Supporting Information

Palladium-catalyzed decarboxylation of vinyloxazolidine-2,4-diones used in the divergent reaction with 2-alkynylphenols and 2-alkynylanilines

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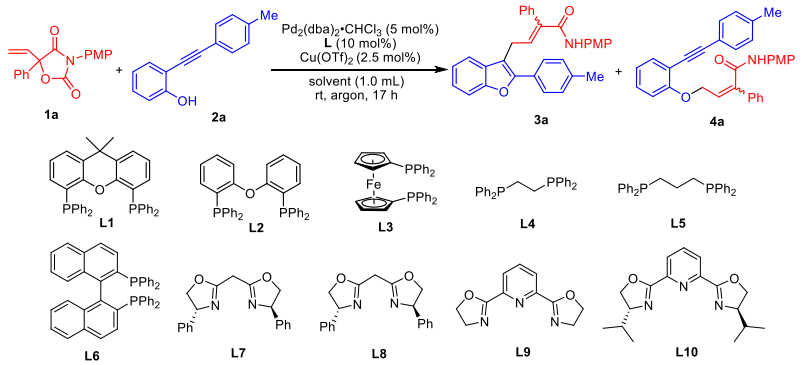
1. General information

Reagents were purchased from commercial sources and were used as received unless mentioned otherwise. Reactions were monitored by TLC. ^{1}H NMR and ^{13}C NMR spectra were recorded in $CDCl_3$ and DMSO-d_6. ^{1}H NMR chemical shifts are reported in ppm relative to tetramethylsilane (TMS) with the solvent resonance employed as internal standard ($CDCl_3$ at 7.26 ppm, DMSO-d_6 at 2.50 ppm). Data are reported as follows: chemical shift, multiplicity (s = singlet, br s = broad singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz) and integration. ^{13}C NMR chemical shifts are reported in ppm from tetramethylsilane (TMS) with the solvent resonance as internal standard ($CDCl_3$ at 77.16 ppm, DMSO-d_6 at 39.51 ppm). HRMS was recorded on Bruker Q TOF. Melting points were recorded on Büchi Melting Point B-545.

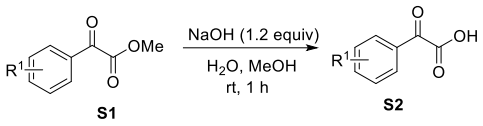
2. Optimization of the reaction conditions[a]



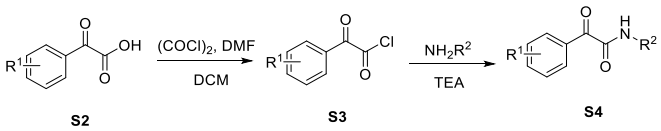
Entry	[Pd]	Solvent	Ligand	Additive	**3a** Yield (%)[b]	**3a** *Z*/*E*[c]	**4a** Yield (%)[b]
1	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L1**	--	18	1.5:1	21
2	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L2**	--	51	4.8:1	23
3	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L3**	--	28	1.2:1	24
4	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L4**	--	16	2.0:1	51
5	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L5**	--	10	2.8:1	58
6	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L6**	--	31	2.0:1	31
7	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L7**	--	17	2.1:1	21
8	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L8**	--	26	1.9:1	16
9	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L9**	--	37	1.4:1	28
10	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L10**	--	41	1.5:1	30
11	$Pd_2(dba)_3{\cdot}CHCl_3$	EtOH	**L2**	--	13	1.7:1	20
12	$Pd_2(dba)_3{\cdot}CHCl_3$	MeOH	**L2**	--	40	3.6:1	40
13	$Pd_2(dba)_3{\cdot}CHCl_3$	^{i}PrOH	**L2**	--	38	2.8:1	21
14	$Pd_2(dba)_3{\cdot}CHCl_3$	^{t}BuOH	**L2**	--	15	2.2:1	14
15	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L2**	--	51	4.8:1	23
16	$Pd_2(dba)_3{\cdot}CHCl_3$	DMF	**L2**	--	12	4.3:1	20
17	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L2**	$Cu(OTf)_2$	53	1:1.1	n.p.
18	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L2**	CuI	21	1:1.4	n.p.
19	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	**L2**	$Cu(OAc)_2$	27	1:1.1	n.p.
20	--	CH_3CN	**L2**	$Cu(OTf)_2$	n.p.	--	n.p.
21[d,]	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	--	$Cu(OTf)_2$	93	1:1.2	n.p.
22[d,e]	$Pd_2(dba)_3{\cdot}CHCl_3$	CH_3CN	PPh_3	--	0	--	94

[a]The reactions were carried out with **1a** (0.055 mmol), **2a** (0.050 mmol), and palladium catalyst (5 mol%) in a sealed tube with the specified solvent at room temperature under an argon atmosphere for 17 h. [b]Yields of two isomers were determined by ^{1}H NMR with CH_2Br_2 as internal standard. n.p. = no product. [c]The ratio of *Z*/*E* isomers was determined by ^{1}H NMR. [*d*]Entries 21 and 22 are the optimal reaction conditions used in our manuscript. [*e*]50 mol% PPh_3 was used, and run for 3 h.

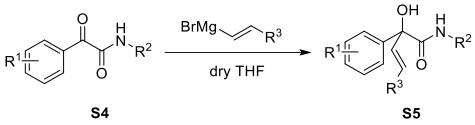
3. General procedures for the synthesis of compounds 1



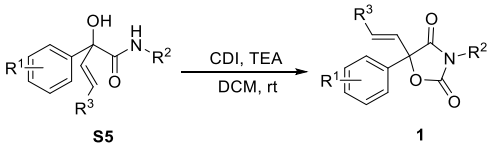
To a solution of **S1** (1.0 equiv.) in methanol (100 mL) and water (40 mL) was added NaOH (1.2 equiv.) under ice-bath. The mixture was stirred at room temperature for 1 h. After the completion of the reaction, methanol was removed in vacuo and the residue was acidified by conc. HCl to pH = 1 under ice bath. The mixture was extracted with ethyl acetate and washed with water, the combined organic extracts were dried over anhydrous sodium sulfate and concentrated under reduced pressure. The residue was used in the next step without further purification.



Oxalyl chloride (1.1 equiv.) and two drops of DMF were added to a solution of **S2** (1.0 equiv.) in dichloromethane under ice bath conditions and stirred at room temperature for 6 h. After the completion of the reaction, the suspension of 2-oxo-2-phenylacetyl chloride in DCM, was added amine (1.1 equiv.) and TEA (3.3 equiv.) at 0 ℃. The reaction was stirred at room temperature for 12 h. The reaction was quenched with water, and extracted with DCM. The combined organic extracts were dried over anhydrous sodium sulfate and concentrated under reduced pressure. The residue was purified by flash chromatography to provide **S4**.



S4 (1.0 equiv.) was suspended in anhydrous THF under argon atmosphere and then cooled to 0 ℃. Then 1 M solution of vinylmagnesiumbromide (2.5 equiv.) was added slowly via cannulating needle and the solution was stirred for 2 h at room temperature. The mixture was quenched with saturated aqueous NH_4Cl and extracted with DCM. The extracts were successively washed with water and brine, dried over anhydrous sodium sulfate and concentrated in vacuo. The residue was purified by chromatography.

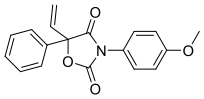


Et_3N (2.0 equiv.) and CDI (3.0 equiv.) were added to a solution of **S5** (1.0 equiv.) in DCM. The resulting solution was stirred at room temperature for 6 h. The residue was cooled to room

temperature and then purified by flash column chromatography to afford product **1**. If necessary, the crude product can be recrystallized in ethyl acetate and hexane.

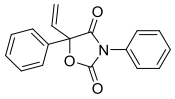
1a-1s were prepared according to the above method for the preparation of **1**. The data **1a-1h, 1m-1p** were in accordance with previous work[1]. The data **1l** was in accordance with previous work[2].

3-(4-methoxyphenyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1a)



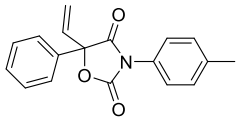
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.60 (m, 2H), 7.50 – 7.39 (m, 3H), 7.35 – 7.27 (m, 2H), 7.02 – 6.94 (m, 2H), 6.28 (dd, *J* = 17.2, 10.7 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.51 (d, *J* = 10.8 Hz, 1H), 3.83 (s, 3H).

3,5-diphenyl-5-vinyloxazolidine-2,4-dione (1b)



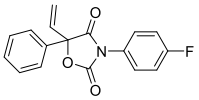
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.68 – 7.60 (m, 2H), 7.53 – 7.36 (m, 8H), 6.29 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.51 (d, *J* = 10.7 Hz, 1H).

5-phenyl-3-(*p*-tolyl)-5-vinyloxazolidine-2,4-dione (1c)



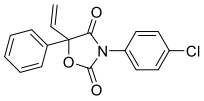
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.68 – 7.60 (m, 2H), 7.50 – 7.37 (m, 3H), 7.28 (s, 4H), 6.28 (dd, *J* = 17.1, 10.6 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.51 (d, *J* = 10.6 Hz, 1H), 2.39 (s, 3H).

3-(4-fluorophenyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1d)



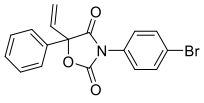
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.58 (m, 2H), 7.51 – 7.35 (m, 5H), 7.23 – 7.12 (m, 2H), 6.28 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.52 (d, *J* = 10.7 Hz, 1H).

3-(4-chlorophenyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1e)



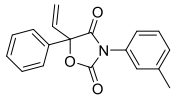
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.62 (d, *J* = 7.1 Hz, 2H), 7.50 – 7.37 (m, 7H), 6.27 (dd, *J* = 17.2, 10.6 Hz, 1H), 5.71 (d, *J* = 17.1 Hz, 1H), 5.52 (d, *J* = 10.7 Hz, 1H).

3-(4-bromophenyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1f)



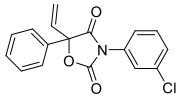
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.57 (m, 4H), 7.48 – 7.40 (m, 3H), 7.37 – 7.30 (m, 2H), 6.27 (dd, *J* = 17.2, 10.7 Hz, 1H), 5.71 (d, *J* = 17.1 Hz, 1H), 5.52 (d, *J* = 10.7 Hz, 1H).

5-phenyl-3-(*m*-tolyl)-5-vinyloxazolidine-2,4-dione (1g)



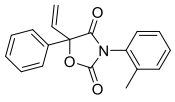
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.60 (m, 2H), 7.48 – 7.39 (m, 3H), 7.36 (m, 1H), 7.25 – 7.15 (m, 3H), 6.28 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.51 (d, *J* = 10.7 Hz, 1H), 2.39 (s, 3H).

3-(3-chlorophenyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1h)



^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.66 – 7.58 (m, 2H), 7.52 – 7.33 (m, 7H), 6.28 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.72 (d, *J* = 17.1 Hz, 1H), 5.53 (d, *J* = 10.6 Hz, 1H).

5-phenyl-3-(*o*-tolyl)-5-vinyloxazolidine-2,4-dione (1i)



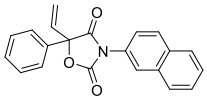
White solid, m.p.70.3 – 71.0 ºC.

Mixture of **major** and **minor** isomers, **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.65 (m, 3.7H), 7.50 – 7.27 (m, 11.1H), 7.24 – 7.17 (m, 0.9H), 7.12 (dd, *J* = 7.9, 1.3 Hz, 1H), 6.31 (m, 1.8H), 5.78 (d, *J* = 6.8 Hz, 1H), 5.74 (d, *J* = 6.8 Hz, 0.9H), 5.55 (d, *J* = 4.9 Hz, 1H), 5.53 (d, *J* = 4.9 Hz, 0.9H), 2.23 (s, 3H), 2.06 (s, 2.6H).

Mixture of **major** and **minor** isomers, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 170.96, 153.23, 153.19, 136.17, 136.06, 135.02, 134.79, 133.78, 133.26, 131.57, 131.53, 130.39, 130.32, 129.61, 129.42, 129.37, 129.19, 129.15, 128.22, 128.11, 127.34, 125.58, 125.41, 118.62, 118.10, 88.04, 87.99, 17.58, 17.56.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{18}H_{16}NO_3$ 294.1131; found: 294.1125.

3-(naphthalen-2-yl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1j)



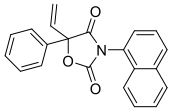
White solid, m.p.103.3 – 104.5 ºC.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.94 (d, *J* = 8.7 Hz, 2H), 7.91 – 7.82 (m, 2H), 7.71 – 7.64 (m, 2H), 7.59 – 7.38 (m, 6H), 6.32 (m, 1H), 5.76 (d, *J* = 17.3 Hz, 1H), 5.54 (d, *J* = 10.7 Hz, 1H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 171.0, 153.3, 134.9, 133.5, 133.2, 133.1, 129.6, 129.5, 129.2, 128.4, 128.2, 127.9, 127.4, 127.1, 125.5, 125.1, 123.0, 118.5, 87.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{21}H_{15}NO_3Na$ 352.0950; found: 352.0944.

