48 (m, 2H), 7.44 (d, *J* = 8.3 Hz, 1H), 7.30 – 7.23 (m, 1H), 7.14 – 7.07 (m, 1H), 6.90 – 6.82 (m, 2H), 3.80 (s, 3H), 3.44 (q, *J* = 7.0 Hz, 4H), 2.46 (s, 3H), 1.18 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.7, 136.1, 131.1, 127.6, 126.5, 123.6, 121.5, 120.67, 121.64, 114.6, 113.2, 110.8, 45.0, 41.1, 29.7, 13.1; IR (neat, cm^{-1}) 3263, 2971, 1613, 1516, 1372, 1325, 1263, 1153, 977, 747. HRMS (EI): calcd for: 371.1667, Found: 371.1673.

N-(3-(4-(diethylamino)phenyl)-1-ethyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3h)

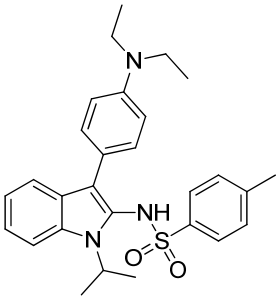


White solid; Yield: 81% ; M.p. 167-168^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.93 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.47 (d, *J* = 8.3 Hz, 1H), 7.31 – 7.26 (m, 2H), 7.26-7.20 (m, 1H), 7.07 – 7.00 (m, 3H), 6.92 (d, *J* = 7.9 Hz, 2H), 6.53 – 6.45 (m, 2H), 4.45 (t, *J* = 7.2 Hz, 2H), 3.40 (q, *J* = 7.0 Hz, 4H), 2.29 (s, 3H), 1.42 (t, *J* = 7.2 Hz, 3H), 1.20 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.1, 143.6, 138.6, 135.0, 130.7, 129.8, 128.0, 126.9, 126.5, 123.4, 121.2, 120.8, 120.4, 115.1, 112.4, 111.0, 44.9, 38.2, 21.8, 15.3, 13.3; IR (neat, cm^{-1}) 3262, 2971, 1613, 1515, 1334, 1159, 1092, 811, 743, 674. HRMS (EI): calcd for: 461.2137, Found: 461.2133.

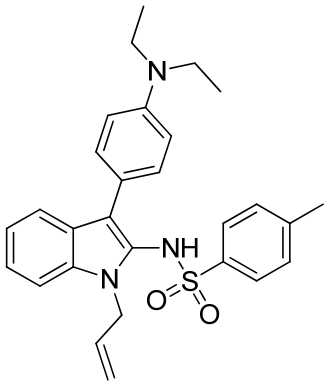
N-(3-(4-(diethylamino)phenyl)-1-isopropyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3i)

White solid; Yield: 88% ; M.p. 191-192^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.92 (s, 1H), 7.68 (d, *J* = 8.4 Hz, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.31 – 7.24 (m, 2H), 7.22 – 7.14 (m, 1H), 7.03-6.99 (m, 3H), 6.92 (d, *J* = 8.0 Hz, 2H),

6.51-6.47 (m, 2H), 5.29 – 5.16 (m, 1H), 3.40 (q, *J* = 7.0 Hz, 4H), 2.29 (s, 3H), 1.69 (d, *J* = 7.0 Hz, 6H), 1.20 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.1, 143.6, 138.5, 133.7, 130.8, 129.8, 128.0, 127.6, 126.4, 122.9, 121.2, 121.0, 120.0, 114.8, 113.1, 112.3, 47.2, 44.9, 21.8, 21.4, 13.3; IR (neat, cm^{-1}) 3263, 2972, 1611, 1516, 1457, 1349, 1268, 1160, 1092, 812, 747, 675. HRMS (EI): calcd for: 475.2293, Found: 475.2300.

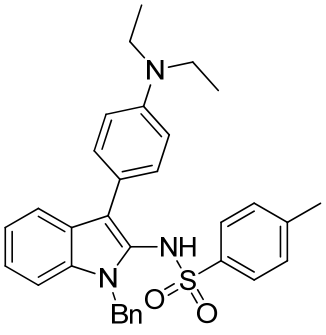


N-(1-allyl-3-(4-(diethylamino)phenyl)-1H-indol-2-yl)-4-methylbenzenesulfonamide(3j)



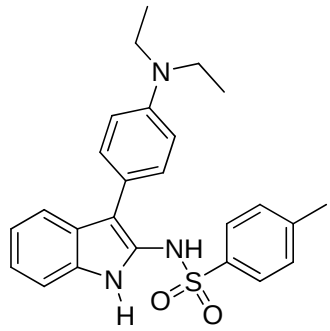
White solid; Yield: 76% ; M.p. 165-166^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.90 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.43 (d, *J* = 8.3 Hz, 1H), 7.28 (d, *J* = 8.3 Hz, 2H), 7.24 – 7.18 (m, 1H), 7.09 – 7.01 (m, 3H), 6.92 (d, *J* = 8.0 Hz, 2H), 6.55 – 6.46 (m, 2H), 6.12-6.01 (m, 1H), 5.19 – 5.17 (m, 2H), 5.07 – 5.00 (m, 2H), 3.41 (q, *J* = 7.0 Hz, 4H), 2.29 (s, 3H), 1.21 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.2, 143.7, 138.4, 135.63, 135.55, 130.8, 129.8, 128.0, 126.9, 126.7, 123.5, 121.1, 120.8, 120.6, 116.9, 115.3, 112.4, 111.5, 46.1, 44.9, 21.8, 13.3; IR (neat, cm^{-1}) 3262, 2972, 1613, 1516, 1462, 1330, 1367, 1160, 1015, 812, 750, 676. HRMS (EI): calcd for: 473.2137, Found: 473.2151.

N-(1-benzyl-3-(4-(diethylamino)phenyl)-1H-indol-2-yl)-4-methylbenzenesulfonamide(3k)



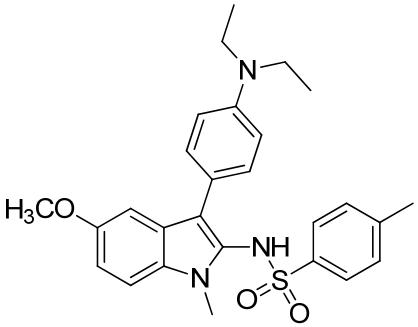
White solid; Yield: 73% ; M.p. 106-107^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.09 (s, 1H), 7.57 (d, *J* = 8.0 Hz, 1H), 7.34 (d, *J* = 8.3 Hz, 1H), 7.32 – 7.20 (m, 5H), 7.20-7.15 (m, 3H), 7.12 – 7.07 (m, 2H), 7.06 – 7.01 (m, 1H), 6.93 (d, *J* = 8.0 Hz, 2H), 6.52 (d, *J* = 8.8 Hz, 2H), 5.67 (s, 2H), 3.42 (q, *J* = 7.0 Hz, 4H), 2.30 (s, 3H), 1.21 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.2, 143.8, 139.6, 138.4, 135.7, 130.8, 129.8, 129.4, 128.04, 127.99, 127.8, 127.1, 127.0, 123.6, 121.0, 120.9, 120.7, 115.6, 112.4, 111.6, 47.0, 45.0, 21.8, 13.3; IR (neat, cm^{-1}) 3258, 2926, 1579, 1516, 1461, 1267, 1157, 1087, 810, 735, 676. MS (malditof): calcd for ($C_{32}H_{33}N_3O_2S$+H^+): 524.237, Found 524.237.

N-(3-(4-(diethylamino)phenyl)-1H-indol-2-yl)-4-methylbenzenesulfonamide(3l)



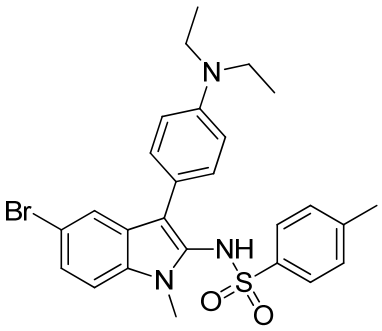
White solid; Yield: 64% ; M.p. 96-97^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 10.21 (s, 1H), 8.97 (s, 1H), 7.57 – 7.41 (m, 4H), 7.19 – 6.09 (m, 3H), 7.03 – 6.97 (m, 1H), 6.88 – 6.77 (m, 2H), 6.55 (d, *J* = 8.8 Hz, 2H), 3.40 (q, *J* = 7.0 Hz, 4H), 2.35 (s, 3H), 1.17 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.3, 144.4, 138.0, 134.9, 130.9, 130.3, 128.0, 127.8, 127.2, 122.8, 120.9, 120.4, 120.0, 112.6, 112.3, 111.1, 45.0, 21.7, 13.2; IR (neat, cm^{-1}) 3309, 2972, 1608, 1518, 1273, 1141, 1083, 817, 754; HRMS (EI): calcd for: 433.1824, Found: 433.1832.

N-(3-(4-(diethylamino)phenyl)-5-methoxy-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3m)



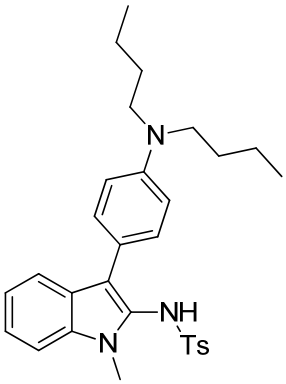
White solid; Yield: 63%; M.p. 138-139^{0}C; ^{1}H NMR (400 MHz, Acetone) δ 8.87 (s, 1H), 7.34 (d, *J* = 8.9 Hz, 1H), 7.30 – 7.25 (m, 2H), 7.05 – 6.99 (m, 3H), 6.94 (d, *J* = 8.0 Hz, 2H), 6.89 (dd, *J* = 8.9, 2.5 Hz, 1H), 6.54 – 6.48 (m, 2H), 3.80 (s, 3H), 3.74 (s, 3H), 3.41 (q, *J* = 7.0 Hz, 4H), 2.30 (s, 3H), 1.21 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 155.5, 147.1, 143.7, 138.5, 131.3, 130.6, 129.8, 128.0, 127.6, 126.7, 121.4, 114.5, 113.8, 112.4, 111.6, 102.1, 56.0, 45.0, 30.0, 21.8, 13.3; IR (neat, cm^{-1}) 3265, 2971, 1515, 1488, 1266, 1160, 1091, 808, 753, 662, HRMS(EI): calcd for: 477.2086, Found: 477.2087.

N-(5-bromo-3-(4-(diethylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3n)



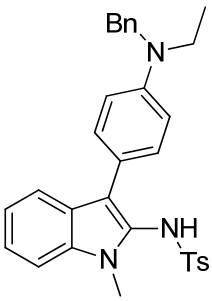
White solid; Yield: 76%; M.p. 100-101^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.03 (s, 1H), 7.64 (d, *J* = 1.6 Hz, 1H), 7.42 (d, *J* = 8.7 Hz, 1H), 7.34 (dd, *J* = 8.7, 1.7 Hz, 1H), 7.28 (d, *J* = 8.3 Hz, 2H), 6.99 (d, *J* = 8.7 Hz, 2H), 6.95 (d, *J* = 8.0 Hz, 2H), 6.51 (d, *J* = 8.8 Hz, 2H), 3.84 (s, 3H), 3.41 (q, *J* = 7.0 Hz, 4H), 2.30 (s, 3H), 1.20 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.3, 144.0, 138.3, 134.7, 130.7, 129.9, 128.6, 128.2, 128.0, 126.0, 122.9, 120.2, 114.5, 113.4, 112.9, 112.4, 45.0, 21.8, 13.3; IR (neat, cm^{-1}) 3267, 2970, 1611, 1515, 1471, 1372, 1159, 1091, 865, 811, 662. HRMS (EI): calcd for: 525.1086, Found: 525.1092.

N-(3-(4-(dibutylamino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3o)



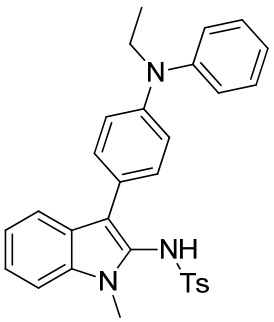
White solid; Yield: 76% ; M.p. 61-62^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.99 (s, 1H), 7.53 (d, *J* = 8.0 Hz, 1H), 7.42 (d, *J* = 8.3 Hz, 1H), 7.32 – 7.26 (m, 2H), 7.23-7.21 (m, 1H), 7.08 – 6.99 (m, 3H), 6.93 (d, *J* = 8.0 Hz, 2H), 6.52 – 6.46 (m, 2H), 3.83 (s, 3H), 3.38 – 3.29 (t, *J* = 8.0 Hz, 4H), 2.30 (s, 3H), 1.69-1.60 (m, 4H), 1.48-1.37 (m, 4H), 1.01 (t, *J* = 7.4 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.5, 143.7, 138.3, 136.1, 130.6, 129.7, 128.0, 127.2, 126.6, 123.4, 121.0, 120.6, 120.4, 114.7, 112.3, 110.7, 51.5, 30.5, 30.0, 21.8, 21.1, 14.5; IR (neat, cm^{-1}) 3375, 2930, 1610, 1570, 1518, 1470, 1284, 1144, 1080, 811, 779, 679 HRMS (EI): calcd for: 503.2606, Found: 503.2610.

N-(3-(4-(benzyl(ethyl)amino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3p)



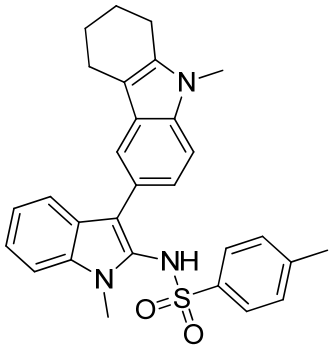
White solid; Yield: 74% ; M.p. 84-85^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.93 (s, 1H), 7.50 (d, *J* = 8.0 Hz, 1H), 7.44 – 7.38 (m, 2H), 7.38 – 7.33 (m, 3H), 7.30 – 7.20 (m, 4H), 7.06-7.01 (m, 1H), 6.98 (d, *J* = 8.8 Hz, 2H), 6.93 (d, *J* = 8.1 Hz, 2H), 6.54 (d, *J* = 8.8 Hz, 2H), 4.58 (s, 2H), 3.83 (s, 3H), 3.55 (q, *J* = 7.0 Hz, 2H), 2.29 (s, 3H), 1.26 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, Acetone) δ 147.7, 143.8, 141.0, 138.1, 136.1, 130.6, 129.8, 129.5, 128.0, 127.72, 127.67, 127.3, 126.6, 123.4, 121.9, 120.58, 120.51, 114.6, 112.9, 110.7, 54.7, 46.1, 21.8, 12.9; IR (neat, cm^{-1}) 3259, 2926, 1577, 1516, 1329, 1294, 1161, 1086, 812, 732, 678. HRMS (EI): calcd for: 509.2137, Found: 509.2134.

N-(3-(4-(ethyl(phenyl)amino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3q)



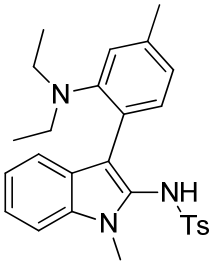
White solid; Yield: 81% ; M.p. 84-85^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.03 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 8.3 Hz, 1H), 7.38 – 7.30 (m, 4H), 7.29 – 7.23 (m, 1H), 7.14-7.03 (m, 7H), 7.02 – 6.96 (m, 1H), 6.84 – 6.77 (m, 2H), 3.90 – 3.81 (m, 5H), 2.32 (s, 3H), 1.26 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, Acetone) δ 148.6, 146.8, 144.1, 138.2, 136.1, 130.7, 130.3, 130.0, 128.1, 127.7, 126.7, 126.5, 123.6, 122.52, 122.47, 120.8, 120.5, 120.4, 114.2, 110.9, 47.1, 30.1, 21.8, 13.3; IR (neat, cm^{-1}) 3264, 2972, 2928, 1567, 1497, 1373, 1329, 1161, 1090, 812, 736, 675. HRMS (EI): calcd for: 495.1980, Found: 495.1986.

4-methyl-N-(1-methyl-3-(9-methyl-2,3,4,9-tetrahydro-1H-carbazol-6-yl)-1H-indol-2-yl)benzenesulfonamide(3r)



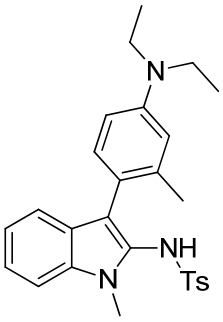
White solid; Yield: 53% ; M.p. 135-136^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 9.23 (s, 1H), 7.74 (d, *J* = 8.0 Hz, 1H), 7.54 (d, *J* = 8.3 Hz, 1H), 7.34 (m, 1H), 7.29 (d, *J* = 8.0 Hz, 1H), 7.23 (d, *J* = 8.3 Hz, 2H), 7.20 (s, 1H), 7.18 – 7.13 (m, 1H), 7.04 (dd, *J* = 8.0, 1.4 Hz, 1H), 6.62 (d, *J* = 8.0 Hz, 2H), 3.95 (s, 3H), 3.65 (s, 3H), 2.87-2.79 (m, 4H), 2.15-2.10 (m, 2H), 2.06 (s, 3H), 1.99 – 1.93 (m, 2H); ^{13}C NMR (100 MHz, Acetone) δ 143.3, 138.9, 138.3, 136.5, 136.1, 129.4, 127.8, 127.5, 126.8, 126.7, 126.4, 123.5, 120.9, 120.6, 117.9, 115.9, 110.8, 110.0, 109.4, 32.5, 29.2, 24.28, 24.26, 22.8, 22.1, 21.3; IR (neat, cm^{-1}) 3282, 2930, 1568, 1471, 1377, 1265, 1161, 1089, 810, 753, 677. MS (malditof): calcd for ($C_{29}H_{29}N_3O_2S$+H^+): 484.205, Found: 484.205.

N-(3-(2-(diethylamino)-4-methylphenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3s)



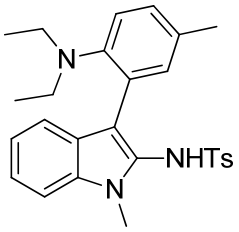
White solid; Yield: 28%; M.p. 146-147^{0}C; ^{1}H NMR (400 MHz, Acetone) δ 10.01 (s, 1H), 7.49 (d, *J* = 8.2 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.27-7.21 (m, 1H), 7.09-7.05 (m, 1H), 7.04 – 7.00 (m, 2H), 6.88 (s, 1H), 6.82 (d, *J* = 7.9 Hz, 2H), 6.72 (d, *J* = 0.9 Hz, 2H), 3.93 (s, 3H), 3.00 – 2.72 (m, 4H), 2.36 (s, 3H), 2.27 (s, 3H), 1.01 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.3, 144.5, 137.2, 137.1, 135.7, 132.9, 130.0, 129.7, 127.5, 126.0, 125.8, 124.4, 123.1, 122.3, 120.9, 119.8, 111.0, 109.4, 46.2, 30.5, 21.62, 21.58, 11.7; IR (neat, cm^{-1}) 3384, 2972, 1702, 1567, 1479, 1406, 1332, 1245, 1166, 1090, 743, 674; HRMS (EI): calcd for:461.2137, Found: 461.2138.

N-(3-(4-(diethylamino)-2-methylphenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3t)



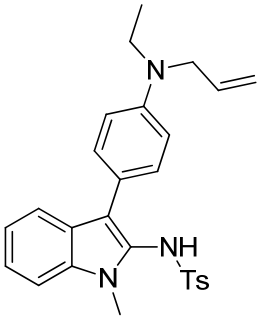
White solid; Yield: 30%; M.p. 111-112^{0}C; ^{1}H NMR (400 MHz, Acetone) δ 8.83 (s, 1H), 7.42 (d, *J* = 8.3 Hz, 1H), 7.33 (d, *J* = 8.3 Hz, 2H), 7.23-7.17 (m, 1H), 7.14 (d, *J* = 7.9 Hz, 1H), 7.05 – 6.98 (m, 3H), 6.83 (d, *J* = 8.7 Hz, 1H), 6.42 – 6.36 (m, 2H), 3.83 (s, 3H), 3.48-3.34 (m, 4H), 2.36 (s, 3H), 1.76 (s, 3H), 1.21 (t, *J* = 7.0 Hz, 6H); ^{13}C NMR (100 MHz, Acetone) δ 147.4, 144.5, 137.2, 137.1, 135.7, 132.9, 130.0, 129.7, 127.5, 126.0, 125.8, 124.4, 123.1, 122.3, 120.9, 119.8, 111.0, 109.4, 46.2, 30.5, 21.62, 21.58, 11.7; IR (neat, cm^{-1}) 3259, 2969, 1609, 1506, 1373, 1329, 1258, 1157, 1092, 776, 677, 668; HRMS (EI): calcd for:461.2137, Found: 461.2131.

N-(3-(2-(diethylamino)-5-methylphenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3u)



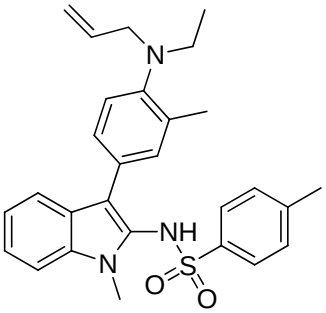
White solid; Yield: 42%; M.p. 141-142^{0}C; ^{1}H NMR (400 MHz, Acetone) δ 10.27 (s, 1H), 7.49 (d, *J* = 8.3 Hz, 2H), 7.28-7.22 (m, 1H), 7.10-7.05 (m, 1H), 7.05 – 7.02 (m, 2H), 6.99 (dd, *J* = 8.3, 1.6 Hz, 1H), 6.95 (d, *J* = 8.2 Hz, 1H), 6.86 (d, *J* = 8.0 Hz, 2H), 6.73 (d, *J* = 1.8 Hz, 1H), 3.94 (s, 3H), 2.90-2.78 (m, 4H), 2.27 (s, 3H), 2.24 (s, 3H), 1.01 (s, 6H); ^{13}C NMR (100 MHz, Acetone) δ 145.0, 144.1, 137.2, 136.0, 133.6, 133.2, 130.2, 129.7, 128.6, 128.1, 127.7, 126.0, 123.1, 121.7, 121.0, 119.8, 111.0, 109.4, 46.3, 30.6, 21.7, 21.0, 11.6; IR (neat, cm^{-1}) 2972, 1701, 1564, 1478, 1407, 1334, 1165, 1089, 747, 678; HRMS (EI): calcd for:461.2137, Found: 461.2140.

N-(3-(4-(allyl(ethyl)amino)phenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3v)



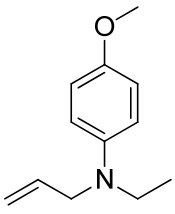
White solid; Yield: 72% ; M.p. 150-151^{0}C ; ^{1}H NMR (400 MHz, Acetone) δ 8.94 (s, 1H), 7.53 (d, *J* = 8.0 Hz, 1H), 7.43 (d, *J* = 8.3 Hz, 1H), 7.30 – 7.26 (m, 2H), 7.26-7.21 (m, 1H), 7.07 – 7.04 (m, 1H), 7.04 – 7.00 (m, 2H), 6.94 (d, *J* = 8.0 Hz, 2H), 6.56 – 6.50 (m, 2H), 6.00-5.90 (m, 1H), 5.30-5.10 (m, 2H), 4.00-3.90 (m, 2H), 3.83 (s, 3H), 3.43 (q, *J* = 7.0 Hz, 2H), 2.30 (s, 3H), 1.21 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, Acetone) δ 147.5, 143.8, 138.3, 136.2, 136.1, 130.6, 129.8, 128.0, 127.3, 126.6, 123.4, 121.7, 120.6, 120.5, 116.1, 114.7, 112.7, 110.8, 53.3, 45.4, 30.0, 21.8, 13.0; IR (neat, cm^{-1}) 3264, 2977, 1569, 1516, 1271, 1090, 812, 753, 679; HRMS (EI): calcd for: 459.1980, Found: 459.1977.

N-(3-(4-(allyl(ethyl)amino)-3-methylphenyl)-1-methyl-1H-indol-2-yl)-4-methylbenzenesulfonamide(3w)



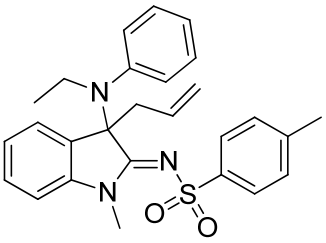
White solid; Yield: 51% ; M.p. 66-67^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (d, *J* = 8.0 Hz, 1H), 7.38 (d, *J* = 8.3 Hz, 1H), 7.29 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 8.2 Hz, 2H), 7.10 (t, *J* = 7.5 Hz, 1H), 7.01 (s, 1H), 6.87-6.83 (m, 3H), 6.71-6.68 (m, 2H), 5.95-5.83 (m, 1H), 5.26 (dd, *J* = 17.2, 1.4 Hz, 1H), 5.17 (d, *J* = 10.2 Hz, 1H), 3.92 (s, 3H), 3.53 (d, *J* = 6.0 Hz, 2H), 3.01 (q, *J* = 7.1 Hz, 2H), 2.29 (s, 3H), 2.18 (s, 3H), 1.04 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 148.2, 143.4, 135.9, 135.1, 134.8, 134.1, 131.4, 129.0, 127.4, 127.3, 126.4, 126.0, 125.3, 122.8, 121.5, 120.0, 119.8, 116.7, 112.6, 109.8, 56.8, 46.2, 30.2, 21.6, 18.4, 12.5; IR (neat, cm^{-1}) 3373, 2978, 1568, 1494, 1469, 1275, 1142, 1082, 813, 753, 680; HRMS (EI): calcd for: 473.2137, Found:473.2140.

N-allyl-N-ethyl-4-methoxyaniline(4f)



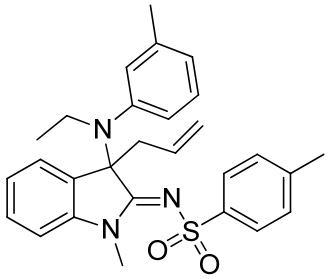
yellow oil; Yield: 86%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.85 – 6.78 (m, 2H), 6.73 – 6.64 (m, 2H), 5.90-5.80 (m, 1H), 5.21-5.10 (m, 2H), 3.83-3.82 (m, 2H), 3.75 (s, 3H), 3.30 (q, *J* = 7.1 Hz, 2H), 1.11 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.4, 143.1, 135.0, 115.9, 114.7, 114.7, 55.8, 53.6, 45.4, 12.2; HRMS (EI): calcd for: 191.1310, Found:191.1313.

(Z)-N-(3-allyl-3-(ethyl(phenyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzenesulfonamide(5a)



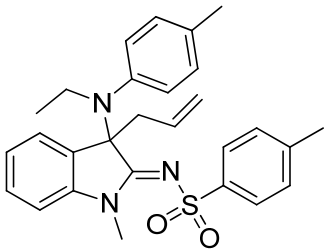
White solid; Yield: 5% ; M.p. 133-134^{0}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.2 Hz, 2H), 7.41 (d, *J* = 7.6 Hz, 2H), 7.37 – 7.27 (m, 4H), 7.20 (t, *J* = 7.6 Hz, 2H), 7.15-7.09 (m, 2H), 6.89 (d, *J* = 7.8 Hz, 1H), 5.09 – 4.94 (m, 1H), 4.89 (dd, *J* = 17.0, 2.3 Hz, 1H), 4.77 (dd, *J* = 9.7, 2.3 Hz, 1H), 3.46 (s, 3H), 3.40 (dd, *J* = 12.5, 7.8 Hz, 1H), 3.00 – 2.74 (m, 2H), 2.44 (s, 3H), 2.29 (dd, *J* = 12.6, 6.1 Hz, 1H), 0.84 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.0, 144.8, 143.3, 141.9, 141.8, 132.3, 131.0, 129.5, 129.0, 128.8, 128.1, 126.2, 125.2, 124.0, 123.8, 119.8, 109.0, 74.9, 44.0, 42.1, 30.3, 21.5, 13.5; IR (neat, cm^{-1}) 2926, 1582, 1490, 1290, 1146, 1085, 773, 678; HRMS (EI): calcd for: 459.1980, Found: 459.1977

(Z)-N-(3-allyl-3-(ethyl(m-tolyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzenesulfonamide(5b)



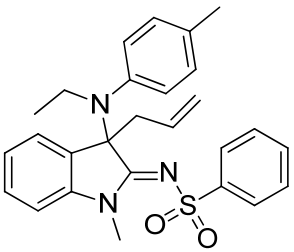
White solid; Yield: 39% ; M.p. 68-69^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.2 Hz, 2H), 7.35-7.24 (m, 5H), 7.18 (d, *J* = 8.0 Hz, 1H), 7.14 (t, *J* = 7.5 Hz, 1H), 7.07 (t, *J* = 7.7 Hz, 1H), 6.93 (d, *J* = 7.4 Hz, 1H), 6.89 (d, *J* = 7.8 Hz, 1H), 5.05-4.96 (m, 1H), 4.93 – 4.85 (m, 1H), 4.77 (dd, *J* = 9.9, 1.8 Hz, 1H), 3.47 (s, 3H), 3.35 (dd, *J* = 12.5, 8.1 Hz, 1H), 2.85 (q, *J* = 6.7 Hz, 2H), 2.43 (s, 3H), 2.30 (dd, *J* = 12.5, 6.4 Hz, 1H), 2.25 (s, 3H), 0.83 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.1, 144.7, 143.3, 141.9, 141.8, 137.7, 132.4, 131.1, 130.4, 129.0, 128.7, 127.7, 126.4, 126.2, 126.0, 124.0, 123.8, 119.7, 109.0, 74.9, 44.0, 42.1, 30.4, 21.4, 21.4, 13.6; IR (neat, cm^{-1}) 2984, 1583, 1486, 1273, 1146, 1086, 918, 755, 679; HRMS (EI): calcd for: 473.2137, Found:473.2144.

(Z)-N-(3-allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzenesulfonamide(5c)



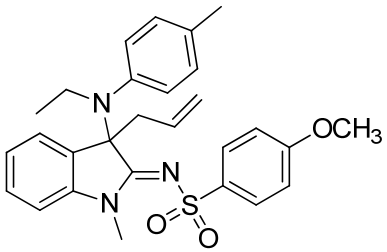
White solid; Yield: 87% ; M.p. 124-125^{0}C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.2 Hz, 2H), 7.38 – 7.26 (m, 6H), 7.13 (t, *J* = 7.4 Hz, 1H), 7.01 (d, *J* = 8.1 Hz, 2H), 6.88 (d, *J* = 7.8 Hz, 1H), 5.08 – 4.93 (m, 1H), 4.88 (dd, *J* = 17.0, 2.3 Hz, 1H), 4.76 (dd, *J* = 9.8, 2.4 Hz, 1H), 3.51 – 3.34 (m, 4H), 2.93 – 2.67 (m, 2H), 2.43 (s, 3H), 2.30 (s, 3H), 2.26 (dd, *J* = 12.6, 6.2 Hz, 1H), 0.82 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 143.3, 141.96, 141.94, 141.7, 134.8, 132.3, 131.1, 129.6, 129.0, 128.7, 128.6, 126.2, 124.0, 123.7, 119.6, 109.0, 75.0, 44.0, 42.0, 30.2, 21.4, 20.9, 13.4; IR (neat, cm^{-1}) 2925, 1597, 1467, 1286, 1145, 1084, 811, 774, 676; HRMS (EI): calcd for: 473.2137, Found: 473.2132.

(Z)-N-(3-allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)benzenesulfonamide(5d)



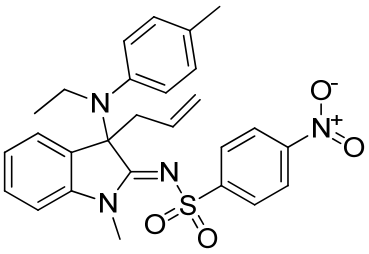
White solid; Yield: 92% ; M.p. 129-130; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.07-8.05 (m, 2H), 7.61 – 7.44 (m, 3H), 7.40 – 7.29 (m, 4H), 7.15 (t, *J* = 7.4 Hz, 1H), 7.01 (d, *J* = 8.1 Hz, 2H), 6.90 (d, *J* = 7.8 Hz, 1H), 5.09 – 4.94 (m, 1H), 4.89 (dd, *J* = 17.0, 2.0 Hz, 1H), 4.77 (dd, *J* = 9.9, 2.2 Hz, 1H), 3.47 (s, 3H), 3.38 (dd, *J* = 12.5, 7.9 Hz, 1H), 2.90 – 2.67 (m, 2H), 2.31 (s, 3H), 2.26 (dd, *J* = 12.6, 6.2 Hz, 1H), 0.81 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.4, 144.7, 143.3, 141.9, 135.0, 132.4, 131.3, 131.1, 129.7, 128.8, 128.7, 128.4, 126.2, 124.1, 123.8, 119.7, 109.1, 75.1, 44.2, 42.1, 30.3, 21.0, 13.4; IR (neat, cm^{-1}) 3007, 1582, 1468, 1384, 1148, 1087, 813, 753, 679; HRMS (EI): calcd for: 459.1980, Found: 459.1981.

(Z)-N-(3-allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)-4-methoxybenzenesulfonamide(5e)



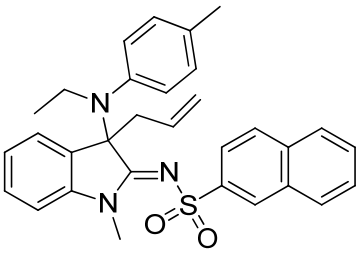
White solid; Yield: 69% ; M.p. 58-59^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.06 – 7.74 (m, 2H), 7.39 – 7.28 (m, 4H), 7.13 (td, *J* = 7.5, 0.7 Hz, 1H), 7.01 (d, *J* = 8.0 Hz, 2H), 6.99 – 6.94 (m, 2H), 6.88 (d, *J* = 7.8 Hz, 1H), 5.07 – 4.94 (m, 1H), 4.88 (dd, *J* = 17.0, 2.1 Hz, 1H), 4.76 (dd, *J* = 10.0, 2.2 Hz, 1H), 3.88 (s, 3H), 3.46 (s, 3H), 3.36 (dd, *J* = 12.5, 8.0 Hz, 1H), 2.89 – 2.74 (m, 2H), 2.31 (s, 3H), 2.27 (dd, *J* = 12.6, 6.4 Hz, 1H), 0.81 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.9, 161.8, 143.4, 142.0, 137.0, 134.9, 132.4, 131.1, 129.6, 128.72, 128.69, 128.2, 124.0, 123.7, 119.6, 113.5, 109.0, 75.0, 55.5, 44.1, 42.1, 30.3, 21.0, 13.5; IR (neat, cm^{-1}) 2976, 1577, 1492, 1465, 1257, 1143, 1085, 830, 753, 679; HRMS (EI): calcd for: 489.2086, Found:489.2084.

(Z)-N-(3-allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)-4-nitrobenzenesulfonamide(5f)



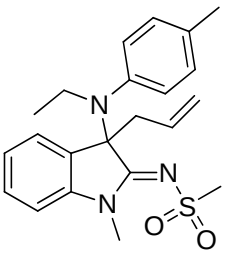
White solid; Yield: 83% ; M.p. 73-74^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40 – 8.28 (m, 2H), 8.27 – 8.16 (m, 2H), 7.38-7.33 (m, 4H), 7.21 – 7.15 (m, 1H), 7.06 (d, *J* = 8.1 Hz, 2H), 6.94 (d, *J* = 7.8 Hz, 1H), 4.97 – 4.87 (m, 2H), 4.84 – 4.72 (m, 1H), 3.60-3.53 (m, 1H), 3.40 (s, 3H), 2.94-2.86 (m, 1H), 2.76-2.68 (m, 1H), 2.32 (s, 3H), 2.25 (dd, *J* = 12.2, 3.9 Hz, 1H), 0.87 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.8, 150.4, 149.2, 142.7, 141.6, 135.1, 132.2, 130.9, 128.93, 128.89, 127.4, 124.3, 124.1, 123.8, 119.9, 109.4, 75.5, 44.1, 41.8, 29.7, 20.9, 13.2; IR (neat, cm^{-1}) 2982, 1574, 1528, 1349, 1274, 1148, 1087, 988, 753, 650; MS (malditof): calcd for ($C_{27}H_{28}N_4O_4S+H^+$): 505.190, Found: 505.190.

(Z)-N-(3-Allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)naphthalene-2-sulfonamide (5g)



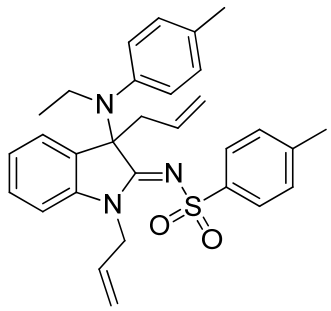
White solid; Yield: 78% ; M.p. 123-124 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.59 (s, 1H), 8.06 (dd, *J* = 8.7, 1.8 Hz, 1H), 7.96 (t, *J* = 7.4 Hz, 2H), 7.91 (d, *J* = 7.9 Hz, 1H), 7.71 – 7.51 (m, 2H), 7.37-7.30 (m, 4H), 7.15 (t, *J* = 7.5 Hz, 1H), 6.96 (d, *J* = 8.1 Hz, 2H), 6.90 (d, *J* = 7.8 Hz, 1H), 5.09 – 4.96 (m, 1H), 4.92 (dd, *J* = 17.0, 2.2 Hz, 1H), 4.78 (dd, *J* = 9.8, 2.3 Hz, 1H), 3.60 – 3.32 (m, 4H), 3.03 – 2.63 (m, 2H), 2.39 – 2.20 (m, 4H), 0.84 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.4, 143.3, 141.9, 141.7, 134.9, 134.4, 132.4, 132.2, 131.1, 129.5, 129.3, 128.8, 128.7, 128.6, 128.0, 127.7, 127.0, 126.3, 124.1, 123.8, 122.9, 119.8, 109.1, 75.1, 44.1, 42.1, 30.2, 20.9, 13.4; IR (neat, cm^{-1}) 2979, 1578, 1467, 1384, 1274, 1146, 1123, 1073, 752, 672; MS (malditof): calcd for ($C_{31}H_{31}N_3O_2S+H^+$): 510.221, Found:510.221.

(Z)-N-(3-Allyl-3-(ethyl(p-tolyl)amino)-1-methylindolin-2-ylidene)methanesulfonamide (5h)



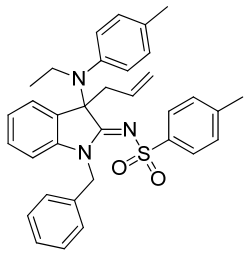
White solid; Yield: 85% ; M.p. 143-144 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 – 7.28 (m, 4H), 7.13 (t, *J* = 7.4 Hz, 1H), 7.09 (d, *J* = 8.1 Hz, 2H), 6.87 (d, *J* = 7.8 Hz, 1H), 5.09 – 4.92 (m, 1H), 4.87 (dd, *J* = 17.0, 1.7 Hz, 1H), 4.76 (dd, *J* = 10.0, 2.0 Hz, 1H), 3.44 (s, 3H), 3.35 (dd, *J* = 12.6, 7.9 Hz, 1H), 3.18 (s, 3H), 2.97 – 2.73 (m, 2H), 2.32 (s,3H), 2.28 (dd, *J* = 12.6, 6.5 Hz, 1H), 0.85 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.2, 143.3, 142.0, 134.9, 132.2, 131.1, 129.3, 128.8, 128.7, 124.1, 123.7, 119.6, 109.0, 74.9, 44.4, 43.8, 42.0, 30.1, 20.9, 13.4; IR (neat, cm^{-1}) 2980, 1585, 1468, 1382, 1279, 1128, 794, 755; HRMS (EI): calcd for: 397.1824, Found:397.1820.

(Z)-N-(1,3-Diallyl-3-(ethyl(p-tolyl)amino)indolin-2-ylidene)-4-methylbenzenesulfonamide (5i)



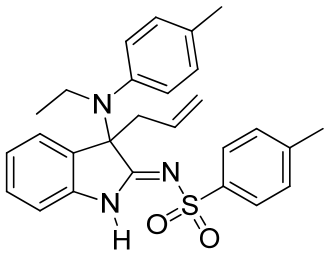
White solid; Yield: 78% ; M.p. 139-140 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.2 Hz, 2H), 7.42 (d, *J* = 8.2 Hz, 2H), 7.33 (d, *J* = 7.3 Hz, 1H), 7.28-7.25 (m, 3H), 7.12 (t, *J* = 7.5 Hz, 1H), 7.07 (d, *J* = 8.1 Hz, 2H), 6.87 (d, *J* = 7.8 Hz, 1H), 5.83-5.75 (m, 1H), 5.39 – 5.11 (m, 2H), 5.09 – 4.84 (m, 2H), 4.76 (dd, *J* = 9.4, 2.7 Hz, 1H), 4.56 (dd, *J* = 16.0, 5.5 Hz, 1H), 4.43 (dd, *J* = 16.0, 5.6 Hz, 1H), 3.75 (dd, *J* = 12.5, 7.5 Hz, 1H), 2.94-2.86 (m, 1H), 2.76-2.69 (m, 1H), 2.42 (s, 3H), 2.33 (s, 3H), 2.19 (dd, *J* = 12.6, 5.7 Hz, 1H), 0.86 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.0, 142.3, 142.1, 141.8, 141.6, 134.8, 132.2, 131.3, 130.6, 129.3, 129.0, 128.8, 128.6, 126.1, 124.1, 123.5, 119.9, 118.5, 109.7, 75.1, 45.3, 44.1, 41.7, 21.4, 21.0, 13.1; IR (neat, cm^{-1}) 2984, 1580, 1467, 1276, 1147, 1089, 919, 754, 697; HRMS (EI): calcd for: 499.2293, Found: 499.2291.

Z)-N-(3-Allyl-1-benzyl-3-(ethyl(p-tolyl)amino)indolin-2-ylidene)-4-methylbenzenesulfonamide (5j)



White solid; Yield: 69% ; M.p. 61-62 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.2 Hz, 2H), 7.47 (d, *J* = 8.1 Hz, 2H), 7.32 (d, *J* = 7.4 Hz, 1H), 7.29 – 7.18 (m, 8H), 7.17 – 7.04 (m, 3H), 6.85 (d, *J* = 7.8 Hz, 1H), 5.08 – 4.89 (m, 4H), 4.67 (dd, *J* = 8.2, 4.0 Hz, 1H), 3.97 (dd, *J* = 12.2, 6.5 Hz, 1H), 3.00-2.94 (m, 1H), 2.76-2.69 (m, 1H), 2.40 (s, 3H), 2.34 (s, 3H), 2.17 (dd, *J* = 12.0, 4.3 Hz, 1H), 0.90 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.7, 142.4, 142.1, 141.7, 141.6, 135.1, 134.8, 132.2, 131.4, 129.1, 129.0, 128.8, 128.6, 127.9, 127.7, 126.1, 124.1, 123.5, 119.9, 109.7, 75.1, 46.3, 44.1, 41.5, 21.4, 21.0, 13.0; IR (neat, cm^{-1}) 3007, 1579, 1466, 1274, 1148, 1089, 753, 703; HRMS(EI): calcd for: 549.2450, Found:549.2465.

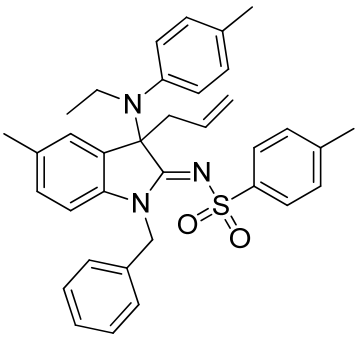
(Z)-N-(3-Allyl-3-(ethyl(p-tolyl)amino)indolin-2-ylidene)-4-methylbenzenesulfonamide (5k)



White solid; Yield: 64% ; M.p. 63-64 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 9.79 (s, 1H), 7.91 (d, *J* = 8.2 Hz, 2H), 7.37 (d, *J* = 7.4 Hz, 1H), 7.31 (d, *J* = 8.1 Hz, 2H), 7.26-7.20 (m, 1H), 7.10 (t, *J* = 7.4 Hz, 1H), 7.06 (d, *J* = 8.2 Hz, 2H), 6.92 (d, *J* = 8.0 Hz, 2H), 6.86 (d, *J* = 7.7 Hz, 1H), 5.08 – 4.90 (m, 1H), 4.70 (d, *J* = 10.1 Hz, 1H), 4.66 (d, *J* = 17.1 Hz, 1H), 3.06-2.99 (m , 1H), 2.76-2.70 (m, 1H), 2.60 (dd, *J* = 12.8, 6.2 Hz, 1H), 2.51 – 2.37 (m, 4H), 2.26 (s, 3H), 0.66 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.6, 143.2, 142.6, 140.2, 139.0, 135.4, 131.6, 130.5, 129.4, 128.9, 128.7, 126.6, 124.5, 123.7, 119.9, 110.5, 110.0, 74.6,

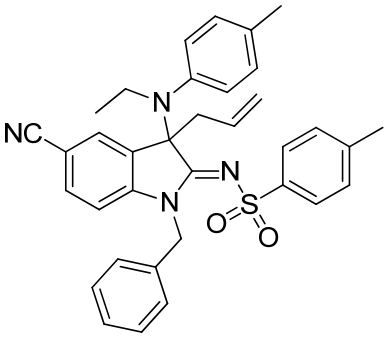
43.8, 42.8, 21.6, 20.9, 14.4; IR (neat, cm^{-1}) 3307, 2982, 1602, 1475, 1272, 1140, 1084, 755, 674; HRMS (EI): calcd for: 459.1980, Found: 459.1987.

(Z)-N-(3-Allyl-1-benzyl-3-(ethyl(p-tolyl)amino)-5-methylindolin-2-ylidene)-4-methylbenzenesulfonamide (5l)



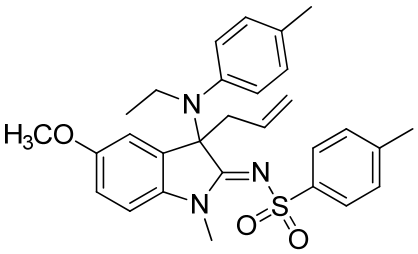
White solid; Yield: 75% ; M.p. 72-73 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.85 (d, *J* = 8.2 Hz, 2H), 7.45 (d, *J* = 8.2 Hz, 2H), 7.29 – 7.18 (m, 7H), 7.16 – 7.07 (m, 3H), 7.01 (d, *J* = 7.9 Hz, 1H), 6.73 (d, *J* = 8.0 Hz, 1H), 5.11 – 4.79 (m, 4H), 4.68 (dd, *J* = 9.5, 2.7 Hz, 1H), 3.93 (dd, *J* = 12.4, 7.8 Hz, 1H), 3.00-2.94 (m, 1H), 2.77-2.70 (m, 1H), 2.40 (s, 3H), 2.34 (s, 3H), 2.33 (s, 3H), 2.17 (dd, *J* = 12.5, 5.3 Hz, 1H), 0.90 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.6, 142.2, 141.8, 141.5, 140.1, 135.2, 134.6, 133.2, 132.3, 131.5, 128.93, 128.91, 128.8, 128.5, 127.9, 127.7, 126.1, 124.8, 119.8, 109.5, 75.1, 46.4, 44.0, 41.6 , 21.4, 21.3, 21.0, 13.0; IR (neat, cm^{-1}) 2982, 1576, 1493, 1442, 1276, 1148, 1088, 753, 674; HRMS(EI): calcd for: 563.2606, Found: 563.2606.

(Z)-N-(3-Allyl-1-benzyl-5-cyano-3-(ethyl(p-tolyl)amino)indolin-2-ylidene)-4-methylbenzenesulfonamide (5m)



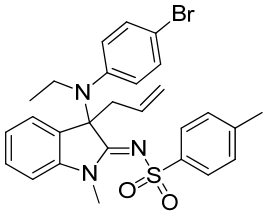
White solid; Yield: 32% ; M.p. 84-85 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (d, *J* = 8.2 Hz, 2H), 7.56 (s, 1H), 7.56 – 7.50 (m, 1H), 7.43 (d, *J* = 8.0 Hz, 2H), 7.28-2.73 (m, 5H), 7.18 (d, *J* = 6.3 Hz, 2H), 7.14 (d, *J* = 8.0 Hz, 2H), 6.89 (d, *J* = 8.2 Hz, 1H), 5.05 – 4.87 (m, 4H), 4.77 – 4.66 (m, 1H), 4.10 – 3.89 (m, 1H), 2.99-2.92 (m, 1H), 2.75-2.68 (m, 1H), 2.42 (s, 3H), 2.36 (s, 3H), 2.24 – 2.07 (m, 1H), 0.93 (t, *J* = 6.9 Hz, 3H)； ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.3, 146.1, 142.2, 141.3, 141.0, 135.5, 134.2, 133.8, 133.5, 130.4, 129.2, 129.1, 128.9, 128.8, 128.1, 127.7, 127.3, 126.2, 120.7, 118.9, 110.1, 106.5, 74.9, 46.5, 44.3, 41.5, 21.5, 21.0, 13.0; IR (neat, cm^{-1}) 2984, 1579, 1488, 1274, 1150, 1088, 817, 752, 673; HRMS (EI): calcd for: 574.2402, Found: 574.2416.

(Z)-N-(3-Allyl-3-(ethyl(p-tolyl)amino)-5-methoxy-1-methylindolin-2-ylidene)-4-methylbenzene-sulfonamide (5n)



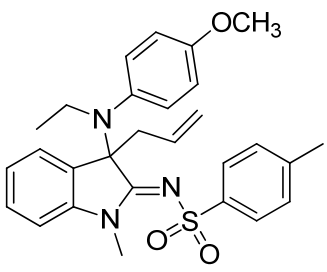
White solid; Yield: 69% ; M.p. 66-67 ^{0}C ; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.2 Hz, 2H), 7.31-7.25 (m, 4H), 6.98 (d, *J* = 8.1 Hz, 2H), 6.94 (d, *J* = 2.2 Hz, 1H), 6.84-6.78 (m, 2H), 5.11 – 4.97 (m, 1H), 4.91 (dd, *J* = 16.9, 1.7 Hz, 1H), 4.79 (dd, *J* = 9.9, 2.0 Hz, 1H), 3.81 (s, 3H), 3.47 (s, 3H), 3.28 (dd, *J* = 12.5, 8.0 Hz, 1H), 2.81 (q, *J* = 7.0 Hz, 2H), 2.44 (s, 3H), 2.30 (s, 3H), 2.25 (dd, *J* = 12.6, 6.3 Hz, 1H), 0.80 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.6, 156.9, 142.0, 141.9, 141.6, 136.9, 134.9, 134.0, 131.0, 129.6, 129.0, 128.7, 126.2, 119.7, 112.9, 111.1, 109.4, 75.1, 55.8, 44.1, 42.3, 30.6, 21.4, 20.9, 13.5; IR (neat, cm^{-1}) 2927, 1580, 1491, 1276, 1145, 1087, 810, 753, 672; HRMS (EI): calcd for: 503.2243, Found:503.2258.

(Z)-N-(3-Allyl-3-((4-bromophenyl)(ethyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzene-sulfonamide (5o)



White solid; Yield: 78% ; M.p. 60-61 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.89 (d, *J* = 8.2 Hz, 2H), 7.32 (t, *J* = 7.7 Hz, 1H), 7.30 – 7.25 (m, 5H), 7.23 (d, *J* = 8.7 Hz, 2H), 7.14 (t, *J* = 7.5 Hz, 1H), 6.90 (d, *J* = 7.8 Hz, 1H), 5.06 – 4.93 (m, 1H), 4.90 (dd, *J* = 17.0, 2.2 Hz, 1H), 4.79 (dd, *J* = 9.6, 2.2 Hz, 1H), 3.46 (s, 3H), 3.36 (dd, *J* = 12.3, 7.7 Hz, 1H), 2.99 – 2.73 (m, 2H), 2.44 (s, 3H), 2.30 (dd, *J* = 12.4, 6.0 Hz, 1H), 0.85 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.6, 144.0, 143.2, 142.0, 141.6, 132.0, 131.1, 130.6, 130.5, 129.1, 129.0, 126.2, 123.9, 123.7, 120.1, 118.2, 109.2, 74.6, 43.8, 42.1, 30.2, 21.5, 13.5; IR (neat, cm^{-1}) 2980, 1579, 1485, 1276, 1145, 1084, 808, 752, 676; HRMS (EI): calcd for: 537.1086, Found: 537.1069.

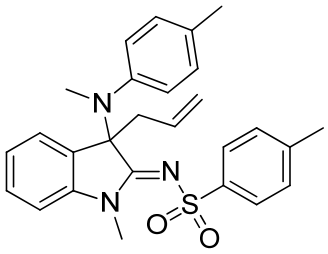
(Z)-N-(3-Allyl-3-(ethyl(4-methoxyphenyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzene-sulfonamide (5p)



White solid; Yield: 80% ; M.p. 135-136 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.95 (d, *J* = 8.2 Hz, 2H), 7.40-7.35 (m, 3H), 7.34 – 7.28 (m, 3H), 7.15 (t, *J* = 7.3 Hz, 1H), 6.88 (d, *J* = 7.8 Hz, 1H), 6.73 (d, *J* = 8.9 Hz, 2H), 5.10 – 4.94 (m, 1H), 4.88 (d, *J* = 16.8 Hz, 1H), 4.77 (dd, *J* = 10.0, 1.9 Hz, 1H), 3.78 (s, 3H), 3.47 (s, 3H), 3.29 (dd, *J* = 12.5, 8.1 Hz, 1H), 2.76 (q, *J* = 7.0 Hz, 2H), 2.44 (s, 3H), 2.25 (dd, *J* = 12.6, 6.4 Hz, 1H), 0.79 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.0, 157.3, 143.4, 142.0, 141.8, 137.5, 132.4, 131.3, 131.1, 129.1, 128.8, 126.2, 124.1, 123.7, 119.6, 113.1, 109.0, 75.1, 55.2, 44.4, 42.1, 30.4, 21.5,

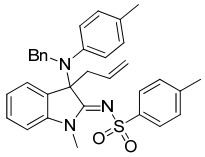
13.4; IR (neat, cm^{-1}) 2982, 1579, 1506, 1466, 1277, 1144, 1084, 810, 753, 675; HRMS (EI): calcd for: 489.2086, Found: 489.2067.

(Z)-N-(3-Allyl-1-methyl-3-(methyl(p-tolyl)amino)indolin-2-ylidene)-4-methylbenzenesulfonamide (5q)



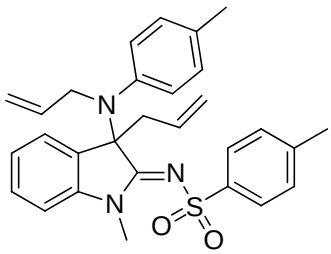
White solid; Yield: 89% ; M.p. 57-58 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.2 Hz, 2H), 7.30 (t, *J* = 7.7 Hz, 1H), 7.23 (d, *J* = 8.0 Hz, 4H), 7.19 (d, *J* = 7.2 Hz, 1H), 7.10 (t, *J* = 7.4 Hz, 1H), 7.01 (d, *J* = 8.1 Hz, 2H), 6.87 (d, *J* = 7.8 Hz, 1H), 5.11 – 4.98 (m, 1H), 4.98 – 4.89 (m, 1H), 4.80 (dd, *J* = 9.8, 2.0 Hz, 1H), 3.69 (dd, *J* = 12.4, 7.8 Hz, 1H), 3.41 (s, 3H), 2.46 (s, 3H), 2.42 – 2.35 (m, 4H), 2.30 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.8, 145.5, 143.1, 141.7, 141.6, 134.0, 131.6, 131.1, 128.9, 128.9, 128.8, 126.7, 126.4, 123.8, 123.7, 119.9, 109.0, 74.6, 42.3, 38.0, 29.8, 21.4, 20.8; IR (neat, cm^{-1}) 2985, 1579, 1467, 1276, 1147, 1085, 925, 812, 754, 678; HRMS (EI): calcd for: 459.1980, Found:459.1972.

(Z)-N-(3-Allyl-3-(benzyl(p-tolyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzenesulfonamide (5r)



White solid; Yield: 36% ; M.p. 62-63 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.2 Hz, 2H), 7.44 (d, *J* = 7.3 Hz, 1H), 7.37 – 7.28 (m, 3H), 7.21 – 7.13 (m, 3H), 7.08 (t, *J* = 7.3 Hz, 2H), 7.06 – 6.98 (m, 3H), 6.90 (d, *J* = 7.9 Hz, 1H), 6.75 (d, *J* = 8.1 Hz, 2H), 5.09-5.02 (m, 1H), 4.88 (d, *J* = 16.7 Hz, 1H), 4.80 (dd, *J* = 10.1, 1.6 Hz, 1H), 4.28 (d, *J* = 14.3 Hz, 1H), 3.93 (d, *J* = 14.3 Hz, 1H), 3.63 (s, 3H), 2.98 (dd, *J* = 12.5, 8.0 Hz, 1H), 2.51 (dd, *J* = 12.5, 6.6 Hz, 1H), 2.45 (s, 3H), 2.15 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 168.6, 143.7, 142.7, 142.0, 141.5, 138.9, 134.3, 132.2, 130.7, 129.1, 129.0, 128.8, 128.6, 128.4, 127.7, 126.4, 126.3, 124.2, 124.1, 120.1, 109.3, 74.4, 54.1, 43.0, 31.7, 21.5, 20.8; IR (neat, cm^{-1}) 3008, 1587, 1467, 1275, 1146, 1086, 917, 814, 753, 678; MS (malditof): calcd for ($C_{33}H_{33}N_3O_2S+H^+$): 536.237, Found: 536.237.

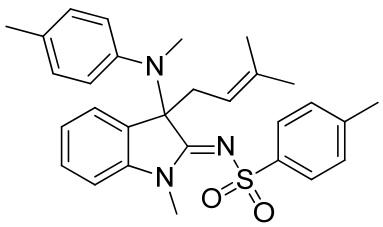
(Z)-N-(3-Allyl-3-(allyl(p-tolyl)amino)-1-methylindolin-2-ylidene)-4-methylbenzenesulfonamide (5s)



White solid; Yield: 71% ; M.p. 65-66 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.93 (d, *J* = 8.2 Hz, 2H), 7.38 – 7.19 (m, 6H), 7.14 (t, *J* = 7.4 Hz, 1H), 6.97 (d, *J* = 8.1 Hz, 2H), 6.88 (d, *J* = 7.8 Hz, 1H), 5.83 – 5.59 (m, 1H), 5.08 – 4.94 (m, 1H), 4.94 – 4.73 (m, 4H), 3.55 (dd, *J* = 14.2, 5.2 Hz, 1H), 3.50 – 3.37 (m, 5H), 2.43 (s, 3H), 2.33 (dd, *J* = 12.5, 6.3 Hz, 1H), 2.28 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.9, 143.3, 142.6, 141.85, 14.78, 136.4, 134.5, 132.0, 131.0, 129.0, 128.87, 128.85, 128.6, 126.2, 124.1, 123.8, 119.9,

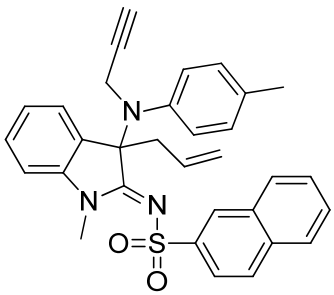
116.3, 109.1, 74.6, 53.5, 42.2, 30.2, 21.5, 20.9; IR (neat, cm^{-1}) 2983, 1578, 1467, 1276, 1145, 1085, 920, 812, 753, 678; HRMS (EI): calcd for: 485.2137, Found:485.2134.

(Z)-4-Methyl-N-(1-methyl-3-(methyl(p-tolyl)amino)-3-(3-methylbut-2-en-1-yl)indolin-2-ylidene)benzenesulfonamide (5ua)



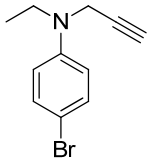
White solid; Yield: 68% ; M.p. 57-58 ^{0}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.89 (d, *J* = 8.2 Hz, 2H), 7.35 – 7.26 (m, 1H), 7.24 – 7.12 (m, 5H), 7.07 (t, *J* = 7.5 Hz, 1H), 6.97 (d, *J* = 8.1 Hz, 2H), 6.85 (d, *J* = 7.8 Hz, 1H), 4.41 (t, *J* = 7.4 Hz, 1H), 3.52 (dd, *J* = 12.9, 8.4 Hz, 1H), 3.44 (s, 3H), 2.51 (s, 3H), 2.39-2.36 (m, 4H), 2.28 (s, 3H), 1.42 (s, 3H), 1.37 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.4, 145.8, 143.2, 141.7, 141.6, 136.3, 133.5, 132.2, 128.9, 128.7, 128.6, 126.5, 126.1, 123.8, 123.6, 116.3, 108.8, 74.7, 38.0, 37.3, 30.1, 25.8, 21.4, 20.8, 18.1; IR (neat, cm^{-1}) 2984, 1577, 1467, 1276, 1147, 1085, 931, 810, 794, 676; HRMS (EI): calcd for: 487.2293, Found: 487.2279.

