Electronic Supplementary Material (ESI) for ChemComm.
This journal is © The Royal Society of Chemistry 2023

Annulation of Enaminones with Quinonediimides/ Quinoneimides for Selective Synthesis of Indoles and 2-Aminobenzofurans

Zukang Zhong,[a,†] Lihua Liao, [b,†] Yunyun Liu,[a] Ming Zhang,[a] Jie-Ping Wan[a]*

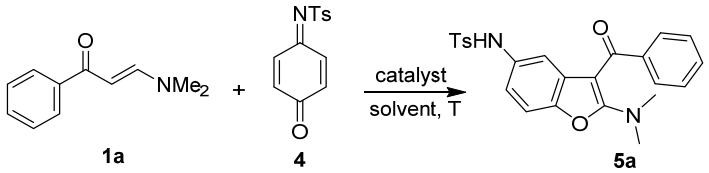
[a]National Engineering Research Center for Carbohydrate Synthesis, College of Chemistry and Chemical Engineering, Jiangxi Normal University, Nanchang, 330022, China.

[b]School of Food and Chemical Engineering, Shaoyang University, Shaoyang 422000, China

[†]These authors contributed equally.

Email: wanjieping@jxnu.edu.cn; chemwanjp@sina.com

Table S1 Optimization on the synthesis of benzofuan



1a 4 5a

entry	catalyst	solvent	*t* (°C)	time (h)	yield (%)[b]
1	-	1,4-dioxane	50	8	0
2	$Cu(OTf)_2$	1,4-dioxane	50	8	17
3	TFA	1,4-dioxane	50	8	0
4	$Fe(OTf)_3$	1,4-dioxane	50	8	34
5	$Fe(OTf)_3$	CH_3CN	50	8	39
6	$Fe(OTf)_3$	DMF	50	8	34
7	$Fe(OTf)_3$	DMSO	50	8	37
8	$Fe(OTf)_3$	CH_3CN	30	8	43
9	$Fe(OTf)_3$	CH_3CN	25	8	46
10	$Fe(OTf)_3$	CH_3CN	0	8	51
11	$Fe(OTf)_3$	CH_3CN	0	5	54
12	$Fe(OTf)_3$	CH_3CN	0	3	57
13[c]	$Fe(OTf)_3$	CH_3CN	0	3	61
14[c,d]	$Fe(OTf)_3$	CH_3CN	0	3	73

[a]General conditions: **1a** (0.2 mmol), **4** (0.24 mmol), catalyst (0.04 mmol, 20 mol %), solvent (2 mL), stirred in a sealed tube for 8 h. [b]Yield of isolated product. [c]With 0.3 mmol of **4**. [d]Catalyst (0.05 mmol, 25 mol %)

General experimental information

All experiments were carried out under air atmosphere. All enaminones[1] **1** and quinonediimides/quinoneimides[2] **2** and **4** were synthesized following literature processes. Other chemicals and solvents used in the experiments were obtained from commercial sources and used directly without further treatment. The ^1H and ^{13}C NMR spectra were recorded in 400 MHz apparatus and the frequencies for ^1H NMR and ^{13}C NMR test are 400 MHz and 100 MHz, respectively. The chemical shifts were reported in ppm with TMS as internal standard. Melting points were tested in X-4A instrument without correcting temperature. The HRMS were obtained under ESI model in a mass spectrometer with TOF analyzer.

General procedure for the synthesis of 3

In a 10 mL sealed tube were added enaminone **1** (0.2 mmol, 1 equiv), quinonediimide **2** (0.24 mmol, 1.2 equiv), $Zn(OTf)_2$ (0.04 mmol, 20 mol %) and 1,4-dioxane (2 mL, 0.1 M). After sealing the tube with Teflon cap, the mixture was stirred at 50 °C with oil bath heating for 24 h. After being cooled down to room temperature, the mixture was transferred into the round bottom flask, and solvent was removed at reduced pressure. The residue obtained therein was subjected to flash silica gel column chromatography to provide pure products with the elution of mixed petroleum ether and ethyl acetate.

Procedure for the 1 mmol scale reaction for the synthesis of 3a

The In a 50 mL sealed tube were added enaminone **1** (1.0 mmol, 1 equiv), quinonediimide **2** (1.2mmol, 1.2 equiv), $Zn(OTf)_2$ (0.2 mmol, 20 mol %) and 1,4-dioxane (10 mL, 0.1 M). After sealing the tube with Teflon cap, the mixture was stirred at 50 °C with oil bath heating for 24 h. After being cooled down to room temperature, the mixture was transferred into a round bottom flask, and solvent was removed at reduced pressure. The residue obtained therein was subjected to flash silica gel column chromatography to provide pure product 3a (424 mg, 78% yield) with the elution of mixed petroleum ether and ethyl acetate (v/v = 2:1).

General procedure for the synthesis of 5

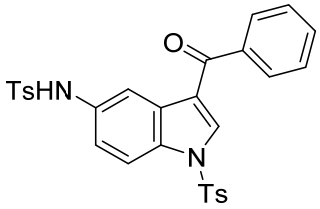
In a 10 mL sealed tube were added enaminone **1** (0.2 mmol, 1 equiv), quinoneimide **4** (0.3 mmol, 1.5 equiv), $Fe(OTf)_3$ (0.05 mmol, 25 mol %) and CH_3CN (2 mL, 0.1 M). After sealing the tube with Teflon cap, the mixture was stirred at 0 °C with ice bath for 3 h. Then the mixture was transferred into the round bottom flask, and solvent was removed at reduced pressure. The residue obtained therein was subjected to flash silica gel column chromatography to provide pure products with the elution of mixed petroleum ether and ethyl acetate.

Procedure for the 1 mmol scale reaction for the synthesis of 5a

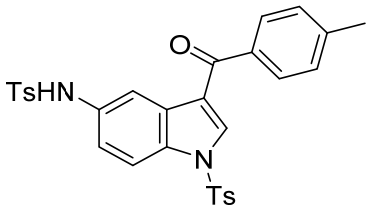
The In a 50 mL sealed tube were added enaminone **1** (1.0 mmol, 1 equiv), quinoneimide

4 (1.5 mmol, 1.5 equiv), $Fe(OTf)_3$ (0.25 mmol, 25 mol %) and CH_3CN (10 mL, 0.1 M). After sealing the tube with Teflon cap, the mixture was stirred at 0 °C with ice bath for 3 h. Then the mixture was transferred into a round bottom flask, and solvent was removed at reduced pressure. The residue obtained therein was subjected to flash silica gel column chromatography to provide pure product **3a** (295 mg, 68% yield) with the elution of mixed petroleum ether and ethyl acetate (v/v = 3:1).

Characterization data

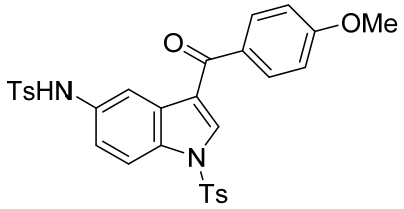


***N*-(3-Benzoyl-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3a**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (92.5 mg, 85% yield); mp 105-106 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.90 (d, *J* = 2.3 Hz, 1H), 7.86 (d, *J* = 9.0 Hz, 1H), 7.81 (d, *J* = 6.9 Hz, 2H), 7.76 (d, *J* = 8.0 Hz, 2H), 7.61 (d, *J* = 8.2 Hz, 3H), 7.52 (s, 2H), 7.39 (s, 1H), 7.27 (s, 2H), 7.19 (s, 1H), 7.13 (d, *J* = 8.0 Hz, 2H), 2.36 (s, 3H), 2.31 (s, 3H);^{13}C NMR (100 MHz, $CDCl_3$) δ 190.8, 146.2, 143.8, 138.9, 136.2, 134.5, 134.3, 134.2, 132.5, 132.5, 130.3, 129.7, 129.6, 129.1, 129.0, 128.7, 127.3, 127.2, 126.5, 120.6, 120.0, 115.5, 113.9, 21.6, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{24}N_2O_5S_2$ 545.1199; Found 545.1197.

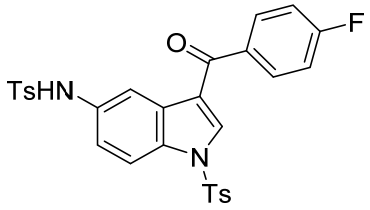


4-Methyl-*N*-(3-(4-methylbenzoyl)-1-tosyl-1H-indol-5-yl)benzenesulfonamide (**3b**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (100.4 mg, 90% yield); mp 175-176 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.93 (d, *J* = 2.2 Hz, 1H), 7.85 (d, *J* = 9.0 Hz, 1H), 7.75 (d, *J* = 8.0 Hz, 4H), 7.56 (d, *J* = 7.9 Hz, 3H), 7.41 (dd, *J* = 9.0, 2.2 Hz, 1H), 7.31 (d, *J* = 7.9 Hz, 2H), 7.23 (d, *J* = 8.0 Hz, 2H), 7.05 (d, *J* = 8.0 Hz, 2H), 2.44 (s, 3H), 2.33

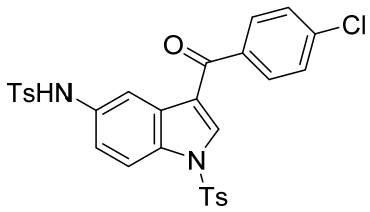
(s, 3H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.8, 146.1, 143.6, 143.4, 136.2, 134.3, 134.3, 134.2, 132.4, 130.3, 129.6, 129.4, 129.3, 129.2, 127.2, 127.2, 120.5, 120.2, 115.4, 113.9, 21.7, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{26}N_2O_5S_2$ 559.1356; Found 559.1348.



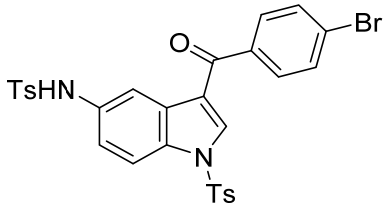
***N*-(3-(4-Methoxybenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3c**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (93.0 mg, 81% yield); mp 210-211 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.86 (d, *J* = 8.6 Hz, 4H), 7.76 (d, *J* = 8.1 Hz, 2H), 7.56 (d, *J* = 7.9 Hz, 2H), 7.40 (d, *J* = 9.0 Hz, 2H), 7.24 (d, *J* = 8.0 Hz, 2H), 7.06 (d, *J* = 7.9 Hz, 2H), 7.00 (d, *J* = 8.5 Hz, 2H), 3.90 (s, 3H), 2.34 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.5, 163.4, 146.1, 143.7, 136.1, 134.3, 134.1, 133.7, 132.4, 131.5, 131.4, 130.3, 129.6, 129.3, 127.2, 127.1, 120.6, 120.2, 115.5, 114.0, 113.9, 55.6, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{26}N_2O_6S_2$ 575.1305; Found 575.1304.



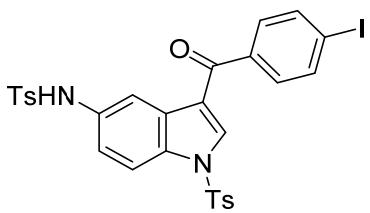
***N*-(3-(4-Fluorobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3d**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (102.3 mg, 91% yield); mp 197-198 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.92 – 7.82 (m, 4H), 7.77 (d, *J* = 8.1 Hz, 2H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.50 – 7.35 (m, 2H), 7.25 (d, *J* = 6.4 Hz, 2H), 7.19 (t, *J* = 8.4 Hz, 2H), 7.08 (d, *J* = 7.8 Hz, 2H), 2.35 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.5, 165.4 (d, *J* = 254.3 Hz), 146.3, 143.8, 136.1, 135.1, 134.3, 134.3, 134.1, 132.4, 131.6, 131.6, 130.4, 129.6, 129.0, 127.2, 127.2, 126.4, 120.6, 119.8, 116.0, 115.8, 115.3, 114.0, 21.7, 21.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -105.59; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{23}FN_2O_5S_2$ 563.1105; Found 563.1104.



***N*-(3-(4-Chlorobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3e**). Eluent: V_{PE}/V_{EA} = 2:1; yellow solid (101.7 mg, 88% yield); mp 202-203 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (s, 1H), 7.92 (s, 1H), 7.85 (d, *J* = 9.0 Hz, 1H), 7.77 (dd, *J* = 8.4, 3.7 Hz, 4H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.48 (d, *J* = 8.0 Hz, 3H), 7.42 – 7.37 (m, 1H), 7.24 (s, 1H), 7.08 (d, *J* = 8.0 Hz, 2H), 2.35 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.7, 146.3, 143.8, 139.0, 137.1, 136.1, 134.4, 134.3, 134.1, 132.4, 130.4, 130.4, 129.6, 129.1, 128.9, 127.2, 127.2, 120.6, 119.7, 115.3, 114.0, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{23}ClN_2O_5S_2$ 579.0810; Found 579.0811.

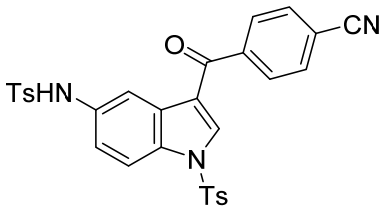


***N*-(3-(4-Bromobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3f**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (108.2 mg, 87% yield); mp 205-206 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (s, 1H), 7.91 (d, *J* = 2.2 Hz, 1H), 7.85 (d, *J* = 9.0 Hz, 1H), 7.77 (d, *J* = 8.1 Hz, 2H), 7.70 (d, *J* = 8.3 Hz, 2H), 7.65 (d, *J* = 8.6 Hz, 2H), 7.59 (d, *J* = 7.9 Hz, 2H), 7.44 – 7.36 (m, 2H), 7.26 (d, *J* = 8.2 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 2.35 (s, 3H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.9, 146.3, 143.8, 137.6, 136.1, 134.5, 134.4, 134.1, 132.4, 132.0, 130.6, 130.4, 129.6, 128.9, 127.6, 127.2, 127.2, 120.6, 119.7, 115.3, 114.0, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{23}BrN_2O_5S_2$ 623.0305; Found 623.0299.

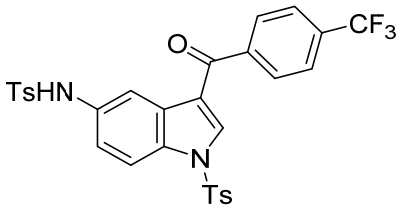


***N*-(3-(4-Iodobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3g**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (108.5 mg, 81% yield); mp 195-196 °C; ^{1}H NMR

(400 MHz, $CDCl_3$) δ 7.95 (s, 1H), 7.91 (s, 1H), 7.88 – 7.84 (m, 3H), 7.76 (d, *J* = 8.1 Hz, 2H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.54 (d, *J* = 8.0 Hz, 2H), 7.41 (s, 1H), 7.25 (d, *J* = 6.1 Hz, 3H), 7.09 (d, *J* = 7.9 Hz, 2H), 2.35 (s, 3H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.1, 146.3, 143.8, 138.1, 138.0, 136.1, 134.5, 134.4, 134.1, 132.4, 130.5, 130.4, 129.6, 128.9, 127.2, 127.2, 120.6, 119.6, 115.3, 114.0, 100.1, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{23}IN_2O_5S_2$ 671.0166; Found 671.0159.

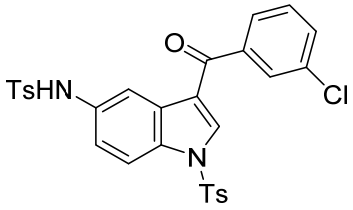


***N*-(3-(4-Cyanobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3h**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (50.1 mg, 44% yield); mp 153-154 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.94 (s, 2H), 7.90 (d, *J* = 8.1 Hz, 2H), 7.83 (d, *J* = 7.8 Hz, 3H), 7.78 (d, *J* = 8.4 Hz, 2H), 7.63 (d, *J* = 8.3 Hz, 2H), 7.35 (s, 2H), 7.28 (d, *J* = 8.1 Hz, 2H), 7.15 (d, *J* = 8.0 Hz, 2H), 2.38 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.2, 146.5, 143.9, 142.4, 136.1, 134.8, 134.5, 133.9, 132.6, 132.3, 130.5, 129.7, 129.3, 128.6, 127.3, 126.4, 120.7, 119.3, 118.0, 115.8, 115.2, 114.0, 21.7, 21.6; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{23}N_3O_5S_2$ 570.1152; Found 570.1147.

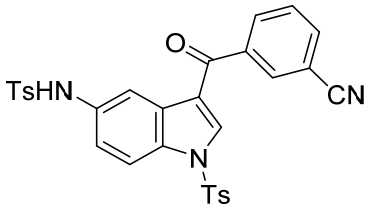


4-Methyl-*N*-(1-tosyl-3-(4-(trifluoromethyl)benzoyl)-1H-indol-5-yl)benzenesulfonamide (**3i**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (61.2 mg, 50% yield); mp 113-114 °C; ^1H NMR (400 MHz, $CDCl_3$) δ 7.95 (s, 2H), 7.92 (d, *J* = 8.0 Hz, 2H), 7.85 (d, *J* = 9.0 Hz, 1H), 7.78 (dd, *J* = 8.1, 5.2 Hz, 4H), 7.62 (d, *J* = 8.1 Hz, 2H), 7.39 (d, *J* = 6.2 Hz, 2H), 7.27 (d, *J* = 8.3 Hz, 2H), 7.13 (d, *J* = 7.9 Hz, 2H), 2.37 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.8, 146.4, 143.8, 141.9, 136.2, 134.9, 134.5, 134.1, 133.8 (d, *J* = 32.9 Hz), 132.4, 130.4, 129.6, 129.2, 128.7, 127.3, 127.2, 125.8 (q, *J* = 3.5 Hz), 123.6 (q, *J* = 272.8 Hz), 120.7, 119.6, 115.3, 114.0, 21.6, 21.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.91; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for

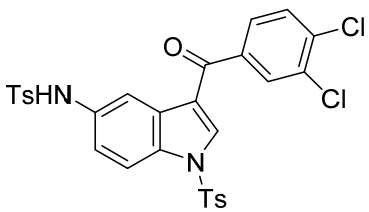
$C_{30}H_{23}F_3N_2O_5S_2$ 613.1073; Found 613.1083.



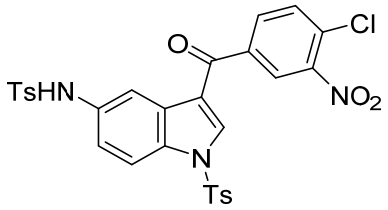
***N*-(3-(3-Chlorobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3j**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (70.5 mg, 61% yield); mp 140-141 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.91 (d, *J* = 2.2 Hz, 1H), 7.86 (d, *J* = 8.9 Hz, 1H), 7.78 (d, *J* = 8.4 Hz, 3H), 7.69 (d, *J* = 7.6 Hz, 1H), 7.64 – 7.55 (m, 3H), 7.49 – 7.36 (m, 3H), 7.27 (d, *J* = 7.5 Hz, 2H), 7.12 (d, *J* = 7.9 Hz, 2H), 2.36 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.4, 146.4, 143.8, 140.5, 136.1, 134.9, 134.7, 134.4, 134.1, 132.5, 132.4, 130.4, 130.1, 129.7, 129.0, 128.8, 127.3, 127.2, 127.1, 120.6, 119.6, 115.2, 114.0, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{23}ClN_2O_5S_2$ 579.0810; Found 579.0808.



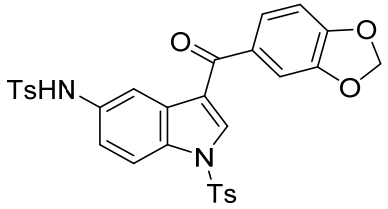
***N*-(3-(3-Cyanobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3k**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (50.1 mg, 44% yield); mp 127-128 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 10.6 Hz, 2H), 7.94 (s, 1H), 7.87 (dd, *J* = 15.4, 9.8 Hz, 3H), 7.79 (d, *J* = 8.0 Hz, 2H), 7.66 (dd, *J* = 16.3, 7.9 Hz, 3H), 7.36 (dd, *J* = 8.9, 2.2 Hz, 1H), 7.30 (d, *J* = 5.0 Hz, 3H), 7.16 (d, *J* = 8.0 Hz, 2H), 2.38 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.5, 146.5, 143.9, 139.9, 136.1, 135.4, 134.6, 134.4, 134.0, 132.8, 132.4, 130.5, 129.8, 129.7, 128.6, 127.3, 127.2, 120.7, 119.3, 117.9, 115.2, 114.1, 113.2, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{23}N_3O_5S_2$ 570.1152; Found 570.1155.



***N*-(3-(3,4-Dichlorobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3l**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (55.1 mg, 45% yield); mp 192-193 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (s, 1H), 7.88 (d, *J* = 6.2 Hz, 3H), 7.78 (d, *J* = 7.9 Hz, 2H), 7.61 (d, *J* = 7.7 Hz, 4H), 7.41 (d, *J* = 13.1 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.12 (d, *J* = 7.8 Hz, 2H), 2.37 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 188.1, 146.9, 143.7, 139.4, 137.2, 136.2, 135.7, 135.6, 133.7, 132.2, 131.4, 131.3, 131.1, 130.9, 130.1, 129.3, 128.7, 127.9, 127.1, 119.8, 119.0, 114.2, 113.7, 21.5, 21.3; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{22}Cl_2N_2O_5S_2$ 613.0420; Found 613.0420.

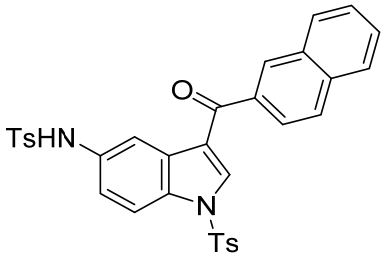


***N*-(3-(4-Chloro-3-nitrobenzoyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3m**). Eluent: V_{PE}/V_{EA} = 2:1; yellow solid (51.2 mg, 41% yield); mp 124-125 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.38 (s, 1H), 8.45 (s, 2H), 8.14 (dd, *J* = 8.3, 2.2 Hz, 1H), 8.00 (d, *J* = 8.2 Hz, 4H), 7.88 (d, *J* = 9.0 Hz, 1H), 7.65 (d, *J* = 8.0 Hz, 2H), 7.39 (d, *J* = 8.2 Hz, 2H), 7.27 (dd, *J* = 13.2, 8.6 Hz, 3H), 2.31 (s, 3H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 187.4, 148.0, 146.9, 143.7, 138.8, 137.1, 136.7, 135.8, 134.1, 133.7, 132.7, 131.3, 130.9, 130.1, 129.1, 128.6, 127.9, 127.1, 126.5, 119.8, 118.8, 114.3, 113.6, 21.5, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{29}H_{22}ClN_3O_7S_2$ 624.0660; Found 624.0661.

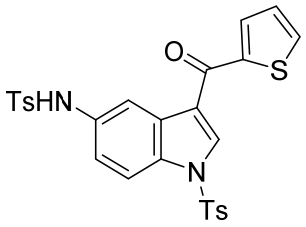


***N*-(3-(Benzo[d][1,3]dioxole-5-carbonyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3n**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (81.2 mg, 69% yield); mp 115-116 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (s, 1H), 7.88 – 7.83 (m, 2H), 7.76 (d, *J* = 8.0 Hz, 2H), 7.59 – 7.52 (m, 3H), 7.43 (dd, *J* = 8.1, 1.7 Hz, 1H), 7.38 (dd, *J* = 8.9, 2.3 Hz, 1H), 7.35 (d, *J* = 1.7 Hz, 1H), 7.24 (d, *J* = 7.9 Hz, 2H), 7.05 (d, *J* = 7.9 Hz, 2H), 6.89 (d, *J* = 8.1 Hz, 1H), 6.07 (s, 2H), 2.34 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz,

$CDCl_3$) δ 189.1, 151.7, 148.2, 146.2, 143.7, 136.0, 134.1, 133.7, 133.1, 132.4, 130.3, 129.6, 129.2, 127.2, 127.2, 126.4, 125.4, 120.5, 120.0, 115.4, 113.9, 109.1, 108.1, 102.0, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{24}N_2O_7S_2$ 589.1098; Found 589.1093.

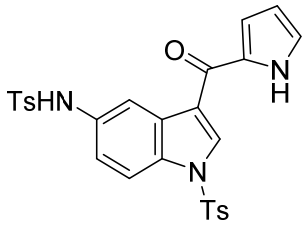


***N*-(3-(2-Naphthoyl)-1-tosyl-1*H*-indol-5-yl)-4-methylbenzenesulfonamide** (**3o**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (89.1 mg, 75% yield); mp 130-131 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (s, 1H), 8.04 (s, 1H), 7.99 (d, *J* = 2.3 Hz, 1H), 7.96 – 7.87 (m, 5H), 7.75 (d, *J* = 7.9 Hz, 2H), 7.64 (s, 1H), 7.62 – 7.55 (m, 4H), 7.43 (dd, *J* = 9.0, 2.3 Hz, 1H), 7.22 (d, *J* = 7.9 Hz, 2H), 7.03 (d, *J* = 7.8 Hz, 2H), 2.32 (s, 3H), 2.25 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.1, 146.2, 143.7, 136.2, 135.3, 134.7, 134.5, 134.2, 132.5, 132.4, 130.5, 130.3, 129.6, 129.5, 129.1, 128.8, 128.4, 127.9, 127.3, 127.2, 127.0, 125.1, 120.6, 120.3, 115.4, 114.0, 21.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{33}H_{26}N_2O_5S_2$ 595.1356; Found 595.1361.

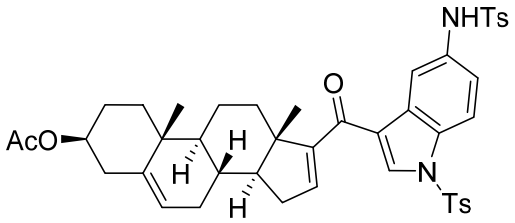


4-Methyl-*N*-(3-(thiophene-2-carbonyl)-1-tosyl-1H-indol-5-yl)benzenesulfonamide (**3p**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (64.9 mg, 59% yield); mp 101-102 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.23 (s, 1H), 7.86 (d, *J* = 9.2 Hz, 2H), 7.81 – 7.77 (m, 3H), 7.72 (d, *J* = 4.9 Hz, 1H), 7.60 (d, *J* = 8.0 Hz, 2H), 7.39 (dd, *J* = 9.0, 2.3 Hz, 1H), 7.31 (s, 1H), 7.26 (d, *J* = 4.8 Hz, 2H), 7.21 (t, *J* = 4.4 Hz, 1H), 7.11 (d, *J* = 8.0 Hz, 2H), 2.36 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 181.5, 146.2, 143.8, 143.8, 136.0, 134.1, 133.7, 132.9, 132.7, 132.3, 130.4, 129.6, 129.0, 128.3, 127.3, 127.2, 126.4, 120.7, 120.1, 115.3, 114.0, 21.7, 21.5.; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for

$C_{27}H_{22}N_2O_5S_3$ 551.0764; Found 551.0773.

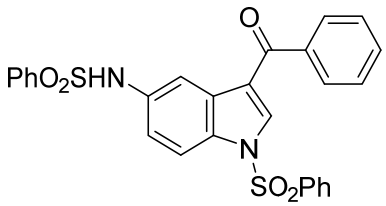


***N*-(3-(1*H*-Pyrrole-2-carbonyl)-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3q**). Eluent: V_{PE}/V_{EA} = 2:1; yellow solid (46.9 mg, 44% yield); mp 93-94 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.02 (s, 1H), 9.42 (s, 1H), 8.20 (s, 1H), 7.90 (d, *J* = 9.0 Hz, 1H), 7.78 (d, *J* = 8.1 Hz, 2H), 7.73 (s, 1H), 7.65 (s, 1H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.26 – 7.21 (m, 3H), 7.06 (d, *J* = 8.0 Hz, 2H), 6.98 (s, 1H), 6.37 (s, 1H), 2.33 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 179.4, 146.0, 143.6, 135.9, 134.4, 134.1, 132.7, 132.6, 131.7, 130.3, 129.6, 129.5, 129.0, 127.2, 127.2, 126.8, 121.1, 120.2, 119.4, 115.4, 114.0, 111.0, 21.6, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{27}H_{23}N_3O_5S_2$ 534.1152; Found 534.1158.

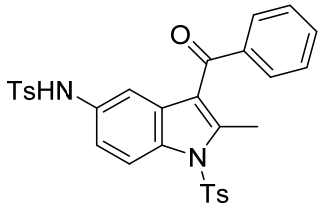


(*3S*, *8R*, *9R*, *10R*, *13S*, *14R*)-10,13-Dimethyl-17-(5-((4-methylphenyl)sulfonamido)-1-tosyl-1H-indole-3-carbonyl)-2,3,4,7,8,9,10,11,12,13,14,15-dodecahydro-1H-cyclopenta[a]phenanthren-3-yl acetate (**3r**). Eluent: V_{PE}/V_{EA} = 2:1; white solid (115.5 mg, 74% yield); mp 153-154 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.79 (dd, *J* = 18.0, 8.3 Hz, 4H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.33 (dd, *J* = 9.0, 2.3 Hz, 1H), 7.27 – 7.20 (m, 3H), 7.12 (d, *J* = 7.9 Hz, 2H), 6.53 (s, 1H), 5.42 (s, 1H), 4.63 (dt, *J* = 9.8, 5.1 Hz, 1H), 2.40 (s, 2H), 2.36 (s, 4H), 2.31 (s, 3H), 2.09 (s, 3H), 2.06 (s, 3H), 1.88 (dd, *J* = 9.5, 4.8 Hz, 2H), 1.82 – 1.68 (m, 2H), 1.66 – 1.53 (m, 4H), 1.37 (s, 1H), 1.09 (s, 3H), 1.07 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.2, 170.7, 155.0, 146.0, 143.8, 143.7, 140.2, 136.2, 134.3, 133.8, 132.7, 132.5, 130.3, 129.6, 128.8, 127.3, 127.1, 122.1, 121.5, 120.3, 115.6, 113.8, 73.9, 56.2, 50.5, 47.5, 38.1, 36.9, 36.8, 34.0, 32.8, 31.6, 30.1,

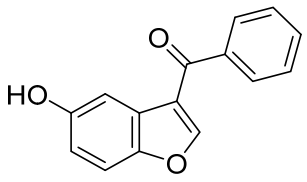
27.7, 21.7, 21.5, 21.5, 20.6, 19.3, 16.3; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{44}H_{48}N_2O_7S_2$ 781.2976; Found 781.2971.



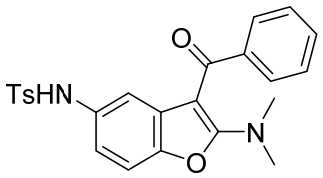
***N*-(3-Benzoyl-1-(phenylsulfonyl)-1H-indol-5-yl)benzenesulfonamide** (**3s**). Eluent: V_{PE}/V_{EA} = 3:1; white solid (83.5 mg, 81% yield); mp 196-197 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.46 (s, 1H), 8.23 (s, 1H), 8.15 (d, J = 7.9 Hz, 2H), 8.02 (d, J = 2.2 Hz, 1H), 7.88 (t, J = 7.6 Hz, 3H), 7.76 (d, J = 7.0 Hz, 2H), 7.73 – 7.67 (m, 2H), 7.60 (t, J = 7.7 Hz, 4H), 7.55 (d, J = 7.1 Hz, 1H), 7.51 (d, J = 7.7 Hz, 2H), 7.26 (dd, J = 9.0, 2.2 Hz, 1H) ; ^{13}C NMR (100 MHz, DMSO-d_6) δ 190.3, 139.9, 139.0, 136.6, 135.8, 135.45, 135.39, 133.4, 133.0, 131.4, 130.5, 129.7, 129.4, 129.3, 129.0, 127.9, 127.1, 120.0, 119.4, 114.2; HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{20}N_2NaO_5S_2$ 539.0706; Found 539.0706.



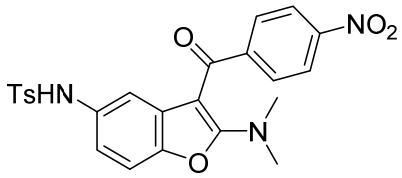
***N*-(3-Benzoyl-2-methyl-1-tosyl-1H-indol-5-yl)-4-methylbenzenesulfonamide** (**3t**). Eluent: V_{PE}/V_{EA}=2:1; yellow liquid (37.9 mg, 34% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (d, J = 9.1 Hz, 1H), 7.69 (d, J = 8.2 Hz, 4H), 7.62 – 7.54 (m, 2H), 7.50 (d, J = 8.5 Hz, 2H), 7.42 (d, J = 6.8 Hz, 2H), 7.25 (t, J = 5.3 Hz, 2H), 7.11 (t, J = 6.8 Hz, 3H), 6.97 (s, 1H), 2.55 (s, 3H), 2.37 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.8, 145.8, 143.7, 142.5, 138.7, 136.1, 135.6, 133.33, 133.29, 133.2, 130.2, 129.6, 129.6, 129.5, 128.7, 127.2, 126.6, 126.4, 119.9, 119.3, 115.0, 113.4, 21.6, 21.5, 14.7; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{30}H_{27}N_2O_5S_2$ 559.1356; Found 559.1357.



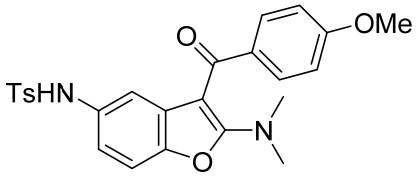
(5-*H*ydroxybenzofuran-3-yl)(phenyl)methanone (**3u**). Eluent: V_{PE}/V_{EA}=5:1; yellow solid (19.1 mg, 40% yield); mp 187-188°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.50 (s, 1H), 8.58 (s, 1H), 7.89 (d, *J* = 7.0 Hz, 2H), 7.69 (t, *J* = 7.4 Hz, 1H), 7.61 – 7.52 (m, 4H), 6.89 (dd, *J* = 8.9, 2.5 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 190.1, 155.3, 155.1, 149.5, 139.2, 133.0, 129.2, 129.1, 126.2, 120.4, 115.0, 112.5, 107.0 ; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{15}H_{11}O_3$ 239.0703; Found 239.0706.



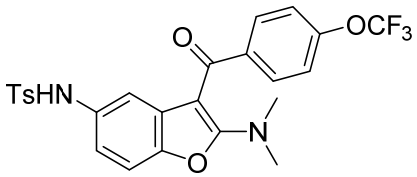
***N*-(3-Benzoyl-2-(dimethylamino)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5a**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (63.4 mg, 73% yield); mp 129-130 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 7.5 Hz, 2H), 7.54 (s, 1H), 7.48 – 7.37 (m, 4H), 7.12 (d, *J* = 7.9 Hz, 2H), 7.06 (d, *J* = 8.6 Hz, 1H), 6.84 (d, *J* = 2.2 Hz, 1H), 6.69 (s, 1H), 6.37 (s, 1H), 3.09 (s, 6H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.2, 164.8, 146.5, 143.4, 140.5, 136.0, 132.2, 132.0, 130.3, 129.4, 128.9, 128.5, 127.3, 116.4, 113.3, 109.7, 94.5, 40.6, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{22}N_2O_4S$ 435.1373; Found 435.1379.



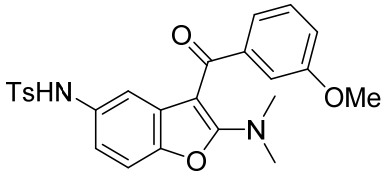
***N*-(2-(Dimethylamino)-3-(4-nitrobenzoyl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5b**). Eluent: V_{PE}/V_{EA} = 3:1; red solid (38.3 mg, 40% yield); mp 135-136 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.35 (d, *J* = 8.7 Hz, 2H), 8.32 (s, 1H), 7.84 (d, *J* = 8.7 Hz, 2H), 7.42 (s, 2H), 7.30 (s, 2H), 7.22 (s, 1H), 6.77 (dd, *J* = 8.6, 2.2 Hz, 1H), 6.43 (d, *J* = 2.2 Hz, 1H), 3.03 (s, 6H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 185.9, 165.0, 149.4, 146.8, 145.6, 143.5, 136.9, 134.2, 129.9, 129.8, 129.7, 127.1, 124.5, 115.4, 111.4, 110.4, 94.0, 79.6, 40.9, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{21}N_3O_6S$ 480.1224; Found 480.1223.



***N*-(2-(Dimethylamino)-3-(4-methoxybenzoyl)benzofuran-5-yl)-4-methylbenzene sulfonamide** (**5c**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (63.1 mg, 68% yield); mp 180-181 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.84 (s, 1H), 7.66 (d, *J* = 8.7 Hz, 2H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.20 (d, *J* = 8.5 Hz, 1H), 7.03 (d, *J* = 8.7 Hz, 2H), 6.77 – 6.71 (m, 2H), 3.87 (s, 3H), 2.95 (s, 6H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 187.2, 164.0, 162.8, 145.6, 143.3, 137.2, 133.9, 133.3, 131.2, 130.6, 129.9, 127.1, 115.0, 114.3, 111.7, 110.0, 93.8, 55.9, 40.6, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{25}H_{24}N_2O_5S$ 465.1479; Found 465.1477.

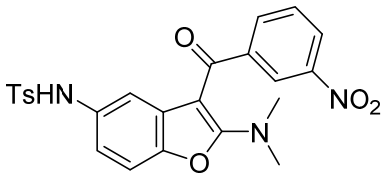


***N*-(2-(Dimethylamino)-3-(4-(trifluoromethoxy)benzoyl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5d**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (52.8 mg, 51% yield); mp 168-169 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, *J* = 8.8 Hz, 2H), 7.46 (d, *J* = 8.3 Hz, 2H), 7.21 (d, *J* = 8.2 Hz, 2H), 7.12 (dd, *J* = 8.3, 2.5 Hz, 2H), 7.09 – 6.96 (m, 2H), 6.85 (d, *J* = 8.6 Hz, 1H), 6.41 (s, 1H), 3.09 (s, 6H), 2.35 (d, *J* = 2.3 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 187.2, 164.9, 151.8, 146.6, 143.4, 137.4 (q, *J* = 259.8 Hz), 132.3, 130.8, 129.9, 129.4, 127.2, 120.4, 117.0, 113.2, 109.9, 94.2, 40.7, 21.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -57.49; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{25}H_{21}F_3N_2O_5S$ 519.1196; Found 519.1197.