3-(naphthalen-1-yl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1k)



White solid, m.p. 120.2 – 120.8 ºC.

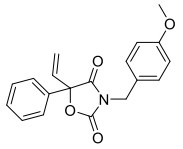
Mixture of **major** and **minor** isomers, **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.02 – 7.89 (m, 3.6H), 7.77 – 7.67 (m, 3.6H), 7.61 – 7.55 (m, 4H), 7.54 – 7.41 (m, 8.6H), 7.39 (dd, *J* = 7.2, 1.2 Hz, 1H), 7.34 (dd, *J* = 8.6, 1.2 Hz, 0.8H), 6.43 (dd, *J* = 17.0, 10.6 Hz, 1H), 6.39 – 6.31 (m, 0.8H), 5.90 (d, *J* = 17.1 Hz, 1H), 5.80 (d, *J* = 17.1 Hz, 0.8H), 5.64 (d, *J* = 10.7 Hz, 1H), 5.57 (d, *J* = 10.7 Hz, 0.8H).

Mixture of **major** and **minor** isomers, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 171.40, 171.38, 153.52, 135.09, 134.82, 134.60, 134.54, 133.96, 133.41, 130.97, 130.92, 129.73, 129.67, 129.47,

129.34, 129.21, 128.95, 128.87, 127.89, 127.83, 127.03, 126.96, 126.79, 126.70, 126.66, 125.61, 125.49, 125.45, 121.33, 118.63, 118.30, 88.28, 88.23.

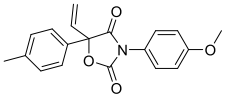
HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{21}H_{15}NO_3Na$ 352.0950; found: 352.0943.

3-(4-methoxybenzyl)-5-phenyl-5-vinyloxazolidine-2,4-dione (1l)



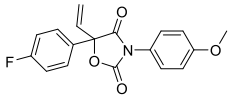
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.44 – 7.37 (m, 2H), 7.33 – 7.25 (m, 3H), 7.23 – 7.17 (m, 2H), 6.78 – 6.70 (m, 2H), 6.06 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.47 (d, *J* = 17.1 Hz, 1H), 5.31 (d, *J* = 10.7 Hz, 1H), 4.53 (s, 2H), 3.67 (s, 3H).

3-(4-methoxyphenyl)-5-(p-tolyl)-5-vinyloxazolidine-2,4-dione (1m)



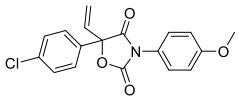
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.54 – 7.46 (m, 2H), 7.35 – 7.28 (m, 2H), 7.27 – 7.25 (m, 1H), 7.24 (s, 1H), 7.04 – 6.93 (m, 2H), 6.27 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.70 (d, *J* = 17.1 Hz, 1H), 5.49 (d, *J* = 10.7 Hz, 1H), 3.82 (s, 3H), 2.37 (s, 3H).

5-(4-fluorophenyl)-3-(4-methoxyphenyl)-5-vinyloxazolidine-2,4-dione (1n)



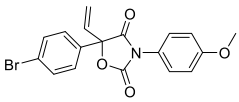
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.67 – 7.57 (m, 2H), 7.35 – 7.27 (m, 2H), 7.19 – 7.08 (m, 2H), 7.03 – 6.94 (m, 2H), 6.24 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.70 (d, *J* = 17.1 Hz, 1H), 5.52 (d, *J* = 10.7 Hz, 1H), 3.83 (s, 3H).

5-(4-chlorophenyl)-3-(4-methoxyphenyl)-5-vinyloxazolidine-2,4-dione (1o)



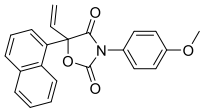
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.62 – 7.54 (m, 2H), 7.46 – 7.38 (m, 2H), 7.34 – 7.27 (m, 2H), 7.02 – 6.94 (m, 2H), 6.23 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.70 (d, *J* = 17.1 Hz, 1H), 5.52 (d, *J* = 10.7 Hz, 1H), 3.83 (s, 3H).

5-(4-bromophenyl)-3-(4-methoxyphenyl)-5-vinyloxazolidine-2,4-dione (1p)



^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.62 – 7.55 (m, 2H), 7.55 – 7.48 (m, 2H), 7.34 – 7.27 (m, 2H), 7.02 – 6.94 (m, 2H), 6.23 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.70 (d, *J* = 17.1 Hz, 1H), 5.51 (d, *J* = 10.7 Hz, 1H), 3.83 (s, 3H).

3-(4-methoxyphenyl)-5-(naphthalen-1-yl)-5-vinyloxazolidine-2,4-dione (1q)



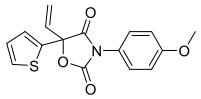
White solid, m.p. 111.1 – 112.5 °C.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.36 – 8.27 (m, 1H), 7.97 – 7.83 (m, 3H), 7.60 – 7.50 (m, 2H), 7.46 (dd, *J* = 8.2, 7.4 Hz, 1H), 7.41 – 7.32 (m, 2H), 7.06 – 6.97 (m, 2H), 6.43 (dd, *J* = 17.2, 10.7 Hz, 1H), 5.69 – 5.56 (m, 2H), 3.84 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.9, 160.1, 153.5, 135.0, 134.4, 131.4, 130.5, 129.7, 129.1, 127.4, 126.7, 126.4, 126.3, 125.1, 124.7, 123.5, 120.1, 114.8, 89.5, 55.7.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{22}H_{18}NO_4$ 360.1237; found: 360.1226.

3-(4-methoxyphenyl)-5-(thiophen-2-yl)-5-vinyloxazolidine-2,4-dione (1r)



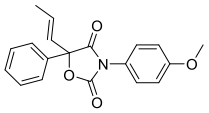
White solid, m.p. 59.3 – 60.5 °C.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 (dd, *J* = 5.1, 1.3 Hz, 1H), 7.36 – 7.31 (m, 2H), 7.26 (dd, *J* = 2.5, 1.2 Hz, 1H), 7.07 (dd, *J* = 5.1, 3.7 Hz, 1H), 7.02 – 6.96 (m, 2H), 6.32 (dd, *J* = 17.1, 10.7 Hz, 1H), 5.78 (d, *J* = 17.1 Hz, 1H), 5.56 (d, *J* = 10.6 Hz, 1H), 3.84 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.2, 160.1, 137.4, 132.6, 127.9, 127.5, 127.3, 127.0, 123.3, 119.0, 114.8, 114.4, 85.6, 55.7.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{16}H_{14}NO_4S$ 316.0644; found: 316.0639.

(*E*)-3-(4-methoxyphenyl)-5-phenyl-5-(prop-1-en-1-yl)oxazolidine-2,4-dione (1s)



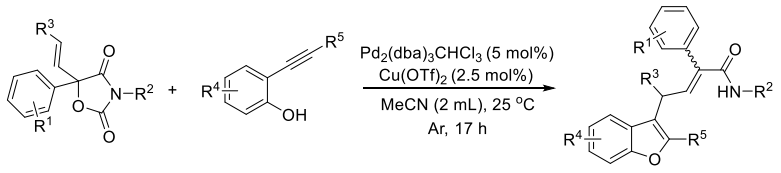
Blue gray solid, m.p. 126.4 – 128.1 °C.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.63 – 7.56 (m, 2H), 7.47 – 7.37 (m, 3H), 7.34 – 7.28 (m, 2H), 7.02 – 6.93 (m, 2H), 6.10 – 5.95 (m, 2H), 3.83 (s, 3H), 1.76 – 1.70 (m, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 172.5, 159.9, 154.0, 136.7, 134.7, 129.3, 129.1, 127.2, 125.6, 125.5, 123.6, 114.7, 87.1, 55.7, 15.0.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{19}H_{17}NO_4Na$ 346.1056; found: 346.1050.

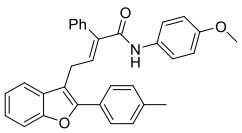
4. General procedure for the synthesis of the product 3



1 **2** **3**

To an oven-dried 25 mL of Schlenk tube equipped with a stir bar, $Pd_2(dba)_3CHCl_3$ (5 mol%) and $Cu(OTf)_2$ (2.5 mol%) was added along with **1** (0.11 mmol), **2** (0.1 mmol) and acetonitrile (2.0 mL). The reaction was stirred at 25 °C under argon atmosphere for 17 h. The reaction mixture was directly purified by silica gel column chromatography to afford the desired product **3**.

(*E*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3a)



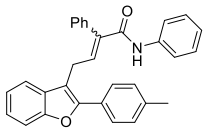
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 40.7 mg, 86% yield; *Z*/*E* = 1:1.2.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 (m, 6H), 7.37 – 7.33 (m, 1H), 7.32 – 7.27 (m, 2H), 7.25 – 7.17 (m, 4H), 7.16 – 7.09 (m, 3H), 6.94 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (d, *J* = 1.0 Hz, 3H), 3.57 (d, *J* = 7.3 Hz, 2H), 2.32 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.3, 156.6, 154.0, 151.8, 138.6, 138.5, 137.0, 135.0, 131.0, 130.1, 129.5, 128.9, 128.0, 127.2, 124.4, 122.6, 121.8, 119.6, 114.2, 112.2, 111.2, 55.6, 25.0, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_3Na$ 496.1889; found: 496.1883.

_N_,2-diphenyl-4-(2-(_p_-tolyl)benzofuran-3-yl)but-2-enamide (3b)



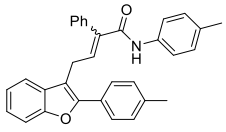
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 37.3 mg, 84% yield; *Z*/*E* = 1:1.5.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:2.5), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.59 (m, 1.2H) (*Z*), 7.50 – 7.37 (m, 7.3H) (*Z*+*E*), 7.36 – 7.10 (m, 17.1H) (*Z*+*E*), 7.03 (s, 1H) (*E*), 6.98 (t, *J* = 7.4 Hz, 1H) (*E*), 6.19 (t, *J* = 7.1 Hz, 0.4H) (*Z*), 4.14 (d, *J* = 7.1 Hz, 0.8H) (*Z*), 3.58 (d, *J* = 7.3 Hz, 2H) (*E*), 2.32 (s, 3H) (*E*), 2.28 (s, 1.2H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 164.38, 154.03, 153.99, 151.88, 151.85, 139.02, 138.57, 138.48, 137.86, 137.73, 137.19, 137.05, 134.86, 130.32, 130.09, 129.59, 129.51, 129.47, 129.21, 129.04, 129.02, 129.00, 128.00, 127.45, 127.15, 124.80, 124.56, 124.46, 122.77, 122.66, 120.05, 119.99, 119.75, 119.54, 113.04, 112.11, 111.18, 25.16, 25.01, 21.51, 21.49.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{25}NO_2Na$ 466.1783; found: 466.1775.

2-phenyl-_N_-(_p_-tolyl)-4-(2-(_p_-tolyl)benzofuran-3-yl)but-2-enamide (3c)



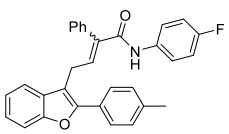
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 36.1 mg, 79% yield; *Z*/*E* = 1:1.3.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.3), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.59 (m, 2.4H) (*Z*+*E*), 7.46 – 7.32 (m, 9.5H) (*Z*+*E*), 7.31 – 7.20 (m, 8.9H) (*Z*+*E*), 7.17 – 7.05 (m, 8H) (*Z*+*E*), 7.00 – 6.94 (m, 3H) (*E*), 6.17 (t, *J* = 7.1 Hz, 0.8H) (*Z*), 4.12 (d, *J* = 7.1 Hz, 1.6H) (*Z*), 3.56 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.28 (s, 2.3H) (*Z*), 2.26 (s, 2.3H) (*Z*), 2.19 (s, 3H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.46, 164.29, 154.02, 153.98, 151.85, 151.81, 138.74, 138.58, 138.52, 138.44, 137.26, 137.09, 135.31, 135.17, 134.95, 134.54, 134.46, 134.19, 130.33, 130.08, 129.66, 129.57, 129.51, 129.46, 129.45, 128.97, 128.92, 128.44, 128.11, 128.00, 127.41, 127.14, 124.44, 122.76, 122.64, 120.13, 120.02, 119.77, 119.55, 113.09, 112.15, 111.15, 25.15, 24.97, 21.49, 21.47, 21.03, 20.96.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_2Na$ 480.1940; found: 480.1932.