(Z)-N-(3-Allyl-1-methyl-3-(prop-2-yn-1-yl(p-tolyl)amino)indolin-2-ylidene)naphthalene-2-sulfonamide (5x)



White solid; Yield: 62%; M.p. 115-116^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (d, *J* = 1.3 Hz, 1H), 7.95 (dd, *J* = 8.7, 1.8 Hz, 1H), 7.84 (d, *J* = 8.7 Hz, 3H), 7.63 – 7.49 (m, 2H), 7.37 (d, *J* = 7.4 Hz, 1H), 7.30 – 7.21 (m, 1H), 7.07 (td, *J* = 7.5, 0.7 Hz, 1H), 6.87-6.82 (m, 3H), 6.71 (d, *J* = 8.3 Hz, 2H), 5.13 – 4.96 (m, 2H), 4.88 (dd, *J* = 7.8, 4.4 Hz, 1H), 4.42 (dd, *J* = 18.4, 2.0 Hz, 1H), 3.91 (dd, *J* = 18.4, 2.3 Hz, 1H), 3.63 (dd, *J* = 11.2, 5.6 Hz, 1H), 3.46 (s, 3H), 2.93 (dd, *J* = 11.5, 3.7 Hz, 1H), 2.23 (t, *J* = 2.3 Hz, 1H), 2.06 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.4, 143.8, 142.7, 140.8, 134.3, 132.0, 131.9, 130.4, 129.2, 128.9, 128.8, 128.5, 127.9, 127.6, 126.8, 126.5, 124.25, 124.21, 122.6, 120.6, 109.0, 82.9, 73.7, 72.2, 42.3, 39.1, 29.9, 20.5; IR (neat, cm^{-1}) 3056, 2921, 1622, 1574, 1518, 1488, 1469, 1384, 1493, 1148, 1126, 1072, 778, 750, 674; HRMS (ESI): calcd for ($C_{32}H_{29}N_3O_2S+H^+$): 520.2053, Found: 520.2066.

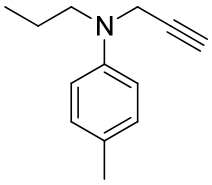
4-Bromo-N-ethyl-N-(prop-2-yn-1-yl)aniline (6d)



Yellow oil; Yield: 80%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 – 7.29 (m, 2H), 6.73 – 6.66 (m, 2H), 3.98 (d, *J* = 2.4 Hz, 2H), 3.41 (q, *J* = 7.1 Hz, 2H), 2.19 (t, *J* = 2.4 Hz, 1H), 1.20 (t, *J* = 7.1 Hz, 3H);

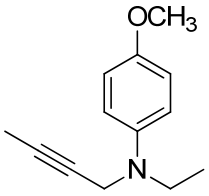
^{13}C NMR (100 MHz, $CDCl_3$) δ 146.7, 131.8, 115.3, 109.6, 79.8, 71.9, 45.7, 39.6, 12.2; HRMS (EI): calcd for: 237.0153, Found:237.0158.

4-Methyl-N-(prop-2-yn-1-yl)-N-propylaniline (6f)



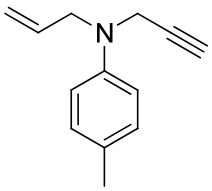
Yellow oil; Yield: 83%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (d, *J* = 8.7 Hz, 2H), 6.76 (d, *J* = 8.6 Hz, 2H), 3.99 (d, *J* = 2.3 Hz, 2H), 3.31 – 3.20 (m, 2H), 2.26 (s, 3H), 2.16 (t, *J* = 2.3 Hz, 1H), 1.71 – 1.60 (m, 2H), 0.94 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.2, 129.6, 127.0, 114.3, 80.3, 71.6, 53.4, 40.4, 20.6, 20.3, 11.5; HRMS (EI): calcd for: 187.1361, Found:187.1361.

N-(But-2-yn-1-yl)-N-ethyl-4-methoxyaniline (6j)



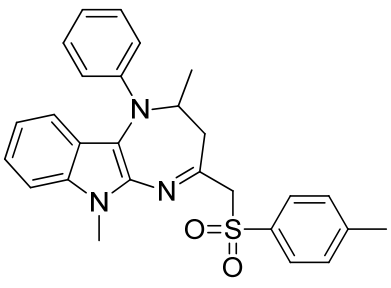
Yellow oil; Yield: 88%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.92 – 6.77 (m, 4H), 3.88 (q, *J* = 2.3 Hz, 2H), 3.76 (s, 3H), 3.32 (q, *J* = 7.1 Hz, 2H), 1.78 (t, *J* = 2.3 Hz, 3H), 1.14 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.7, 143.1, 117.2, 114.5, 79.5, 75.2, 55.6, 46.0, 41.0, 12.4, 3.6; HRMS (EI): calcd for: 203.1310, Found:203.1308.

N-Allyl-4-methyl-N-(prop-2-yn-1-yl)aniline (6k)



Yellow oil; Yield: 84%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (d, *J* = 8.5 Hz, 2H), 6.85 – 6.74 (m, 2H), 5.94-5.84 (m, 1H), 5.30-5.24 (m, 1H), 5.20-5.16 (m, 1H), 3.99 (d, *J* = 2.3 Hz, 2H), 3.92 (d, *J* = 5.4 Hz, 2H), 2.26 (s, 3H), 2.17 (t, *J* = 2.3 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.2, 134.3, 129.6, 127.6, 116.8, 114.7, 80.0, 71.8, 54.0, 39.9, 20.3; HRMS (EI): calcd for: 185.1204, Found:185.1207.

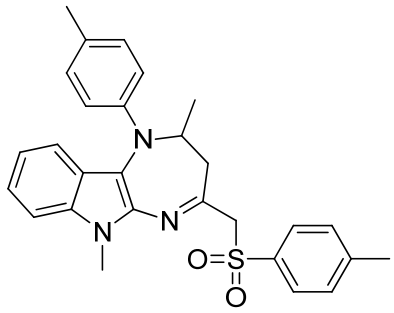
2,6-Dimethyl-1-phenyl-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7a)



Yellow solid; Yield: 31%; M.p. 227-228 ^{0}C ; ^{1}H NMR (400 MHz, acetone) δ 7.75 (d, *J* = 8.3 Hz, 2H), 7.40 (d, *J* = 7.9 Hz, 2H), 7.28 (d, *J* = 8.3 Hz, 1H), 7.26-7.20 (m, 2H), 7.15-7.09 (m, 1H), 6.96 – 6.90 (m, 3H), 6.86 – 6.77 (m, 2H), 4.67 – 4.59 (m, 1H), 4.51 – 4.41 (m, 2H), 3.38 (s, 3H), 3.25 (dd, *J* = 16.8, 5.2 Hz, 1H), 2.52 (dd, *J* = 16.7, 3.4 Hz, 1H), 2.43 (s, 3H), 1.00 (d, *J* =

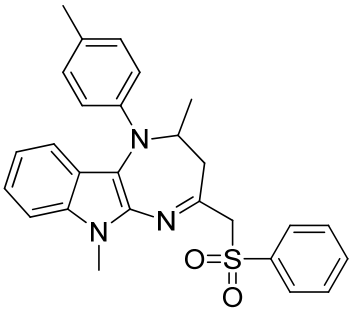
6.9 Hz, 3H); ^{13}C NMR (100 MHz, Acetone) δ 156.3, 151.0, 145.6, 137.6, 136.4, 134.6, 130.6, 130.1, 129.6, 123.9, 122.6, 122.4, 122.1, 121.2, 119.4, 113.8, 110.6, 69.1, 55.1, 44.3, 28.3, 21.6, 18.8; IR (neat, cm^{-1})2929, 1702, 1597, 1495, 1317, 1251, 1151, 1086, 817, 750, 681; HRMS (EI): calcd for: 457.1824, Found: 457.1831.

2,6-Dimethyl-1-(p-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7b)



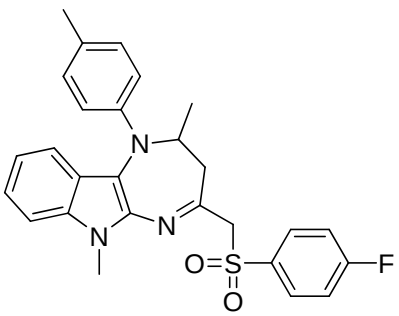
Yellow solid; Yield: 64% ; M.p. 224-225^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 8.3 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.22 – 7.11 (m, 2H), 7.03 (d, *J* = 8.1 Hz, 2H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.88 – 6.77 (m, 3H), 4.50 – 4.39 (m, 1H), 4.36 (d, *J* = 13.1 Hz, 1H), 4.22 (d, *J* = 13.0 Hz, 1H), 3.33 (s, 3H), 3.19 (dd, *J* = 16.7, 5.0 Hz, 1H), 2.46 (dd, *J* = 16.7, 2.8 Hz, 1H), 2.42 (s, 3H), 2.29 (s, 3H), 0.97 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 147.7, 144.6, 135.7, 135.3, 132.7, 131.5, 129.7, 129.5, 128.6, 123.1, 122.1, 121.2, 121.0, 118.3, 114.2, 109.1, 68.8, 54.1, 43.6, 27.7, 21.6, 20.7, 18.3; IR (neat, cm^{-1}) 3053, 2925, 1605, 1466, 1317, 1262, 1151, 1084, 816, 739, 678; HRMS (EI): calcd for: 471.1980, Found: 471.1985.

2,6-Dimethyl-4-((phenylsulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7c)



Yellow solid; Yield: 55% ; M.p. 199-200^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 – 7.81 (m, 2H), 7.70 – 7.57 (m, 1H), 7.52-7.47 (m, 2H), 7.20 – 7.12 (m, 2H), 7.03 (d, *J* = 8.1 Hz, 2H), 6.91 (d, *J* = 8.0 Hz, 1H), 6.85-6.79 (m, 3H), 4.48 – 4.41 (m, 1H), 4.39 (d, *J* = 13.2 Hz, 1H), 4.25 (d, *J* = 13.1 Hz, 1H), 3.30 (s, 3H), 3.20 (dd, *J* = 16.7, 5.0 Hz, 1H), 2.48 (dd, *J* = 16.7, 2.9 Hz, 1H), 2.29 (s, 3H), 0.98 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 151.9, 147.7, 138.7, 135.3, 133.6, 132.6, 131.6, 129.7, 128.9, 128.6, 123.2, 122.1, 121.2, 121.0, 118.3, 114.3, 109.1, 68.8, 54.1, 43.6, 27.9, 20.7, 18.3; IR (neat, cm^{-1}) 2925, 1610, 1509, 1310, 1263, 1154, 817, 742, 690; HRMS (EI): calcd for: 457.1824, Found: 457.1818.

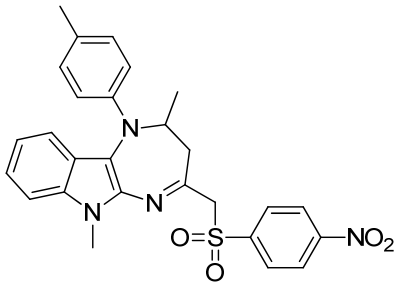
4-(((4-Fluorophenyl)sulfonyl)methyl)-2,6-dimethyl-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7d)



Yellow solid; Yield: 57% ; M.p. 225-226^{0}C ; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.88-7.83 (m, 2H), 7.24 – 7.11 (m, 4H), 7.03 (d, *J* = 8.2 Hz, 2H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.85-6.81 (m, 3H), 4.54 – 4.41 (m, 1H), 4.37 (d, *J* = 13.2 Hz,

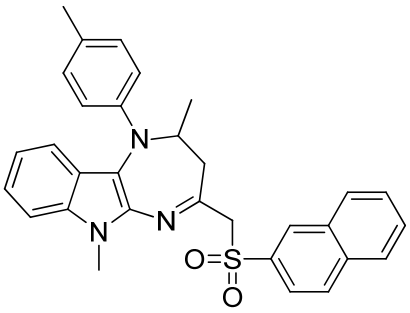
1H), 4.24 (d, J = 13.2 Hz, 1H), 3.36 (s, 3H), 3.17 (dd, J = 16.6, 5.1 Hz, 1H), 2.48 (dd, J = 16.5, 2.9 Hz, 1H), 2.29 (s, 3H), 0.99 (d, J = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 165.8 (d, $J_{C\text{-}F}$ = 256.4 Hz), 151.9, 147.6, 135.3, 134.6 (d, $J_{C\text{-}F}$ = 3.1 Hz), 132.6, 131.53, 131.46 (d, $J_{C\text{-}F}$ = 9.6 Hz), 129.8, 123.3, 121.9, 121.2, 121.0, 118.4, 116.2 (d, $J_{C\text{-}F}$ = 22.6 Hz), 114.3, 109.2, 68.8, 54.4, 43.7, 27.8, 20.6, 18.4; IR (neat, cm^{-1}) 3056, 2927, 1591, 1507, 1324, 1262, 1150, 1084, 839, 818, 742; HRMS (EI): calcd for: 475.1730, Found: 475.1737.

2,6-Dimethyl-4-(((4-nitrophenyl)sulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7e)



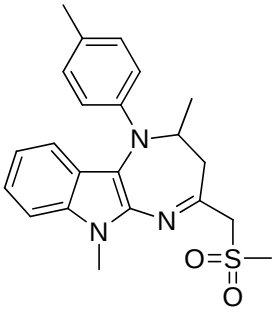
Yellow solid; Yield: 40% ; M.p. 204-205^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.42 – 8.25 (m, 2H), 8.15 – 7.98 (m, 2H), 7.20 (d, J = 3.4 Hz, 2H), 7.07 (d, J = 8.2 Hz, 2H), 6.93 (d, J = 8.0 Hz, 1H), 6.88-6.82 (m, 3H), 4.58-4.50 (m, 1H), 4.48 (d, J = 13.4 Hz, 1H), 4.35 (d, J = 13.4 Hz, 1H), 3.33 (s, 3H), 3.19 (dd, J = 16.4, 5.4 Hz, 1H), 2.52 (dd, J = 16.4, 3.0 Hz, 1H), 2.33 (s, 3H), 1.02 (d, J = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 151.2, 150.7, 147.3, 144.2, 135.4, 132.6, 131.6, 130.1, 129.8, 124.0, 123.6, 121.7, 121.1, 121.0, 118.6, 114.5, 109.2, 68.5, 55.2, 43.8, 27.8, 20.6, 18.4; IR (neat, cm^{-1}) 2924, 1568, 1530, 1468, 1347, 1156, 1087, 1015, 854, 745, 686; HRMS (ESI): calcd for ($C_{27}H_{26}N_4O_4S$+H^+): 503.1748, Found: 503.1728.

2,6-Dimethyl-4-((naphthalen-2-ylsulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7f)



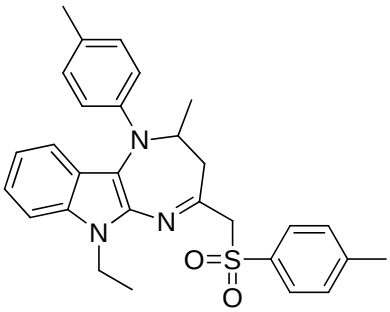
Yellow solid; Yield: 59% ; M.p. 94-95^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.42 (s, 1H), 7.95-7.83 (m, 4H), 7.72 – 7.63 (m, 1H), 7.62 – 7.55 (m, 1H), 7.15 – 7.07 (m, 1H), 7.08 – 6.97 (m, 3H), 6.89 (d, J = 8.0 Hz, 1H), 6.86 – 6.74 (m, 3H), 4.55 – 4.37 (m, 2H), 4.32 (d, J = 13.1 Hz, 1H), 3.23 (dd, J = 16.7, 5.0 Hz, 1H), 2.97 (s, 3H), 2.52 (dd, J = 16.7, 2.8 Hz, 1H), 2.29 (s, 3H), 0.99 (d, J = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.9, 147.7, 135.5, 135.25, 135.22, 132.5, 132.0, 131.5, 130.4, 129.7, 129.4, 129.3, 129.1, 127.8, 127.6, 123.2, 123.1, 122.12, 121.09, 120.9, 118.2, 114.2, 109.1, 68.7, 54.0, 43.7, 27.4, 20.7, 18.3; IR (neat, cm^{-1}) 3055, 2927, 1611, 1509, 1316, 1263, 1152, 818, 744, 676; HRMS (ESI): calcd for ($C_{31}H_{29}N_3O_2S$+H^+): 508.2053, Found: 508.2049.

2,6-Dimethyl-4-((methylsulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7g)



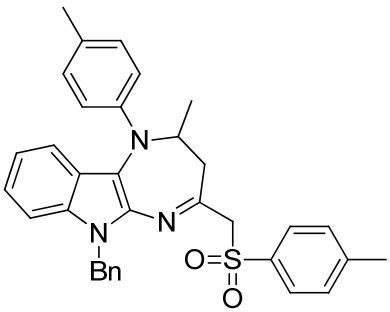
Yellow solid; Yield: 32% ; M.p. 70-71^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20 (d, *J* = 8.3 Hz, 1H), 7.25 – 7.18 (m, 1H), 7.03 (d, *J* = 8.1 Hz, 2H), 6.92 (d, *J* = 7.9 Hz, 1H), 6.89 (d, *J* = 8.4 Hz, 2H), 6.88 – 6.82 (m, 1H), 4.68 – 4.39 (m, 1H), 4.27 (d, *J* = 13.5 Hz, 1H), 4.11 (d, *J* = 13.5 Hz, 1H), 3.81 (s, 3H), 3.20 (dd, *J* = 16.6, 5.0 Hz, 1H), 3.03 (s, 3H), 2.46 (dd, *J* = 16.6, 2.6 Hz, 1H), 2.29 (s, 3H), 1.01 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 147.8, 135.6, 132.3, 132.0, 129.8, 123.6, 122.6, 121.2, 121.1, 118.4, 115.1, 109.2, 67.4, 54.0, 43.8, 40.0, 28.4, 20.7, 18.1; IR (neat, cm^{-1}) 2927, 1610, 1509, 1467, 1309, 1260, 1153, 1118, 911, 817, 736; HRMS (EI): calcd for: 395.1667, Found: 395.1664.

6-Ethyl-2-methyl-1-(p-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7h)



Yellow solid; Yield: 60%; M.p. 191-192^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, *J* = 8.3 Hz, 2H), 7.27 – 7.24 (m, 2H), 7.20 (d, *J* = 8.3 Hz, 1H), 7.16 – 7.11 (m, 1H), 7.03 (d, *J* = 8.1 Hz, 2H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.85 – 6.77 (m, 3H), 4.51 – 4.40 (m, 1H), 4.37 (d, *J* = 13.1 Hz, 1H), 4.23 (d, *J* = 13.1 Hz, 1H), 3.94 (q, *J* = 7.1 Hz, 2H), 3.20 (dd, *J* = 16.7, 5.0 Hz, 1H), 2.47 (dd, *J* = 16.7, 3.0 Hz, 1H), 2.39 (s, 3H), 2.29 (s, 3H), 1.01 (t, *J* = 7.1 Hz, 3H), 0.98 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 147.7, 144.7, 135.8, 134.2, 132.1, 131.4, 129.7, 129.6, 128.5, 123.0, 122.0, 121.4, 121.1, 118.1, 114.1, 109.1, 69.1, 54.1, 43.4, 36.2, 21.6, 20.7, 18.3, 14.8;IR (neat, cm^{-1}) 2976, 2930, 1526, 1507, 1317, 1230, 1154, 1084, 909. 816, 738; HRMS (EI): calcd for: 485.2137, Found: 485.2132.

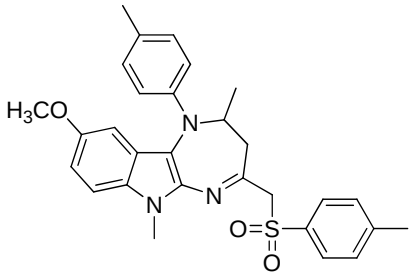
6-Benzyl-2-methyl-1-(p-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7i)



Yellow solid; Yield: 44%; M.p. 85-86^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, *J* = 8.2 Hz, 2H), 7.27 – 7.16 (m, 5H), 7.07 – 7.03 (m, 4H), 6.99 (d, *J* = 6.7 Hz, 2H), 6.93 (d, *J* = 8.0 Hz, 1H), 6.87 (d, *J* = 8.2 Hz, 2H), 6.83 – 6.78 (m,

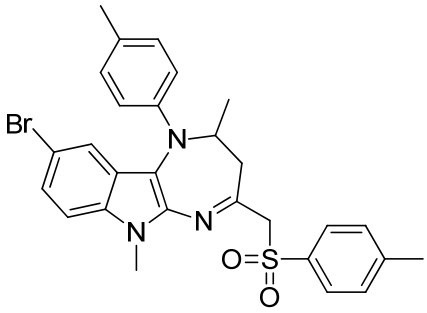
1H), 5.12 – 4.95 (m, 2H), 4.53 – 4.38 (m, 1H), 4.33 (d, *J* = 13.2 Hz, 1H), 4.18 (d, *J* = 13.1 Hz, 1H), 3.22 (dd, *J* = 16.7, 5.0 Hz, 1H), 2.50 (dd, *J* = 16.8, 2.8 Hz, 1H), 2.37 (s, 3H), 2.30 (s, 3H), 1.02 (d, *J* = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.5, 147.6, 144.6, 138.9, 135.9, 134.8, 132.4, 131.6, 129.8, 129.6, 128.44, 128.38, 126.9, 126.5, 123.4, 122.1, 121.6, 121.0, 118.6, 114.4, 109.9, 68.8, 54.1, 44.8, 43.7, 21.6, 20.7, 18.4; IR (neat, cm^{-1}) 2925, 1597, 1508, 1454, 1317, 1152, 1084, 909, 816, 737; HRMS (EI): calcd for: 547.2293, Found: 547.2300.

9-methoxy-2,6-dimethyl-1-(p-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7j)



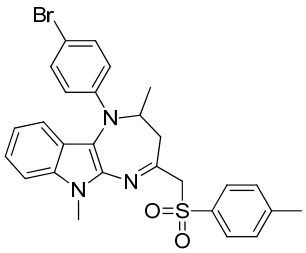
Yellow solid; Yield: 56%; M.p. 76-77^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, *J* = 8.3 Hz, 2H), 7.27 (d, *J* = 7.8 Hz, 2H), 7.10 (d, *J* = 8.9 Hz, 1H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.89 – 6.75 (m, 3H), 6.35 (d, *J* = 2.4 Hz, 1H), 4.48 – 4.40 (m, 1H), 4.34 (d, *J* = 13.1 Hz, 1H), 4.21 (d, *J* = 13.0 Hz, 1H), 3.58 (s, 3H), 3.30 (s, 3H), 3.17 (dd, *J* = 16.8, 5.0 Hz, 1H), 2.50 (dd, *J* = 16.8, 3.1 Hz, 1H), 2.42 (s, 3H), 2.28 (s, 3H), 0.99 (d, *J* = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.9, 152.3, 147.2, 144.6, 135.7, 133.6, 131.1, 130.7, 129.7, 129.5, 128.6, 121.5, 121.4, 113.7, 113.7, 110.0, 102.3, 68.7, 55.7, 53.8, 43.5, 27.8, 21.6, 20.6, 18.4; IR (neat, cm^{-1}) 2929, 1614, 1511, 1383, 1317, 1297, 1265, 1155, 1086, 806, 744; HRMS (EI): calcd for: 501.2086, Found: 501.2072.

9-bromo-2,6-dimethyl-1-(p-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7k)



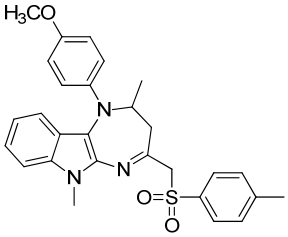
Yellow solid; Yield: 40%; M.p. 98-99^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 8.3 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.23 (dd, *J* = 8.8, 1.9 Hz, 1H), 7.10 – 6.98 (m, 4H), 6.79 (d, *J* = 8.4 Hz, 2H), 4.50 – 4.37 (m, 1H), 4.35 (d, *J* = 13.0 Hz, 1H), 4.21 (d, *J* = 13.0 Hz, 1H), 3.32 (s, 3H), 3.17 (dd, *J* = 16.8, 4.9 Hz, 1H), 2.47 (dd, *J* = 16.8, 3.1 Hz, 1H), 2.42 (s, 3H), 2.30 (s, 3H), 0.96 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.8, 147.4, 144.6, 135.7, 133.8, 133.5, 131.8, 129.9, 129.6, 128.5, 126.0, 123.0, 122.9, 121.8, 113.5, 111.3, 110.7, 68.7, 54.0, 43.6, 27.9, 21.6, 20.7, 18.3; IR (neat, cm^{-1}) 2924, 1610, 1508, 1465, 1378, 1263, 1153, 1087, 820,752; HRMS (EI): calcd for: 549.1086, Found: 549.1081.

1-(4-bromophenyl)-2,6-dimethyl-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole(7l)



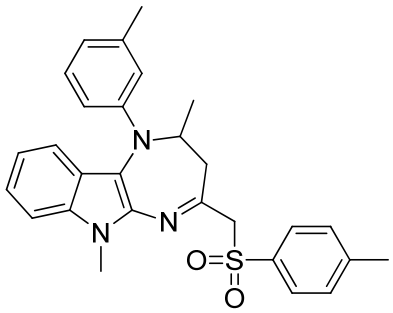
yellow solid; Yield: 56%; M.p. 202-203^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 8.3 Hz, 2H), 7.30 (d, *J* = 9.0 Hz, 2H), 7.26 – 7.15 (m, 4H), 6.99 – 6.92 (m, 1H), 6.91 – 6.86 (m, 1H), 6.79 – 6.70 (m, 2H), 4.62 – 4.47 (m, 1H), 4.35 (d, *J* = 13.1 Hz, 1H), 4.23 (d, *J* = 13.0 Hz, 1H), 3.35 (s, 3H), 3.16 (dd, *J* = 16.6, 5.4 Hz, 1H), 2.55 (dd, *J* = 16.6, 3.5 Hz, 1H), 2.41 (s, 3H), 1.04 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.5, 148.1, 144.7, 135.5, 135.1, 133.8, 132.0, 129.6, 128.5, 123.2, 122.0, 121.2, 120.5, 118.8, 113.6, 112.3, 109.3, 68.6, 54.7, 43.7, 27.9, 21.6, 18.4; IR (neat, cm^{-1}) 2929, 1586, 1528, 1486, 1317, 1302, 1153, 1083, 909, 814, 736; HRMS (EI): calcd for: 535.0929, Found:535.0922.

1-(4-methoxyphenyl)-2,6-dimethyl-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7m)



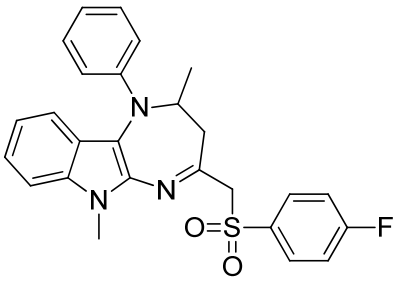
Yellow solid; Yield: 65%; M.p. 91-92^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, *J* = 8.2 Hz, 2H), 7.29 (d, *J* = 8.1 Hz, 2H), 7.22 – 7.09 (m, 2H), 6.92 – 6.86 (m, 3H), 6.84 – 6.73 (m, 3H), 4.38 (d, *J* = 13.1 Hz, 1H), 4.31 – 4.25 (m, 1H), 4.23 (d, *J* = 13.1 Hz, 1H), 3.77 (s, 3H), 3.32 (s, 3H), 3.19 (dd, *J* = 16.6, 5.0 Hz, 1H), 2.48 – 2.33 (m, 4H), 0.94 (d, *J* = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 155.3, 151.3, 144.6, 144.3, 135.8, 135.4, 132.1, 129.5, 128.6, 124.4, 123.2, 121.1, 121.0, 118.2, 115.0, 114.4, 109.0, 68.9, 55.4, 54.7, 43.3, 27.7, 21.6, 18.3; IR (neat, cm^{-1}) 2931, 1597, 1526, 1505, 1467, 1381, 1316, 1243, 1153, 1084, 1036, 910, 827, 737; HRMS (EI): calcd for: 487.1930, Found: 487.1940.

2,6-dimethyl-1-(m-tolyl)-4-(tosylmethyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7n)



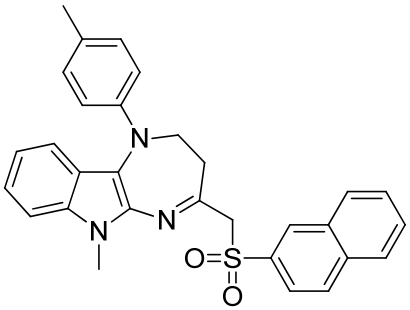
Yellow solid; Yield: 43%; M.p. 220-221^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 8.3 Hz, 2H), 7.26 (d, *J* = 8.5 Hz, 2H), 7.22 – 7.13 (m, 2H), 7.09 (t, *J* = 7.8 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 1H), 6.86 – 6.81 (m, 1H), 6.78 – 6.75 (m, 2H), 6.68 (d, *J* = 7.6 Hz, 1H), 4.62 – 4.45 (m, 1H), 4.36 (d, *J* = 13.1 Hz, 1H), 4.24 (d, *J* = 13.1 Hz, 1H), 3.33 (s, 3H), 3.18 (dd, *J* = 16.7, 5.2 Hz, 1H), 2.53 (dd, *J* = 16.7, 3.1 Hz, 1H), 2.41 (s, 3H), 2.26 (s, 3H), 1.00 (d, *J* = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.1, 149.6, 144.6, 138.9, 135.6, 135.2, 133.1, 129.5, 128.9, 128.6, 123.1, 122.6, 121.9, 121.4, 120.9, 118.8, 118.4, 113.6, 109.1, 68.6, 54.2, 43.8, 27.8, 21.59, 21.58, 18.4; IR (neat, cm^{-1}) 2926, 1600, 1526, 1488, 1382, 1317, 1153, 1084, 909, 737; HRMS (EI): calcd for: 471.1980, Found:471.1978.

4-(((4-fluorophenyl)sulfonyl)methyl)-2,6-dimethyl-1-phenyl-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7o)



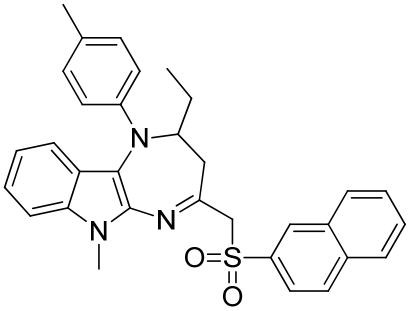
Yellow solid; Yield: 52%; M.p. 223-224^{0}C ; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.85 – 7.82 (m, 2H), 7.25 – 7.16 (m, 4H), 7.12 (t, *J* = 8.4 Hz, 2H), 6.99 – 6.88 (m, 4H), 6.85 (t, *J* = 7.2 Hz, 1H), 4.64 – 4.57 (m, 1H), 4.36 (d, *J* = 13.2 Hz, 1H), 4.24 (d, *J* = 13.2 Hz, 1H), 3.38 (s, 3H), 3.17 (dd, *J* = 16.6, 5.3 Hz, 1H), 2.56 (dd, *J* = 16.4, 2.4 Hz, 1H), 1.04 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 165.8 (d, $J_{C\text{-}F}$ = 256.5 Hz), 153.2, 149.4, 135.3, 134.5 (d, $J_{C\text{-}F}$ = 3.1 Hz), 133.3, 131.5 (d, $J_{C\text{-}F}$ = 9.5 Hz), 129.2, 123.3, 121.6, 121.3, 121.0, 120.8, 118.6, 116.2 (d, $J_{C\text{-}F}$ = 22.6 Hz), 113.5, 109.2, 68.8, 54.8, 43.9, 27.9, 18.5; IR (neat, cm^{-1}) 3061, 2926, 2854, 1704, 1613, 1590, 1526, 1493, 1470, 1319, 1290, 1149, 1083, 909, 839, 740; HRMS (EI): calcd for: 461.1573, Found: 461.1567.

6-methyl-4-((naphthalen-2-ylsulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole (7p)



Yellow solid; Yield: 25%; M.p. 76-77^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.38 (d, *J* = 1.2 Hz, 1H), 7.93 – 7.86 (m, 3H), 7.78 (dd, *J* = 8.6, 1.8 Hz, 1H), 7.69 – 7.64 (m, 1H), 7.61 – 7.53 (m, 1H), 7.10 – 7.16 (m, 1H), 7.06 (d, *J* = 9.2 Hz, 2H), 7.03 – 6.98 (m, 2H), 6.88 – 6.81 (m, 3H), 4.35 (s, 2H), 3.77 – 3.65 (m, 2H), 3.01 – 2.96 (m, 2H), 2.95 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.2, 146.0, 135.4, 135.3, 134.8, 132.3, 132.0, 131.0, 130.4, 129.8, 129.4, 129.3, 129.1, 127.8, 127.6, 123.3, 123.1, 120.7, 120.6, 120.4, 118.5, 116.7, 109.2, 68.4, 47.5, 39.7, 27.3, 20.6; IR (neat, cm^{-1}) 2925, 1612, 1508, 1372, 1313, 1151, 1128, 1071, 909, 863, 737; HRMS (ESI): calcd for ($C_{30}H_{27}N_3O_2S$+H^+): 494.1897, Found:494.1862.

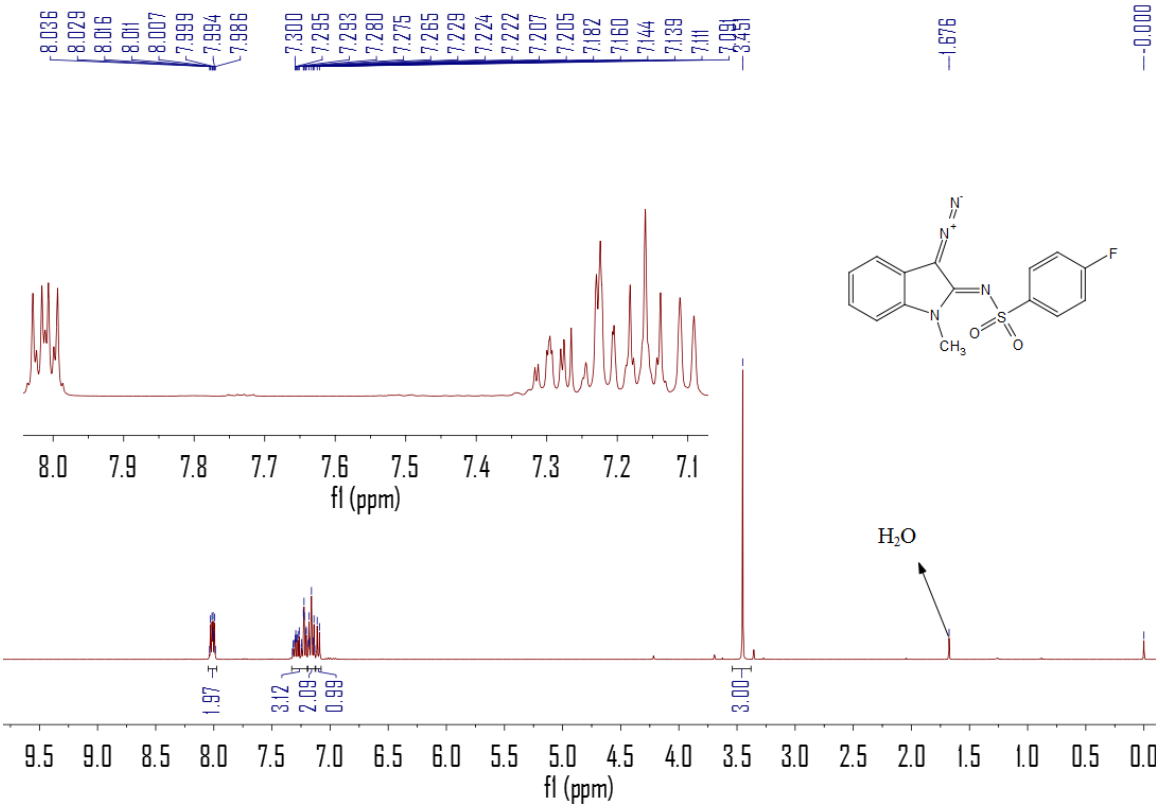
2-ethyl-6-methyl-4-((naphthalen-2-ylsulfonyl)methyl)-1-(p-tolyl)-1,2,3,6-tetrahydro-[1,4]diazepino[2,3-b]indole(7q)



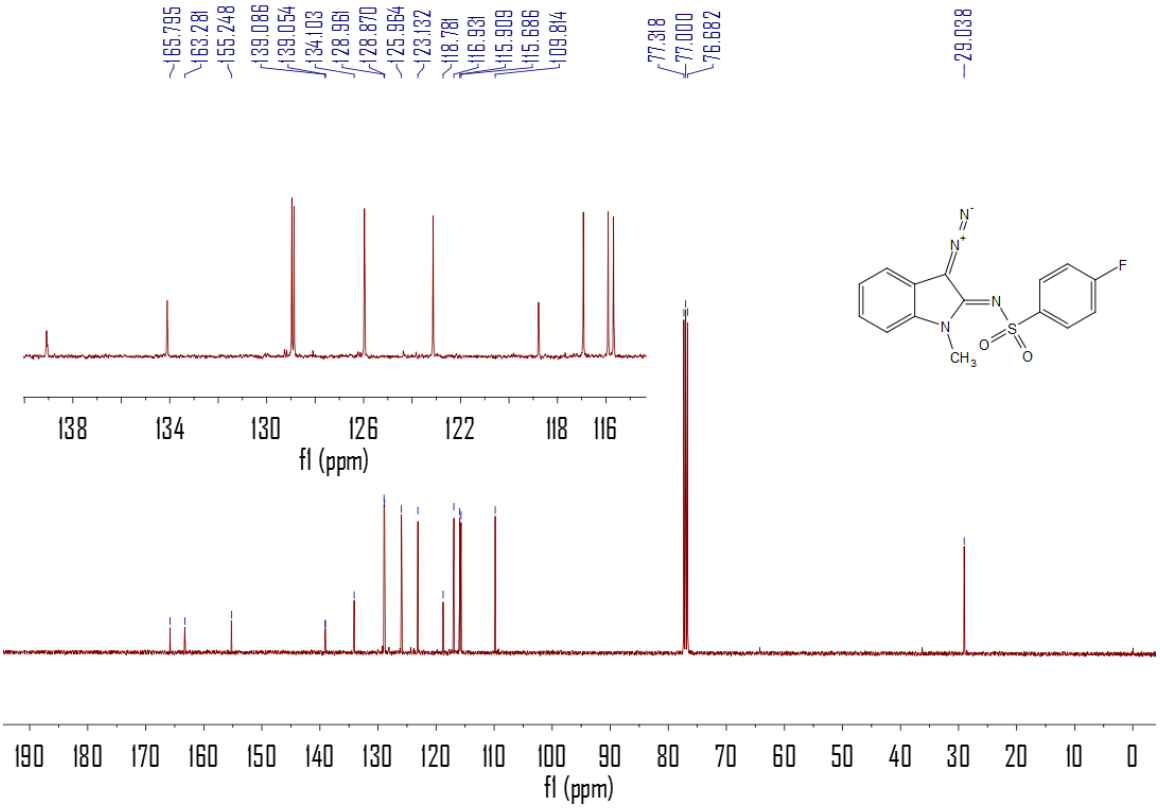
Yellow solid; Yield: 63%; M.p. 97-98 ^{0}C ; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.42 (d, *J* = 1.0 Hz, 1H), 7.95 (d, *J* = 8.6 Hz, 1H), 7.90 (t, *J* = 7.4 Hz, 2H),

7.84 (dd, *J* = 8.6, 1.8 Hz, 1H), 7.69 – 7.63 (m, 1H), 7.61 – 7.56 (m, 1H), 7.13 – 7.08 (m, 1H), 7.05 – 7.00 (m, 3H), 6.89 (d, *J* = 8.0 Hz, 1H), 6.84 (d, *J* = 8.3 Hz, 2H), 6.81– 6.75(m, 1H), 4.45 (d, *J* = 13.1 Hz, 1H), 4.29 (d, *J* = 13.1 Hz, 1H), 4.18 – 4.07 (m, 1H), 3.31 (dd, *J* = 16.9, 4.5 Hz, 1H), 2.96 (s, 3H), 2.53 (dd, *J* = 16.9, 3.1 Hz, 1H), 2.29 (s, 3H), 1.37 – 1.28 (m, 1H), 0.99 – 0.95 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.5, 148.1, 135.5, 135.2, 132.4, 132.0, 131.4, 130.4, 129.7, 129.33, 129.28, 129.0, 127.8, 127.7, 123.2, 123.1, 122.3, 121.0, 120.9, 118.2, 114.0, 109.0, 68.8, 59.9, 43.1, 27.3, 24.4, 20.6, 11.5; IR (neat, cm^{-1}) 2961, 2929, 1608, 1527, 1509, 1310, 1251, 1152, 1069, 861, 813, 739; HRMS (ESI): calcd for ($C_{32}H_{31}N_3O_2S+H^+$): 522.2210, Found: 522.2236.

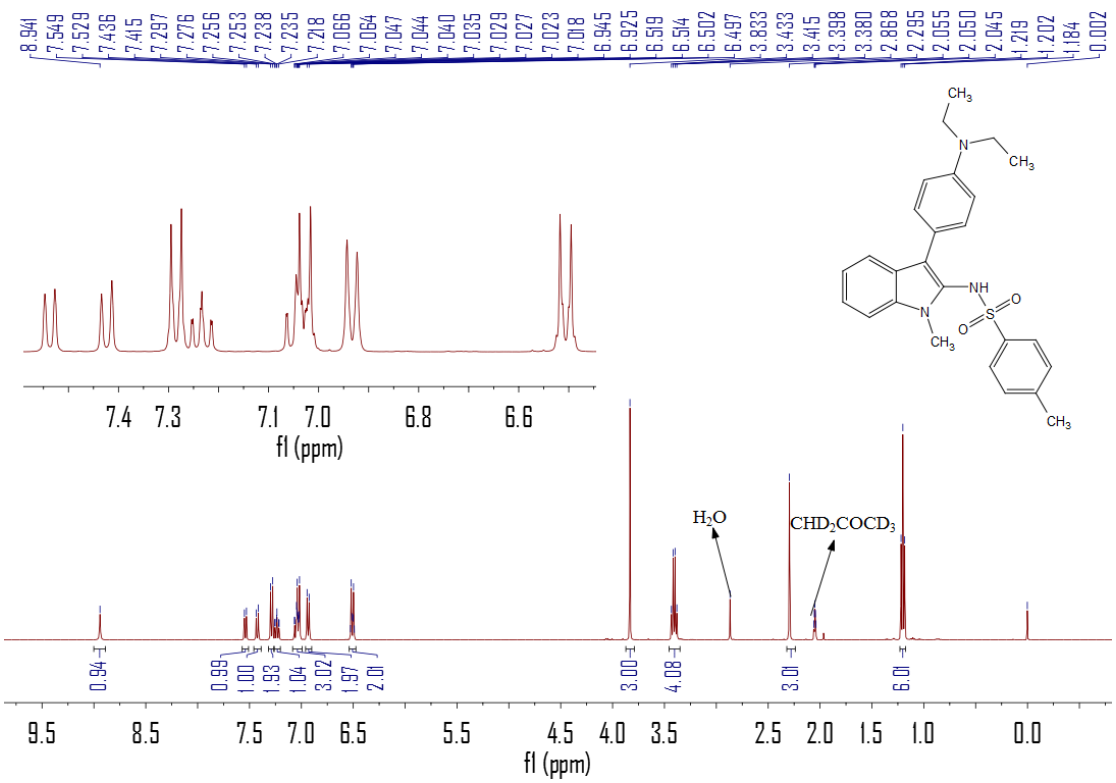
Copies of ^{1}H & ^{13}C NMR Spectra



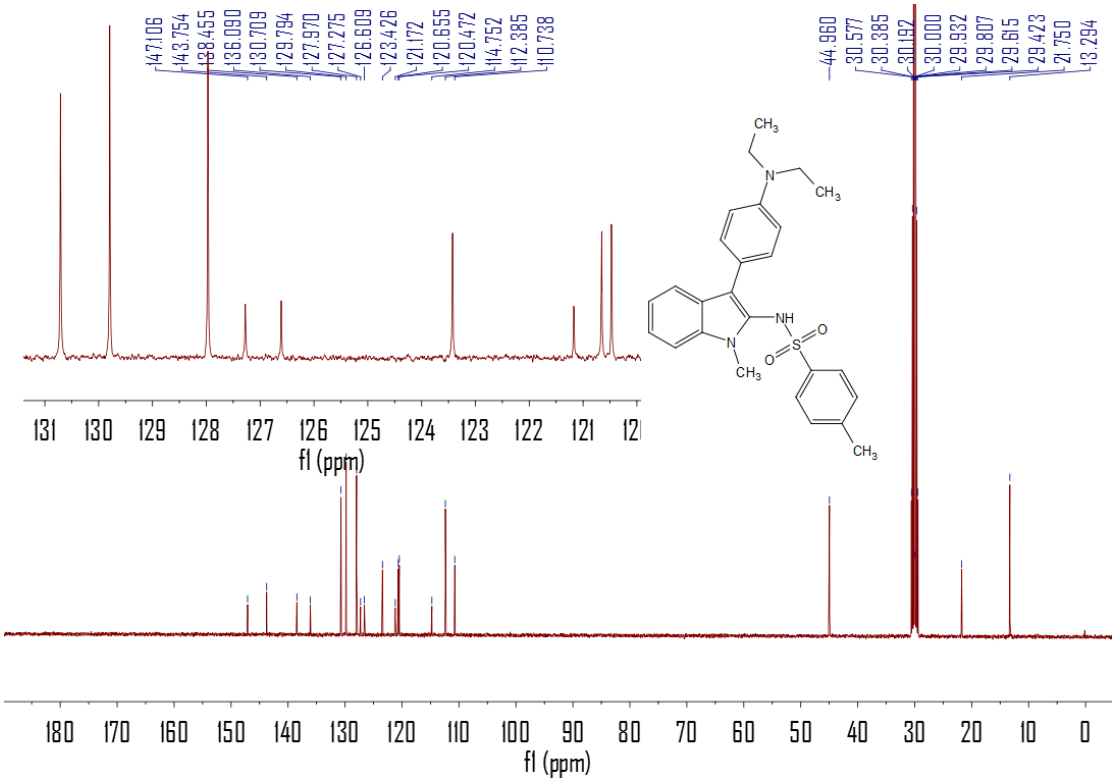
^{1}H NMR Spectrum for **1e** ($CDCl_3$, 400 MHz)



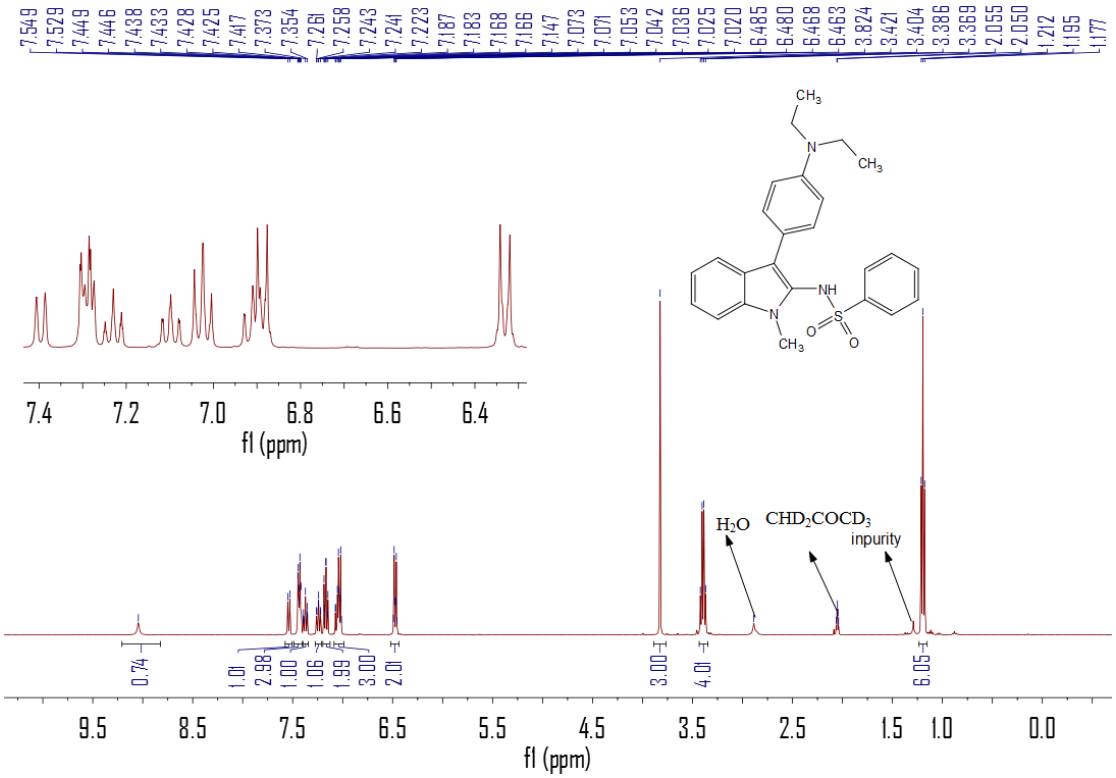
^{13}C NMR Spectrum for **1e** ($CDCl_3$, 100 MHz)



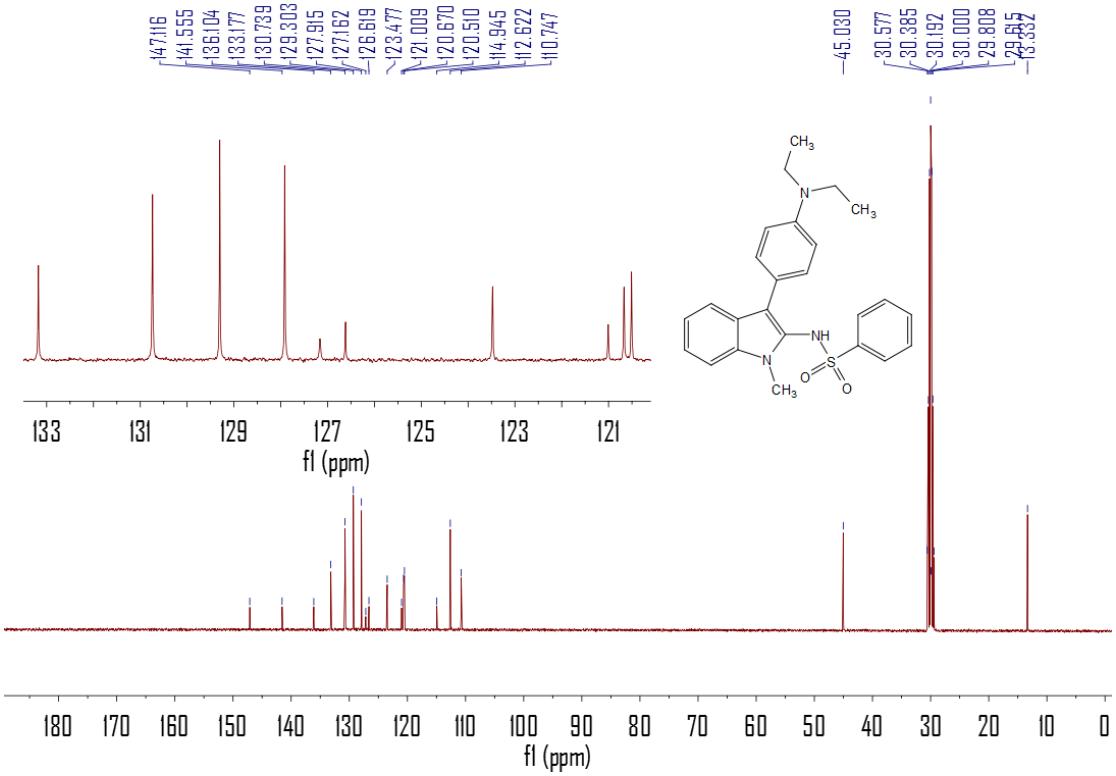
^{1}H NMR Spectrum for **3a** (Acetone, 400 MHz)



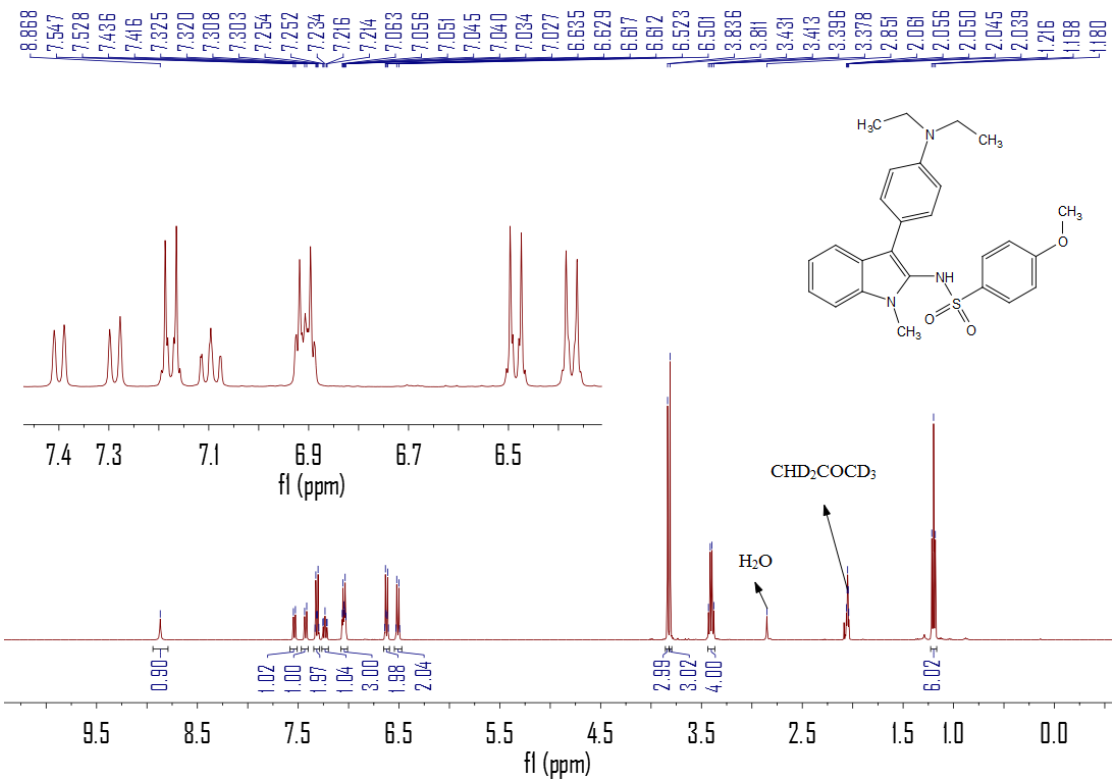
^{13}C NMR Spectrum for **3a** (Acetone, 100 MHz)



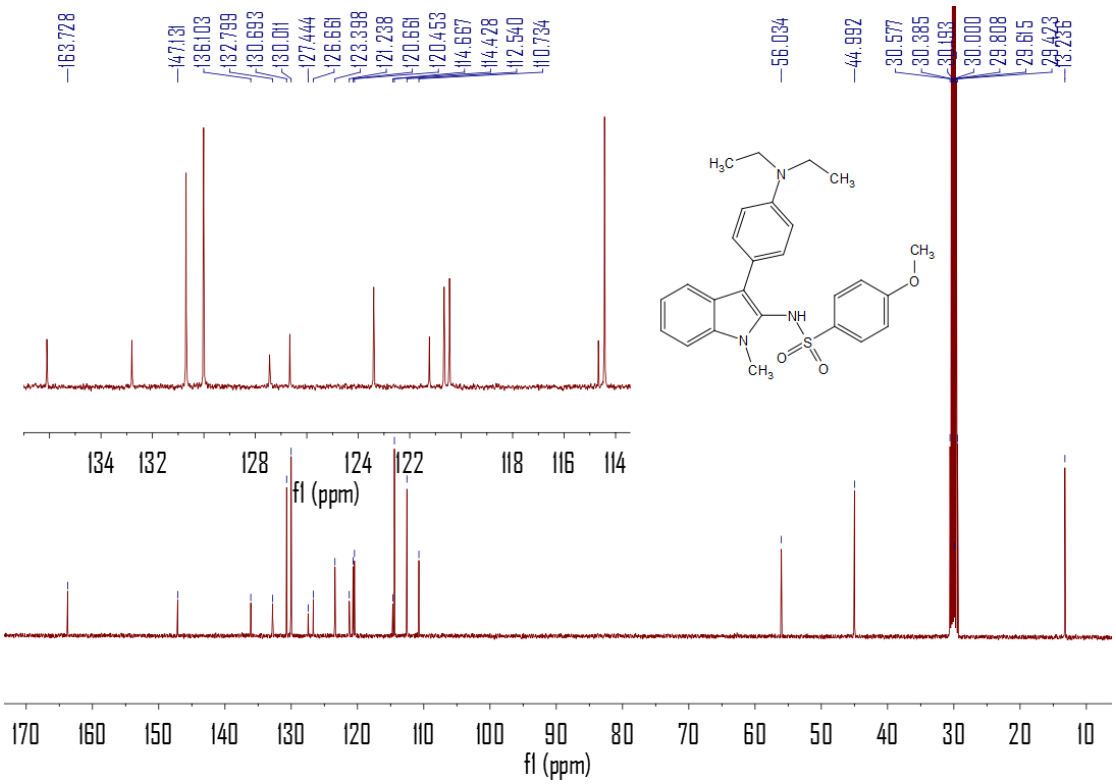
^{1}H NMR Spectrum for **3b** (Acetone, 400 MHz)



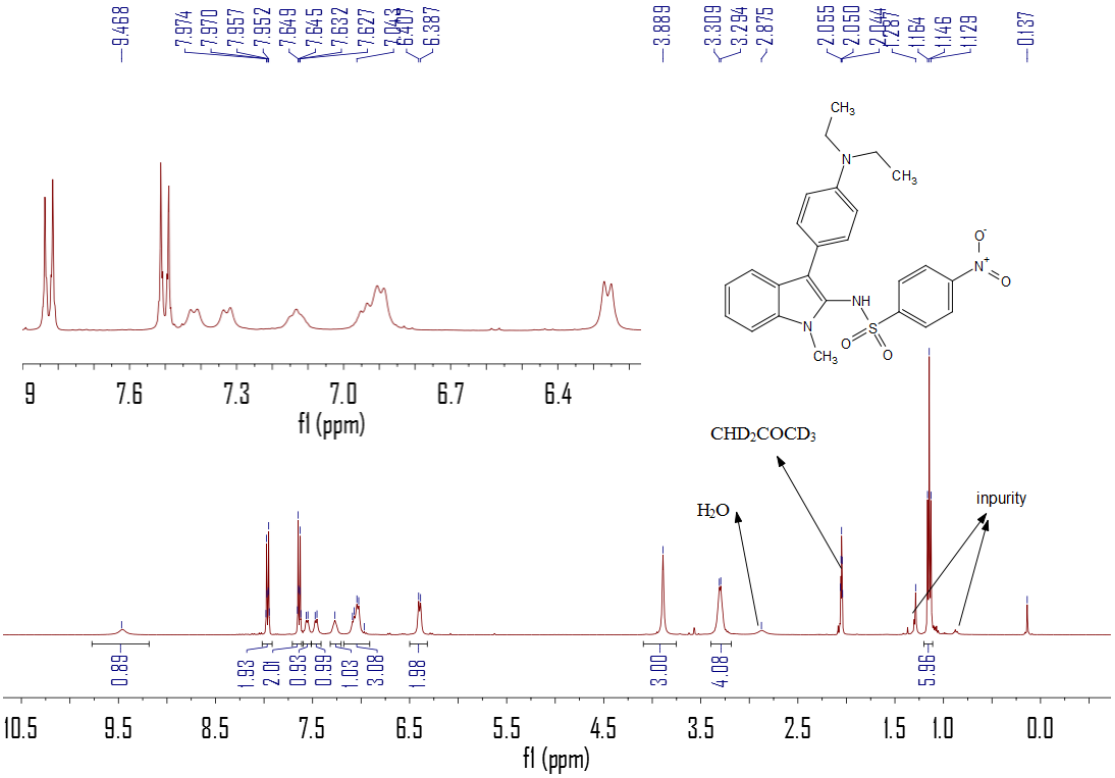
^{13}C NMR Spectrum for **3b** (Acetone, 100 MHz)