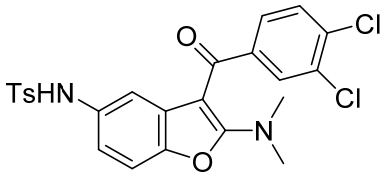


***N*-(2-(Dimethylamino)-3-(3-methoxybenzoyl)benzofuran-5-yl)-4-methylbenzene sulfonamide** (**5e**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (50.1 mg, 54% yield); mp 170-

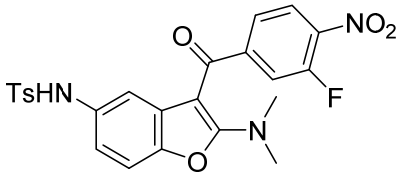
171 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 8.2 Hz, 2H), 7.28 (d, *J* = 3.0 Hz, 2H), 7.16 – 7.00 (m, 5H), 6.81 (d, *J* = 2.3 Hz, 1H), 6.74 (s, 1H), 6.49 (d, *J* = 2.3 Hz, 1H), 3.82 (s, 3H), 3.09 (s, 6H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.9, 164.7, 159.9, 146.5, 143.4, 142.0, 136.2, 130.4, 129.5, 129.4, 127.3, 121.5, 118.4, 116.1, 113.3, 113.2, 109.7, 94.6, 77.2, 55.4, 40.6, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{25}H_{24}N_2O_5S$ 465.1479; Found 465.1479.



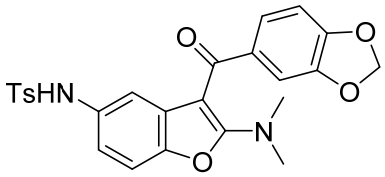
***N*-(2-(Dimethylamino)-3-(3-nitrobenzoyl)benzofuran-5-yl)-4-methylbenzenesulfonamide (5f)**. Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (30.7 mg, 32% yield); mp 118-119 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (s, 1H), 7.93 (d, *J* = 7.7 Hz, 1H), 7.79 (d, *J* = 7.8 Hz, 1H), 7.56 (t, *J* = 7.7 Hz, 1H), 7.46 (d, *J* = 8.0 Hz, 2H), 7.26 (s, 1H), 7.11 (d, *J* = 7.9 Hz, 2H), 7.07 (d, *J* = 8.5 Hz, 1H), 6.82 (dd, *J* = 8.6, 2.3 Hz, 1H), 6.44 (s, 1H), 3.09 (s, 6H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 187.2, 165.1, 146.4, 143.5, 141.1, 136.0, 132.6, 132.2, 131.2, 130.9, 129.9, 129.4, 129.2, 128.4, 127.2, 125.6, 125.2, 122.5, 116.2, 112.7, 109.9, 94.3, 40.7, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{21}N_3O_6S$ 480.1224; Found 480.1222.



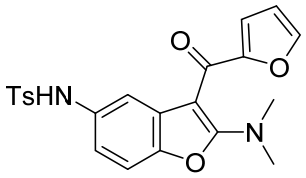
***N*-(3-(3,4-Dichlorobenzoyl)-2-(dimethylamino)benzofuran-5-yl)-4-methylbenzenesulfonamide (5g)**. Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (65.3 mg, 65% yield); mp 181-182 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, *J* = 1.8 Hz, 1H), 7.48 – 7.45 (m, 1H), 7.39 (d, *J* = 8.3 Hz, 3H), 7.19 (s, 1H), 7.07 (d, *J* = 8.1 Hz, 2H), 6.98 (s, 1H), 6.76 – 6.73 (m, 1H), 6.37 (s, 1H), 3.03 (s, 6H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.0, 165.0, 146.4, 143.5, 140.1, 136.2, 136.2, 133.1, 132.6, 130.7, 130.6, 129.7, 129.5, 128.2, 127.3, 127.2, 116.5, 112.8, 110.0, 94.1, 40.7, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{20}Cl_2N_2O_4S$ 503.0594; Found 503.0599.



***N*-(2-(Dimethylamino)-3-(3-fluoro-4-nitrobenzoyl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5h**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (35.8 mg, 36% yield); mp 215-216 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (dd, *J* = 7.2, 2.2 Hz, 1H), 8.04 (ddd, *J* = 8.6, 4.2, 2.2 Hz, 1H), 7.47 (d, *J* = 8.2 Hz, 2H), 7.36 (dd, *J* = 10.3, 8.6 Hz, 1H), 7.15 (d, *J* = 8.1 Hz, 2H), 7.05 (d, *J* = 8.1 Hz, 2H), 6.72 – 6.68 (m, 1H), 6.44 (d, *J* = 2.2 Hz, 1H), 3.16 (s, 6H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 184.4, 165.2, 158.7, 146.4, 143.7, 137.1, 136.1 – 135.9 (m), 135.9, 132.6, 129.6, 129.5, 127.2, 127.1, 119.1, 118.9, 116.3, 112.7, 110.1, 93.8, 40.7, 21.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -111.71; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{20}FN_3O_6S$ 498.1130; Found 498.1130.

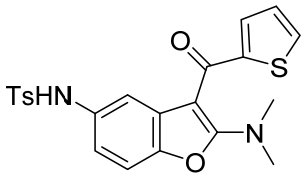


***N*-(3-(Benzo[d][1,3]dioxole-5-carbonyl)-2-(dimethylamino)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5i**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (49.8 mg, 52% yield); mp 210-211 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43 (d, *J* = 7.9 Hz, 2H), 7.25 (d, *J* = 8.1 Hz, 1H), 7.17 (s, 1H), 7.08 (d, *J* = 7.8 Hz, 2H), 6.97 (d, *J* = 8.5 Hz, 1H), 6.70 (t, *J* = 9.6 Hz, 2H), 6.56 (s, 1H), 6.42 (s, 1H), 6.01 (s, 2H), 3.03 (s, 6H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 164.0, 150.9, 148.1, 145.5, 143.4, 137.1, 135.2, 134.0, 130.5, 129.9, 127.1, 124.8, 114.8, 111.4, 110.1, 108.6, 108.5, 102.3, 93.7, 79.6, 40.6, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{25}H_{22}N_2O_6S$ 480.1272; Found 480.1287.

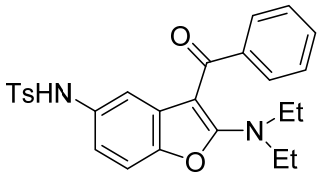


***N*-(2-(Dimethylamino)-3-(furan-2-carbonyl)benzofuran-5-yl)-4-methylbenzene**

sulfonamide (**5j**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (49.8 mg, 54% yield); mp 162-163 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 7.9 Hz, 3H), 7.19 (s, 1H), 7.09 (d, *J* = 7.9 Hz, 2H), 6.99 – 6.95 (m, 2H), 6.73 (dd, *J* = 8.5, 2.2 Hz, 1H), 6.69 (d, *J* = 2.1 Hz, 1H), 6.46 (dd, *J* = 3.5, 1.5 Hz, 1H), 3.04 (s, 6H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.5, 164.2, 153.7, 146.6, 145.6, 143.5, 136.2, 132.2, 129.9, 129.5, 127.3, 117.2, 116.9, 113.7, 112.2, 109.7, 93.8, 40.4, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{22}H_{20}N_2O_5S$ 425.1166; Found 425.1172.

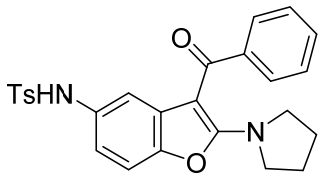


***N*-(2-(Dimethylamino)-3-(thiophene-2-carbonyl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5k**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (45.8 mg, 52% yield); mp 159-160 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (dd, *J* = 4.9, 1.2 Hz, 1H), 7.49 (d, *J* = 8.3 Hz, 1H), 7.45 – 7.41 (m, 3H), 7.08 (d, *J* = 8.3 Hz, 2H), 6.98 – 6.95 (m, 2H), 6.75 (dd, *J* = 8.6, 2.3 Hz, 1H), 6.68 (d, *J* = 2.2 Hz, 1H), 3.02 (s, 6H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 180.6, 163.9, 146.5, 145.8, 143.4, 136.1, 132.6, 132.4, 132.2, 130.1, 129.5, 127.7, 127.3, 125.7, 116.8, 116.0, 113.3, 109.8, 94.1, 40.5, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{22}H_{20}N_2O_4S_2$ 441.0937; Found 441.0944.

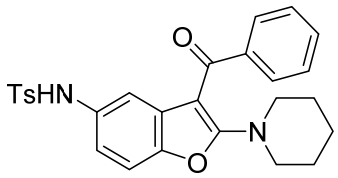


***N*-(3-Benzoyl-2-(diethylamino)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5l**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (61.9 mg, 67% yield); mp 201-202 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 – 7.66 (m, 2H), 7.53 (s, 1H), 7.43 (dd, *J* = 14.7, 8.1 Hz, 4H), 7.13 (d, *J* = 8.0 Hz, 2H), 7.05 (d, *J* = 8.5 Hz, 1H), 6.79 (dd, *J* = 8.5, 2.3 Hz, 1H), 6.71 (s, 1H), 6.23 (d, *J* = 2.3 Hz, 1H), 3.56 (d, *J* = 7.1 Hz, 4H), 2.36 (s, 3H), 1.18 (d, *J* = 7.1 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.5, 163.2, 146.4, 143.3, 140.5, 136.1, 132.1, 131.9, 130.5, 129.4, 128.9, 128.5, 127.3, 116.2, 113.3, 109.6, 94.5, 45.2, 21.5, 13.1; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{26}H_{26}N_2O_4S$ 463.1686; Found

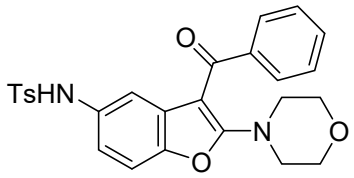
463.1688.



***N*-(3-Benzoyl-2-(pyrrolidin-1-yl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5m**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (59.8 mg, 65% yield); mp 201-202 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.82 (s, 1H), 7.65 (dd, *J* = 7.8, 6.2 Hz, 3H), 7.50 (t, *J* = 7.7 Hz, 2H), 7.44 (d, *J* = 8.2 Hz, 2H), 7.29 (d, *J* = 8.2 Hz, 2H), 7.20 (d, *J* = 8.5 Hz, 1H), 6.69 (dd, *J* = 8.6, 2.3 Hz, 1H), 6.63 (d, *J* = 2.2 Hz, 1H), 3.37 (d, *J* = 5.7 Hz, 4H), 2.33 (s, 3H), 1.92 – 1.84 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.3, 167.0, 150.6, 148.1, 145.6, 141.8, 138.6, 137.1, 134.9, 134.7, 133.8, 133.7, 131.9, 119.7, 116.3, 114.9, 98.6, 54.9, 30.2, 26.1; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{26}H_{24}N_2O_4S$ 461.1530; Found 461.1534.



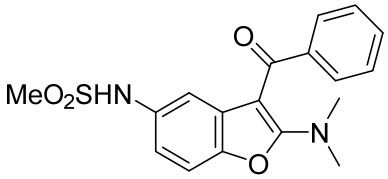
***N*-(3-Benzoyl-2-(piperidin-1-yl)benzofuran-5-yl)-4-methylbenzenesulfonamide** (**5n**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (65.1 mg, 69% yield); mp 151-152 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 6.8 Hz, 2H), 7.52 (d, *J* = 7.4 Hz, 1H), 7.47 (d, *J* = 8.3 Hz, 2H), 7.41 (t, *J* = 7.6 Hz, 2H), 7.08 (dd, *J* = 14.9, 8.3 Hz, 3H), 6.93 – 6.86 (m, 2H), 6.59 (d, *J* = 2.3 Hz, 1H), 3.41 (d, *J* = 5.5 Hz, 4H), 2.33 (s, 3H), 1.59 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.2, 164.2, 145.8, 143.4, 140.6, 137.1, 134.1, 132.3, 130.2, 129.9, 129.1, 128.7, 127.2, 115.7, 112.1, 110.2, 94.5, 79.6, 49.9, 25.2, 23.6, 21.4; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{27}H_{26}N_2O_4S$ 475.1686; Found 475.1686.



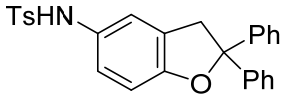
***N*-(3-Benzoyl-2-morpholinobenzofuran-5-yl)-4-methylbenzenesulfonamide** (**5o**).

Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (66.7 mg, 70% yield); mp 203-204 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 – 7.67 (m, 2H), 7.55 (t, *J* = 7.4 Hz, 1H), 7.44 (q, *J* = 8.0, 7.5 Hz, 4H), 7.11 (dd, *J* = 10.0, 8.2 Hz, 3H), 6.92 – 6.85 (m, 2H), 6.55 (d, *J* = 2.1 Hz, 1H), 3.72 (t, *J* = 4.7 Hz, 4H), 3.51 (t, *J* = 4.7 Hz, 4H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.2, 163.7, 146.5, 143.4, 140.2, 136.0, 132.6, 132.2, 129.8, 129.5, 128.7, 128.6, 127.3, 117.0, 113.7, 110.0, 95.6, 66.2, 48.3, 21.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{26}H_{24}N_2O_5S$ 477.1479; Found 477.1487.

***N*-(3-Benzoyl-2-(dimethylamino)-7-methylbenzofuran-5-yl)-4-methylbenzene sulfonamide** (**5p**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (45.7 mg, 51% yield); mp 103-104 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.80 (s, 1H), 7.63 (t, *J* = 9.2 Hz, 3H), 7.48 (dd, *J* = 17.6, 7.8 Hz, 4H), 7.28 (d, *J* = 8.0 Hz, 2H), 6.59 (d, *J* = 6.9 Hz, 2H), 2.94 (s, 6H), 2.32 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 188.4, 164.3, 144.3, 143.3, 141.0, 137.2, 133.9, 132.3, 129.9, 129.8, 129.0, 128.8, 127.1, 119.7, 116.4, 109.3, 94.3, 79.6, 40.6, 21.4, 14.9; HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{24}N_2NaO_4S$ 471.1349; Found 471.1349.

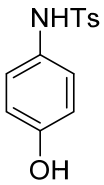


***N*-(3-Benzoyl-2-(dimethylamino)benzofuran-5-yl)methanesulfonamide** (**5q**). Eluent: V_{PE}/V_{EA} = 3:1; yellow solid (66.7 mg, 70% yield); mp 137-138 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 (d, *J* = 6.4 Hz, 2H), 7.56 (t, *J* = 7.5 Hz, 1H), 7.47 (t, *J* = 7.5 Hz, 2H), 7.17 (d, *J* = 8.6 Hz, 1H), 6.98 (dd, *J* = 8.5, 2.2 Hz, 1H), 6.72 (d, *J* = 2.2 Hz, 1H), 6.58 (s, 1H), 3.10 (s, 6H), 2.83 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 189.4, 164.8, 146.9, 140.7, 132.3, 132.1, 130.9, 128.9, 128.6, 116.5, 113.3, 110.1, 94.5, 40.7, 38.9; HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{18}H_{18}N_2NaO_4S$ 381.0879; Found 381.0880.

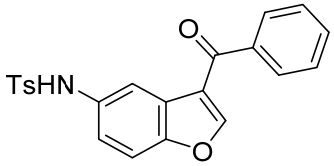


***N*-(2,2-Diphenyl-2,3-dihydrobenzofuran-5-yl)-4-methylbenzenesulfonamide** (**6**).[3]

Eluent: V_{PE}/V_{EA}=6:1; yellow liquid (27.79 mg, 21% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 8.0 Hz, 2H), 7.42 (d, *J* = 7.7 Hz, 4H), 7.31 (t, *J* = 7.5 Hz, 4H), 7.24 (d, *J* = 4.9 Hz, 2H), 7.16 (d, *J* = 8.0 Hz, 2H), 6.95 (s, 1H), 6.75 (s, 1H), 6.72 (s, 1H), 6.53 (s, 1H), 3.83 (s, 2H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.3, 145.0, 143.6, 129.5, 129.1, 128.3, 127.5, 127.5, 127.4, 125.9, 124.7, 121.7, 109.6, 93.2, 44.1, 21.5.



***N*-(4-Hydroxyphenyl)-4-methylbenzenesulfonamide** (**7**).[4] Eluent: V_{PE}/V_{EA}=5:1; white solid (15.87 mg, 30 % yield); mp 151-152°C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.67 (s, 1H), 9.31 (s, 1H), 7.55 (d, *J* = 7.9 Hz, 2H), 7.30 (d, *J* = 7.9 Hz, 2H), 6.85 (d, *J* = 8.3 Hz, 2H), 6.61 (d, *J* = 8.3 Hz, 2H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 155.2, 143.3, 137.2, 129.9, 129.1, 127.2, 124.4, 116.0, 21.4.



***N*-(3-Benzoylbenzofuran-5-yl)-4-methylbenzenesulfonamide** (**8**). Eluent: V_{PE}/V_{EA}=4:1; white solid (41.45 mg, 53% yield); mp 190-191°C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (s, 1H), 7.90 – 7.83 (m, 3H), 7.61 (dd, *J* = 23.7, 9.7 Hz, 4H), 7.51 (d, *J* = 7.9 Hz, 2H), 7.43 (s, 1H), 7.40 (d, *J* = 2.2 Hz, 1H), 7.14 (d, *J* = 8.1 Hz, 2H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.3, 153.3, 143.7, 138.9, 136.1, 133.8, 132.7, 129.6, 128.9, 128.7, 127.3, 125.8, 121.2, 121.1, 116.3, 112.1, 21.5. HRMS (ESI-TOF) m/z: [M + H]+ Calcd for $C_{22}H_{18}NO_4S$ 392.0951; Found 392.0951.

References

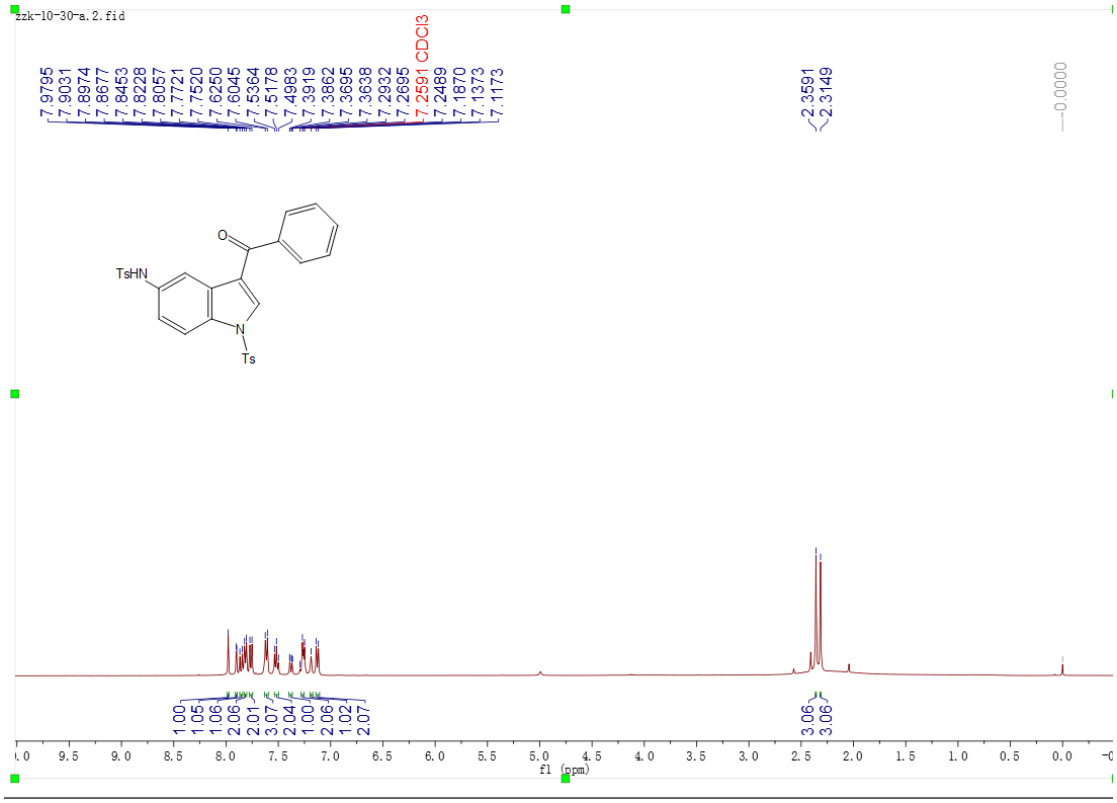
1. (a) Guo, H.; Tian, L.; Liu, Y.; Wan, J.-P., DMSO as a C1 Source for [2 + 2 + 1] Pyrazole Ring Construction via Metal-Free Annulation with Enaminones and Hydrazines. *Org. Lett.* **2022,** *24*, 228-233; (b) Ying, J.; Liu, T.; Liu, Y.; Wan, J.-P., Base-Promoted Annulative Difluoromethylenation of Enaminones with BrCF2CO2Et toward 2,2-Difluorinated 2,3-Dihydrofurans. *Org. Lett.* **2022,** *24*, 2404-2408.

2. (a) Liao, L.; Shu, C.; Zhang, M.; Liao, Y.; Hu, X.; Zhang, Y.; Wu, Z.; Yuan, W.; Zhang, X., Highly Enantioselective [3+2] Coupling of Indoles with Quinone Monoimines Promoted by a Chiral Phosphoric Acid. *Angew. Chem. Int. Ed.* **2014,** *53*, 10471-10475; (b) Ma, W.-Y.; Gelis, C.; Bouchet, D.; Retailleau, P.; Moreau, X.; Neuville, L.; Masson, G., Chiral Phosphoric Acid-Catalyzed Enantioselective Construction of 2,3-Disubstituted Indolines. *Org. Lett.* **2021,** *23*, 442-448.

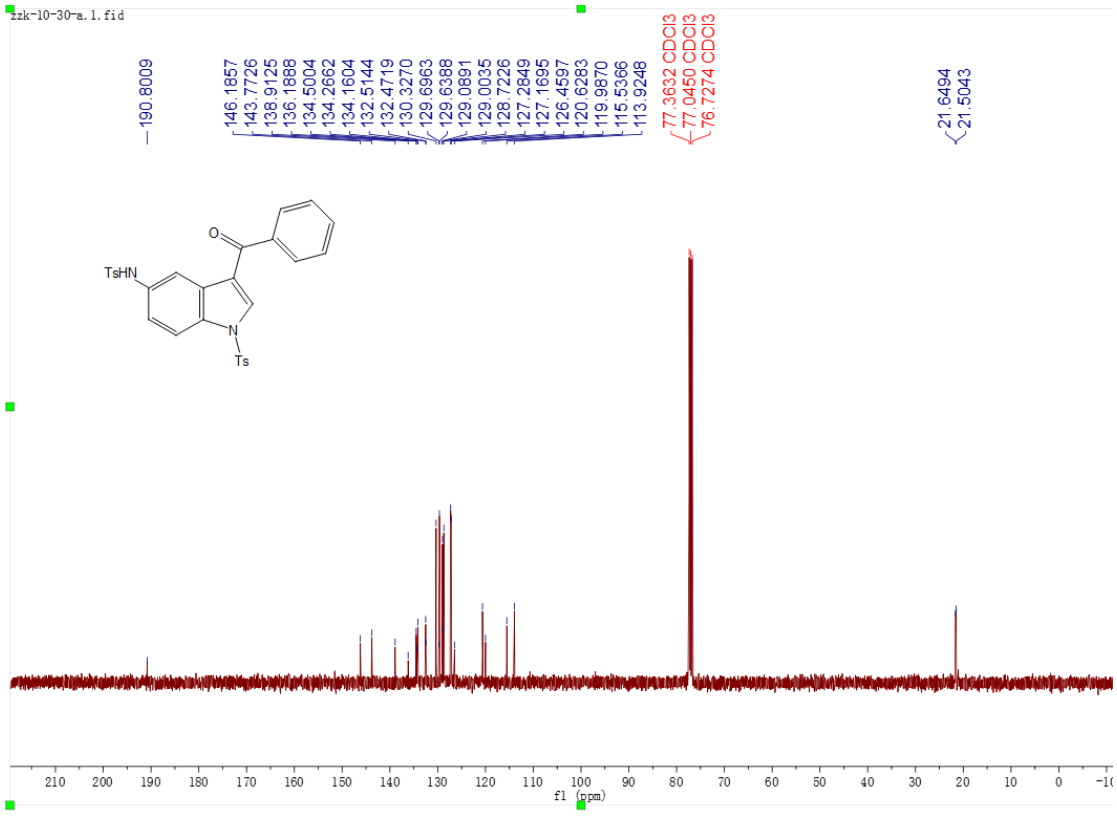
3. Fan, R.; Li, W.; Ye, Y.; Wang, L. One-Pot Oxidative Heteroannulations of *N*-Sulfonylanilines with Styrenes for the Construction of 5-Aminocoumaran Derivatives. *Adv. Synth. Catal.* **2008**, *350*, 1531-1536.

4. Deng, X.; Mani, N. S. A facile, environmentaly benign sulfonamide synthesis in water. *Green Chem.* **2006**, *8*, 835-838.

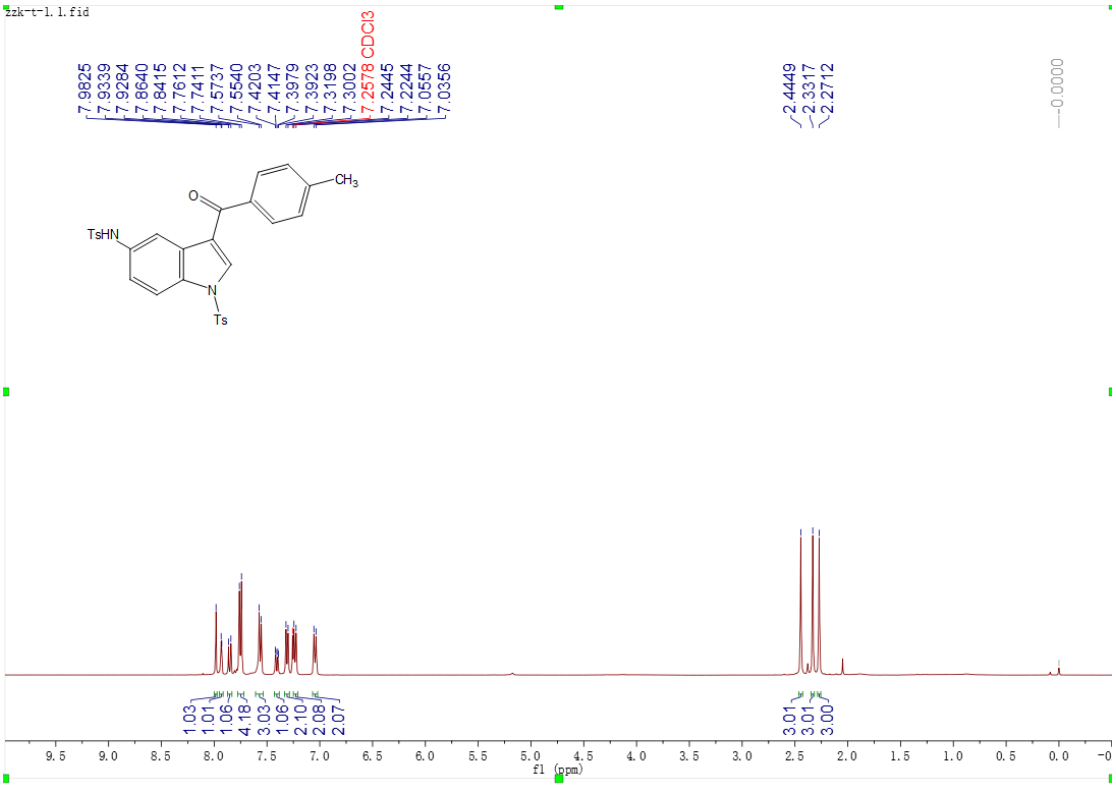
The ^{1}H and ^{13}C NMR spectra



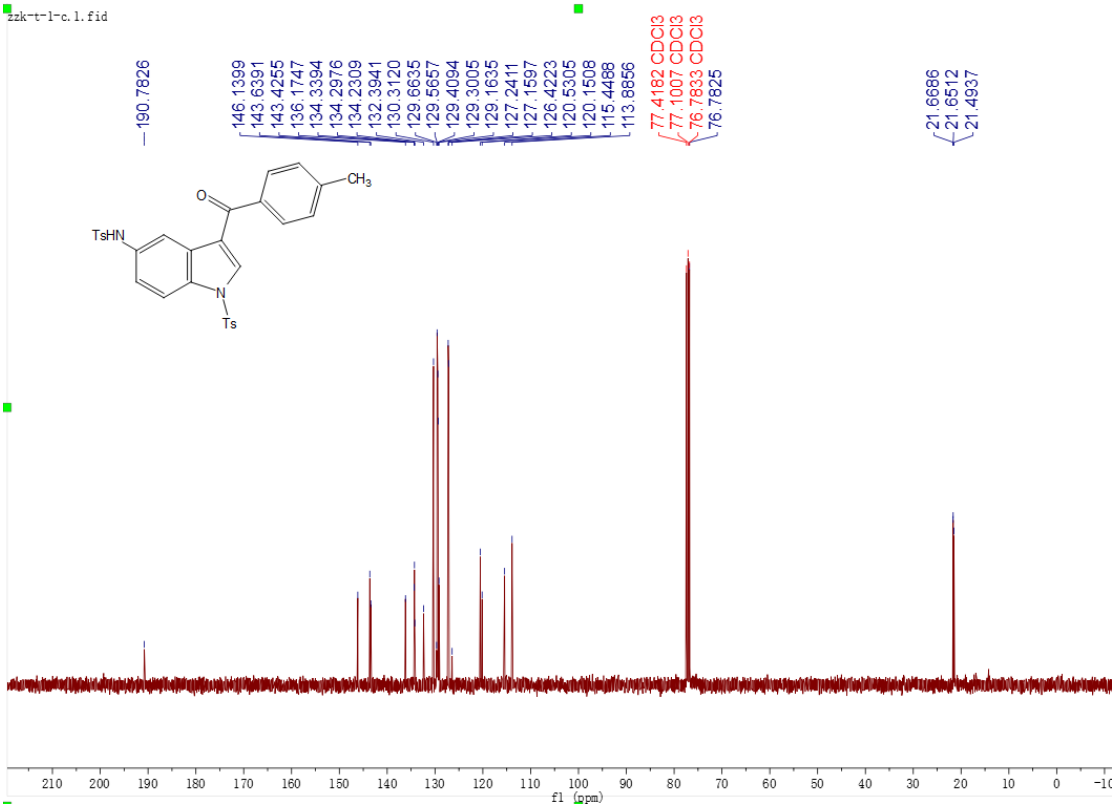
^{1}H NMR spectrum of **3a** ($CDCl_3$, 400 MHz)



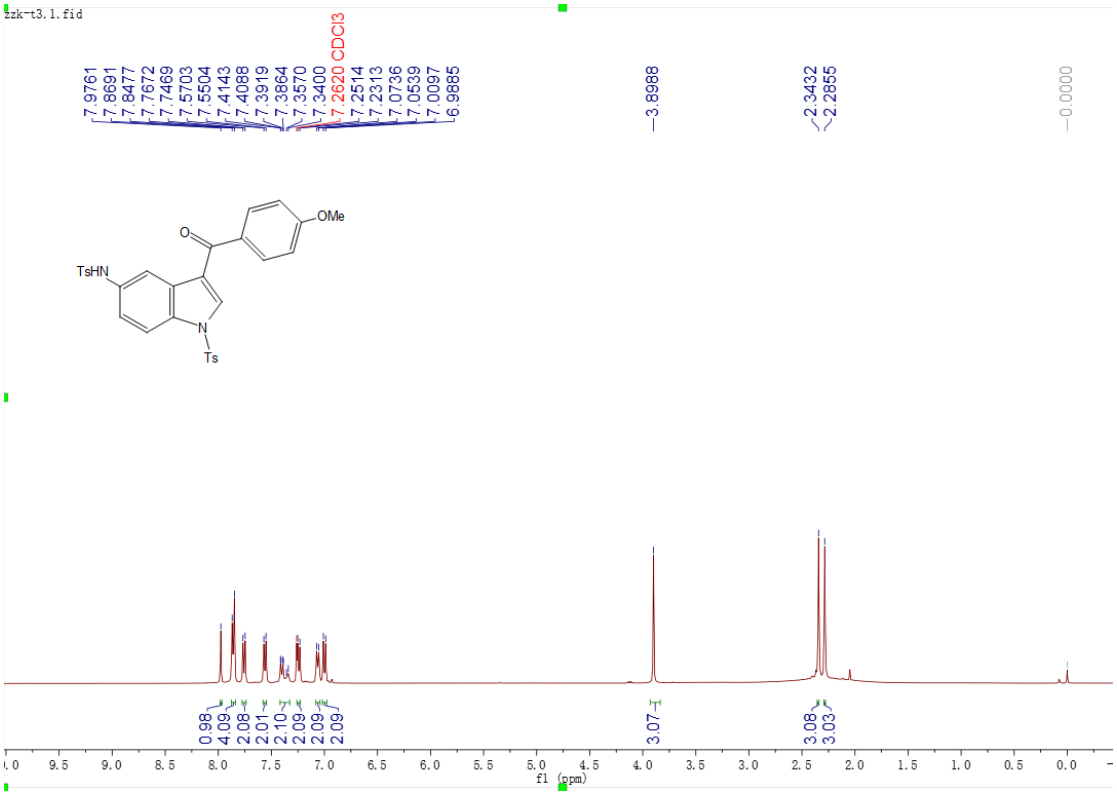
^{13}C NMR spectrum of **3a** ($CDCl_3$, 100 MHz)



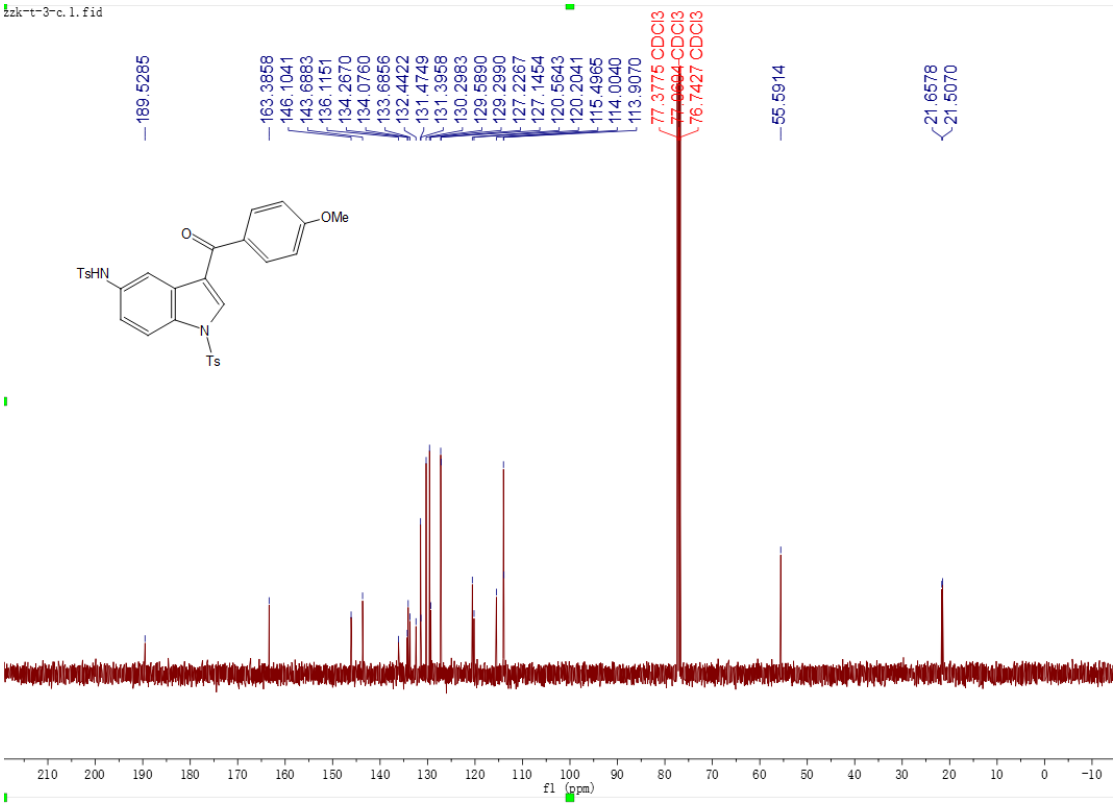
^{1}H NMR spectrum of **3b** ($CDCl_3$, 400 MHz)