***N*-(4-fluorophenyl)-2-phenyl-4-(2-(_p_-tolyl)benzofuran-3-yl)but-2-enamide (3d)**



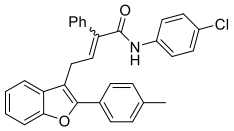
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 39.7 mg, 86% yield; *Z*/*E* = 1:1.8.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.8), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.62 – 7.54 (m, 1.7H) (*Z*), 7.47 – 7.36 (m, 7.7H) (*Z*+*E*), 7.35 – 7.20 (m, 10H) (*Z*+*E*), 7.18 – 7.08 (m, 5.3H) (*Z*+*E*), 7.00 (s, 1H) (*E*), 6.94 (t, *J* = 8.6 Hz, 1.2H) (*Z*), 6.86 (t, *J* = 8.7 Hz, 2H) (*E*), 6.19 (t, *J* = 7.1 Hz, 0.6H) (*Z*), 4.11 (d, *J* = 7.1 Hz, 1.1H) (*Z*), 3.56 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.28 (s, 1.6H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.50, 164.39, 154.03, 153.98, 151.87, 151.84, 139.16, 138.58, 138.49, 138.31, 137.15, 136.82, 134.90, 134.75, 133.88, 133.85, 133.74, 133.71, 130.27, 130.05, 130.04, 129.57, 129.53, 129.46, 129.03, 129.02, 128.53, 128.07, 127.97, 127.40, 127.17, 127.13, 124.47, 122.76, 122.66, 121.90, 121.86, 121.82, 121.78, 119.71, 119.49, 115.91, 115.76, 115.69, 115.54, 112.97, 112.03, 111.21, 111.19, 25.16, 24.98, 21.49, 21.47.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{31}H_{25}FNO_2$ 462.1870; found: 462.1866.

***N*-(4-chlorophenyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3e)**



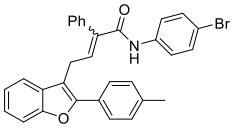
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 40.6 mg, 85% yield; *Z*/*E* = 1:2.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.6), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.61 – 7.53 (m, 1.9H) (*Z*), 7.46 – 7.36 (m, 7.8H) (*Z*+*E*), 7.34 – 7.19 (m, 12H) (*Z*+*E*), 7.18 – 7.08 (m, 7.5H) (*Z*+*E*), 7.02 (s, 1H) (*E*), 6.19 (t, *J* = 7.1 Hz, 0.6H) (*Z*), 4.10 (d, *J* = 7.1 Hz, 1.2H) (*Z*), 3.56 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.27 (s, 1.8H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.51, 164.37, 154.02, 153.97, 151.88, 151.86, 139.44, 138.61, 138.51, 138.23, 137.04, 136.76, 136.43, 136.30, 135.16, 134.62, 130.24, 130.05, 130.01, 129.69, 129.57, 129.49, 129.46, 129.14, 129.09, 129.05, 129.02, 128.58, 128.53, 128.04, 127.95, 127.41, 127.15, 127.12, 124.49, 122.77, 122.67, 121.22, 121.20, 119.68, 119.47, 112.91, 111.97, 111.22, 111.20, 25.16, 25.00, 21.50, 21.48.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}ClNO_2Na$ 500.1394; found: 500.1392.

***N*-(4-bromophenyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3f)**



Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 44.9 mg, 86% yield; *Z*/*E* = 1:2.1.

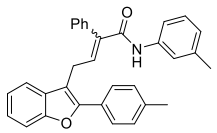
Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.2), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.62 – 7.52 (m, 2.6H) (*Z*), 7.47 – 7.30 (m, 11.4H) (*Z*+*E*), 7.29 – 7.19 (m, 13.4H) (*Z*+*E*), 7.12 (m, 5.5H) (*Z*+*E*), 7.01 (s, 1H) (*E*), 6.21 (t, *J* = 7.1 Hz, 0.9H) (*Z*), 4.11 (d, *J* = 7.1 Hz, 1.7H) (*Z*), 3.56 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.28 (s, 2.5H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.49, 164.36, 154.03, 153.98, 151.89, 151.86, 139.51, 138.63, 138.52, 138.22, 137.04, 136.94, 136.81, 136.78, 135.29, 134.61, 132.11, 131.97, 130.24, 130.05, 130.02, 129.58, 129.47, 129.11, 129.06, 128.60, 128.04, 127.96, 127.44,

127.16, 127.13, 124.50, 122.78, 122.68, 121.52, 119.68, 119.47, 117.32, 117.13, 112.91, 111.96, 111.23, 111.20, 25.16, 25.02, 21.50, 21.49.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}BrNO_2Na$ 544.0888, 546.0868; found: 544.0881, 546.0866.

2-phenyl-*N*-(*m*-tolyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3g)



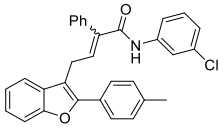
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 30.2 mg, 66% yield; *Z*/*E* = 1:1.4.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.4), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.59 (m, 2.2H) (*Z*), 7.47 – 7.32 (m, 8.6H) (*Z*+*E*), 7.31 – 7.20 (m, 8.2H) (*Z*+*E*), 7.18 – 7.09 (m, 9.1H) (*Z*+*E*), 7.05 (t, *J* = 7.7 Hz, 1H) (*E*), 6.98 (s, 1H) (*E*), 6.89 (d, *J* = 7.6 Hz, 0.8H) (*Z*), 6.80 (d, *J* = 7.4 Hz, 1H) (*E*), 6.18 (t, *J* = 7.1 Hz, 0.7H) (*Z*), 4.13 (d, *J* = 7.1 Hz, 1.4H) (*Z*), 3.57 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.28 (s, 4.2H) (*Z*), 2.20 (s, 3H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.52, 164.36, 154.03, 153.99, 151.87, 151.83, 139.16, 138.95, 138.87, 138.57, 138.54, 138.46, 137.76, 137.65, 137.21, 137.11, 134.90, 134.72, 130.33, 130.08, 129.58, 129.49, 129.46, 129.02, 129.00, 128.96, 128.85, 128.48, 128.11, 128.00, 127.42, 127.17, 127.15, 125.61, 125.37, 124.45, 122.76, 122.65, 120.66, 120.61, 119.76, 119.55, 117.13, 117.08, 113.07, 112.12, 111.17, 25.16, 24.99, 21.63, 21.53, 21.50, 21.47.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_2Na$ 480.1940; found: 480.1932.

***N*-(3-chlorophenyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3h)**



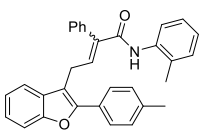
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 40.2 mg, 84% yield; *Z*/*E* = 1:2.1.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:2.2), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.62 – 7.55 (m, 1.8H) (*Z*), 7.41 (m, 7.6H) (*Z*+*E*), 7.36 – 7.21 (m, 7.8H) (*Z*+*E*), 7.19 – 7.04 (m, 7.9H) (*Z*+*E*), 7.02 (s, 1H) (*E*), 6.95 (m, 1H) (*E*), 6.21 (t, *J* = 7.1 Hz, 0.5H) (*Z*), 4.12 (d, *J* = 7.1 Hz, 0.9H) (*Z*), 3.57 (d, *J* = 7.3 Hz, 2H) (*E*), 2.32 (s, 3H) (*E*), 2.28 (s, 1.3H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.54, 164.41, 154.04, 153.99, 151.93, 151.88, 139.61, 138.99, 138.86, 138.64, 138.53, 138.16, 136.98, 136.75, 135.41, 134.84, 134.65, 134.55, 130.24, 130.13, 130.04, 130.02, 129.60, 129.59, 129.48, 129.14, 129.08, 128.62, 128.04, 127.96, 127.43, 127.17, 127.15, 124.76, 124.55, 124.50, 122.79, 122.69, 120.05, 120.01, 119.69, 119.48, 117.97, 117.92, 112.90, 111.96, 111.23, 111.21, 25.16, 25.02, 21.51, 21.48.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}ClNO_2Na$ 500.1394, 502.1364; found: 500.1389, 502.1377.

2-phenyl-*N*-(*o*-tolyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3i)



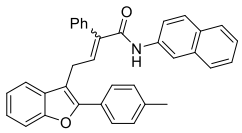
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 36.6 mg, 80% yield; *Z*/*E* = 1:1.9.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.9), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.97 (d, *J* = 8.1 Hz, 1.5H) (*Z*), 7.61 (t, *J* = 7.9 Hz, 1.5H) (*Z*), 7.48 – 7.35 (m, 7.7H) (*Z*+*E*), 7.34 – 7.21 (m, 6.1H) (*Z*+*E*), 7.18 – 7.06 (m, 7H) (*Z*+*E*), 7.06 – 6.87 (m, 4.2H) (*Z*+*E*), 6.18 (t, *J* = 7.0 Hz, 0.5H) (*Z*), 4.22 (d, *J* = 7.0 Hz, 1H) (*E*), 3.58 (d, *J* = 7.3 Hz, 2H) (*E*), 2.32 (s, 3H) (*E*), 2.28 (s, 1.5H) (*Z*), 1.95 (s, 1.5H) (*Z*), 1.73 (s, 3H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.28, 164.09, 154.03, 153.98, 151.86, 151.83, 138.89, 138.53, 138.45, 138.26, 137.69, 137.13, 136.18, 136.08, 135.65, 135.15, 130.63, 130.37, 130.34, 130.09, 130.06, 129.56, 129.47, 129.45, 128.98, 128.69, 128.53, 128.13, 128.02, 127.83, 127.64, 127.17, 127.15, 127.01, 126.99, 125.36, 124.76, 124.44, 122.74, 122.63, 121.59, 119.76, 119.57, 113.19, 112.10, 111.16, 25.12, 25.01, 21.49, 21.47, 17.69, 17.19.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{32}H_{28}NO_2$ 458.2121; found: 458.2118.

_N_-(naphthalen-2-yl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3j)



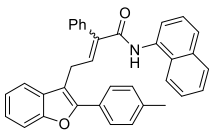
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 42.0 mg, 85% yield; *Z*/*E* = 1:1.7.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.6), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.21 (s, 0.6H) (*Z*), 8.07 (s, 1H) (*E*), 7.78 – 7.67 (m, 2H) (*Z*+*E*), 7.62 (m, 5H) (*Z*+*E*), 7.49 – 7.36 (m, 8.6H) (*Z*+*E*), 7.35 – 7.20 (m, 11.6H) (*Z*+*E*), 7.19 – 7.05 (m, 6.4H) (*Z*+*E*), 6.22 (t, *J* = 7.1 Hz, 0.6H) (*Z*), 4.17 (d, *J* = 7.1 Hz, 1.2H) (*Z*), 3.59 (d, *J* = 7.3 Hz, 2H) (*E*), 2.31 (s, 3H) (*E*), 2.20 (s, 1.9H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.71, 164.55, 154.03, 153.99, 151.89, 151.84, 139.14, 138.55, 138.48, 137.20, 137.05, 135.28, 135.16, 134.94, 134.82, 133.94, 133.88, 130.93, 130.79, 130.30, 130.11, 130.06, 129.55, 129.46, 129.04, 128.90, 128.72, 128.53, 128.06, 127.99, 127.85, 127.80, 127.70, 127.62, 127.46, 127.14, 126.73, 126.60, 125.30, 125.16, 124.46, 122.78, 122.67, 119.93, 119.89, 119.75, 119.53, 116.86, 116.79, 113.02, 112.08, 111.18, 25.20, 25.03, 21.49, 21.40.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{35}H_{27}NO_2Na$ 516.1940; found: 516.1934.

_N_-(naphthalen-1-yl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3k)



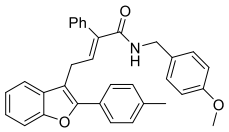
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 36.0 mg, 73% yield; *Z*/*E* = 1:2.6.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:2.5), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.10 (d, *J* = 7.5 Hz, 0.4H) (*Z*), 8.04 (d, *J* = 7.6 Hz, 1H) (*E*), 7.78 (d, *J* = 8.2 Hz, 0.4H) (*Z*), 7.72 (d, *J* = 8.1 Hz, 1H) (*E*), 7.66 – 7.59 (m, 2H) (*E*), 7.56 – 7.22 (m, 19.5H) (*Z*+*E*), 7.19 – 7.05 (m, 6H) (*Z*+*E*), 6.25 (t, *J* = 7.0 Hz, 0.4H) (*Z*), 4.27 (d, *J* = 7.0 Hz, 0.8H) (*Z*), 3.62 (d, *J* = 7.4 Hz, 2H) (*E*), 2.32 (s, 3H) (*E*), 2.24 (s, 1.2H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.77, 164.61, 154.05, 154.00, 151.92, 151.87, 139.29, 138.53, 138.48, 138.25, 137.71, 137.05, 136.44, 135.18, 134.24, 134.07, 132.42, 132.08, 130.37, 130.18, 130.11, 129.66, 129.56, 129.47, 129.15, 129.12, 128.98, 128.95, 128.66, 128.11, 128.03, 127.90, 127.17, 127.16, 126.54, 126.48, 126.34, 126.11, 125.97, 125.93, 125.91, 125.50, 124.46, 122.78, 122.66, 120.44, 120.28, 119.85, 119.78, 119.62, 119.58, 113.18, 112.09, 111.18, 25.21, 25.05, 21.51, 21.43.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{35}H_{27}NO_2Na$ 516.1940; found: 516.1934.