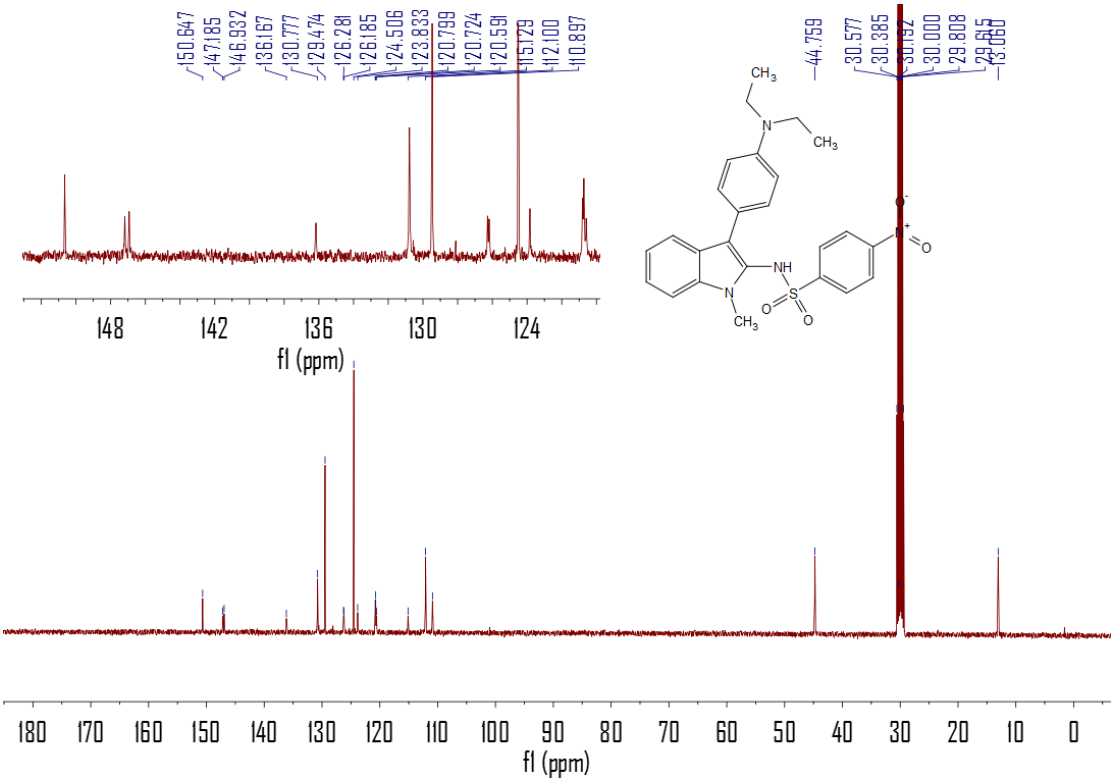
^{1}H NMR Spectrum for **3c** (Acetone, 400 MHz)



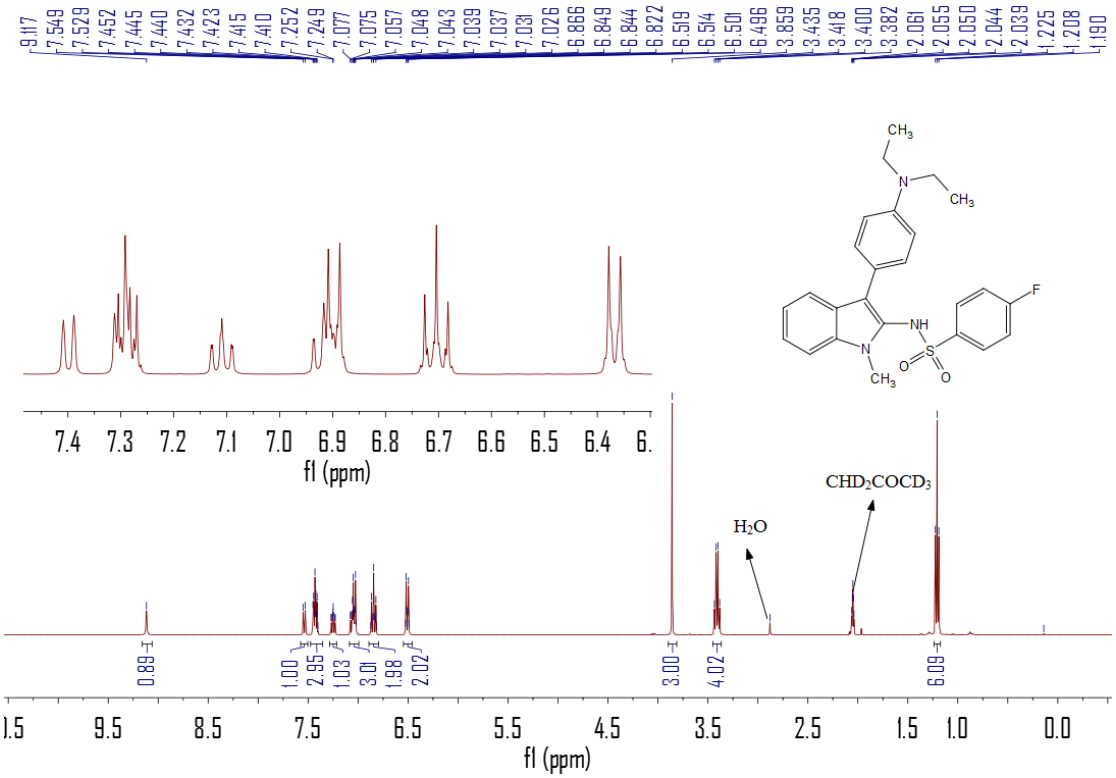
^{13}C NMR Spectrum for **3c** (Acetone, 100 MHz)



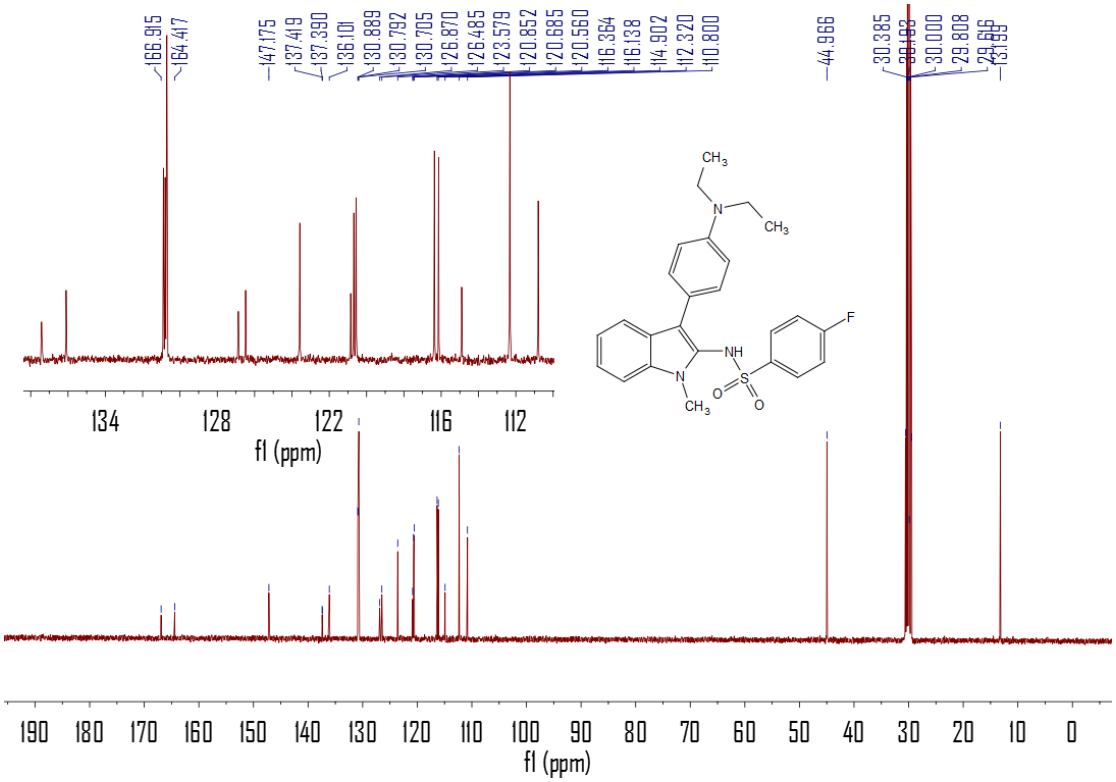
^{1}H NMR Spectrum for **3d** (Acetone, 400 MHz)



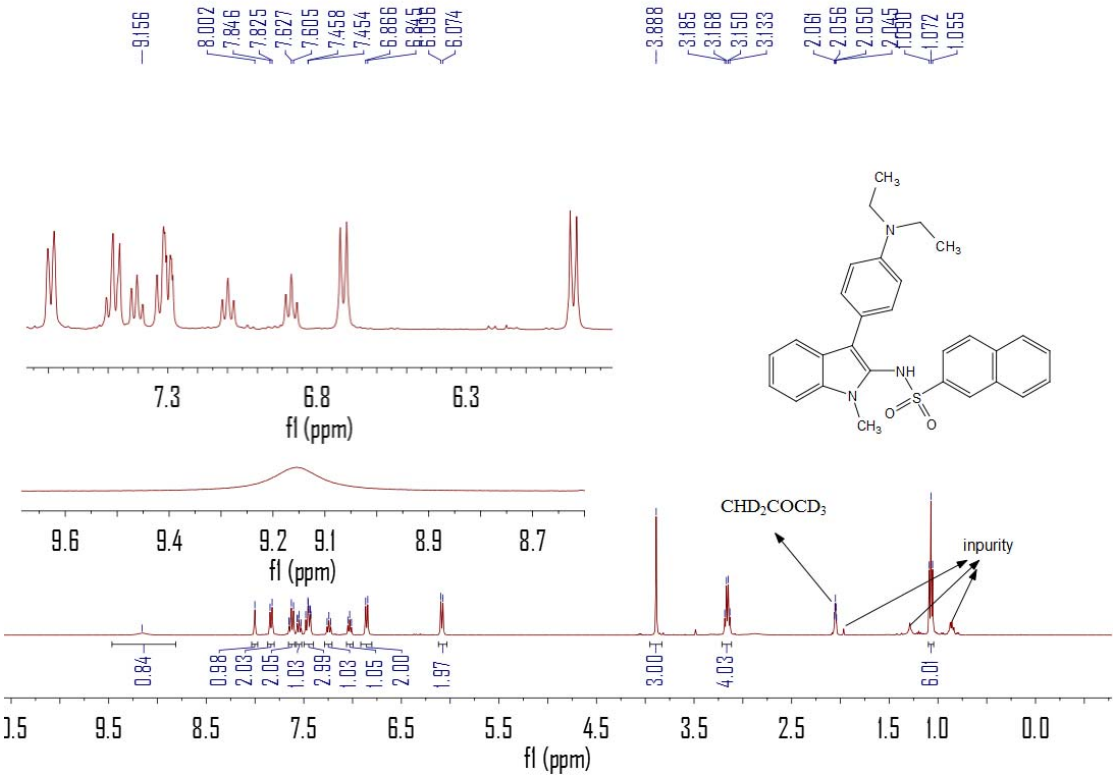
^{13}C NMR Spectrum for **3d** (Acetone, 100 MHz)



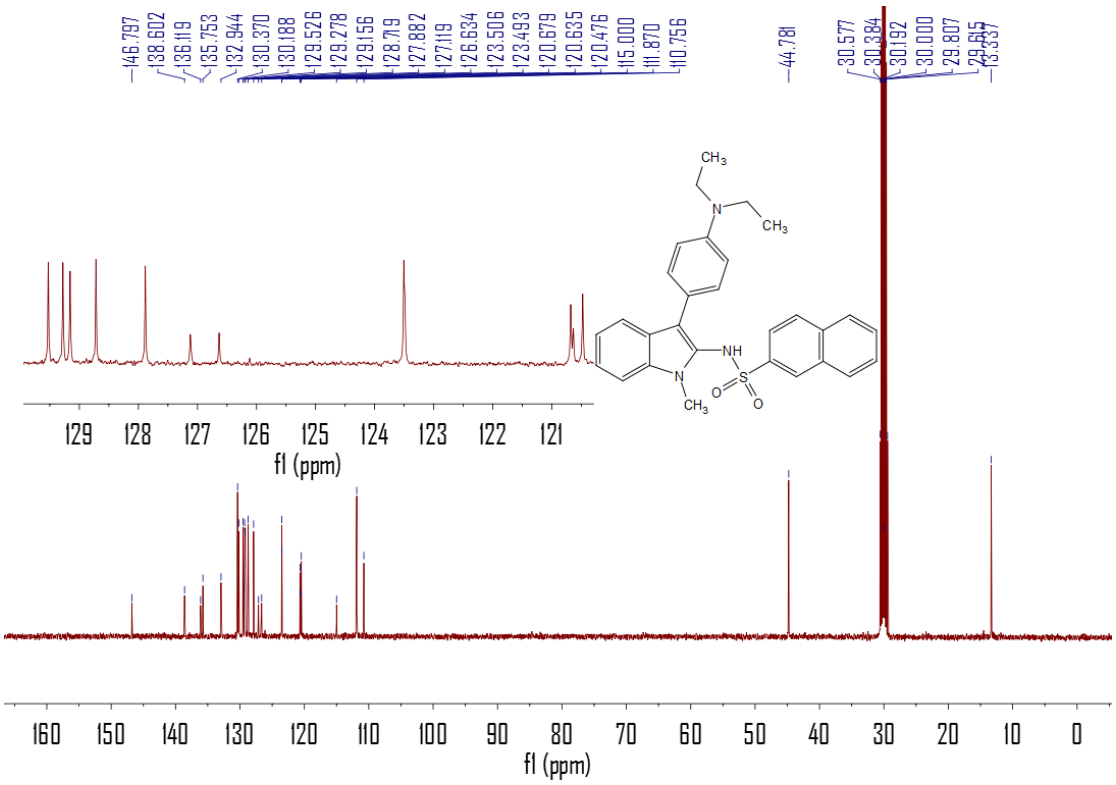
^{1}H NMR Spectrum for **3e** (Acetone, 400 MHz)



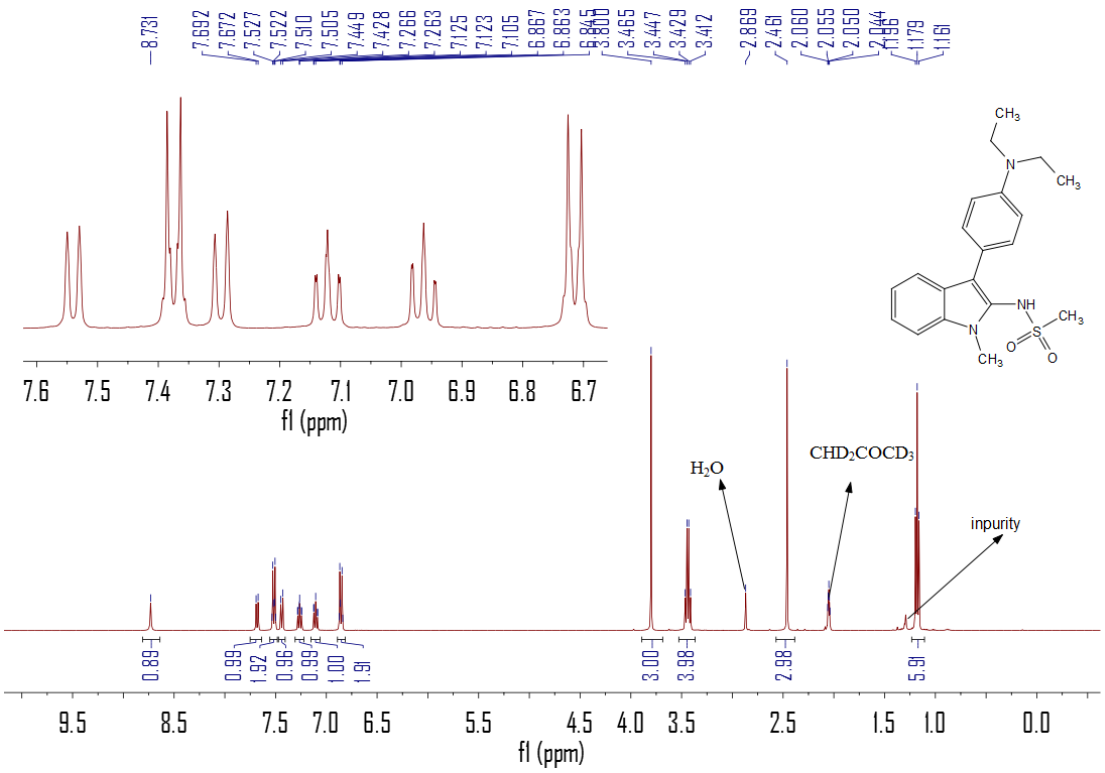
^{13}C NMR Spectrum for **3e** (Acetone, 100 MHz)



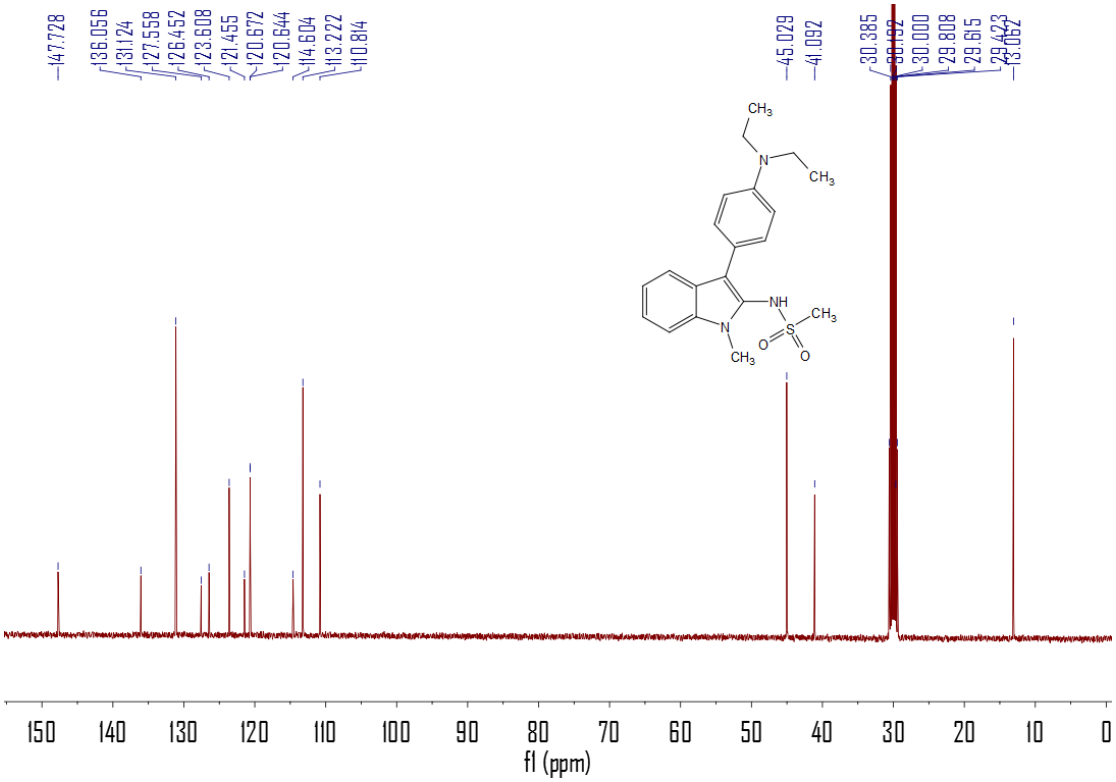
^{1}H NMR Spectrum for **3f** (Acetone, 400 MHz)



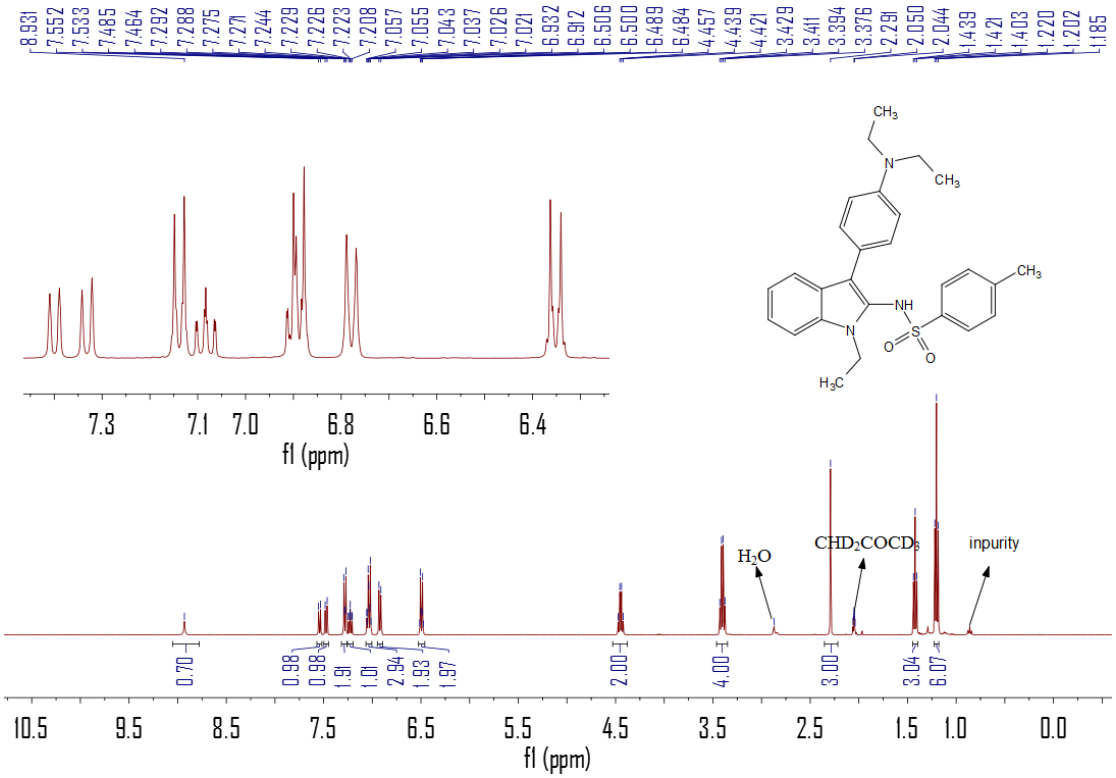
^{13}C NMR Spectrum for **3f** (Acetone, 100 MHz)



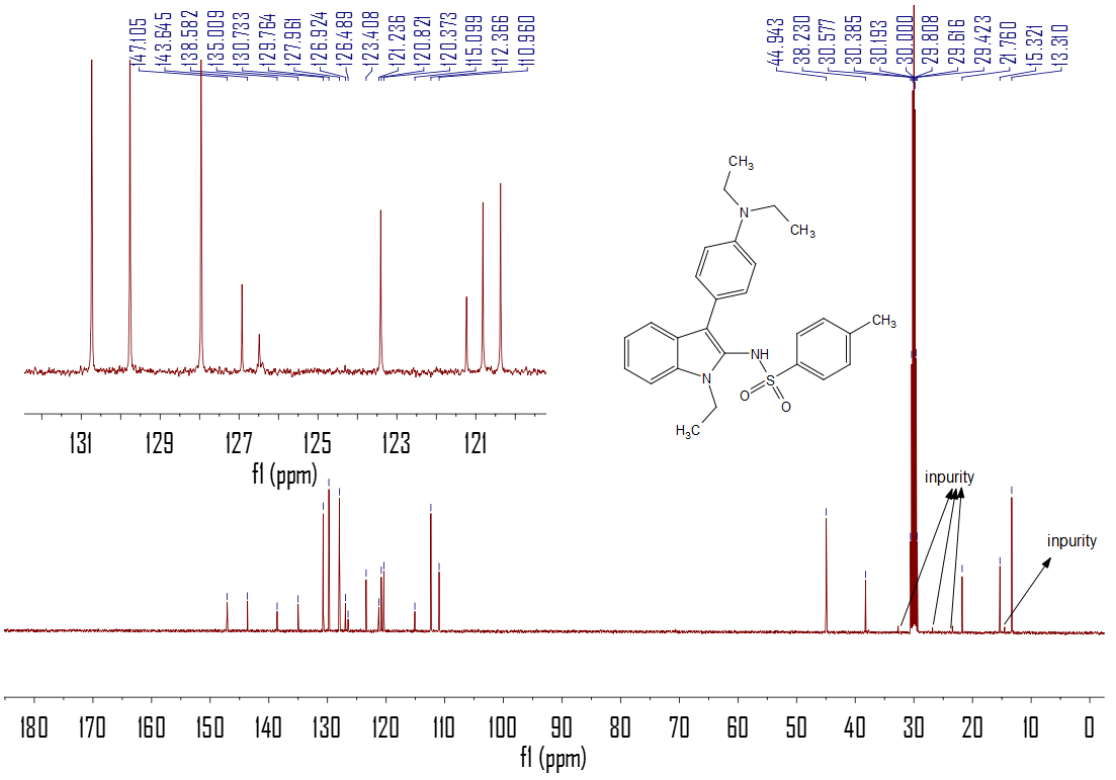
^{1}H NMR Spectrum for **3g** (Acetone, 400 MHz)



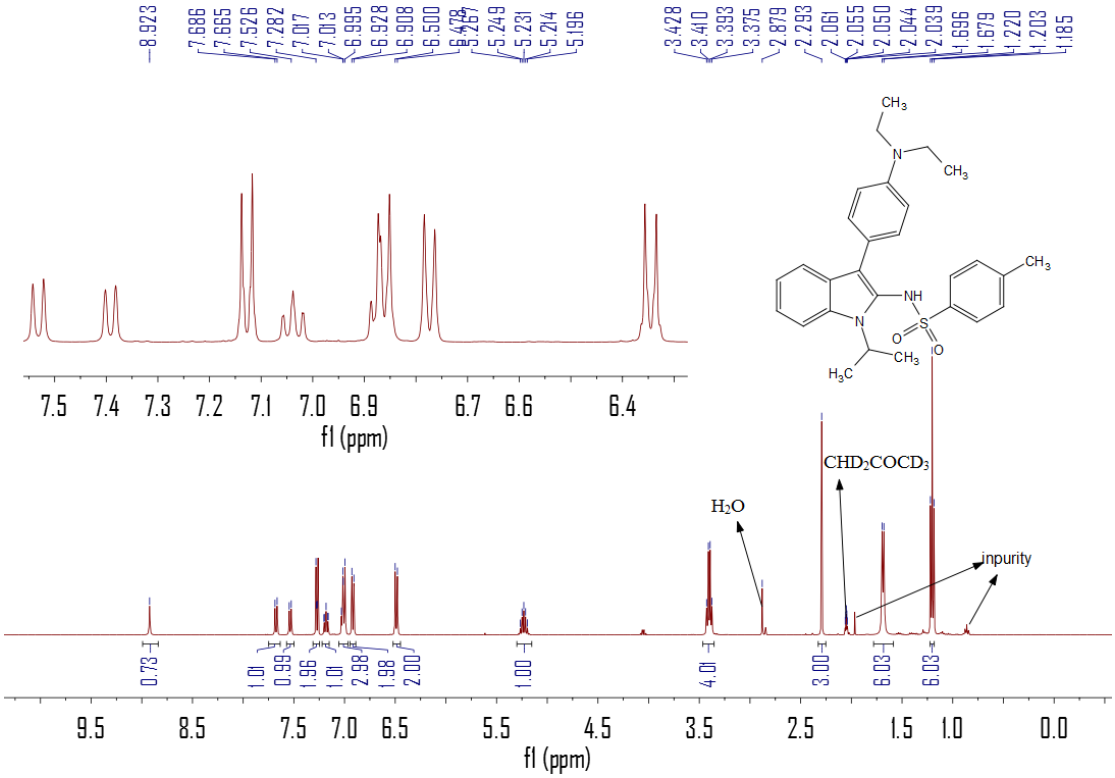
^{13}C NMR Spectrum for **3g** (Acetone, 100 MHz)



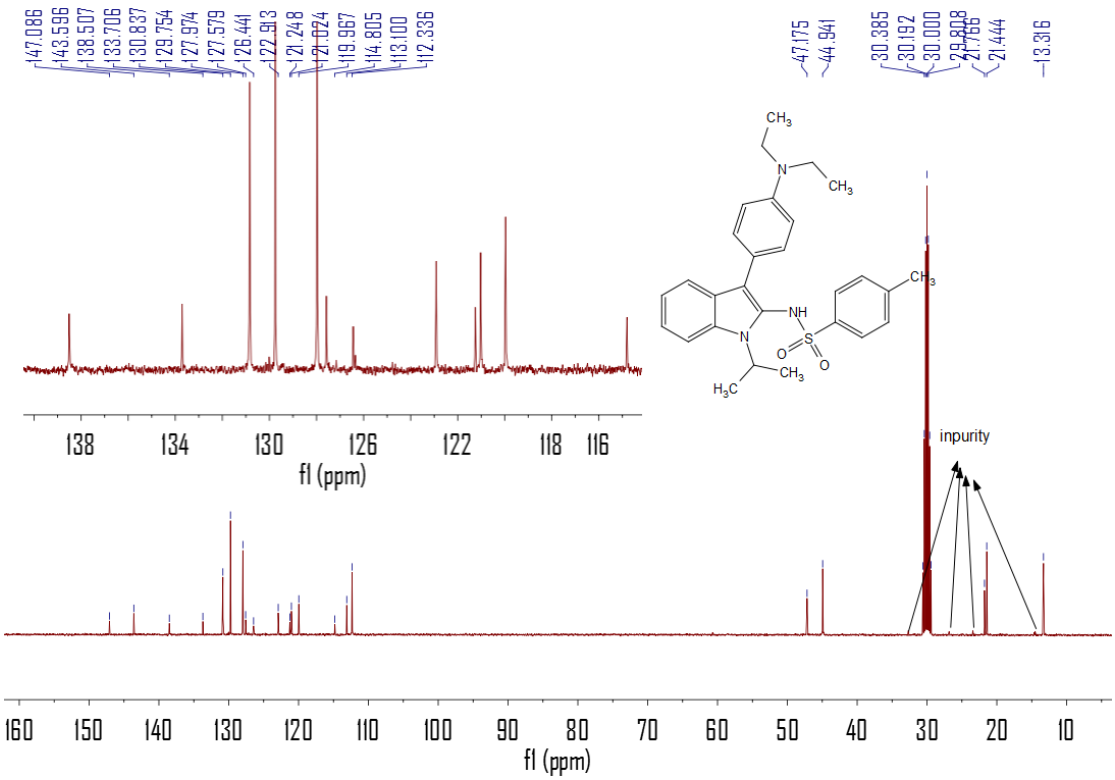
^{1}H NMR Spectrum for **3h** (Acetone, 400 MHz)



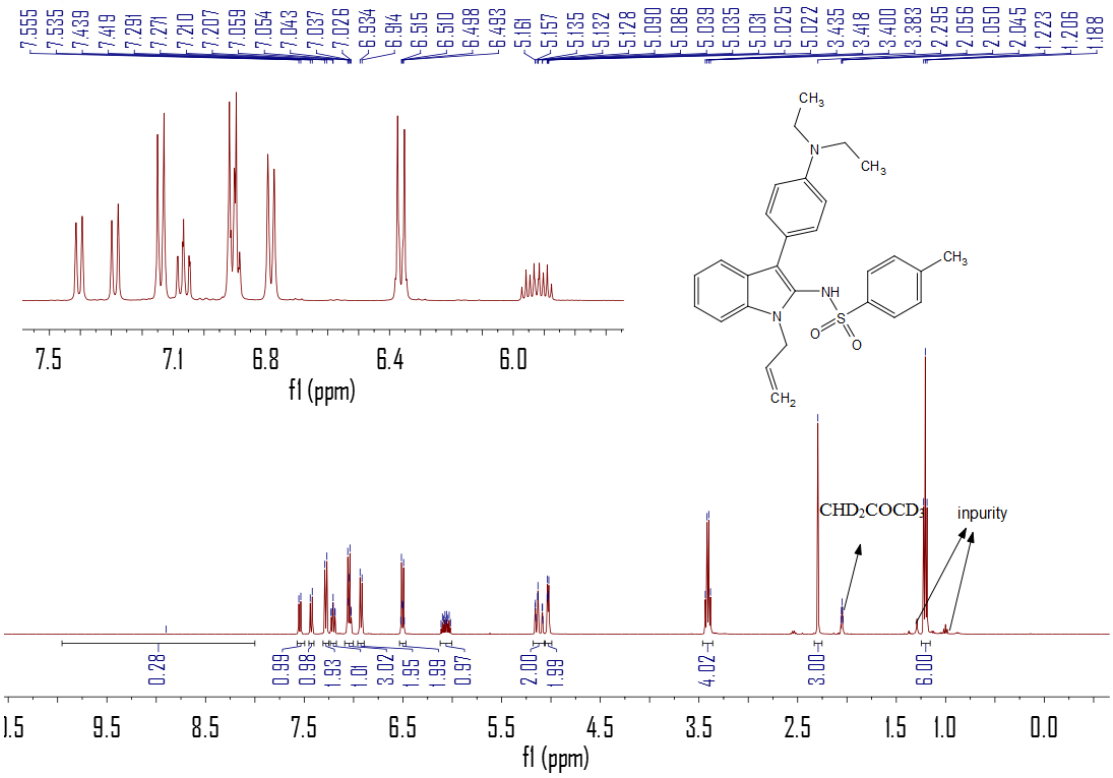
^{13}C NMR Spectrum for **3h** (Acetone, 100 MHz)



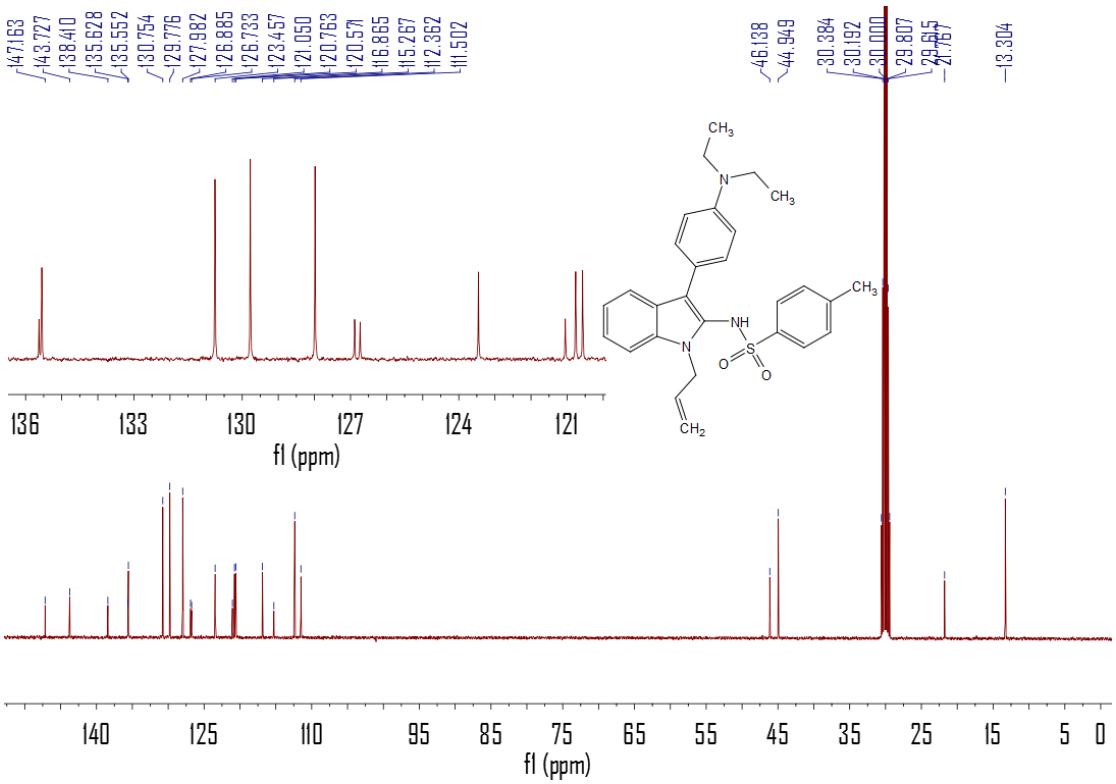
^{1}H NMR Spectrum for **3i** (Acetone, 400 MHz)



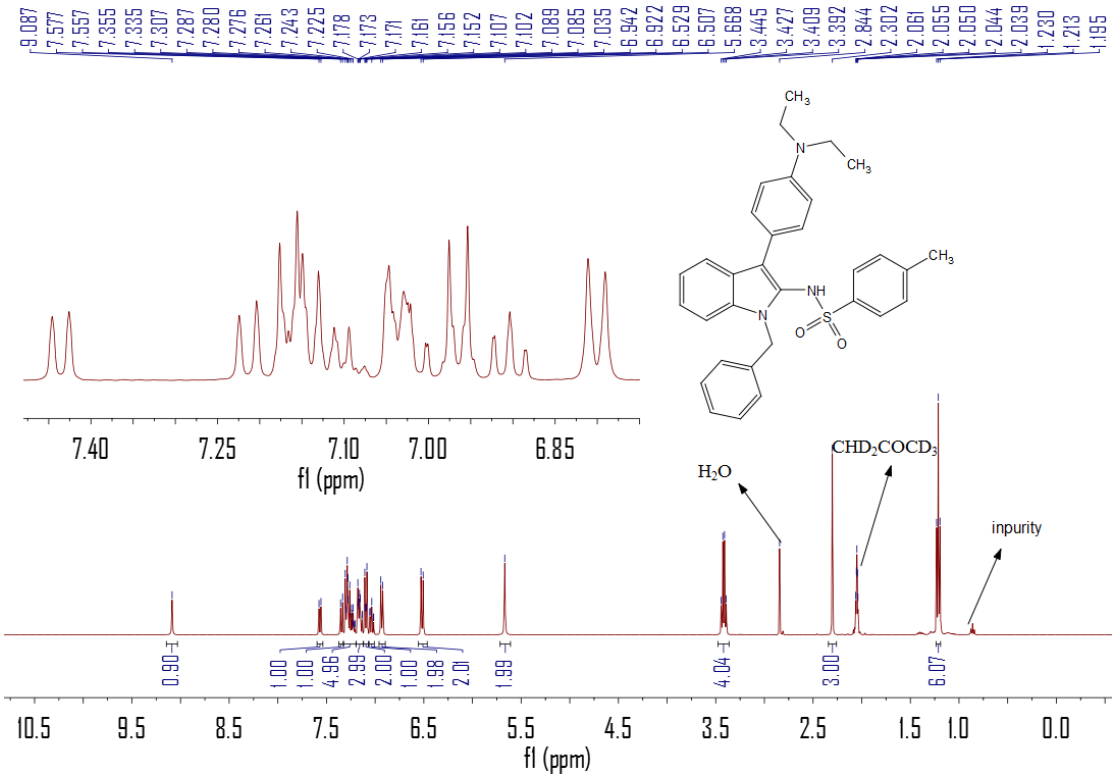
^{13}C NMR Spectrum for **3i** (Acetone, 100 MHz)



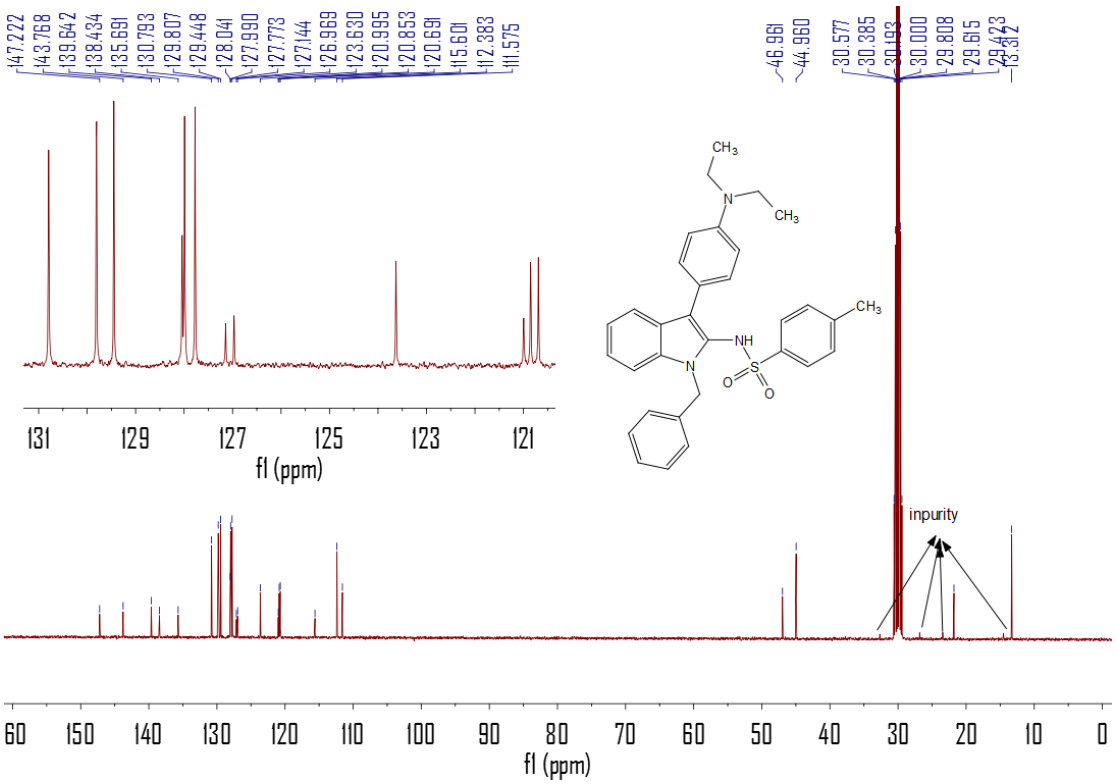
^{1}H NMR Spectrum for **3j** (Acetone, 400 MHz)



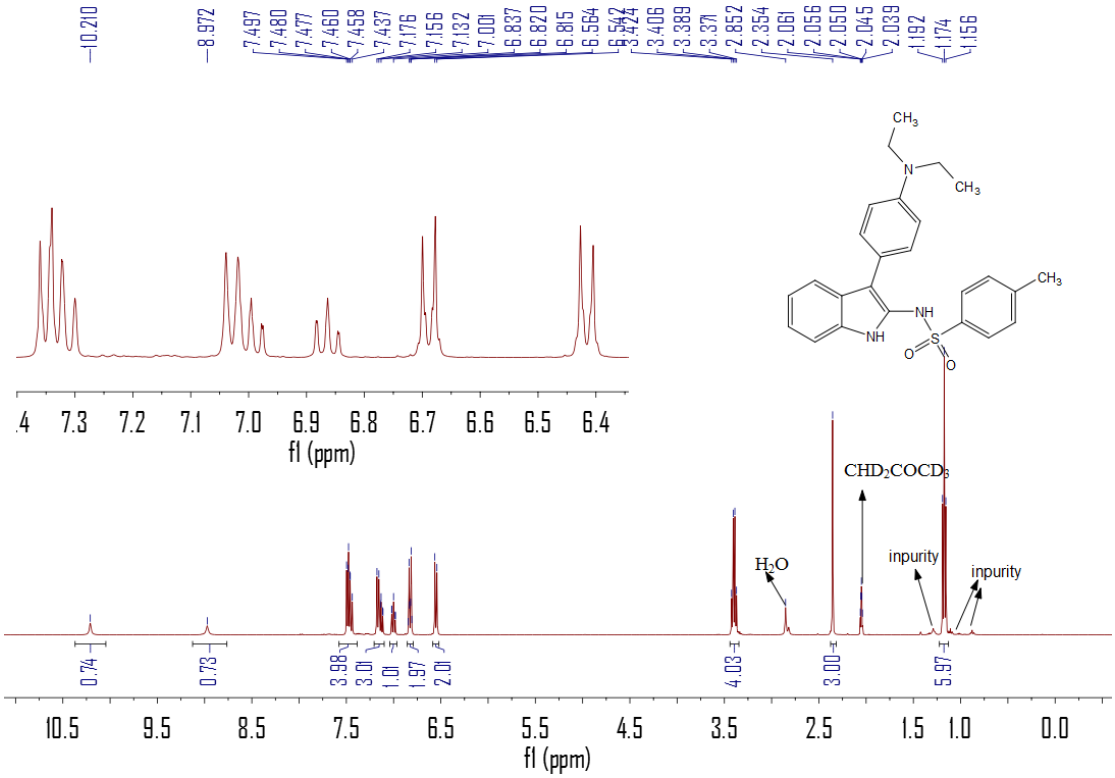
^{13}C NMR Spectrum for **3j** (Acetone, 100 MHz)



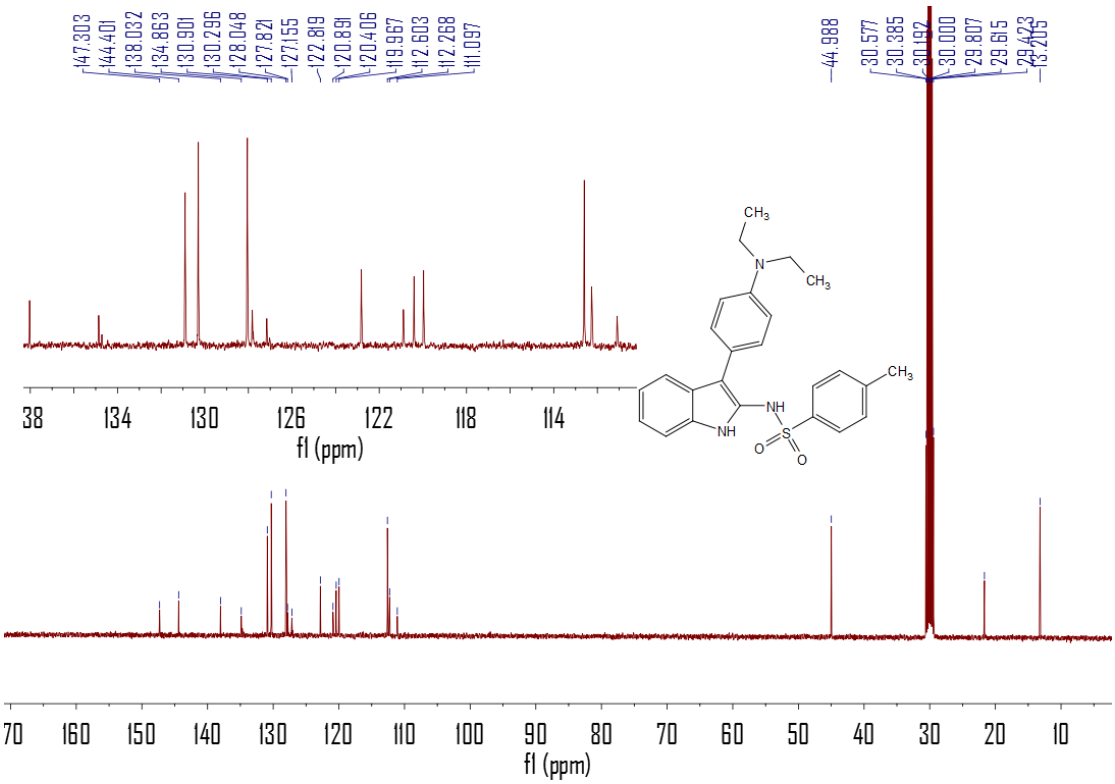
^{1}H NMR Spectrum for **3k** (Acetone, 400 MHz)



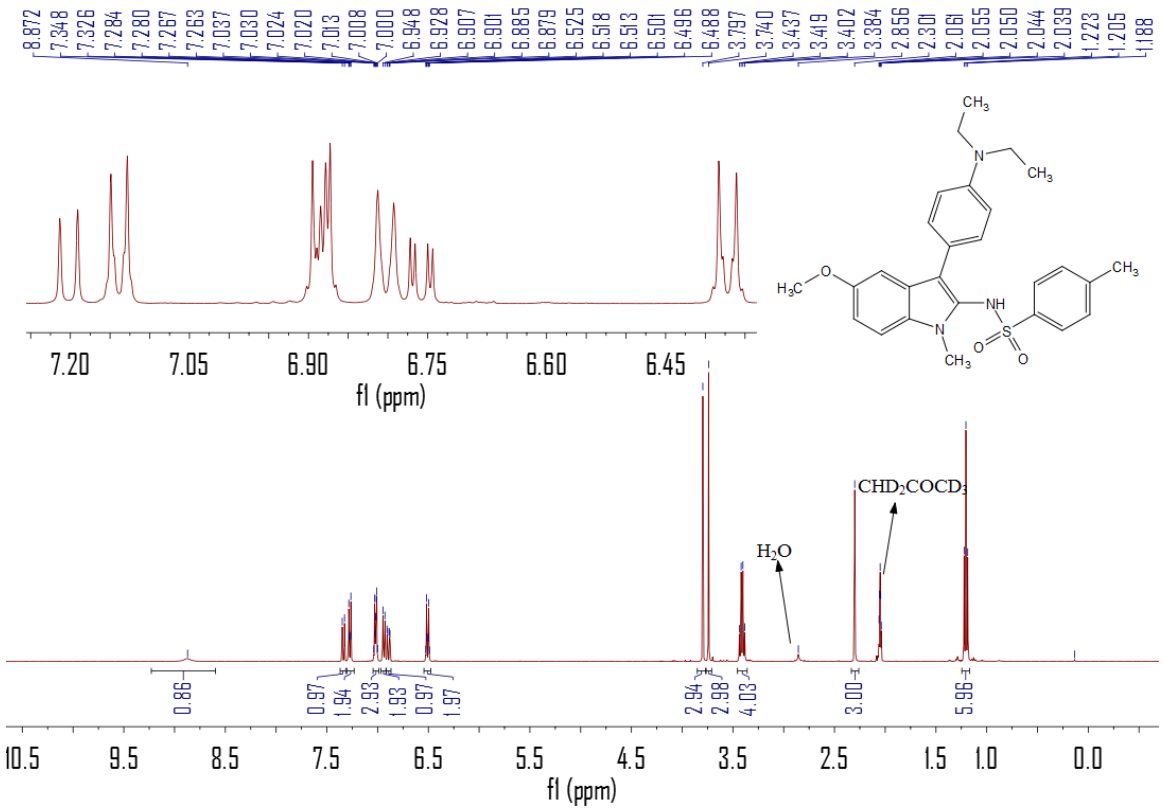
^{13}C NMR Spectrum for **3k** (Acetone, 100 MHz)



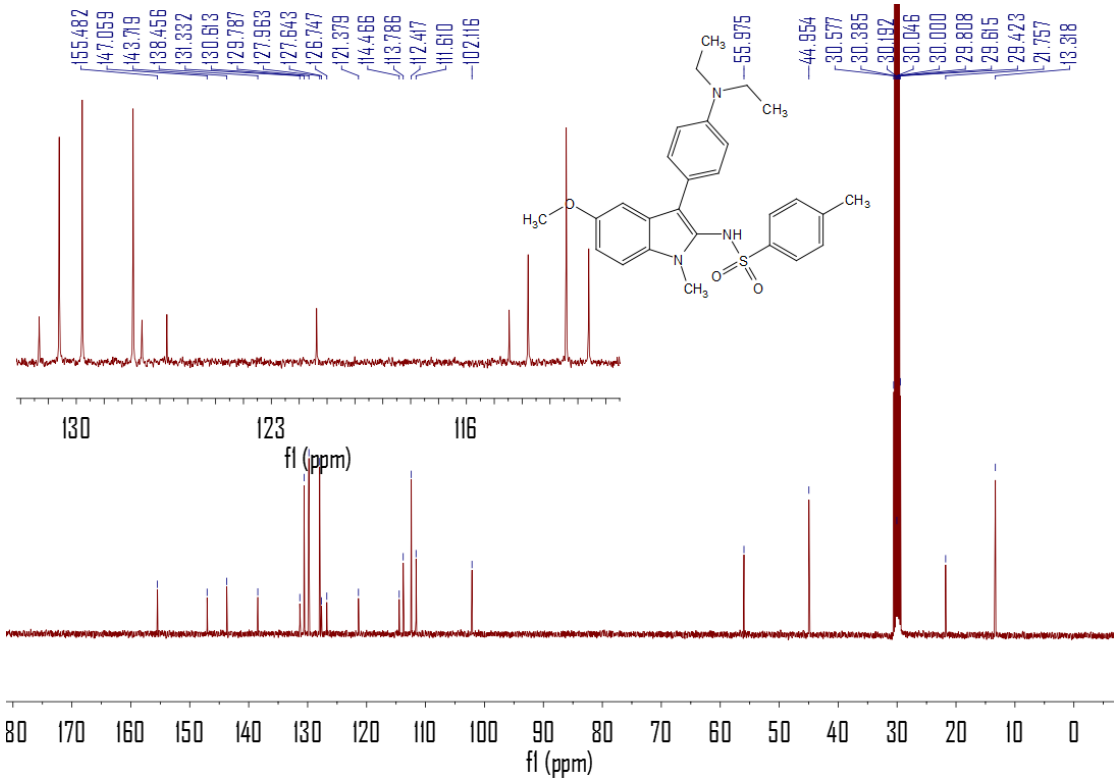
^{1}H NMR Spectrum for **3l** (Acetone, 400 MHz)



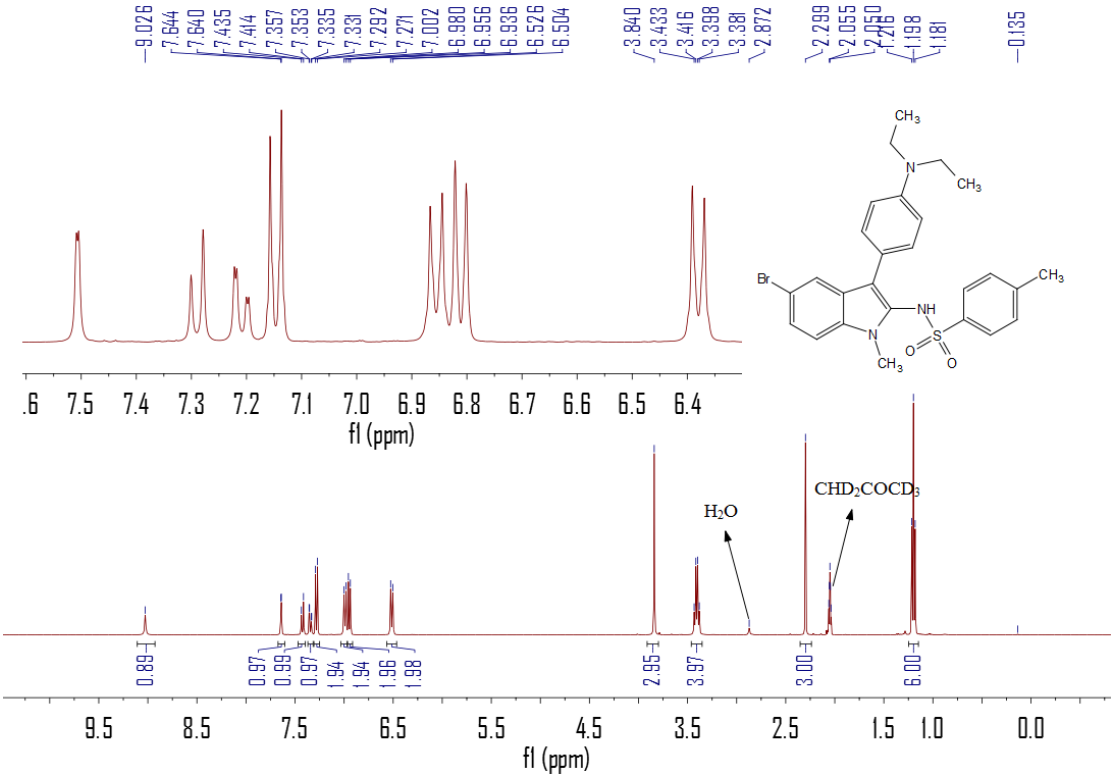
^{13}C NMR Spectrum for **3l** (Acetone, 100 MHz)



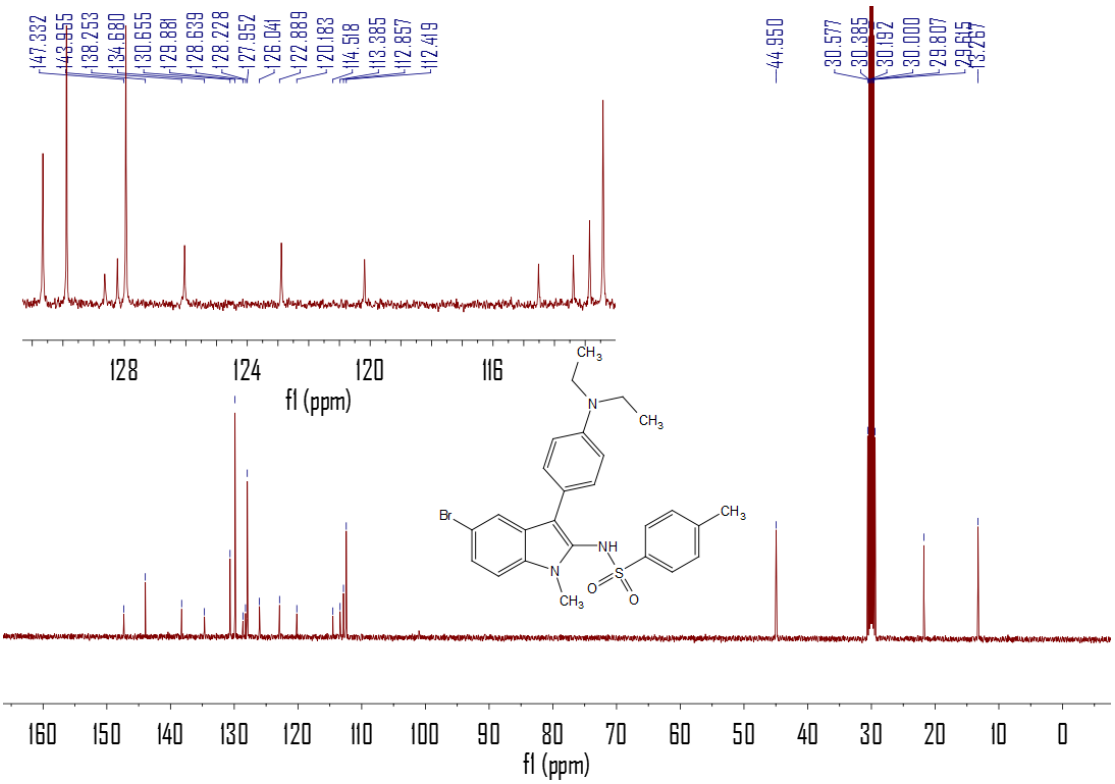
^{1}H NMR Spectrum for **3m** (Acetone, 400 MHz)



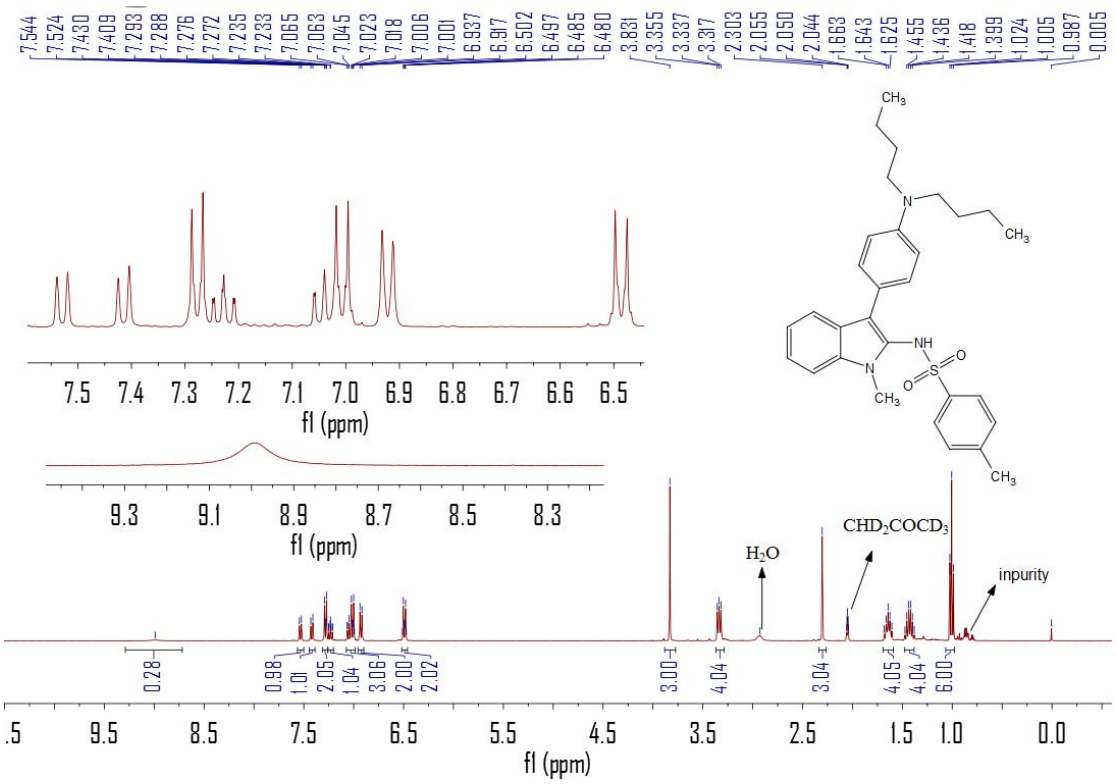
^{13}C NMR Spectrum for **3m** (Acetone, 100 MHz)