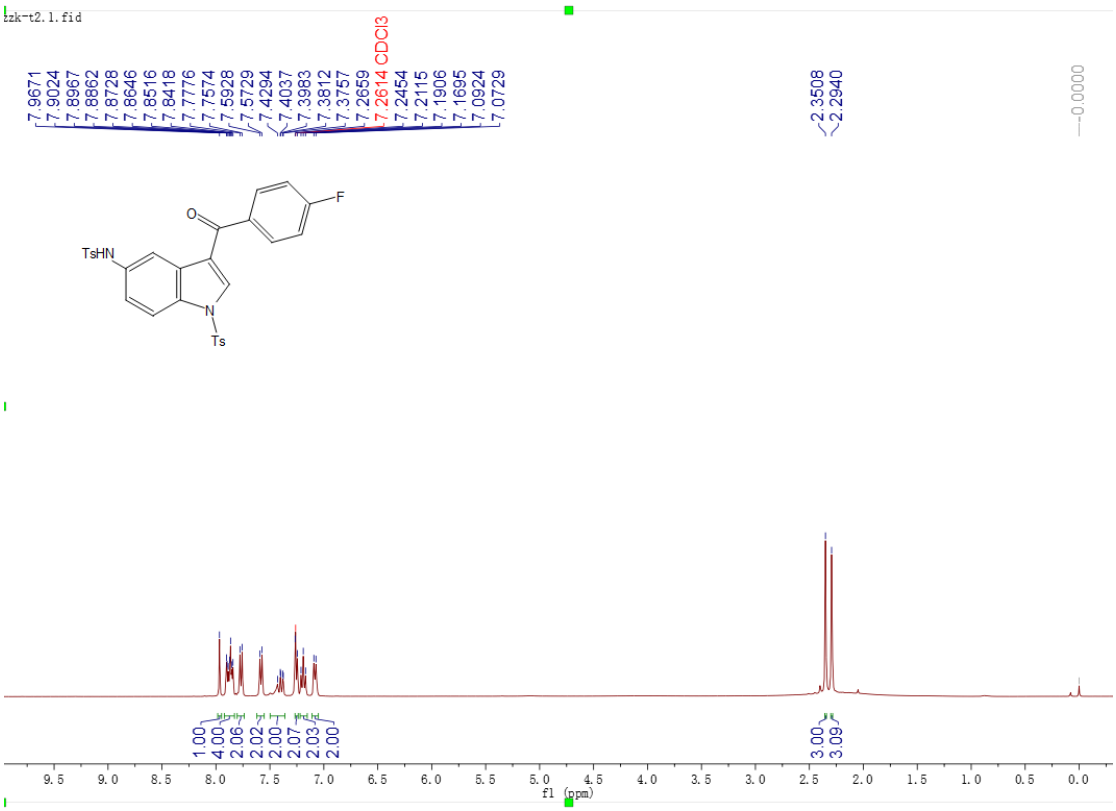
^{13}C NMR spectrum of **3b** ($CDCl_3$, 100 MHz)



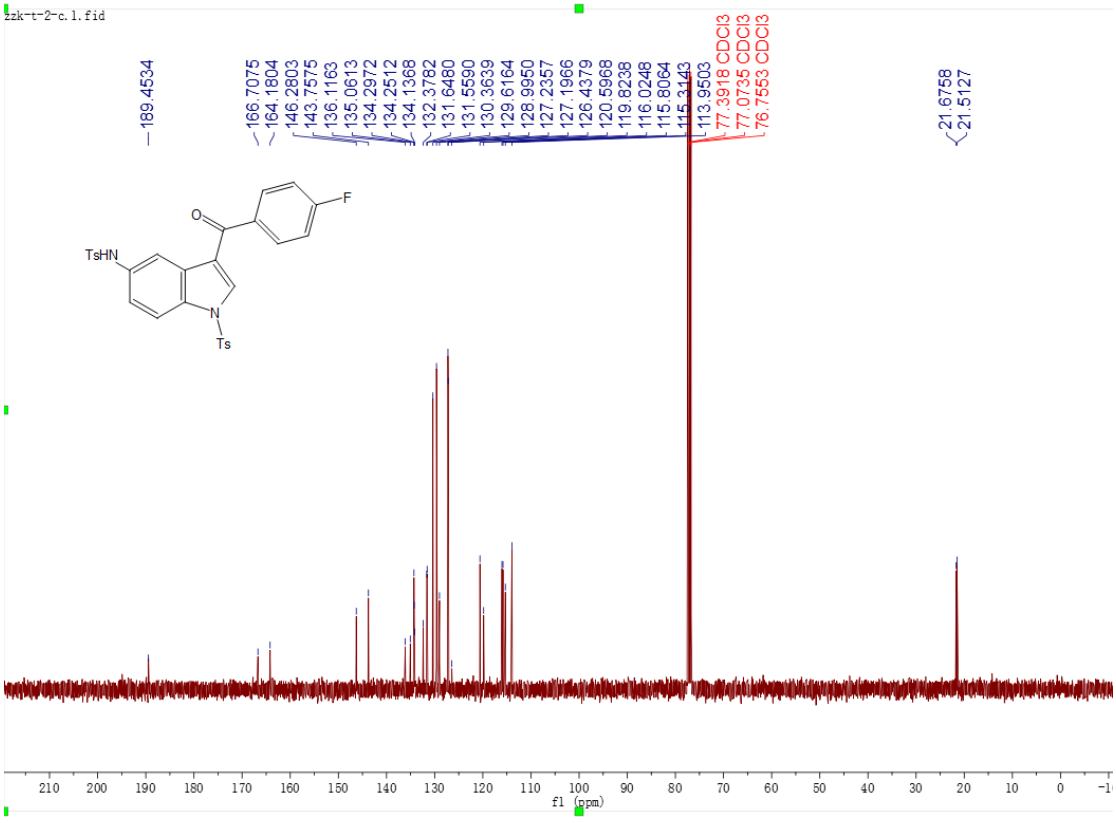
^{1}H NMR spectrum of **3c** ($CDCl_3$, 400 MHz)



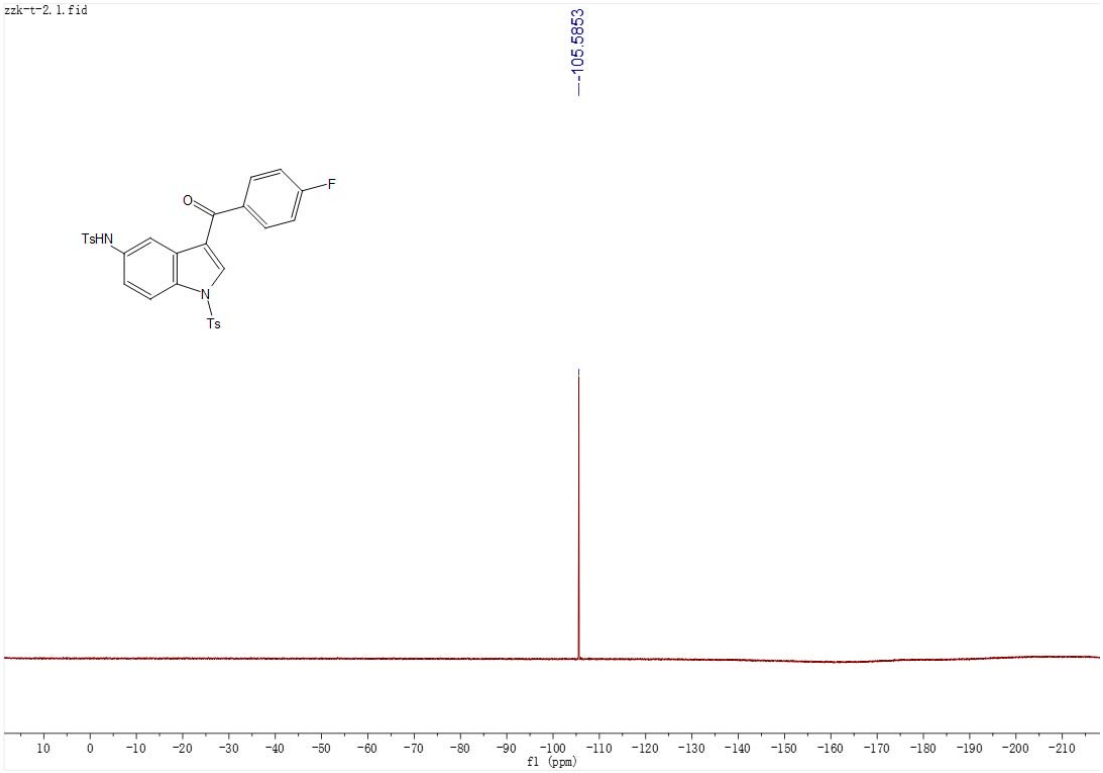
^{13}C NMR spectrum of **3c** ($CDCl_3$, 100 MHz)



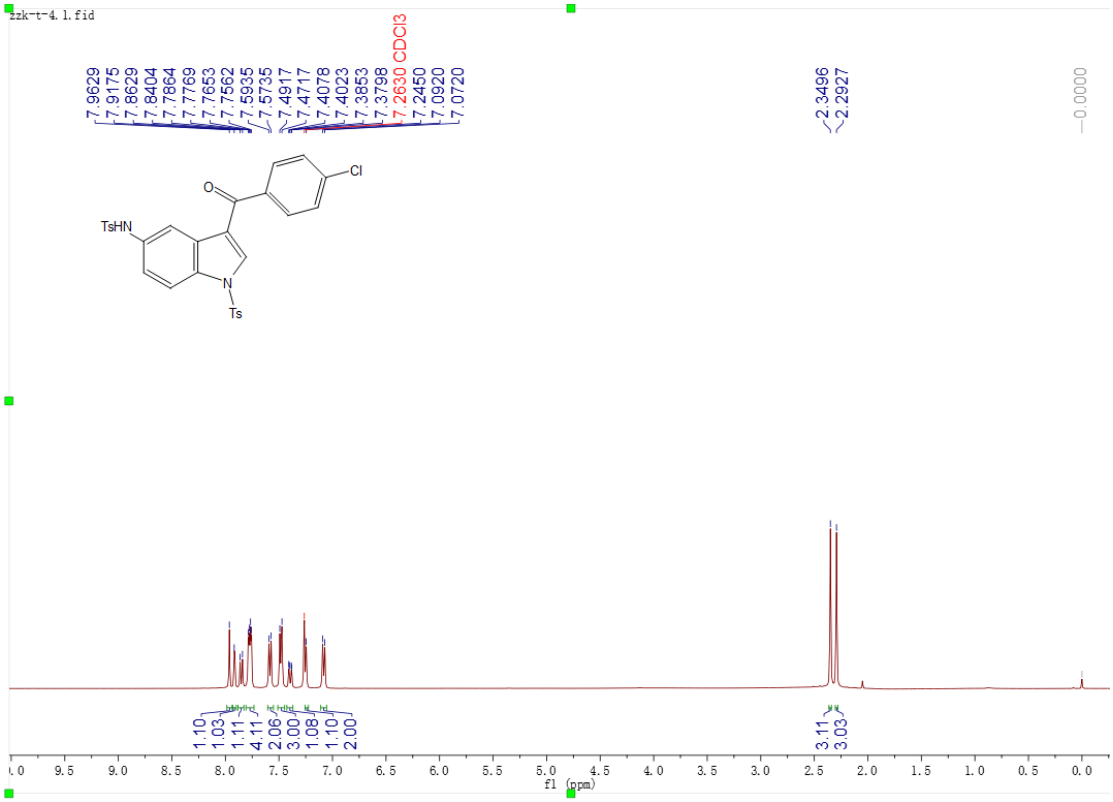
^{1}H NMR spectrum of **3d** ($CDCl_3$, 400 MHz)



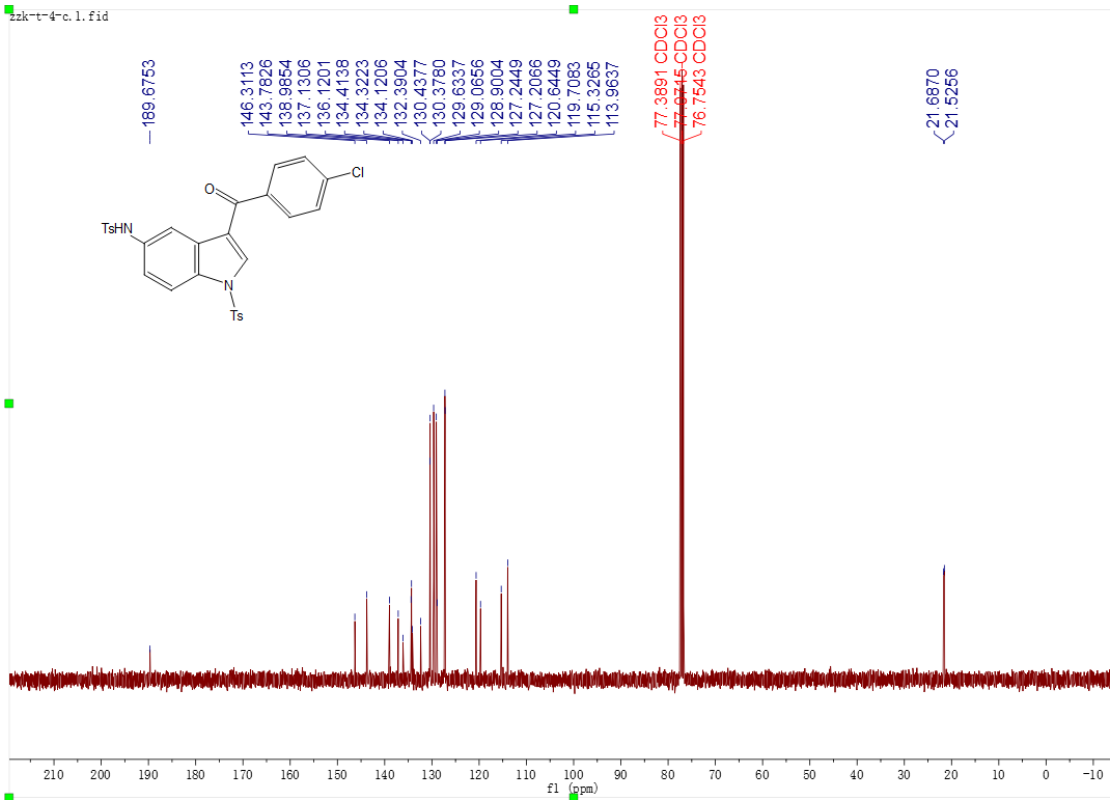
^{13}C NMR spectrum of **3d** ($CDCl_3$, 100 MHz)



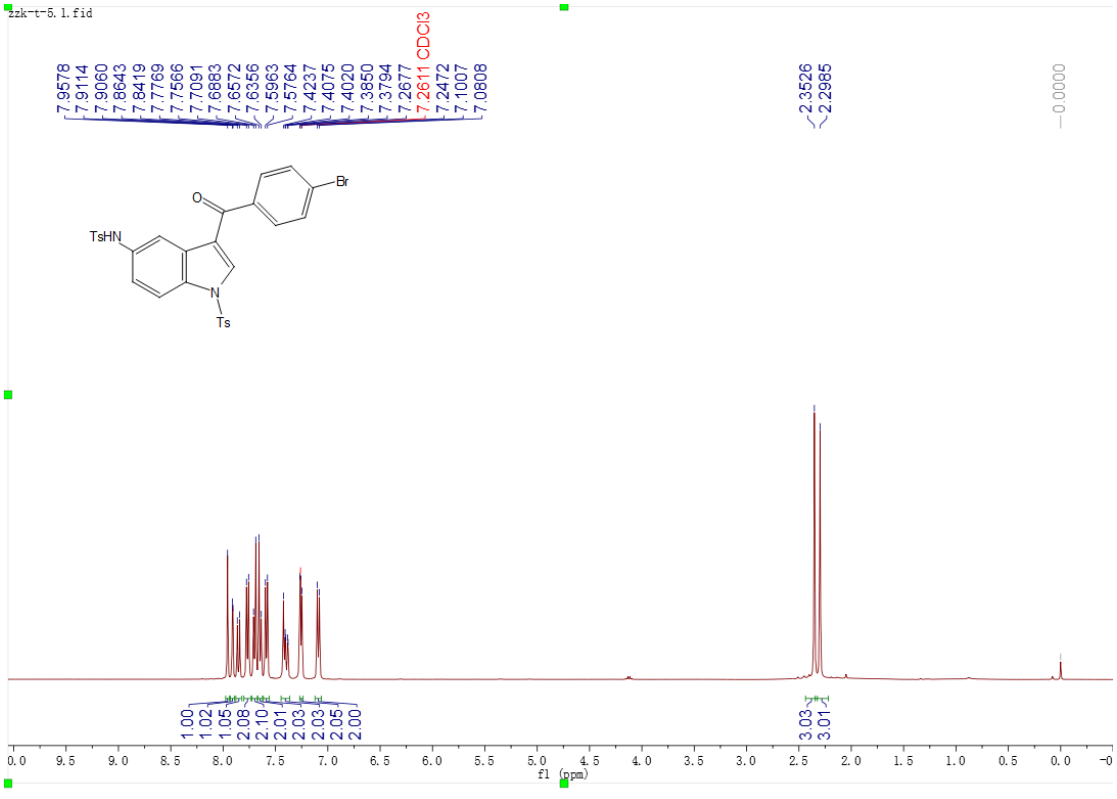
^{19}F NMR spectrum of **3d** ($CDCl_3$, 376 MHz)



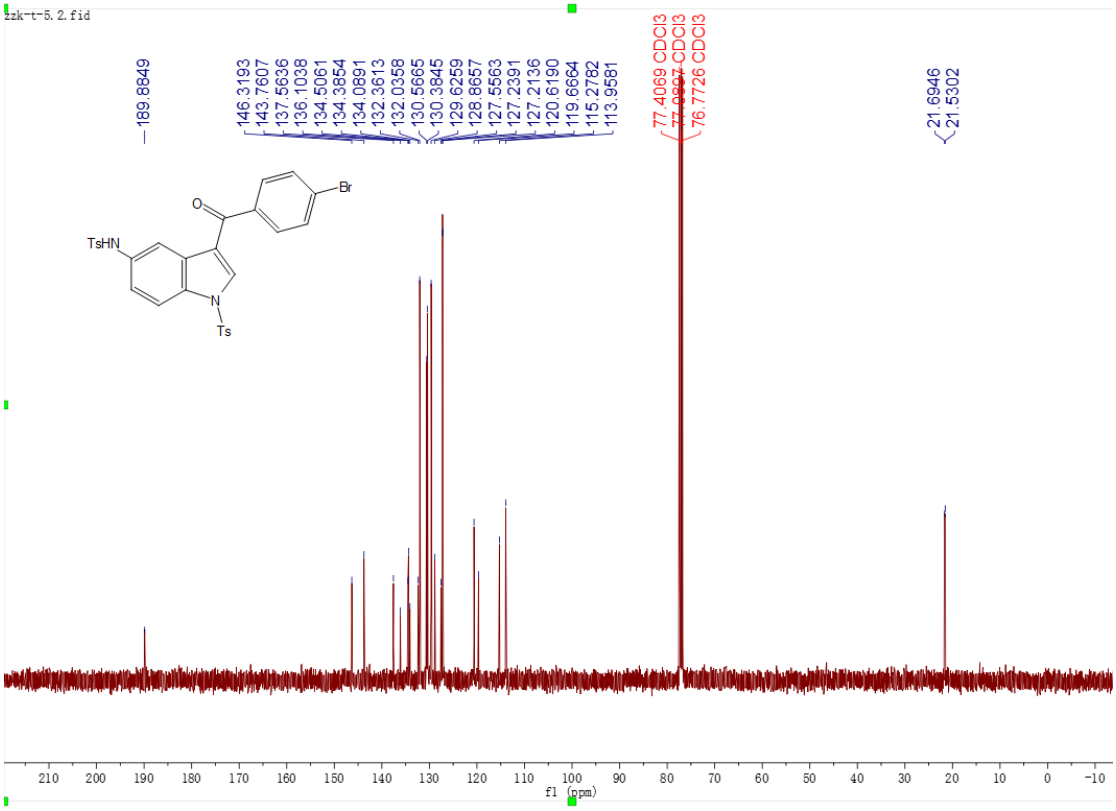
^{1}H NMR spectrum of **3e** ($CDCl_3$, 400 MHz)



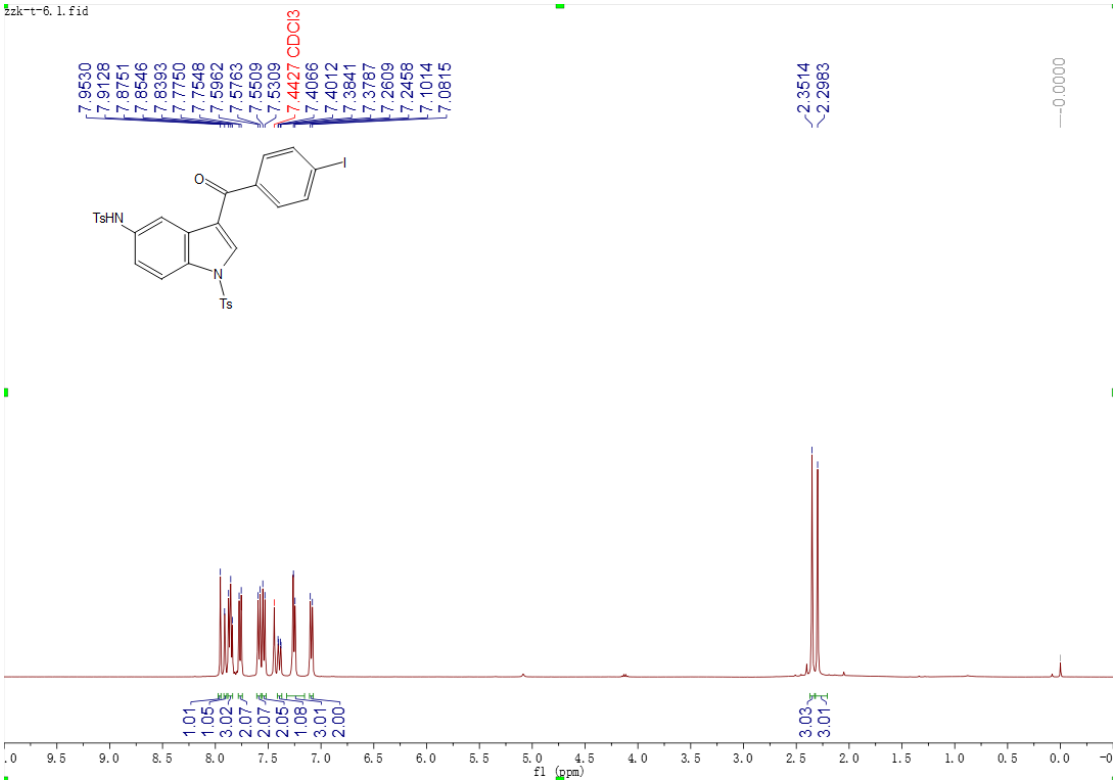
^{13}C NMR spectrum of **3e** ($CDCl_3$, 100 MHz)



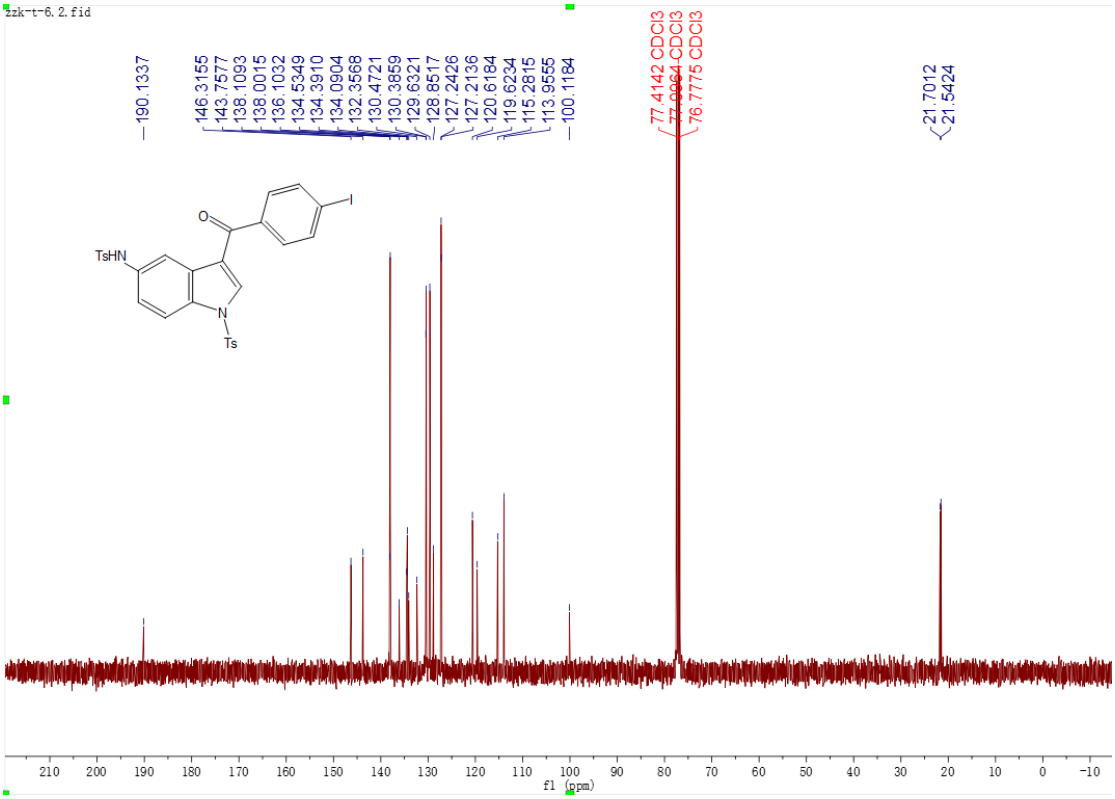
^{1}H NMR spectrum of **3f** ($CDCl_3$, 400 MHz)



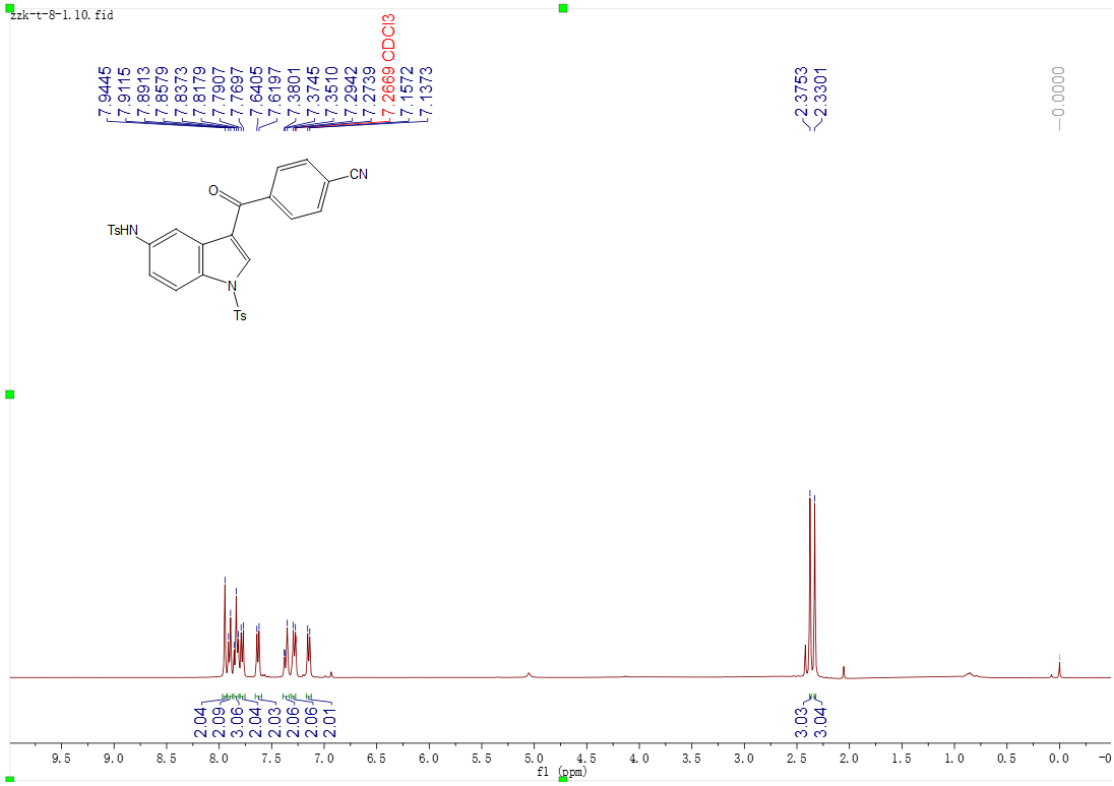
^{13}C NMR spectrum of **3f** ($CDCl_3$, 100 MHz)



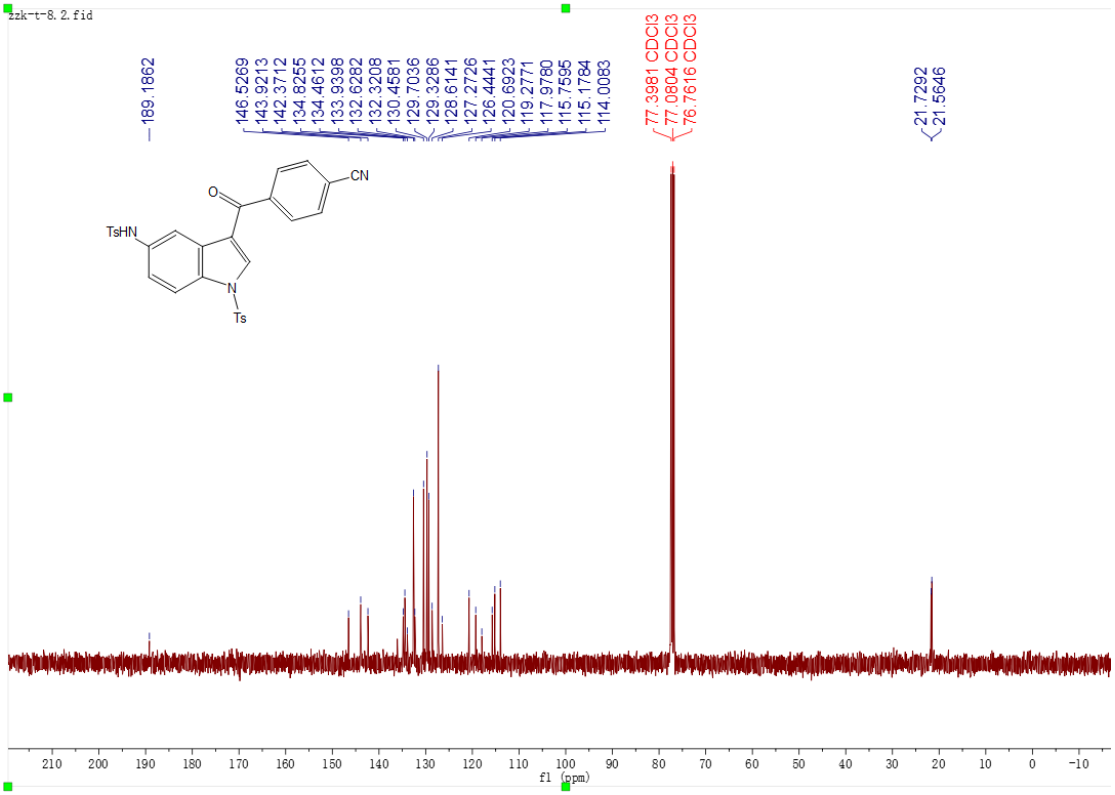
^{1}H NMR spectrum of **3g** ($CDCl_3$, 400 MHz)



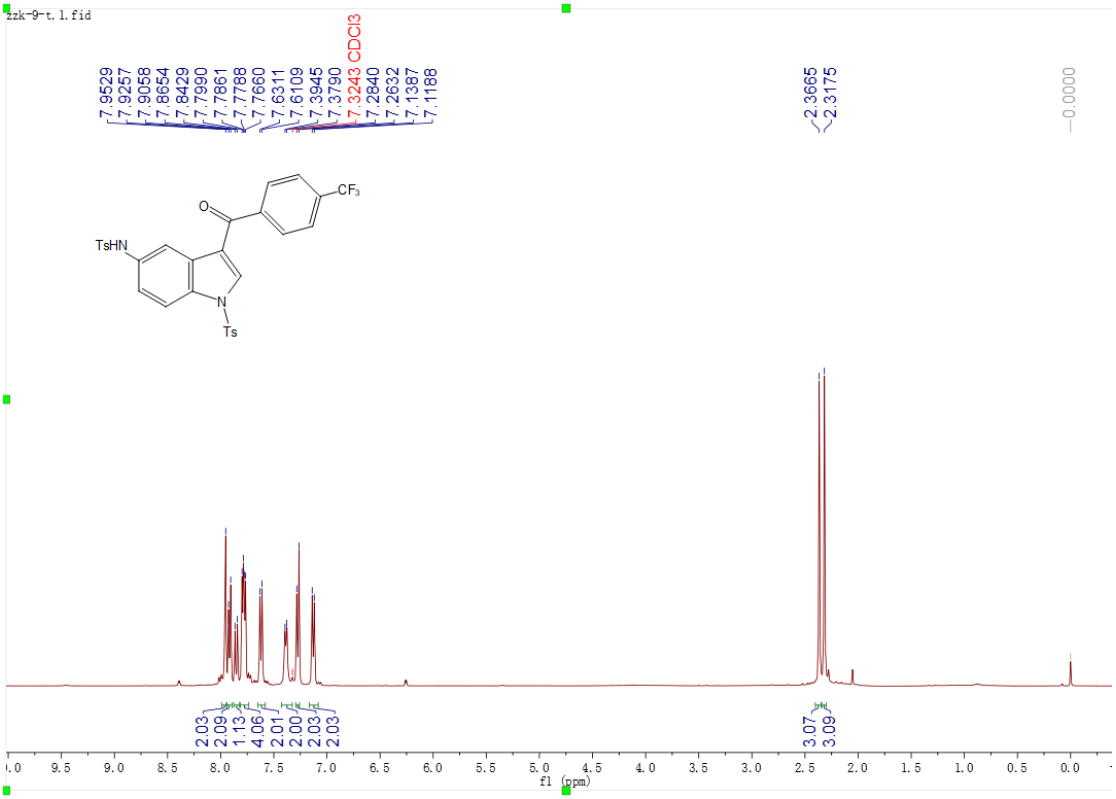
^{13}C NMR spectrum of **3g** ($CDCl_3$, 100 MHz)



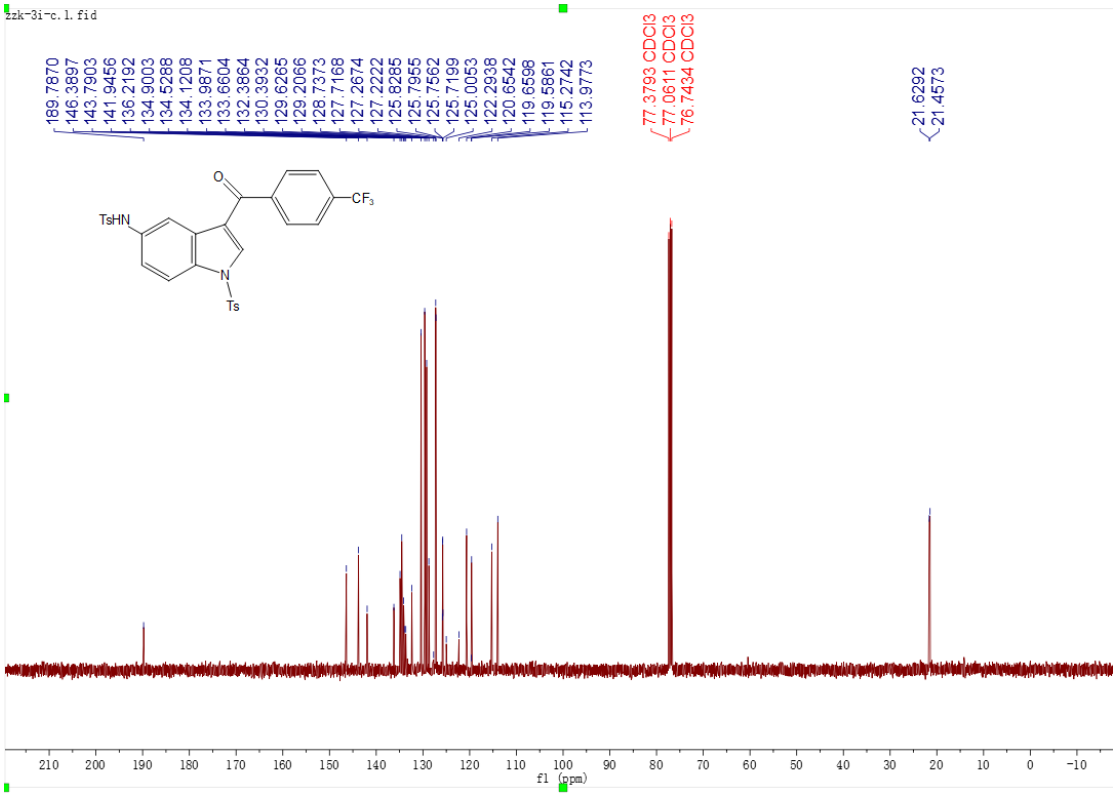
^{1}H NMR spectrum of **3h** ($CDCl_3$, 400 MHz)



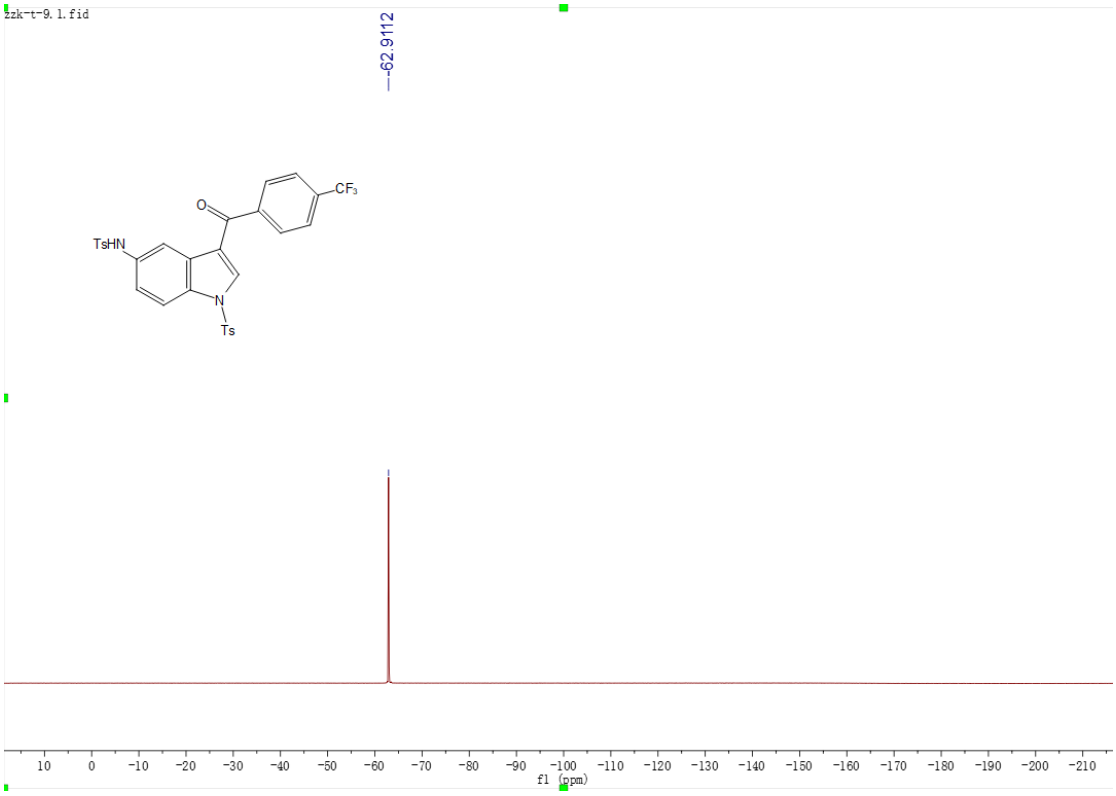
^{13}C NMR spectrum of **3h** ($CDCl_3$, 100 MHz)