(*E*)-*N*-(4-methoxybenzyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3l)



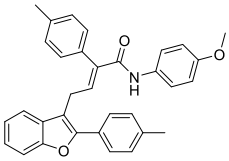
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 143.5 – 144.0 °C; 23.4 mg, 48% yield; *Z*/*E* = 1:1.2.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.27 (m, 7H), 7.22 – 7.08 (m, 7H), 7.06 – 6.99 (m, 2H), 6.76 – 6.69 (m, 2H), 5.61 (t, *J* = 5.8 Hz, 1H), 4.31 (d, *J* = 5.8 Hz, 2H), 3.68 (s, 3H), 3.53 (d, *J* = 7.3 Hz, 2H), 2.31 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 166.4, 159.0, 154.0, 151.8, 138.4, 138.0, 136.5, 135.2, 130.4, 130.1, 130.0, 129.4, 129.2, 128.9, 128.6, 128.0, 127.1, 124.4, 122.6, 119.6, 114.1, 112.3, 111.1, 55.4, 43.5, 24.8, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{33}H_{29}NO_3Na$ 510.2045; found: 510.2040.

(*E*)-*N*-(4-methoxyphenyl)-2-(*p*-tolyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3m)



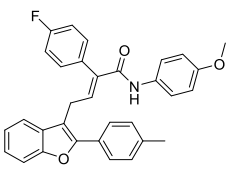
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 162.3 – 163.0 °C; 41.4 mg, 85% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 – 7.34 (m, 4H), 7.27 – 7.23 (m, 2H), 7.22 – 7.14 (m, 6H), 7.14 – 7.09 (m, 3H), 6.99 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (s, 3H), 3.56 (d, *J* = 7.3 Hz, 2H), 2.37 (s, 3H), 2.32 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.4, 156.5, 154.0, 151.8, 138.8, 138.5, 138.4, 137.0, 131.9, 131.1, 130.1, 130.0, 129.4, 128.1, 127.2, 124.4, 122.6, 121.7, 119.6, 114.1, 112.3, 111.1, 55.6, 25.0, 21.5, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{33}H_{29}NO_3Na$ 510.2045; found: 510.2038.

(*E*)-2-(4-fluorophenyl)-*N*-(4-methoxyphenyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3n)



Following the general procedure, the crude product was purified by flash chromatography

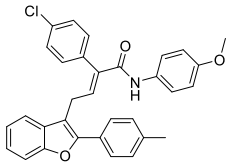
(petroleum ether/ethyl acetate = 5:1). White solid, m.p. 125.3 – 125.9 °C; 40.8 mg, 83% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.40 (dd, *J* = 8.2, 3.7 Hz, 3H), 7.35 (dd, *J* = 7.7, 1.4 Hz, 1H), 7.27 – 7.18 (m, 6H), 7.17 – 7.10 (m, 3H), 7.07 (m, 2H), 6.87 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (s, 3H), 3.56 (d, *J* = 7.4 Hz, 2H), 2.33 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.2, 162.9 (d, *J* = 247.1 Hz), 156.7, 154.0, 151.8, 138.9, 138.6, 136.2, 131.9 (d, *J* = 8.1 Hz), 130.9, 130.8 (d, *J* = 3.6 Hz), 130.0, 129.5, 128.0, 127.2, 124.5, 122.7, 121.8, 119.5, 116.5 (d, *J* = 21.6 Hz), 114.2, 112.0, 111.2, 55.6, 24.9, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{26}FNO_3Na$ 514.1795; found: 514.1792.

(*E*)-2-(4-chlorophenyl)-*N*-(4-methoxyphenyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3o)



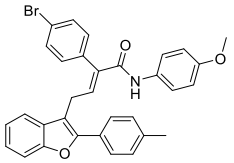
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 135.0 – 135.8 °C; 41.7 mg, 82% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 – 7.31 (m, 6H), 7.23 – 7.19 (m, 3H), 7.19 – 7.09 (m, 6H), 6.84 (s, 1H), 6.75 – 6.68 (m, 2H), 3.67 (s, 3H), 3.55 (d, *J* = 7.4 Hz, 2H), 2.34 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.0, 156.7, 154.0, 151.8, 138.9, 138.7, 136.2, 135.0, 133.3, 131.4, 130.8, 129.9, 129.6, 129.5, 127.9, 127.2, 124.5, 122.7, 121.8, 119.5, 114.2, 111.9, 111.2, 55.6, 24.9, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{26}ClNO_3Na$ 530.1499, 532.1469; found: 530.1498, 532.1482.

(*E*)-2-(4-bromophenyl)-*N*-(4-methoxyphenyl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3p)



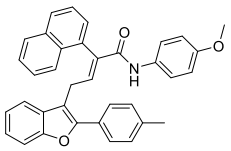
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 129.5 – 130.2 °C; 44.2 mg, 80% yield; *Z*/*E* = 1:1.4.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.50 – 7.45 (m, 2H), 7.38 (m, 4H), 7.23 (m, 3H), 7.19 – 7.06 (m, 6H), 6.84 (s, 1H), 6.76 – 6.69 (m, 2H), 3.68 (s, 3H), 3.56 (d, *J* = 7.4 Hz, 2H), 2.35 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 163.9, 156.7, 154.0, 151.9, 138.9, 138.7, 136.2, 133.7, 132.6, 131.6, 130.8, 129.9, 129.5, 127.9, 127.2, 124.5, 123.2, 122.7, 121.9, 119.5, 114.2, 111.9, 111.3, 55.6, 24.9, 21.6.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{26}BrNO_3Na$ 574.0994, 576.0974; found: 574.0992, 576.0978.

(*E*)-*N*-(4-methoxyphenyl)-2-(naphthalen-1-yl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3q)



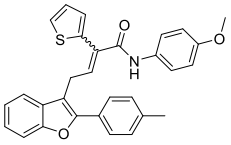
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 162.5 – 163.3 °C; 39.8 mg, 76% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.89 (m, 2H), 7.85 – 7.79 (m, 1H), 7.59 – 7.36 (m, 6H), 7.36 – 7.27 (m, 3H), 7.17 (m, 1H), 7.12 – 7.05 (m, 3H), 6.96 (d, *J* = 7.9 Hz, 2H), 6.82 (s, 1H), 6.68 – 6.61 (m, 2H), 3.64 (s, 3H), 3.43 (d, *J* = 7.2 Hz, 2H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.2, 156.6, 153.9, 151.8, 140.8, 138.3, 135.3, 134.1, 132.1, 132.0, 130.9, 130.1, 129.6, 129.3, 128.8, 128.5, 127.9, 127.4, 127.0, 126.9, 125.8, 125.3, 124.4, 122.6, 122.0, 119.6, 114.1, 112.0, 111.1, 55.5, 25.1, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{36}H_{29}NO_3Na$ 546.2045; found: 546.2042.

***N*-(4-methoxyphenyl)-2-(thiophen-2-yl)-4-(2-(*p*-tolyl)benzofuran-3-yl)but-2-enamide (3r)**



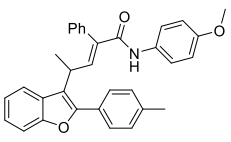
Following the general procedure. the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 42.2 mg, 88% yield; *Z*/*E* = 1:2.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.7), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.63 – 7.53 (m, 1.8H) (*Z*), 7.50 – 7.34 (m, 7.3H) (*Z*+*E*), 7.32 – 7.19 (m, 5.3H) (*Z*+*E*), 7.19 – 7.09 (m, 7H) (*Z*+*E*), 7.06 (dd, *J* = 3.5, 1.1 Hz, 1H) (*E*), 6.98 (d, *J* = 3.6 Hz, 0.6H) (*Z*), 6.89 (dd, *J* = 5.1, 3.7 Hz, 0.6H) (*Z*), 6.85 – 6.79 (m, 1.2H) (*Z*), 6.76 – 6.70 (m, 2H) (*E*), 6.21 (t, *J* = 7.2 Hz, 0.6H) (*Z*), 4.04 (d, *J* = 7.2 Hz, 1.2H) (*Z*), 3.74 (s, 1.8H) (*Z*), 3.71 (d, *J* = 7.2 Hz, 2H) (*E*), 3.68 (s, 3H) (*E*), 2.32 (s, 3H) (*E*), 2.29 (s, 1.8H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 165.26, 163.76, 156.92, 156.70, 154.02, 153.99, 152.01, 151.90, 141.82, 140.56, 138.60, 138.56, 135.03, 132.87, 132.13, 130.88, 130.62, 130.22, 130.15, 130.07, 129.60, 129.50, 129.49, 128.20, 128.02, 127.95, 127.81, 127.20, 126.05, 125.62, 124.50, 124.48, 122.81, 122.71, 121.95, 121.89, 119.80, 119.50, 114.37, 114.20, 112.64, 111.89, 111.19, 55.66, 55.57, 25.35, 25.09, 21.50, 21.49.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{30}H_{25}NO_3SNa$ 502.1453; found: 502.1448.

(*E*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)pent-2-enamide (3s)



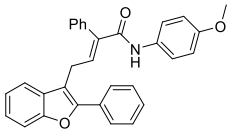
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 23.4 mg, 48% yield; *Z*/*E* = 1:2.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.78 (dd, *J* = 6.8, 2.0 Hz, 1H), 7.62 (d, *J* = 10.3 Hz, 1H), 7.43 – 7.36 (m, 1H), 7.23 – 7.10 (m, 9H), 7.01 (dd, *J* = 7.8, 2.9 Hz, 4H), 6.82 (s, 1H), 6.74 – 6.67 (m, 2H), 3.94 (dq, *J* = 10.3, 7.0 Hz, 1H), 3.67 (s, 3H), 2.32 (s, 3H), 1.49 (d, *J* = 7.0 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.5, 156.6, 154.5, 150.8, 143.5, 138.4, 135.5, 134.7, 131.0, 129.8, 129.2, 129.1, 128.5, 128.3, 128.0, 127.7, 124.2, 122.6, 121.7, 121.3, 117.7, 114.1, 111.4, 55.6, 31.2, 21.5, 21.1.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{33}H_{29}NO_3Na$ 510.2045; found: 510.2039.

(*E*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-phenylbenzofuran-3-yl)but-2-enamide (3t)



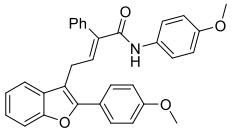
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 38.6 mg, 84% yield; *Z*/*E* = 1:1.5.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.56 – 7.49 (m, 2H), 7.46 – 7.35 (m, 5H), 7.31 (m, 4H), 7.27 – 7.21 (m, 4H), 7.20 – 7.12 (m, 2H), 6.94 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (s, 3H), 3.59 (d, *J* = 7.3 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.2, 156.6, 154.1, 151.6, 138.5, 137.1, 134.9, 131.0, 130.8, 130.1, 130.0, 129.5, 129.0, 128.7, 128.4, 127.2, 124.7, 122.7, 121.8, 119.7, 114.2, 112.8, 111.2, 55.6, 25.0.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{25}NO_3Na$ 482.1732; found: 482.1726.

(*E*)-*N*-(4-methoxyphenyl)-4-(2-(4-methoxyphenyl)benzofuran-3-yl)-2-phenylbut-2-enamide (3u)



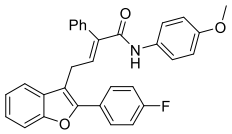
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 33.3 mg, 68% yield; *Z*/*E* = 1:1.1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.47 – 7.39 (m, 5H), 7.38 – 7.27 (m, 4H), 7.23 (dd, *J* = 8.1, 6.1 Hz, 3H), 7.19 – 7.11 (m, 2H), 6.94 (s, 1H), 6.87 – 6.81 (m, 2H), 6.77 – 6.68 (m, 2H), 3.78 (s, 3H), 3.68 (s, 3H), 3.55 (d, *J* = 7.3 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.3, 159.8, 156.6, 153.9, 151.7, 138.7, 137.0, 135.0, 131.0, 130.2, 130.1, 129.5, 128.9, 128.7, 124.3, 123.5, 122.6, 121.8, 119.5, 114.2, 114.2, 111.4, 111.1, 55.6, 55.5, 25.0.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_4Na$ 512.1838; found: 512.1832.