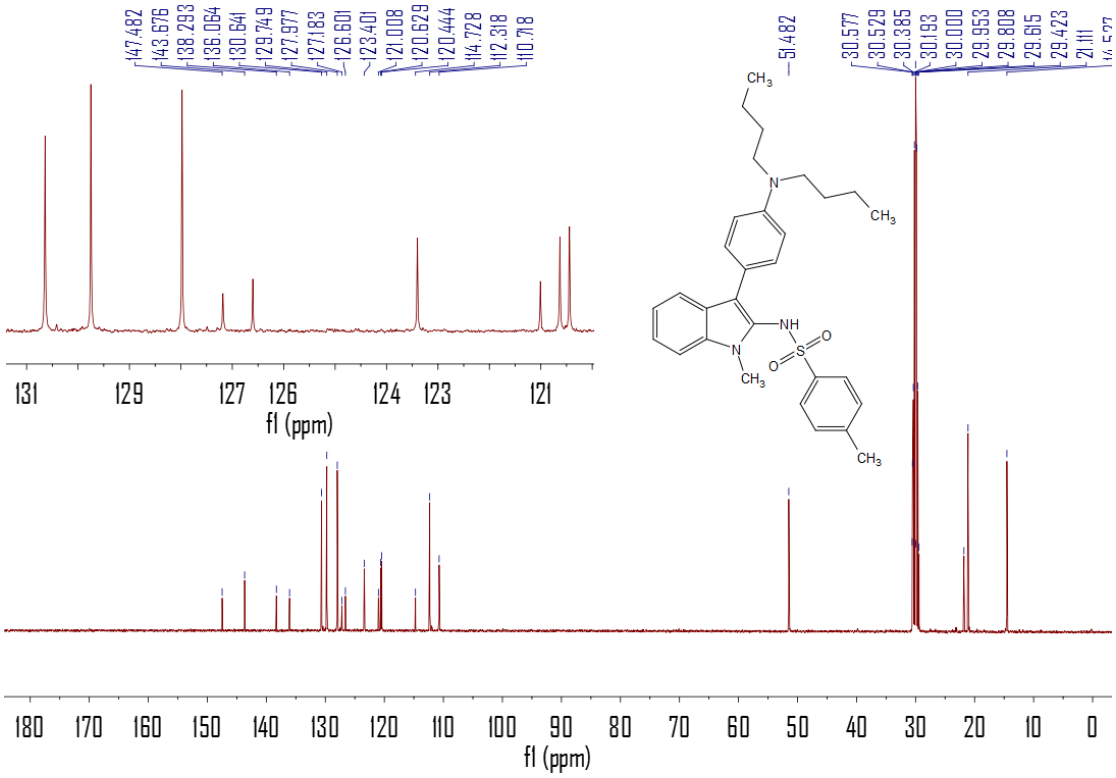
^{1}H NMR Spectrum for **3n** (Acetone, 400 MHz)



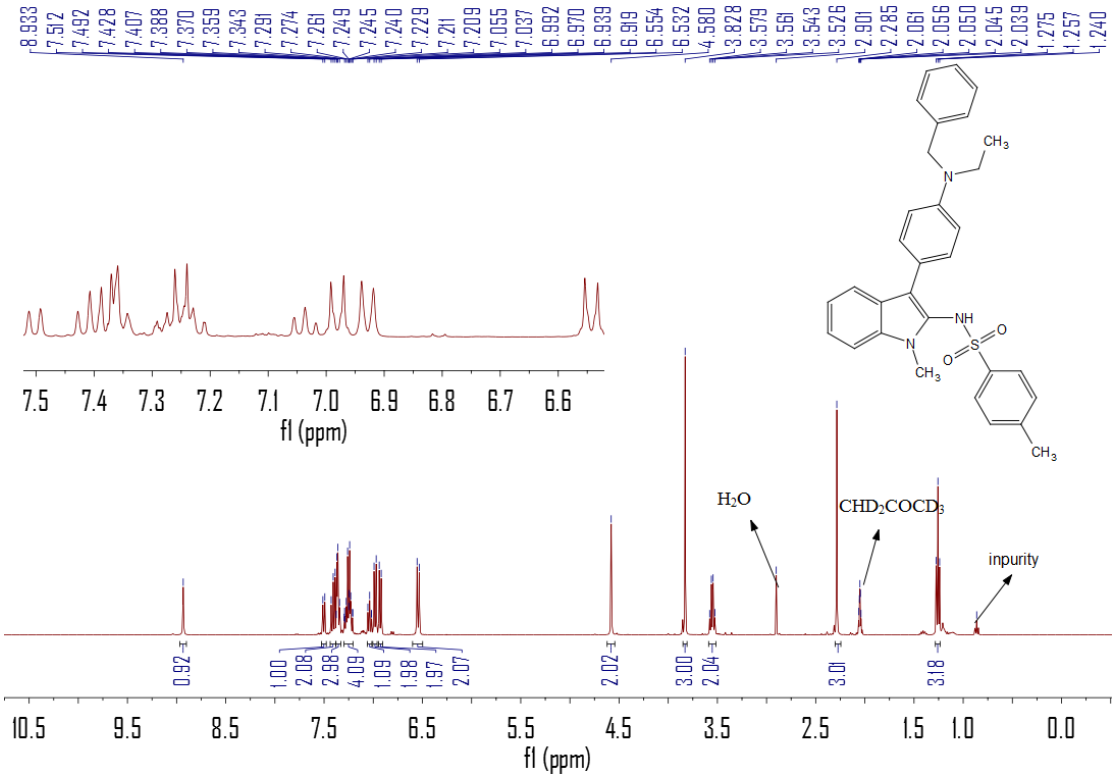
^{13}C NMR Spectrum for **3n** (Acetone, 100 MHz)



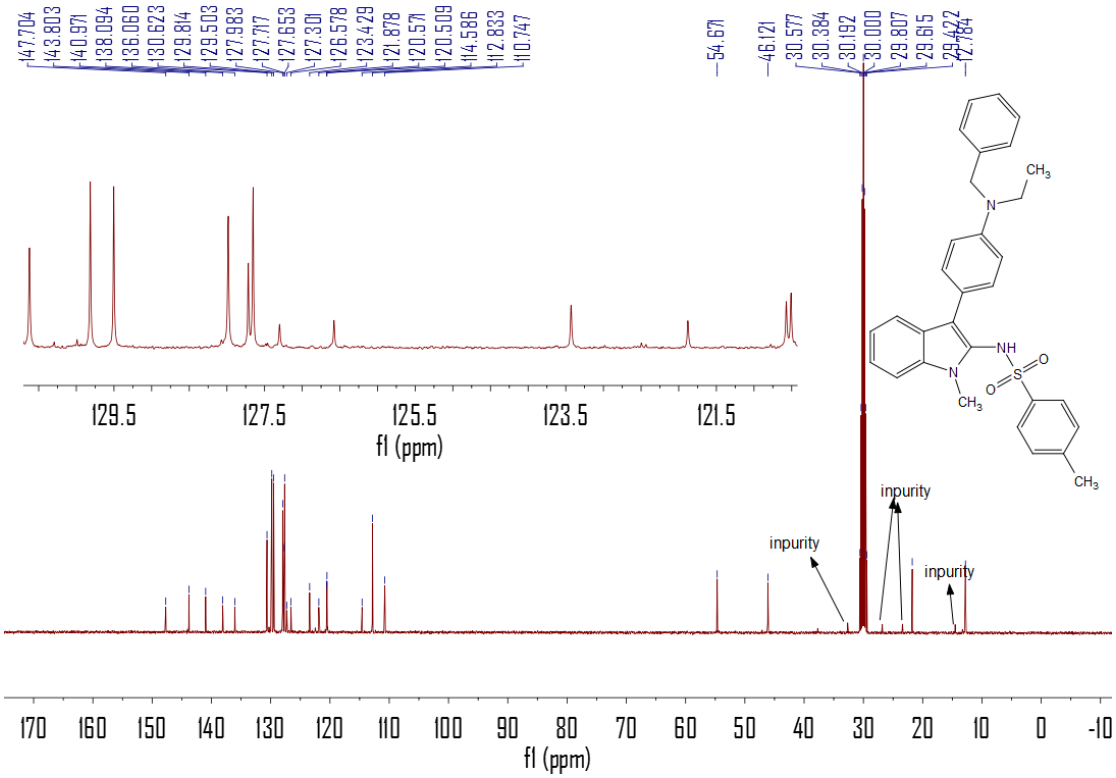
^{1}H NMR Spectrum for **3o** (Acetone, 400 MHz)



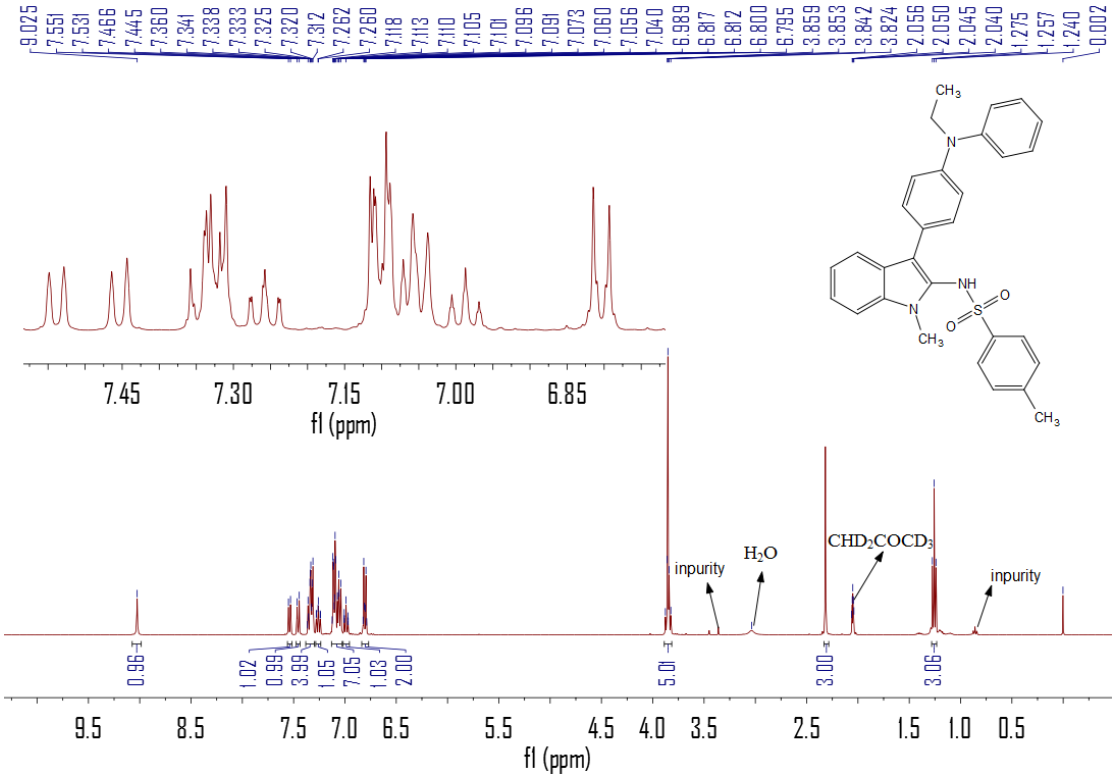
^{13}C NMR Spectrum for **3o** (Acetone, 100 MHz)



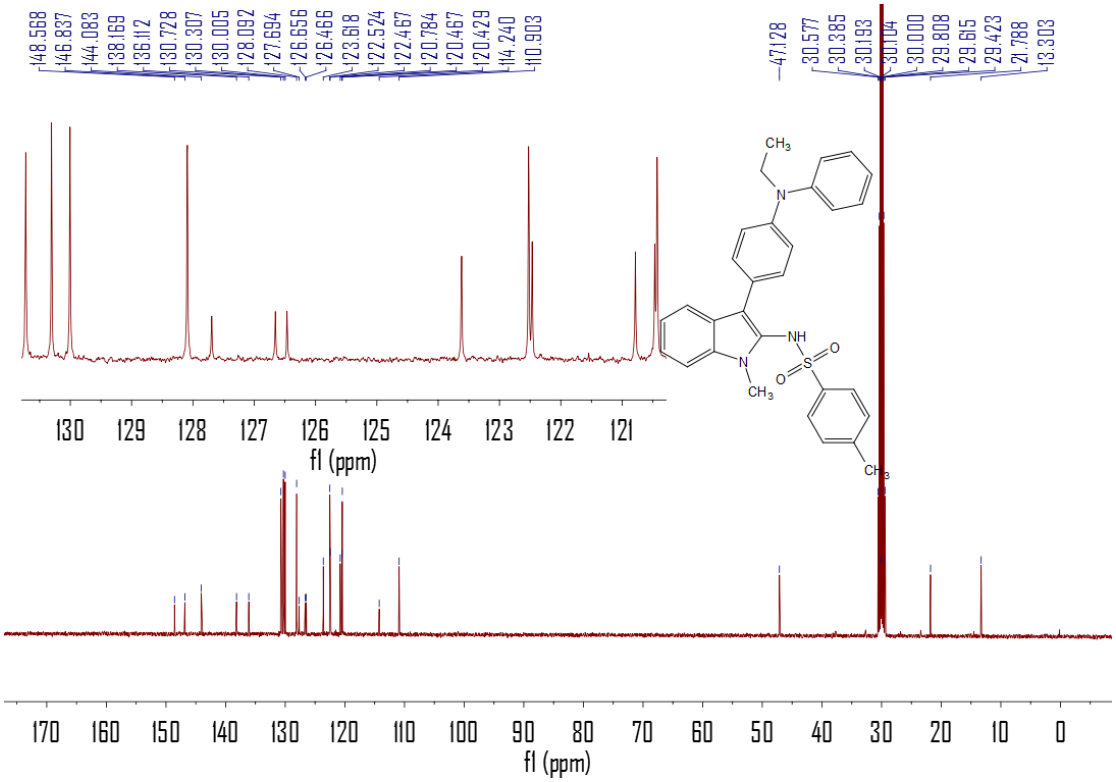
^{1}H NMR Spectrum for **3p** (Acetone, 400 MHz)



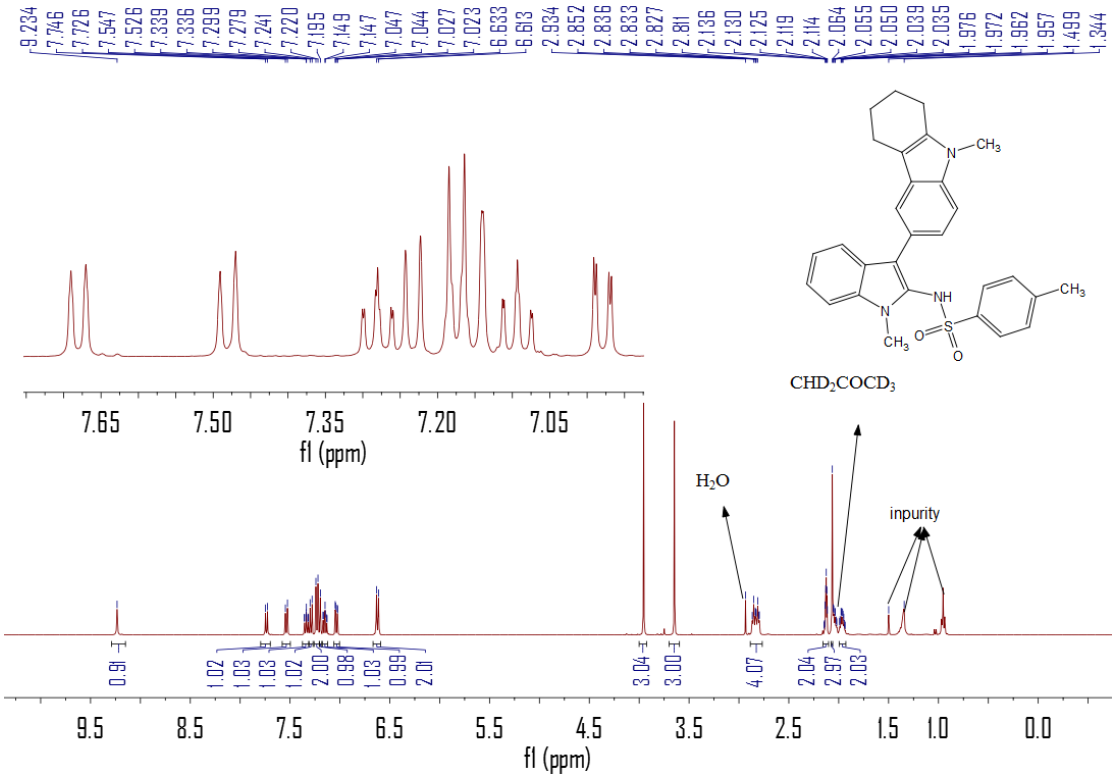
^{13}C NMR Spectrum for **3p** (Acetone, 100 MHz)



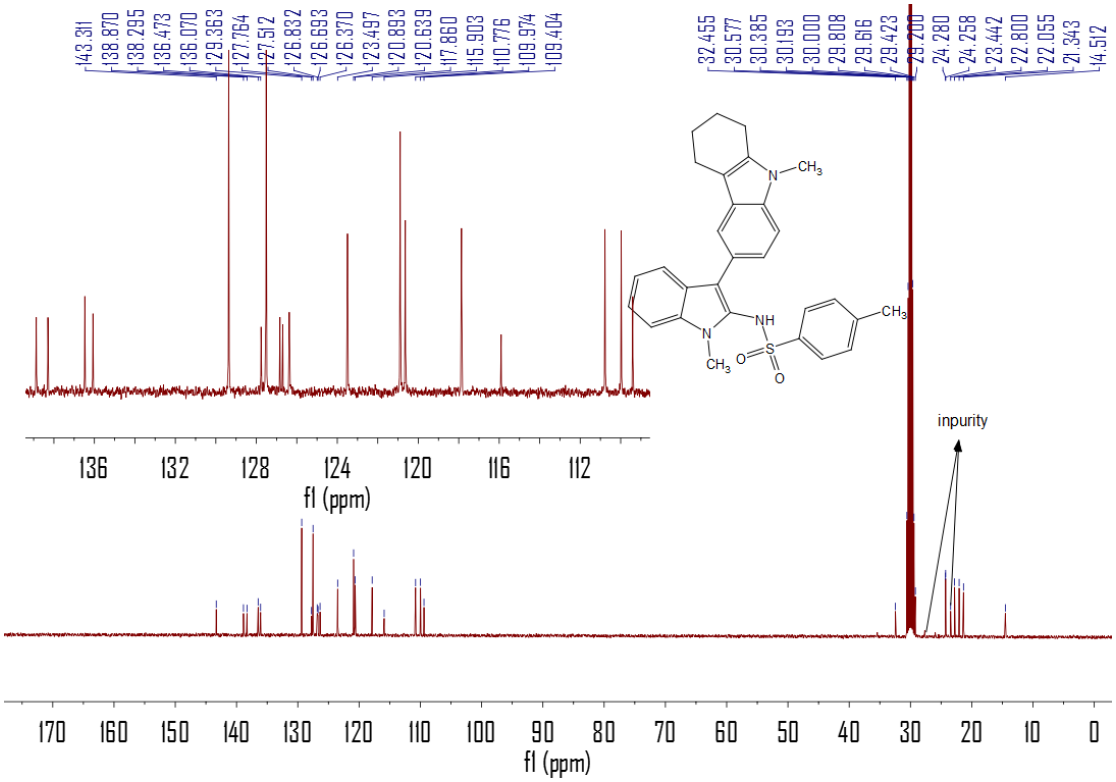
^{1}H NMR Spectrum for **3q** (Acetone, 400 MHz)



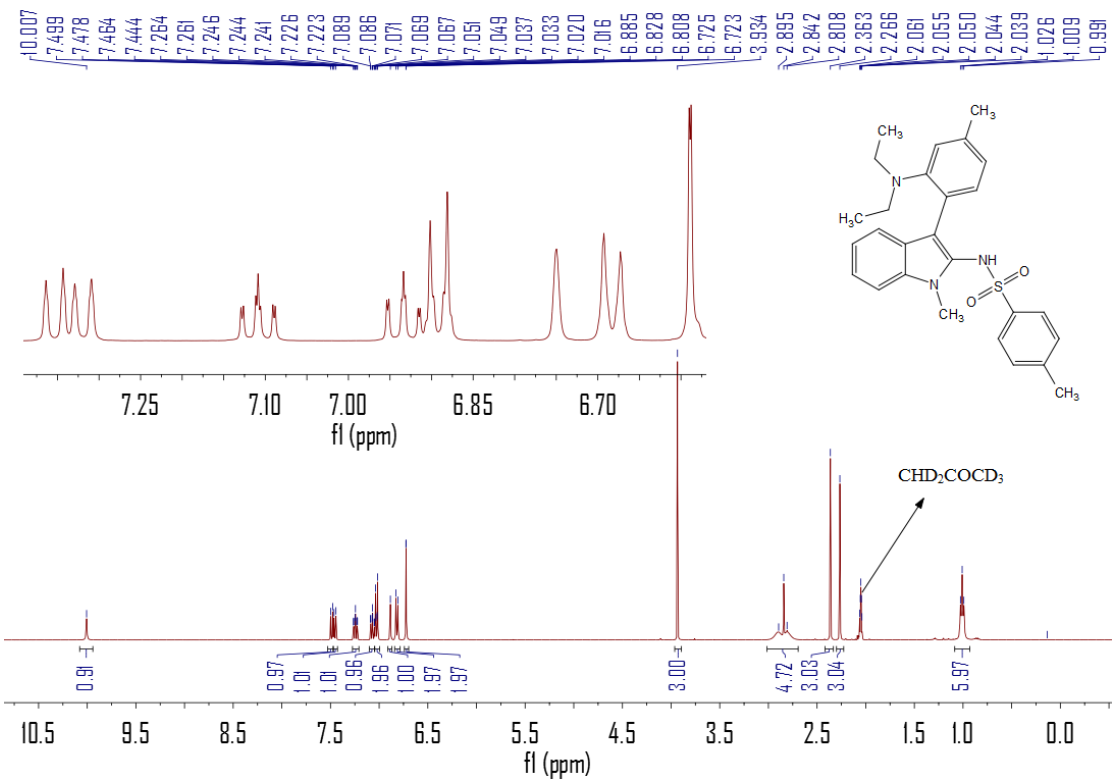
^{13}C NMR Spectrum for **3q** (Acetone, 100 MHz)



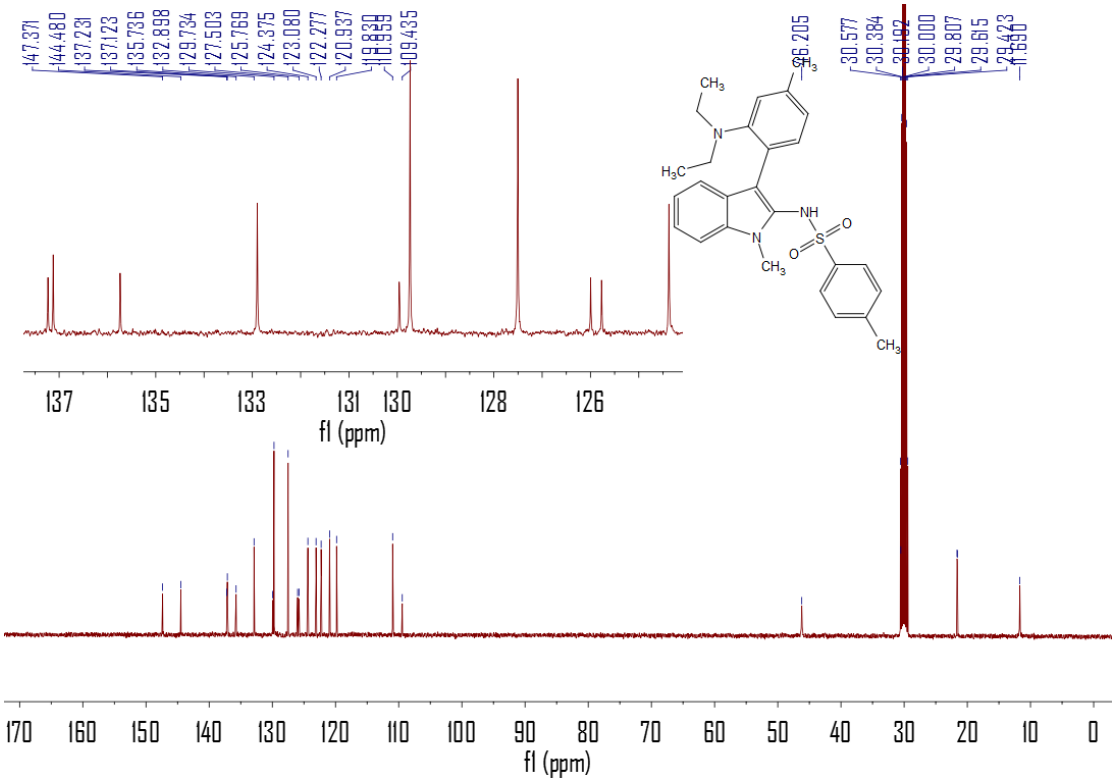
^{1}H NMR Spectrum for **3r** (Acetone, 400 MHz)



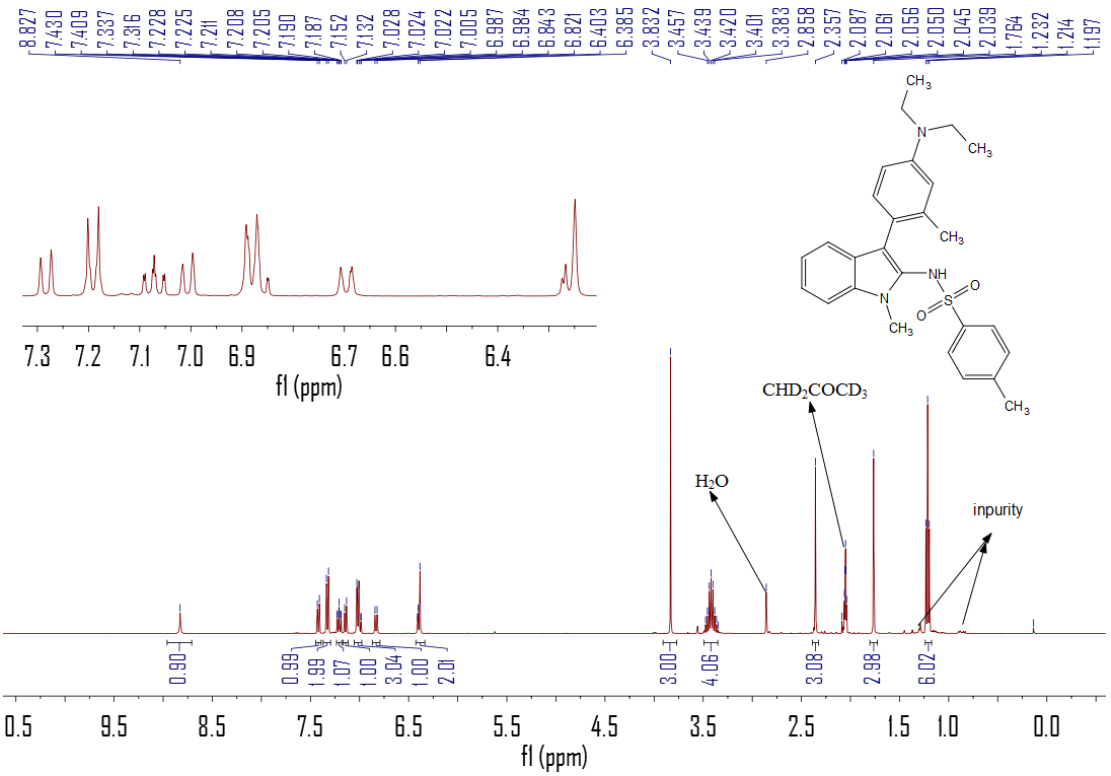
^{13}C NMR Spectrum for **3r** (Acetone, 100 MHz)



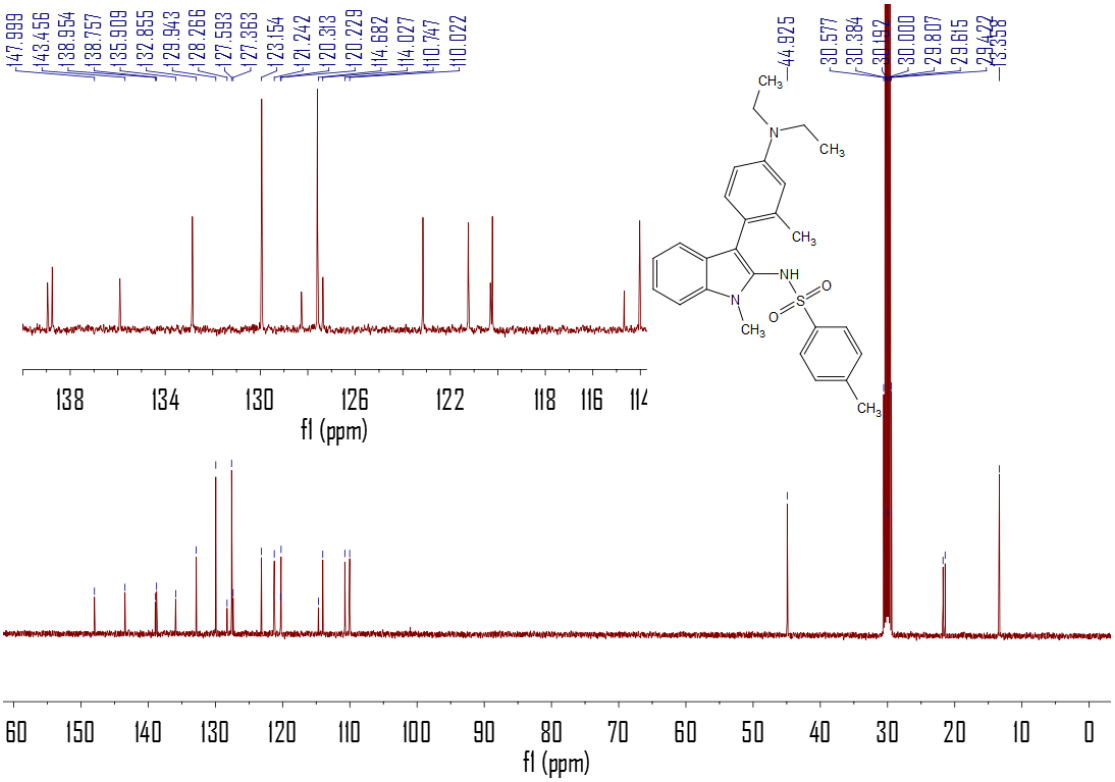
^{1}H NMR Spectrum for **3s** (Acetone, 400 MHz)



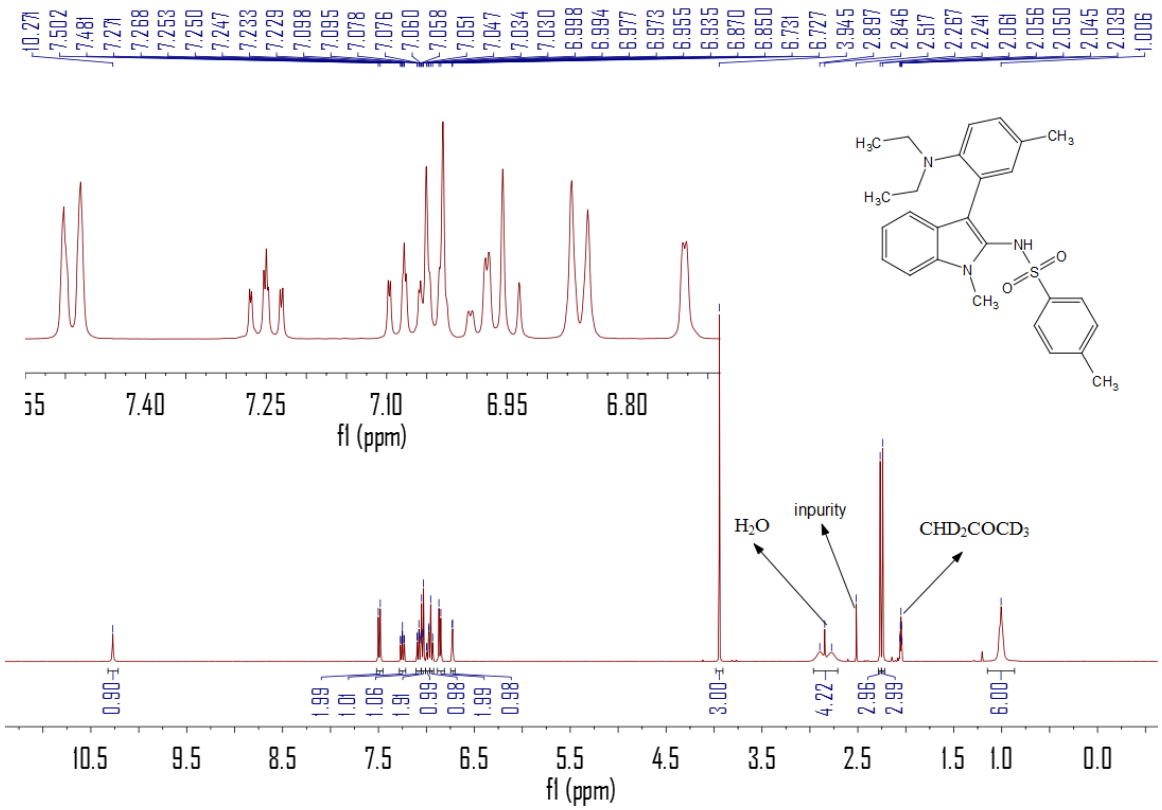
^{13}C NMR Spectrum for **3s** (Acetone, 100 MHz)



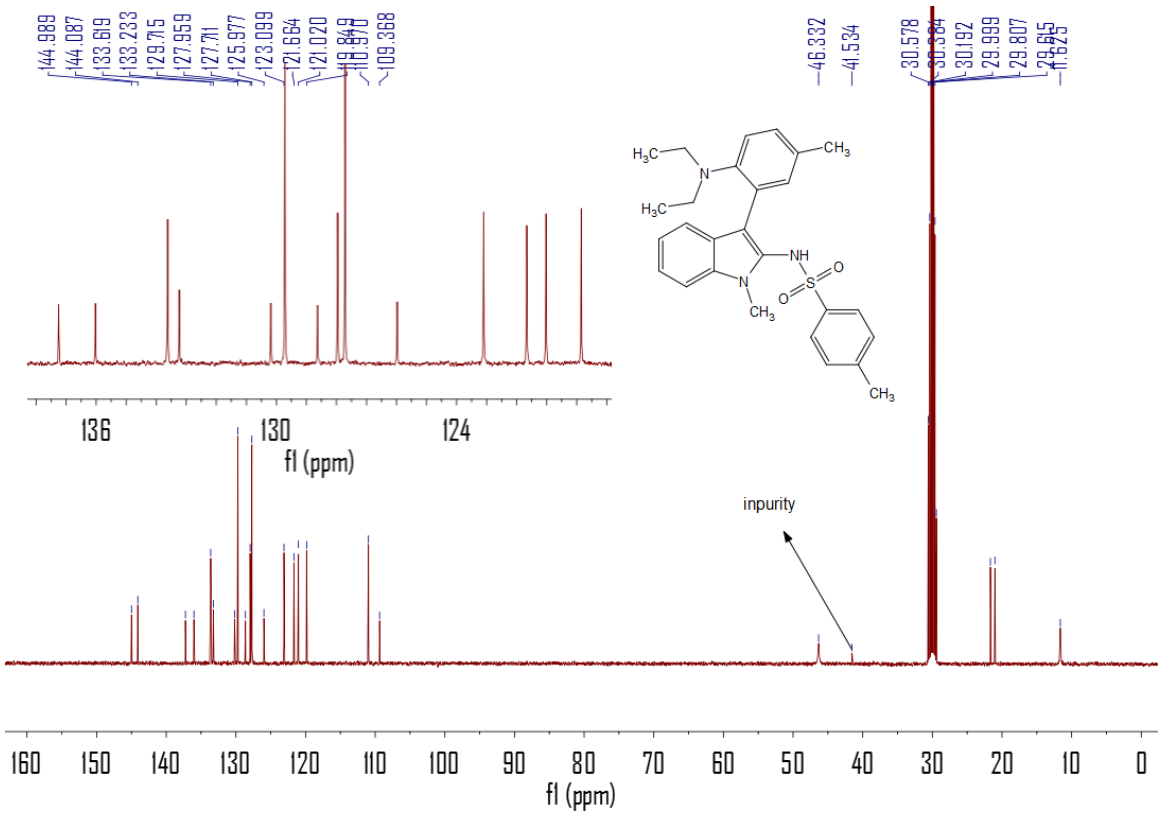
^{1}H NMR Spectrum for **3t** (Acetone, 400 MHz)



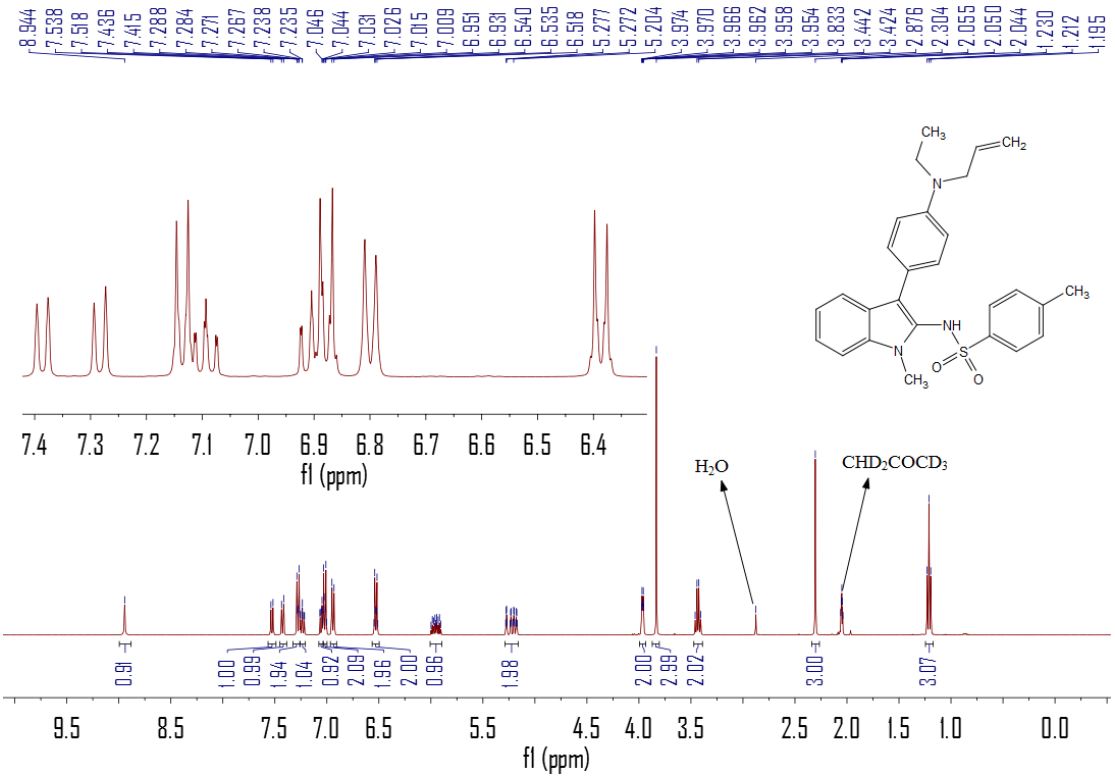
^{13}C NMR Spectrum for **3t** (Acetone, 100 MHz)



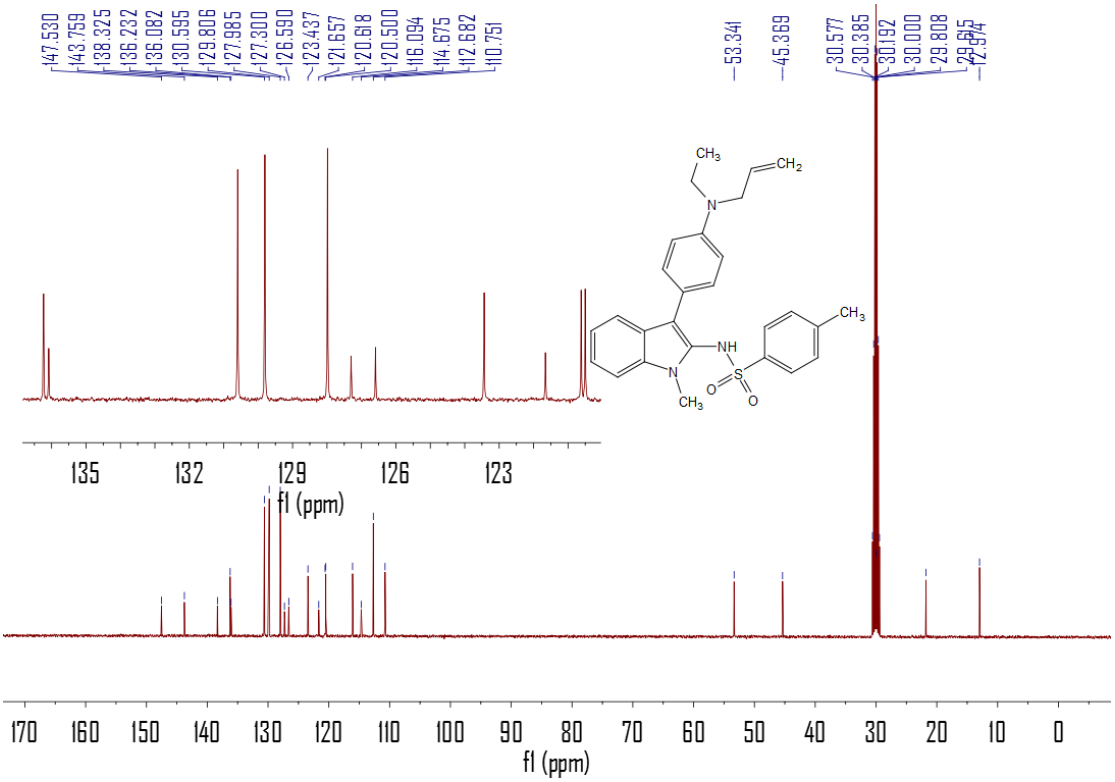
^{1}H NMR Spectrum for **3u** (Acetone, 400 MHz)



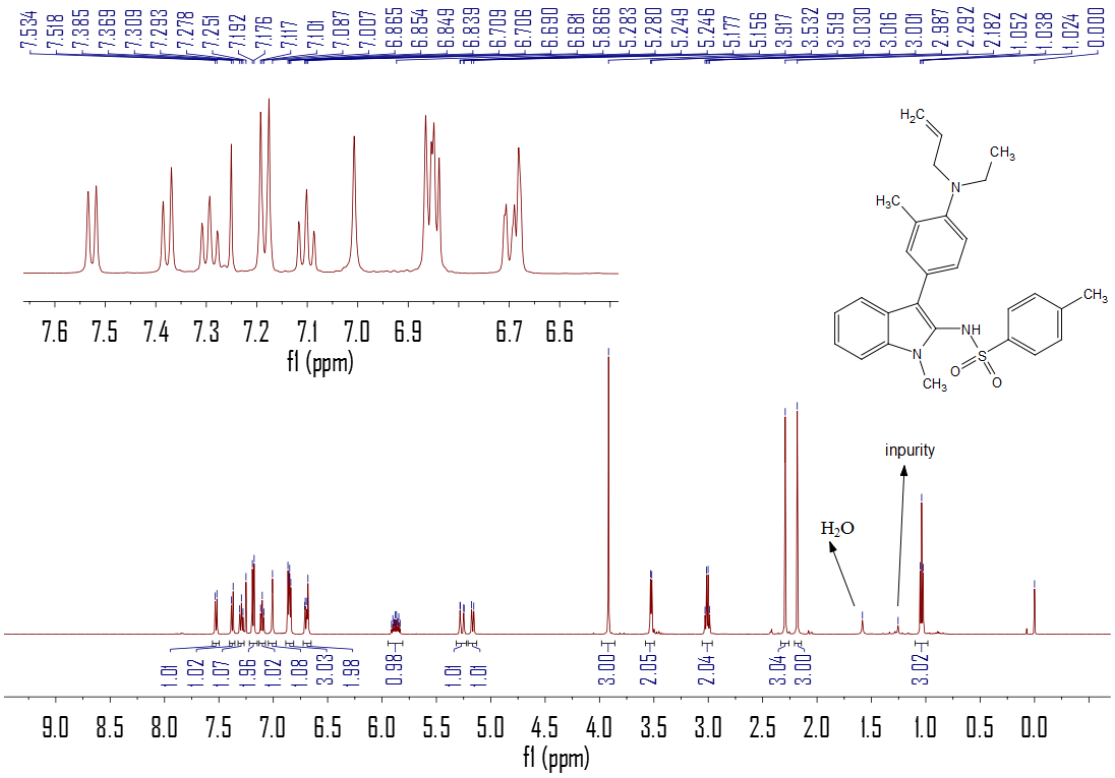
^{13}C NMR Spectrum for **3u** (Acetone, 100 MHz)



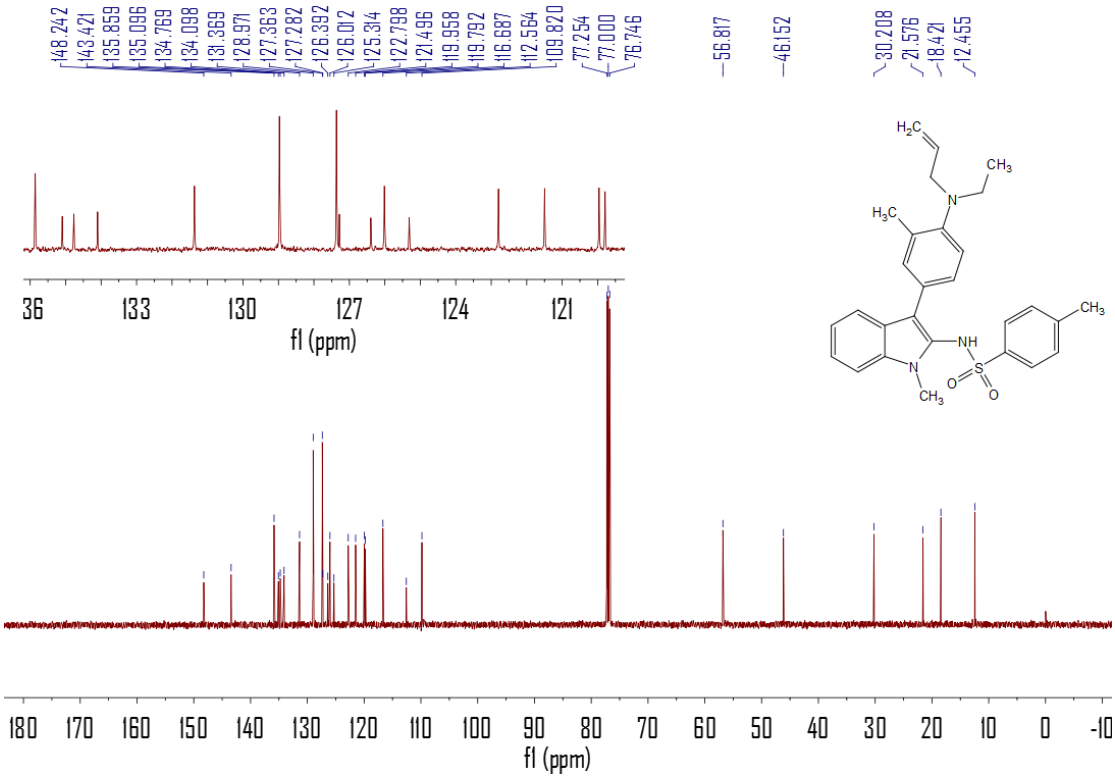
^{1}H NMR Spectrum for **3v** (Acetone, 400 MHz)



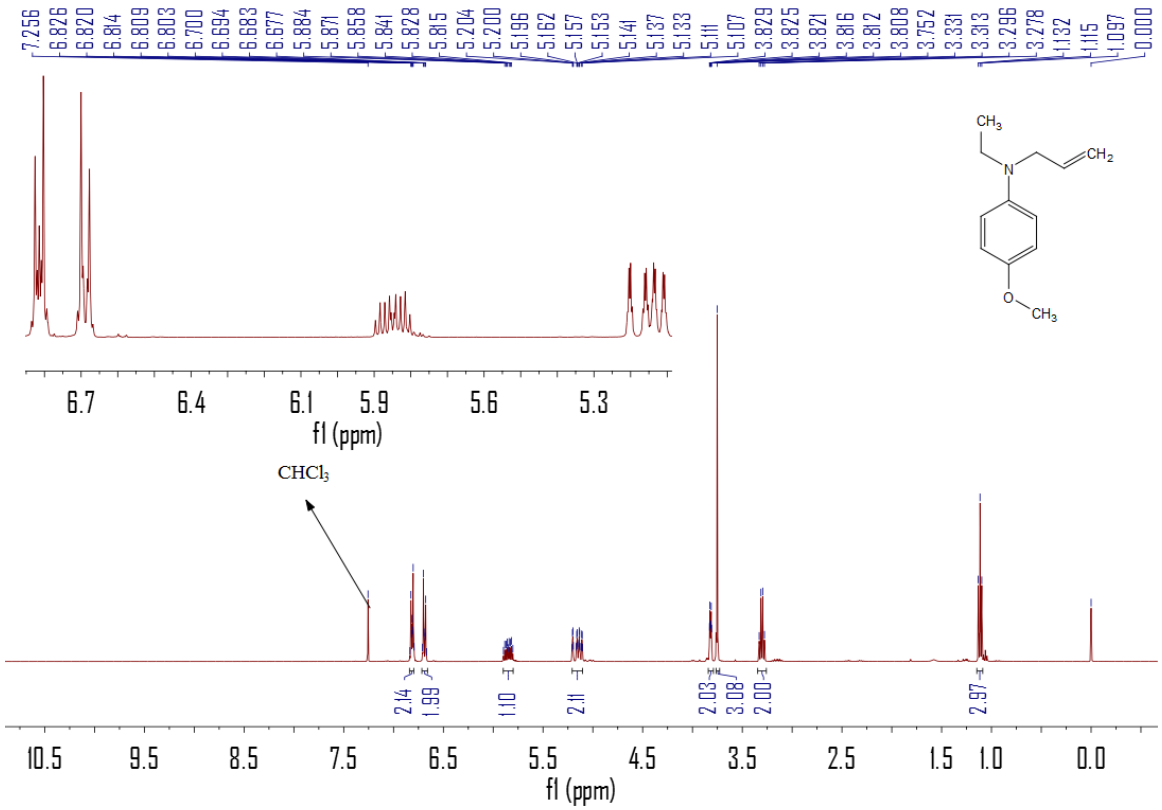
^{13}C NMR Spectrum for **3v** (Acetone, 100 MHz)



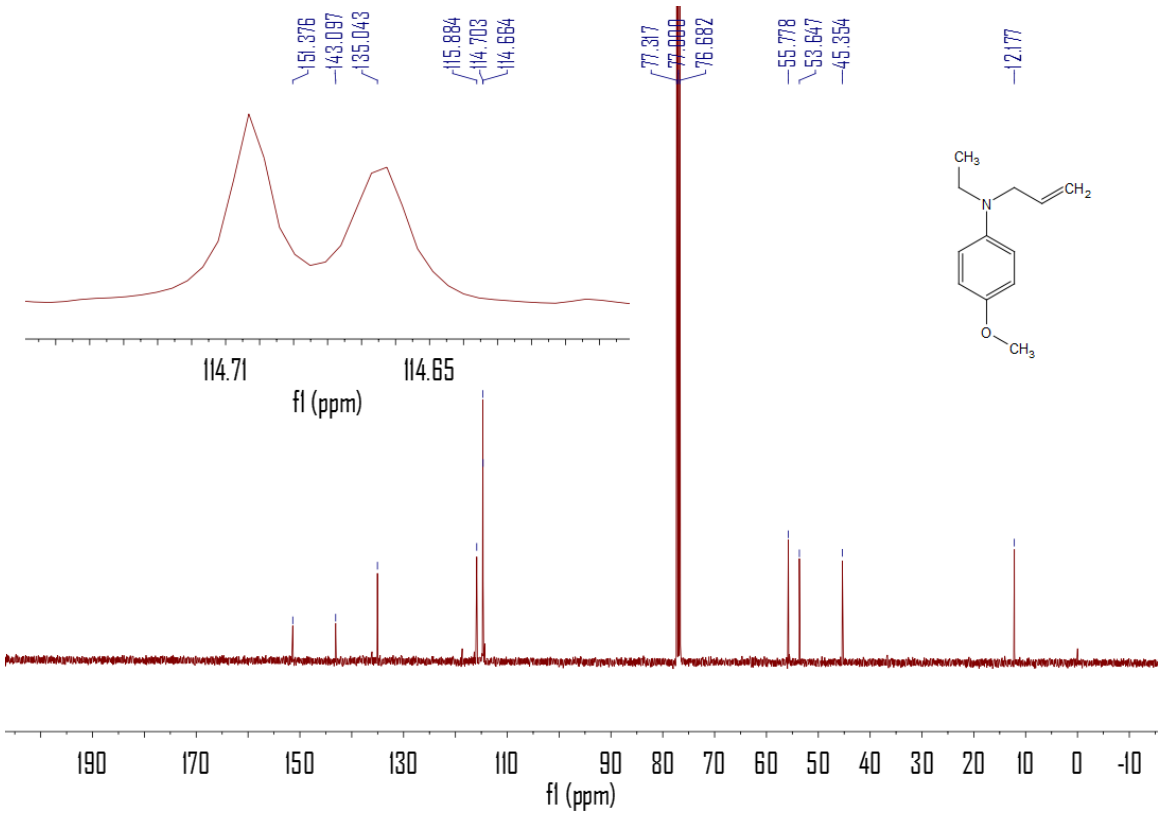
^{1}H NMR Spectrum for **3w** (Acetone, 500 MHz)



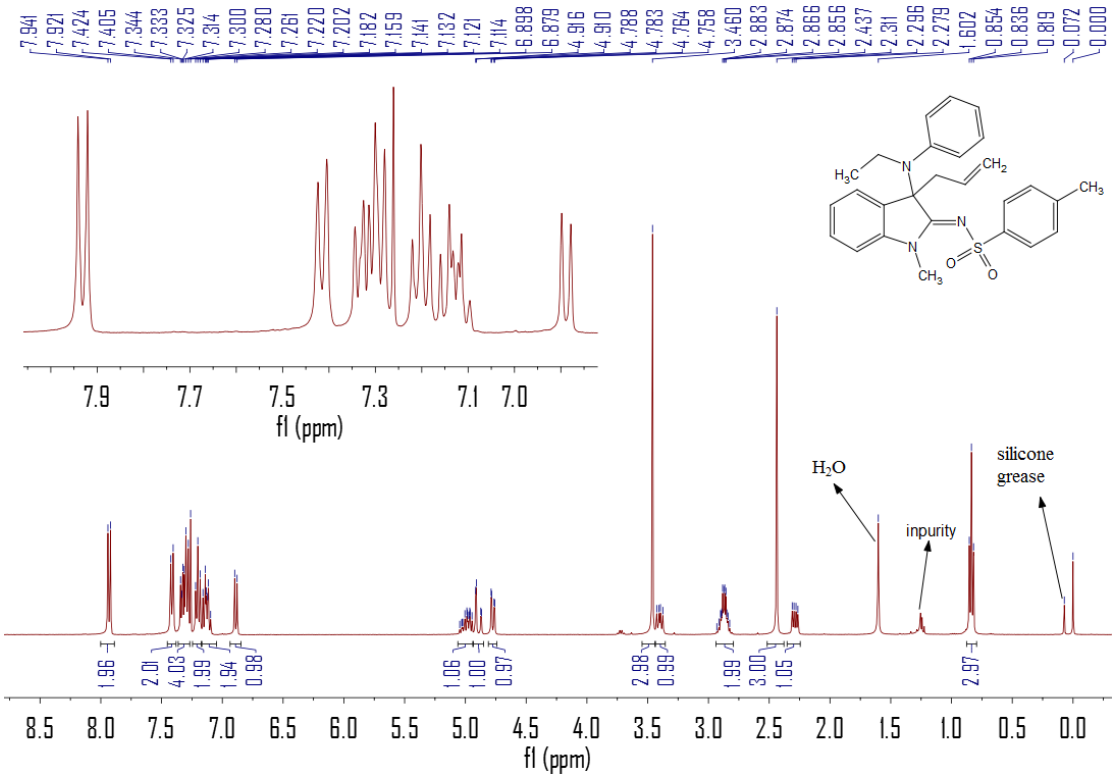
^{13}C NMR Spectrum for **3w** (Acetone, 125 MHz)



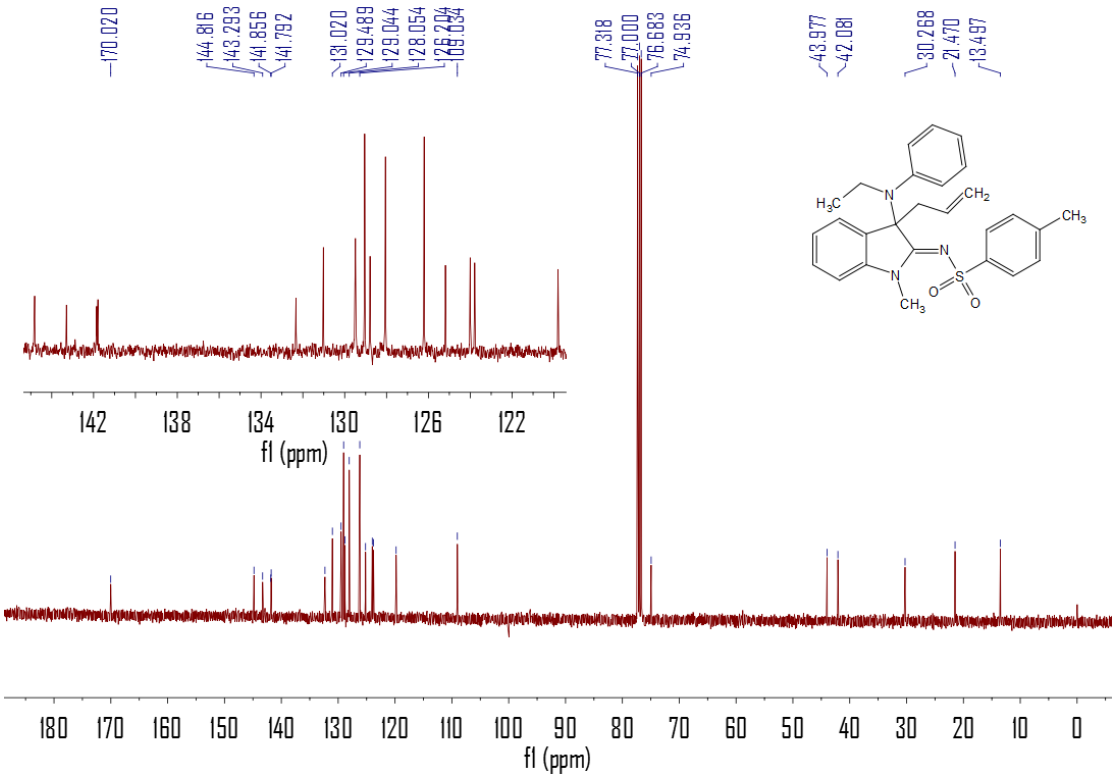
^{1}H NMR Spectrum for **4f** ($CDCl_3$, 400 MHz)



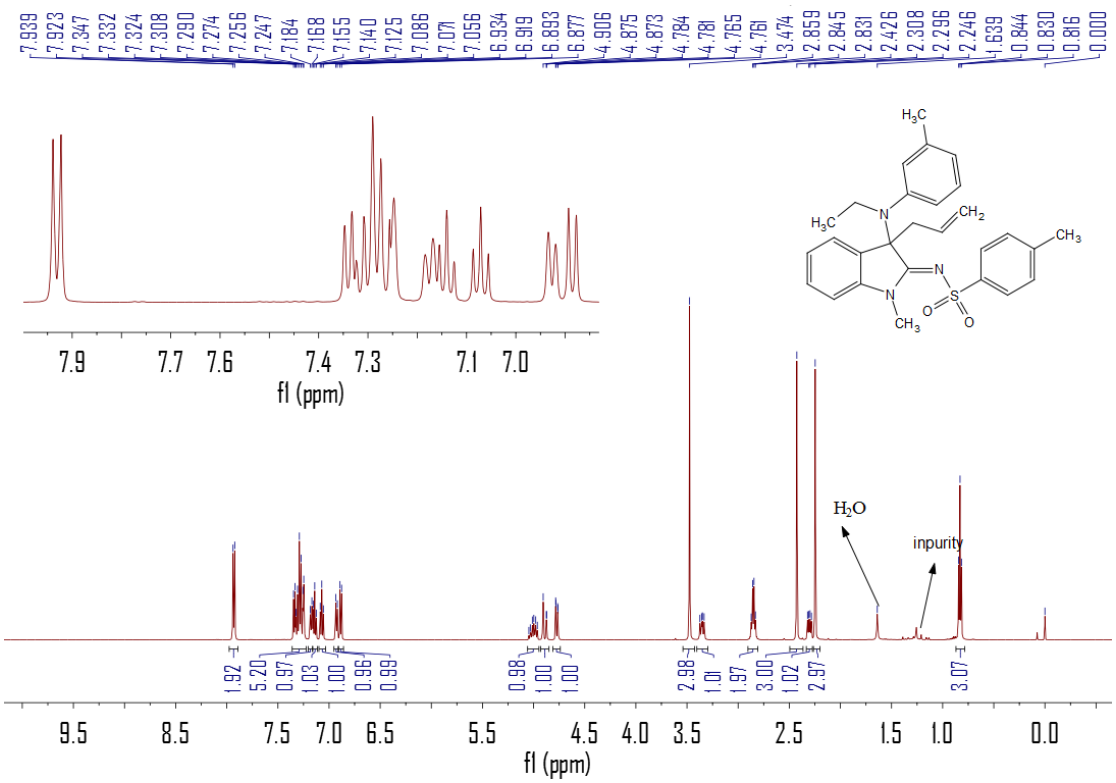
^{13}C NMR Spectrum for **4f** ($CDCl_3$, 100 MHz)