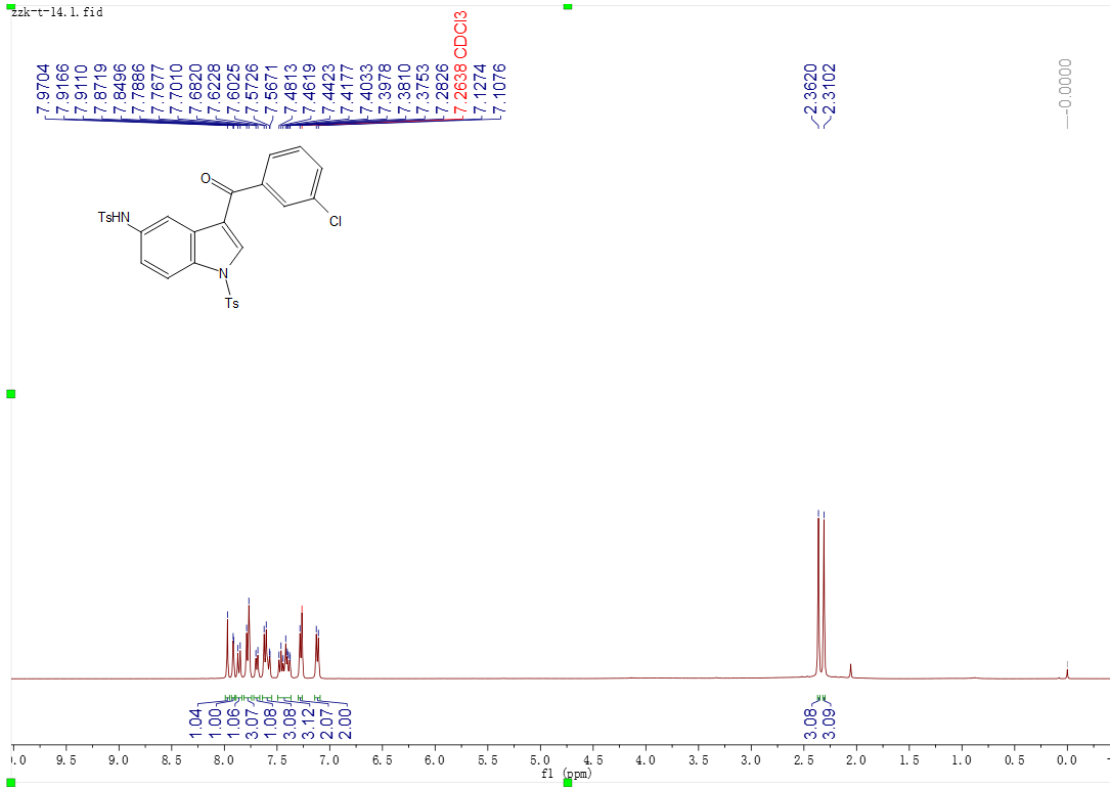
^{1}H NMR spectrum of **3i** ($CDCl_3$, 400 MHz)



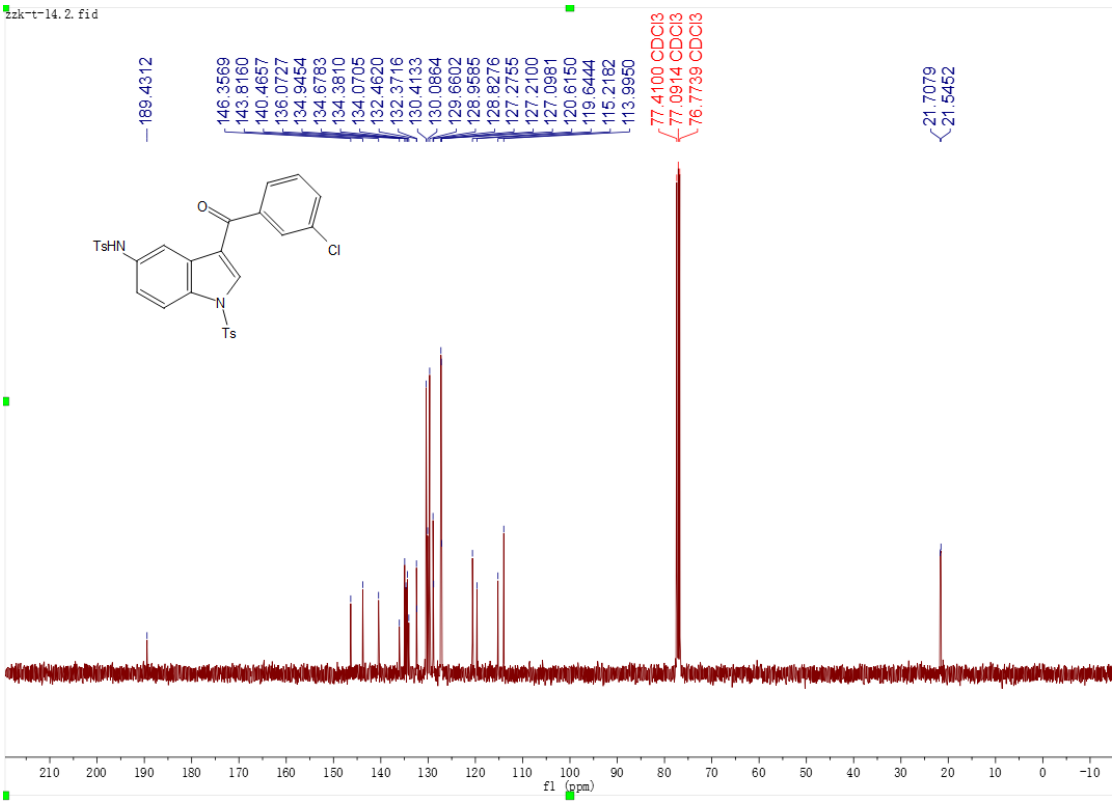
^{13}C NMR spectrum of **3i** ($CDCl_3$, 100 MHz)



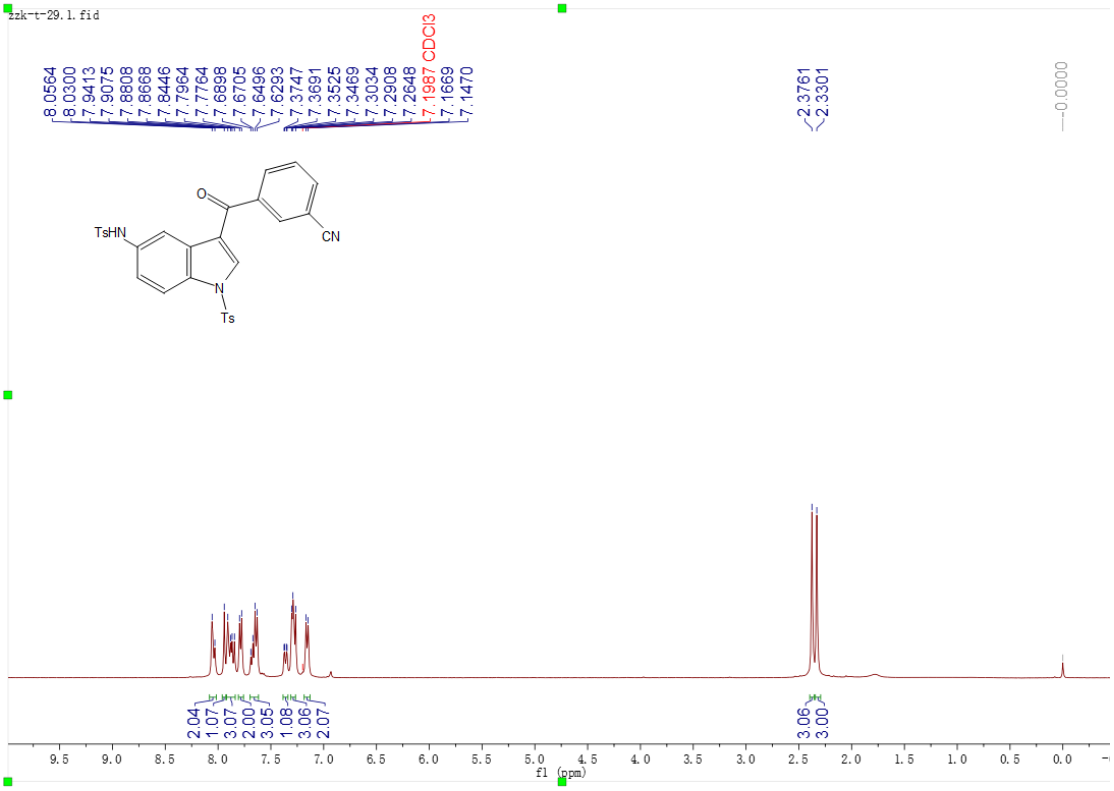
^{19}F NMR spectrum of **3i** ($CDCl_3$, 376 MHz)



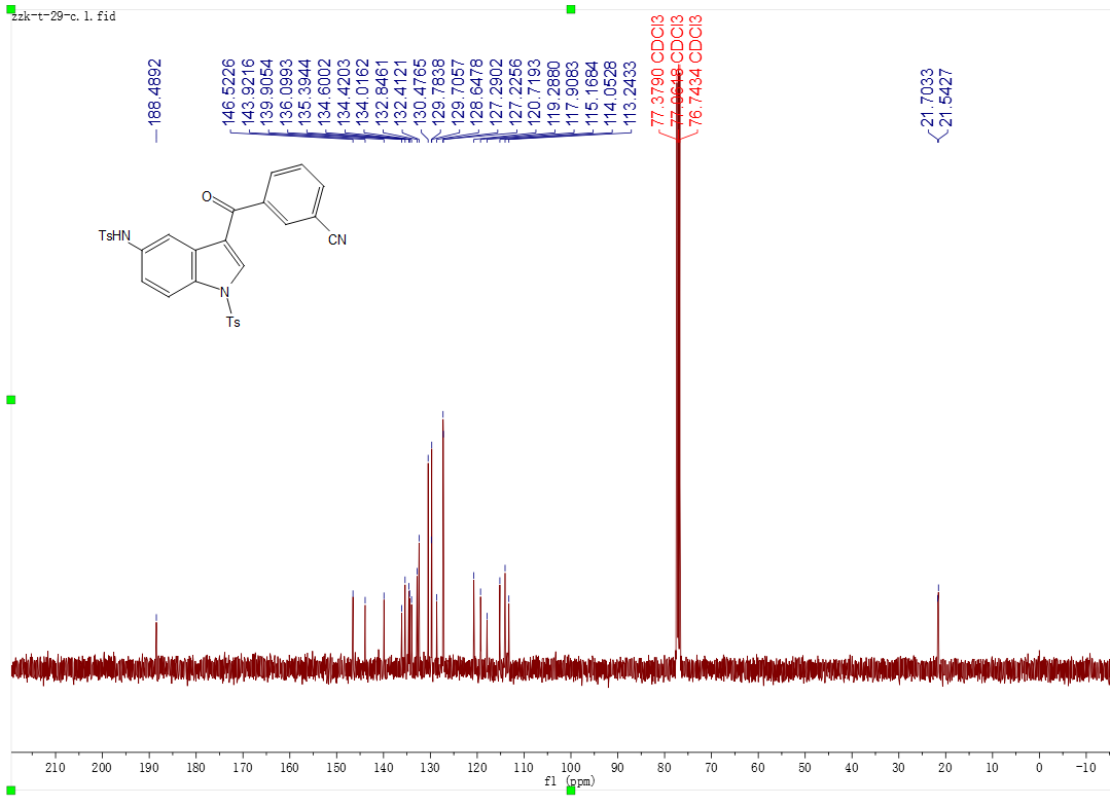
^{1}H NMR spectrum of **3j** ($CDCl_3$, 400 MHz)



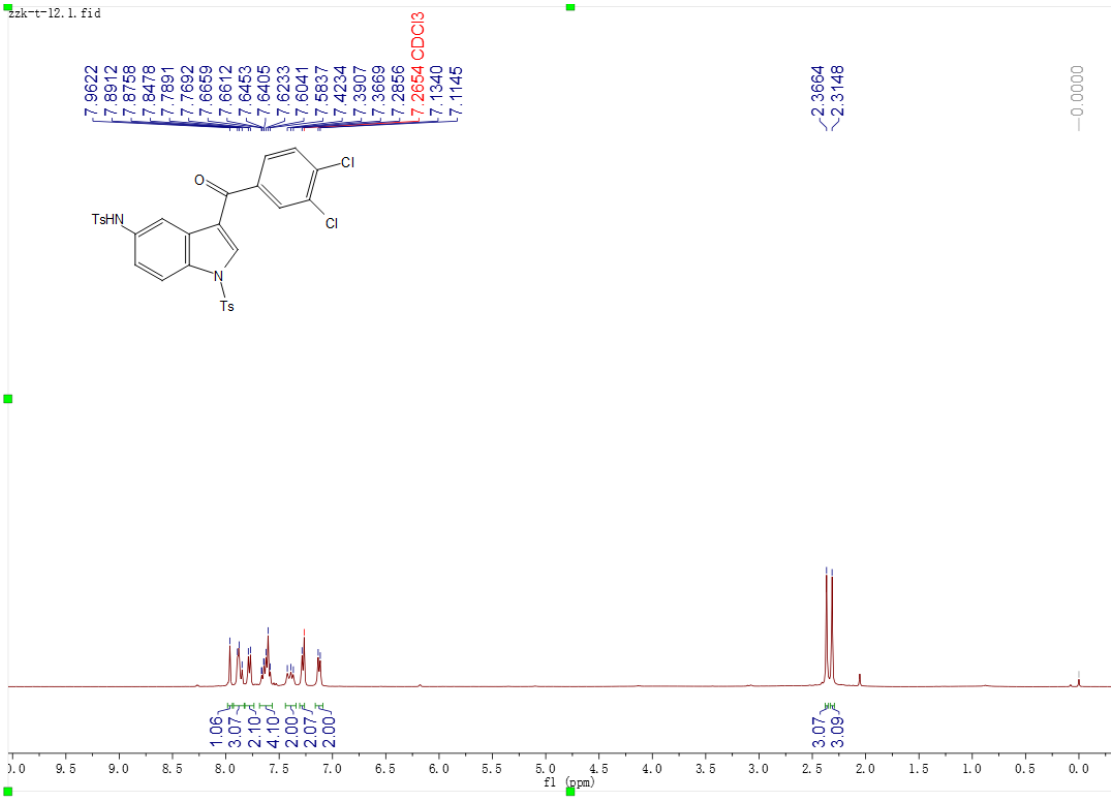
^{13}C NMR spectrum of **3j** ($CDCl_3$, 100 MHz)



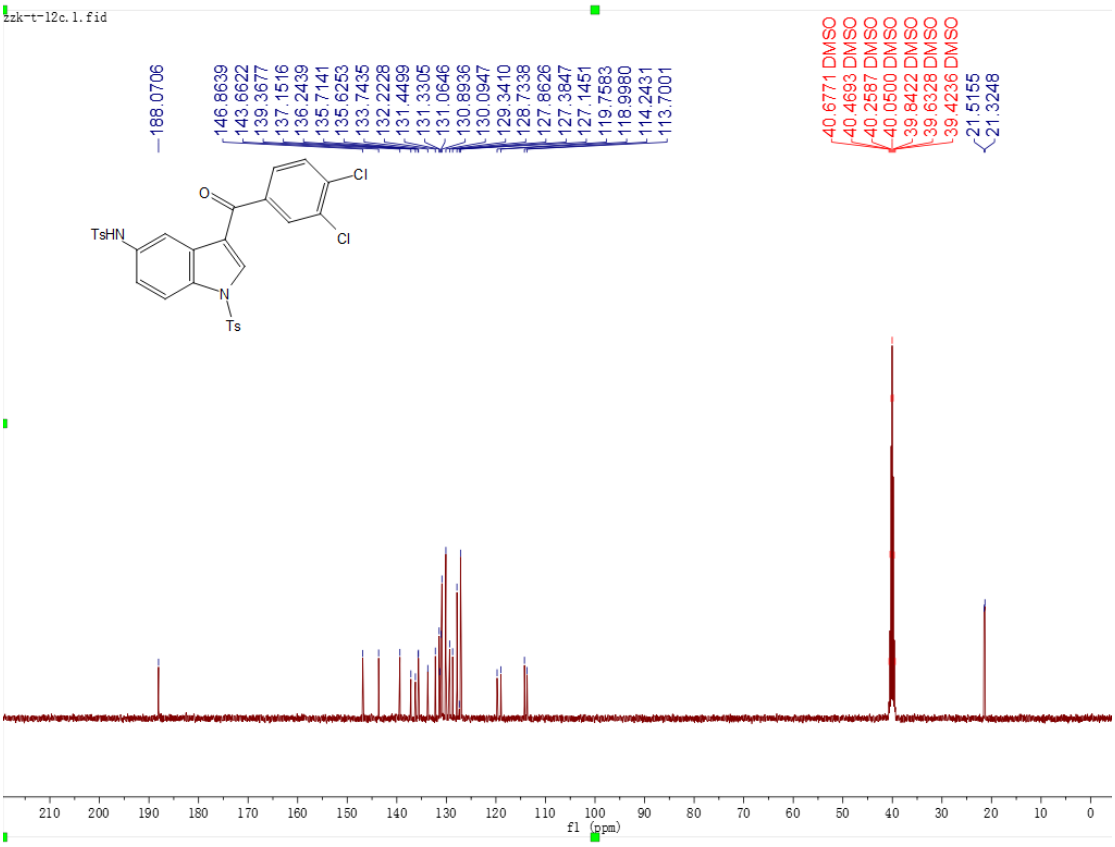
^{1}H NMR spectrum of **3k** ($CDCl_3$, 400 MHz)



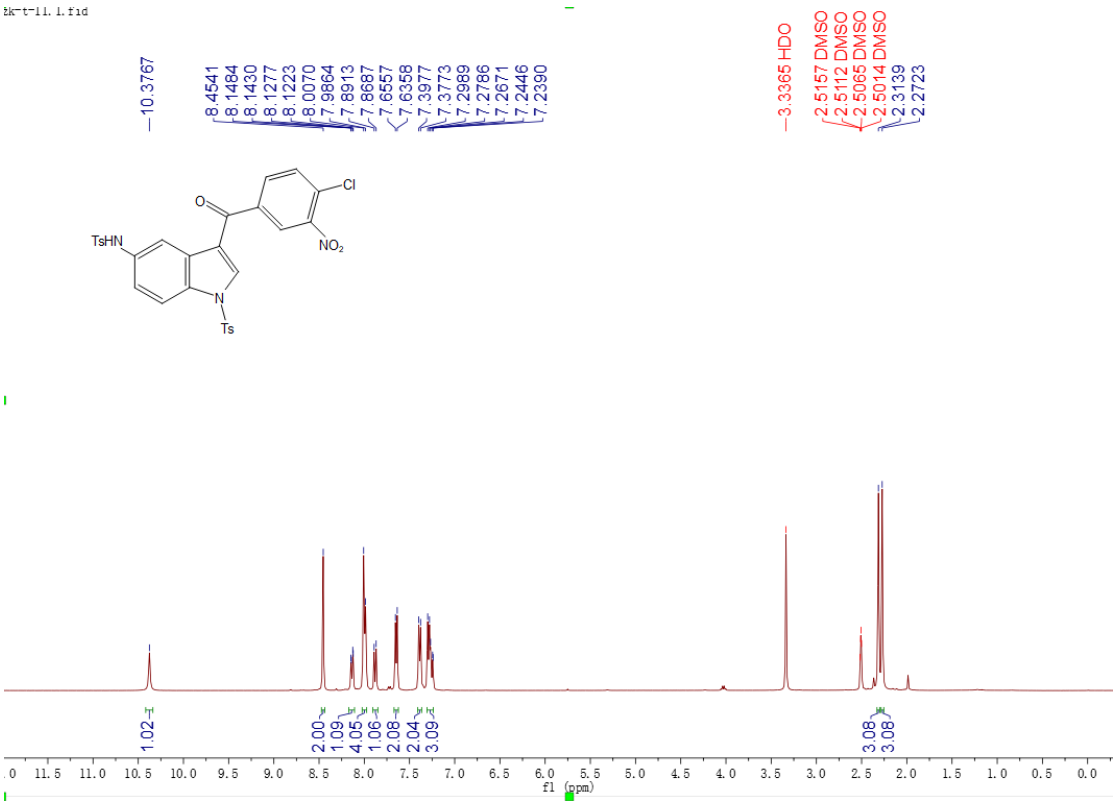
^{13}C NMR spectrum of **3k** ($CDCl_3$, 100 MHz)



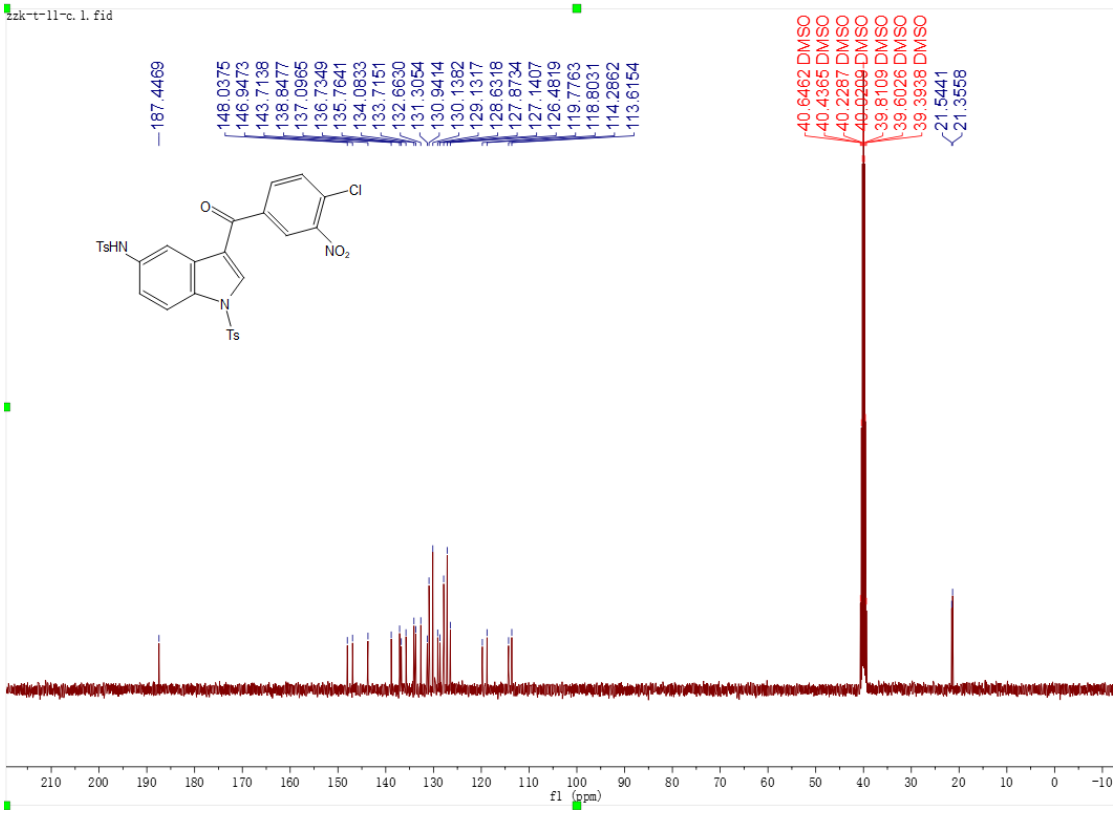
^{1}H NMR spectrum of **3l** ($CDCl_3$, 400 MHz)



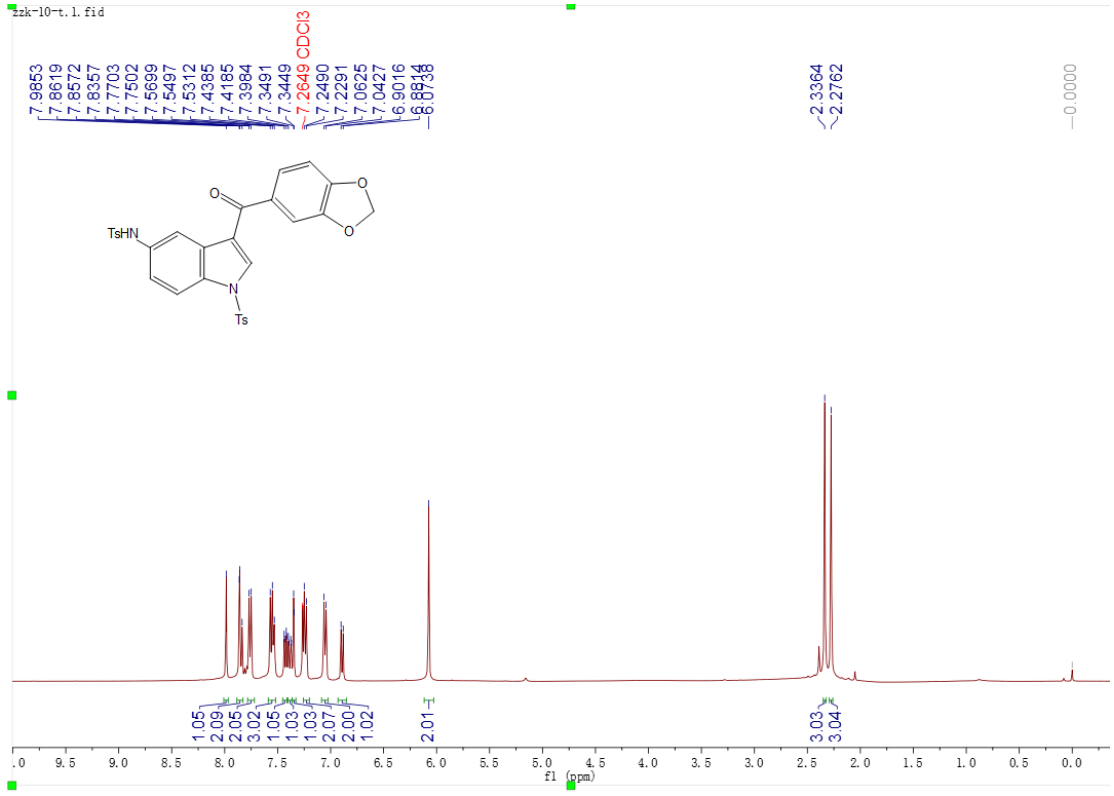
^{13}C NMR spectrum of **3l** (DMSO-d_6, 100 MHz)



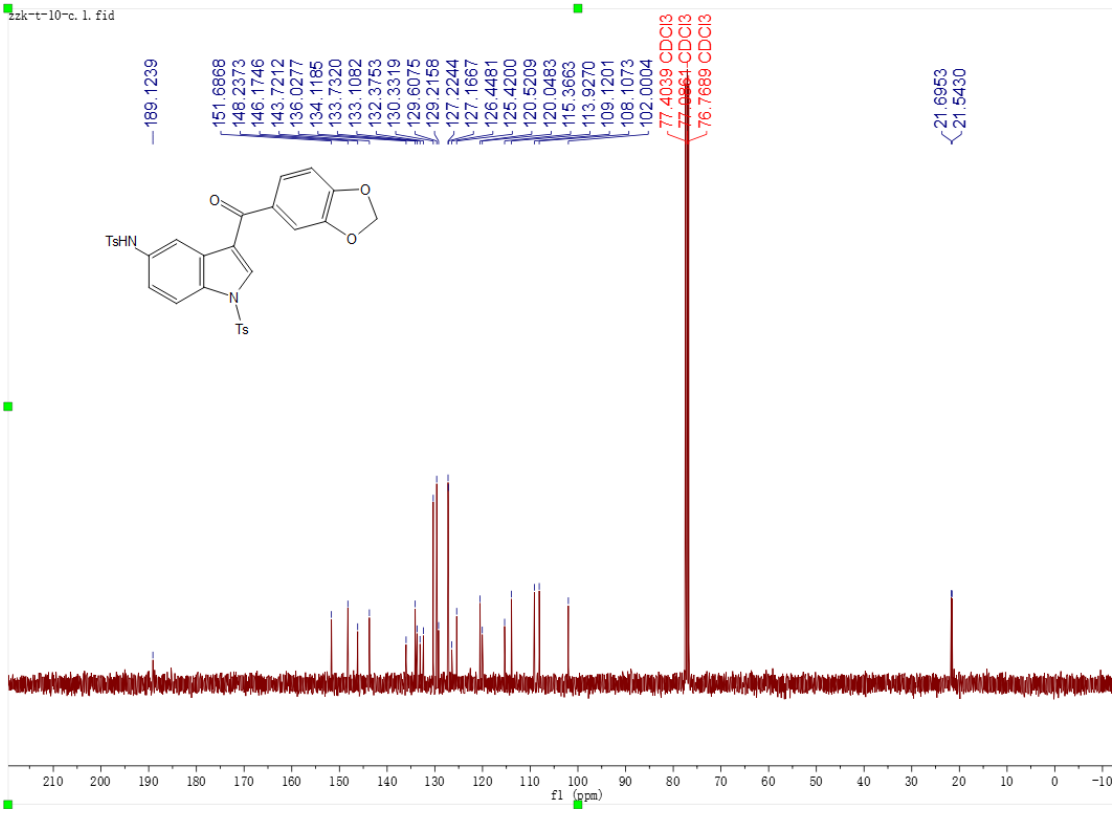
^{1}H NMR spectrum of **3d** (DMSO-d_6, 400 MHz)



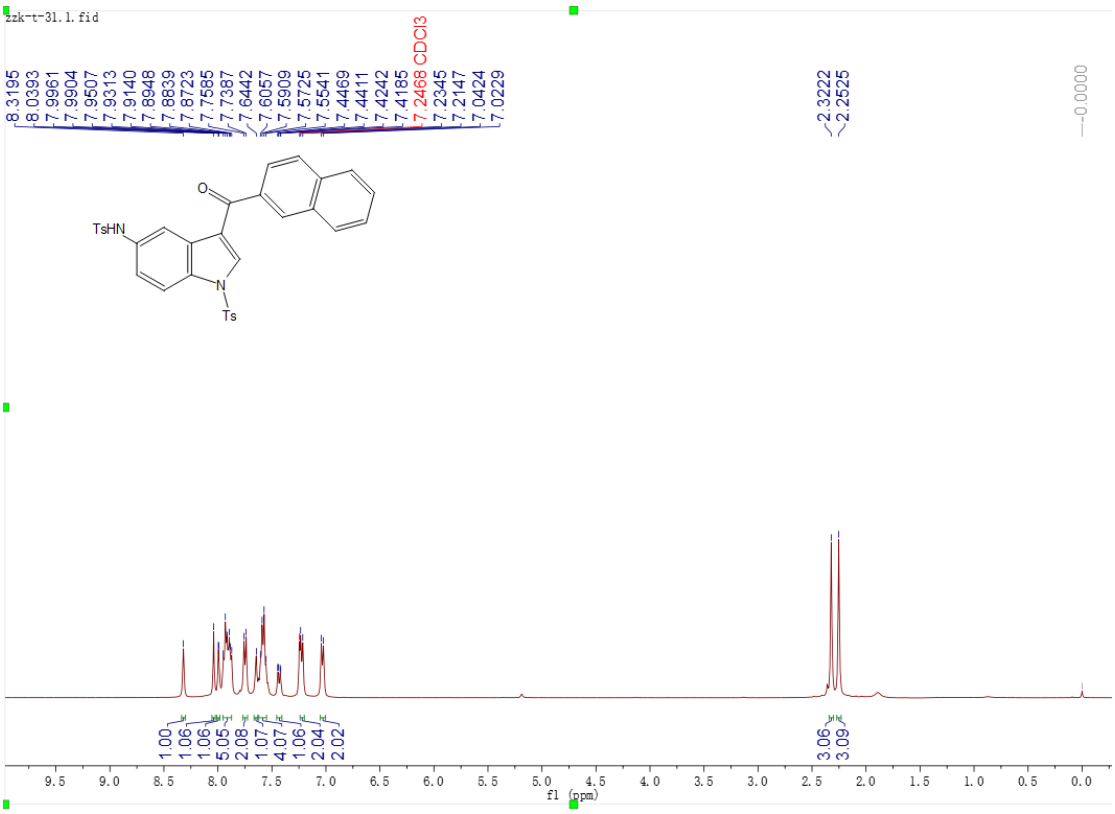
^{13}C NMR spectrum of **3d** (DMSO-d_6, 100 MHz)



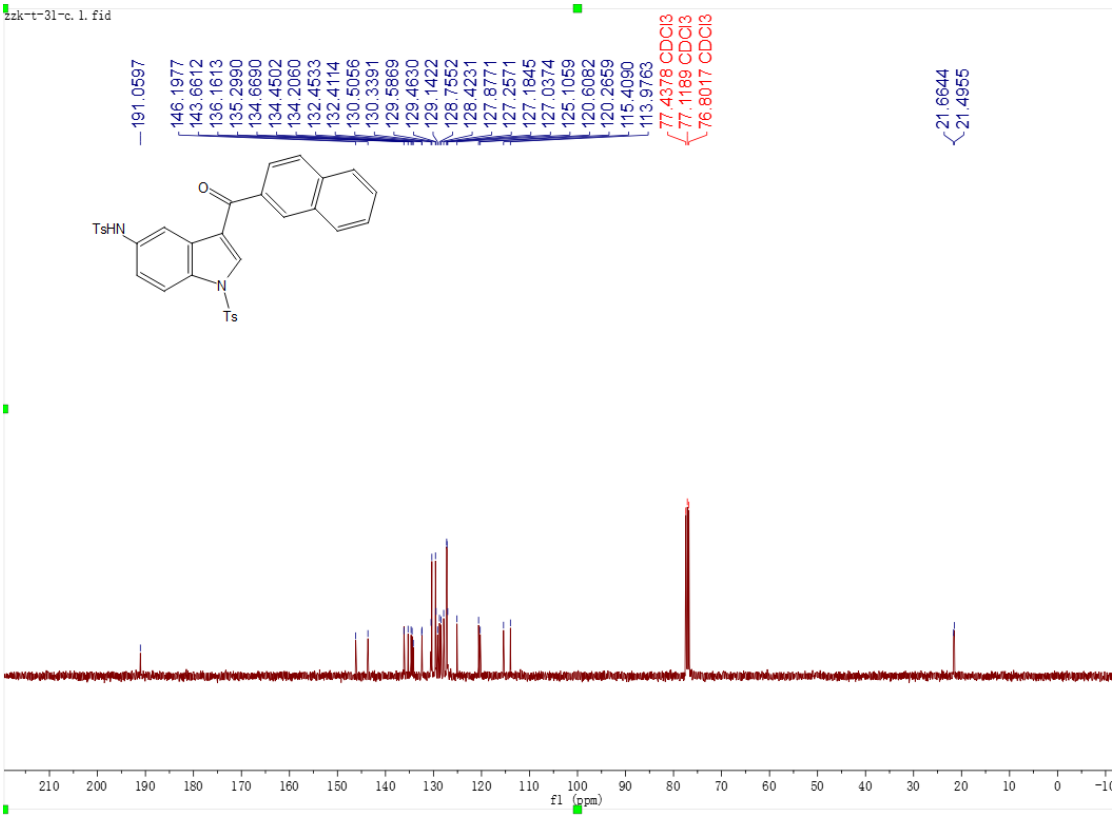
^{1}H NMR spectrum of **3n** ($CDCl_3$, 400 MHz)