(*E*)-4-(2-(4-fluorophenyl)benzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3v)



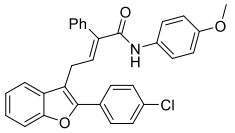
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 37.2 mg, 78% yield; *Z*/*E* = 1:1.5.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.49 – 7.35 (m, 7H), 7.28 (dd, *J* = 7.8, 1.7 Hz, 2H), 7.25 – 7.18 (m, 4H), 7.18 – 7.12 (m, 1H), 6.99 (t, *J* = 8.7 Hz, 2H), 6.94 (s, 1H), 6.76 – 6.69 (m, 2H), 3.68 (s, 3H), 3.55 (d, *J* = 7.4 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.1, 162.7 (d, *J* = 250.0 Hz), 156.7, 154.0, 150.7, 138.2, 137.1, 134.9, 131.0, 130.1, 129.9, 129.5, 129.1 (d, *J* = 8.3 Hz), 129.0, 127.1 (d, *J* = 3.3 Hz), 124.8, 122.8, 121.8, 119.7, 115.8 (d, *J* = 21.8 Hz), 114.2, 112.6, 111.2, 55.6, 24.9.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{31}H_{25}FNO_3$ 478.1819; found: 478.1813.

(*E*)-4-(2-(4-chlorophenyl)benzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3w)



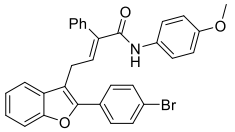
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 147.6 – 148.8 °C; 37.5 mg, 76% yield; *Z*/*E* = 1:1.6.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.37 (m, 7H), 7.31 – 7.25 (m, 4H), 7.25 – 7.13 (m, 5H), 6.94 (s, 1H), 6.77 – 6.68 (m, 2H), 3.68 (s, 3H), 3.57 (d, *J* = 7.4 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.1, 156.7, 154.1, 150.4, 138.1, 137.2, 134.8, 134.3, 130.9, 130.0, 129.8, 129.5, 129.3, 129.1, 129.0, 128.3, 125.0, 122.9, 121.8, 119.8, 114.2, 113.3, 111.3, 55.6, 24.9.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}ClNO_3Na$ 516.1343, 518.1313; found: 516.1339, 518.1326.

(*E*)-4-(2-(4-bromophenyl)benzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3x)



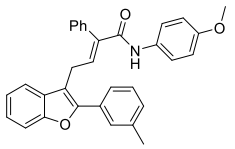
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 167.2 – 167.6 °C; 40.4 mg, 75% yield; *Z*/*E* = 1:1.5.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.46 – 7.33 (m, 9H), 7.28 (d, *J* = 2.0 Hz, 1H), 7.27 – 7.12 (m, 6H), 6.94 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (s, 3H), 3.56 (d, *J* = 7.4 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.1, 156.7, 154.1, 150.4, 138.0, 137.2, 134.8, 131.9, 130.9, 130.0, 129.8, 129.7, 129.5, 129.1, 128.6, 125.0, 122.9, 122.5, 121.8, 119.8, 114.2, 113.5, 111.3, 55.6, 24.9.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}BrNO_3Na$ 560.0838, 562.0817; found: 560.0832, 562.0818.

(*E*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(*m*-tolyl)benzofuran-3-yl)but-2-enamide (3y)



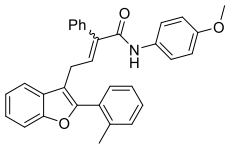
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 31.3 mg, 66% yield; *Z*/*E* = 1:1.2.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 – 7.35 (m, 6H), 7.29 (m, 3H), 7.25 – 7.11 (m, 6H), 7.09 (d, *J* = 7.6 Hz, 1H), 6.93 (s, 1H), 6.75 – 6.69 (m, 2H), 3.68 (s, 3H), 3.58 (d, *J* = 7.3 Hz, 2H), 2.31 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.3, 156.6, 154.1, 151.8, 138.6, 138.5, 137.1, 135.0, 131.0, 130.8, 130.1, 130.0, 129.5, 129.3, 128.9, 128.6, 127.9, 124.6, 124.5, 122.7, 121.8, 119.7, 112.7, 111.2, 55.6, 25.0, 21.7.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_3Na$ 496.1889; found: 496.1888.

_N_-(4-methoxyphenyl)-2-phenyl-4-(2-(*o*-tolyl)benzofuran-3-yl)but-2-enamide (3z)



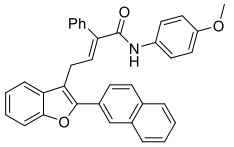
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 17.0 mg, 36% yield; *Z*/*E* = 1:1.6.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.6), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.65 (dd, *J* = 7.4, 1.6 Hz, 0.6H) (*Z*), 7.47 – 7.37 (m, 3H) (*E*), 7.37 – 7.28 (m, 5.4H) (*Z*+*E*), 7.25 – 7.12 (m, 16.4H) (*Z*+*E*), 6.96 (s, 0.7H) (*Z*), 6.86 (s, 1H) (*E*), 6.82 – 6.76 (m, 1.3H) (*Z*), 6.74 – 6.69 (m, 2H) (*E*), 6.09 (t, *J* = 7.2 Hz, 0.6H) (*Z*), 3.88 (d, *J* = 7.2 Hz, 1.3H) (*Z*), 3.72 (s, 1.9H) (*Z*), 3.68 (s, 3H) (*E*), 3.32 (d, *J* = 7.5 Hz, 2H) (*E*), 2.27 (s, 1.9H) (*Z*), 2.22 (s, 3H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.34, 164.24, 156.82, 156.60, 154.50, 154.45, 152.91, 152.88, 138.85, 138.53, 138.51, 138.31, 137.33, 136.75, 134.89, 134.45, 131.02, 130.84, 130.80, 130.74, 130.72, 130.70, 130.08, 129.90, 129.54, 129.46, 129.38, 129.14, 128.94, 128.72, 128.38, 127.32, 125.79, 125.74, 124.36, 122.75, 122.65, 122.00, 121.77, 120.03, 119.79, 114.80, 114.29, 114.16, 113.94, 111.31, 55.65, 55.58, 25.00, 24.68, 20.40, 20.37.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_3Na$ 496.1889; found: 496.1882.

(*E*)-*N*-(4-methoxyphenyl)-4-(2-(naphthalen-2-yl)benzofuran-3-yl)-2-phenylbut-2-enamide (3a')



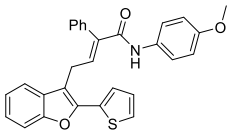
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 163.5 – 164.1 °C; 40.8 mg, 80% yield; *Z*/*E* = 1:1.2.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.01 (s, 1H), 7.81 – 7.73 (m, 3H), 7.63 (dd, *J* = 8.6, 1.8 Hz, 1H), 7.42 (m, 4H), 7.38 – 7.31 (m, 3H), 7.31 – 7.26 (m, 3H), 7.24 – 7.14 (m, 4H), 6.92 (s, 1H), 6.75 – 6.66 (m, 2H), 3.68 (s, 2H), 3.67 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.2, 156.6, 154.2, 151.6, 138.5, 137.2, 134.9, 133.4, 133.1, 131.0, 130.1, 130.0, 129.4, 128.9, 128.6, 128.4, 128.3, 127.8, 126.7, 126.6, 126.6, 124.8, 124.8, 122.8, 121.8, 119.8, 114.2, 113.3, 111.3, 55.6, 25.0.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{35}H_{27}NO_3Na$ 532.1889; found: 532.1885.

(*E*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(thiophen-2-yl)benzofuran-3-yl)but-2-enamide (3b')



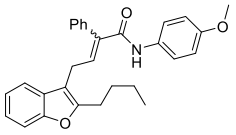
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 109.3 – 110.1 °C; 26.1 mg, 56% yield; *Z*/*E* = 1:1.1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.48 – 7.40 (m, 3H), 7.37 (d, *J* = 8.3 Hz, 1H), 7.30 (m, 4H), 7.25 – 7.09 (m, 6H), 7.00 (dd, *J* = 5.0, 3.7 Hz, 1H), 6.94 (s, 1H), 6.76 – 6.68 (m, 2H), 3.68 (s, 3H), 3.60 (d, *J* = 7.3 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.2, 156.6, 153.9, 147.1, 138.0, 137.4, 135.0, 132.7, 131.0, 130.1, 129.8, 129.5, 129.0, 127.7, 126.2, 125.7, 124.8, 122.9, 121.8, 119.6, 114.2, 112.3, 111.1, 55.6, 24.9.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{29}H_{24}NO_3S$ 466.1478; found: 466.1476.

4-(2-butylbenzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3c')



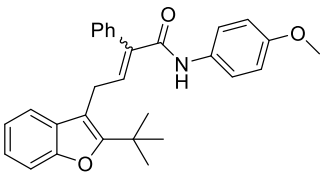
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 22.4 mg, 51% yield; *Z*/*E* = 1:1.4.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.5), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.49 – 7.37 (m, 5H) (*Z*+*E*), 7.35 – 7.12 (m, 13.1H) (*Z*+*E*), 7.10 – 7.05 (m, 1.9H) (*Z*+*E*), 6.92 (s, 1H) (*E*), 6.84 – 6.78 (m, 1.4H) (*Z*), 6.74 – 6.69 (m, 2H) (*E*), 6.13 (t, *J* = 7.3 Hz, 0.7H) (*Z*), 3.82 (d, *J* = 7.3 Hz, 1.4H) (*Z*), 3.72 (s, 2H) (*E*), 3.67 (s, 3H) (*E*), 3.26 (d, *J* = 7.6 Hz, 2H) (*E*), 2.69 (t, *J* = 7.5 Hz, 1.4H) (*Z*), 2.49 (t, *J* = 7.6 Hz, 2H) (*E*), 1.60 – 1.54 (m, 3.4H) (*Z*+*E*), 1.28 – 1.20 (m, 3.4H) (*Z*+*E*), 0.82 (t, *J* = 7.3 Hz, 5H) (*Z*+*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.43, 164.22, 156.81, 156.61, 155.48, 155.21, 154.11, 154.01, 139.21, 138.08, 137.42, 136.56, 135.17, 134.91, 131.01, 130.84, 130.08, 129.52, 129.48, 129.27, 128.98, 128.91, 128.38, 127.36, 123.36, 122.36, 122.27, 121.85, 121.81, 119.13, 118.97, 114.36, 114.16, 112.13, 111.21, 110.85, 110.78, 55.65, 55.57, 30.66, 30.49, 26.27, 24.40, 24.12, 22.52, 22.49, 13.96, 13.93.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{29}H_{29}NO_3Na$ 462.2045; found: 462.2039.

4-(2-(*tert*-butyl)benzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3d')



Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 18.8 mg, 43% yield; *Z*/*E* = 1:1.3.

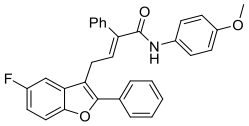
Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.3), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.53 – 7.38 (m, 5.6H) (*Z*+*E*), 7.37 – 7.22 (m, 9.8H) (*Z*+*E*), 7.17 – 7.02 (m, 6.5H) (*Z*+*E*), 6.94 (s, 1H) (*E*), 6.86 – 6.79 (m,

1.6H) (*Z*), 6.75 – 6.69 (m, 2H) (*E*), 6.09 (t, *J* = 6.9 Hz, 1H) (*Z*), 4.03 (d, *J* = 6.9 Hz, 1.6H) (*Z*), 3.73 (s, 2.4H) (*Z*), 3.68 (s, 3H) (*E*), 3.45 (d, *J* = 7.1 Hz, 2H) (*E*), 1.38 (s, 7.2H) (*Z*), 1.28 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.35, 164.22, 160.81, 160.61, 156.81, 156.56, 153.08, 153.01, 140.13, 137.57, 137.48, 136.81, 136.13, 135.19, 131.05, 130.79, 130.65, 130.43, 130.14, 129.51, 129.00, 128.95, 128.39, 127.60, 123.51, 123.48, 122.21, 122.03, 121.95, 121.76, 119.11, 118.90, 114.35, 114.14, 110.71, 110.65, 110.58, 109.58, 55.65, 55.57, 34.57, 34.51, 29.93, 29.81, 24.86, 24.65.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{29}H_{29}NO_3Na$ 462.2045; found: 462.2045.