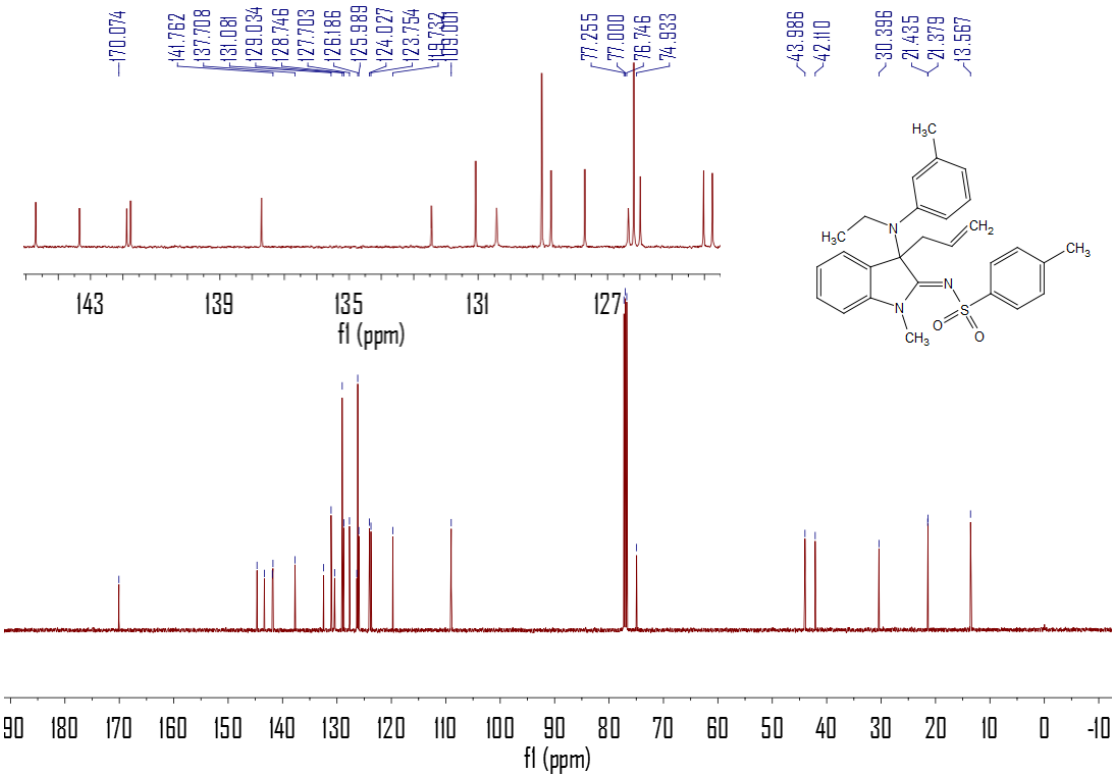
^{1}H NMR Spectrum for **5a** ($CDCl_3$, 400 MHz)



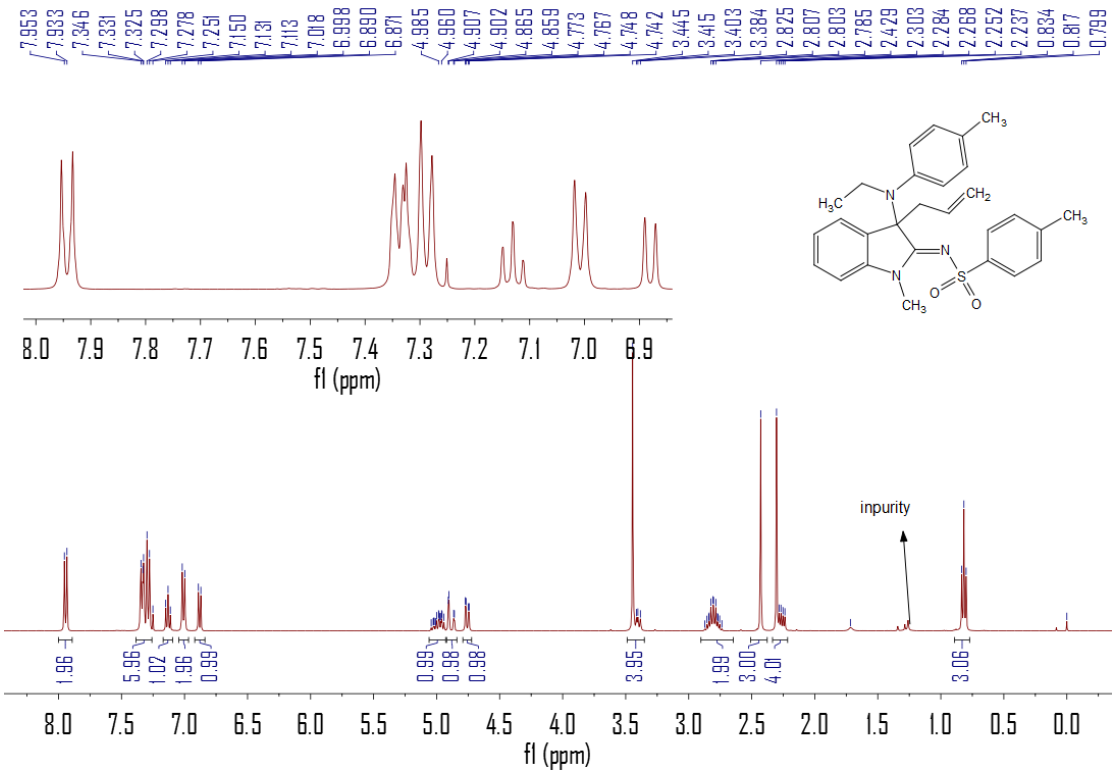
^{13}C NMR Spectrum for **5a** ($CDCl_3$, 100 MHz)



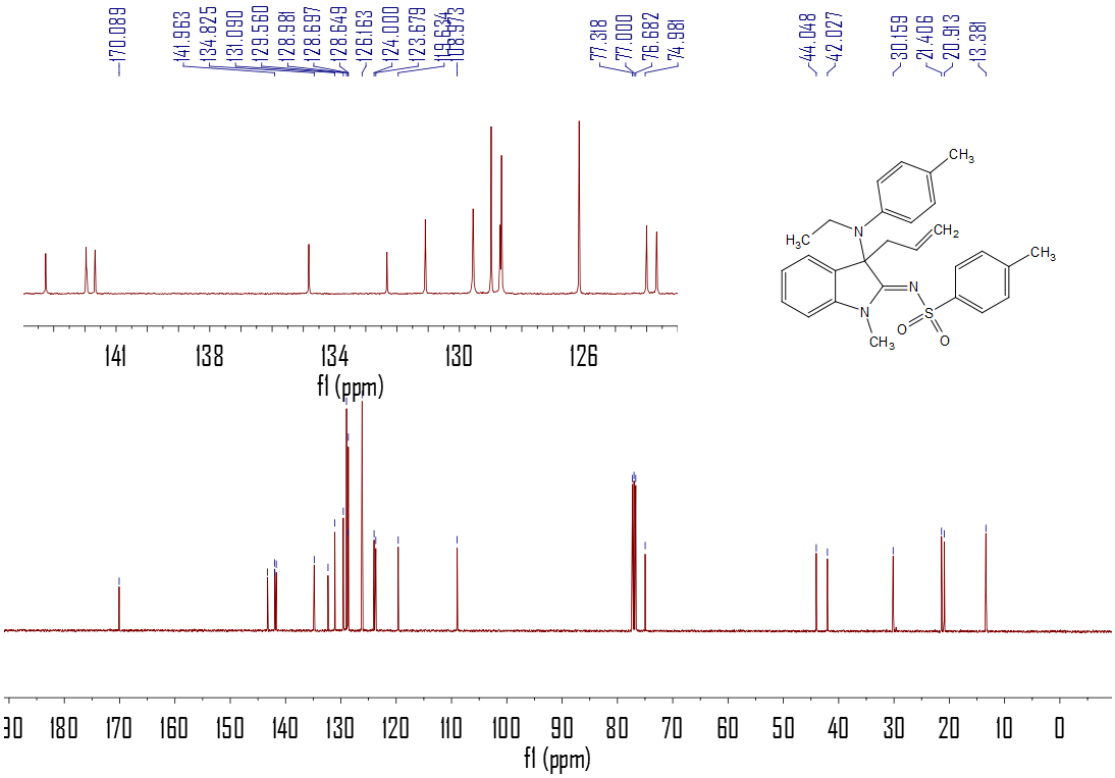
^{1}H NMR Spectrum for **5b** ($CDCl_3$, 500 MHz)



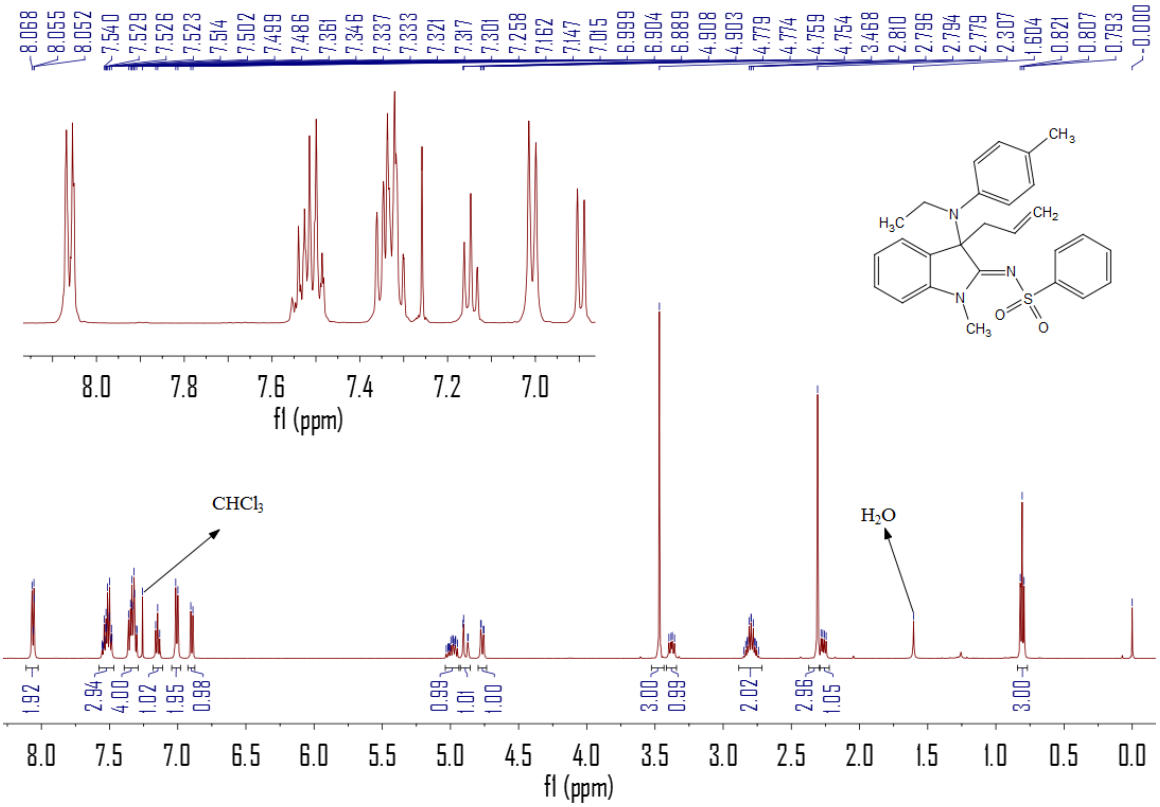
^{13}C NMR Spectrum for **5b** ($CDCl_3$, 125 MHz)



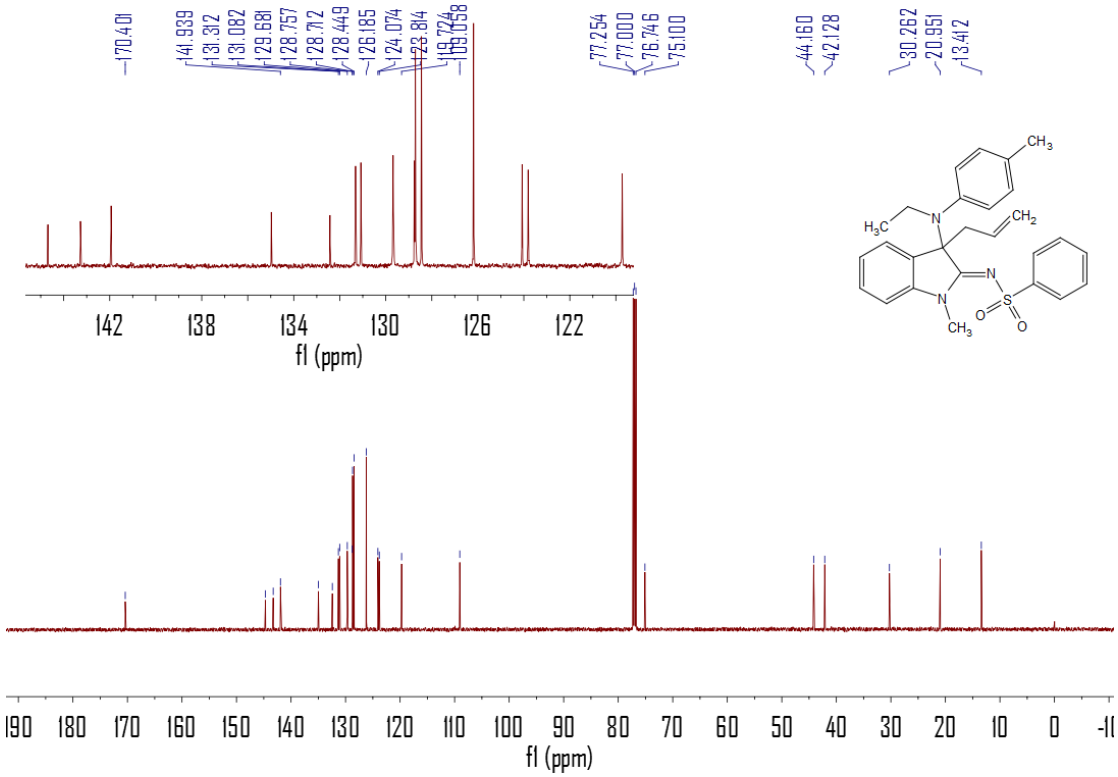
^{1}H NMR Spectrum for **5c** ($CDCl_3$, 400 MHz)



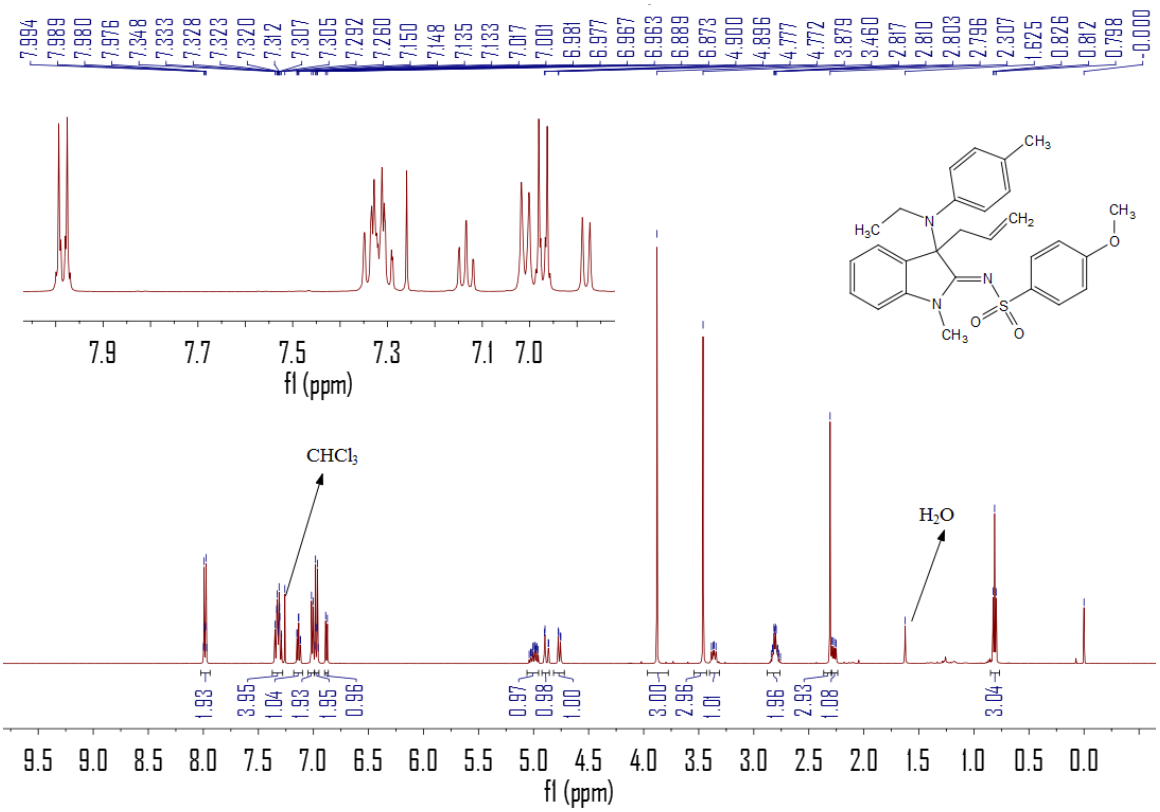
^{13}C NMR Spectrum for **5c** ($CDCl_3$, 100 MHz)



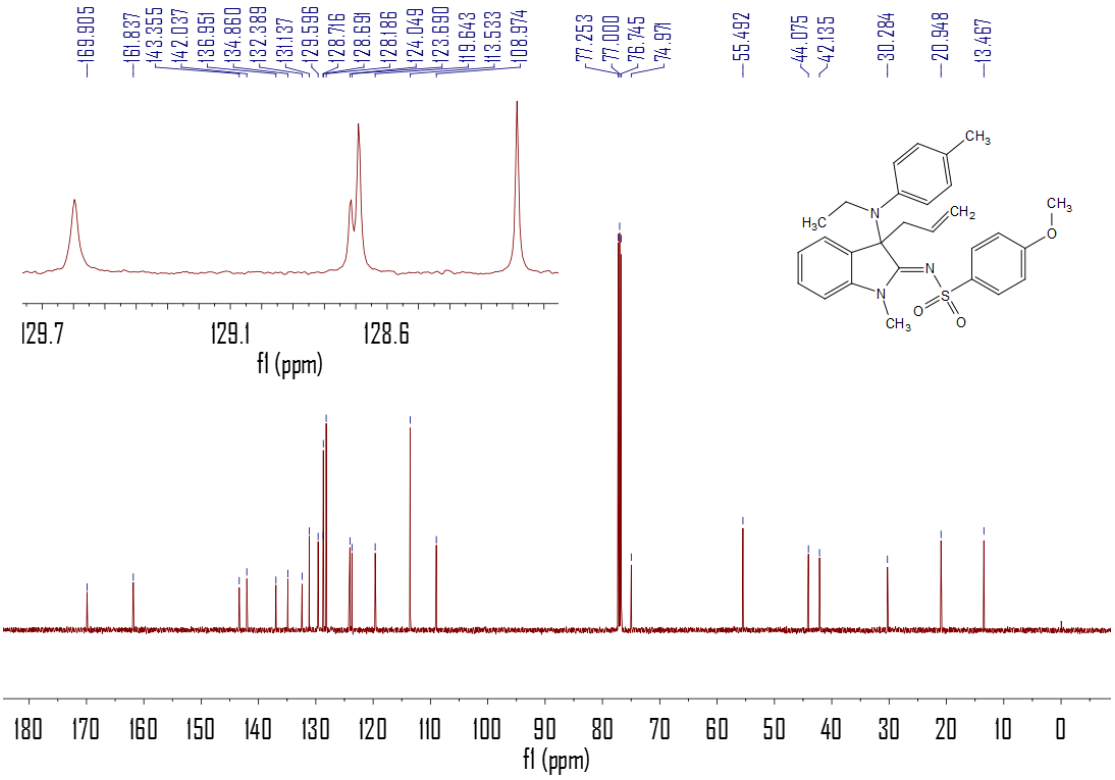
^{1}H NMR Spectrum for **5d** ($CDCl_3$, 500 MHz)



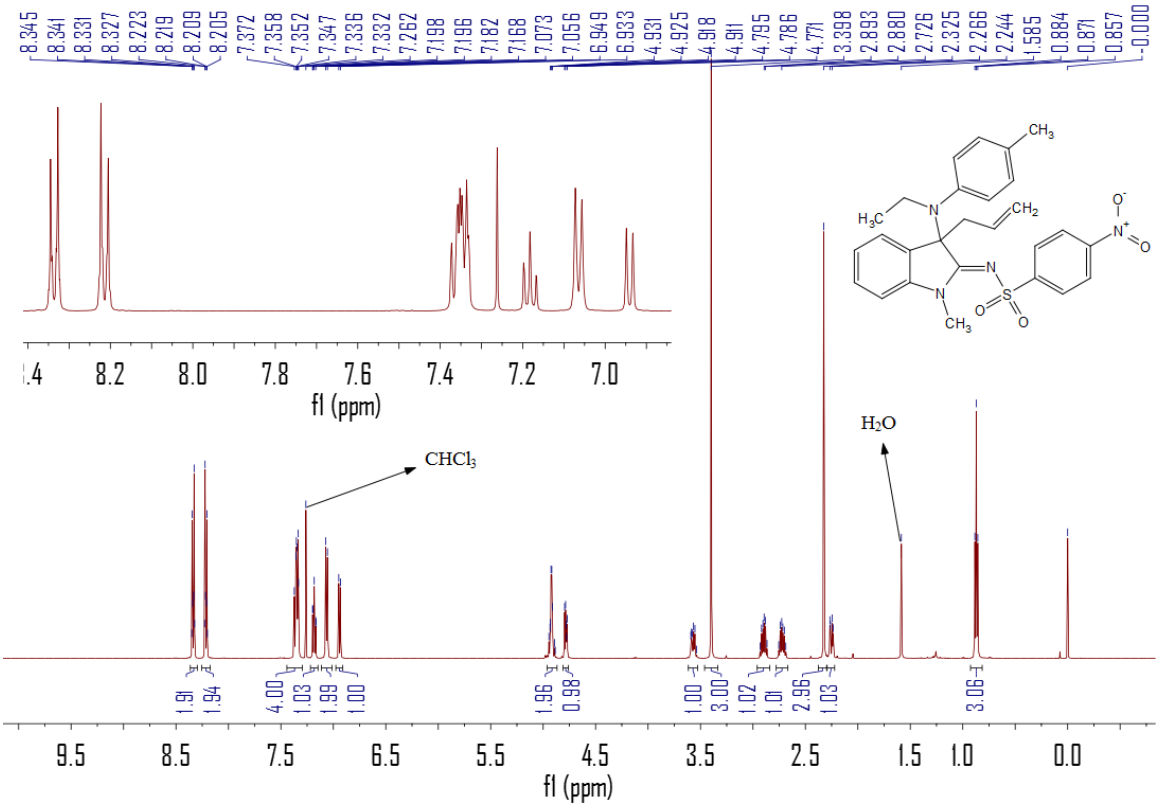
^{13}C NMR Spectrum for **5d** ($CDCl_3$, 125 MHz)



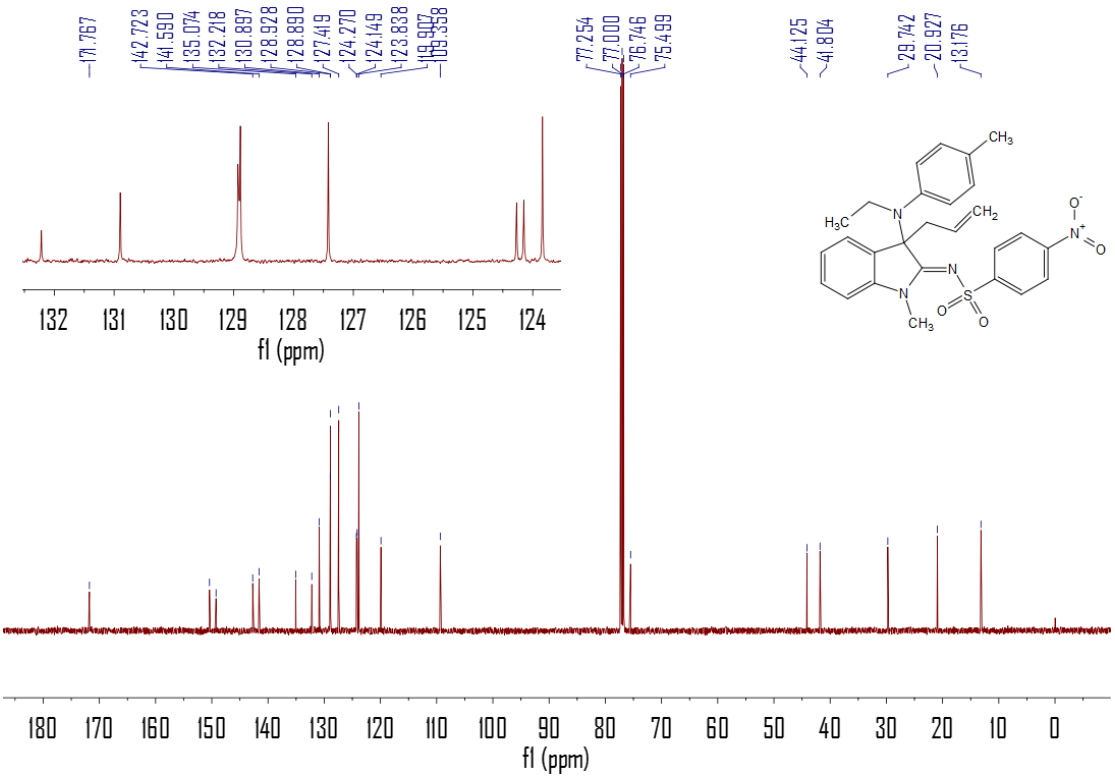
^{1}H NMR Spectrum for **5e** ($CDCl_3$, 500 MHz)



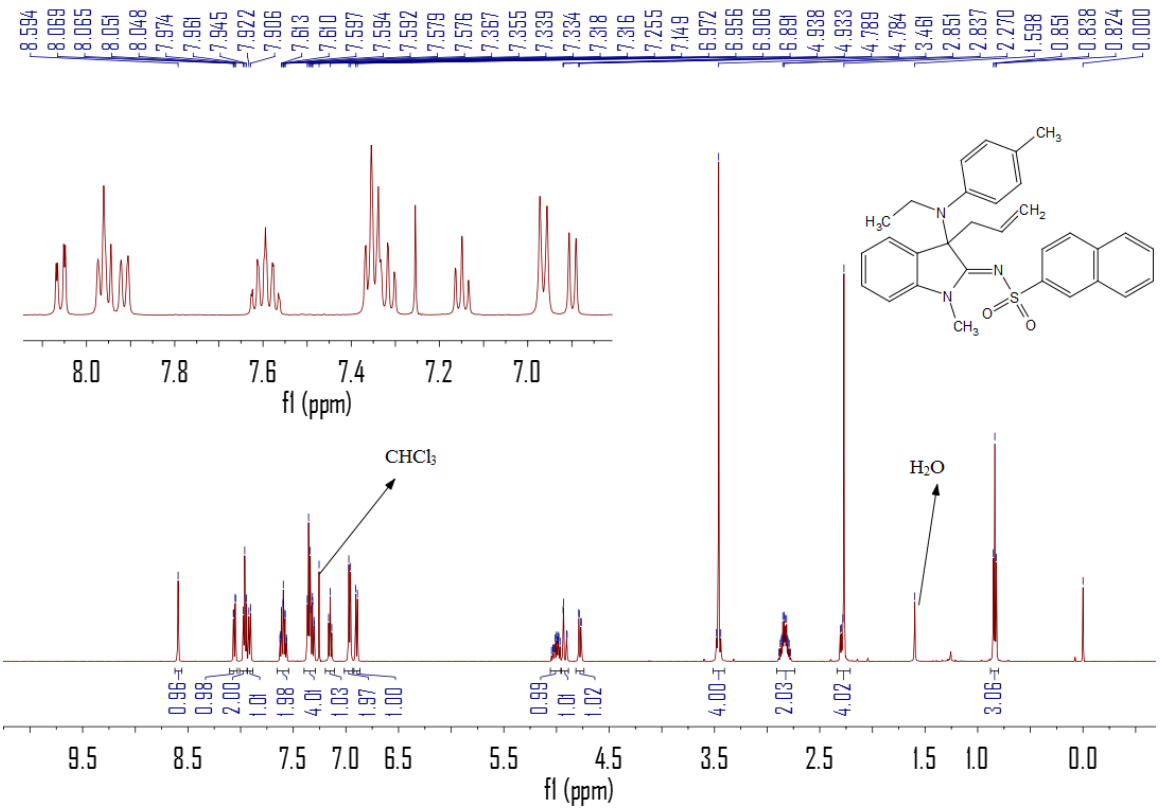
^{13}C NMR Spectrum for **5e** ($CDCl_3$, 125 MHz)



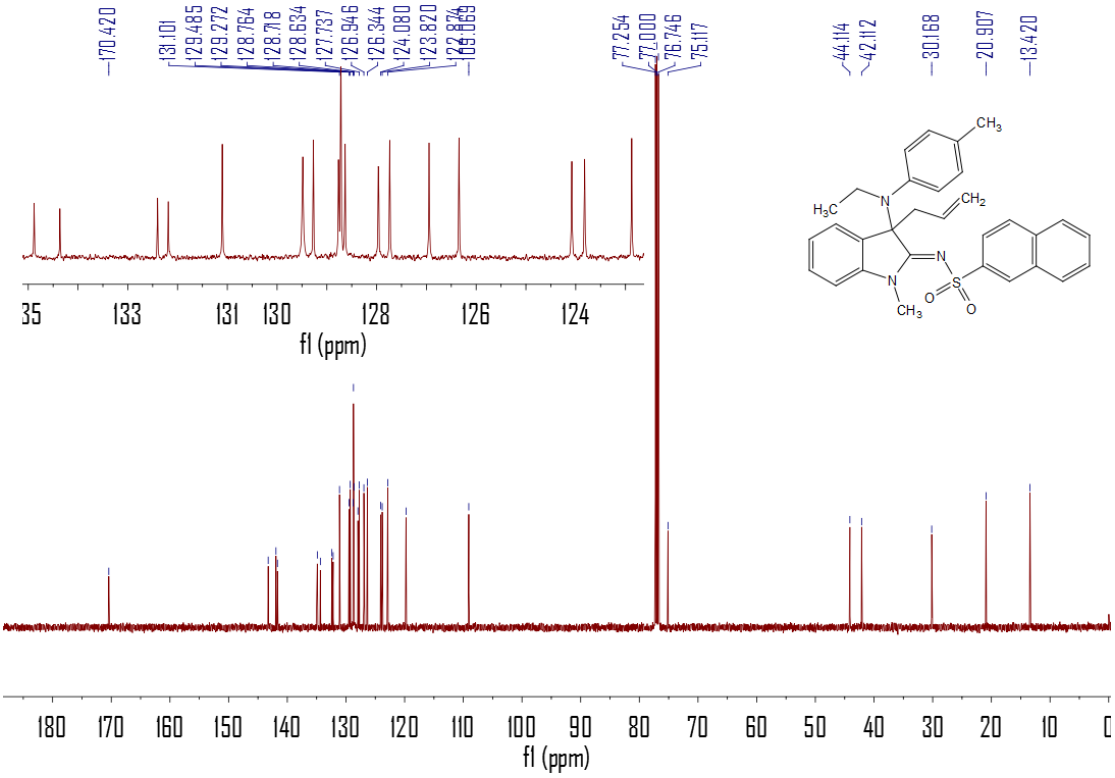
^{1}H NMR Spectrum for **5f** ($CDCl_3$, 500 MHz)



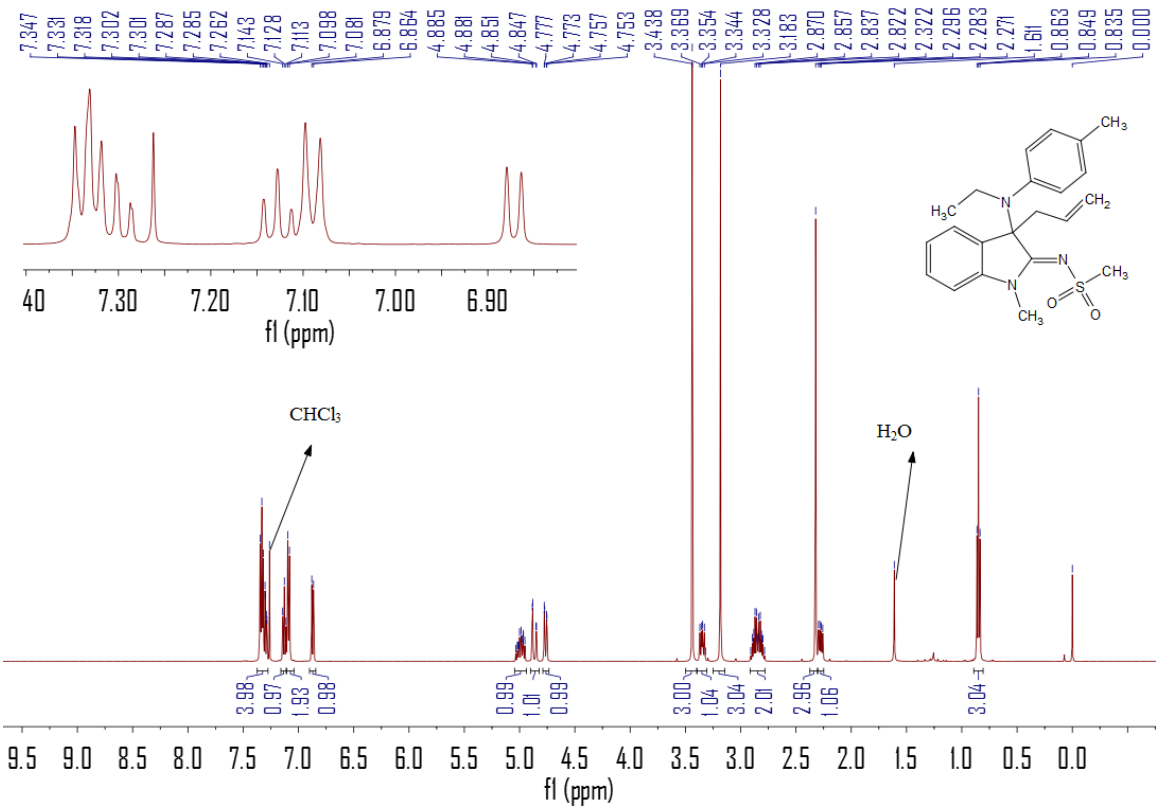
^{13}C NMR Spectrum for **5f** ($CDCl_3$, 125 MHz)



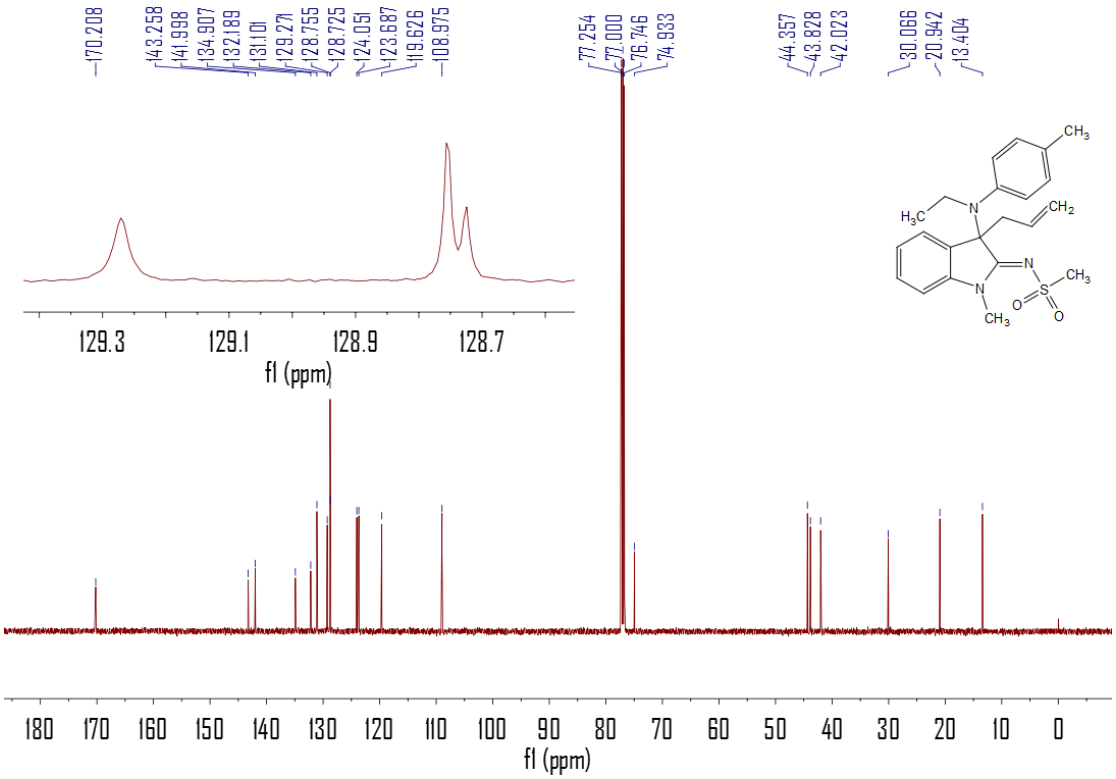
^{1}H NMR Spectrum for **5g** ($CDCl_3$, 500 MHz)



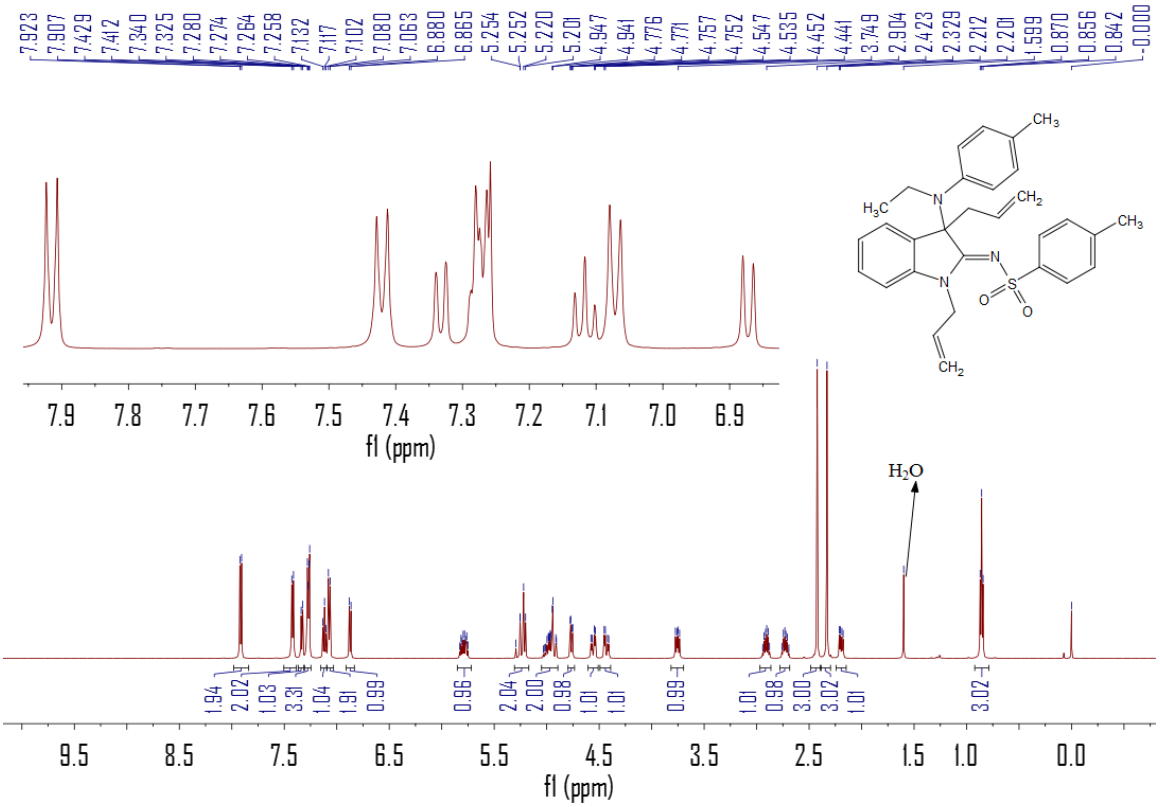
^{13}C NMR Spectrum for **5g** ($CDCl_3$, 125 MHz)



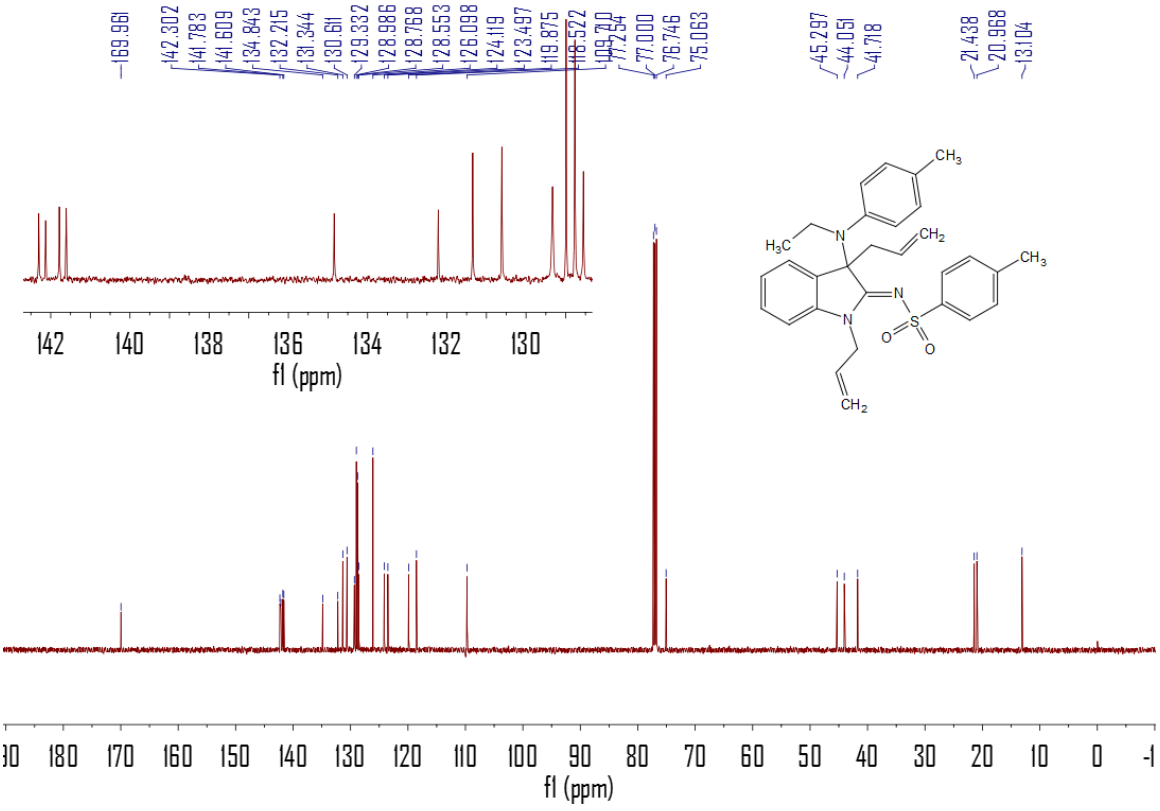
^{1}H NMR Spectrum for **5h** ($CDCl_3$, 500 MHz)



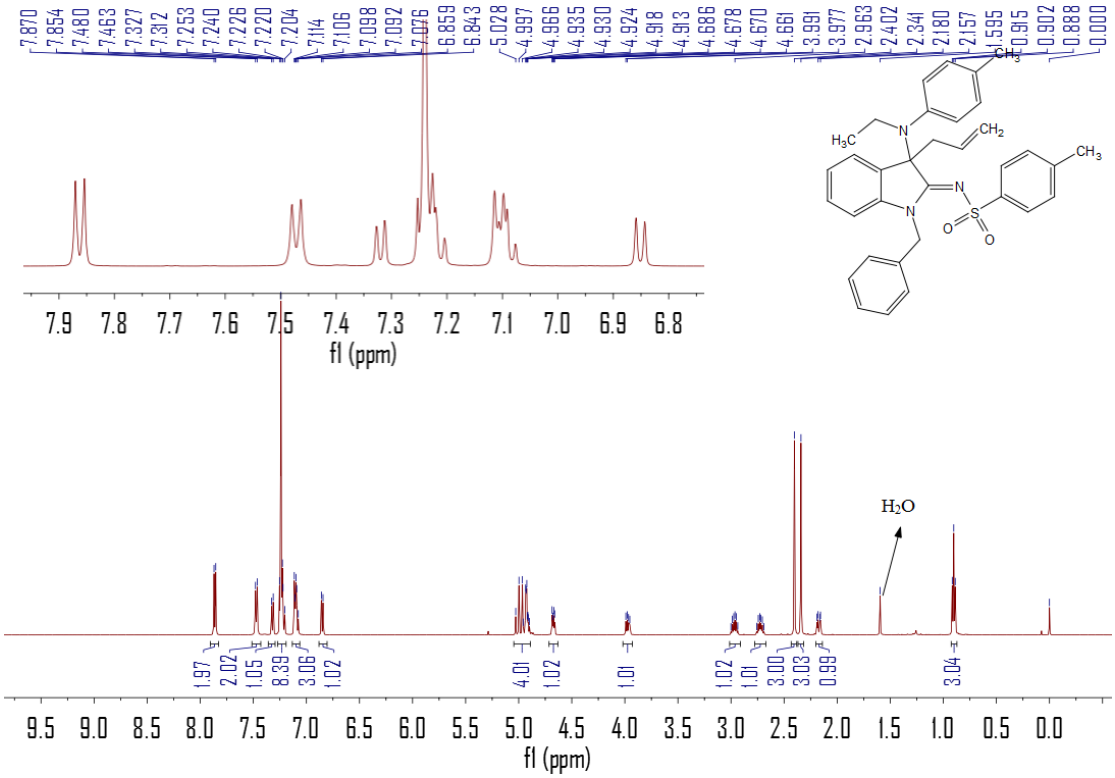
^{13}C NMR Spectrum for **5h** ($CDCl_3$, 125 MHz)



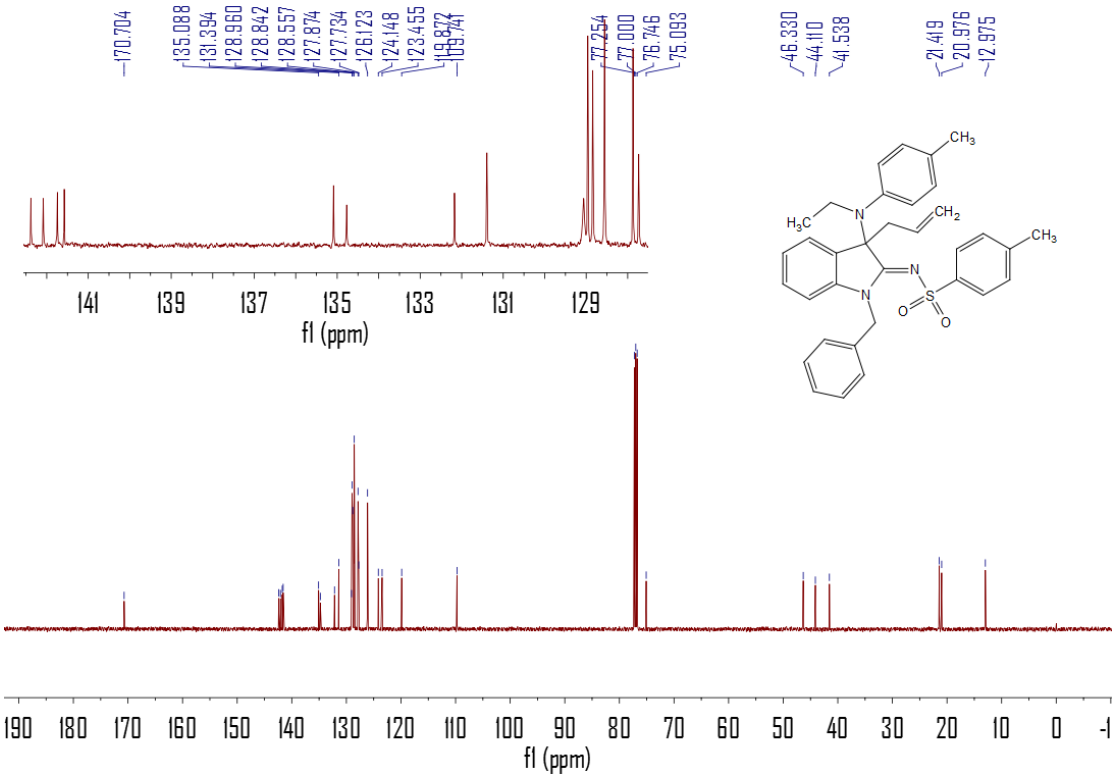
^{1}H NMR Spectrum for **5i** ($CDCl_3$, 500 MHz)



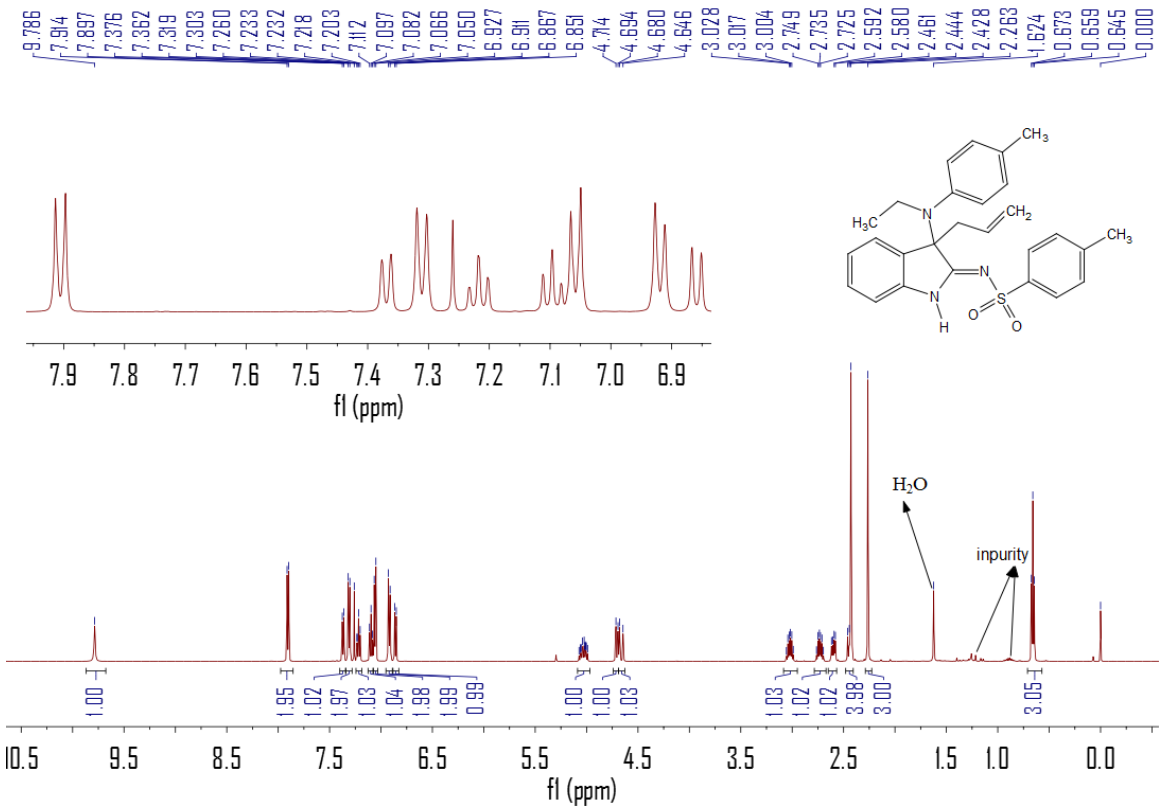
^{13}C NMR Spectrum for **5i** ($CDCl_3$, 125 MHz)



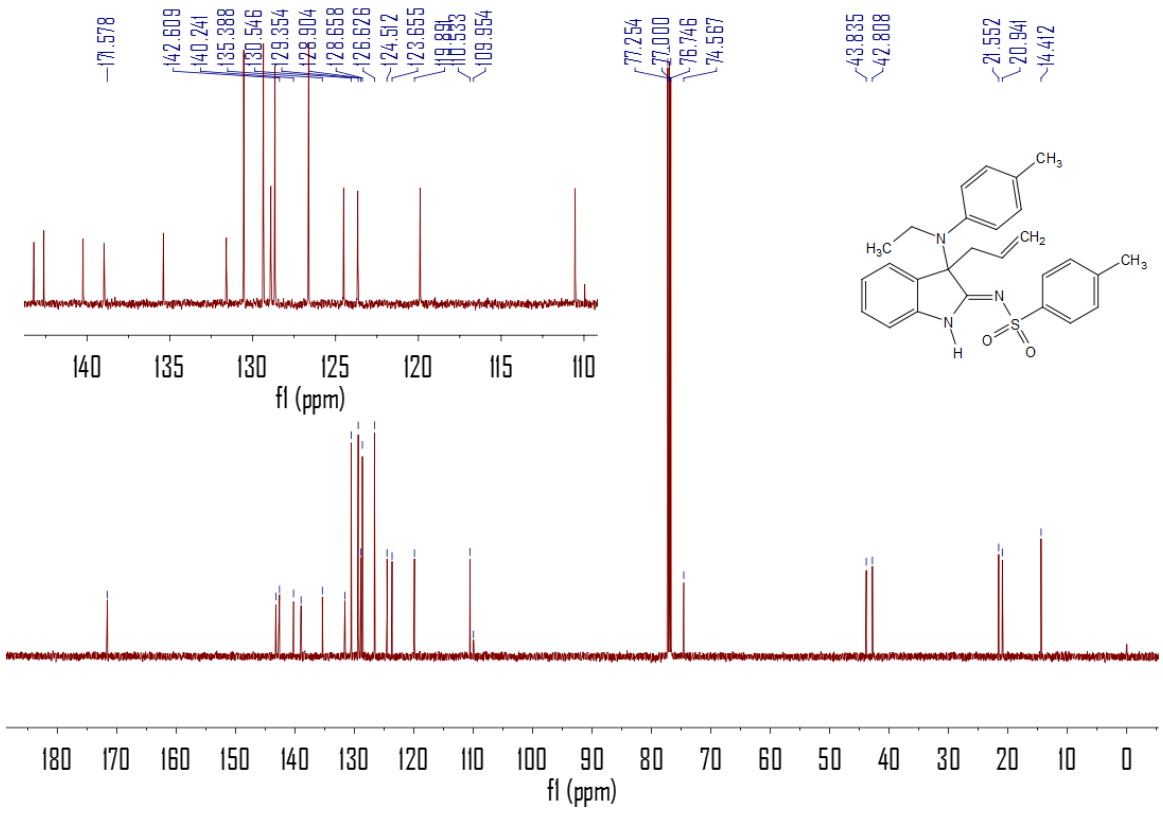
^{1}H NMR Spectrum for **5j** ($CDCl_3$, 500 MHz)



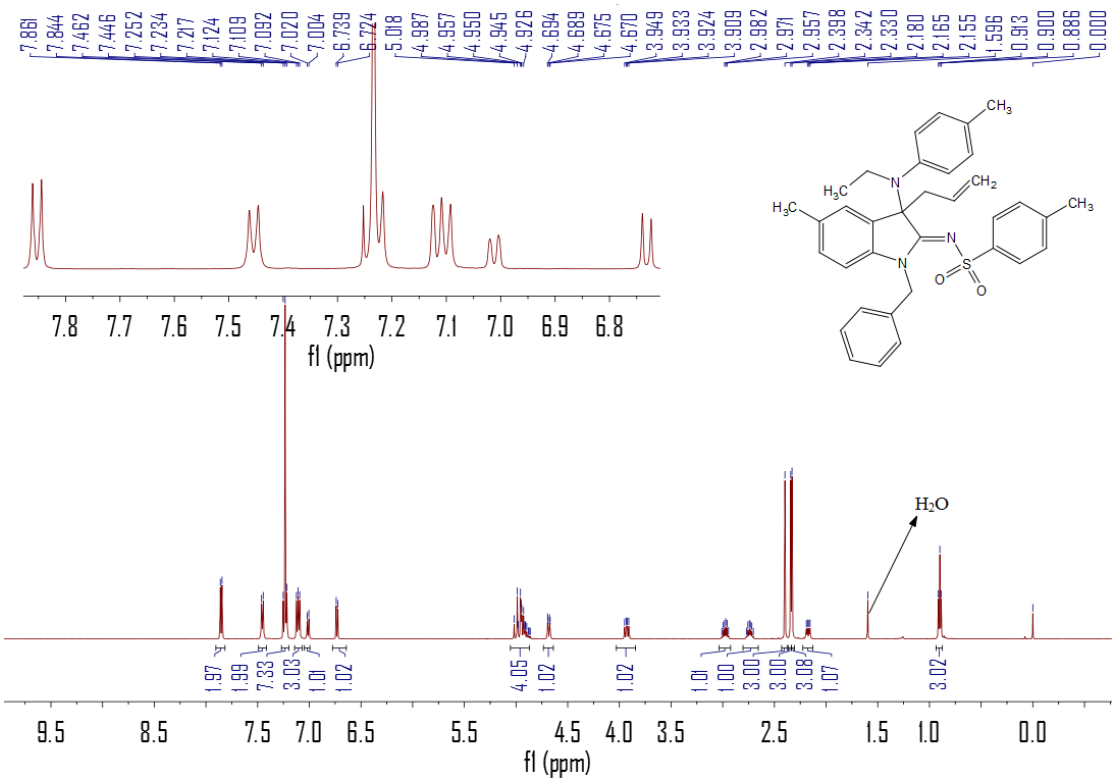
^{13}C NMR Spectrum for **5j** ($CDCl_3$, 125 MHz)



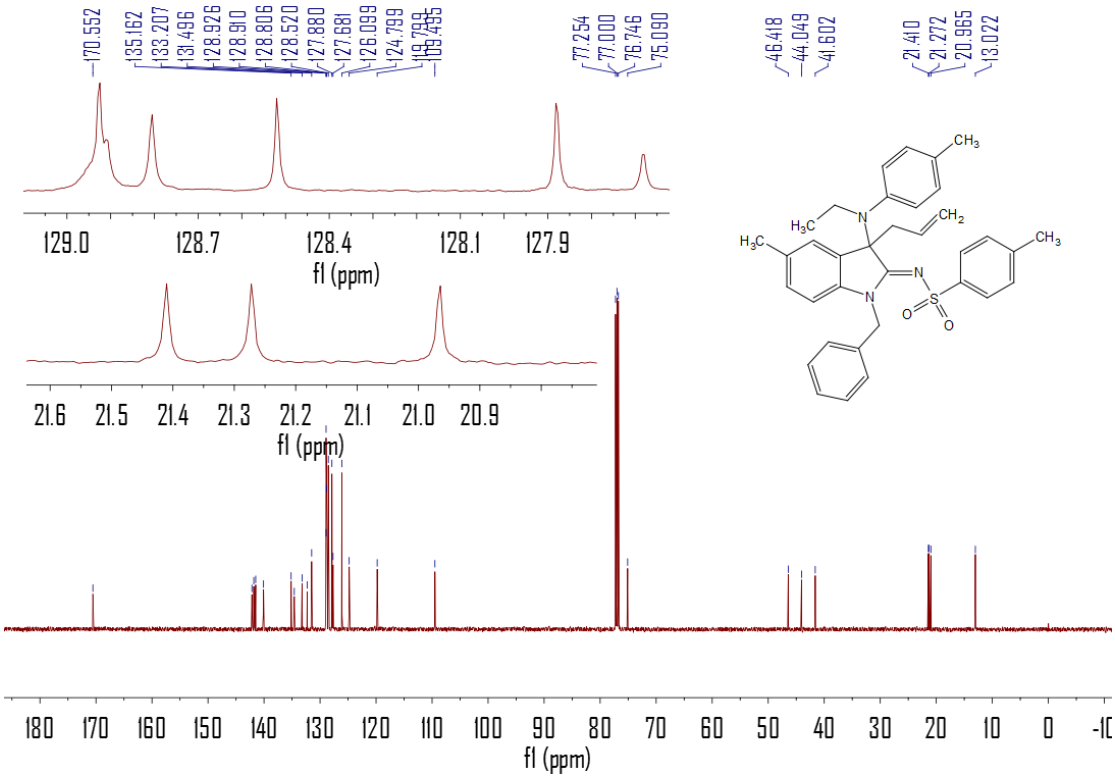
^{1}H NMR Spectrum for **5k** ($CDCl_3$, 500 MHz)