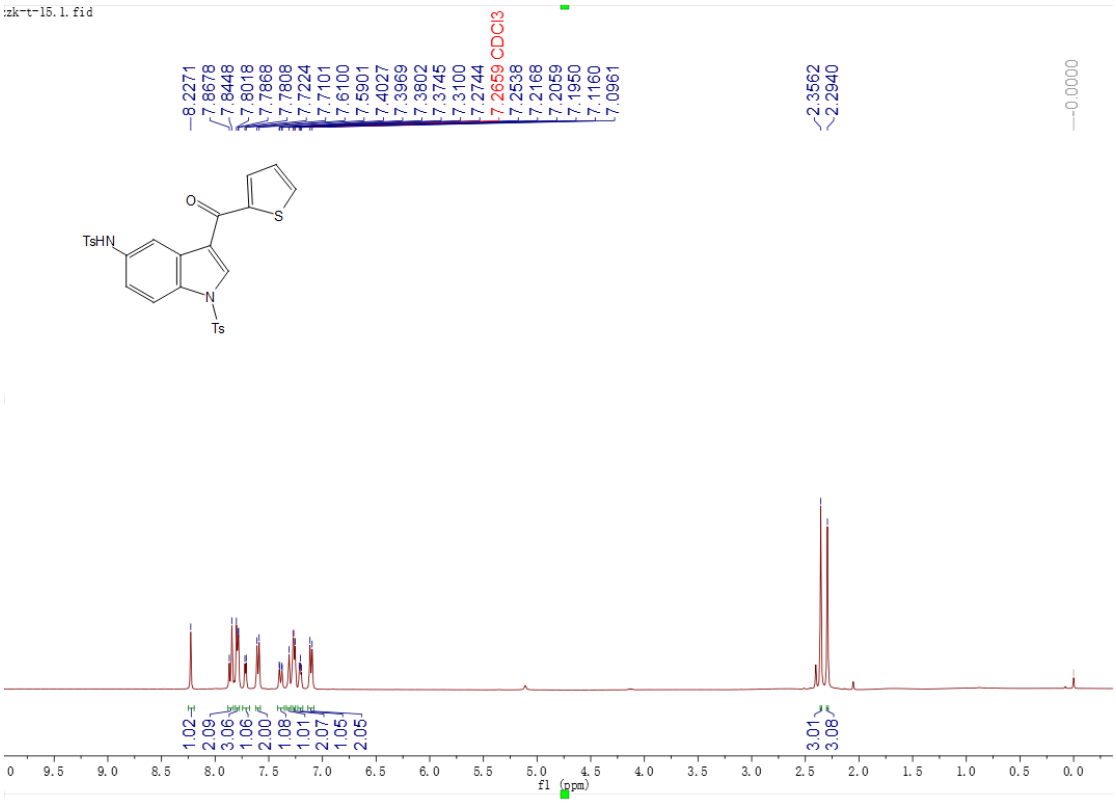
^{13}C NMR spectrum of **3n** ($CDCl_3$, 100 MHz)



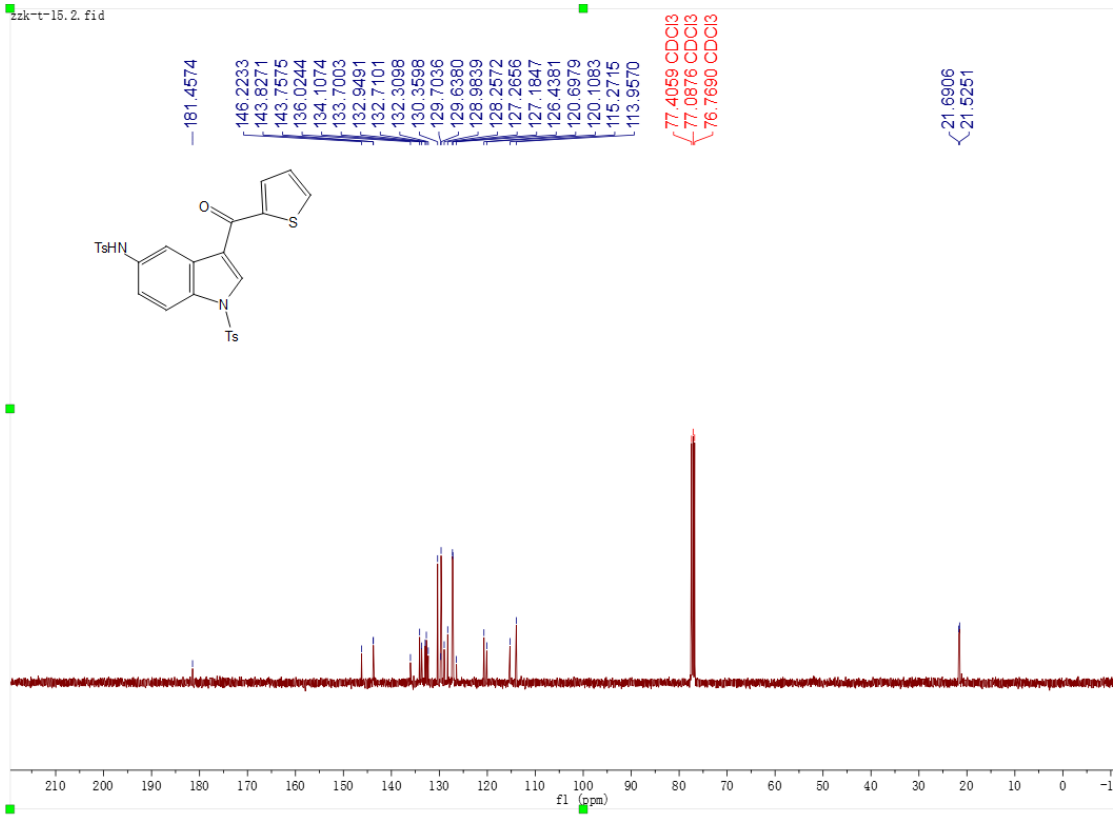
^{1}H NMR spectrum of **3o** ($CDCl_3$, 400 MHz)



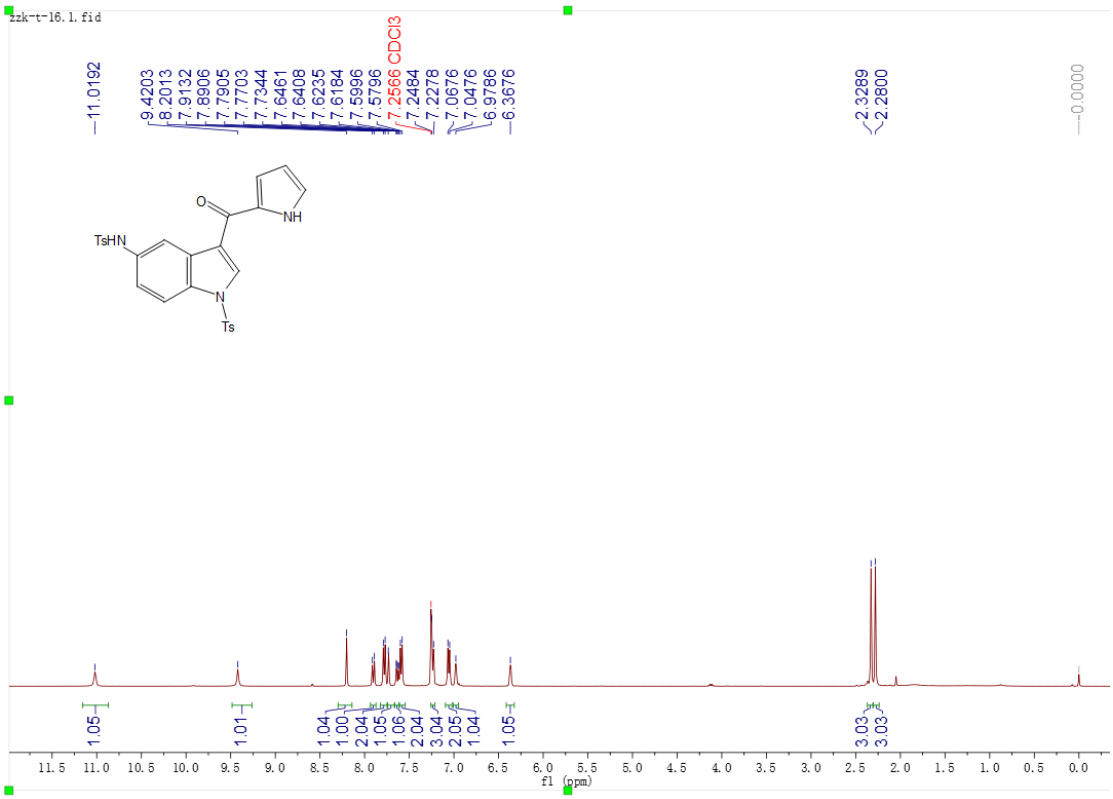
^{13}C NMR spectrum of **3o** ($CDCl_3$, 100 MHz)



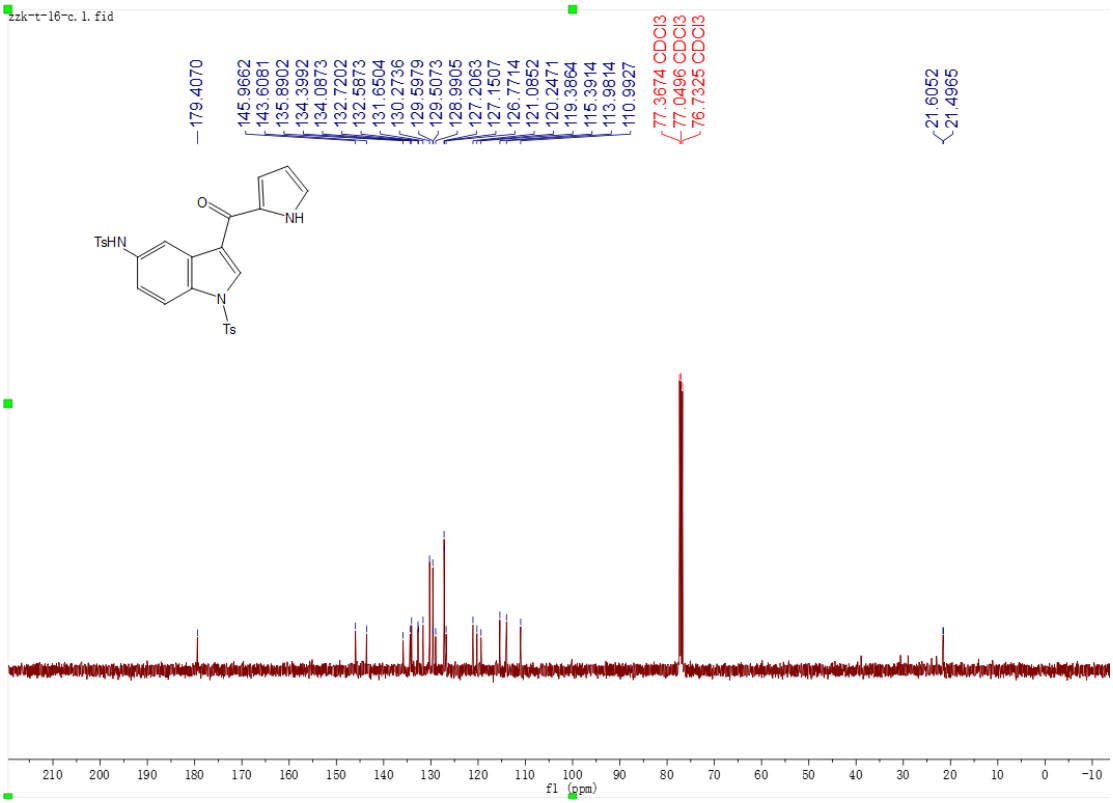
^{1}H NMR spectrum of **3p** ($CDCl_3$, 400 MHz)



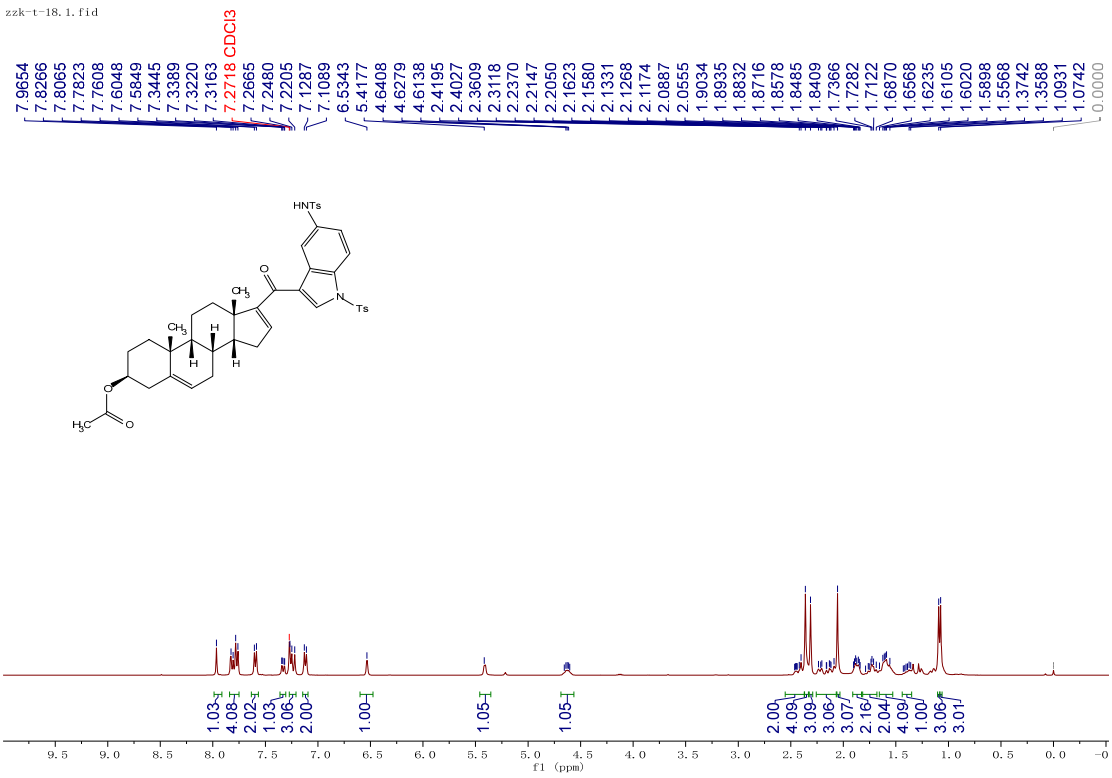
^{13}C NMR spectrum of **3p** ($CDCl_3$, 100 MHz)



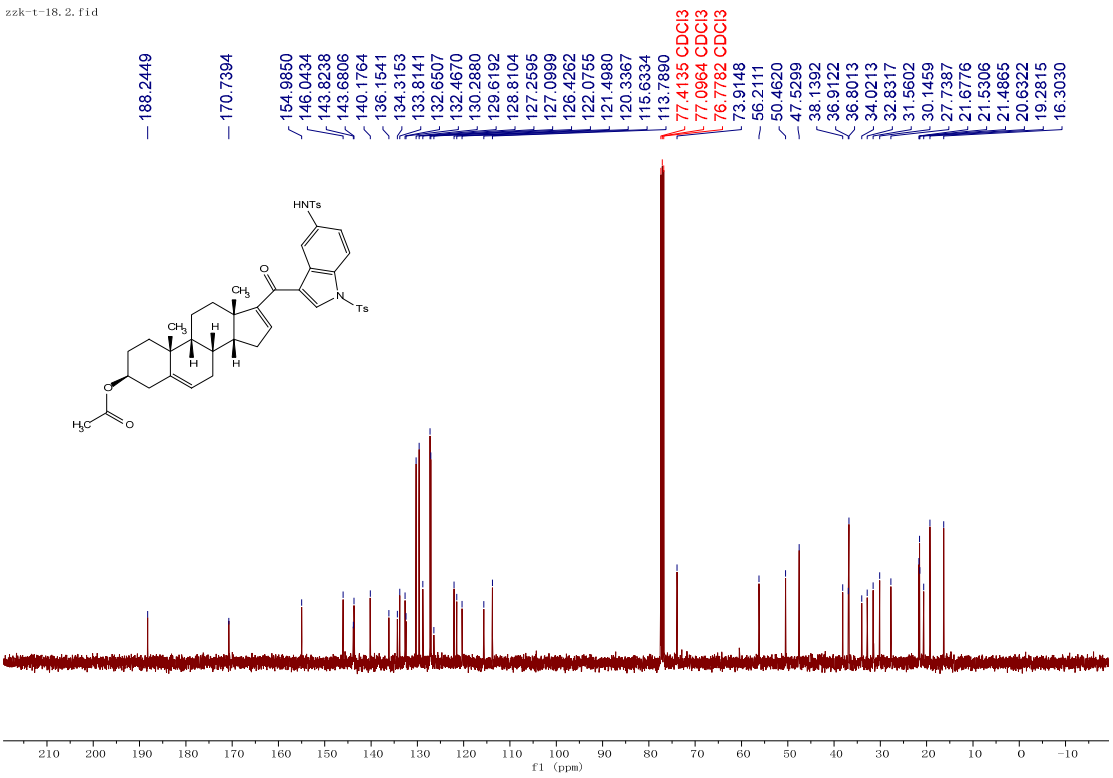
^{1}H NMR spectrum of **3q** ($CDCl_3$, 400 MHz)



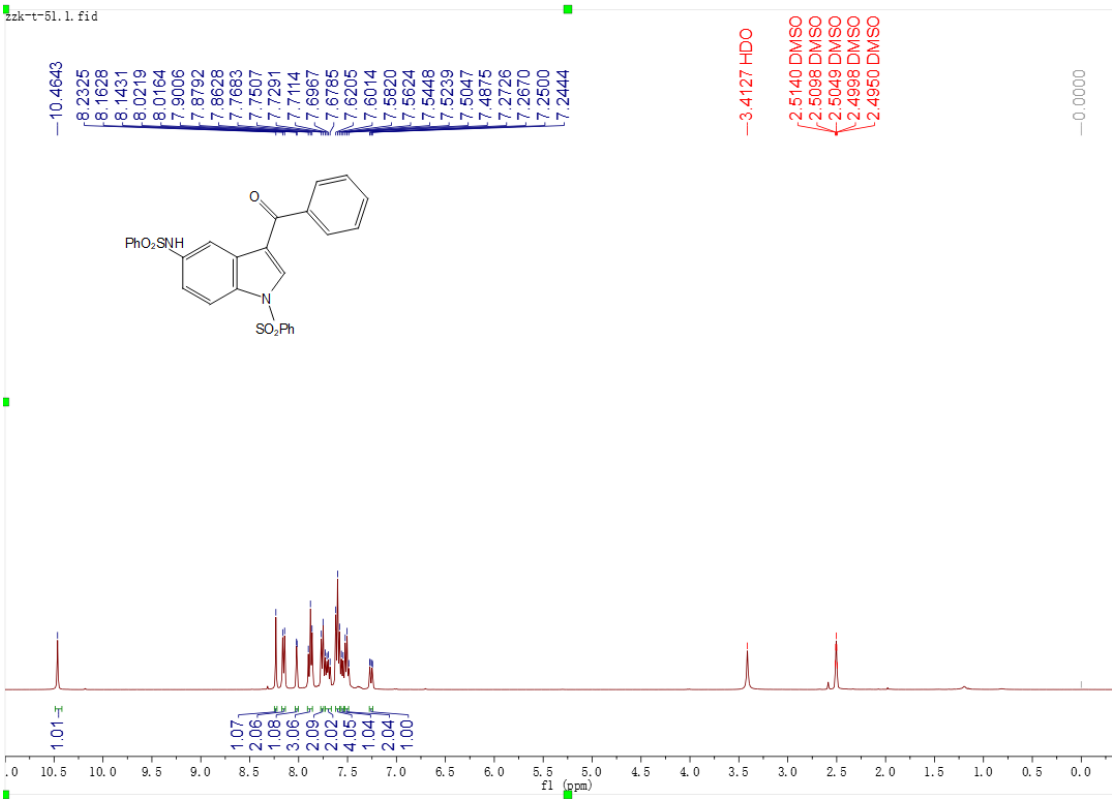
^{13}C NMR spectrum of **3q** ($CDCl_3$, 100 MHz)



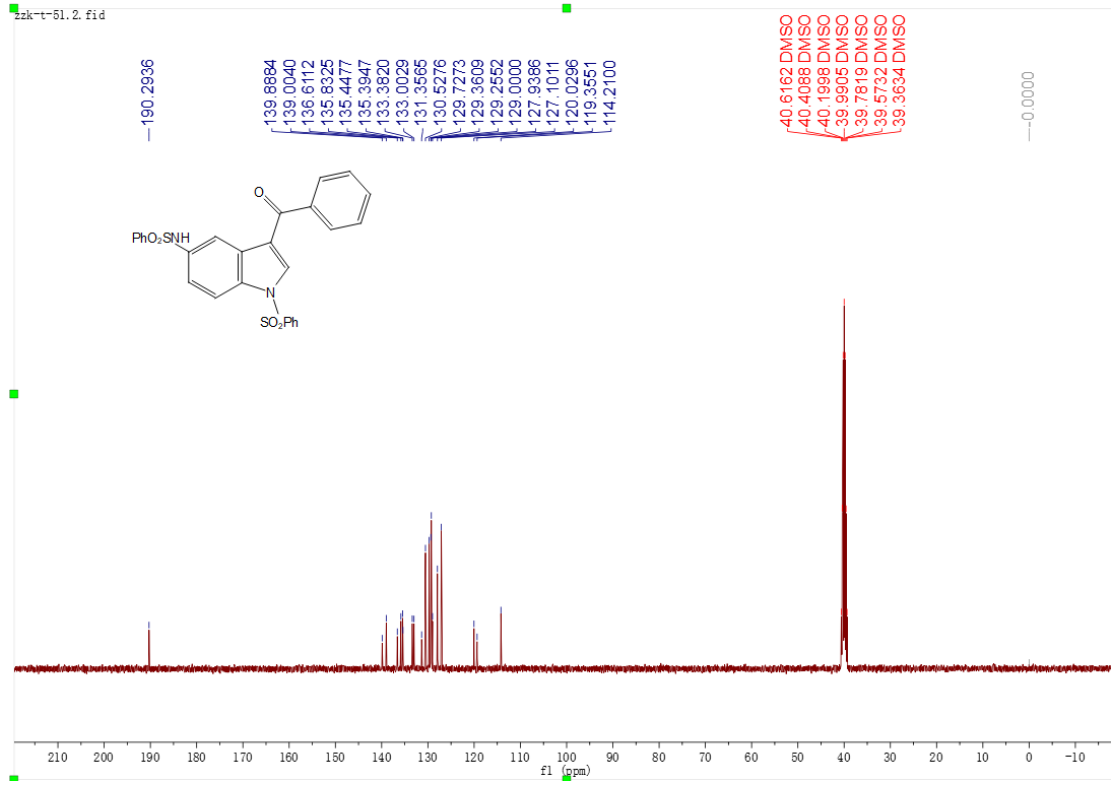
^{1}H NMR spectrum of **3r** ($CDCl_3$, 400 MHz)



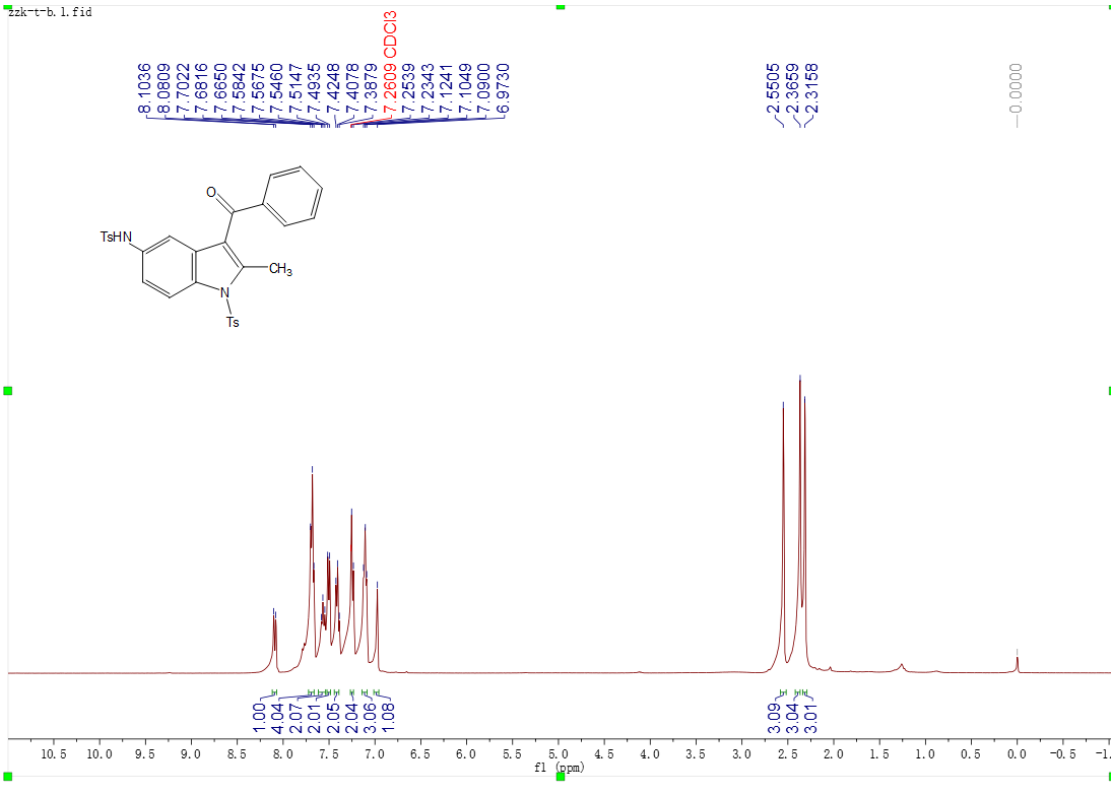
^{13}C NMR spectrum of **3r** ($CDCl_3$, 100 MHz)



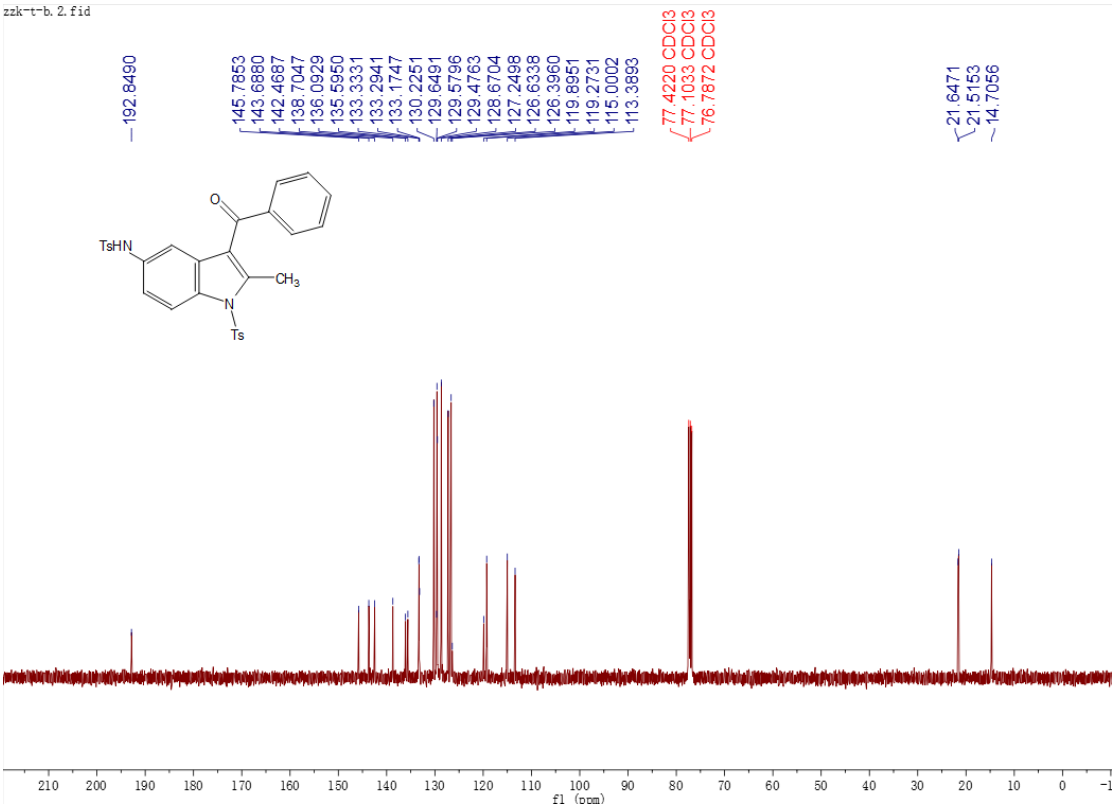
^{1}H NMR spectrum of **3s** (DMSO-d_6, 400 MHz)



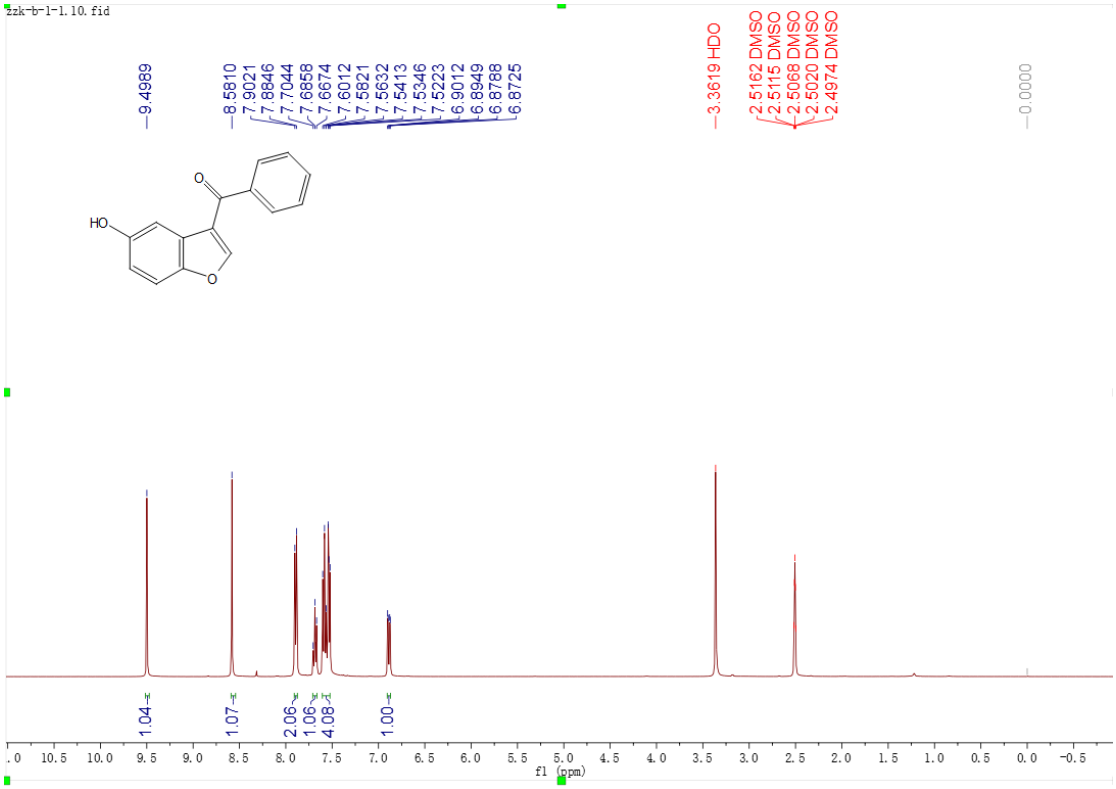
^{13}C NMR spectrum of **3s** (DMSO-d_6, 100 MHz)



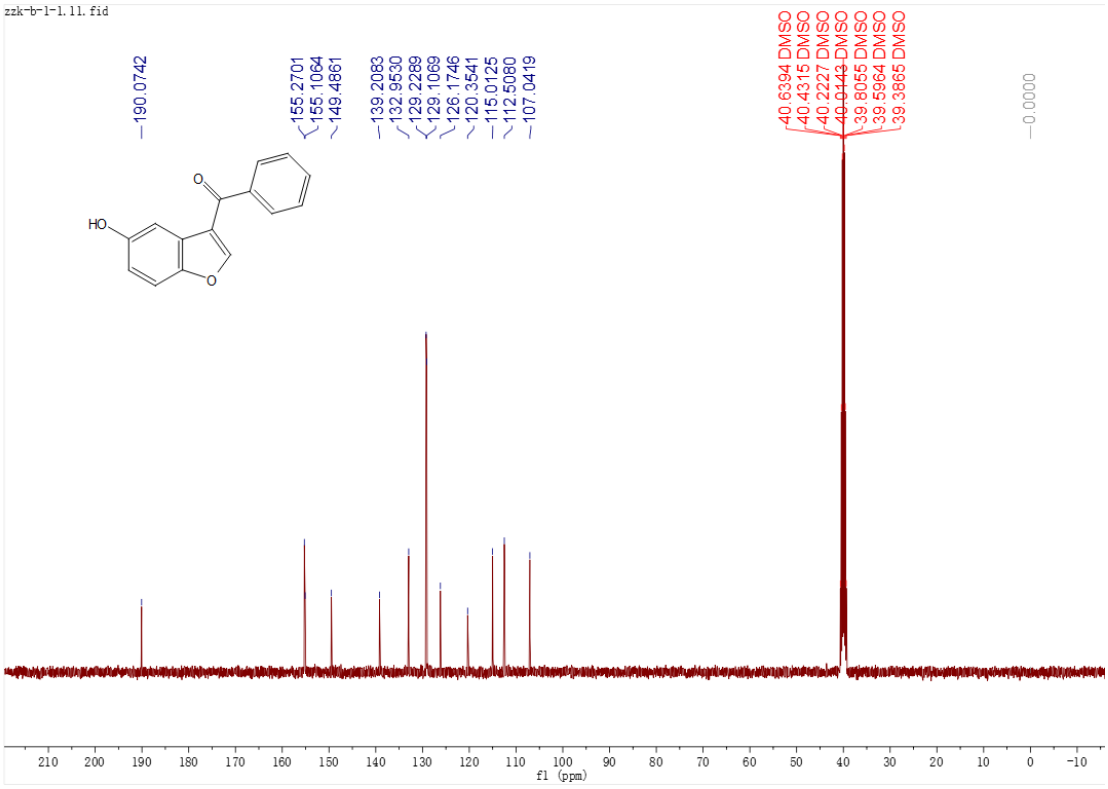
^{1}H NMR spectrum of **3t** ($CDCl_3$, 400 MHz)



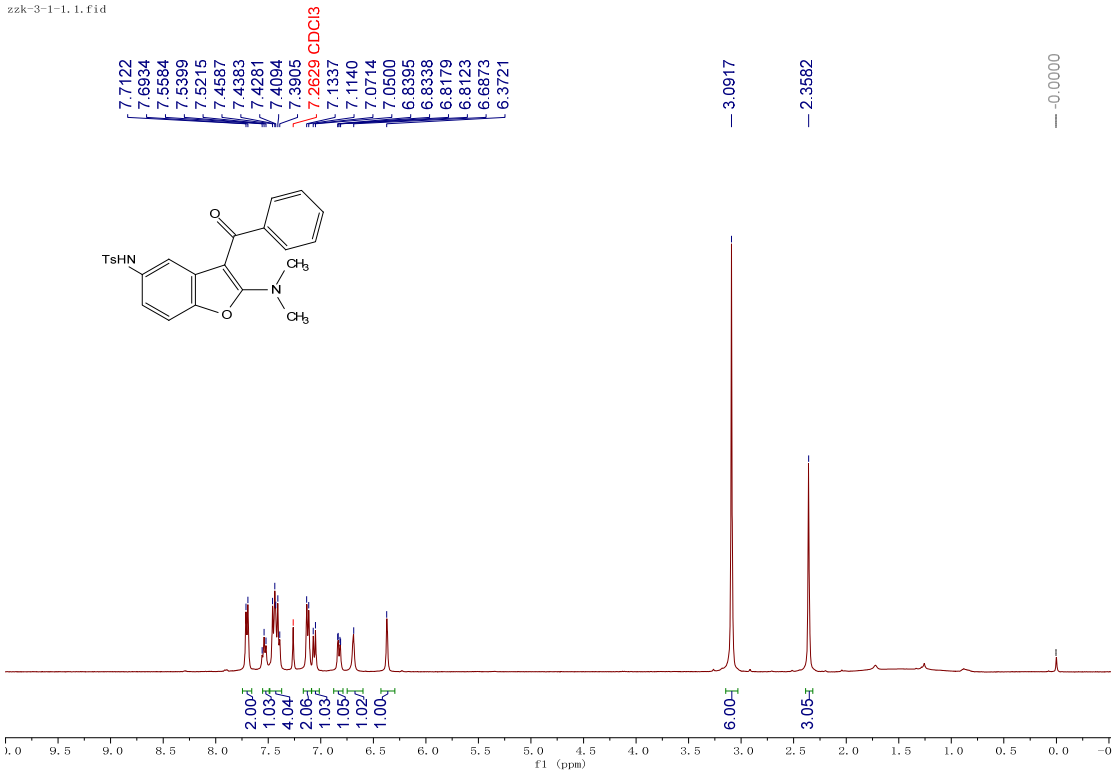
^{13}C NMR spectrum of **3t** ($CDCl_3$, 100 MHz)



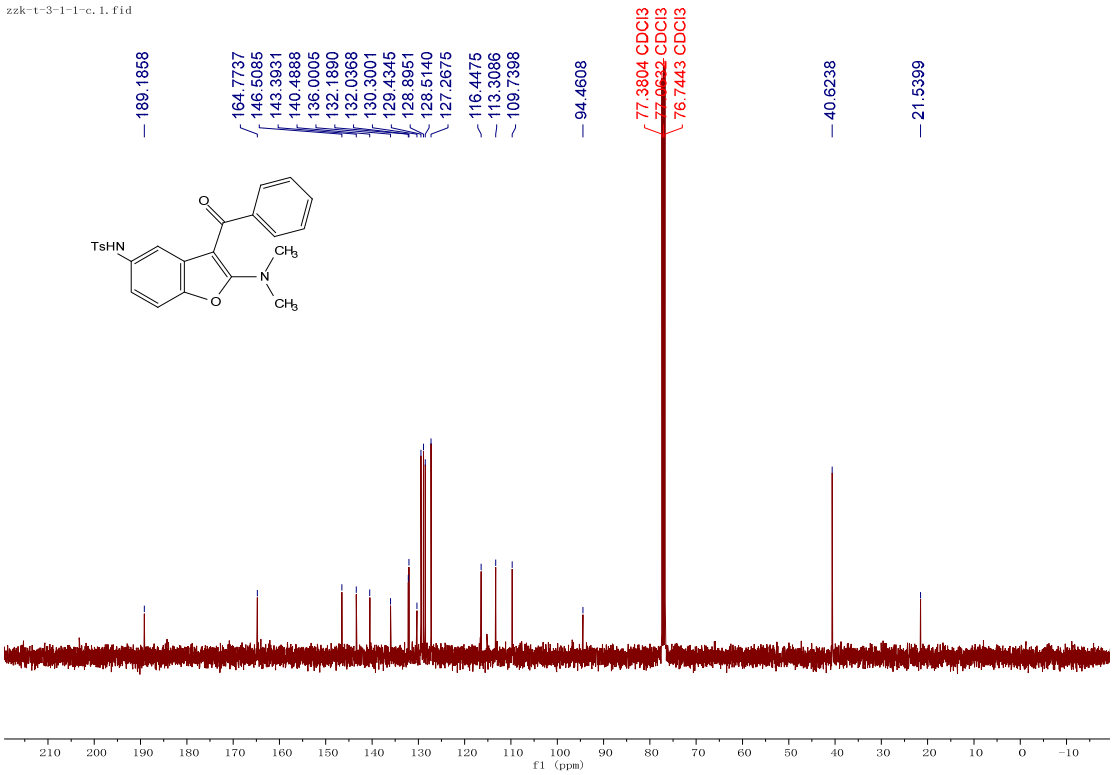
^{1}H NMR spectrum of **3u** (DMSO-d_6, 400 MHz)