(*E*)-4-(5-fluoro-2-phenylbenzofuran-3-yl)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (3e')



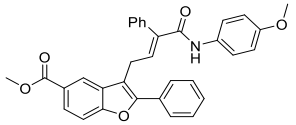
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 28.2 mg, 59% yield; *Z*/*E* = 1:1.4.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.53 (m, 2H), 7.48 – 7.38 (m, 3H), 7.36 – 7.28 (m, 6H), 7.25 – 7.16 (m, 3H), 7.00 – 6.86 (m, 3H), 6.77 – 6.69 (m, 2H), 3.68 (s, 3H), 3.54 (d, *J* = 7.3 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.1, 159.3 (d, *J* = 239.3 Hz), 156.7, 153.4, 150.3, 138.0, 137.3, 134.8, 130.9, 130.8 (d, *J* = 10.3 Hz), 130.5, 130.1, 129.6, 129.1, 128.8 (d, *J* = 4.1 Hz), 127.3, 121.8, 114.2, 113.0 (d, *J* = 4.1 Hz), 112.3 (d, *J* = 26.3 Hz), 111.9 (d, *J* = 9.6 Hz), 105.3 (d, *J* = 25.1 Hz), 55.6, 24.9.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}FNO_3Na$ 500.1638; found: 500.1642.

methyl (*E*)-3-(4-((4-methoxyphenyl)amino)-4-oxo-3-phenylbut-2-en-1-yl)-2-phenylbenzofuran-5-carboxylate (3f')



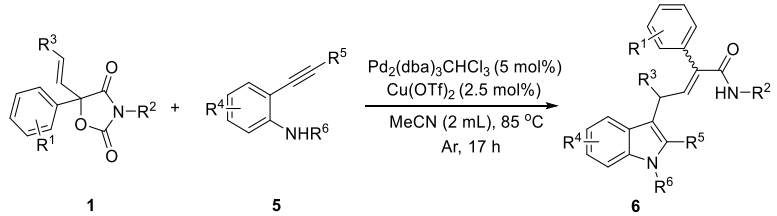
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 155.6 – 156.6 °C; 16.6 mg, 32% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.10 (d, *J* = 1.7 Hz, 1H), 7.95 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.59 – 7.52 (m, 2H), 7.48 (dd, *J* = 8.0, 6.3 Hz, 2H), 7.44 – 7.39 (m, 2H), 7.37 – 7.30 (m, 5H), 7.24 – 7.16 (m, 3H), 6.95 (s, 1H), 6.77 – 6.69 (m, 2H), 3.90 (s, 3H), 3.69 (s, 3H), 3.61 (d, *J* = 7.3 Hz, 2H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 167.4, 164.1, 156.7, 156.7, 153.1, 137.9, 137.4, 134.8, 131.0, 130.3, 130.1, 129.6, 129.1, 128.9, 128.9, 127.3, 126.5, 125.1, 122.1, 121.8, 114.2, 113.2, 111.1, 55.6, 52.3, 24.8.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{33}H_{28}NO_5$ 518.1968; found: 518.1964.

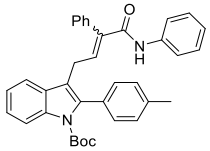
5. General procedure for the synthesis of the product 6



1 5 6

To an oven-dried 25 mL of Schlenk tube equipped with a stir bar, $Pd_2(dba)_3CHCl_3$ (5 mol%) and $Cu(OTf)_2$ (2.5 mol%) was added along with **1** (0.11 mmol), **5** (0.1 mmol) and acetonitrile (2.0 mL). The reaction was stirred at 85 °C under argon atmosphere for 17 h. The reaction mixture was directly purified by silica gel column chromatography to afford the desired product **6**.

***tert*-butyl-3-(4-oxo-3-phenyl-4-(phenylamino)but-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6a)**



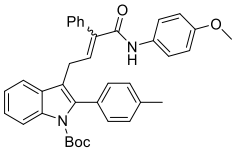
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 41.2 mg, 76% yield; *Z*/*E* = 1:1.5.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.4), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.14 (dd, *J* = 11.6, 8.2 Hz, 1.7H) (*Z*+*E*), 7.58 (d, *J* = 7.8 Hz, 0.7H) (*Z*), 7.42 – 7.32 (m, 4.5H) (*Z*+*E*), 7.31 – 7.13 (m, 14.5H) (*Z*+*E*), 7.12 – 6.95 (m, 11.2H) (*Z*+*E*), 6.94 (s, 1H) (*E*), 6.02 (t, *J* = 7.1 Hz, 0.7H) (*Z*), 3.73 (d, *J* = 7.1 Hz, 1.4H) (*Z*), 3.22 (d, *J* = 7.3 Hz, 2H) (*E*), 2.34 (s, 3H) (*E*), 2.22 (s, 2.1H) (*Z*), 1.17 (s, 6.3H) (*Z*), 1.16 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.63, 164.46, 150.30, 150.27, 140.09, 137.90, 137.70, 137.65, 137.59, 137.41, 137.17, 136.67, 136.60, 136.56, 136.02, 134.93, 134.76, 134.74, 131.11, 131.03, 129.99, 129.77, 129.51, 129.36, 129.33, 129.07, 128.97, 128.87, 128.76, 128.74, 128.63, 128.24, 127.13, 124.67, 124.63, 124.60, 124.42, 122.96, 122.77, 120.14, 119.91, 119.07, 118.83, 118.10, 117.28, 115.38, 83.13, 83.10, 27.64, 25.22, 24.99, 21.46, 21.36.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{36}H_{34}N_2O_3Na$ 565.2467; found: 565.2461.

***tert*-butyl-3-(4-((4-methoxyphenyl)amino)-4-oxo-3-phenylbut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6b)**



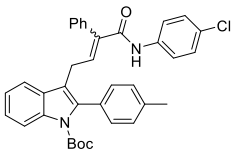
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 38.9 mg, 68% yield; *Z*/*E* = 1:1.1.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.3), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.22 (dd, *J* = 13.1, 8.3 Hz, 1.8H) (*Z*+*E*), 7.66 (d, *J* = 7.7 Hz, 0.8H) (*Z*), 7.42 (dd, *J* = 5.2, 1.9 Hz, 3H) (*Z*+*E*), 7.37 – 7.26 (m, 10.2H) (*Z*+*E*), 7.24 – 7.08 (m, 11.7H) (*Z*+*E*), 6.97 (s, 0.8H) (*Z*), 6.92 (s, 1H) (*E*), 6.89 – 6.83 (m, 1.6H) (*Z*), 6.80 – 6.75 (m, 2H) (*E*), 6.08 (t, *J* = 7.1 Hz, 0.8H) (*Z*), 3.80 (d, *J* = 6.1 Hz, 3.8H) (*Z*), 3.74 (s, 3H) (*E*), 3.28 (d, *J* = 7.3 Hz, 2H) (*E*), 2.41 (s, 3H) (*E*), 2.31 (s, 2.3H) (*Z*), 1.25 (s, 6.9H) (*Z*), 1.24 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.53, 164.37, 156.78, 156.53, 150.32, 150.29, 139.73, 137.66, 137.60, 137.40, 137.32, 136.66, 136.58, 136.02, 135.09, 134.48, 134.47, 131.18, 131.09, 131.05, 130.73, 130.01, 129.82, 129.79, 129.54, 129.40, 129.29, 128.86, 128.78, 128.74, 128.56, 128.20, 127.13, 124.64, 124.59, 122.97, 122.77, 122.09, 121.73, 119.09, 118.87, 118.19, 117.37, 115.40, 115.37, 114.24, 114.12, 83.15, 83.10, 55.65, 55.56, 27.67, 27.65, 25.21, 24.97, 21.47, 21.39.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{37}H_{37}N_2O_4$ 573.2754; found: 573.2754.

***tert*-butyl-3-(4-((4-chlorophenyl)amino)-4-oxo-3-phenylbut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6c)**



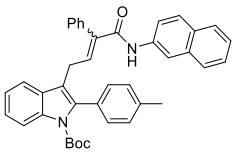
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 40.4 mg, 70% yield; *Z*/*E* = 1:1.2.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.2), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.14 (dd, *J* = 11.3, 8.3 Hz, 1.8H) (*Z*+*E*), 7.56 (d, *J* = 7.7 Hz, 1H) (*E*), 7.38 – 7.30 (m, 4.8H) (*Z*+*E*), 7.29 – 7.11 (m, 16.5H) (*Z*+*E*), 7.10 – 7.02 (m, 8.1H) (*Z*+*E*), 6.97 (s, 0.8H) (*Z*), 6.93 (s, 1H) (*E*), 6.03 (t, *J* = 7.1 Hz, 0.8H) (*Z*), 3.72 (d, *J* = 7.2 Hz, 1.6H) (*Z*), 3.21 (d, *J* = 7.3 Hz, 2H) (*E*), 2.34 (s, 3H) (*E*), 2.23 (s, 2.4H) (*Z*), 1.17 (s, 7.3H) (*Z*), 1.17 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.57, 164.46, 150.28, 150.26, 140.58, 137.62, 137.46, 137.34, 137.09, 136.72, 136.65, 136.58, 136.56, 136.51, 136.27, 135.75, 135.39, 134.73, 131.12, 131.01, 129.98, 129.80, 129.78, 129.63, 129.46, 129.42, 129.36, 129.32, 129.07, 128.98, 128.96, 128.77, 128.75, 128.37, 127.19, 124.68, 124.64, 122.98, 122.80, 121.35, 121.15, 118.99, 118.78, 117.98, 117.16, 115.45, 115.42, 83.21, 83.16, 27.65, 25.22, 25.03, 21.47, 21.38.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{36}H_{33}ClN_2O_3Na$ 599.2078; found: 599.2075.

***tert*-butyl-3-(4-(naphthalen-2-ylamino)-4-oxo-3-phenylbut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6d)**



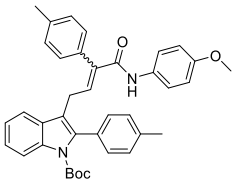
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 42.1 mg, 71% yield; *Z*/*E* = 1:1.2.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.2), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.19 – 8.10 (m, 2.7H) (*Z*+*E*), 8.05 (s, 1H) (*E*), 7.76 – 7.56 (m, 6.8H) (*Z*+*E*), 7.42 – 7.20 (m, 15.5H) (*Z*+*E*), 7.20 – 7.12 (m, 8.4H) (*Z*+*E*), 7.10 – 7.00 (m, 5H) (*Z*+*E*), 6.06 (t, *J* = 7.1 Hz, 0.9H) (*Z*), 3.78 (d, *J* = 7.1 Hz, 1.7H) (*Z*), 3.24 (d, *J* = 7.4 Hz, 2H) (*E*), 2.34 (s, 3H) (*E*), 2.16 (s, 2.5H) (*Z*), 1.17 (s, 9H) (*E*), 1.16 (s, 7.6H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.77, 164.64, 150.31, 150.29, 140.28, 137.62, 137.44, 137.25, 136.73, 136.63, 136.59, 136.03, 135.35, 135.22, 135.12, 134.92, 133.92, 133.89, 131.12, 131.04, 130.90, 130.74, 130.05, 129.79, 129.52, 129.41, 129.37, 128.95, 128.80, 128.77, 128.70, 128.67, 128.32, 127.82, 127.80, 127.68, 127.61, 127.24, 126.69, 126.57, 125.26, 125.11, 124.65, 124.63, 122.99, 122.81, 120.03, 119.94, 119.07, 118.85, 118.12, 117.27, 116.95, 116.70, 115.41, 83.16, 83.13, 27.65, 25.27, 25.05, 21.47, 21.33.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{40}H_{36}N_2O_3Na$ 615.2624; found: 615.2633.