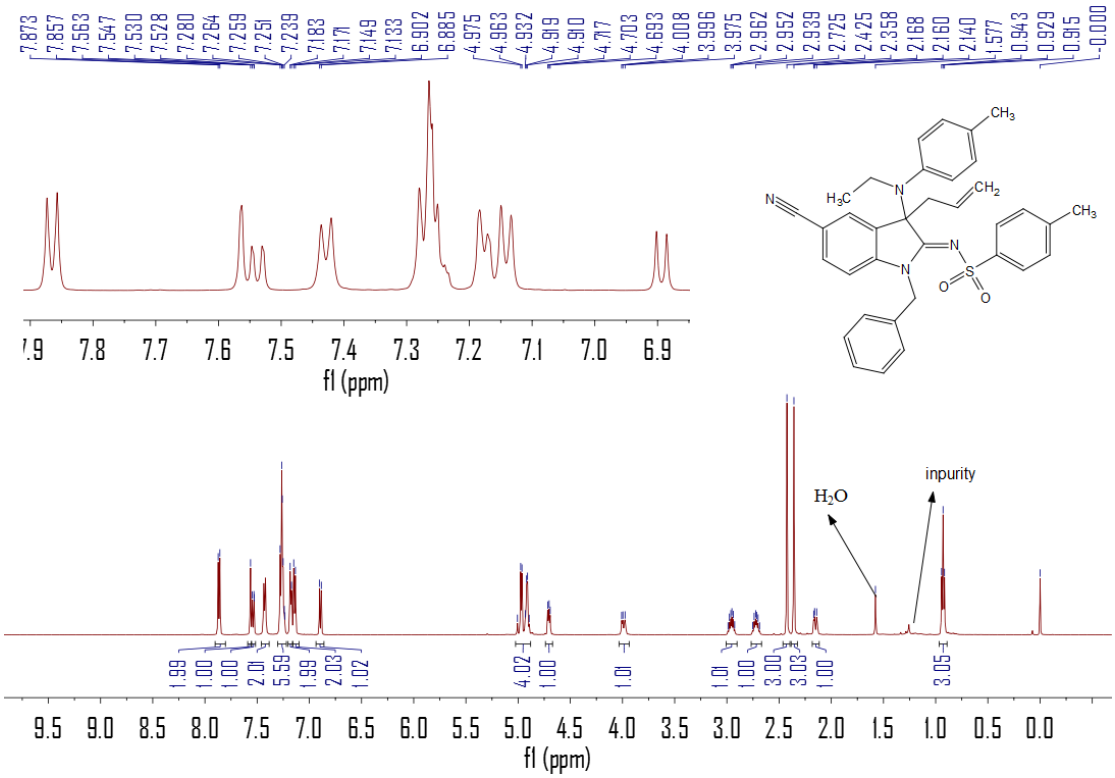
^{13}C NMR Spectrum for **5k** ($CDCl_3$, 125 MHz)



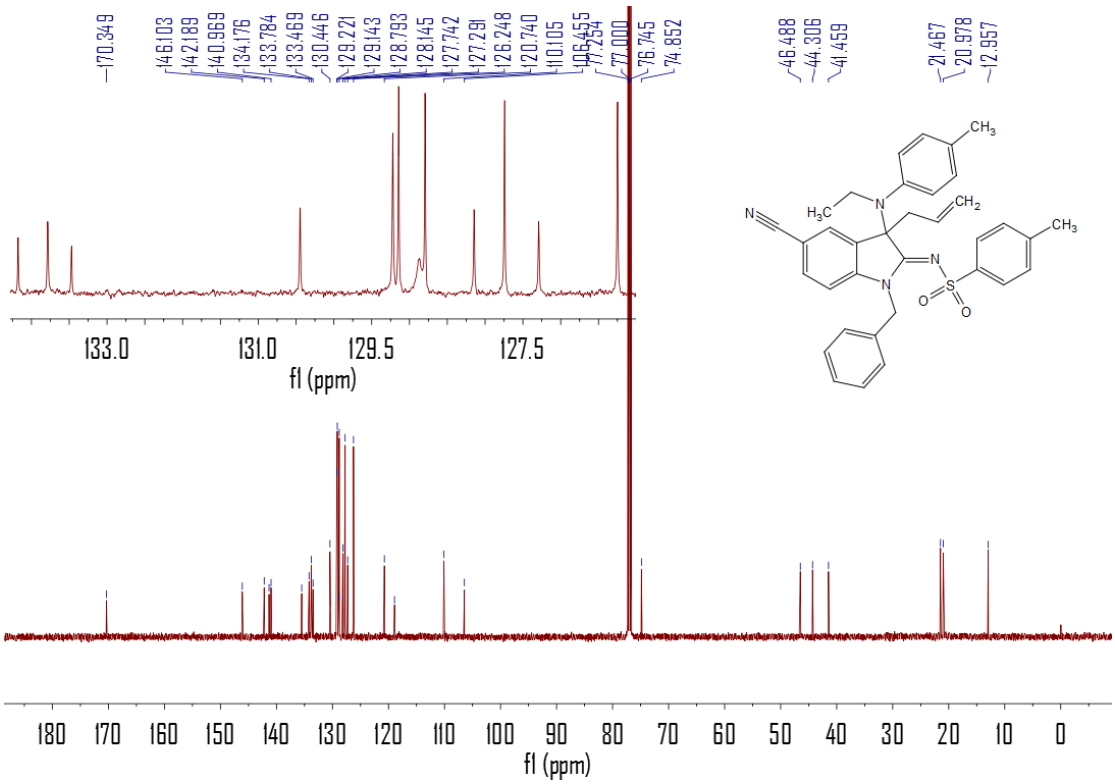
^{1}H NMR Spectrum for **5l** ($CDCl_3$, 500 MHz)



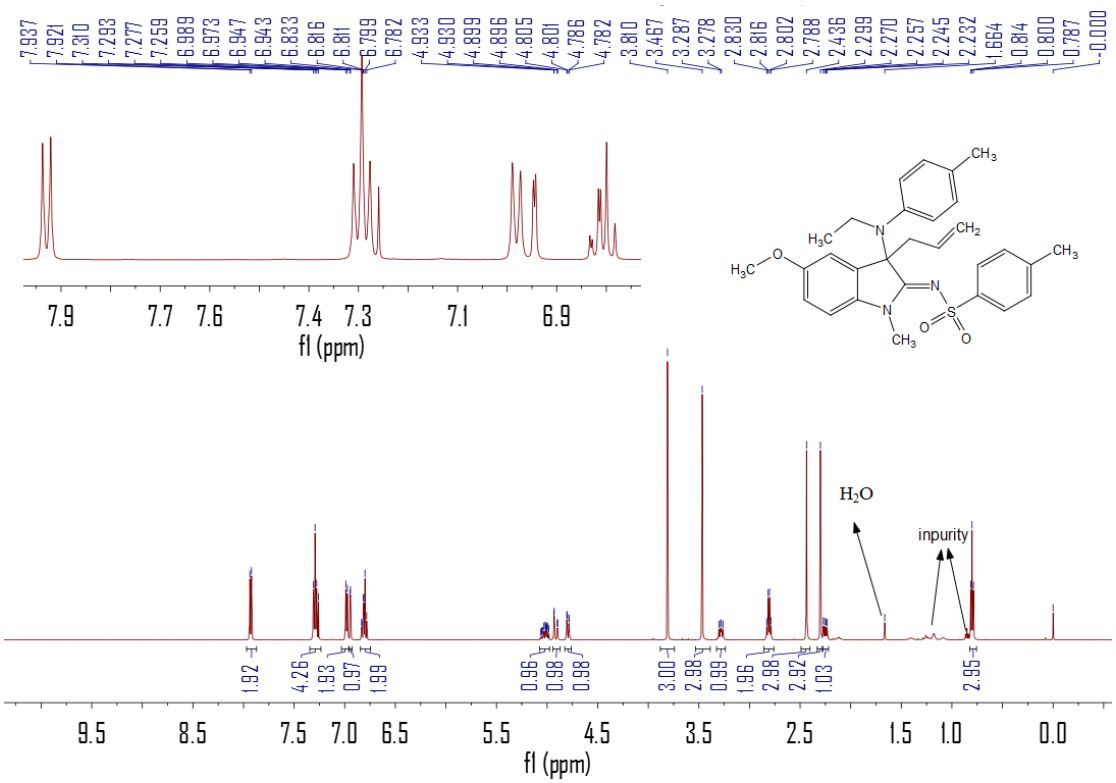
^{13}C NMR Spectrum for **5l** ($CDCl_3$, 125 MHz)



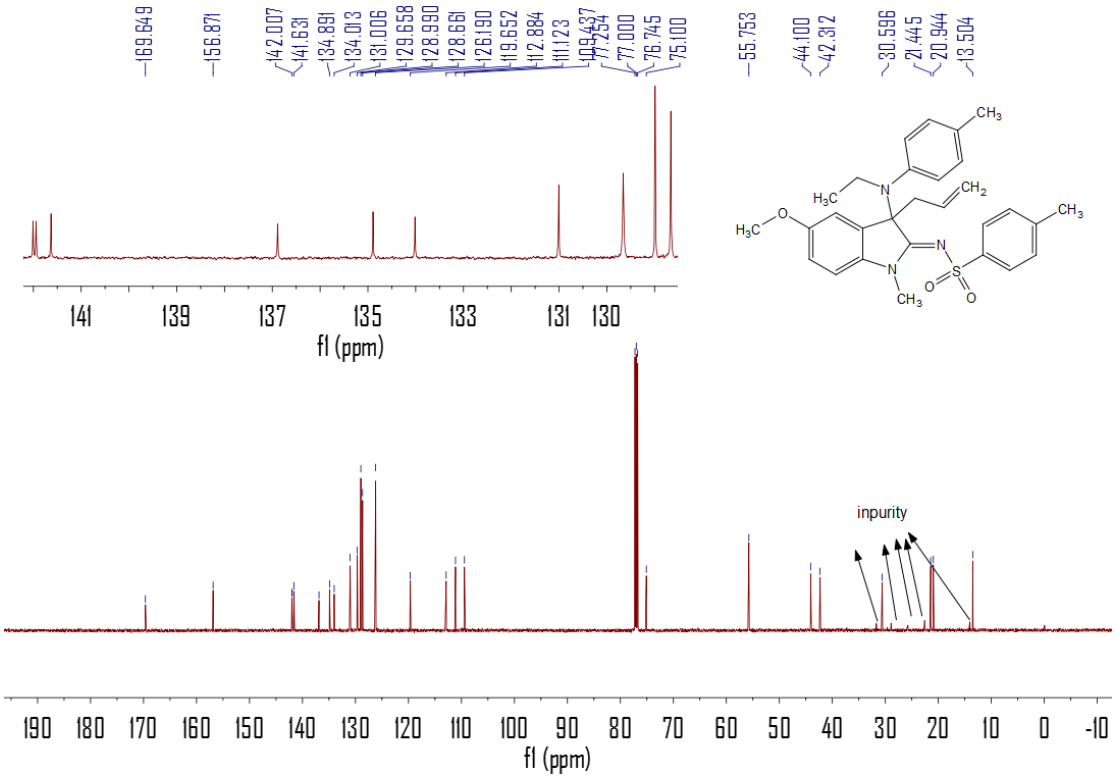
^{1}H NMR Spectrum for **5m** ($CDCl_3$, 500 MHz)



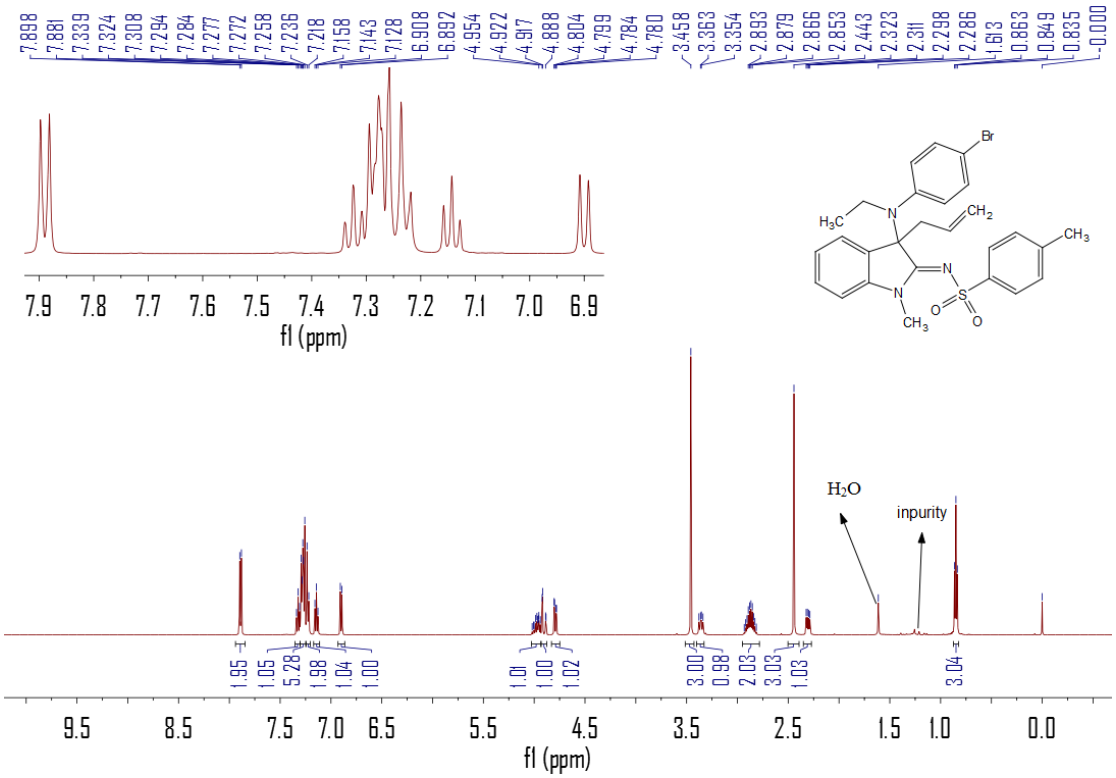
^{13}C NMR Spectrum for **5m** ($CDCl_3$, 125 MHz)



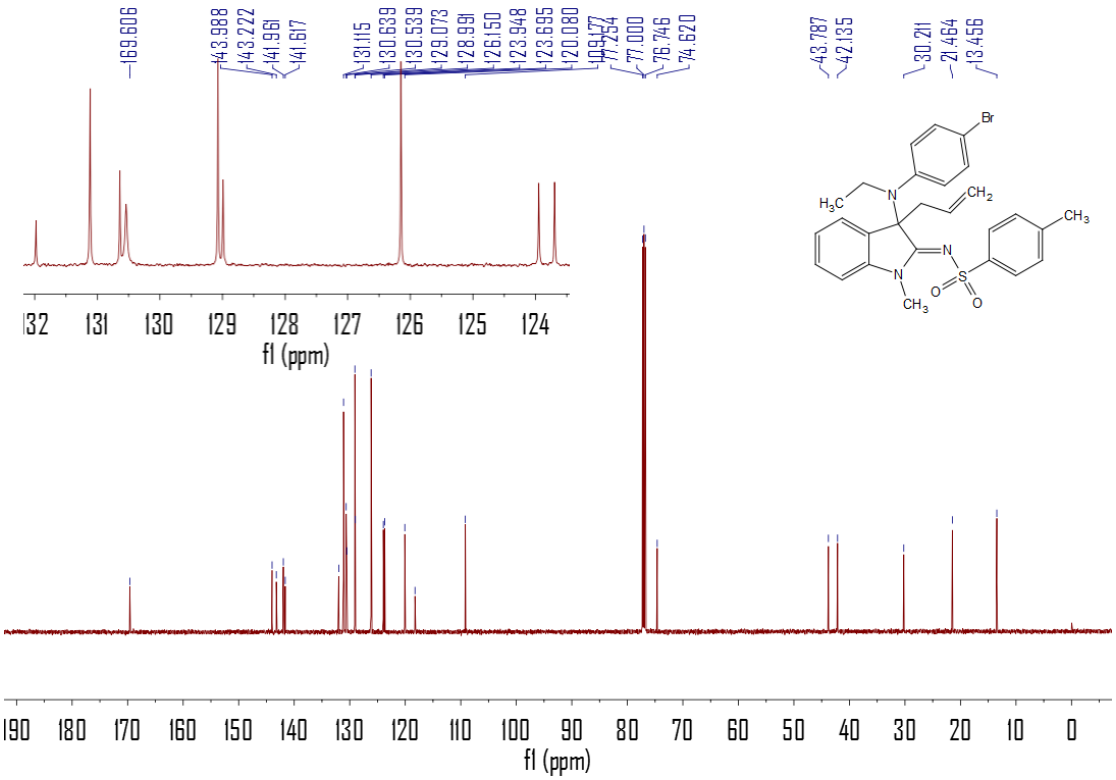
^{1}H NMR Spectrum for **5n** ($CDCl_3$, 500 MHz)



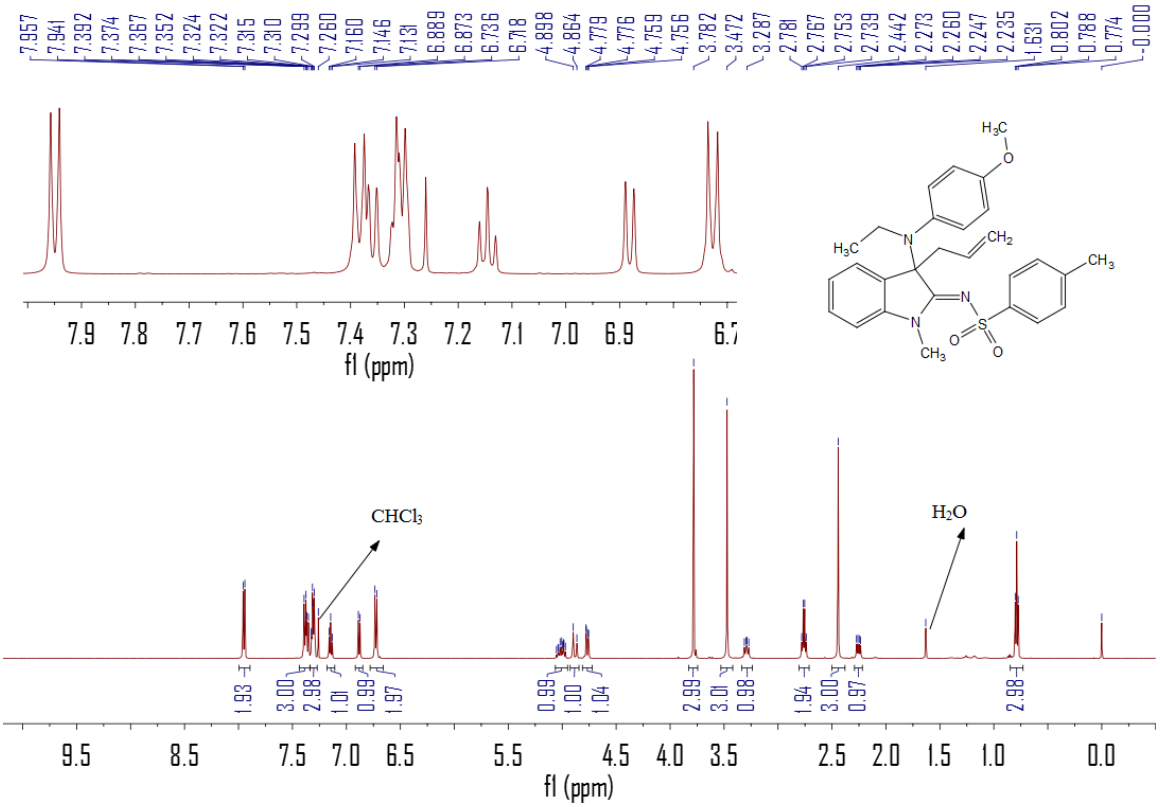
^{13}C NMR Spectrum for **5n** ($CDCl_3$, 125 MHz)



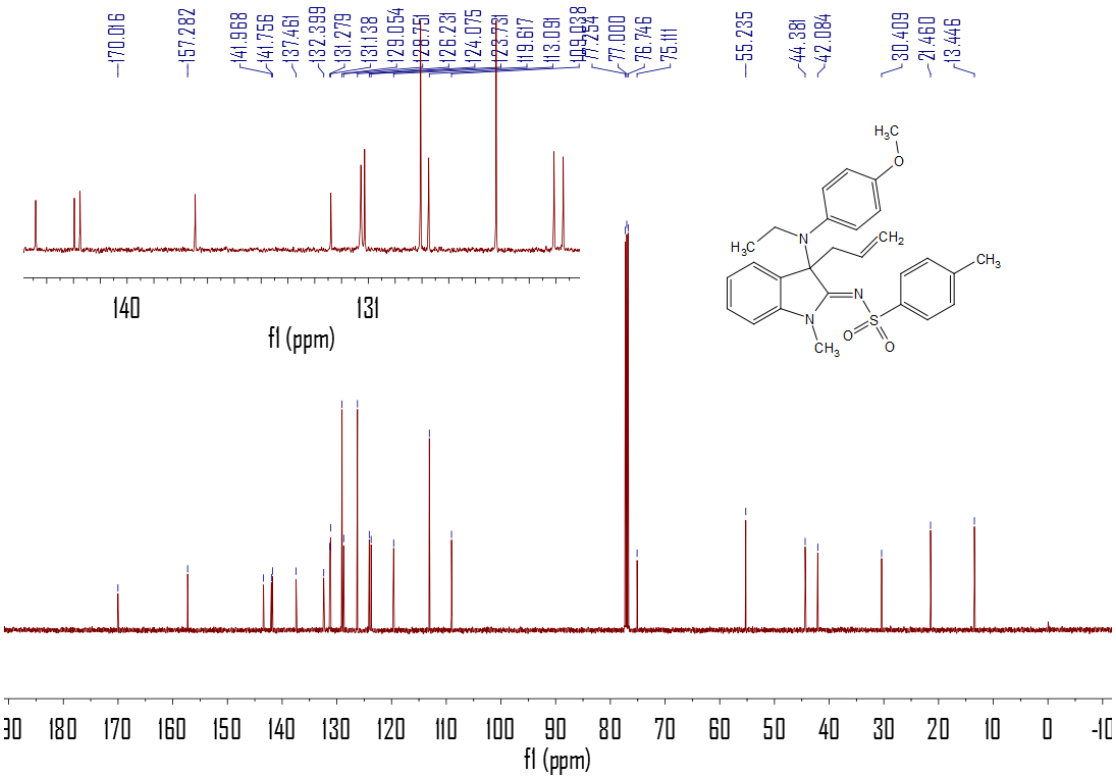
^{1}H NMR Spectrum for **5o** ($CDCl_3$, 500 MHz)



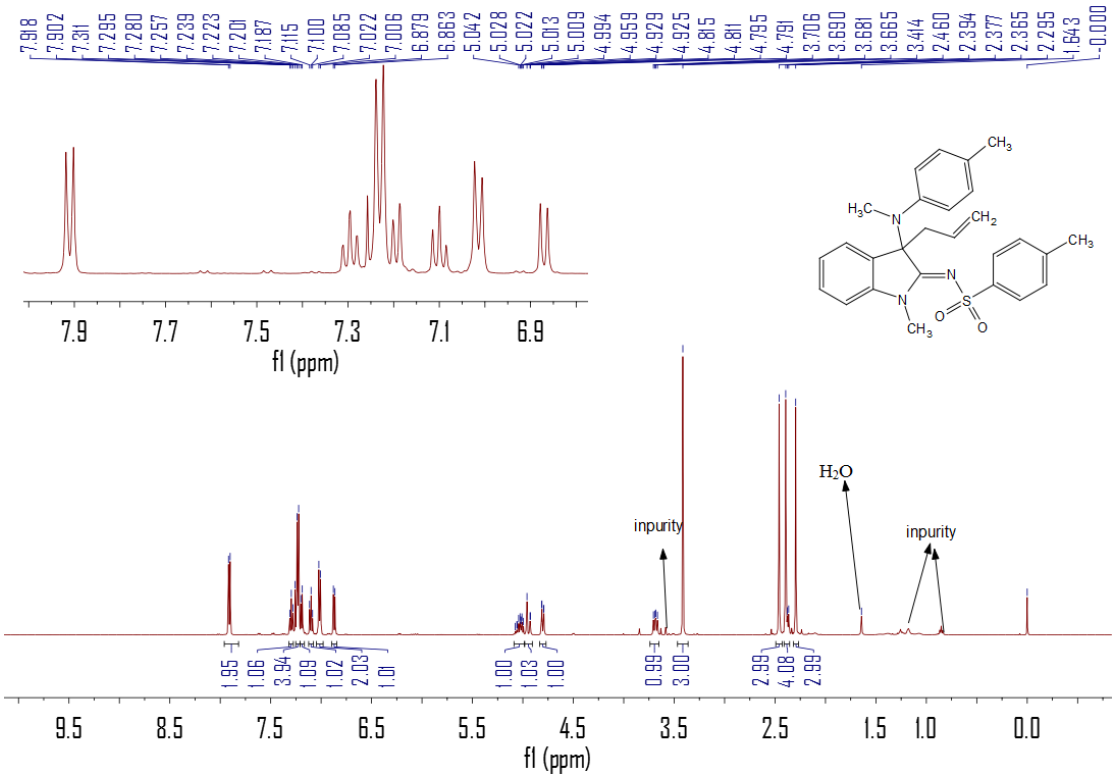
^{13}C NMR Spectrum for **5o** ($CDCl_3$, 125 MHz)



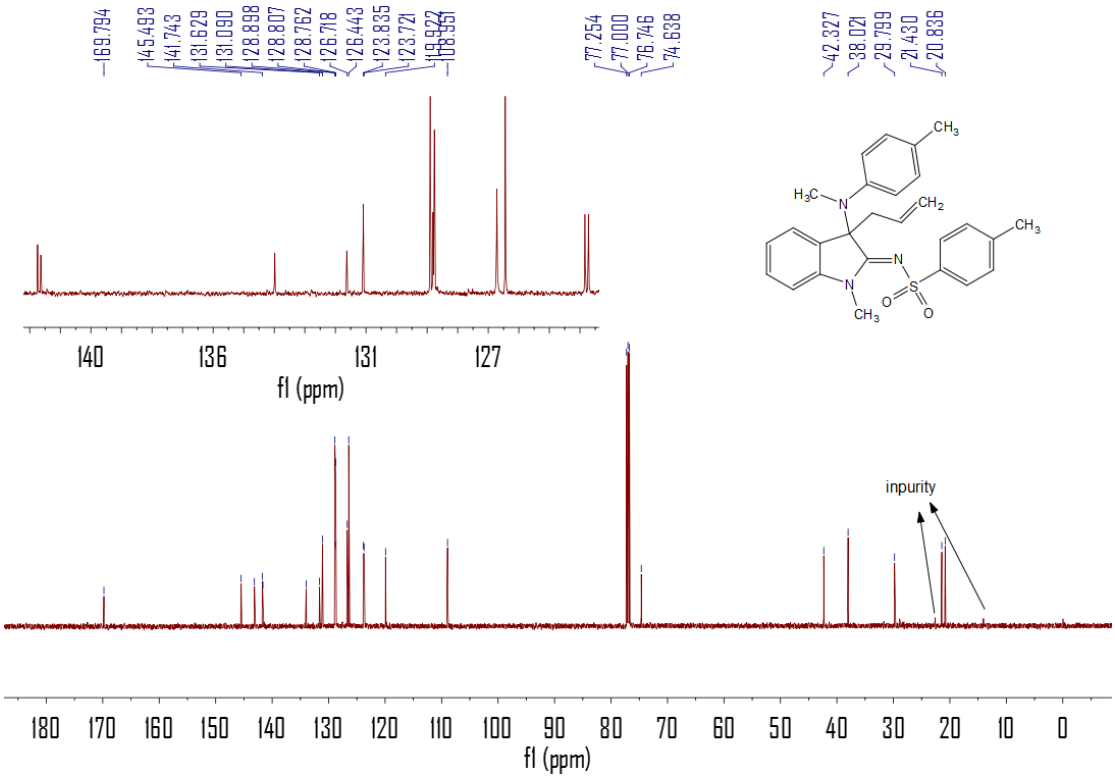
^{1}H NMR Spectrum for **5p** ($CDCl_3$, 500 MHz)



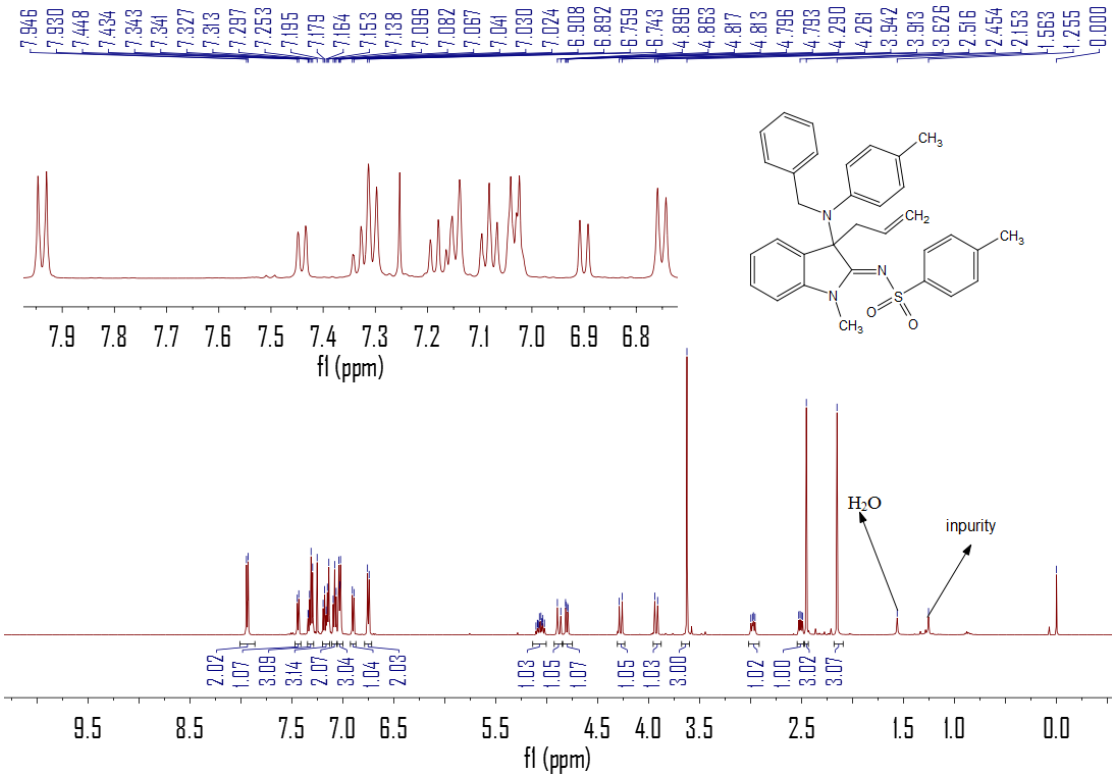
^{13}C NMR Spectrum for **5p** ($CDCl_3$, 125 MHz)



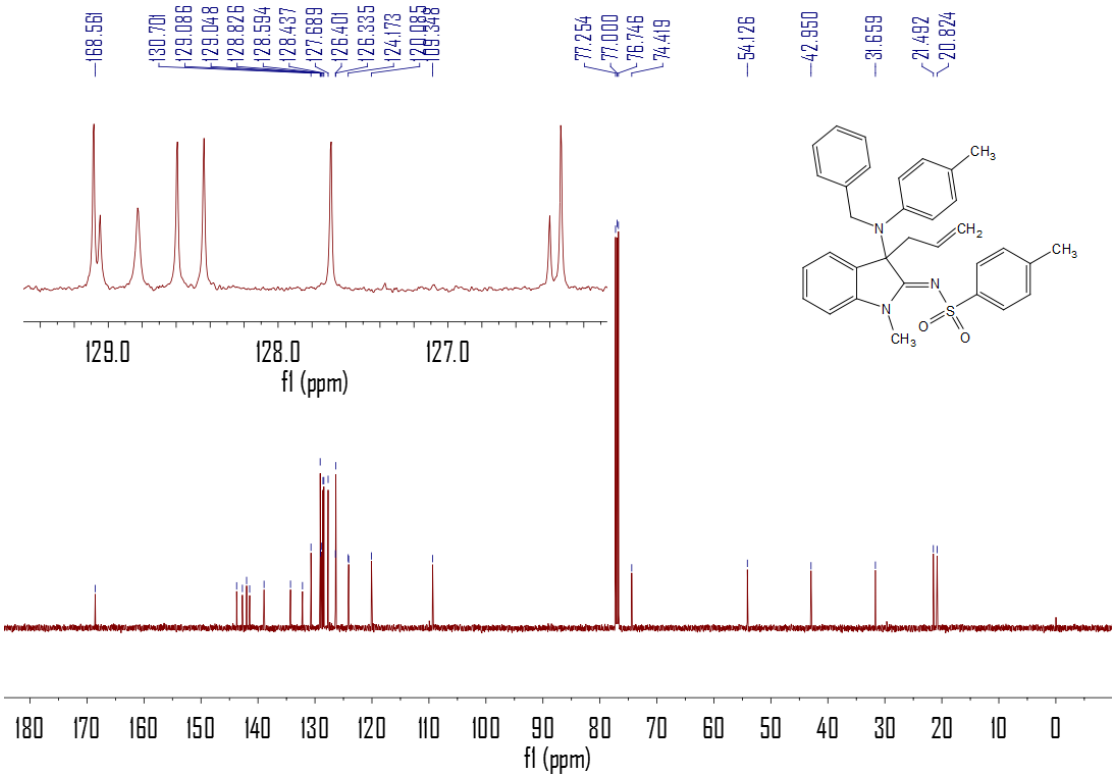
^{1}H NMR Spectrum for **5q** ($CDCl_3$, 500 MHz)



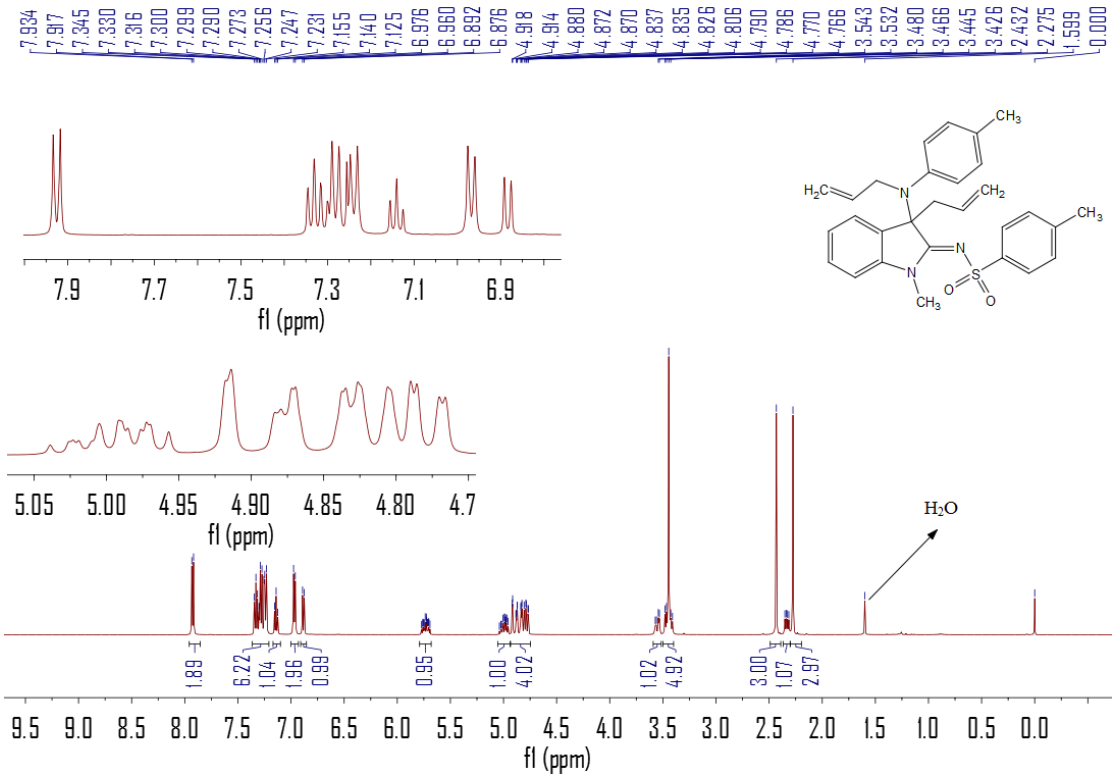
^{13}C NMR Spectrum for **5q** ($CDCl_3$, 125 MHz)



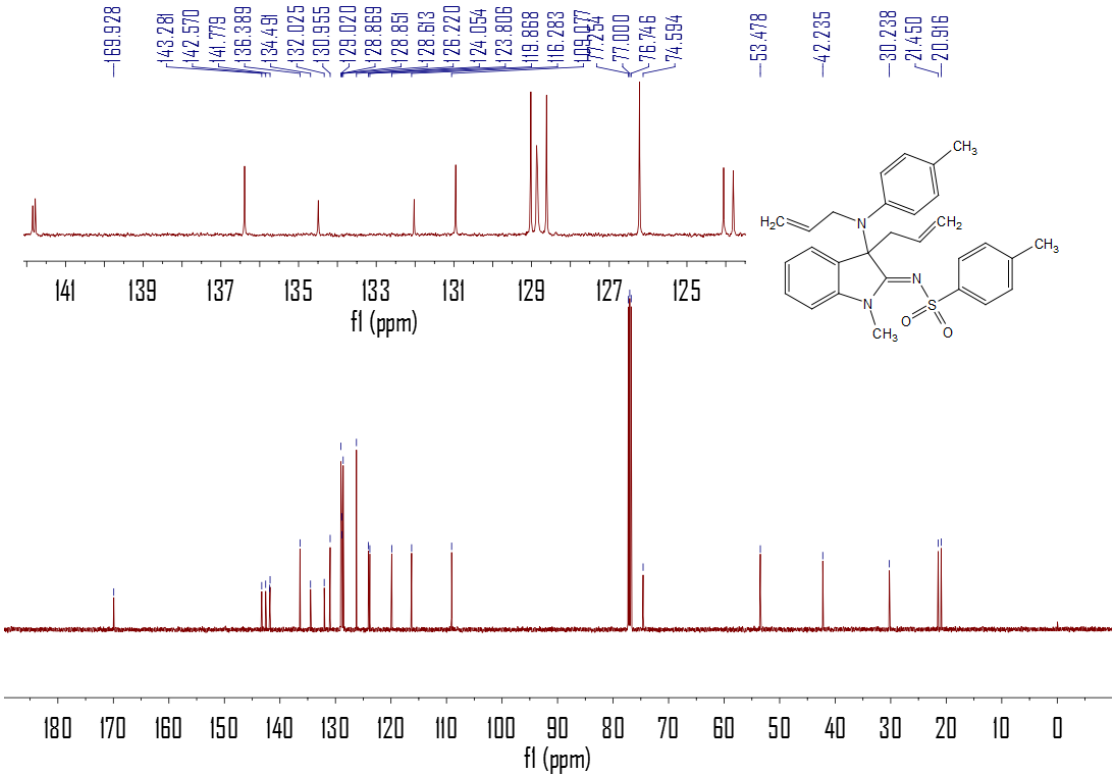
^{1}H NMR Spectrum for **5r** ($CDCl_3$, 500 MHz)



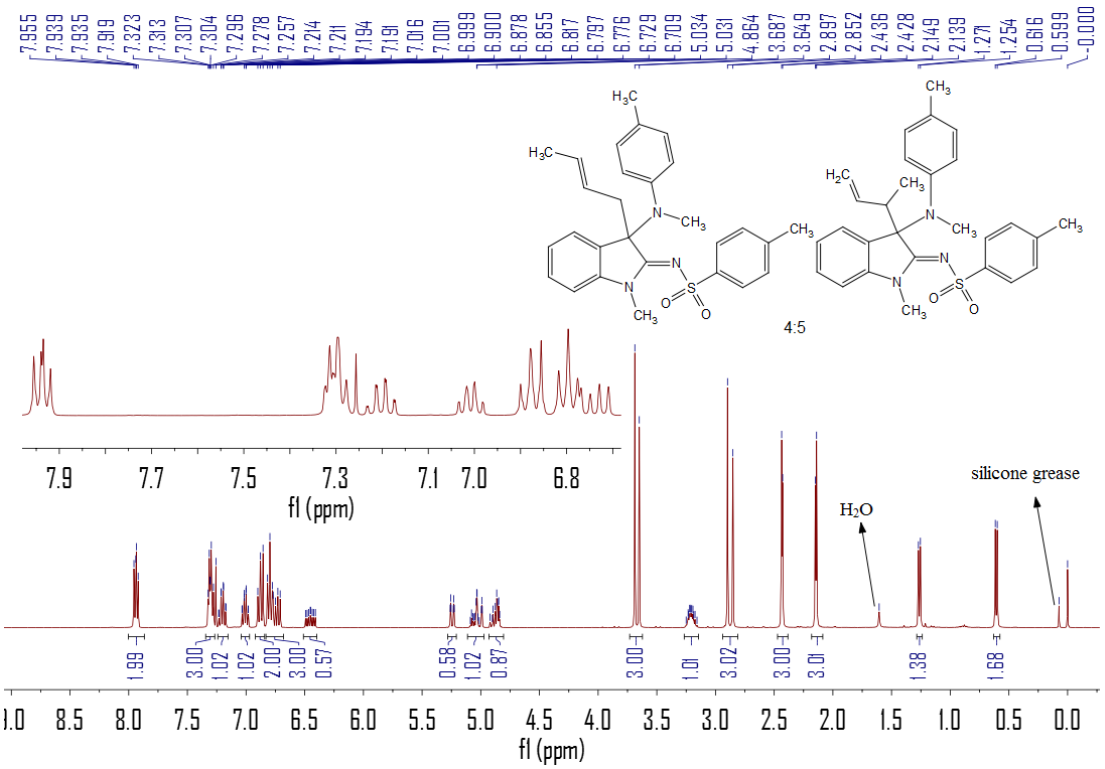
^{13}C NMR Spectrum for **5r** ($CDCl_3$, 125 MHz)



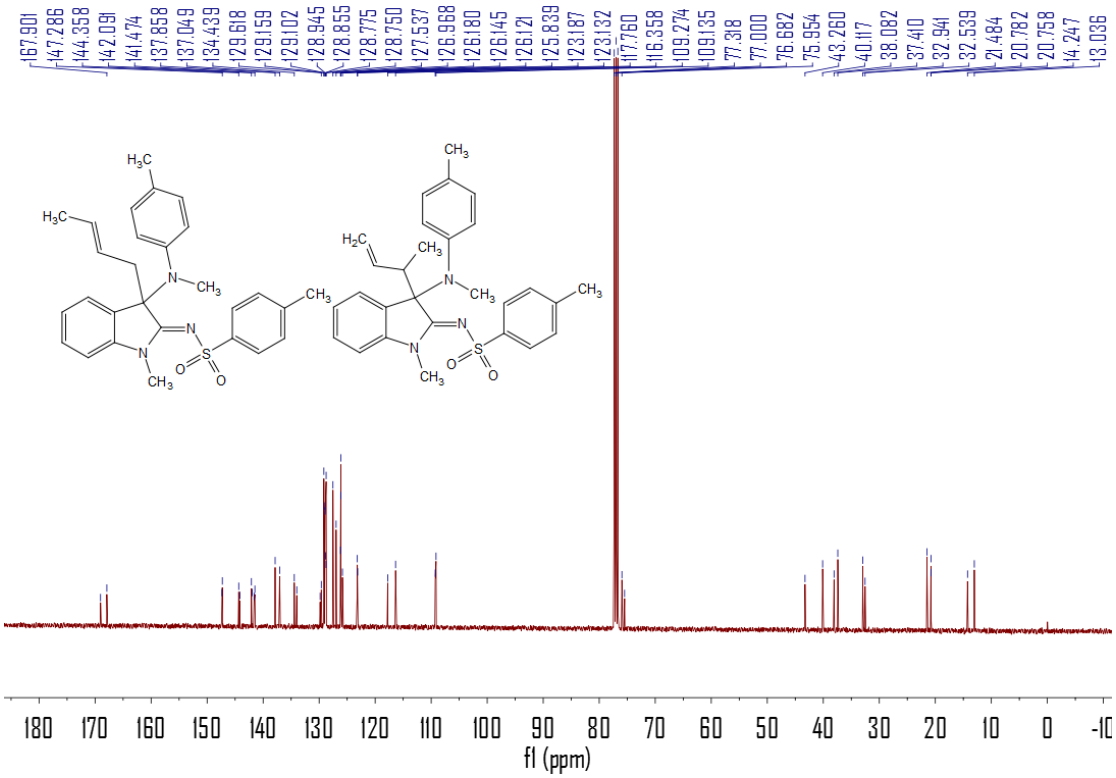
^{1}H NMR Spectrum for **5s** ($CDCl_3$, 500 MHz)



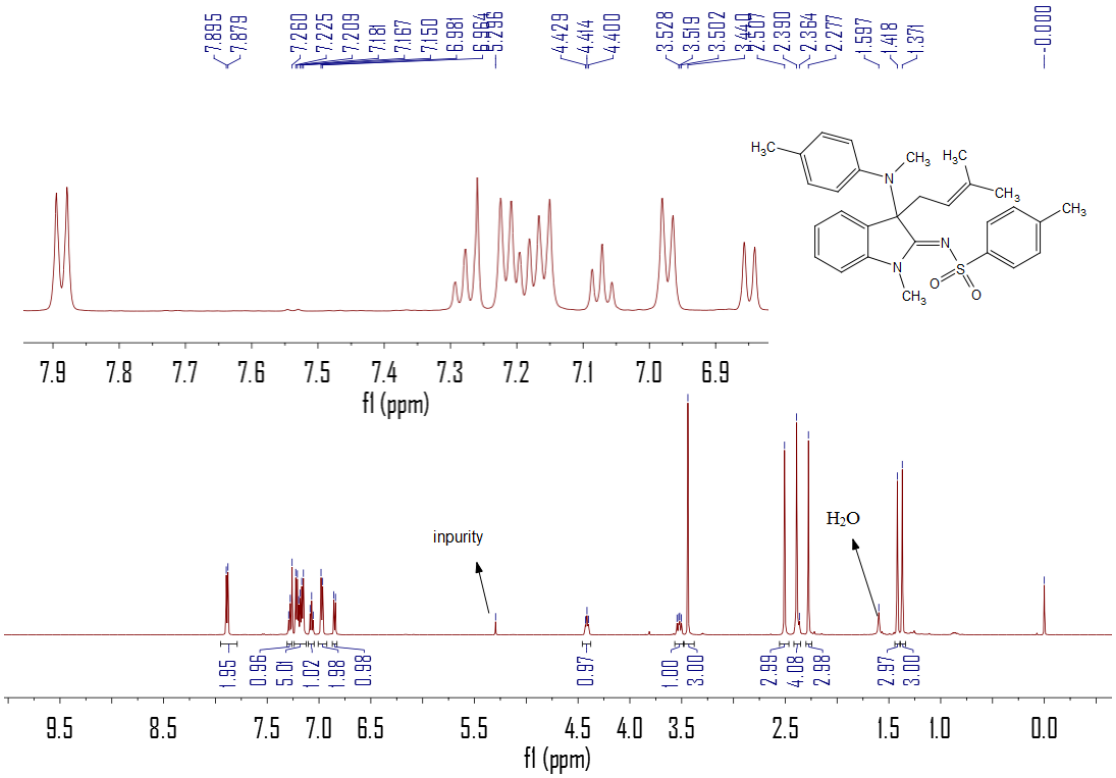
^{13}C NMR Spectrum for **5s** ($CDCl_3$, 125 MHz)



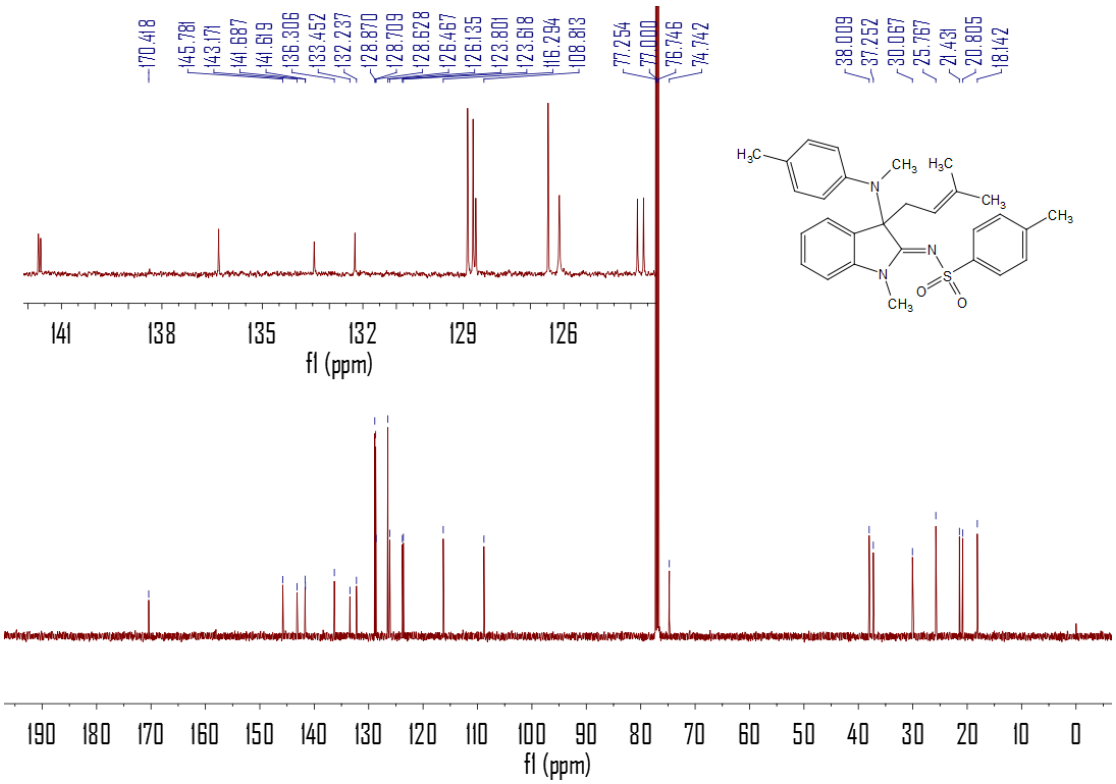
^{1}H NMR Spectrum for **5ta** and **5tb** ($CDCl_3$, 400 MHz)



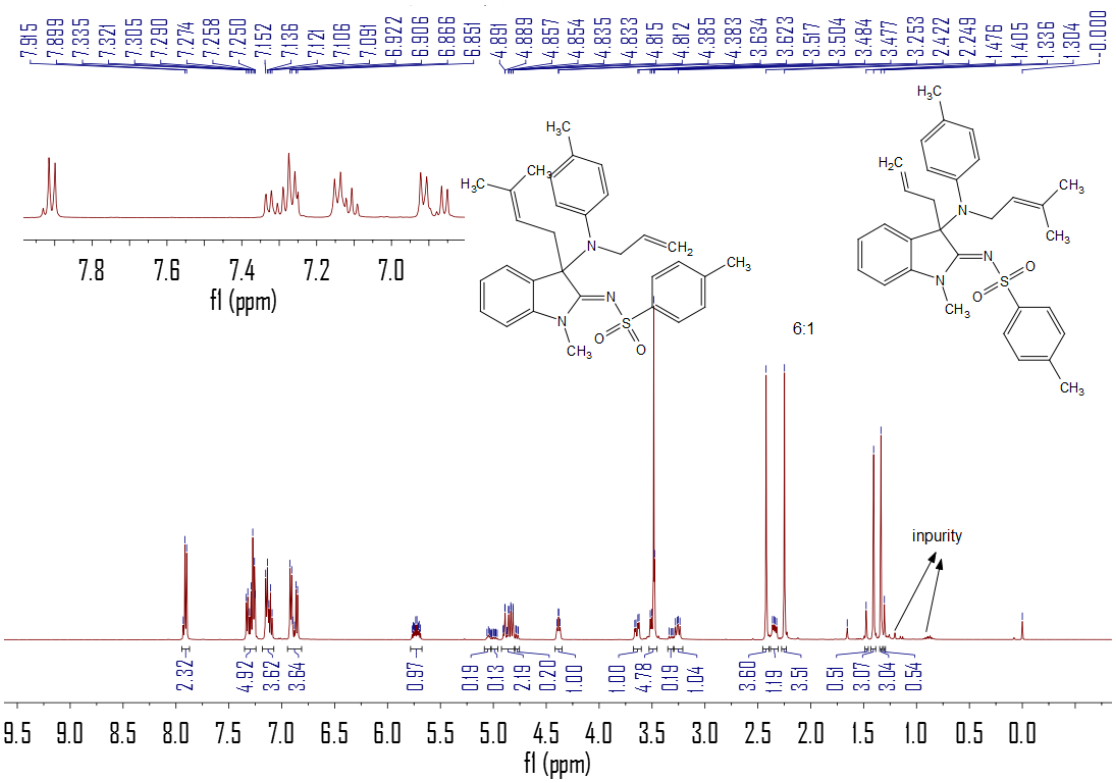
^{13}C NMR Spectrum for **5ta** and **5tb** ($CDCl_3$, 100 MHz)



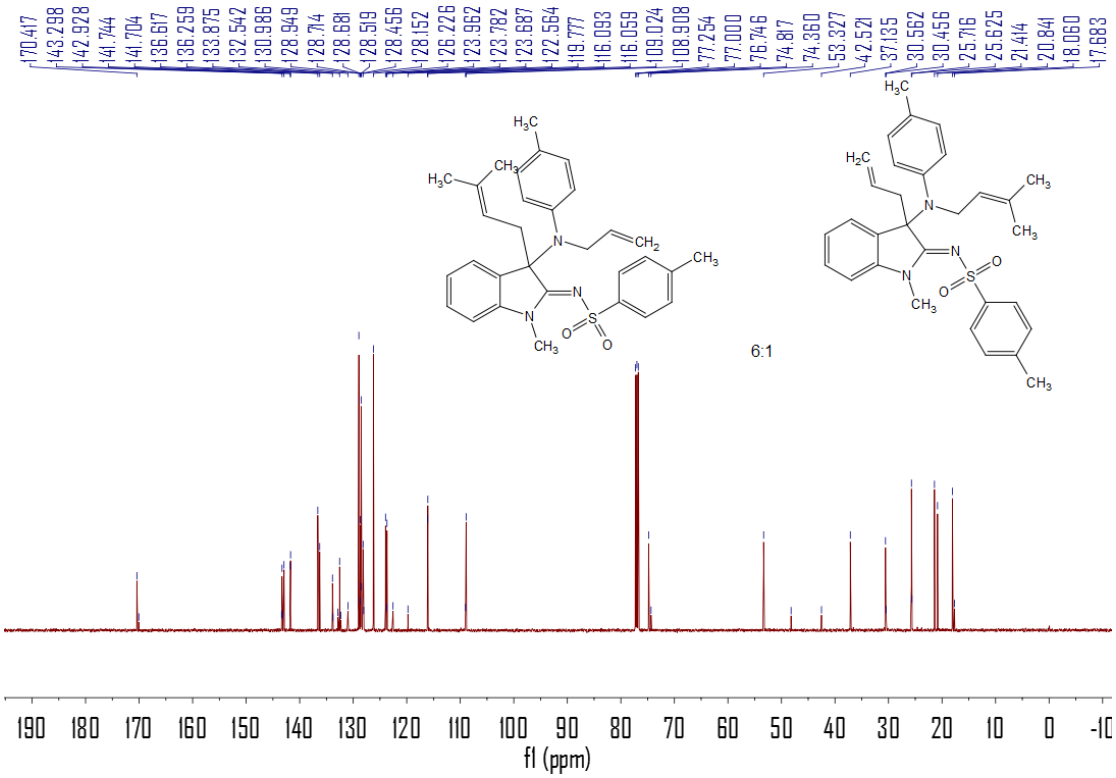
^{1}H NMR Spectrum for **5ua** ($CDCl_3$, 500 MHz)



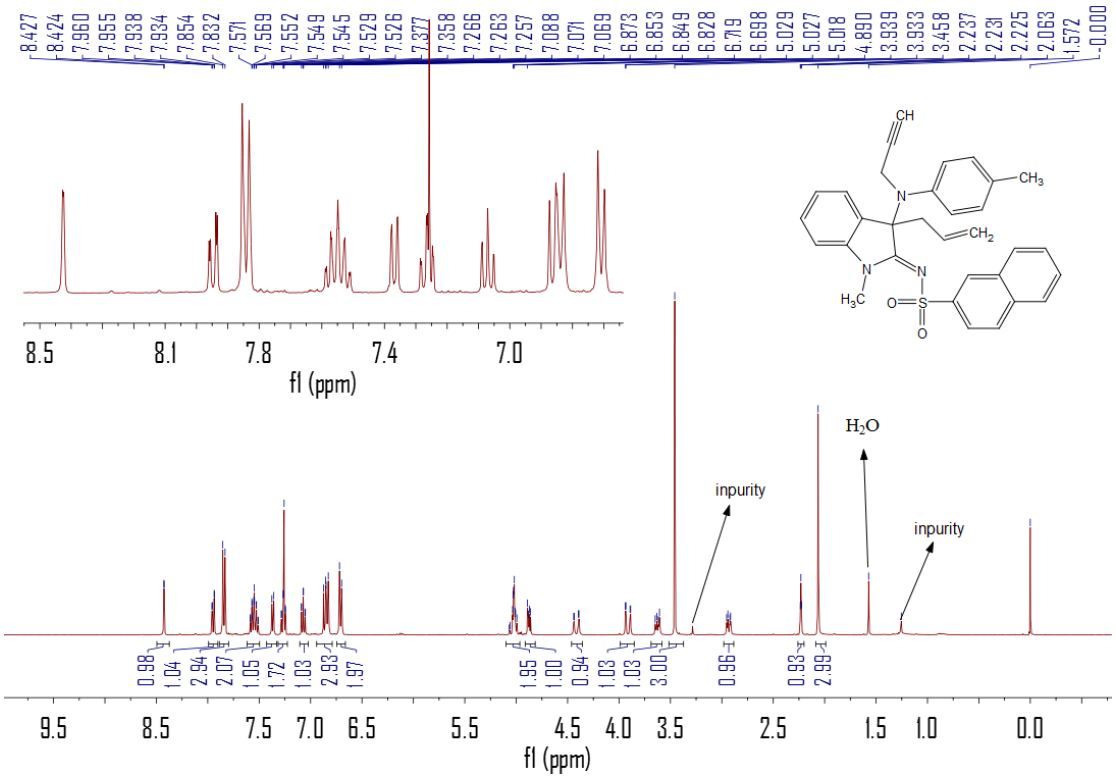
^{13}C NMR Spectrum for **5ua** ($CDCl_3$, 125 MHz)



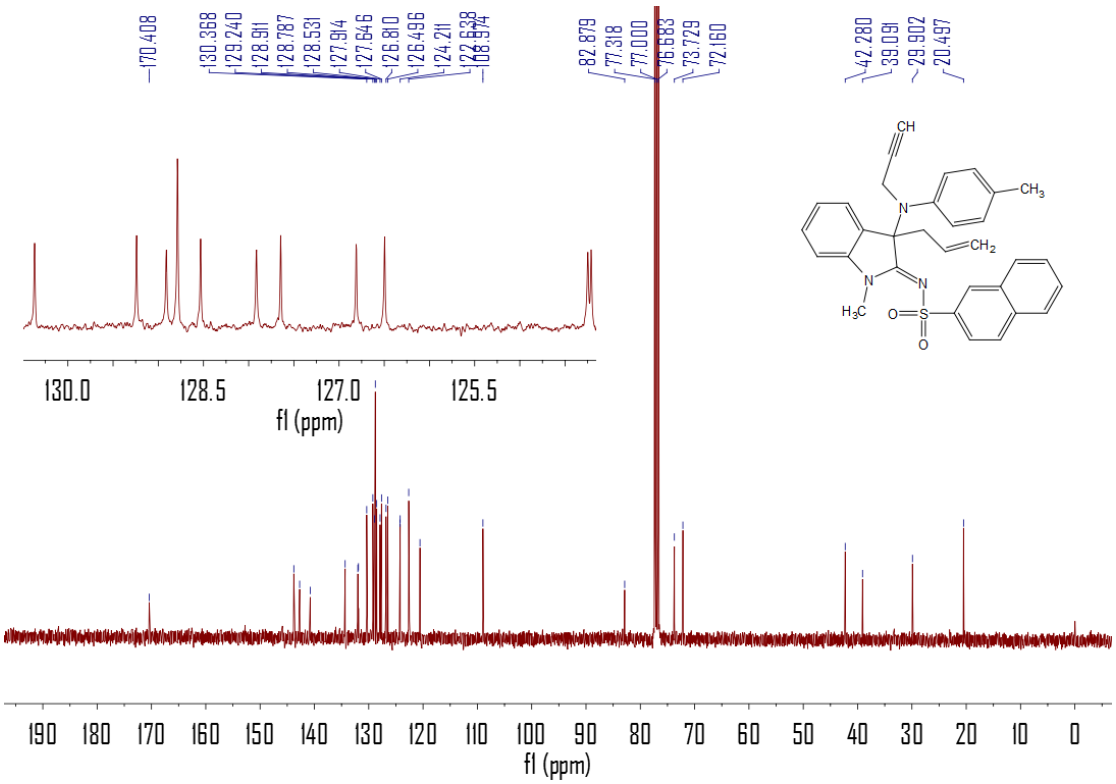
^{1}H NMR Spectrum for **5v** and **5w** ($CDCl_3$, 500 MHz)