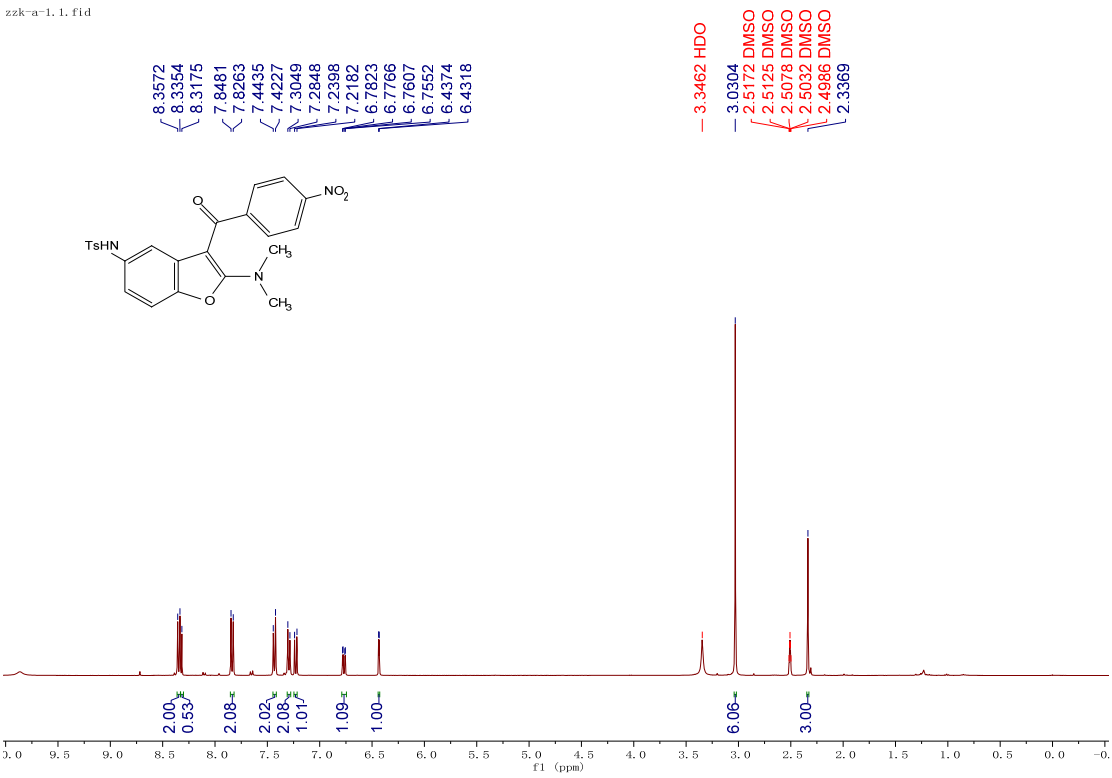
^{13}C NMR spectrum of **3u** (DMSO-d_6, 100 MHz)



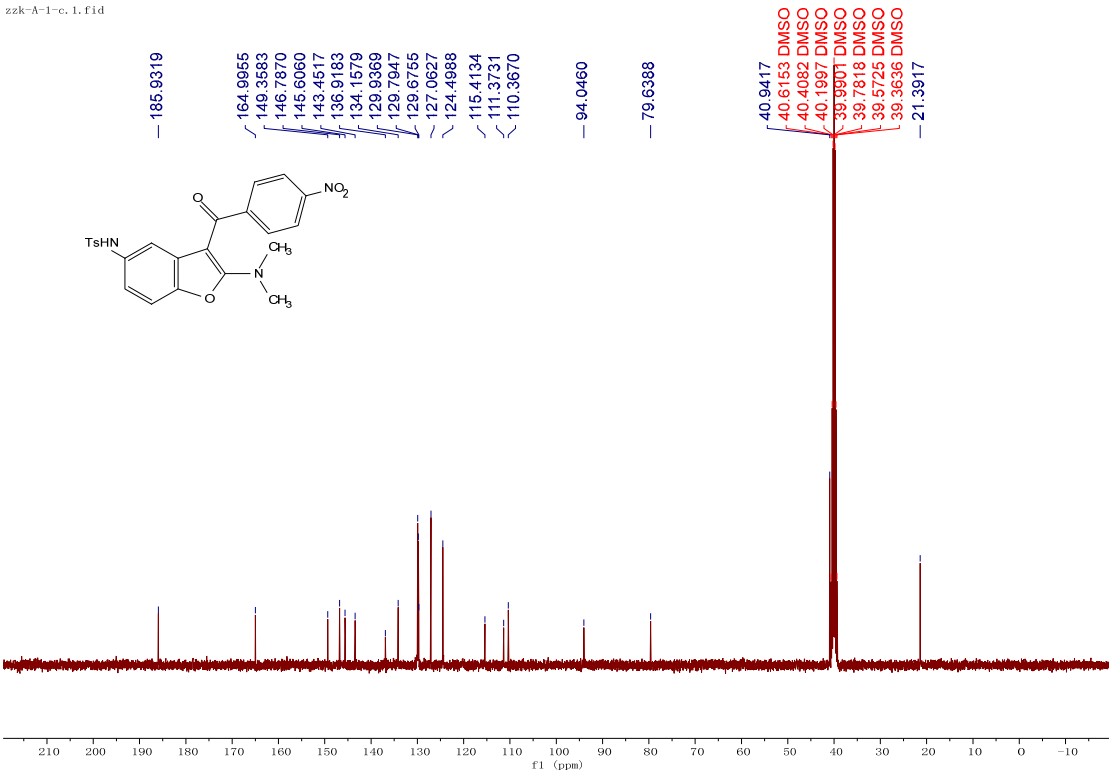
^{1}H NMR spectrum of **5a** ($CDCl_3$, 400 MHz)



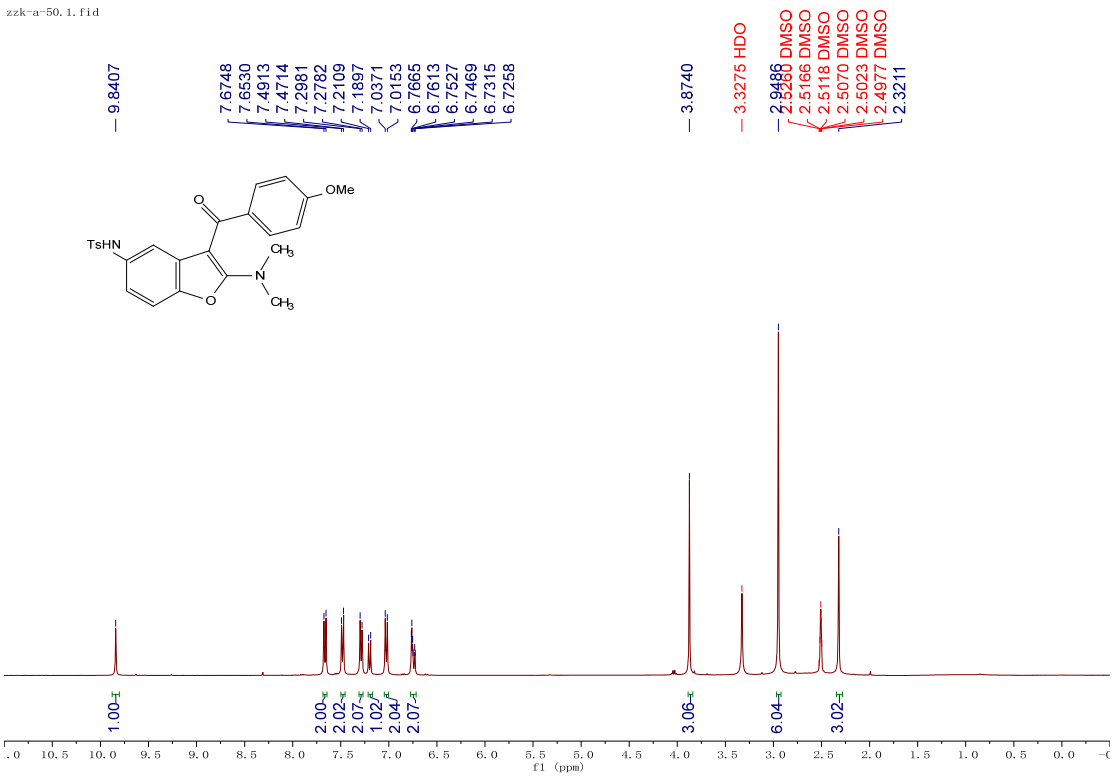
^{13}C NMR spectrum of **5a** ($CDCl_3$, 100 MHz)



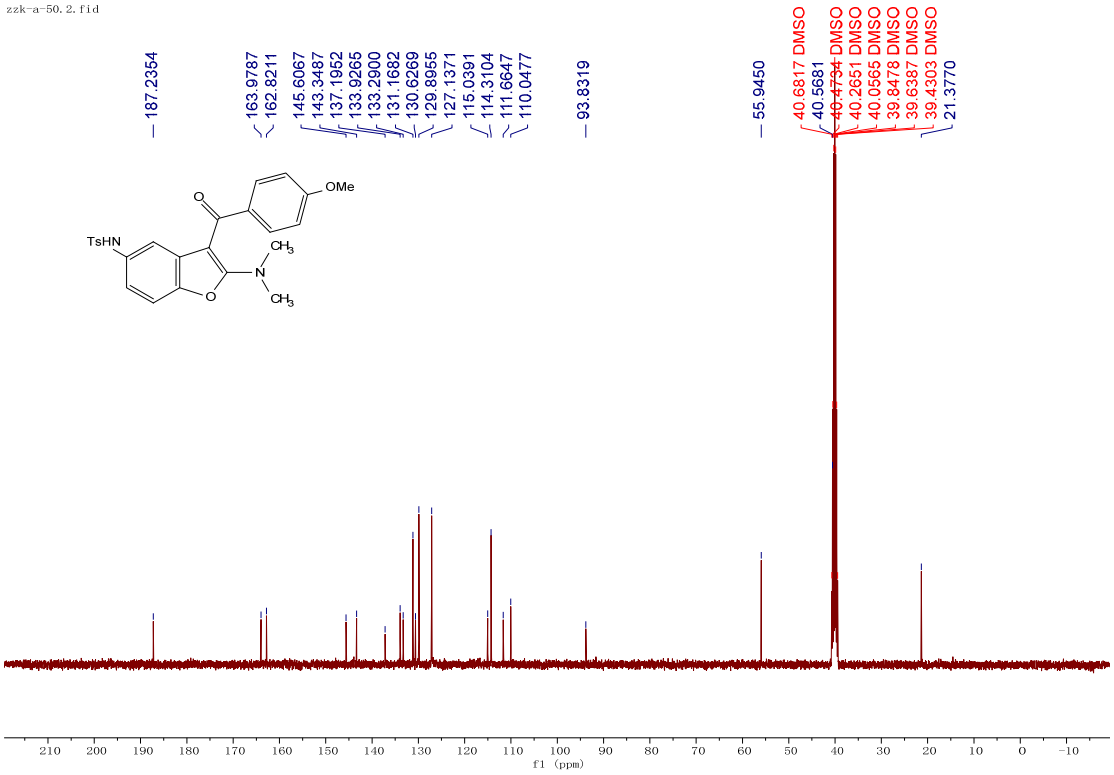
^{1}H NMR spectrum of **5b** (DMSO-d_6, 400 MHz)



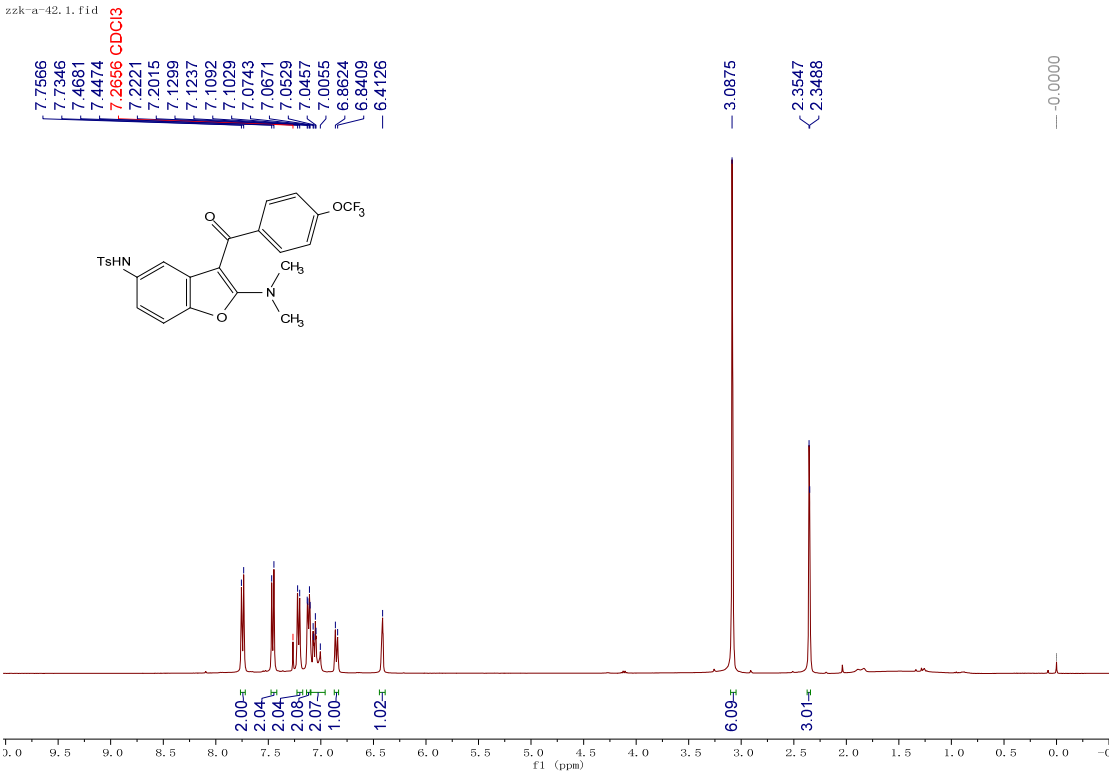
^{13}C NMR spectrum of **5b** (DMSO-d_6, 100 MHz)



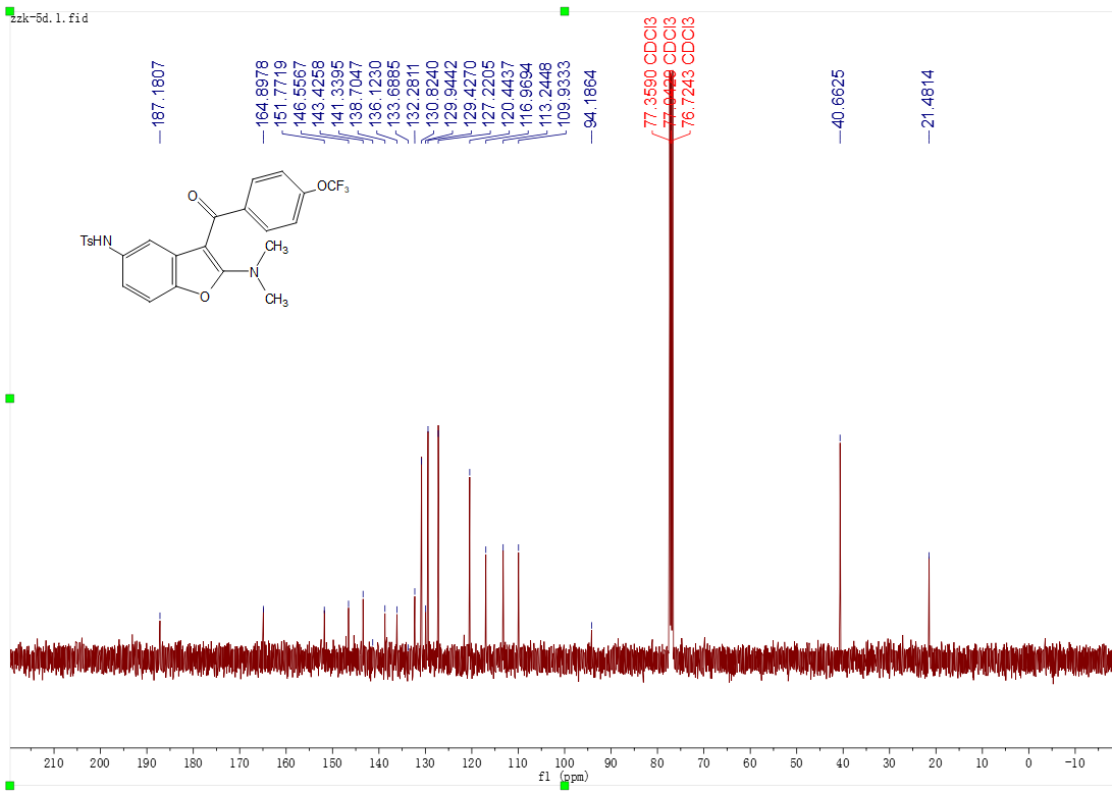
^{1}H NMR spectrum of **5c** (DMSO-d_6, 400 MHz)



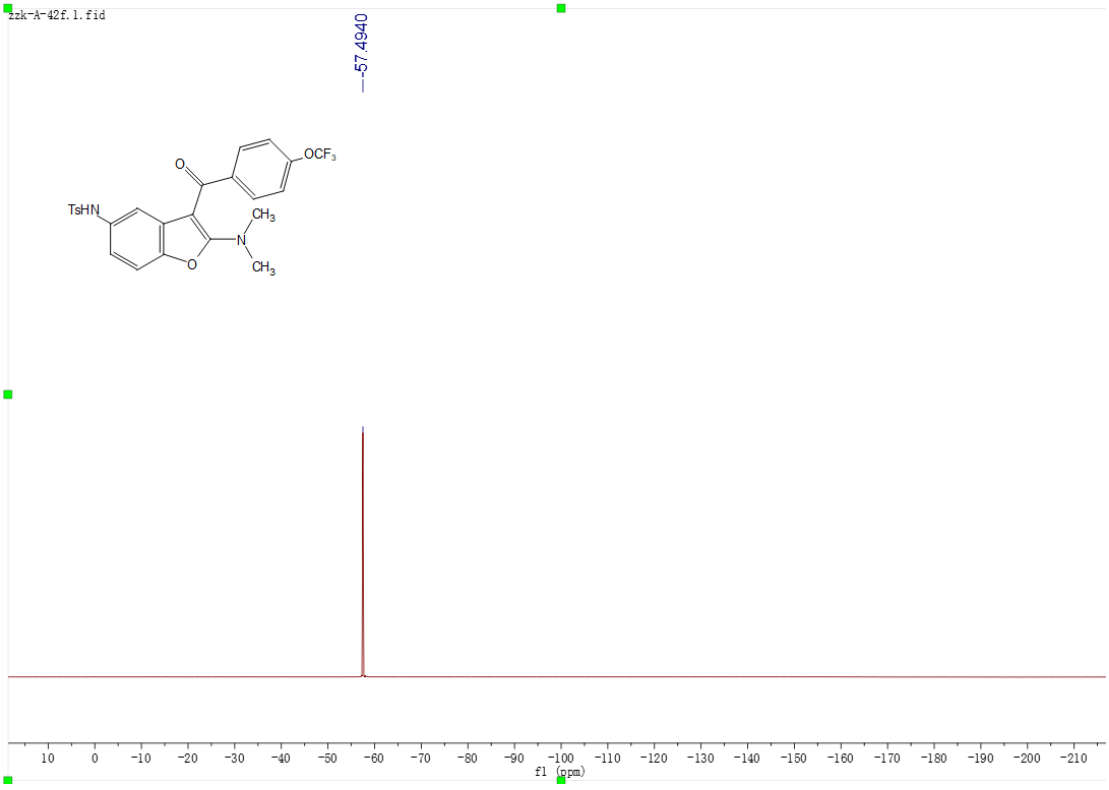
^{13}C NMR spectrum of **5c** (DMSO-d_6, 100 MHz)



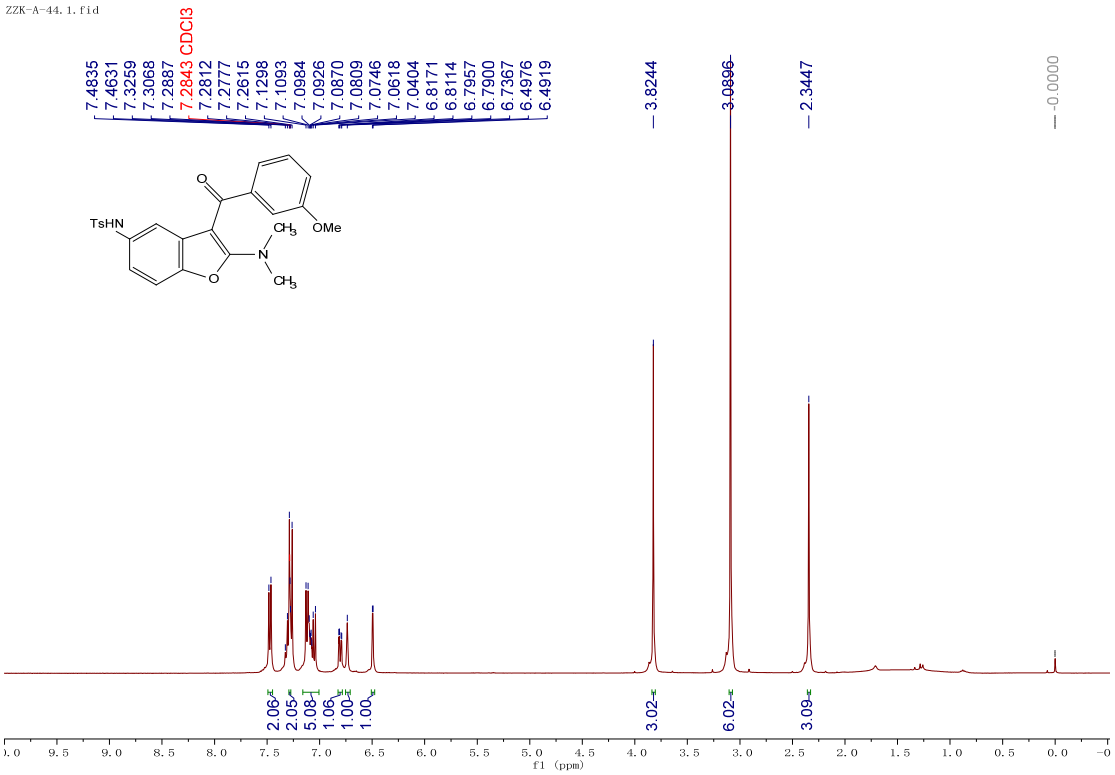
^{1}H NMR spectrum of **5d** ($CDCl_3$, 400 MHz)



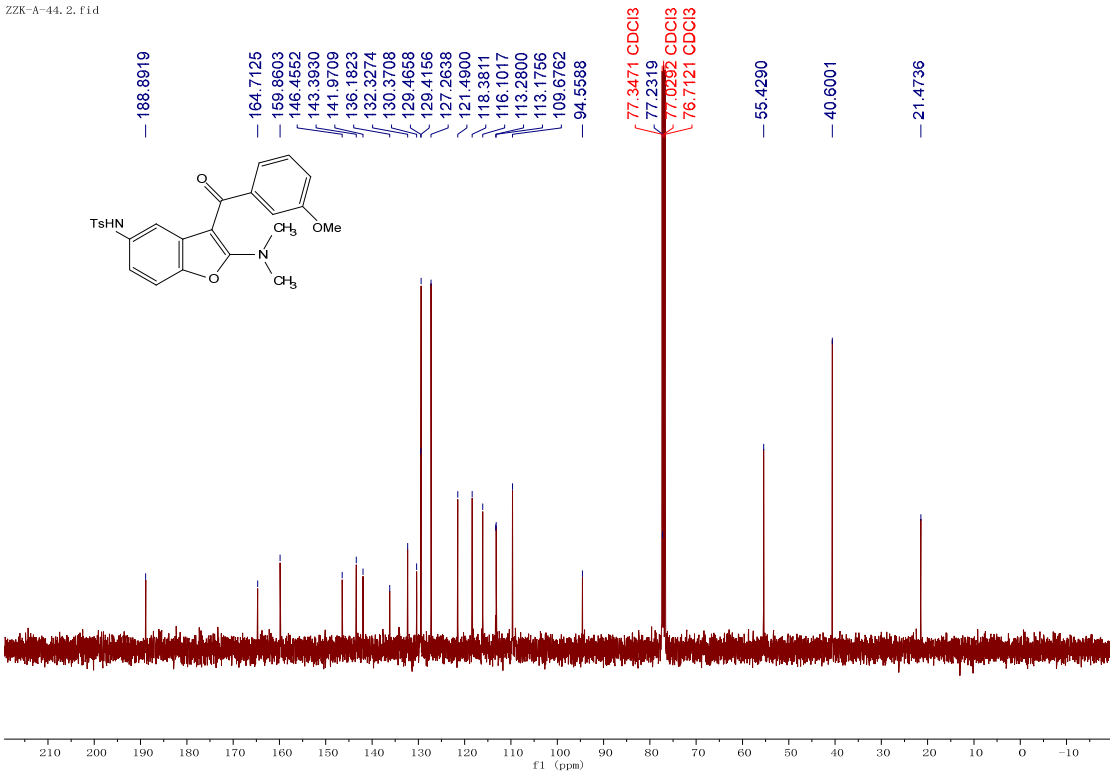
^{13}C NMR spectrum of **5d** ($CDCl_3$, 100 MHz)



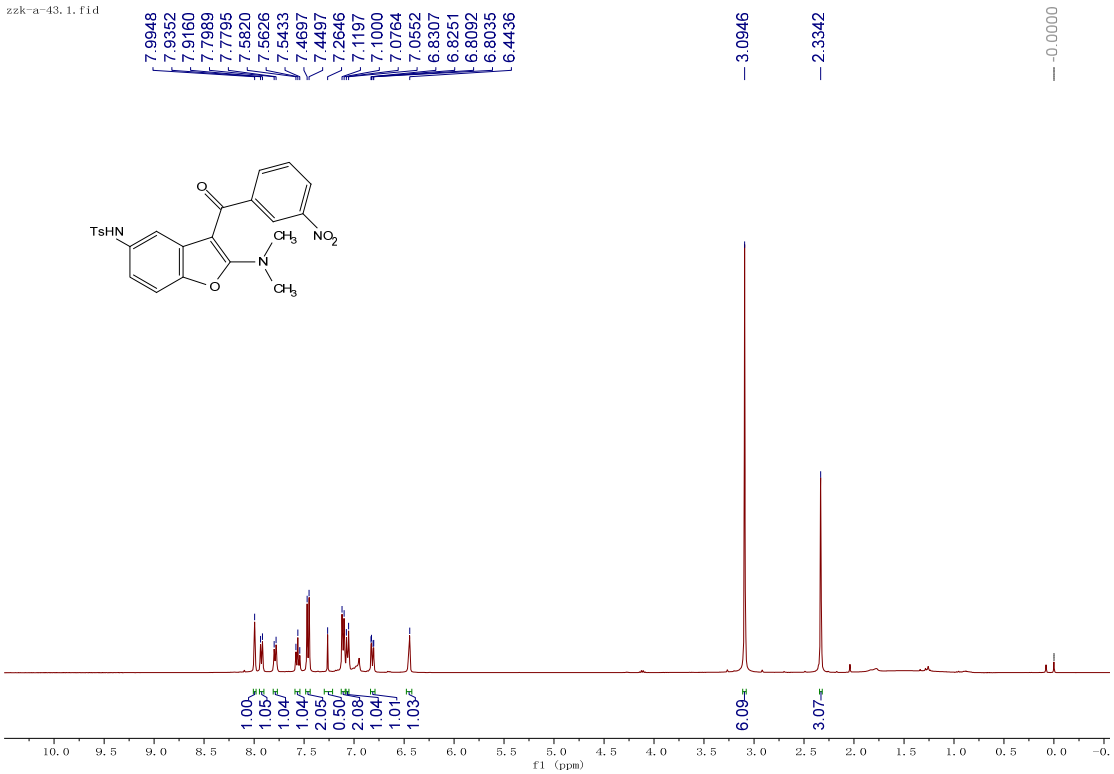
^{19}F NMR spectrum of **5d** ($CDCl_3$, 376 MHz)



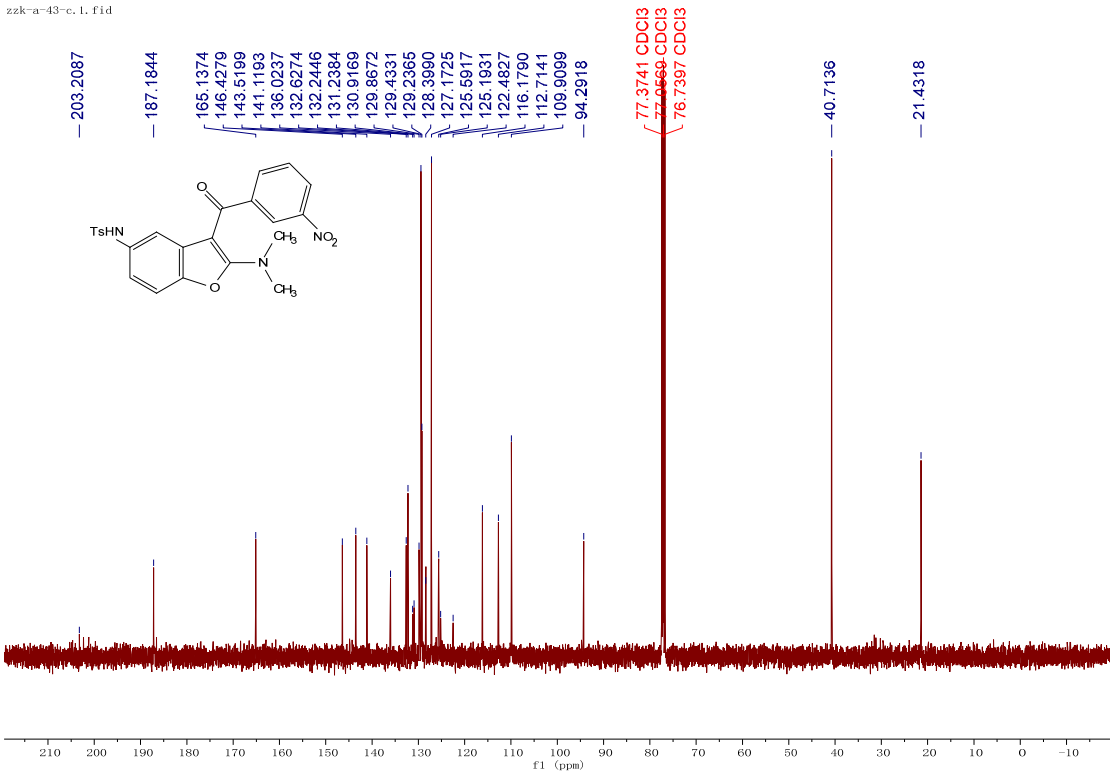
^{1}H NMR spectrum of **5e** ($CDCl_3$, 400 MHz)



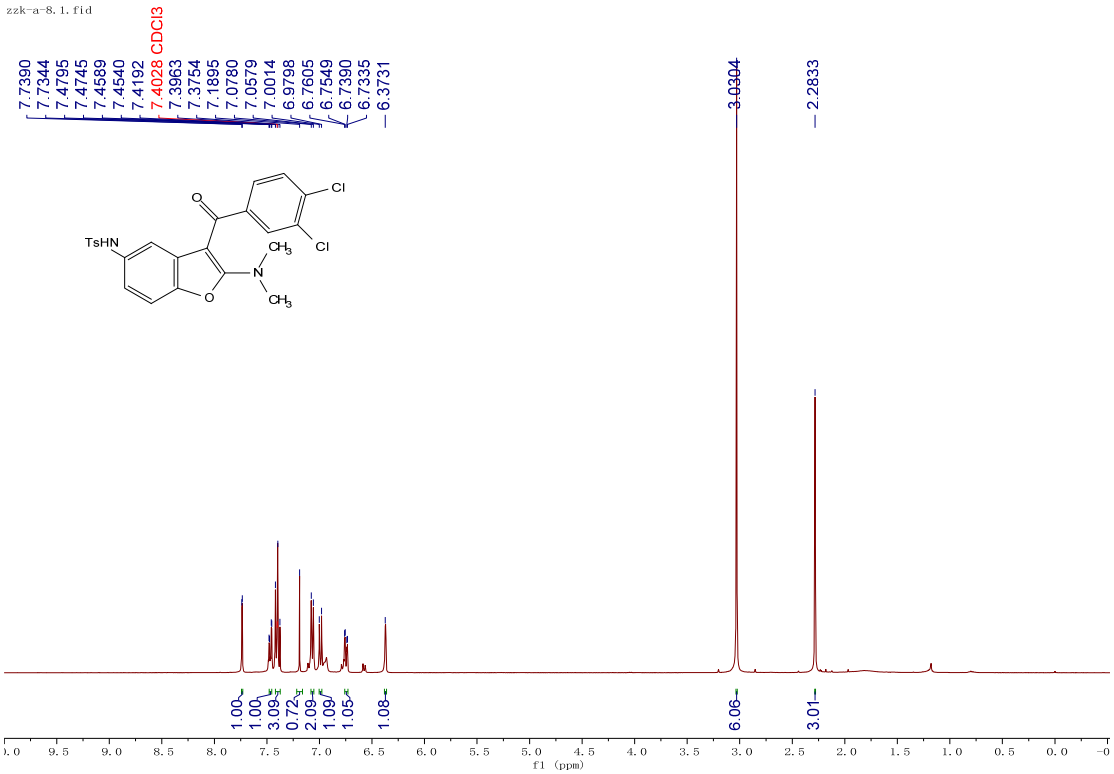
^{13}C NMR spectrum of **5e** ($CDCl_3$, 100 MHz)



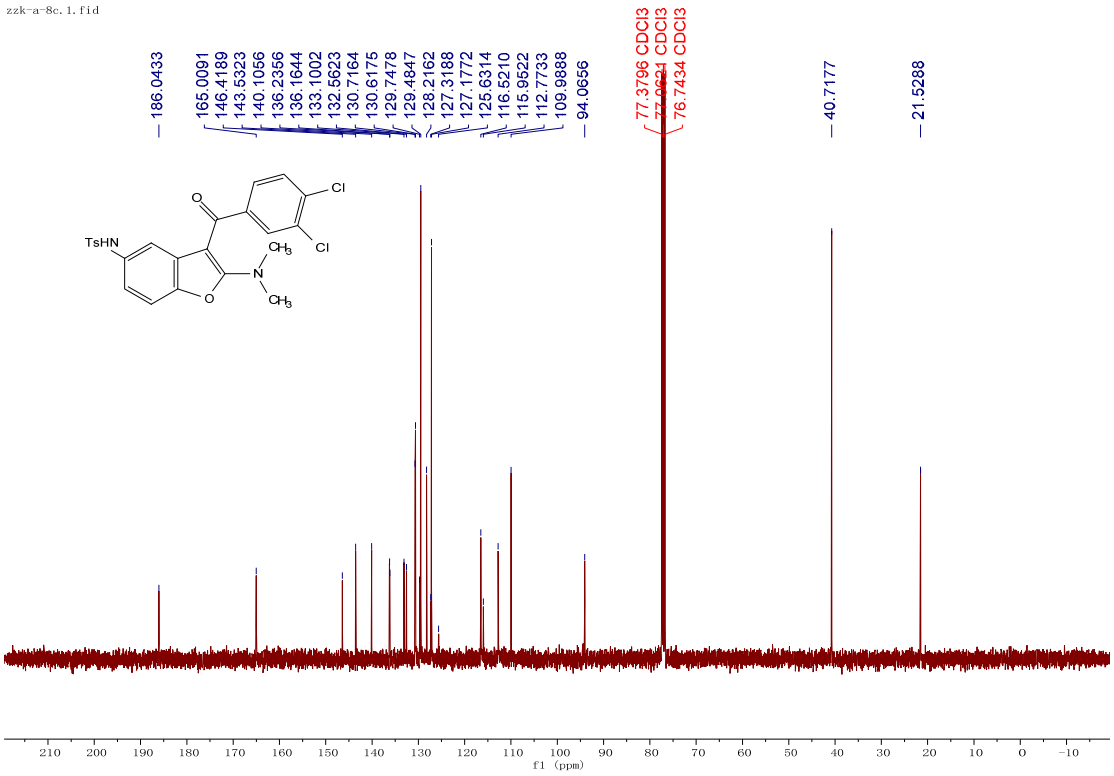
^{1}H NMR spectrum of **5f** ($CDCl_3$, 400 MHz)