***tert*-butyl-3-(4-((4-methoxyphenyl)amino)-4-oxo-3-(*p*-tolyl)but-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6e)**



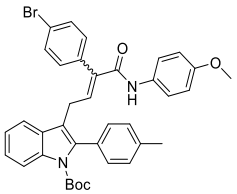
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 29.3 mg, 50% yield; *Z*/*E* = 1:1.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.14 (m, 2H) (*Z*+*E*), 7.58 (d, *J* = 7.7 Hz, 1H) (*Z*), 7.32 – 7.10 (m, 17H) (*Z*+*E*), 7.08 – 6.98 (m, 9H) (*Z*+*E*), 6.90 (s, 1H) (*Z*), 6.86 (s, 1H) (*E*), 6.81 – 6.76 (m, 2H) (*Z*), 6.71 (m, 2H) (*E*), 5.96 (t, *J* = 7.1 Hz, 1H) (*Z*), 3.72 (s, 3H) (*Z*), 3.71 (s, 2H) (*Z*), 3.67 (s, 3H) (*E*), 3.21 (d, *J* = 7.3 Hz, 2H) (*E*), 2.34 (s, 6H) (*Z*+*E*), 2.25 (s, 3H) (*Z*), 2.23 (s, 3H) (*E*), 1.18 (s, 9H) (*Z*), 1.17 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.68, 164.55, 156.73, 156.47, 150.33, 150.31, 139.60, 138.40, 138.12, 137.56, 137.47, 137.36, 136.63, 136.57, 136.52, 135.94, 134.49, 133.87, 131.98, 131.18, 131.07, 130.80, 129.99, 129.90, 129.82, 129.80, 129.58, 129.54, 129.45, 128.76, 128.70, 127.07, 124.60, 124.56, 122.95, 122.74, 122.05, 121.69, 119.13, 118.94, 118.34, 117.50, 115.38, 115.34, 114.23, 114.11, 83.13, 83.08, 55.65, 55.57, 27.67, 27.65, 25.16, 25.01, 21.47, 21.45, 21.39, 21.25.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{38}H_{38}N_2O_4Na$ 609.2730; found: 609.2727.

tert-butyl-3-(3-(4-bromophenyl)-4-((4-methoxyphenyl)amino)-4-oxobut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6f)



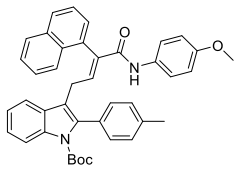
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 31.3 mg, 48% yield; *Z*/*E* = 1:1.1.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1.1:1), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.15 (m, 1.8H) (*Z*+*E*), 7.55 (d, *J* = 7.7 Hz, 1H) (*Z*), 7.44 (d, *J* = 8.2 Hz, 1.8H) (*E*), 7.37 – 7.13 (m, 12.3H) (*Z*+*E*), 7.12 – 6.99 (m, 9.3H) (*Z*+*E*), 6.92 (d, *J* = 8.3 Hz, 2H) (*Z*), 6.79 (m, 4H) (*Z*+*E*), 6.71 (d, *J* = 8.8 Hz, 2H) (*Z*), 5.98 (t, *J* = 7.1 Hz, 1H) (*Z*), 3.73 (s, 3H) (*Z*), 3.69 (d, *J* = 7.1 Hz, 4.7H) (*Z*+*E*), 3.21 (d, *J* = 7.4 Hz, 1.8H) (*E*), 2.36 (s, 2.7H) (*E*), 2.24 (s, 3H) (*Z*), 1.18 (s, 9H) (*Z*), 1.17 (s, 8.1H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.12, 164.00, 156.91, 156.65, 150.27, 150.24, 139.87, 137.72, 137.57, 136.80, 136.71, 136.62, 136.57, 136.54, 136.10, 135.08, 134.25, 133.87, 132.42, 131.97, 131.63, 131.16, 130.97, 130.88, 130.49, 129.82, 129.77, 129.41, 129.21, 128.82, 128.77, 128.56, 124.73, 124.70, 123.03, 122.86, 122.83, 122.31, 122.17, 121.81, 118.95, 118.77, 117.80, 116.99, 115.46, 114.29, 114.17, 83.24, 83.20, 55.66, 55.58, 27.67, 27.65, 25.23, 24.97, 21.51, 21.41.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{37}H_{35}BrN_2O_4Na$ 673.1678, 675.1658; found: 673.1677, 675.1664.

tert-butyl (*E*)-3-(4-((4-methoxyphenyl)amino)-3-(naphthalen-1-yl)-4-oxobut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6g)



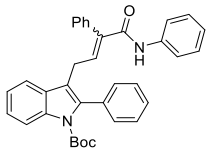
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 36.1 mg, 58% yield; *Z*/*E* = 1:3.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.10 (d, *J* = 8.3 Hz, 1H), 7.85 (dd, *J* = 8.3, 4.0 Hz, 2H), 7.75 (d, *J* = 8.3 Hz, 1H), 7.48 (m, 1H), 7.45 – 7.38 (m, 2H), 7.35 (t, *J* = 7.2 Hz, 1H), 7.25 – 7.18 (m, 3H), 7.10 – 7.04 (m, 3H), 6.99 (s, 4H), 6.73 (s, 1H), 6.68 – 6.60 (m, 2H), 3.64 (s, 3H), 3.08 (d, *J* = 7.2 Hz, 2H), 2.31 (s, 3H), 1.15 (s, 9H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 164.3, 156.5, 150.3, 141.9, 137.3, 136.6, 136.5, 134.2, 134.1, 132.2, 132.0, 130.9, 130.9, 129.7, 129.4, 129.3, 128.7, 128.6, 128.4, 127.2, 126.7, 125.8, 125.4, 124.5, 122.7, 121.9, 118.9, 117.2, 115.3, 114.0, 83.1, 55.5, 27.6, 25.1, 21.5.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{41}H_{39}N_2O_4$ 623.2911; found: 623.2915.

***tert*-butyl-3-(4-(naphthalen-2-ylamino)-4-oxo-3-phenylbut-2-en-1-yl)-2-(*p*-tolyl)-1*H*-indole-1-carboxylate (6h)**



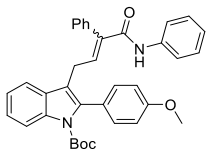
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 39.6 mg, 75% yield; *Z*/*E* = 1:1.2.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.2), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.17 (m, 1.8H) (*Z*+*E*), 7.59 (d, *J* = 7.7 Hz, 0.8H) (*Z*), 7.43 – 7.32 (m, 4.9H) (*Z*+*E*), 7.31 – 7.12 (m, 24.5H) (*Z*+*E*), 7.10 – 7.02 (m, 3.6H) (*Z*+*E*), 6.99 (s, 0.8H) (*Z*), 6.97 (m, 1H) (*E*), 6.94 (s, 1H) (*E*), 6.00 (t, *J* = 7.1 Hz, 0.8H) (*Z*), 3.74 (d, *J* = 7.1 Hz, 1.7H) (*Z*), 3.21 (d, *J* = 7.3 Hz, 2H) (*E*), 1.14 (s, 8H) (*Z*), 1.13 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.60, 164.42, 150.25, 150.22, 140.00, 137.89, 137.73, 137.68, 137.17, 136.65, 136.47, 136.40, 136.10, 134.89, 134.21, 134.11, 129.96, 129.94, 129.48, 129.39, 129.30, 129.09, 128.98, 128.90, 128.69, 128.29, 128.09, 127.84, 127.74, 127.17, 124.78, 124.77, 124.70, 124.45, 123.04, 122.86, 120.13, 119.93, 119.17, 118.91, 118.33, 117.48, 115.41, 83.16, 83.12, 27.61, 27.59, 25.19, 24.97.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{35}H_{32}N_2O_3Na$ 551.2311; found: 551.2304.

***tert*-butyl-2-(4-methoxyphenyl)-3-(4-oxo-3-phenyl-4-(phenylamino)but-2-en-1-yl)-1*H*-indole-1-carboxylate (6i)**



Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 50.3 mg, 90% yield; *Z*/*E* = 1:1.1.

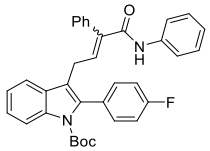
Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.1), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.14 (dd, *J* = 11.4, 8.3 Hz, 1.9H) (*Z*+*E*), 7.57 (d, *J* = 7.7 Hz, 0.9H) (*Z*), 7.43 – 7.33 (m, 4.8H) (*Z*+*E*), 7.32 – 7.11 (m, 18.8H) (*Z*+*E*), 7.09 – 6.95 (m, 5.3H) (*Z*+*E*), 6.94 (s, 1H) (*E*), 6.85 – 6.76 (m, 3.9H) (*Z*+*E*), 6.02 (t, *J* = 7.1

Hz, 0.9H) (*Z*), 3.78 (s, 3H) (*E*), 3.74 (d, *J* = 7.1 Hz, 1.8H) (*Z*), 3.64 (s, 2.7H) (*Z*), 3.21 (d, *J* = 7.3 Hz, 2H) (*E*), 1.20 (s, 8H) (*Z*), 1.19 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.62, 164.46, 159.33, 150.35, 150.32, 140.07, 137.89, 137.70, 137.63, 137.19, 136.54, 136.45, 136.33, 136.01, 134.94, 134.87, 131.10, 131.07, 130.00, 129.47, 129.35, 129.32, 129.10, 128.98, 128.90, 128.66, 128.28, 127.17, 126.37, 126.35, 124.68, 124.62, 124.59, 124.44, 122.97, 122.79, 120.11, 119.93, 119.01, 118.79, 118.19, 117.38, 115.43, 115.41, 113.55, 83.10, 83.06, 55.48, 55.34, 27.74, 25.24, 25.02.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{36}H_{34}N_2O_4Na$ 581.2417; found: 581.2411.

***tert*-butyl-2-(4-fluorophenyl)-3-(4-oxo-3-phenyl-4-(phenylamino)but-2-en-1-yl)-1*H*-indole-1-carboxylate (6j)**



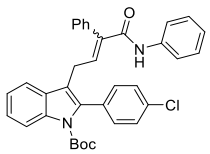
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 44.3 mg, 81% yield; *Z*/*E* = 1:1.3.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.6), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.16 (m, 1.6H) (*Z*+*E*), 7.60 (d, *J* = 7.8 Hz, 0.6H) (*Z*), 7.43 – 7.32 (m, 4.9H) (*Z*+*E*), 7.31 – 7.13 (m, 15.6H) (*Z*+*E*), 7.09 – 6.95 (m, 8.2H) (*Z*+*E*), 6.94 (s, 1H) (*E*), 6.01 (t, *J* = 7.1 Hz, 0.6H) (*Z*), 3.73 (d, *J* = 7.1 Hz, 1.2H) (*Z*), 3.19 (d, *J* = 7.3 Hz, 2H) (*E*), 1.19 (s, 5.6H) (*Z*), 1.18 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.45, 164.33, 163.76, 161.30, 150.17, 150.12, 139.66, 137.87, 137.84, 137.63, 137.17, 136.62, 136.59, 136.15, 135.31, 135.24, 134.94, 134.80, 131.68, 131.65, 131.60, 131.57, 130.18, 130.14, 130.11, 130.07, 129.91, 129.42, 129.36, 129.16, 129.14, 129.01, 128.96, 128.78, 128.40, 127.26, 124.95, 124.76, 124.51, 123.14, 122.99, 120.01, 119.96, 119.23, 118.95, 118.77, 117.92, 115.55, 115.27, 115.21, 115.06, 115.00, 83.39, 83.36, 27.72, 25.19, 24.92.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{35}H_{32}FN_2O_3$ 547.2398; found: 547.2392.

***tert*-butyl-2-(4-chlorophenyl)-3-(4-oxo-3-phenyl-4-(phenylamino)but-2-en-1-yl)-1*H*-indole-1-carboxylate (6k)**



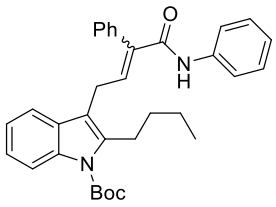
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 43.4 mg, 77% yield; *Z*/*E* = 1:1.6.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.6), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.15 (m, 1.6H) (*Z*+*E*), 7.60 (d, *J* = 7.8 Hz, 0.6H) (*Z*), 7.44 – 7.32 (m, 5.5H) (*Z*+*E*), 7.31 – 7.13 (m, 17.1H) (*Z*+*E*), 7.10 – 7.02 (m, 5.2H) (*Z*+*E*), 6.97 (t, *J* = 7.4 Hz, 1H) (*E*), 6.93 (s, 1H) (*E*), 6.00 (t, *J* = 7.1 Hz, 0.6H) (*Z*), 3.74 (d, *J* = 7.1 Hz, 1.3H) (*Z*), 3.20 (d, *J* = 7.3 Hz, 2H) (*E*), 1.20 (s, 5.8H) (*Z*), 1.19 (s, 9H) (*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.42, 164.31, 150.10, 150.05, 139.46, 137.92, 137.83, 137.61, 137.15, 136.68, 136.63, 136.18, 135.09, 135.03, 134.88, 134.72, 133.92, 133.80, 132.64, 132.57, 131.26, 131.22, 129.88, 129.43, 129.37, 129.19, 129.13, 129.01, 128.97, 128.77, 128.42, 128.35, 128.32, 127.27, 125.06, 124.78, 124.52, 123.18, 123.04, 120.04, 119.96, 119.30, 119.01, 118.90, 118.03, 115.57, 115.55, 83.56, 83.54, 27.72, 25.17, 24.88.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{35}H_{32}ClN_2O_3$ 563.2102, 565.2082; found: 563.2098, 565.2090.