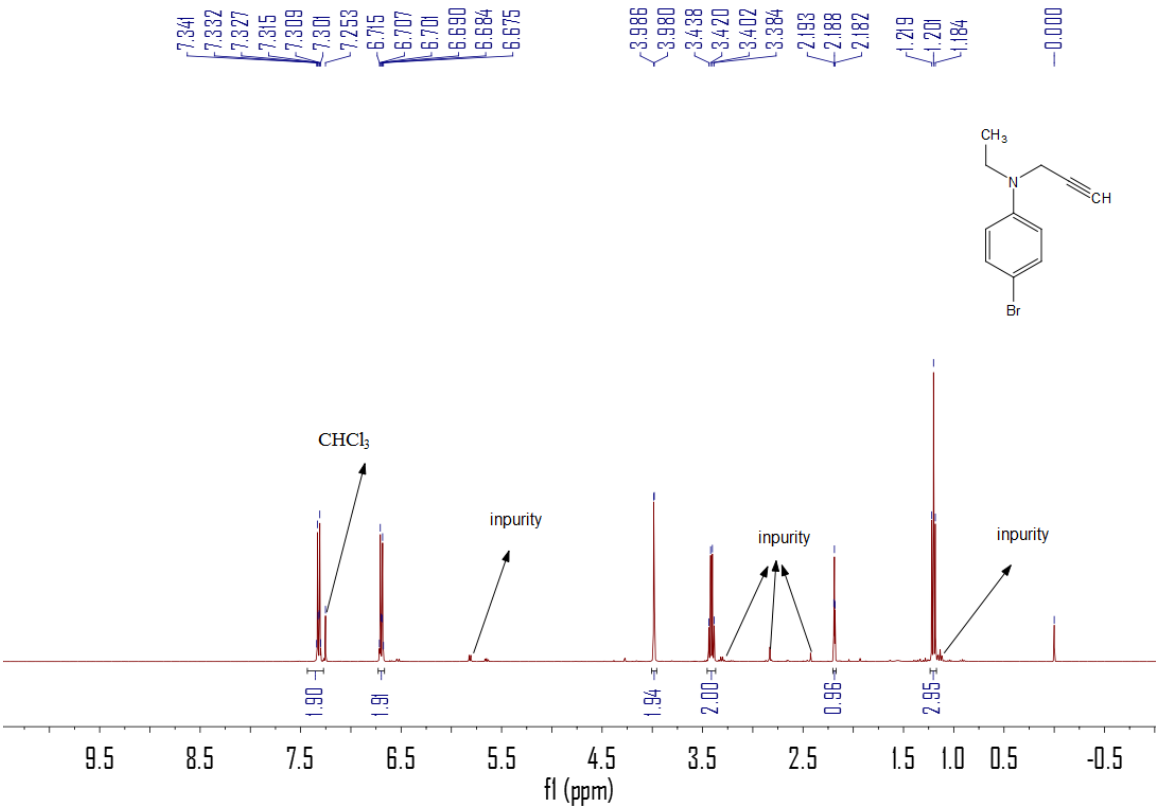
^{13}C NMR Spectrum for **5v** and **5w** ($CDCl_3$, 125 MHz)



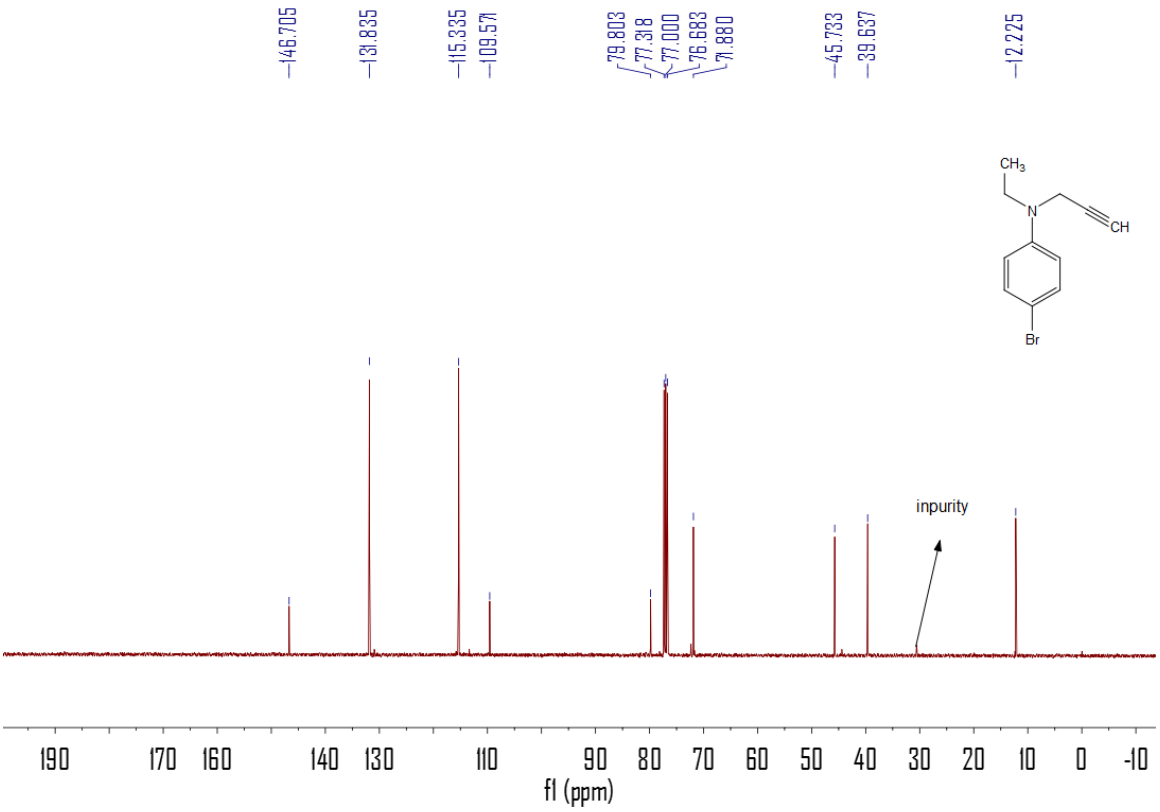
^{1}H NMR Spectrum for **5x** ($CDCl_3$, 400 MHz)



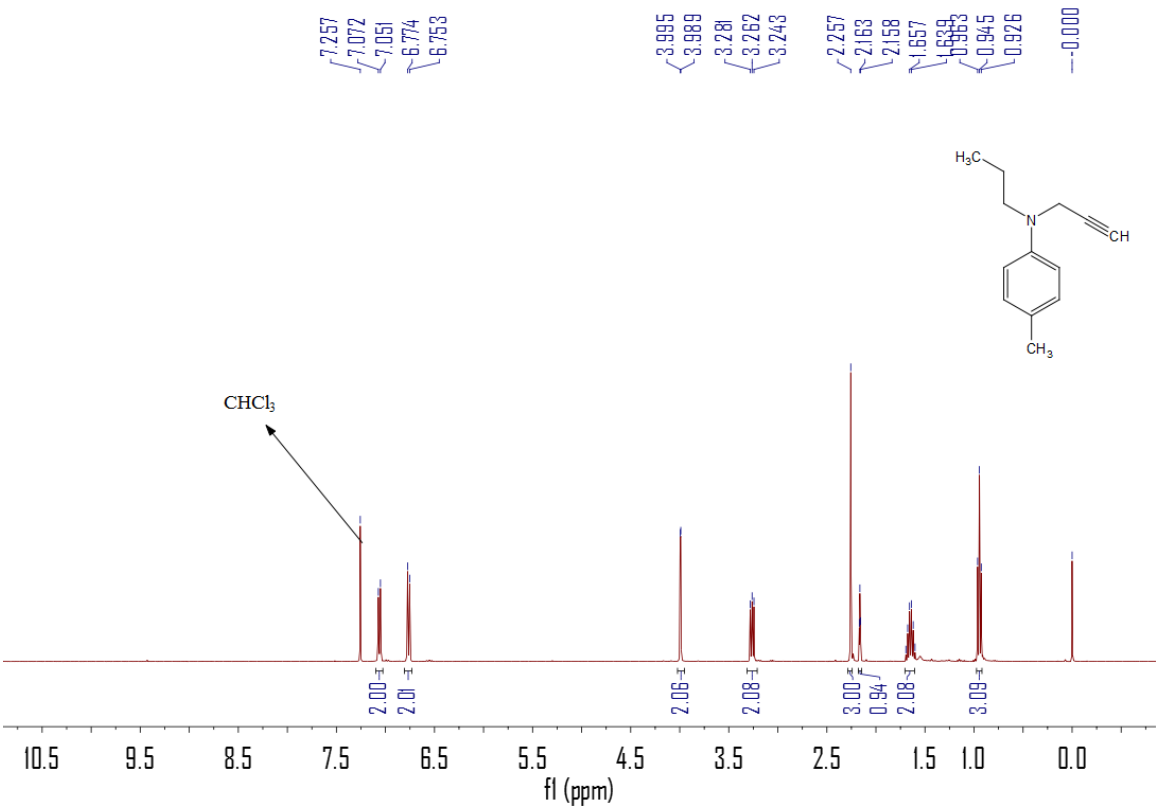
^{13}C NMR Spectrum for **5x** ($CDCl_3$, 100 MHz)



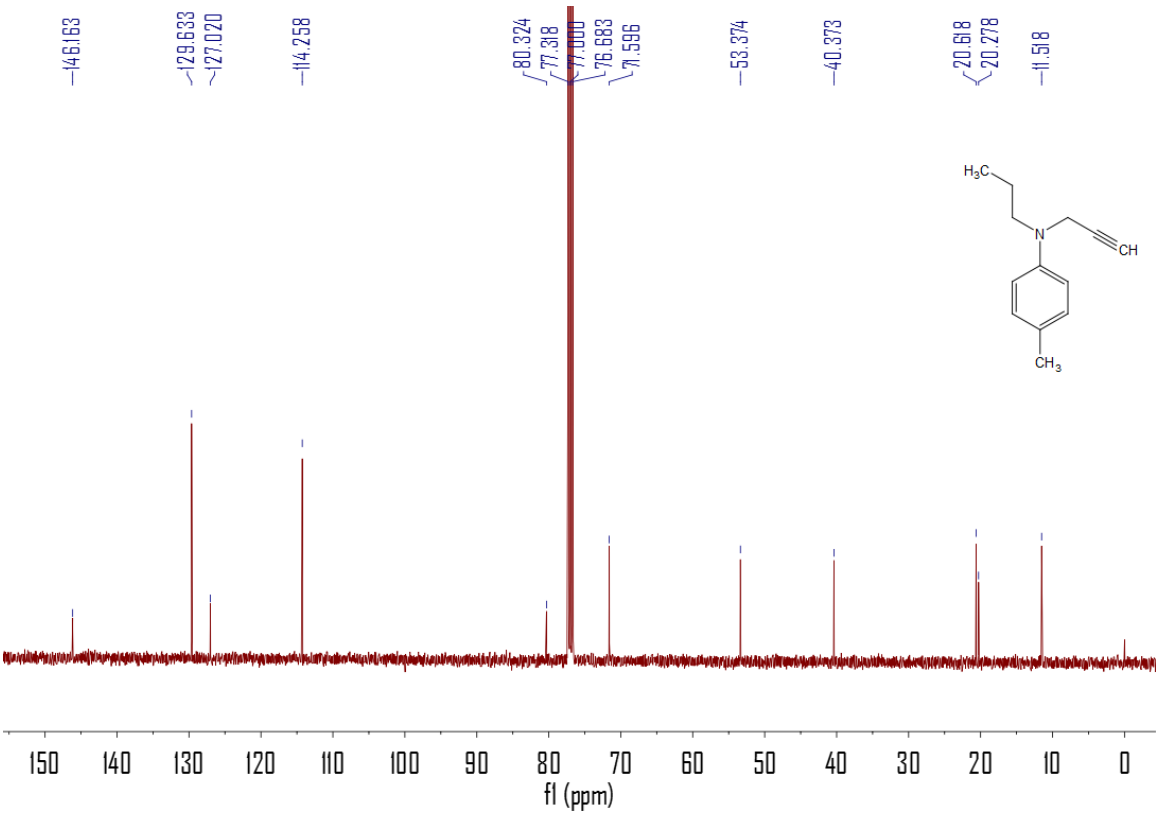
^{1}H NMR Spectrum for **6d** ($CDCl_3$, 400 MHz)



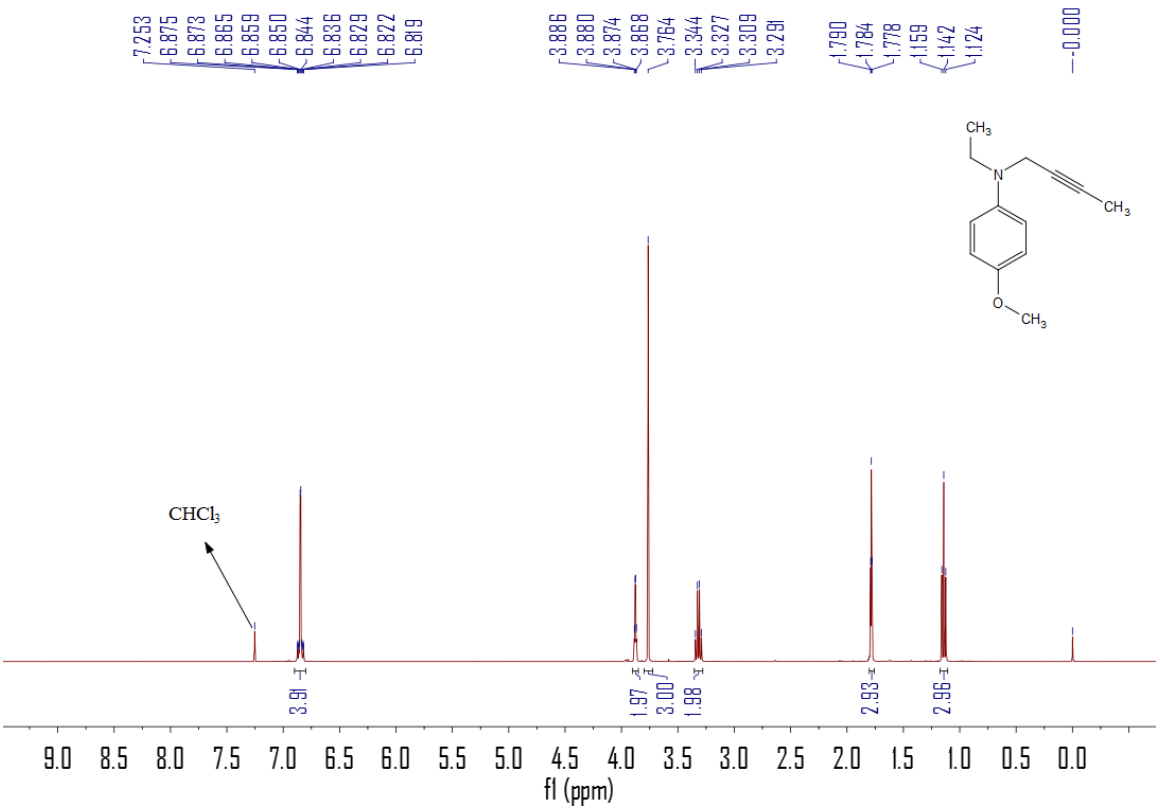
^{13}C NMR Spectrum for **6d** ($CDCl_3$, 100 MHz)



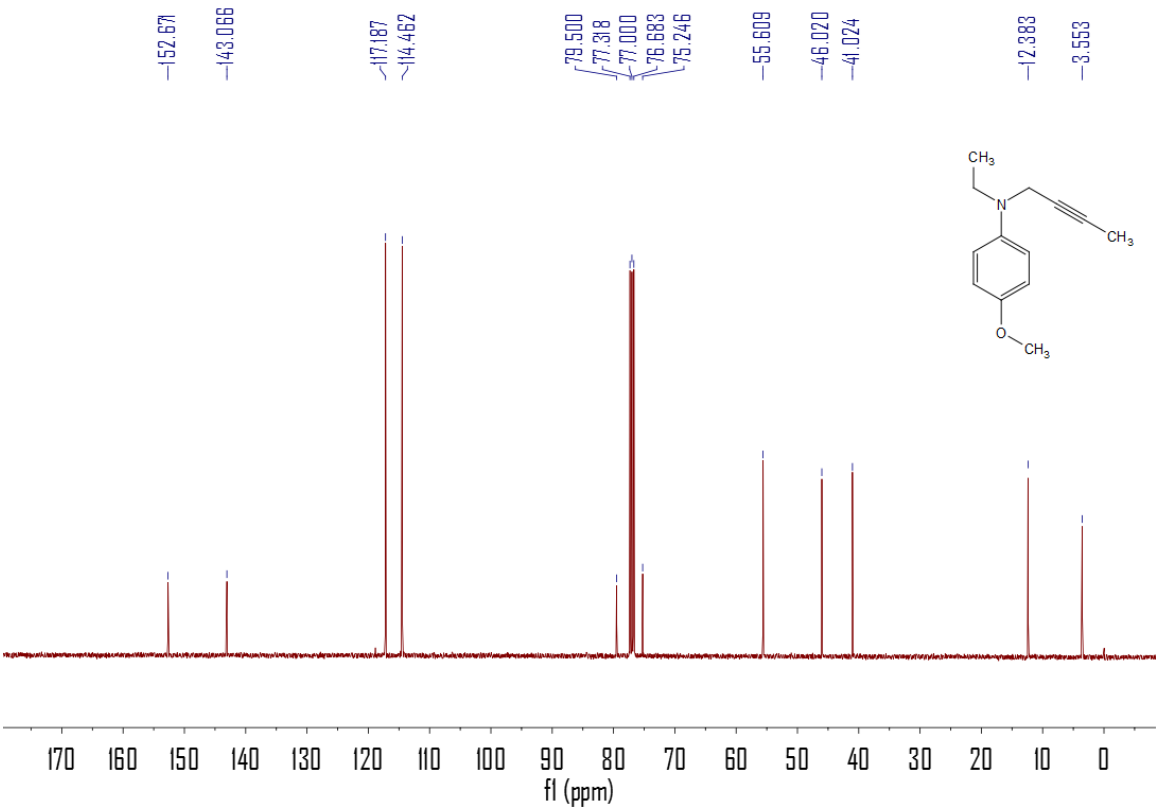
^{1}H NMR Spectrum for **6g** ($CDCl_3$, 400 MHz)



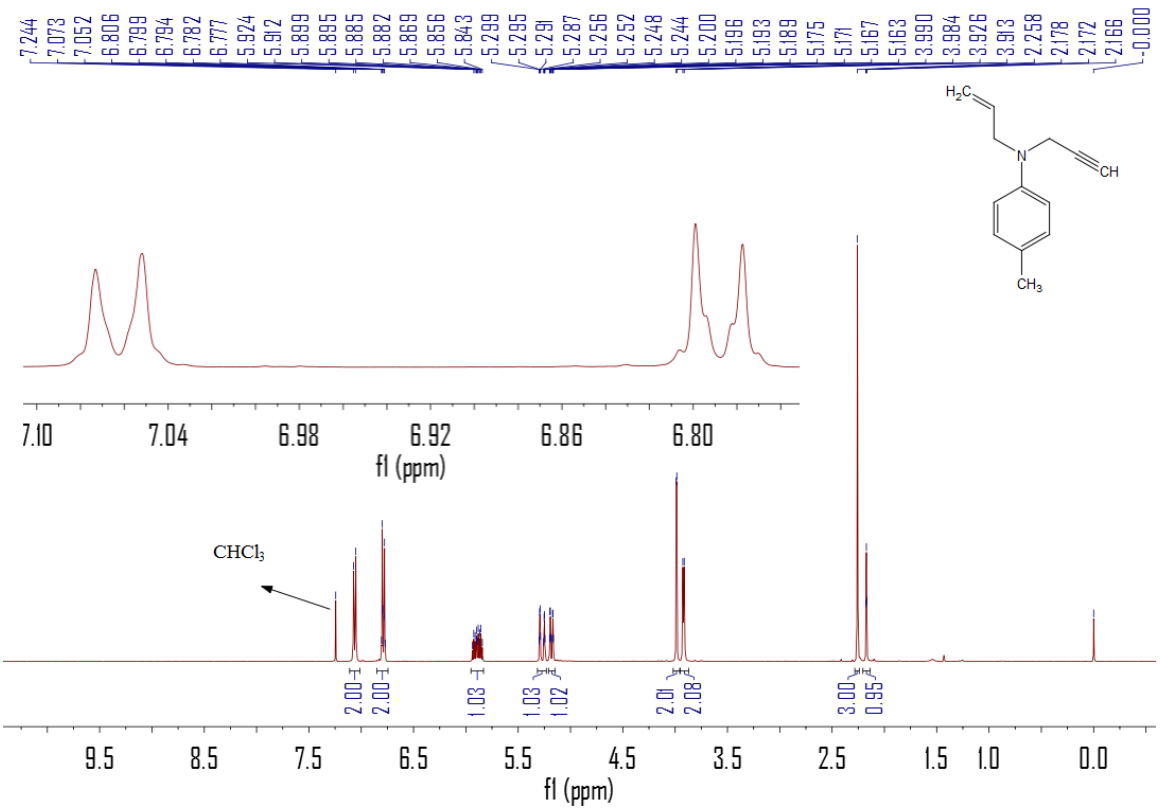
^{13}C NMR Spectrum for **6g** ($CDCl_3$, 100 MHz)



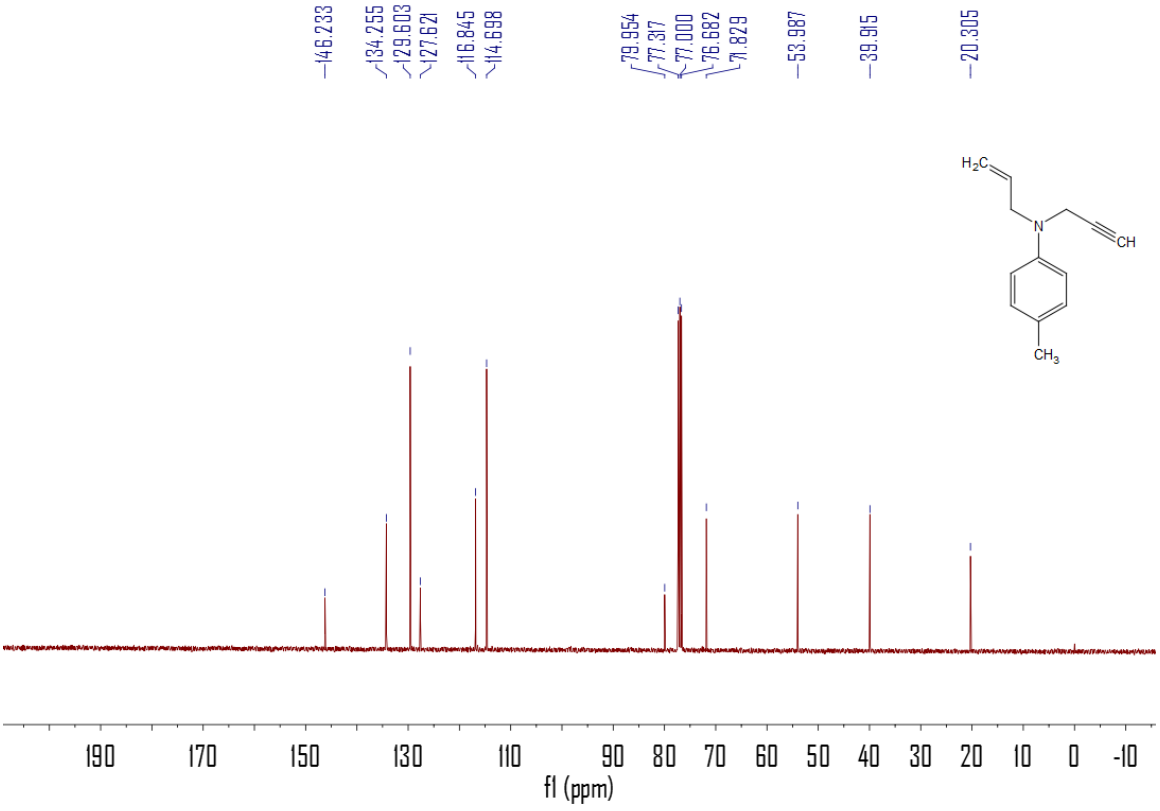
^{1}H NMR Spectrum for **6j** ($CDCl_3$, 400 MHz)



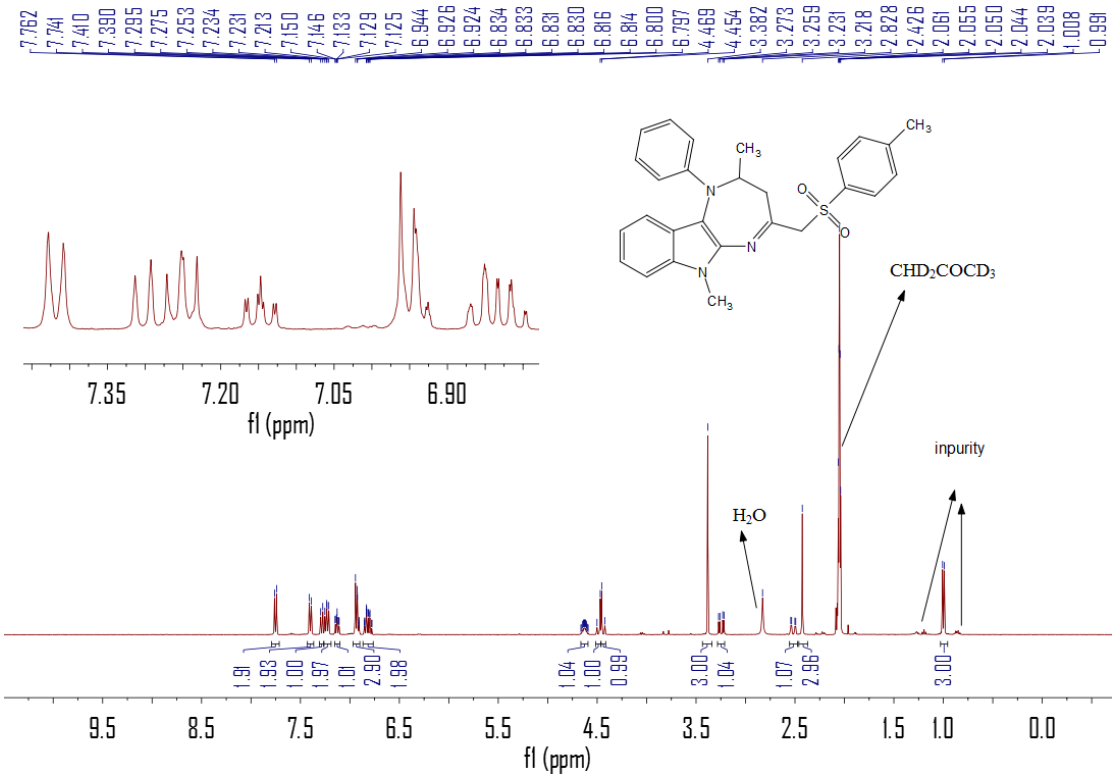
^{13}C NMR Spectrum for **6j** ($CDCl_3$, 100 MHz)



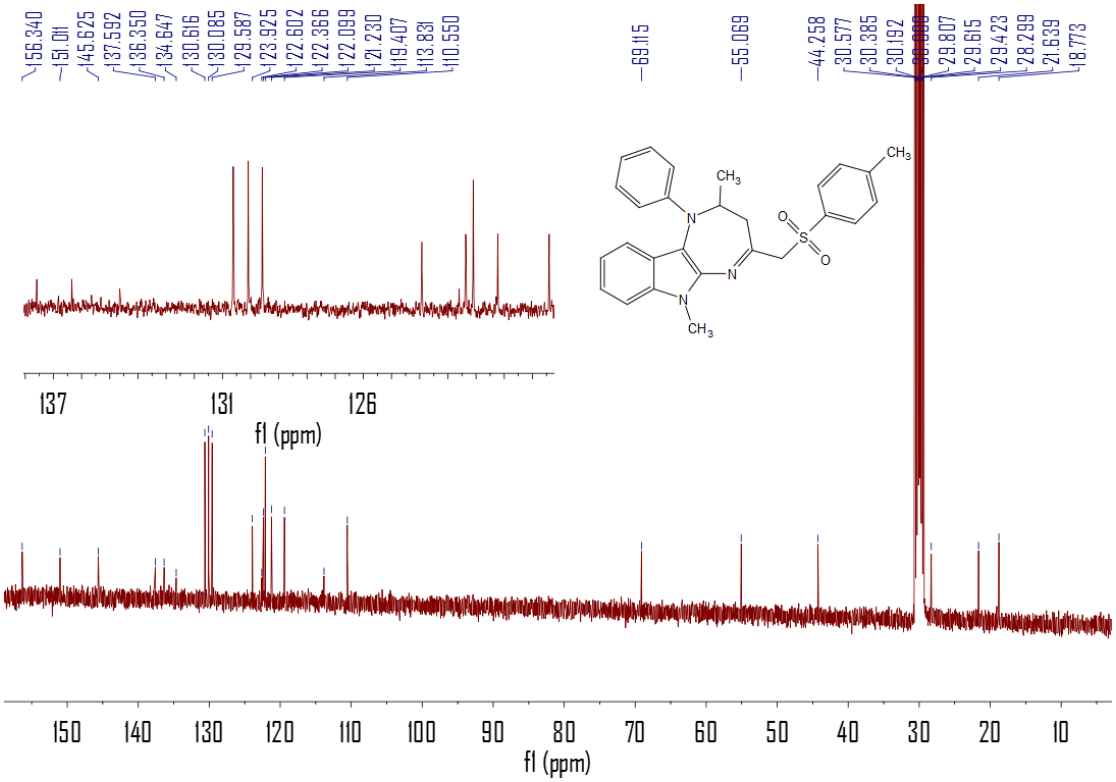
^{1}H NMR Spectrum for **6k** ($CDCl_3$, 400 MHz)



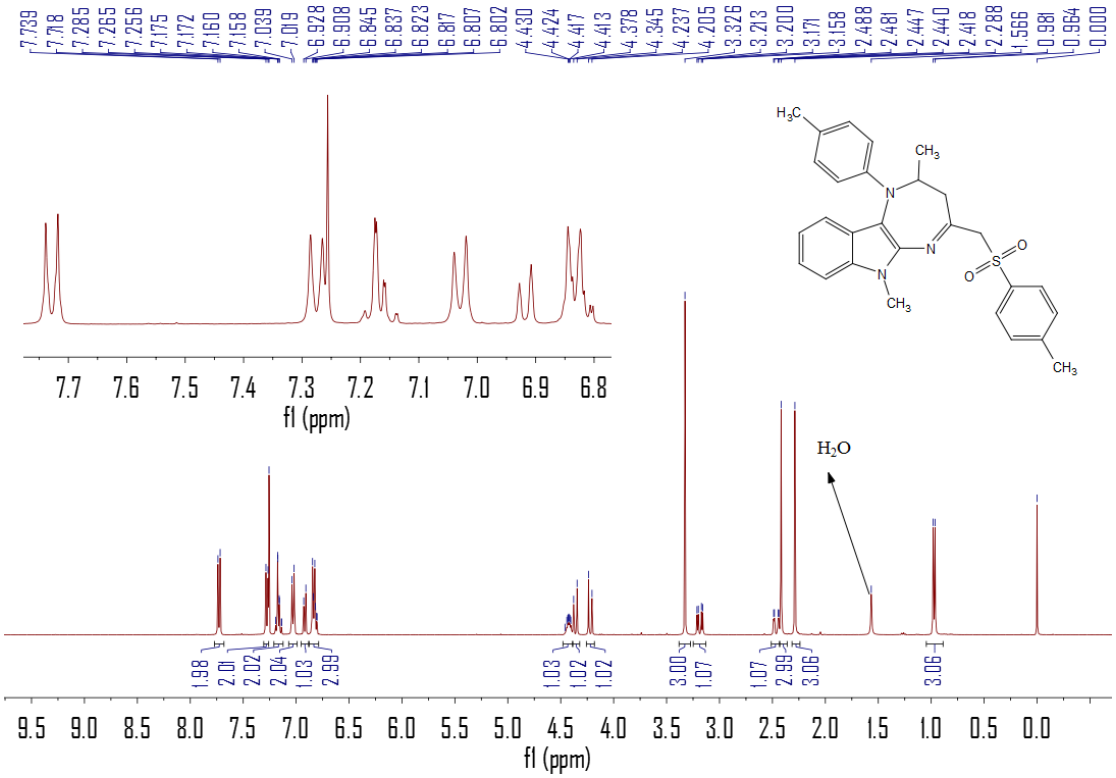
^{13}C NMR Spectrum for **6k** ($CDCl_3$, 100 MHz)



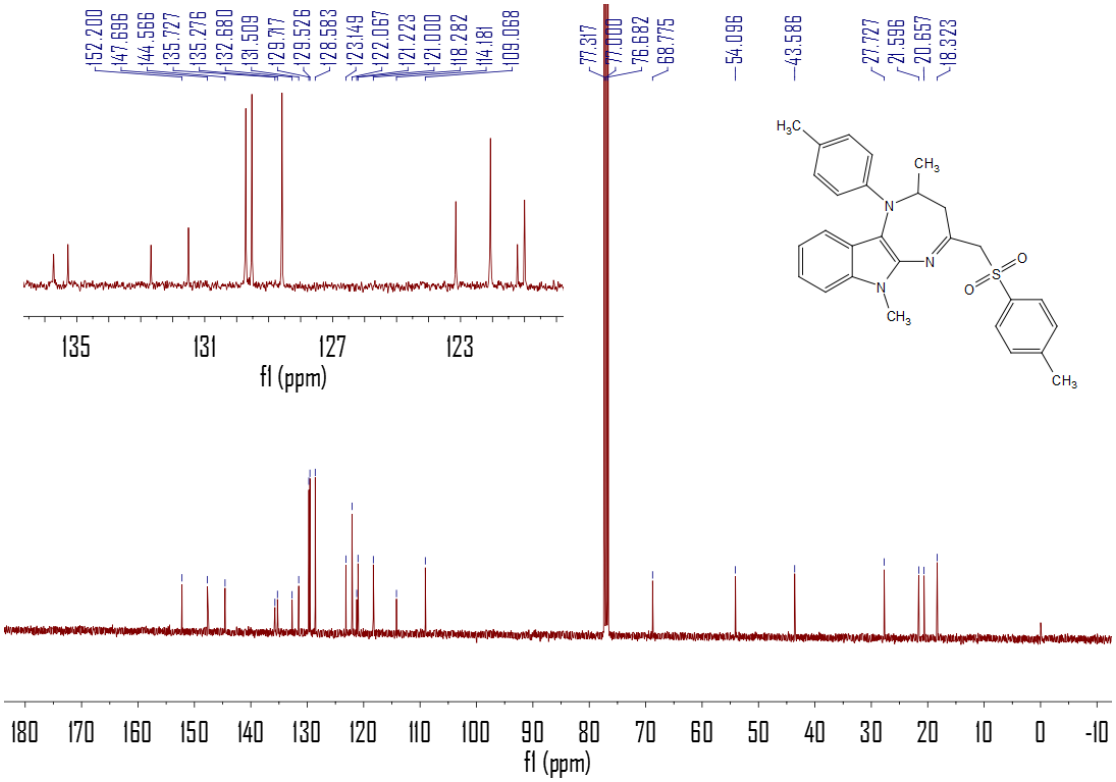
^{1}H NMR Spectrum for **7a** (Actone, 400 MHz)



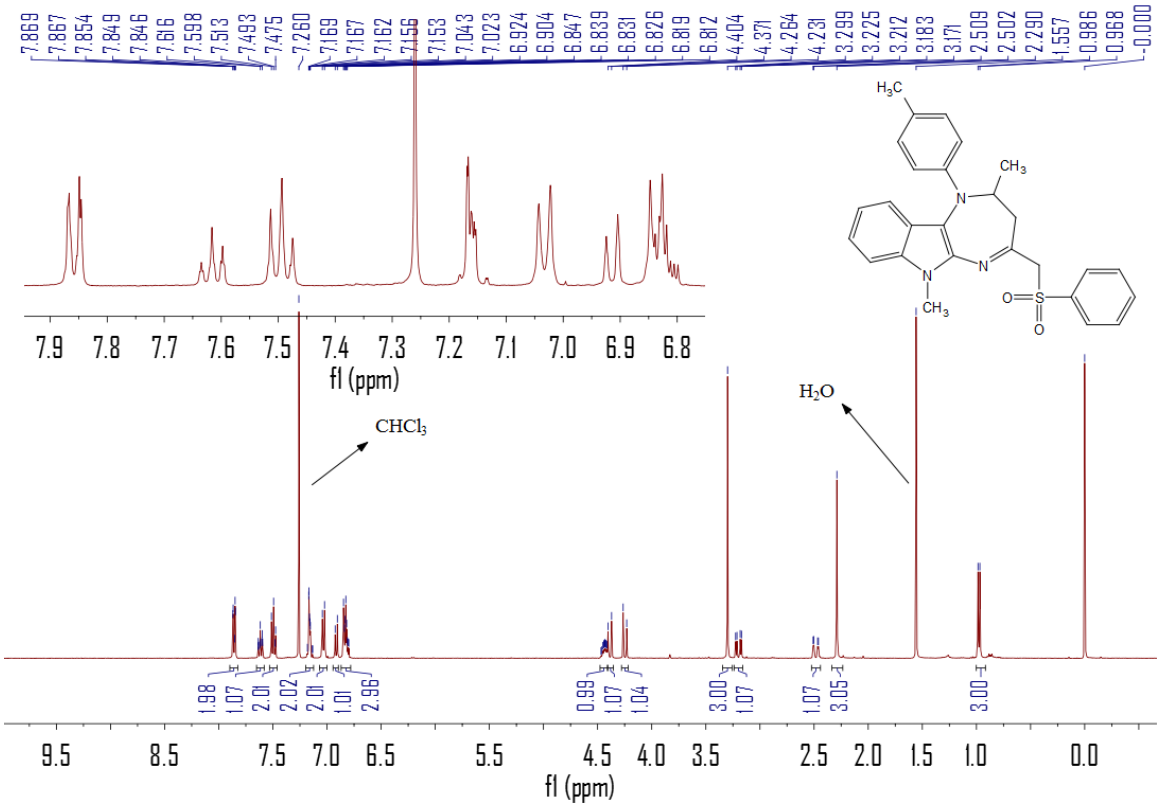
^{13}C NMR Spectrum for **7a** (Actone, 100 MHz)



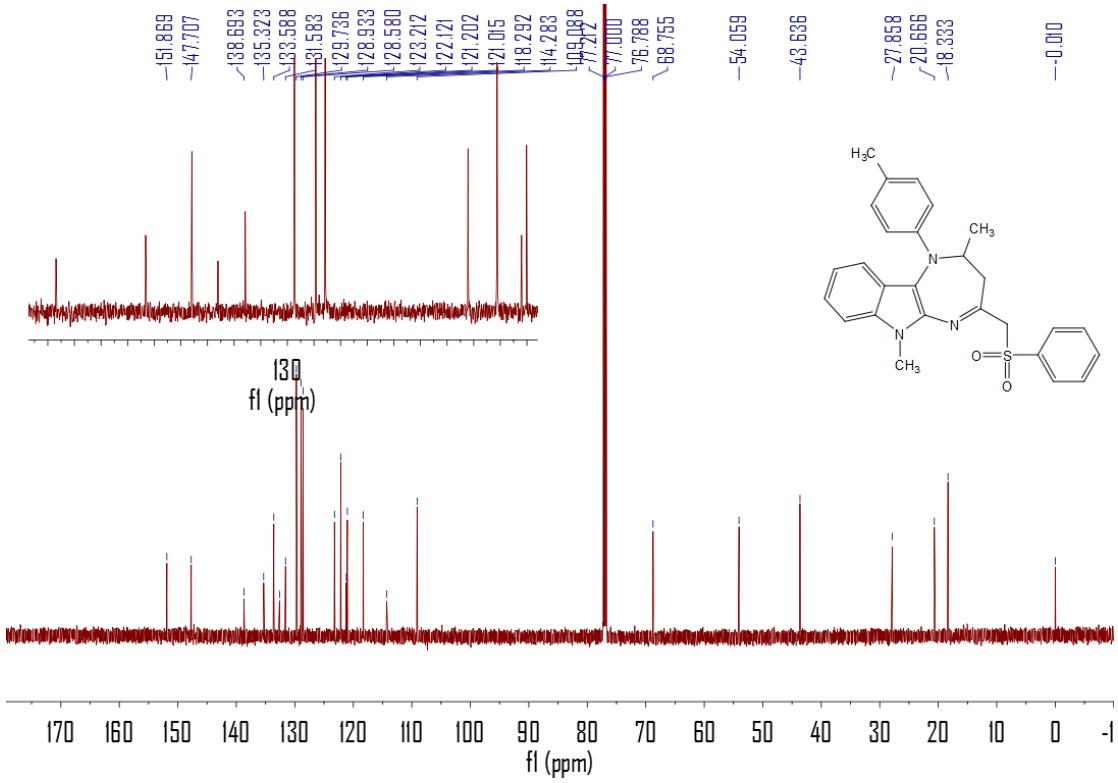
^{1}H NMR Spectrum for **7b** ($CDCl_3$, 400 MHz)



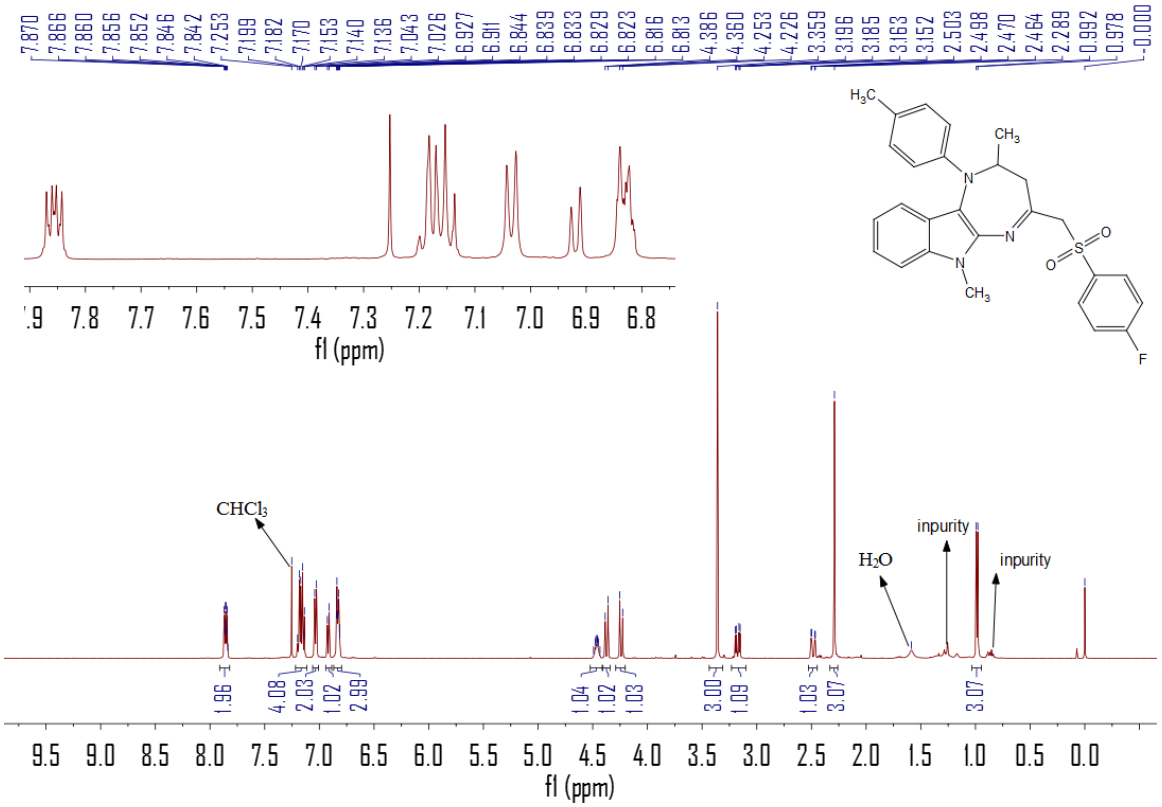
^{13}C NMR Spectrum for **7b** ($CDCl_3$, 100 MHz)



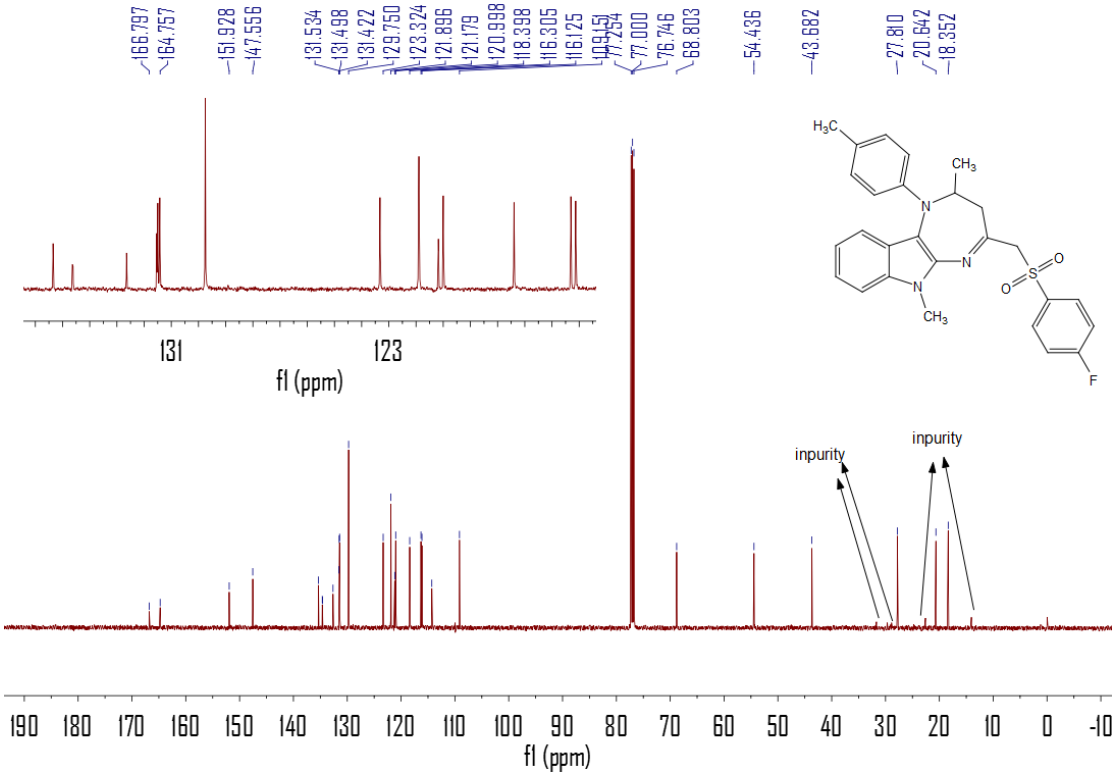
^{1}H NMR Spectrum for **7c** ($CDCl_3$, 400 MHz)



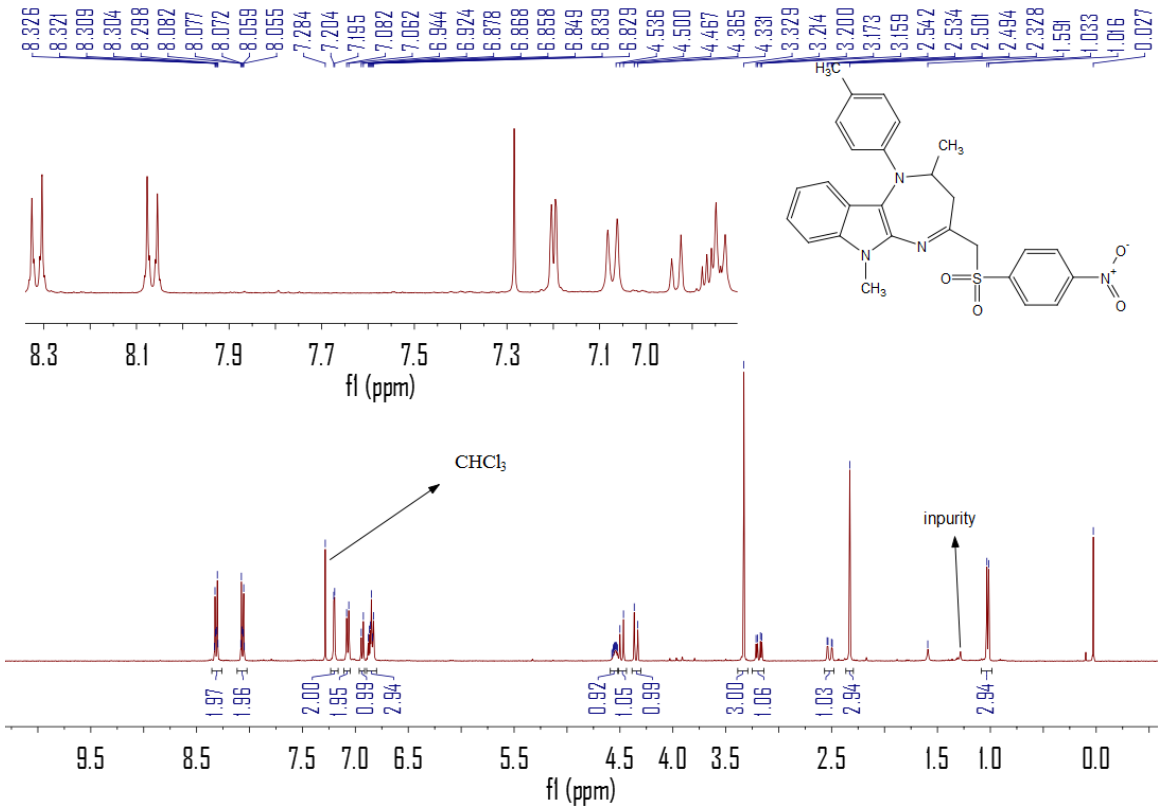
^{13}C NMR Spectrum for **7c** ($CDCl_3$, 150 MHz)



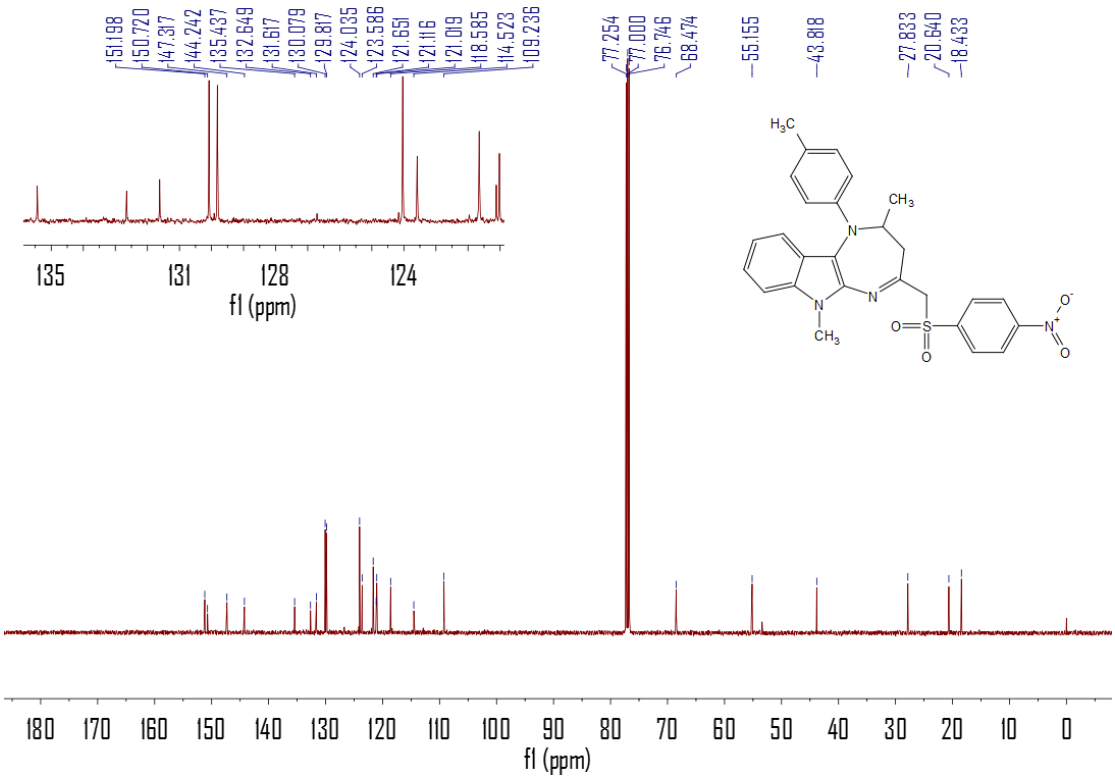
^{1}H NMR Spectrum for **7d** ($CDCl_3$, 500 MHz)



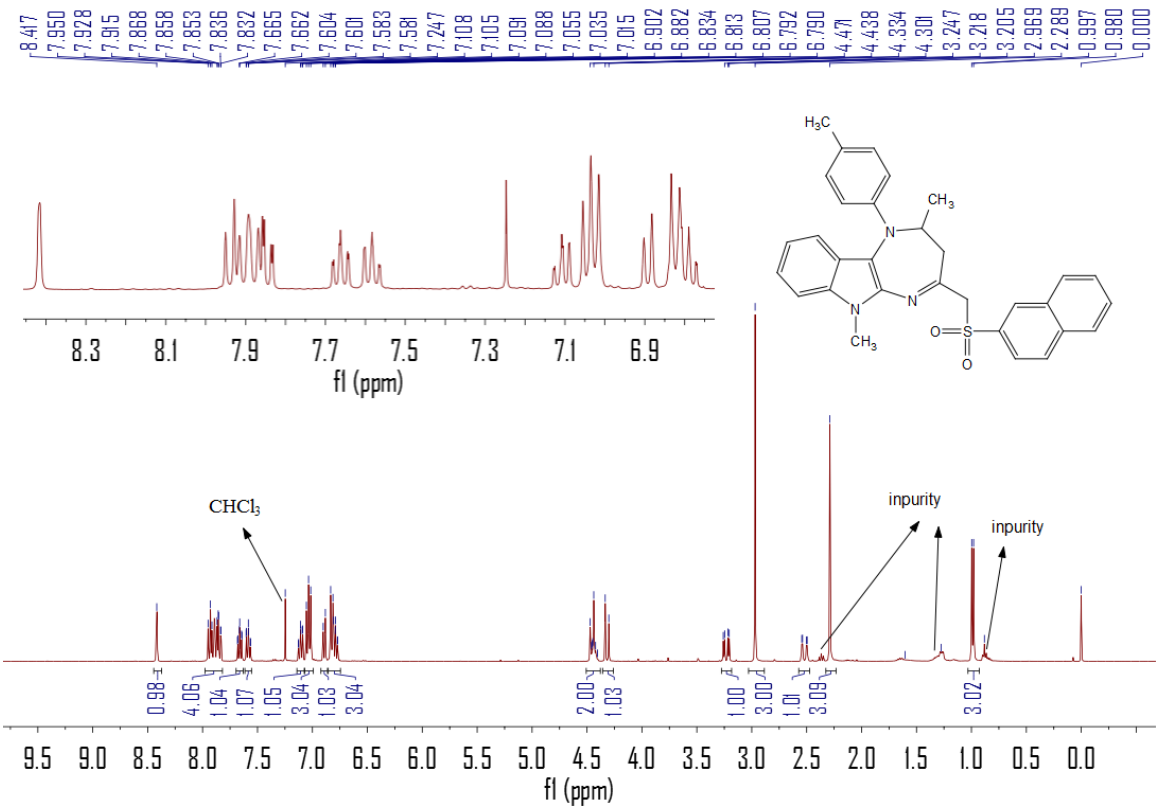
^{13}C NMR Spectrum for **7d** ($CDCl_3$, 125 MHz)



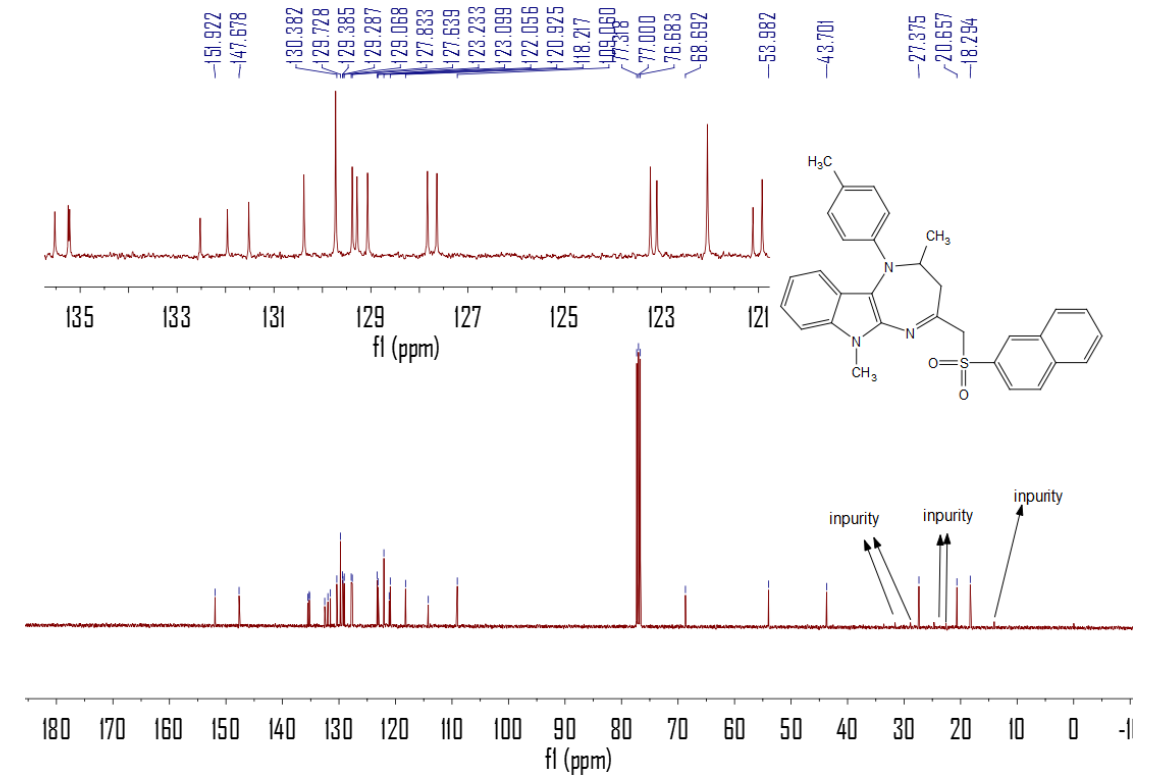
^{1}H NMR Spectrum for **7e** ($CDCl_3$, 400 MHz)



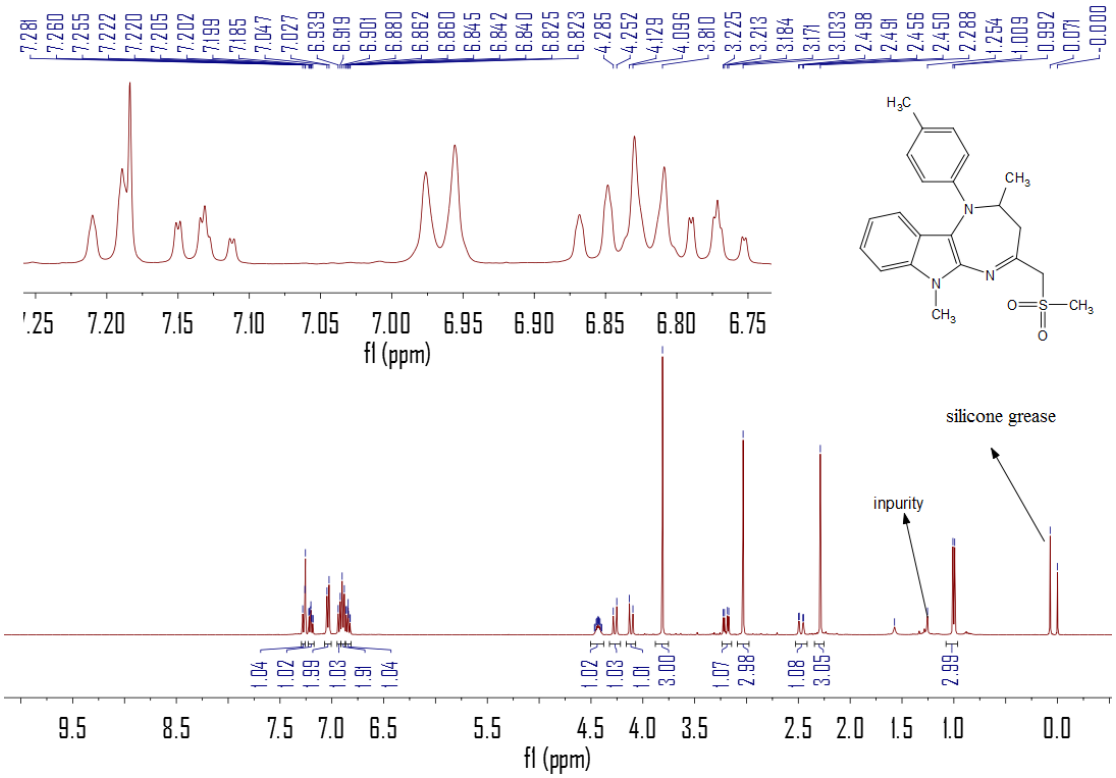
^{13}C NMR Spectrum for **7e** ($CDCl_3$, 125 MHz)