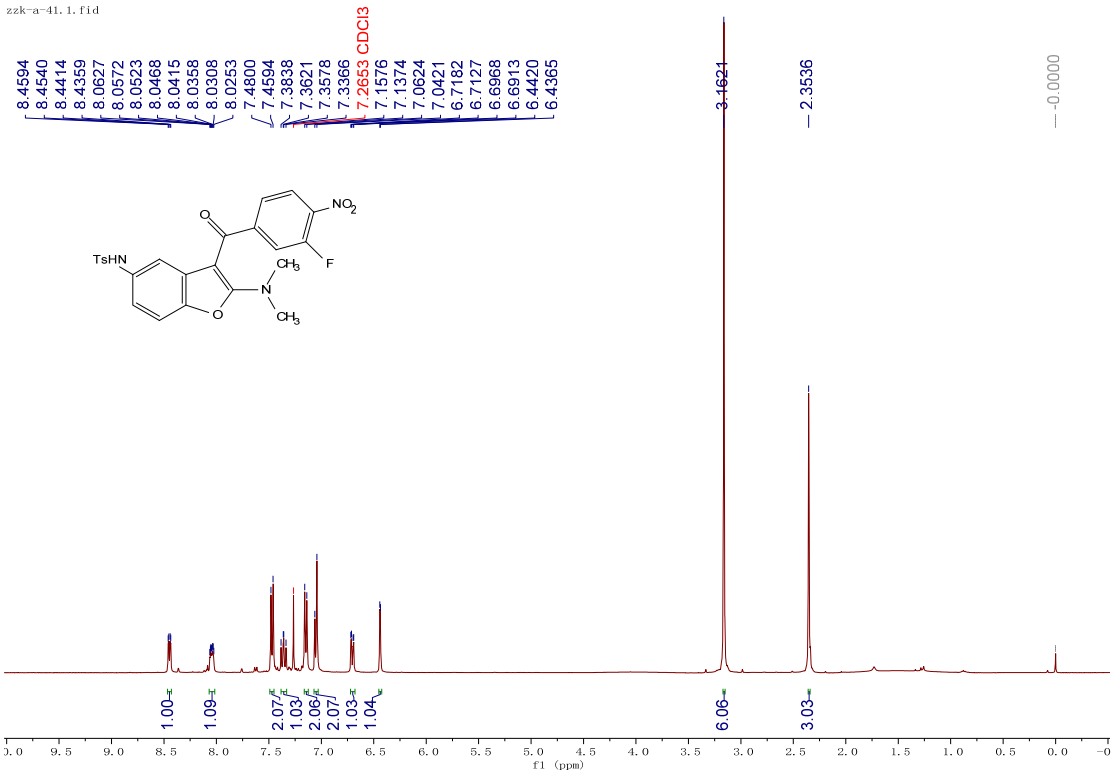
^{13}C NMR spectrum of **5f** ($CDCl_3$, 100 MHz)



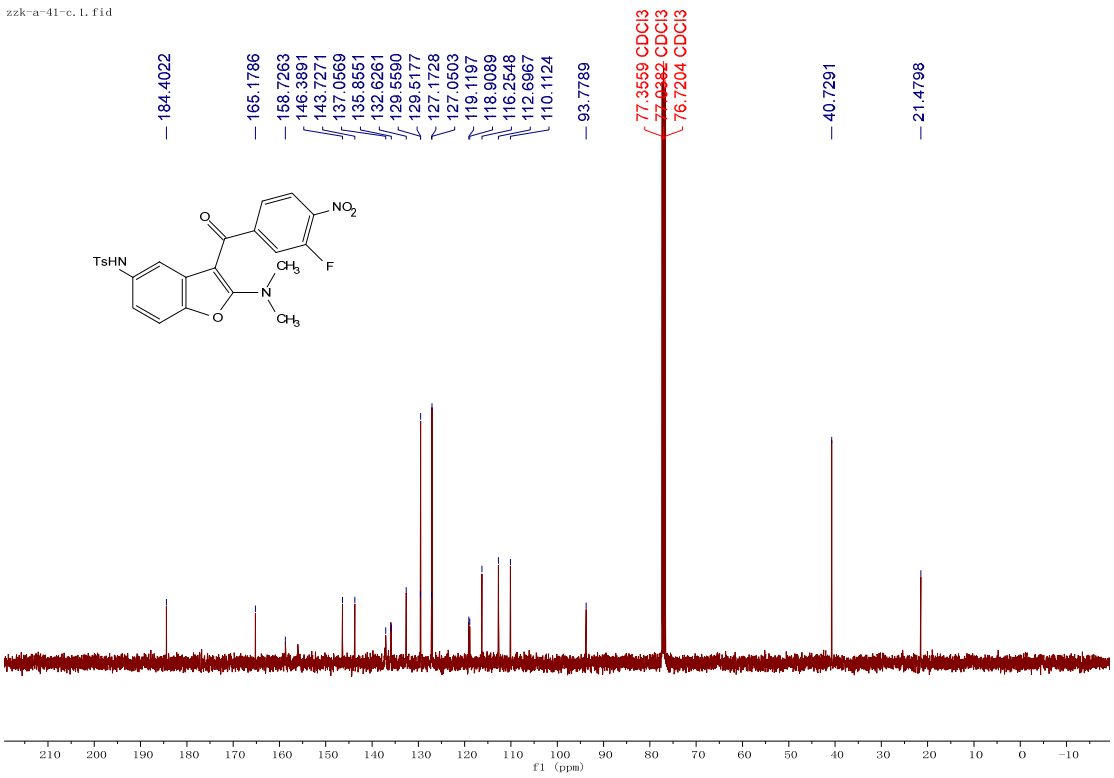
^{1}H NMR spectrum of **5g** ($CDCl_3$, 400 MHz)



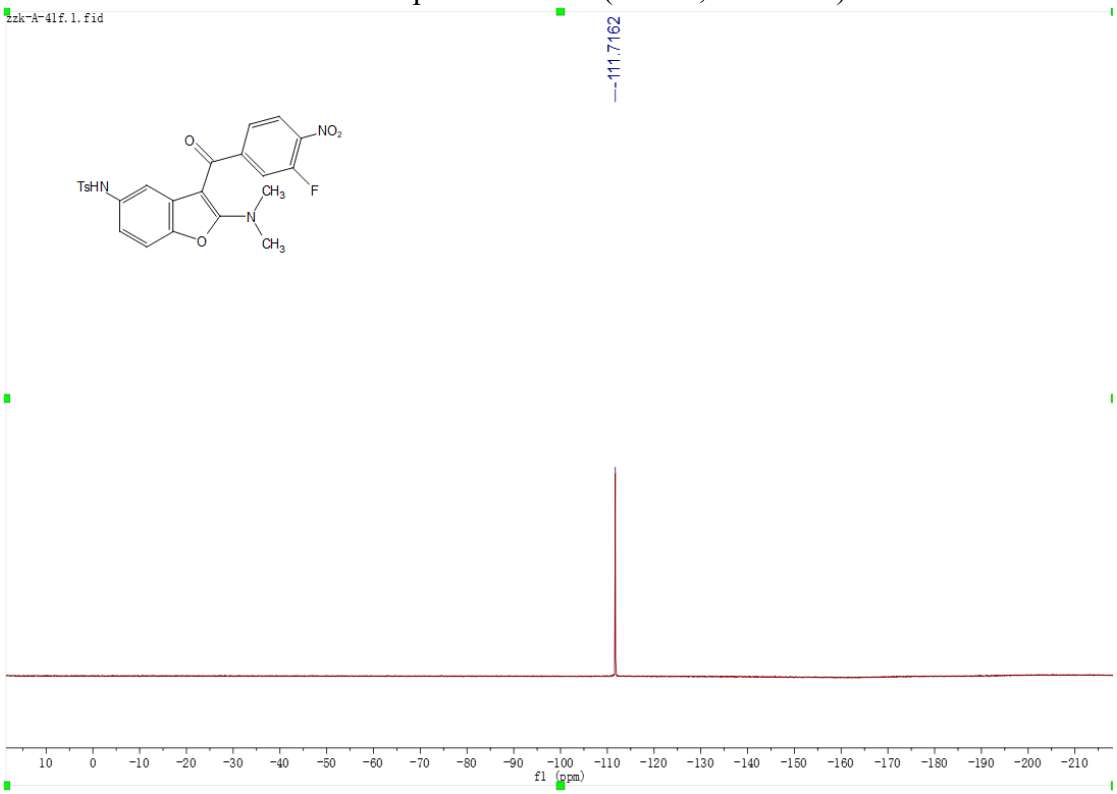
^{13}C NMR spectrum of **5g** ($CDCl_3$, 100 MHz)



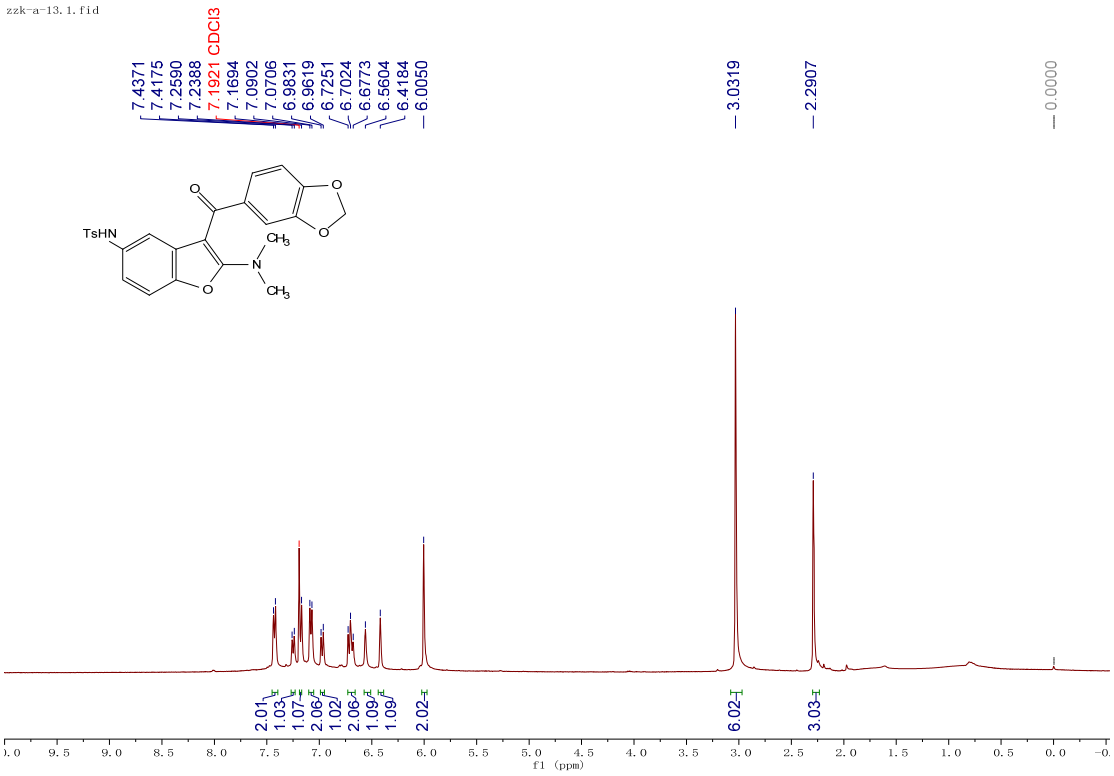
^{1}H NMR spectrum of **5h** ($CDCl_3$, 400 MHz)



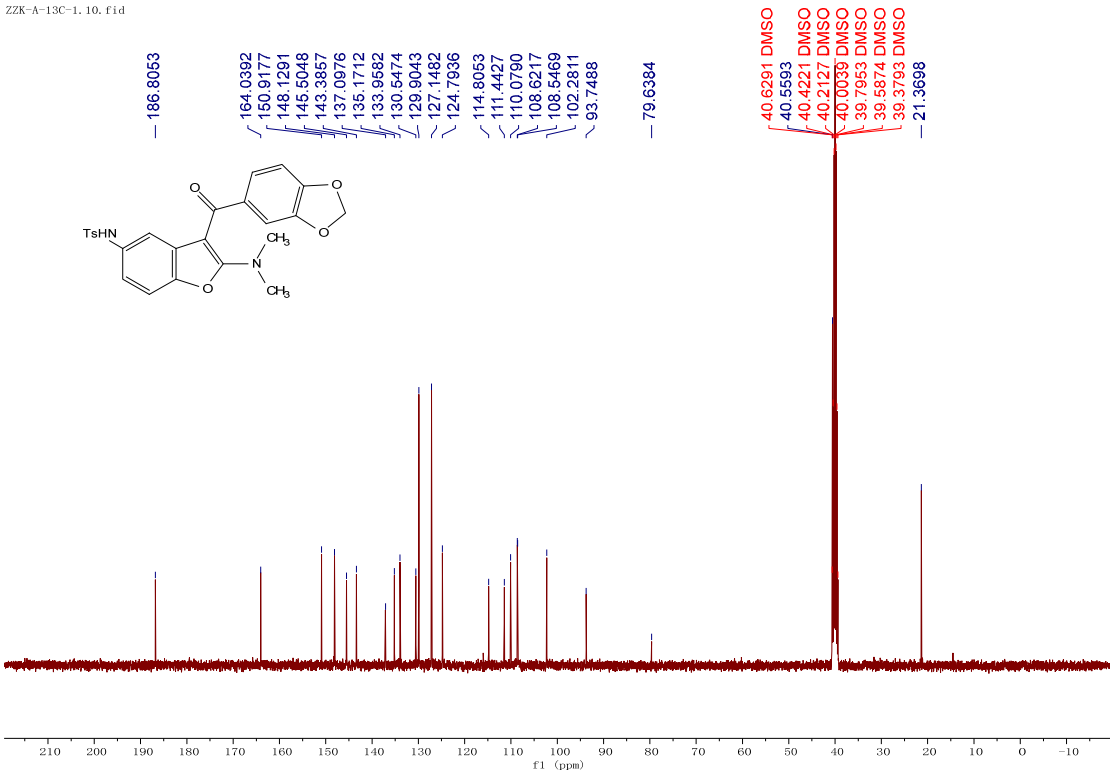
^{13}C NMR spectrum of **5h** ($CDCl_3$, 100 MHz)



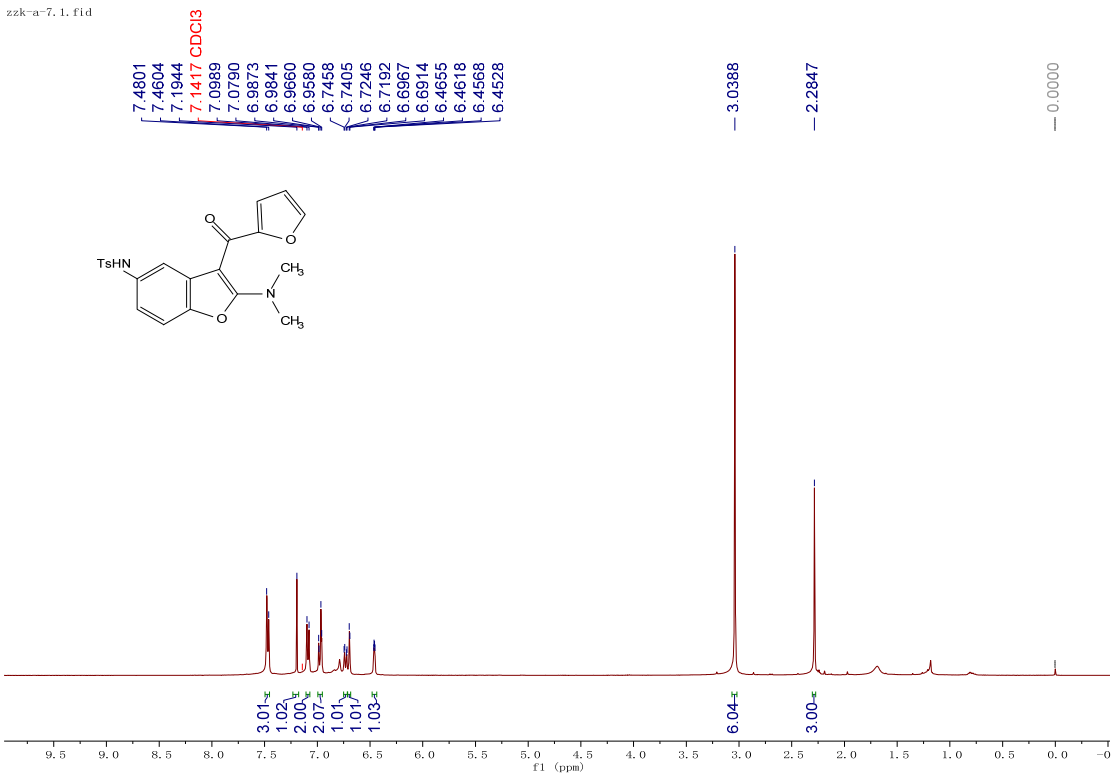
^{19}F NMR spectrum of **5h** ($CDCl_3$, 376 MHz)



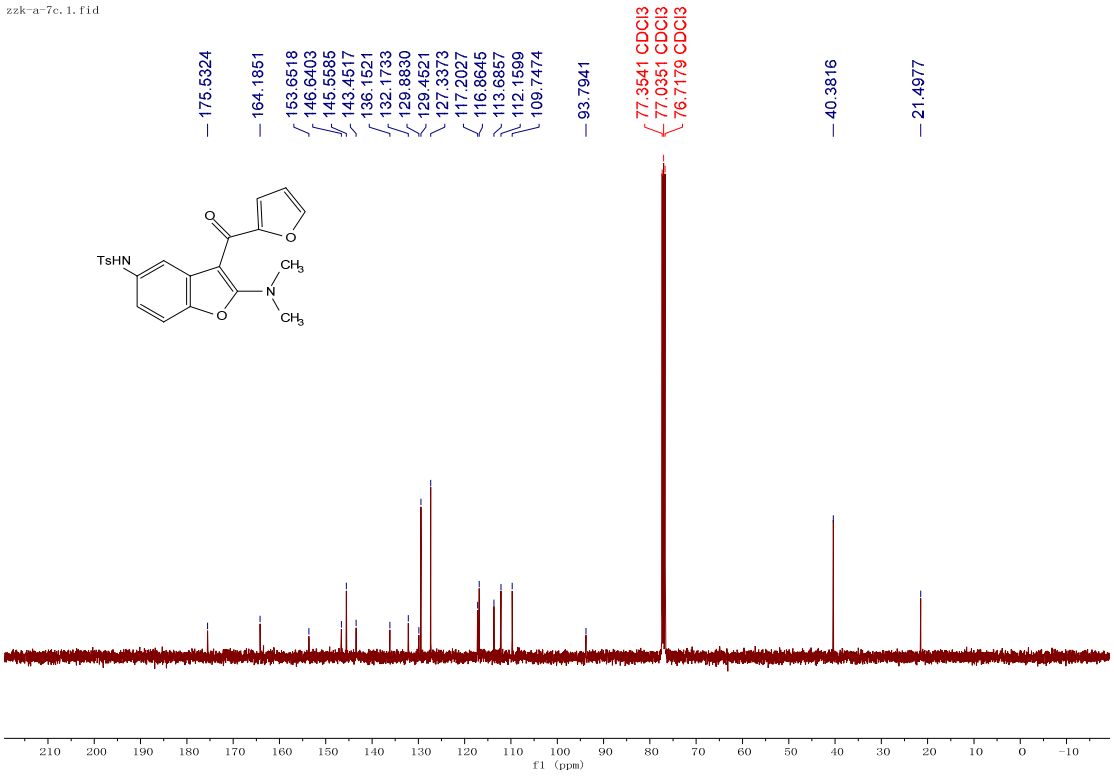
^{1}H NMR spectrum of **5i** ($CDCl_3$, 400 MHz)



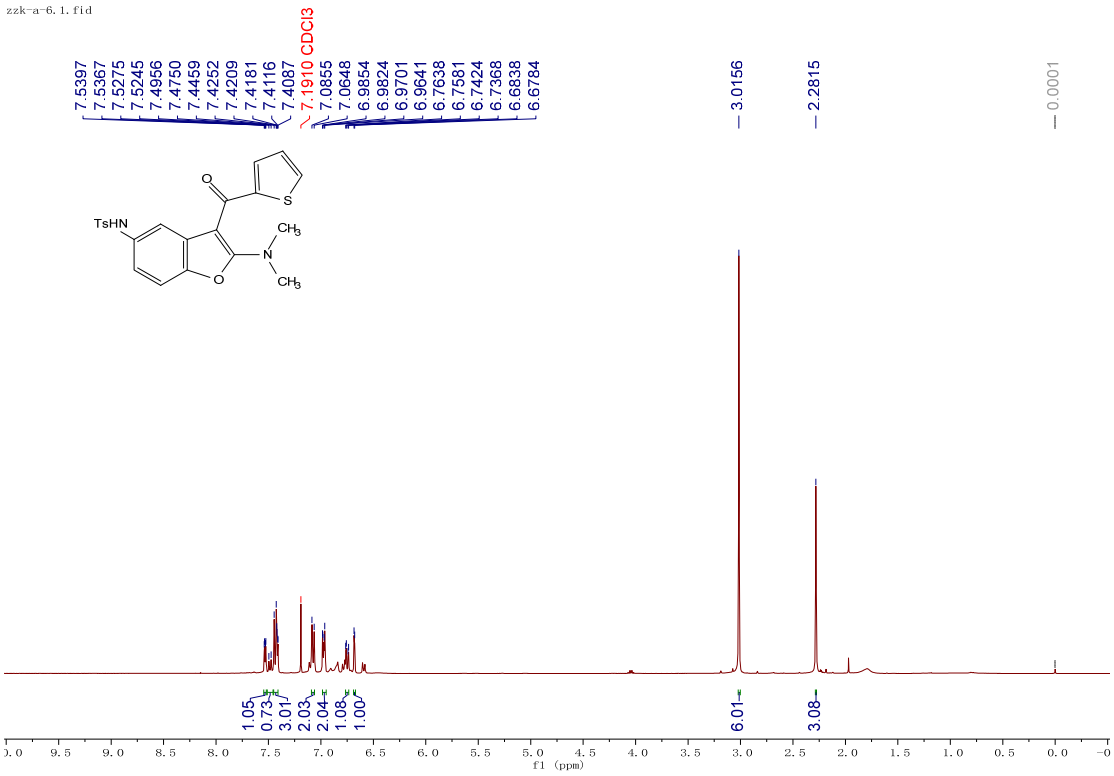
^{13}C NMR spectrum of **5i** ($CDCl_3$, 100 MHz)



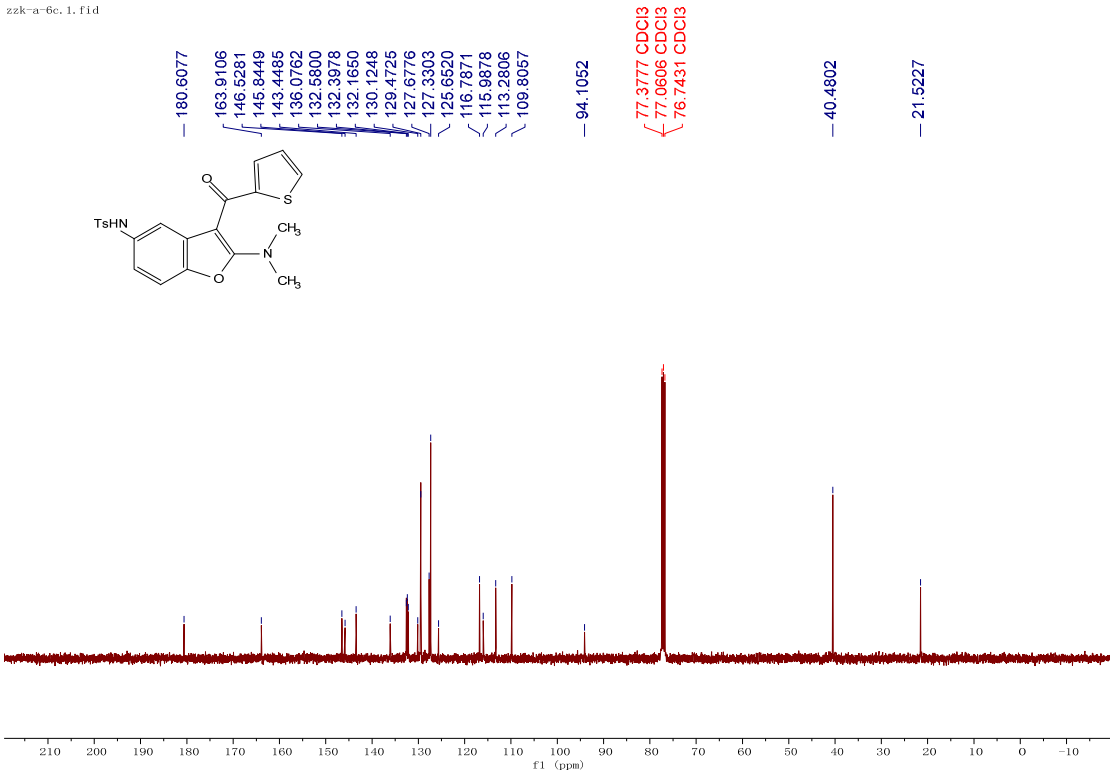
^{1}H NMR spectrum of **5j** ($CDCl_3$, 400 MHz)



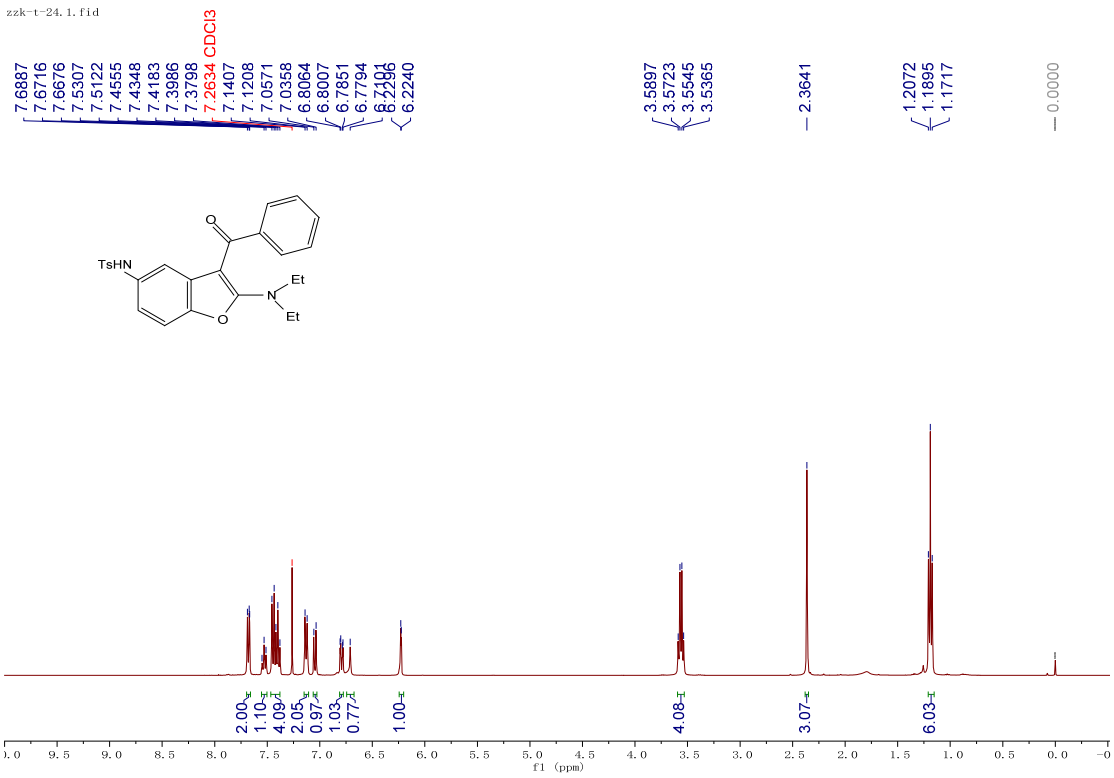
^{13}C NMR spectrum of **5j** ($CDCl_3$, 100 MHz)



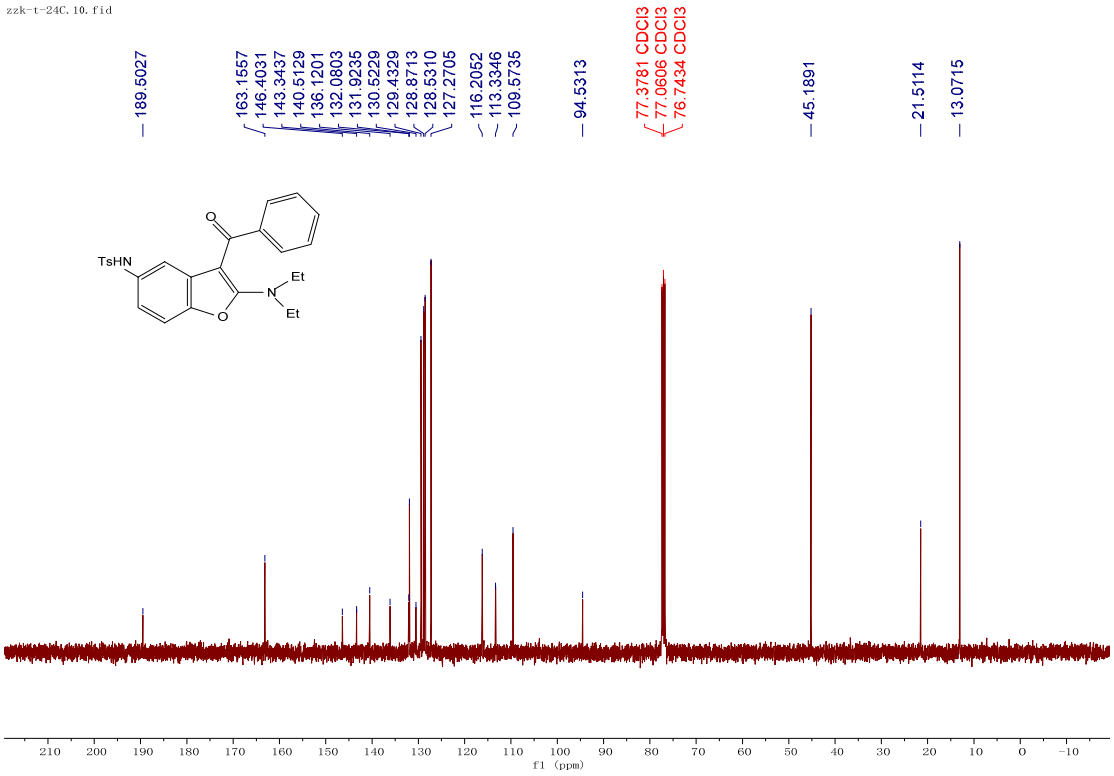
^{1}H NMR spectrum of **5k** ($CDCl_3$, 400 MHz)



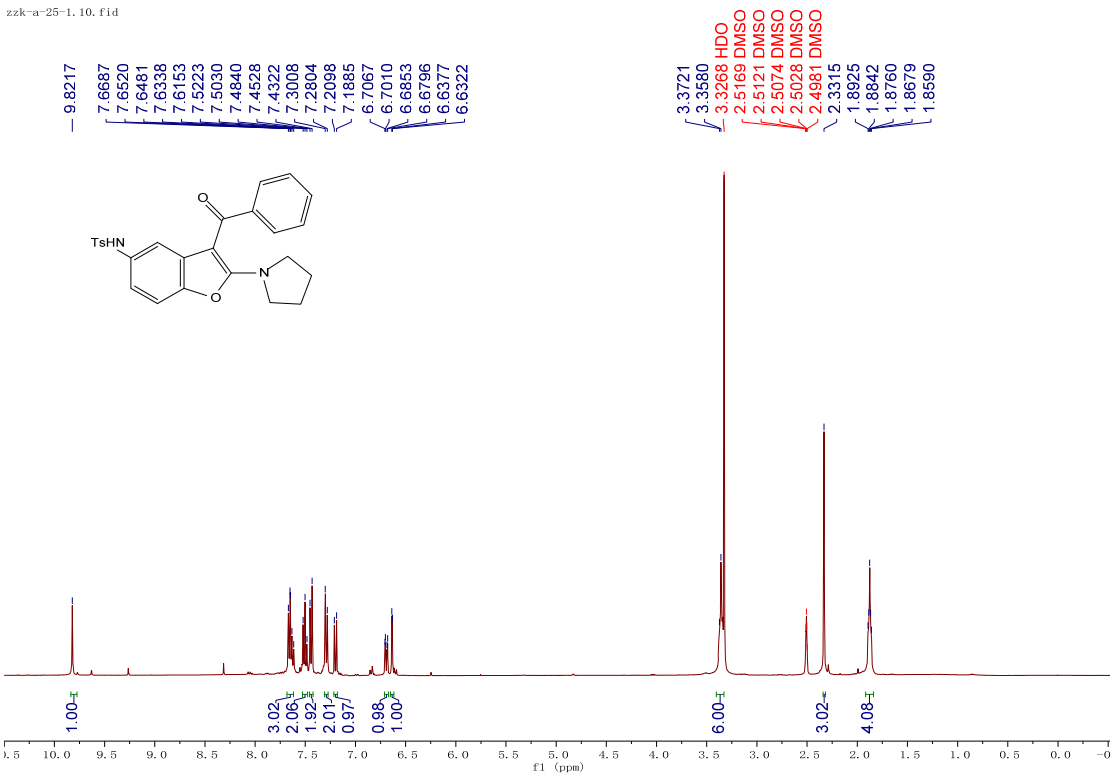
^{13}C NMR spectrum of **3d** ($CDCl_3$, 100 MHz)



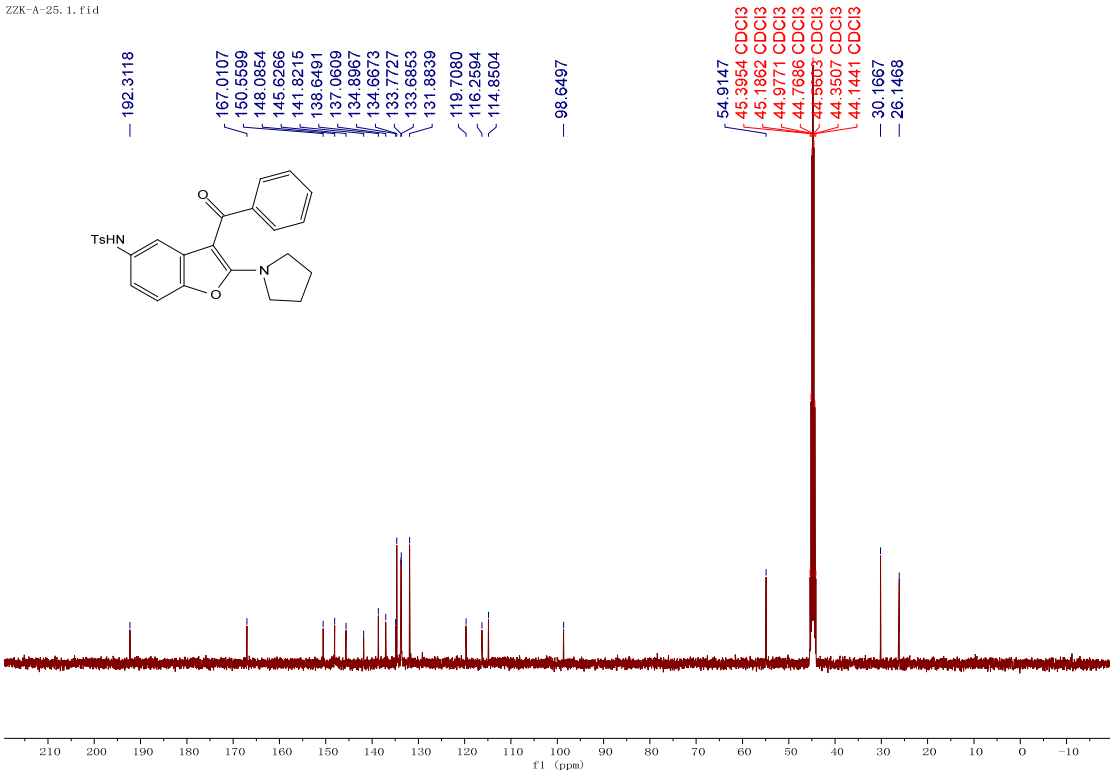
^{1}H NMR spectrum of **5l** ($CDCl_3$, 400 MHz)



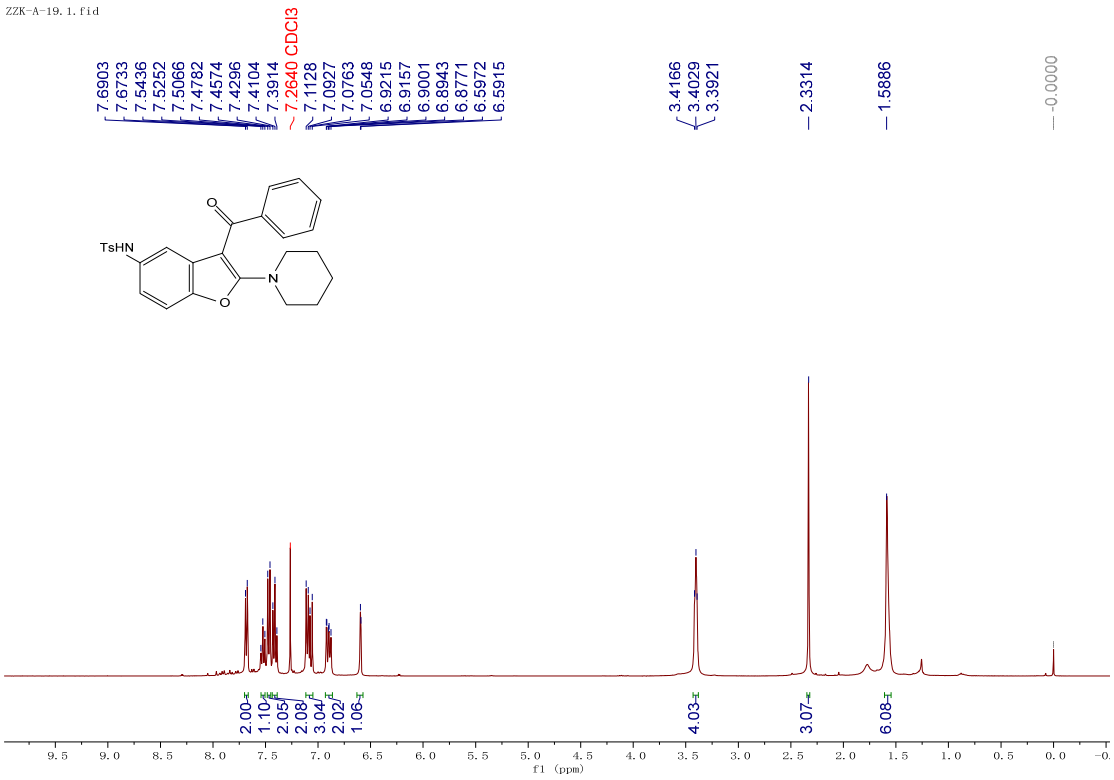
^{13}C NMR spectrum of **5l** ($CDCl_3$, 100 MHz)



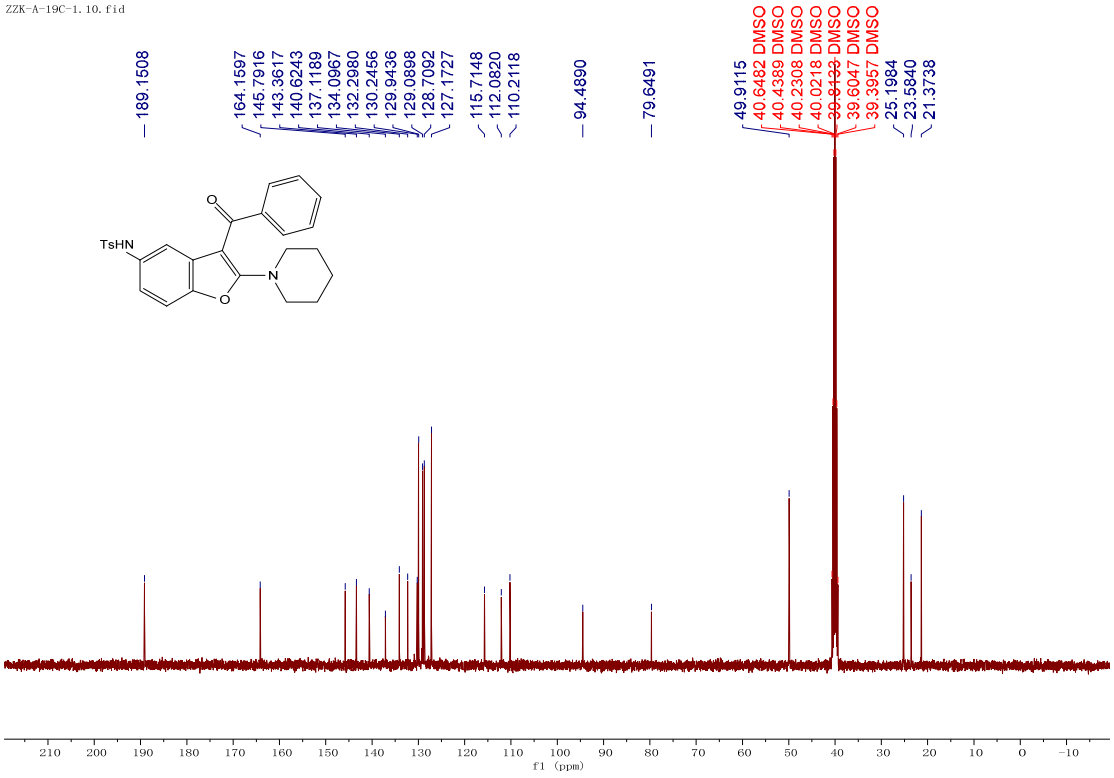
^{1}H NMR spectrum of **5m** ($CDCl_3$, 400 MHz)



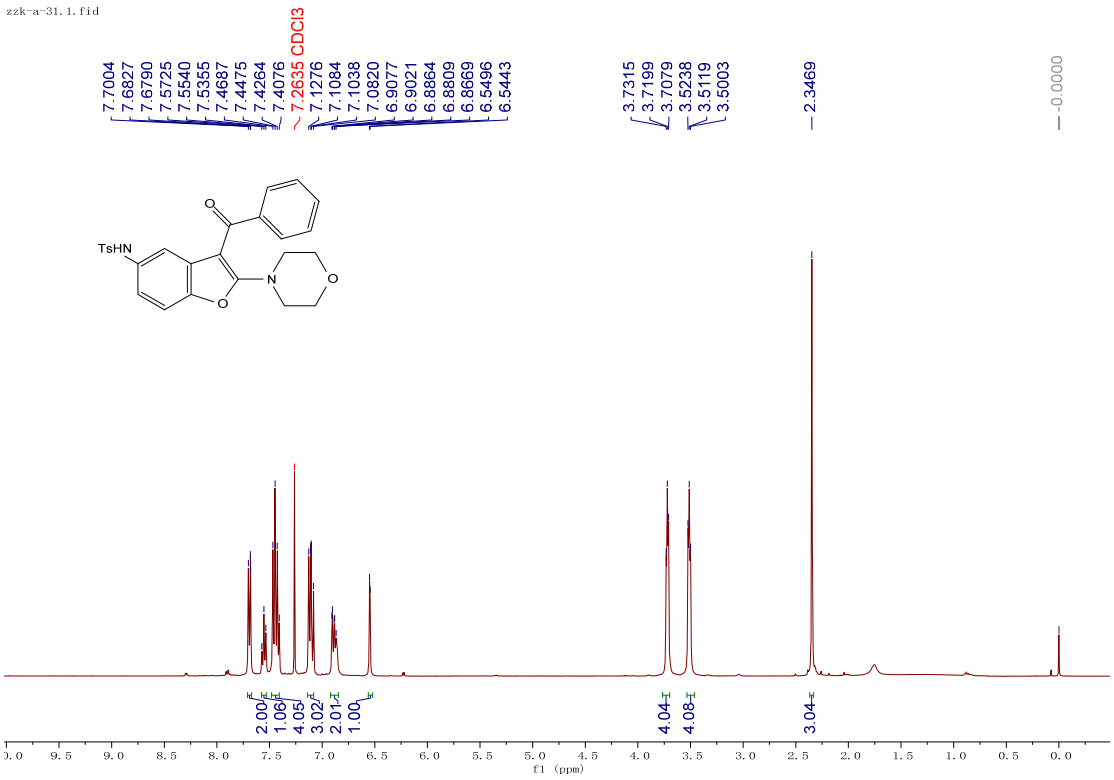
^{13}C NMR spectrum of **5m** ($CDCl_3$, 100 MHz)



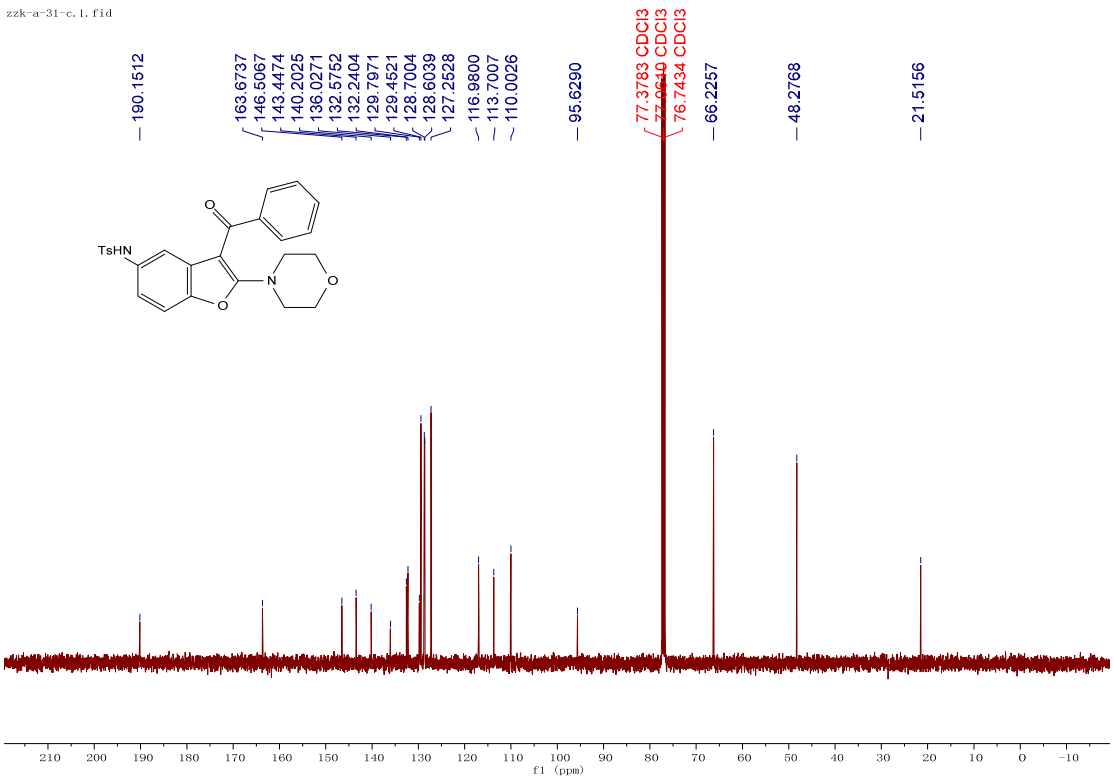
^{1}H NMR spectrum of **5n** ($CDCl_3$, 400 MHz)



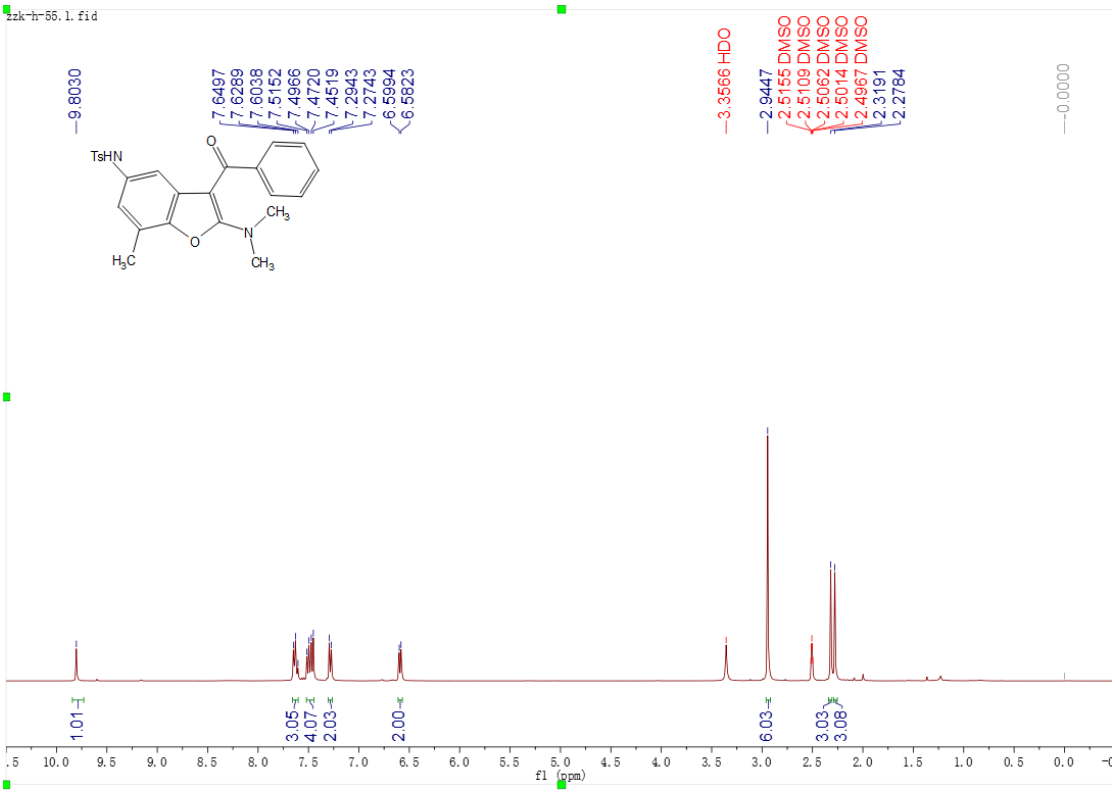
^{13}C NMR spectrum of **5n** ($CDCl_3$, 100 MHz)



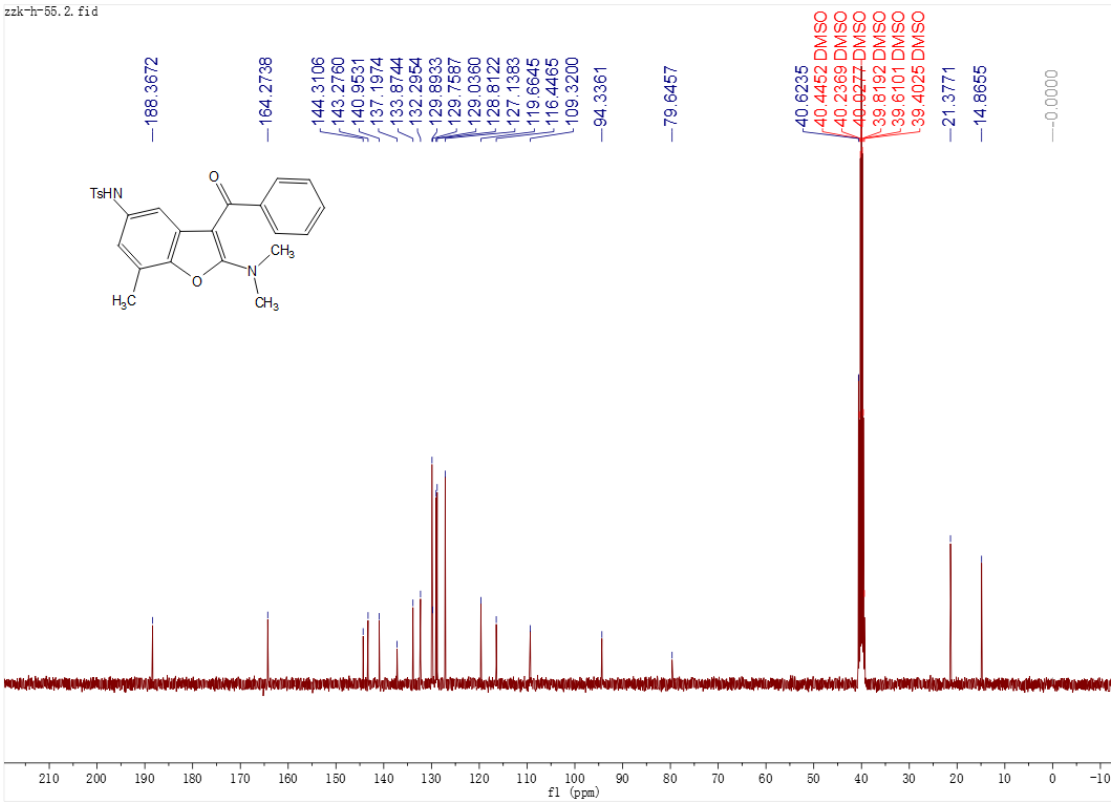
^{1}H NMR spectrum of **5o** ($CDCl_3$, 400 MHz)



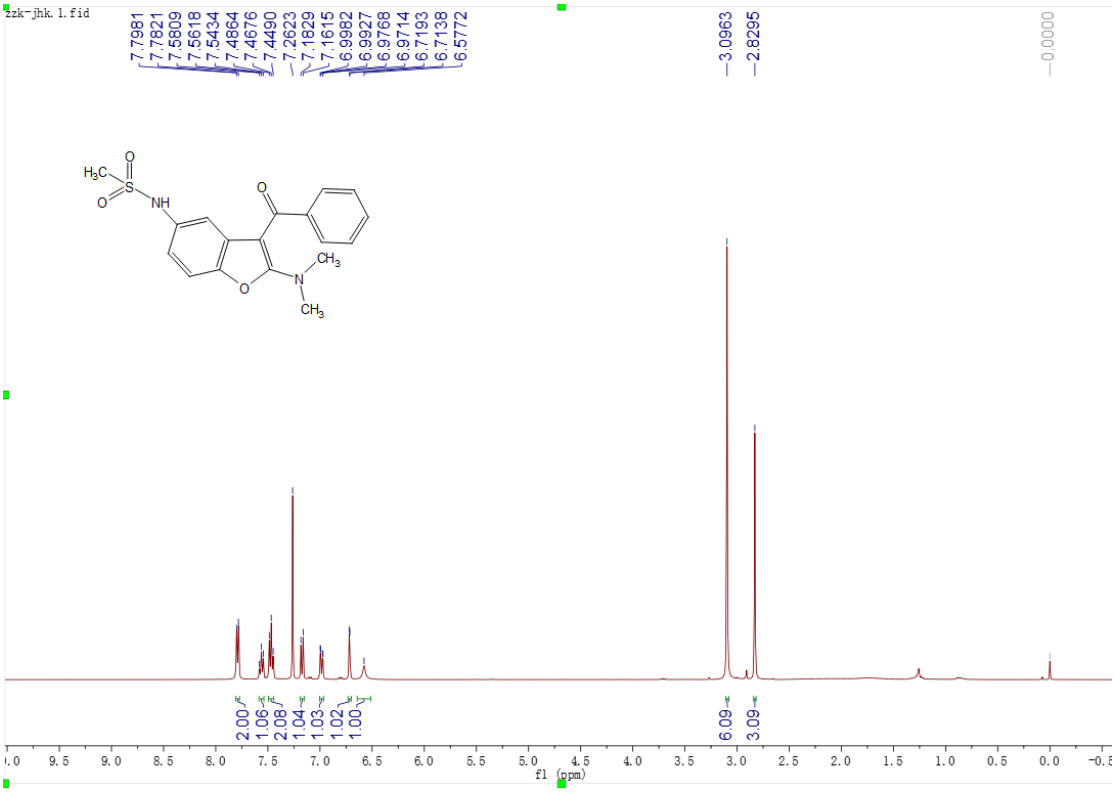
^{13}C NMR spectrum of **5o** ($CDCl_3$, 100 MHz)



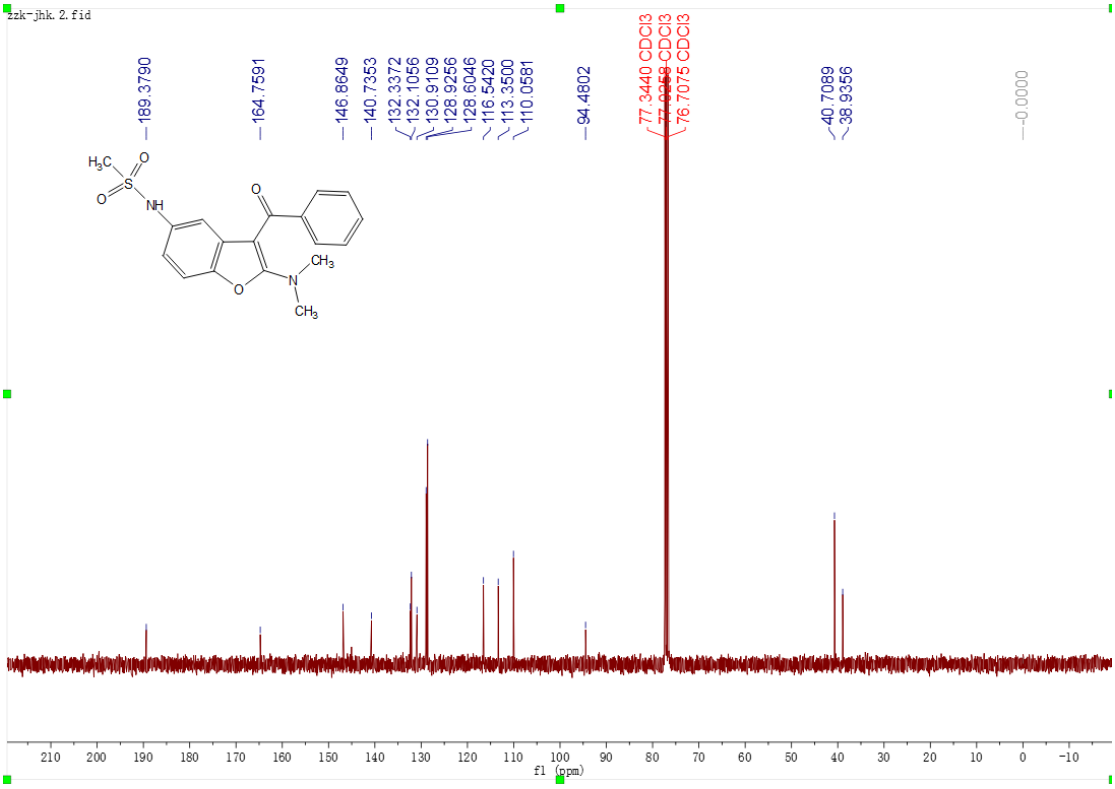
^{1}H NMR spectrum of **5p** (DMSO-d_6, 400 MHz)



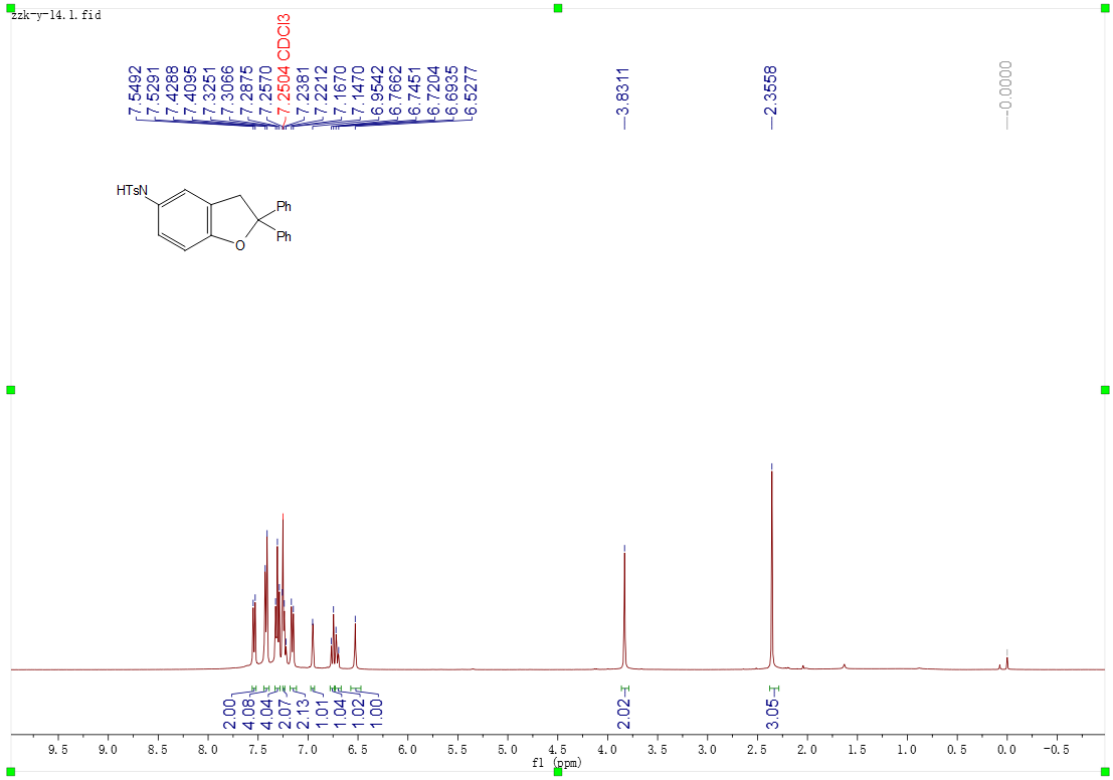
^{13}C NMR spectrum of **5p** (DMSO-d_6, 100 MHz)



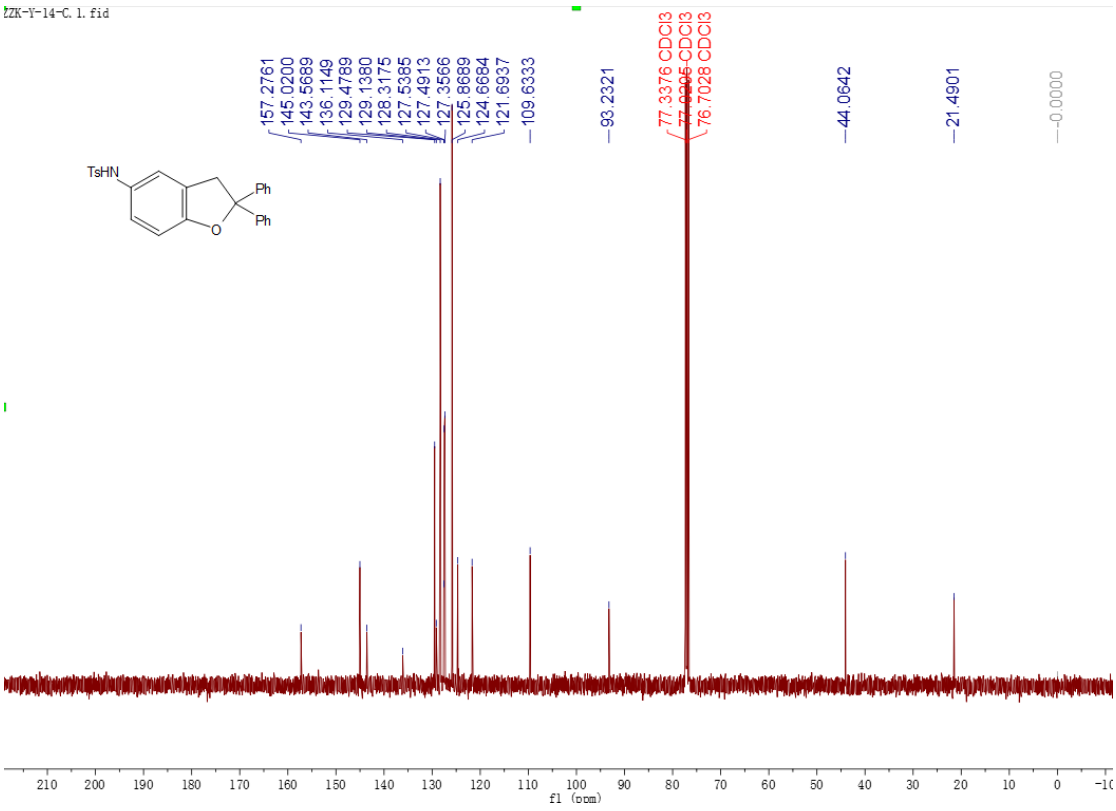
^{1}H NMR spectrum of **5q** ($CDCl_3$, 400 MHz)



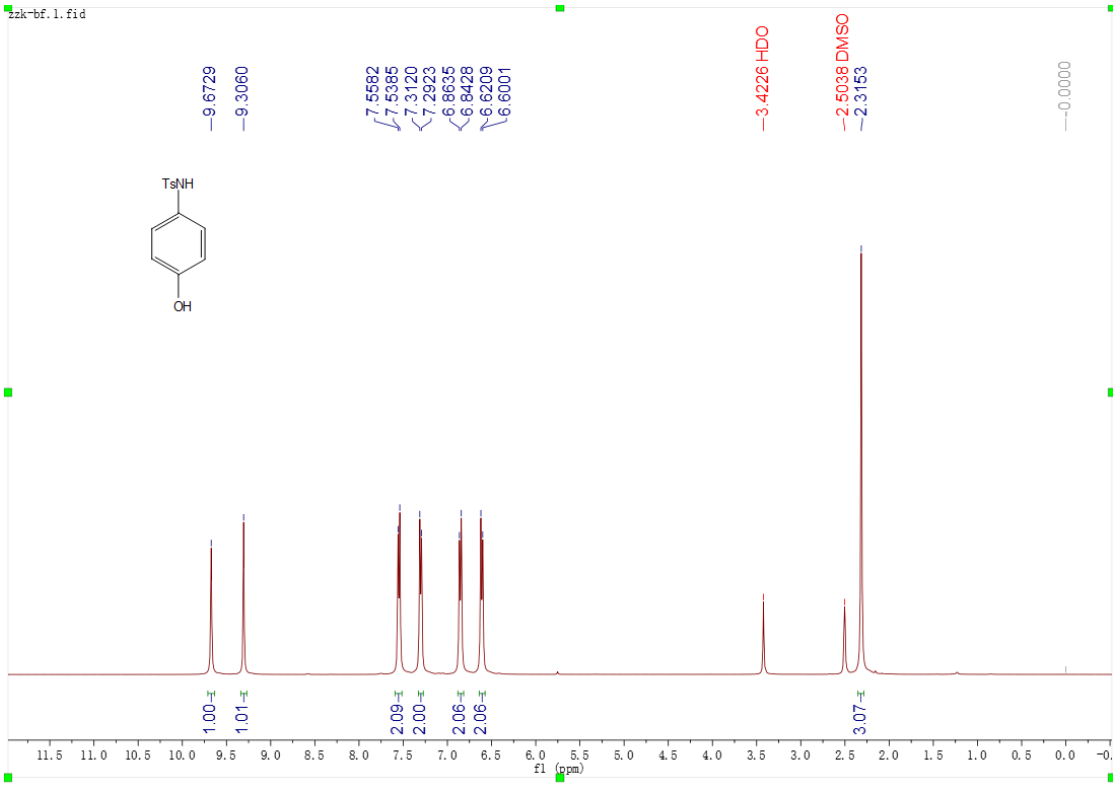
^{13}C NMR spectrum of **5q** ($CDCl_3$, 100 MHz)



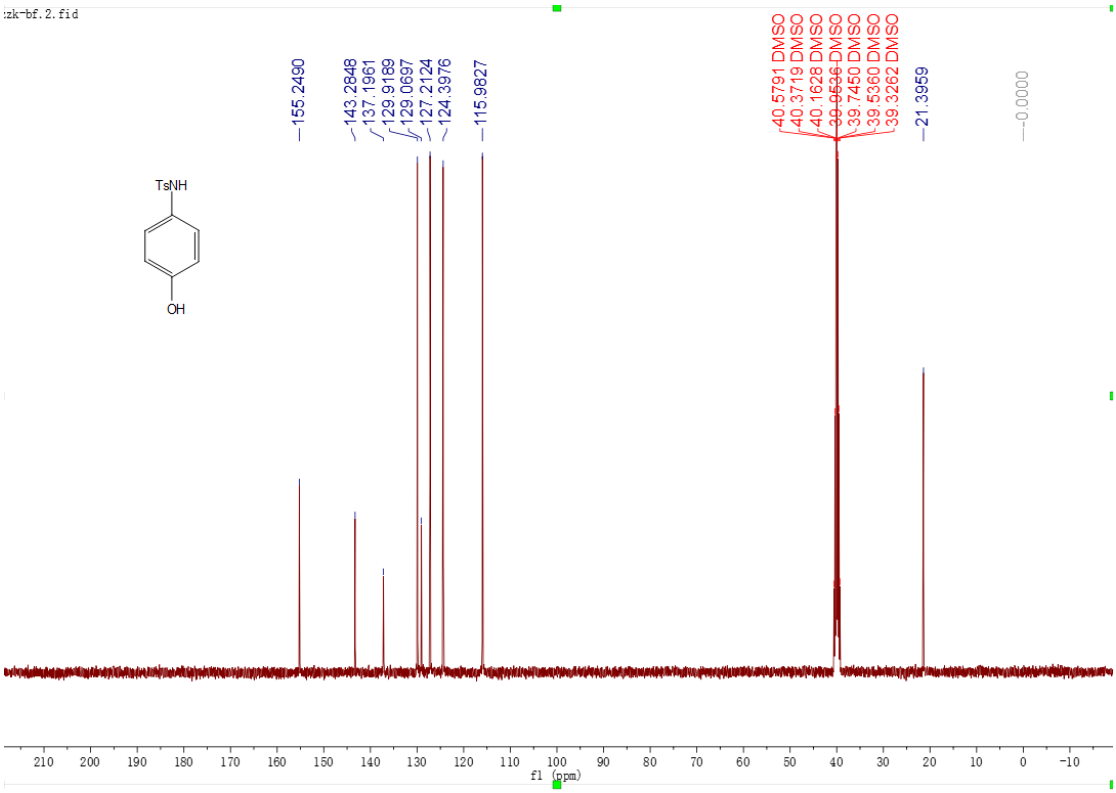
^{1}H NMR spectrum of **6** ($CDCl_3$, 400 MHz)



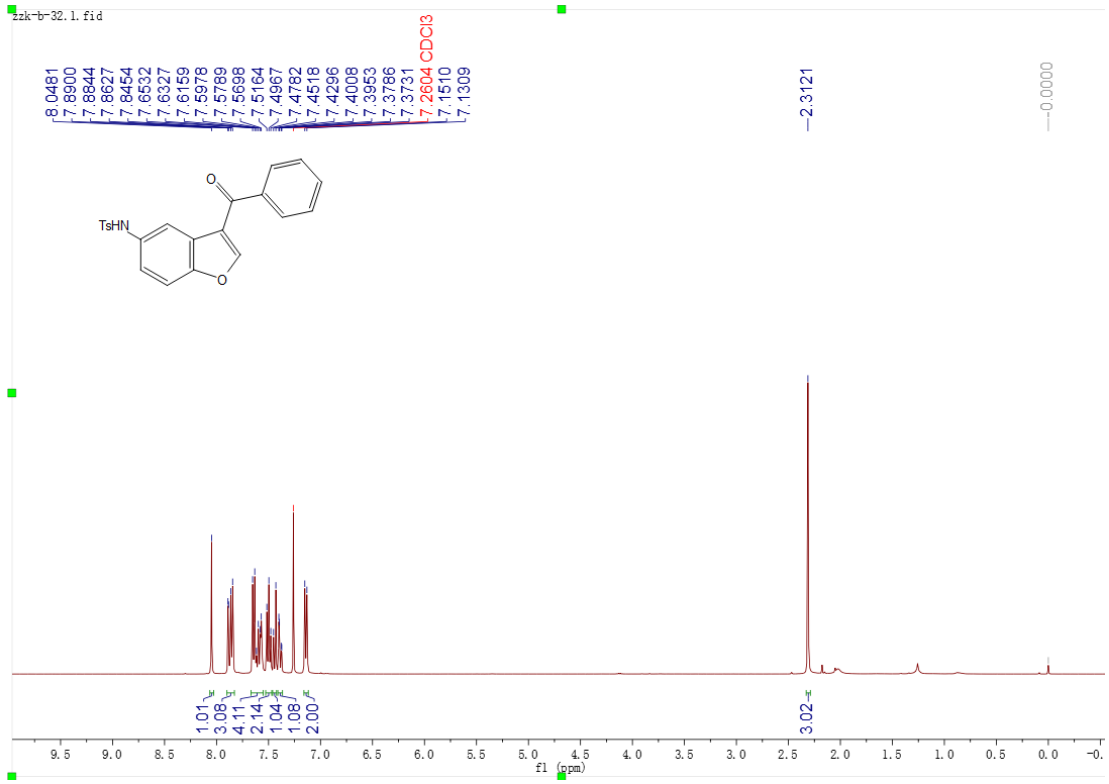
^{13}C NMR spectrum of **6** ($CDCl_3$, 100 MHz)



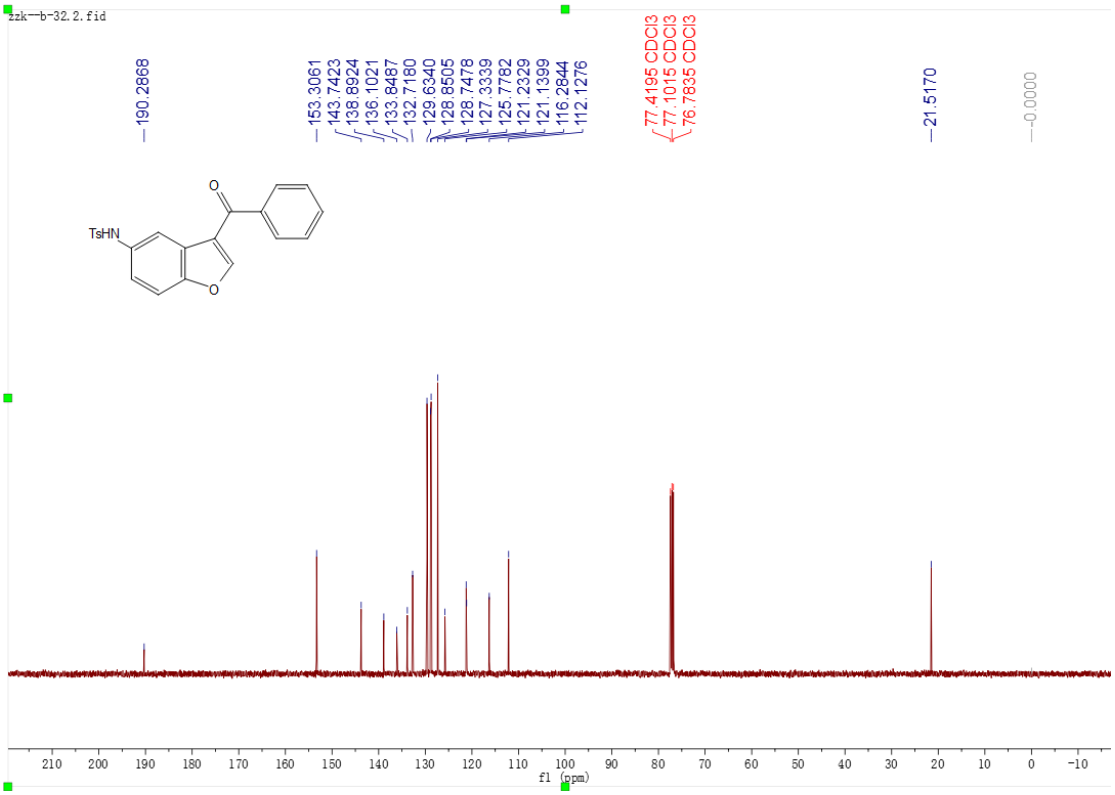
^{1}H NMR spectrum of **7** (DMSO-d_6, 400 MHz)



^{13}C NMR spectrum of **7** (DMSO-d_6, 100 MHz)



^{1}H NMR spectrum of **8** ($CDCl_3$, 400 MHz)



^{13}C NMR spectrum of **8** ($CDCl_3$, 100 MHz)