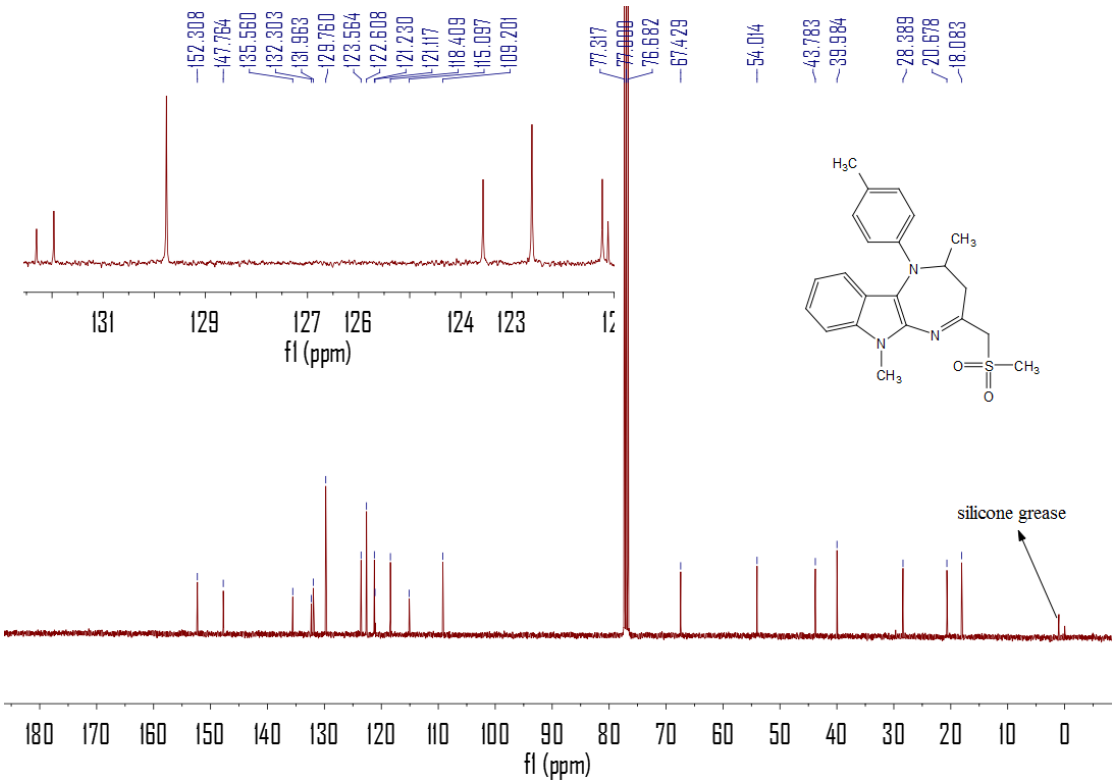
^{1}H NMR Spectrum for **7f** ($CDCl_3$, 400 MHz)



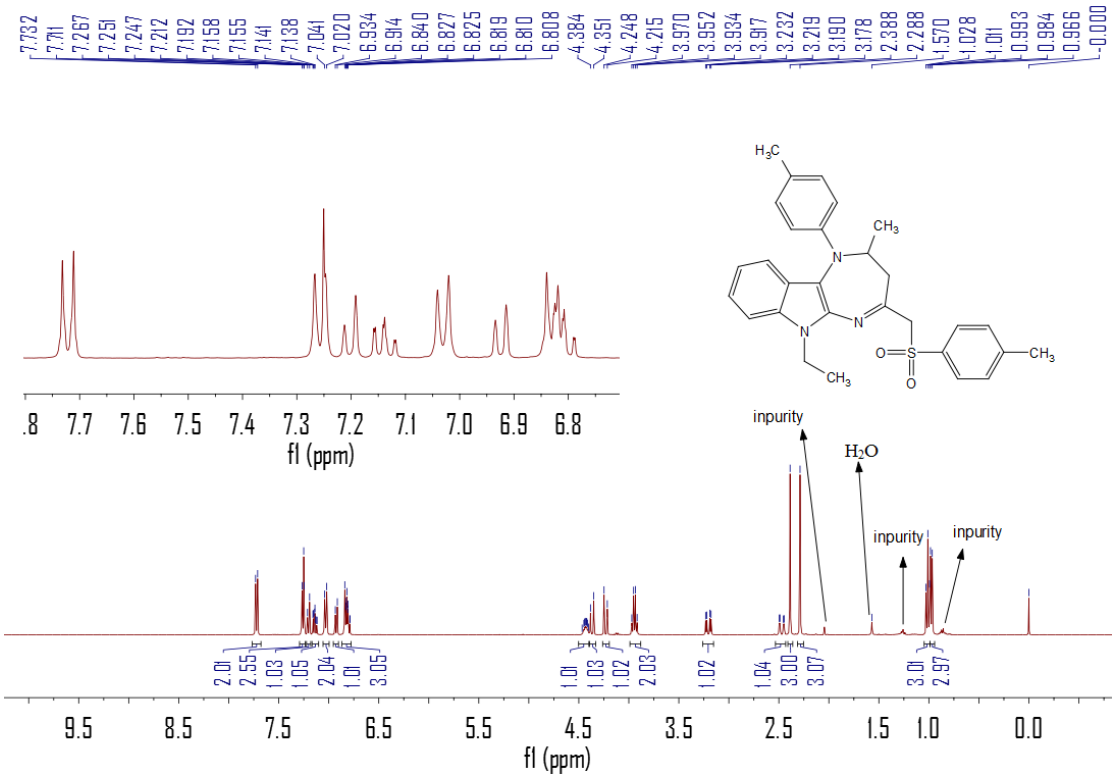
^{13}C NMR Spectrum for **7f** ($CDCl_3$, 100 MHz)



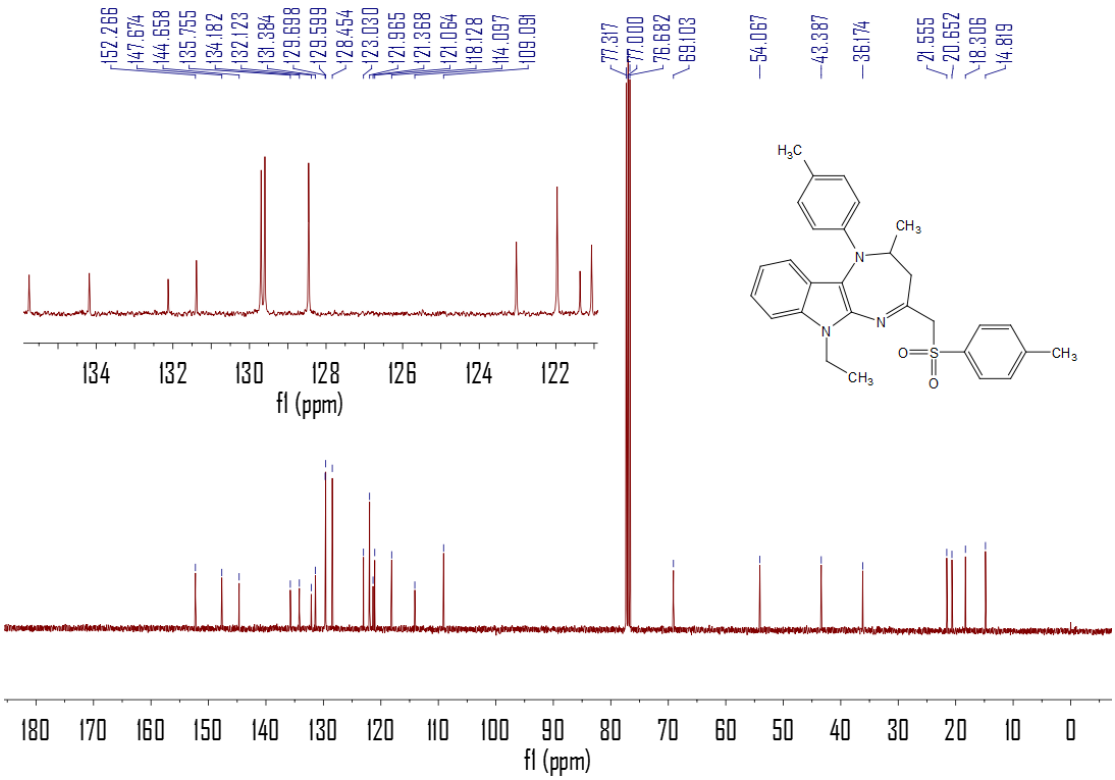
^{1}H NMR Spectrum for **7g** ($CDCl_3$, 400 MHz)



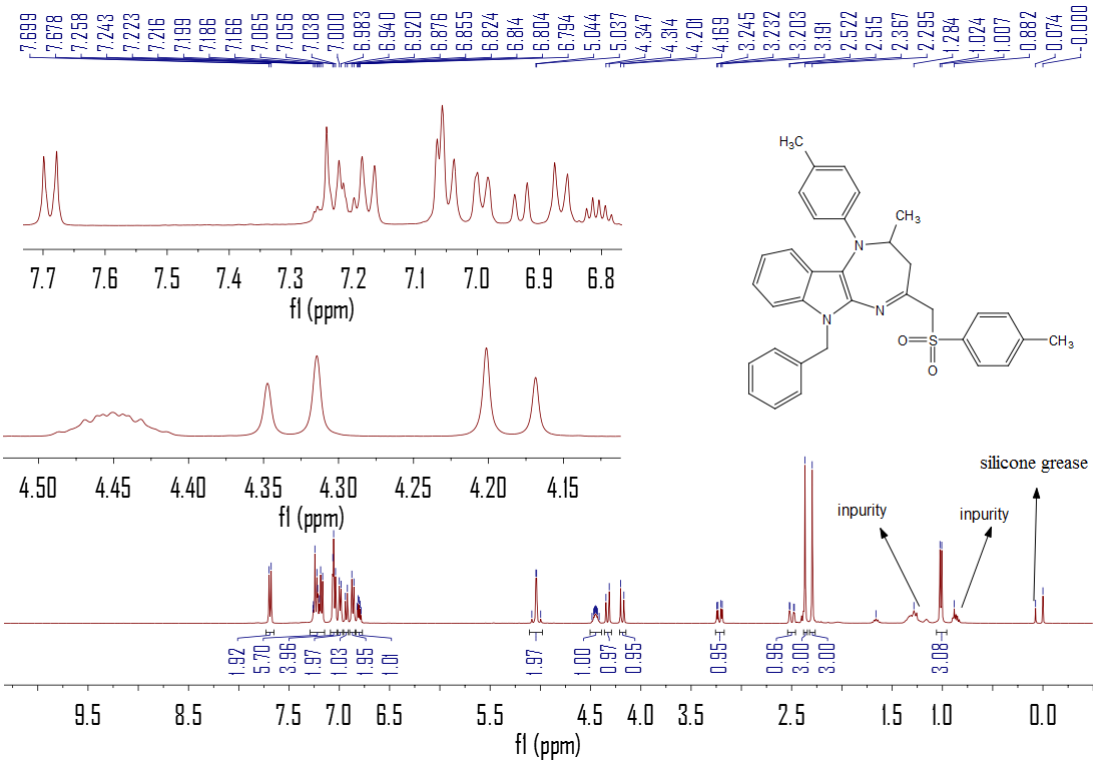
^{13}C NMR Spectrum for **7g** ($CDCl_3$, 100 MHz)



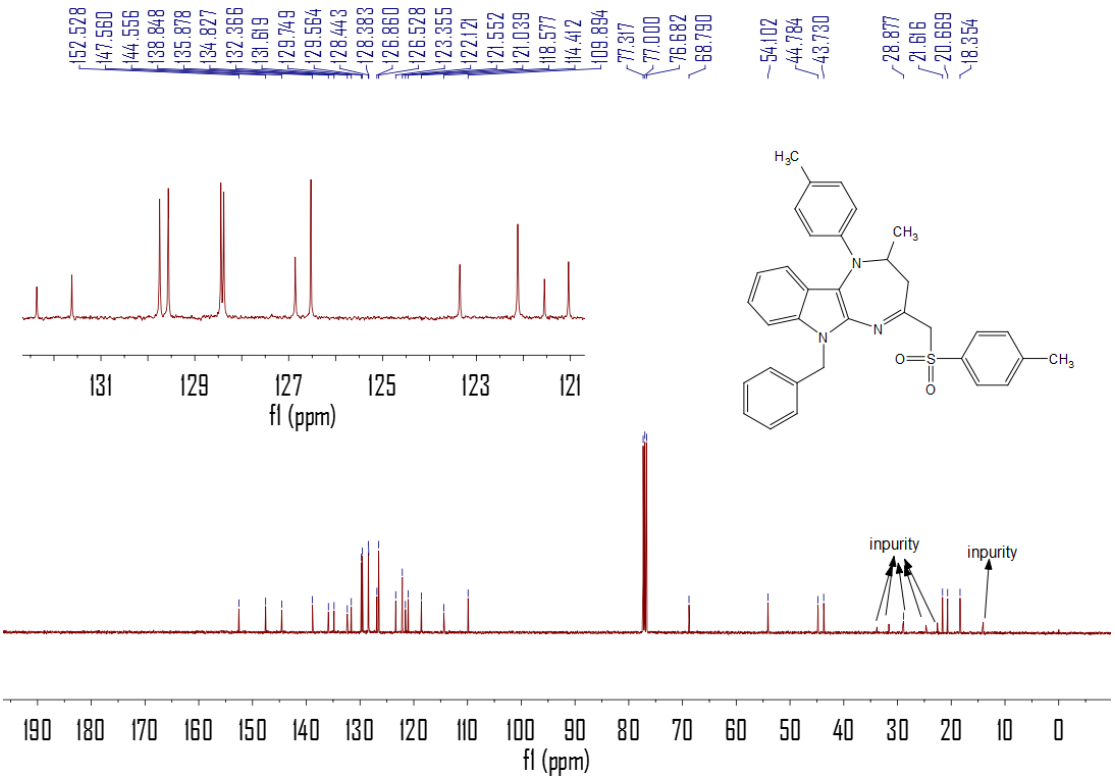
^{1}H NMR Spectrum for **7h** ($CDCl_3$, 400 MHz)



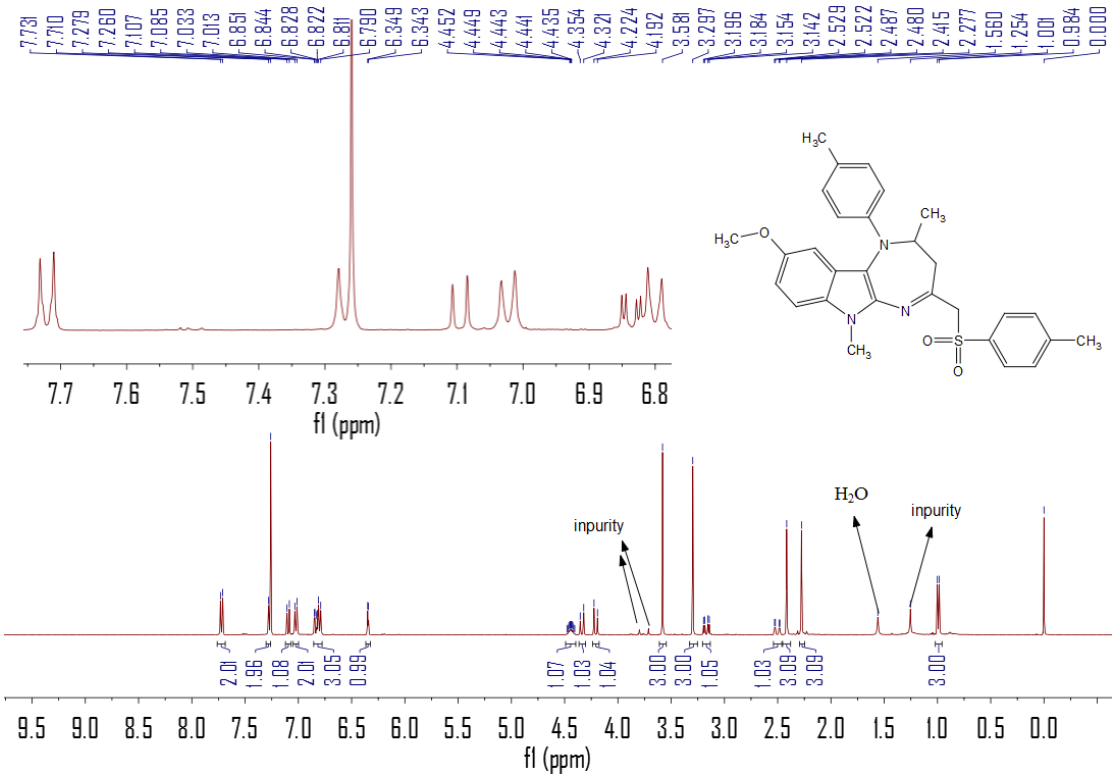
^{13}C NMR Spectrum for **7h** ($CDCl_3$, 100 MHz)



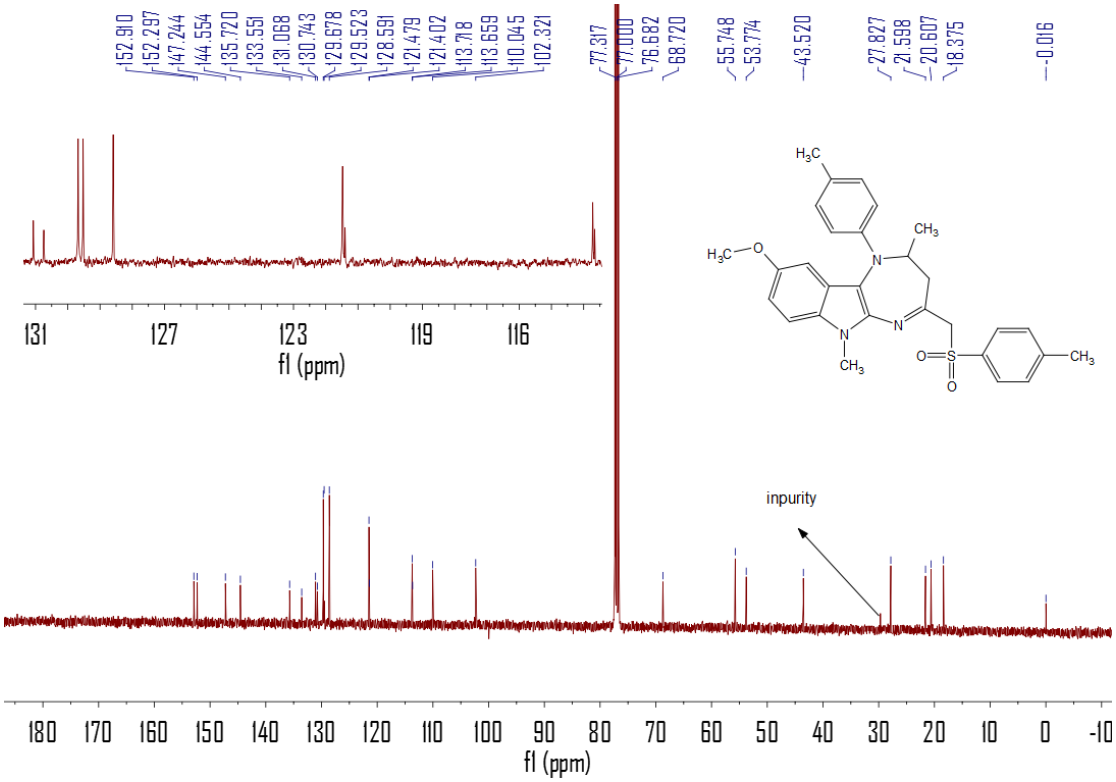
^{1}H NMR Spectrum for **7i** ($CDCl_3$, 400 MHz)



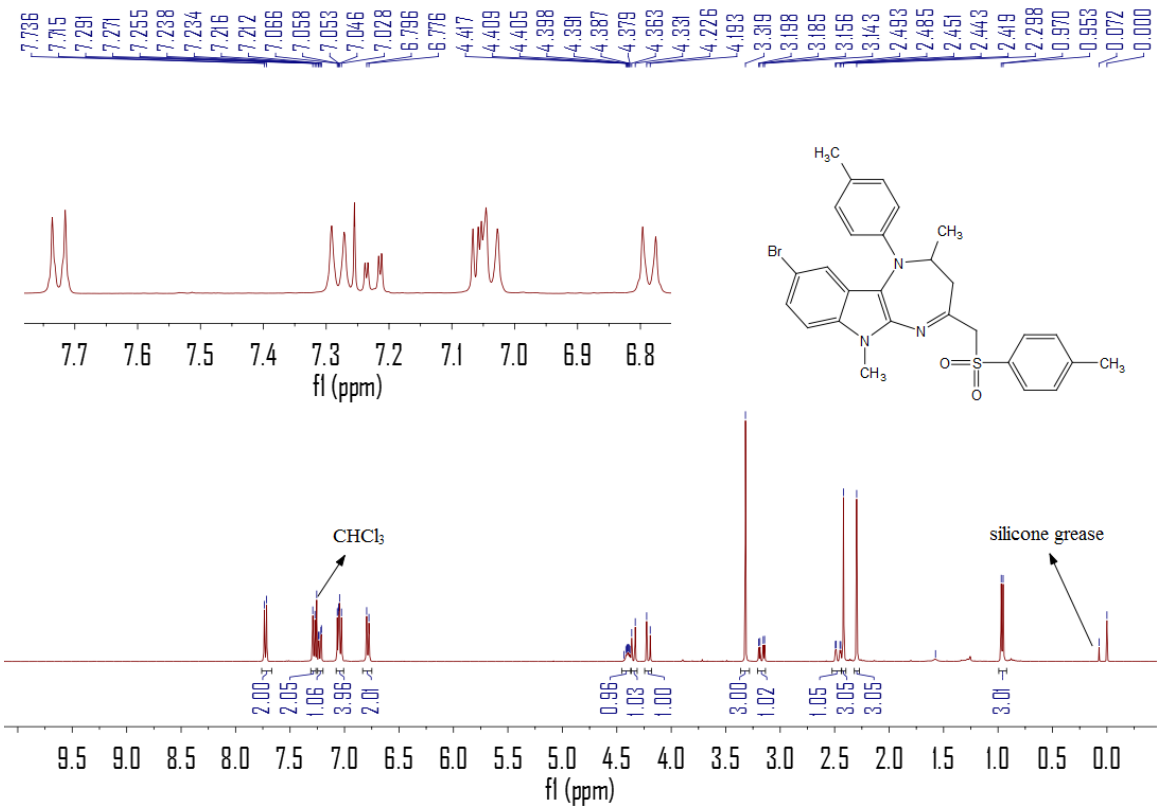
^{13}C NMR Spectrum for **7i** ($CDCl_3$, 100 MHz)



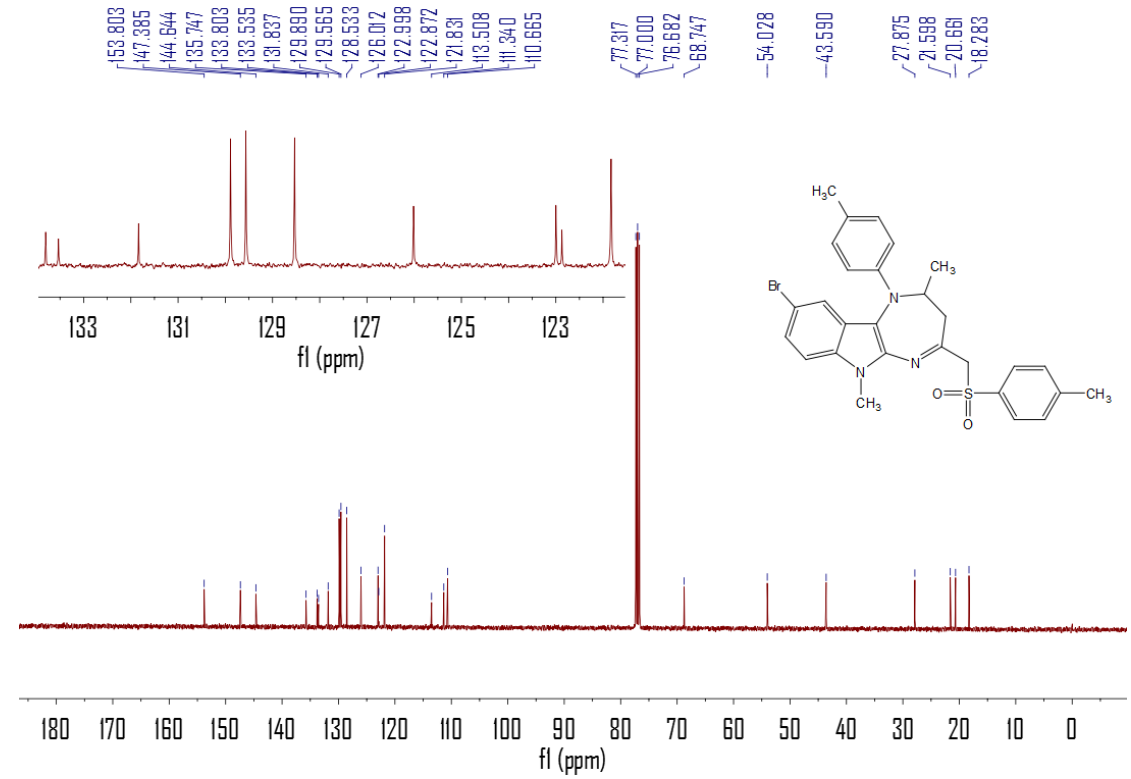
^{1}H NMR Spectrum for **7j** ($CDCl_3$, 400 MHz)



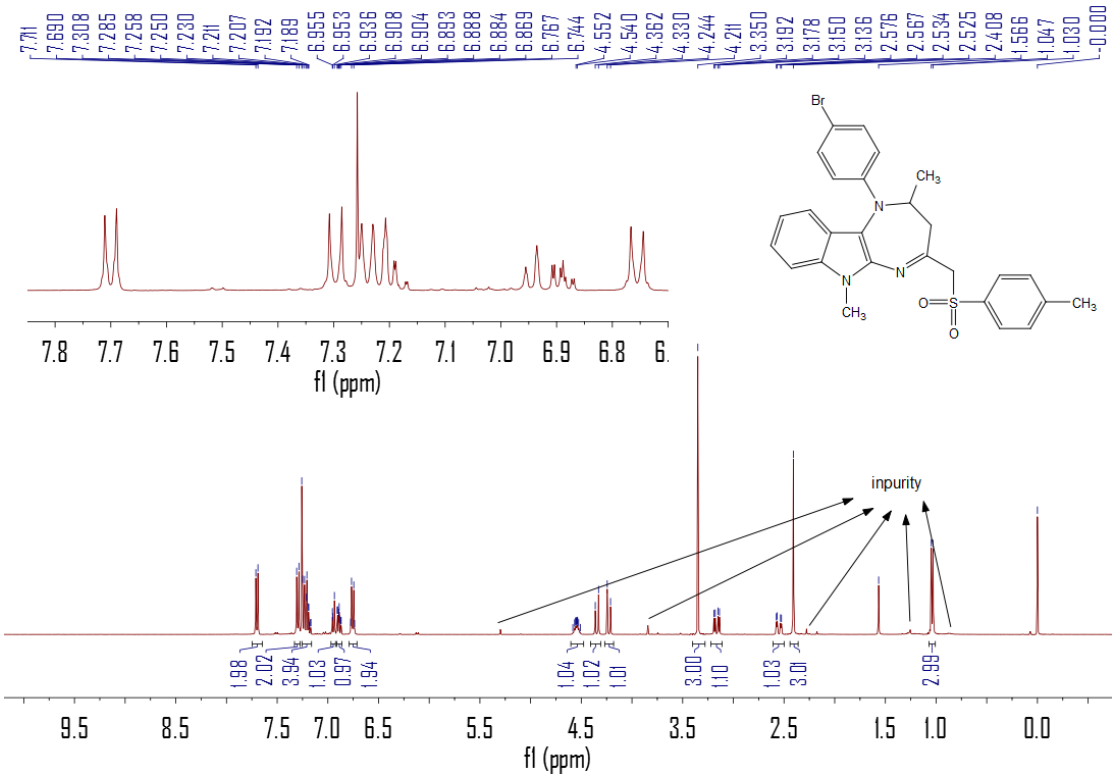
^{13}C NMR Spectrum for **7j** ($CDCl_3$, 100 MHz)



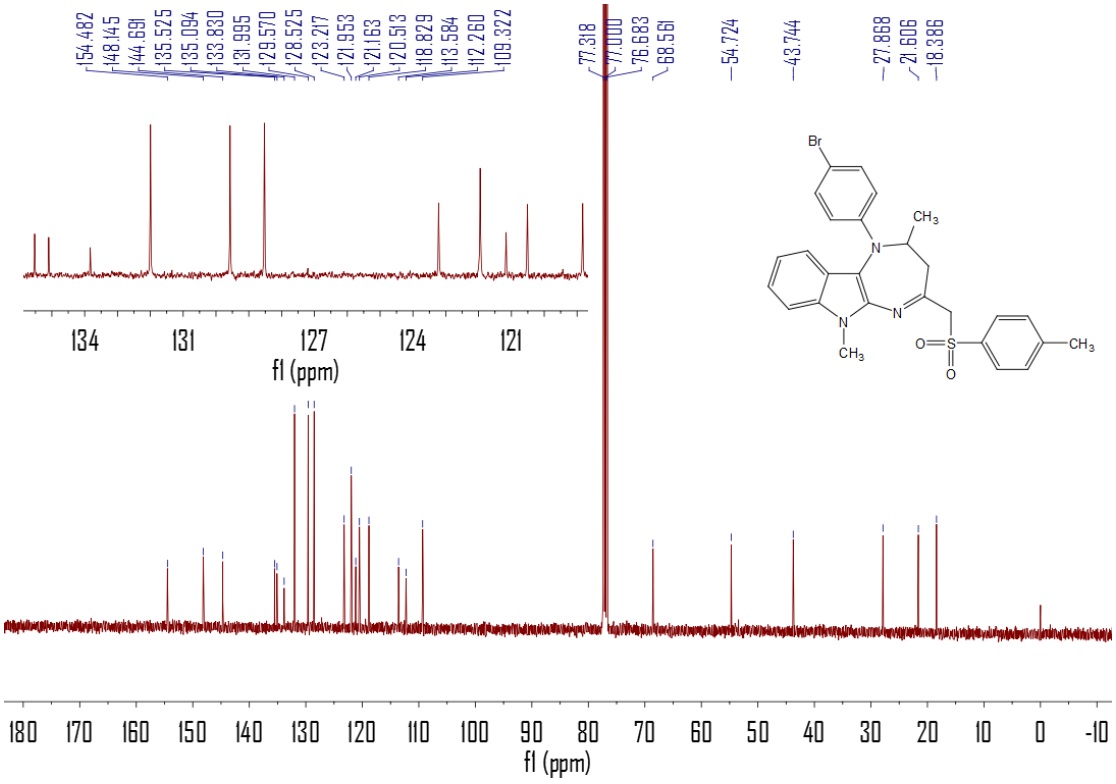
^{1}H NMR Spectrum for **7k** ($CDCl_3$, 400 MHz)



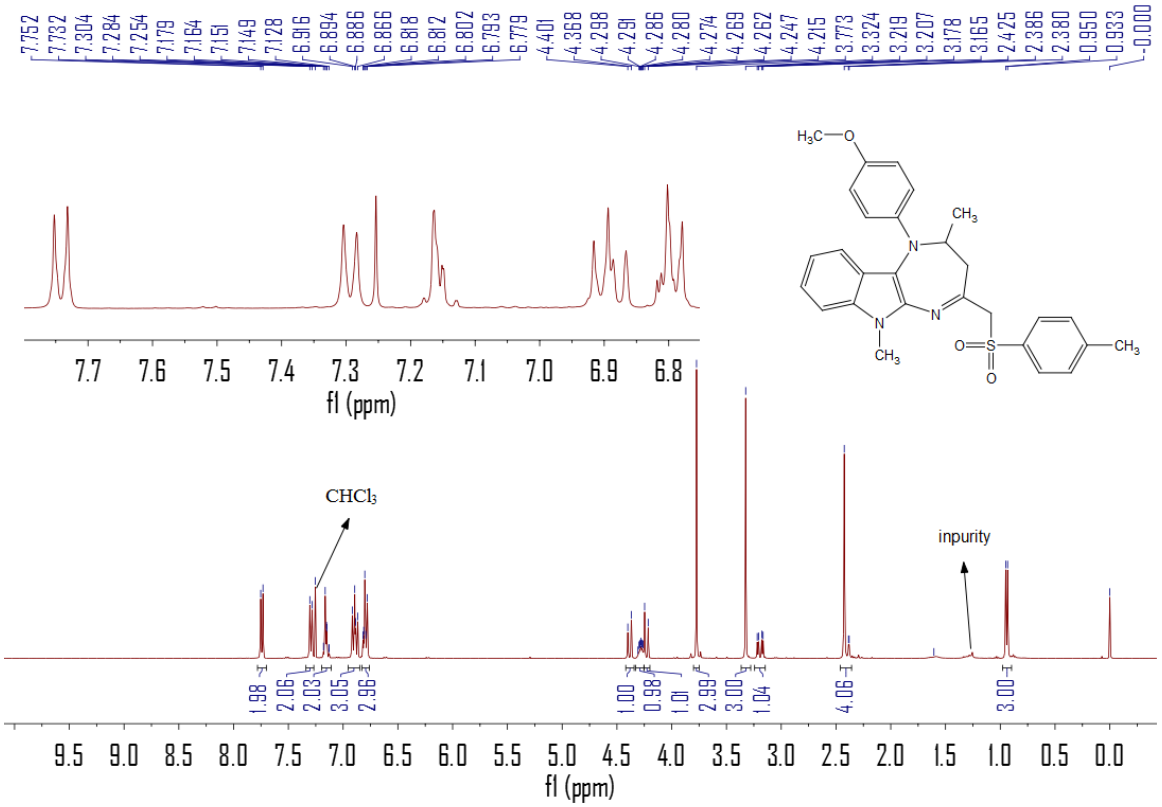
^{13}C NMR Spectrum for **7k** ($CDCl_3$, 100 MHz)



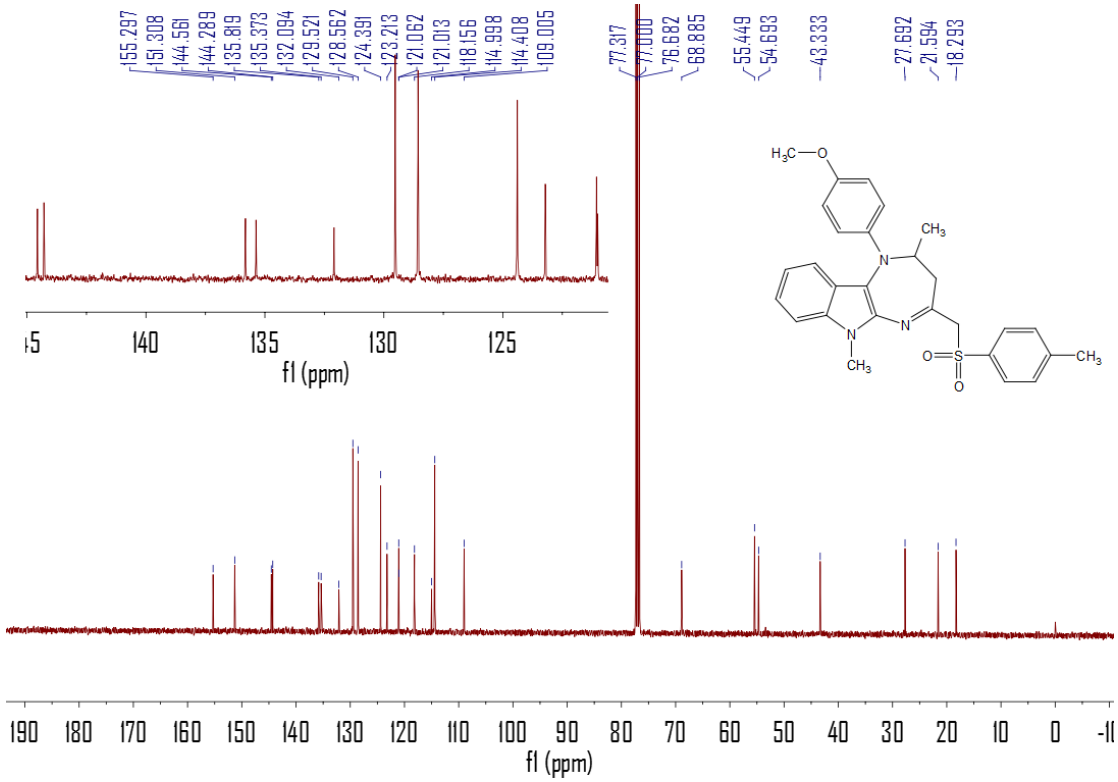
^{1}H NMR Spectrum for **7l** ($CDCl_3$, 400 MHz)



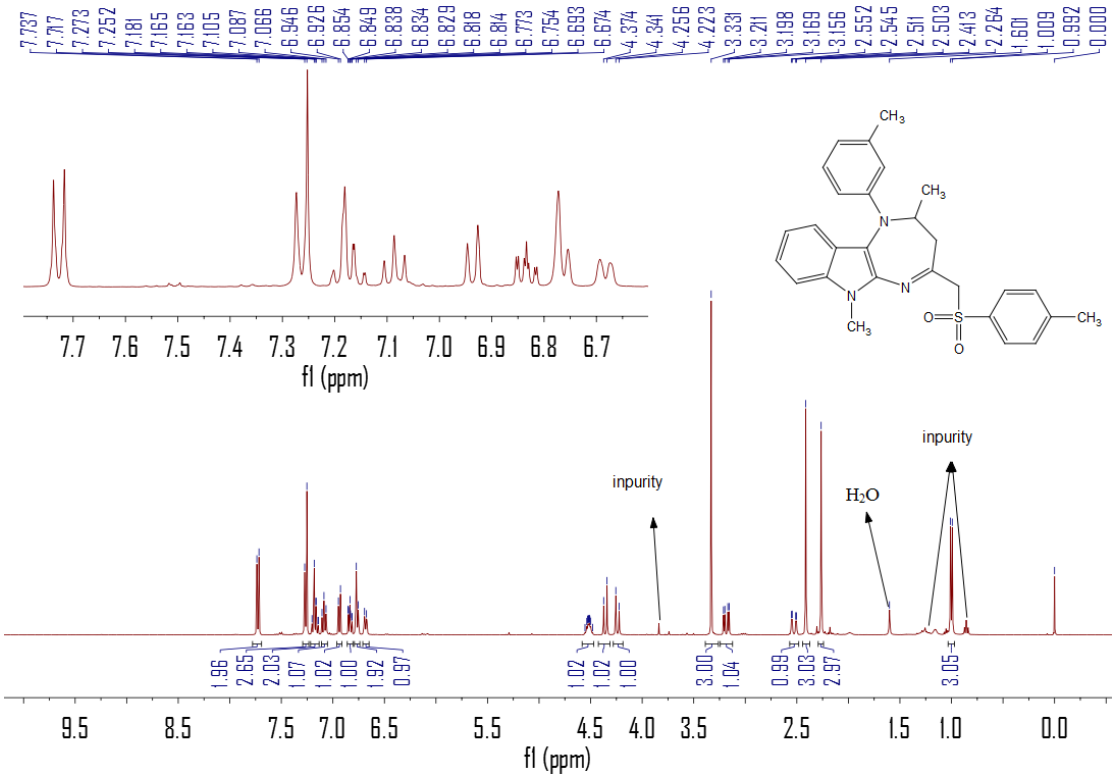
^{13}C NMR Spectrum for **7l** ($CDCl_3$, 100 MHz)



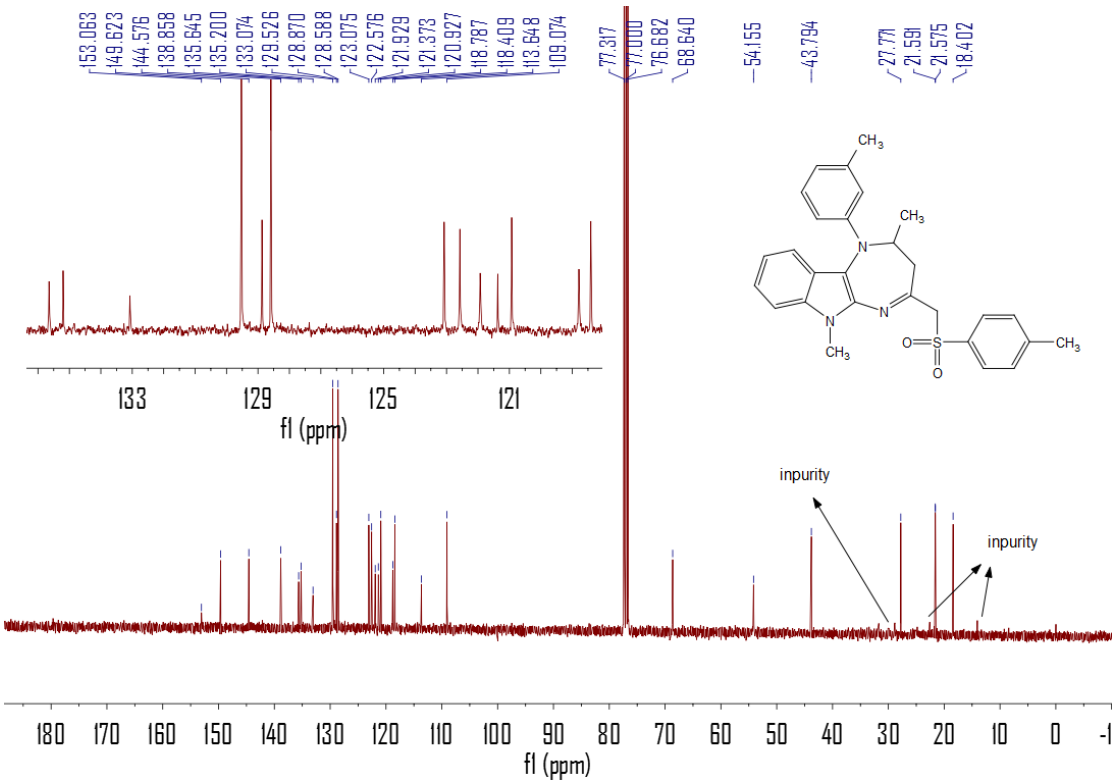
^{1}H NMR Spectrum for **7m** ($CDCl_3$, 400 MHz)



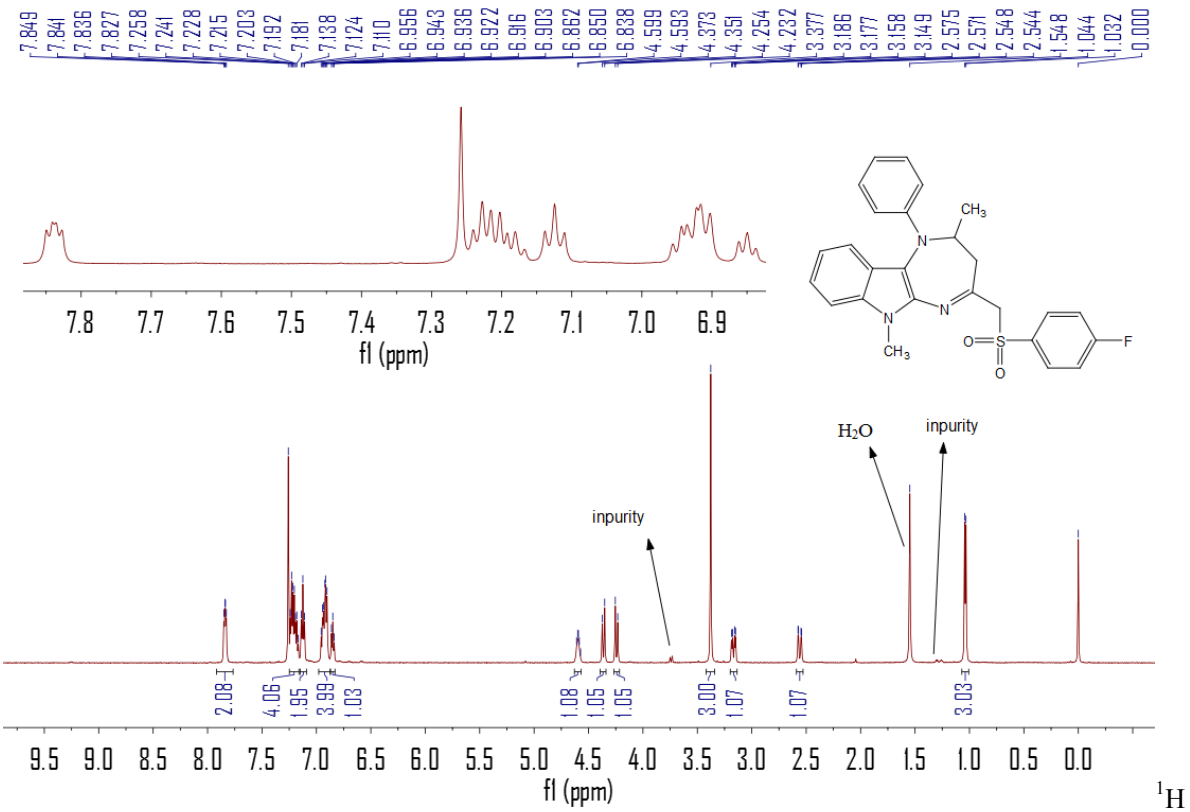
^{13}C NMR Spectrum for **7m** ($CDCl_3$, 100 MHz)



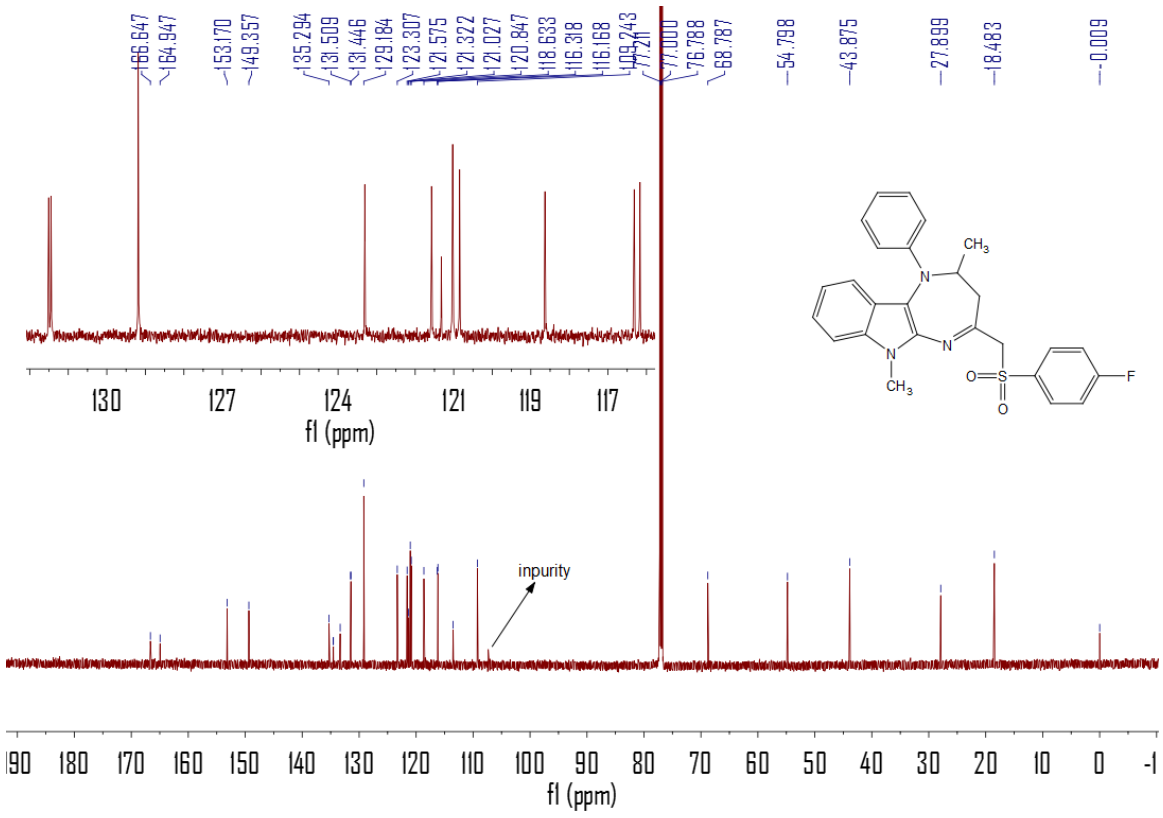
^{1}H NMR Spectrum for **7n** ($CDCl_3$, 400 MHz)



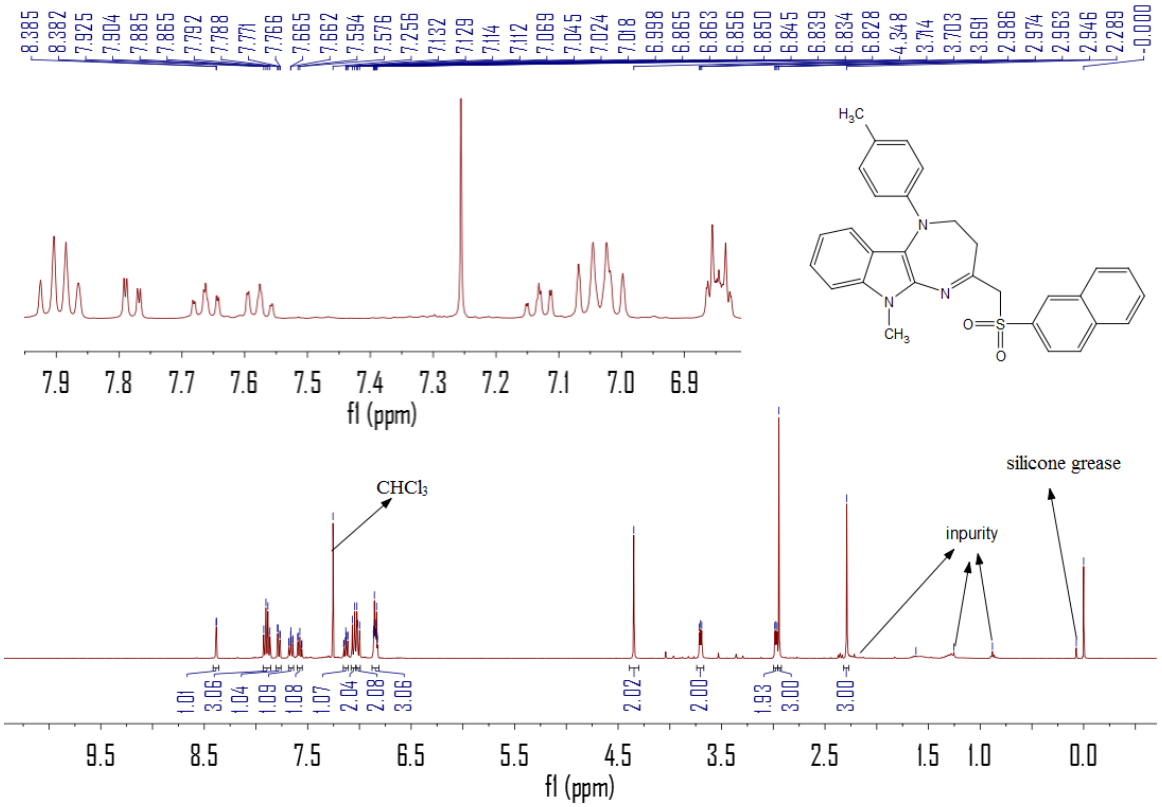
^{13}C NMR Spectrum for **7n** ($CDCl_3$, 100 MHz)



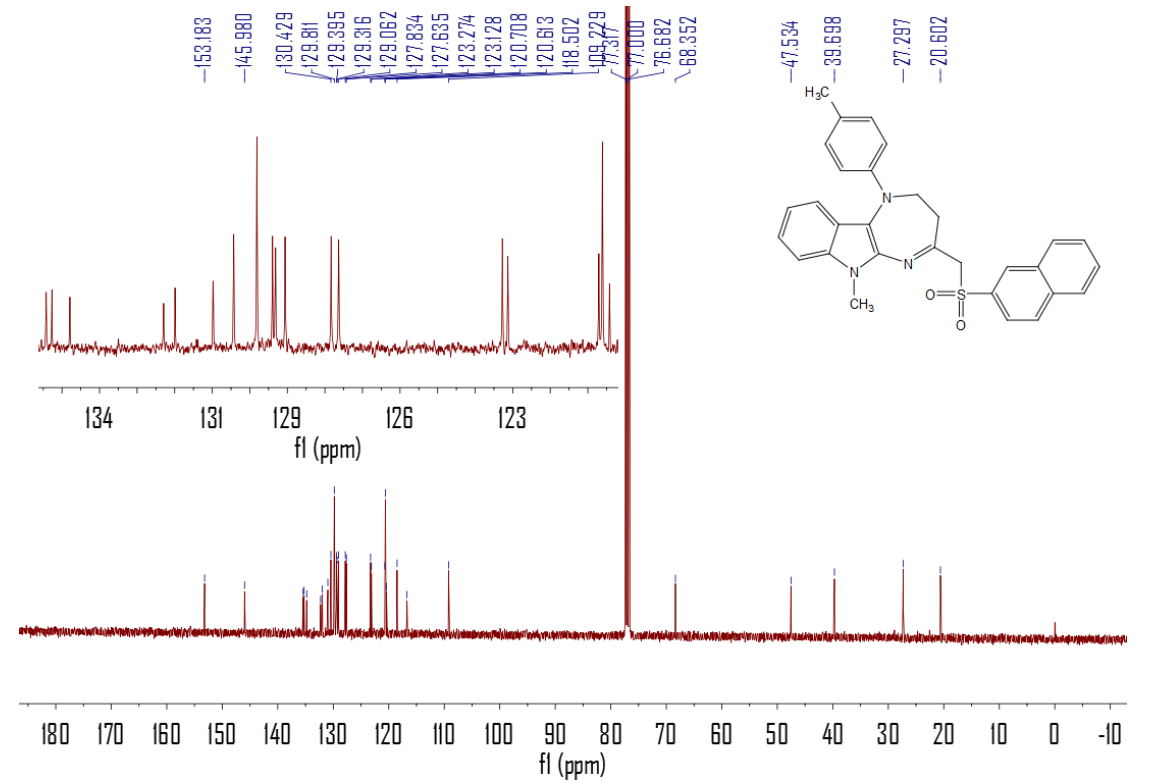
^{1}H NMR Spectrum for **7o** ($CDCl_3$, 600 MHz)



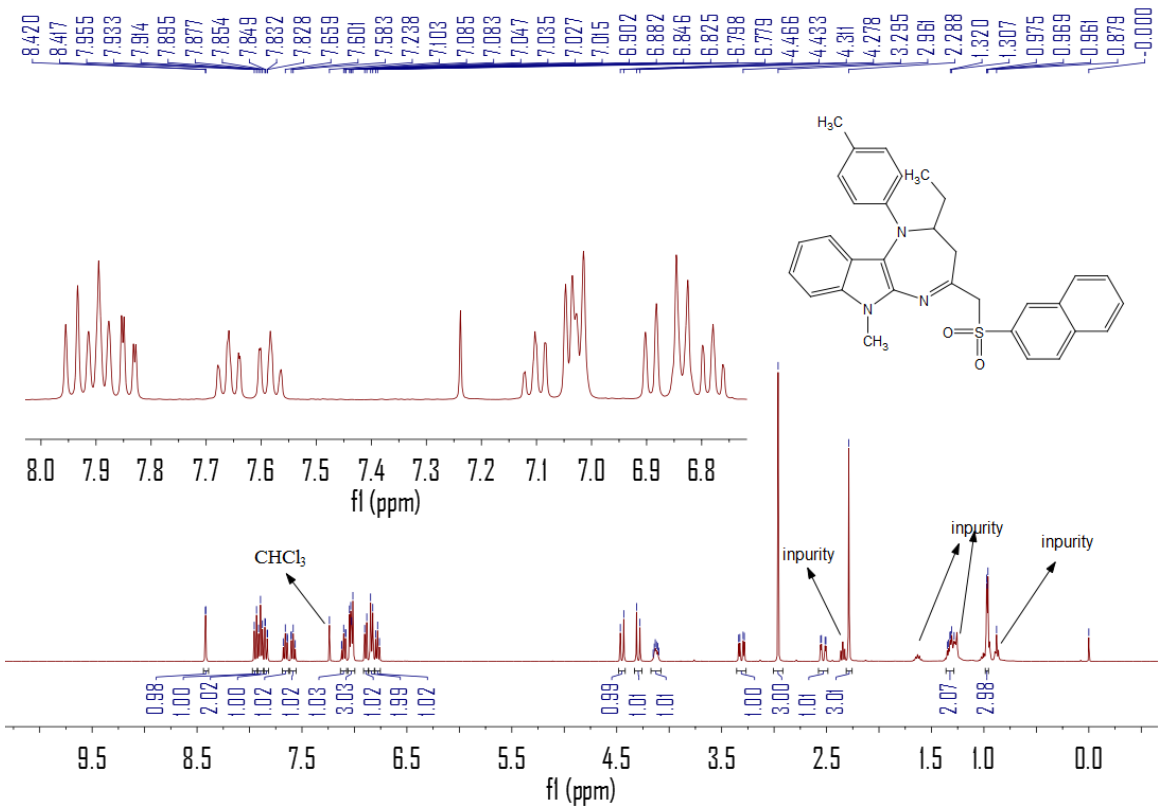
^{13}C NMR Spectrum for **7o** ($CDCl_3$, 150 MHz)



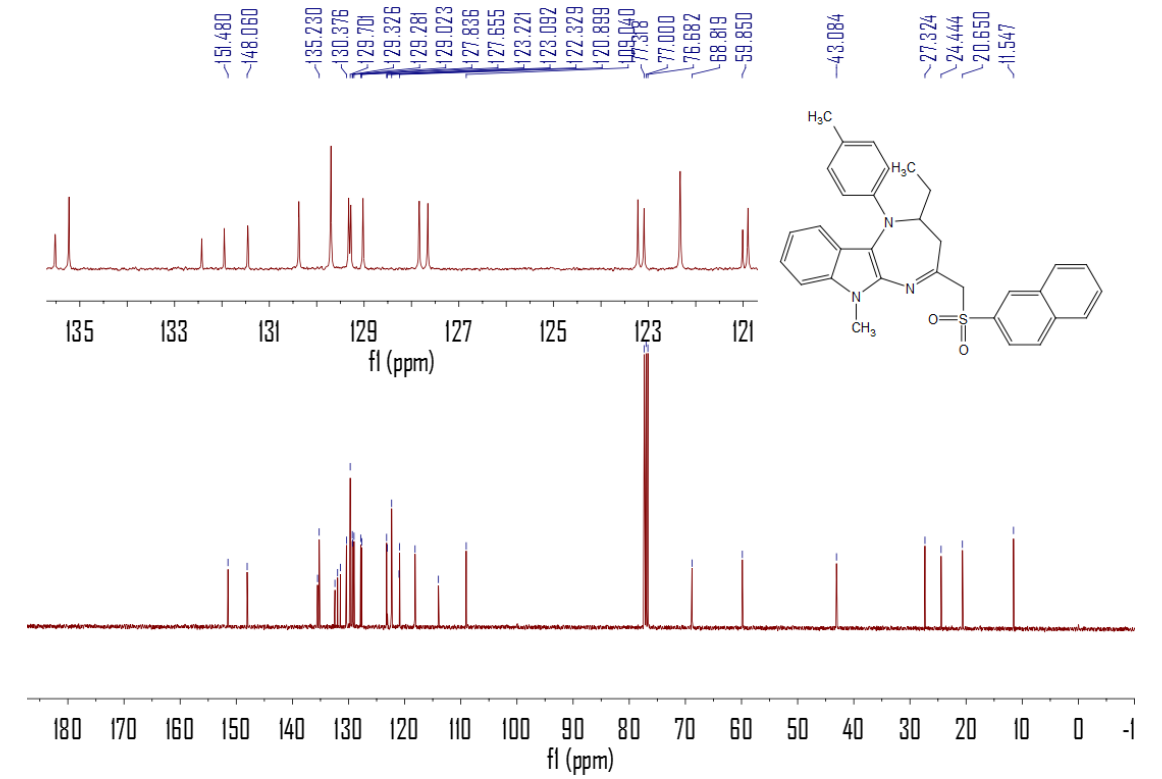
^{1}H NMR Spectrum for **7p** ($CDCl_3$, 400 MHz)



^{13}C NMR Spectrum for **7p** ($CDCl_3$, 100 MHz)



^{1}H NMR Spectrum for **7q** ($CDCl_3$, 400 MHz)



^{13}C NMR Spectrum for **7q** ($CDCl_3$, 100 MHz)

Crystal Structures of **7a**