***tert*-butyl 2-butyl-3-(4-oxo-3-phenyl-4-(phenylamino)but-2-en-1-yl)-1*H*-indole-1-carboxylate (6l)**



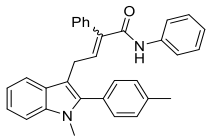
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). Colorless oil; 27.7 mg, 54% yield; *Z*/*E* = 1:1.3.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.3), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.11 (d, *J* = 8.2 Hz, 0.7H) (*Z*), 8.07 (d, *J* = 8.2 Hz, 1H) (*E*), 7.60 – 7.50 (m, 5H) (*Z*+*E*), 7.44 – 7.26 (m, 12.5H) (*Z*+*E*), 7.24 – 7.02 (m, 7.9H) (*Z*+*E*), 6.17 (t, *J* = 7.1 Hz, 0.8H) (*Z*), 3.95 (d, *J* = 7.2 Hz, 1.5H) (*Z*), 3.39 (d, *J* = 7.3 Hz, 2H) (*E*), 3.08 – 2.99 (m, 1.5H) (*Z*), 2.86 – 2.78 (m, 2H) (*E*), 1.67 (s, 6.7H) (*Z*), 1.67 (s, 9H) (*E*), 1.59 – 1.47 (m, 3.5H) (*Z*+*E*), 1.35 – 1.25 (m, 3.5H) (*Z*+*E*), 0.87 (m, 5.3H) (*Z*+*E*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.64, 164.39, 150.58, 150.52, 143.49, 140.10, 138.50, 138.37, 137.90, 137.80, 137.59, 137.36, 136.20, 136.12, 135.15, 130.15, 129.55, 129.53, 129.20, 129.10, 129.01, 128.98, 128.94, 128.53, 128.37, 127.39, 125.52, 124.73, 124.47, 123.64, 123.62, 122.65, 122.52, 119.97, 118.24, 118.06, 116.15, 115.72, 115.66, 115.19, 83.64, 83.62, 32.81, 32.56, 28.34, 26.78, 24.93, 24.69, 22.84, 22.82, 14.23, 14.15.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{33}H_{36}N_2O_3Na$ 531.2624; found: 531.2630.

4-(1-methyl-2-(*p*-tolyl)-1*H*-indol-3-yl)-*N*,2-diphenylbut-2-enamide (6m)



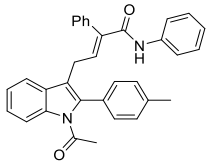
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 14.2 mg, 31% yield; *Z*/*E* = 1:1.

Mixture of ***Z*** and ***E*** (*Z*/*E* = 1.4:1), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 7.63 (d, *J* = 7.9 Hz, 1H) (*Z*), 7.42 – 7.30 (m, 6.1H) (*Z*+*E*), 7.29 – 7.15 (m, 17.6H) (*Z*+*E*), 7.13 – 7.04 (m, 6H) (*Z*+*E*), 6.99 – 6.93 (m, 2.6H) (*Z*+*E*), 6.16 (t, *J* = 7.2 Hz, 1H) (*Z*), 3.87 (d, *J* = 7.2 Hz, 2H) (*Z*), 3.50 (s, 3H) (*Z*), 3.49 (s, 2.1H) (*E*), 3.37 (d, *J* = 7.4 Hz, 1.4H) (*E*), 2.37 (s, 2.1H) (*E*), 2.26 (s, 3H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.89, 164.80, 141.57, 138.57, 138.43, 138.26, 138.08, 138.03, 137.80, 137.39, 137.21, 136.89, 136.08, 135.26, 135.12, 130.68, 130.66, 130.13, 129.36, 129.33, 129.24, 129.07, 128.98, 128.83, 128.81, 128.46, 128.08, 127.67, 127.61, 127.09, 124.58, 124.33, 121.91, 121.86, 120.09, 119.93, 119.65, 119.49, 119.07, 118.97, 110.56, 109.64, 109.53, 109.46, 30.90, 25.66, 25.40, 21.50, 21.42.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{28}N_2ONa$ 479.2100; found: 479.2095.

(*E*)-4-(1-acetyl-2-(*p*-tolyl)-1*H*-indol-3-yl)-*N*,2-diphenylbut-2-enamide (6n)



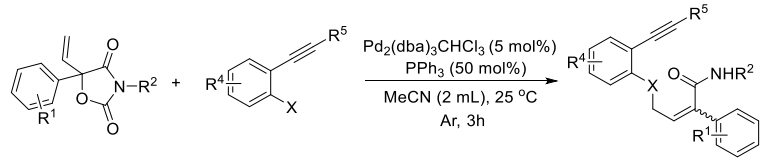
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1). Colorless oil; 24.7 mg, 51% yield; *Z*/*E* = 1:1.3.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.34 – 8.29 (m, 1H), 7.37 (m, 3H), 7.31 – 7.24 (m, 5H), 7.20 – 7.11 (m, 9H), 7.07 (t, *J* = 7.2 Hz, 1H), 6.98 – 6.95 (m, 1H), 3.22 (d, *J* = 7.3 Hz, 2H), 2.37 (s, 3H), 1.86 (s, 3H).

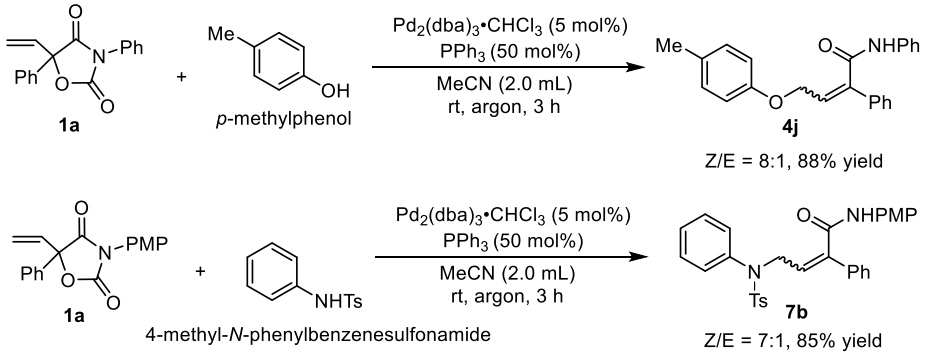
^{13}C NMR (101 MHz, Chloroform-*d*) δ 171.3, 164.4, 139.7, 138.9, 137.9, 136.9, 136.3, 135.9, 134.9, 130.3, 130.0, 129.7, 129.4, 129.0, 128.7, 127.2, 125.5, 124.5, 123.7, 120.0, 120.0, 119.0, 118.8, 116.6, 27.8, 25.1, 21.5.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{33}H_{28}N_2O_2Na$ 507.2049; found: 507.2046.

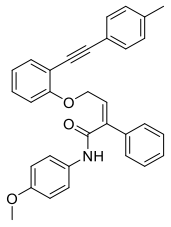
6. General procedure for the synthesis of the product 4 and 7



An oven-dried 25 mL of Schlenk tube was added $Pd_2(dba)_3CHCl_3$ (5 mol%) and PPh_3 (50 mol%), acetonitrile (1.0 mL) under argon atmosphere and stirred for 0.5 h. **1** (0.11 mmol), **2** or **5** (0.1 mmol) and acetonitrile (1.0 mL) were added under argon atmosphere. The mixture was stirred at 25 ℃ for 3 h. The reaction mixture was directly purified by silica gel column chromatography to afford the desired product **4** and **7**.



(*Z*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (4a)



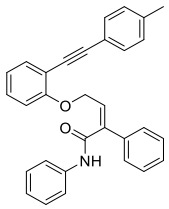
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 132.4 – 133.2 °C; 41.7 mg, 88% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.45 – 7.36 (m, 4H), 7.35 – 7.28 (m, 7H), 7.19 – 7.15 (m, 1H), 7.03 (d, *J* = 7.9 Hz, 2H), 6.94 – 6.82 (m, 2H), 6.76 – 6.69 (m, 2H), 6.38 (t, *J* = 5.7 Hz, 1H), 5.09 (d, *J* = 5.8 Hz, 2H), 3.68 (s, 3H), 2.26 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.4, 158.8, 156.8, 139.6, 138.4, 136.9, 134.4, 133.6, 131.6, 130.5, 129.8, 129.2, 129.1, 128.9, 128.1, 122.0, 121.2, 120.5, 114.3, 113.4, 112.9, 94.0, 85.3, 67.1, 55.6, 21.6.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{32}H_{28}NO_3$ 474.2070; found: 474.2067.

(*Z*)-*N*,2-diphenyl-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (4b)



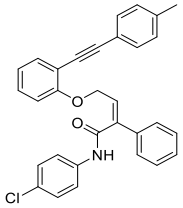
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 139.1 – 139.8 °C; 30.2 mg, 68% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.47 (s, 1H), 7.44 – 7.37 (m, 5H), 7.36 – 7.30 (m, 5H), 7.23 – 7.16 (m, 3H), 7.04 (d, *J* = 7.7 Hz, 3H), 6.95 – 6.84 (m, 2H), 6.42 (t, *J* = 5.7 Hz, 1H), 5.11 (d, *J* = 5.7 Hz, 2H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 158.8, 139.4, 138.4, 137.5, 136.9, 135.1, 133.7, 131.6, 129.8, 129.2, 129.2, 129.0, 128.2, 124.9, 121.2, 120.6, 120.2, 113.4, 112.9, 94.0, 85.3, 67.2, 21.6.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{31}H_{26}NO_2$ 444.1964; found: 444.1960.

(*Z*)-*N*-(4-chlorophenyl)-2-phenyl-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (4c)



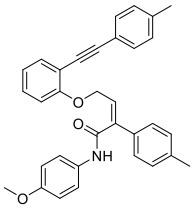
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 143.7 – 144.6 °C; 36.8 mg, 77% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.56 (s, 1H), 7.42 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.37 (m, 4H), 7.33 – 7.30 (m, 4H), 7.28 – 7.12 (m, 4H), 7.03 (d, *J* = 7.9 Hz, 2H), 6.94 – 6.83 (m, 2H), 6.42 (t, *J* = 5.8 Hz, 1H), 5.07 (d, *J* = 5.9 Hz, 2H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 158.7, 139.6, 138.5, 136.7, 136.1, 134.8, 133.7, 131.6, 129.9, 129.8, 129.2, 129.2, 129.1, 129.1, 128.1, 121.4, 121.4, 120.5, 113.4, 113.0, 94.1, 85.2, 67.0, 21.6.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}ClNO_2Na$ 500.1394, 502.1364; found: 500.1386, 502.1381.

(*Z*)-*N*-(4-methoxyphenyl)-2-(*p*-tolyl)-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (4d)



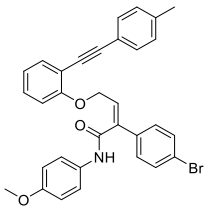
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 150.3 – 151.2 °C; 26.3 mg, 54% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.42 (dd, *J* = 7.7, 1.7 Hz, 2H), 7.33 (dd, *J* = 8.4, 4.7 Hz, 4H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.23 – 7.18 (m, 1H), 7.12 (d, *J* = 7.9 Hz, 2H), 7.04 (d, *J* = 7.9 Hz, 2H), 6.93 – 6.84 (m, 2H), 6.76 – 6.70 (m, 2H), 6.36 (t, *J* = 5.7 Hz, 1H), 5.09 (d, *J* = 5.8 Hz, 2H), 3.69 (s, 3H), 2.30 (s, 3H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 158.9, 156.8, 139.4, 138.9, 138.4, 134.1, 133.9, 133.6, 131.6, 130.6, 129.8, 129.2, 128.1, 122.0, 121.1, 120.6, 114.3, 113.3, 112.9, 94.0, 85.3, 67.2, 55.6, 21.6, 21.3.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{33}H_{30}NO_3$ 488.2226; found: 488.2224.

(*Z*)-2-(4-bromophenyl)-*N*-(4-methoxyphenyl)-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (4e)



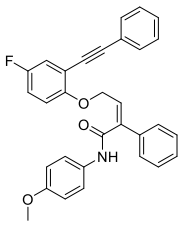
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 162.4 – 163.5 °C; 27.6 mg, 50% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.49 (s, 1H), 7.43 (td, *J* = 5.9, 3.0 Hz, 3H), 7.36 – 7.29 (m, 4H), 7.26 (d, *J* = 8.3 Hz, 2H), 7.18 (d, *J* = 7.8 Hz, 1H), 7.04 (d, *J* = 7.9 Hz, 2H), 6.89 (d, *J* = 7.8 Hz, 2H), 6.77 – 6.69 (m, 2H), 6.39 (t, *J* = 6.0 Hz, 1H), 5.01 (d, *J* = 5.6 Hz, 2H), 3.69 (s, 3H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.0, 158.7, 156.9, 139.3, 138.5, 135.7, 133.7, 133.5, 132.2, 131.6, 130.4, 129.8, 129.6, 129.2, 123.2, 122.0, 121.4, 120.4, 114.3, 113.5, 113.0, 94.1, 85.2, 66.9, 55.6, 21.6.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{32}H_{27}BrNO_3$ 552.1175, 554.1155; found: 552.1172, 554.1158.

(*Z*)-4-(4-fluoro-2-(phenylethynyl)phenoxy)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (4f)



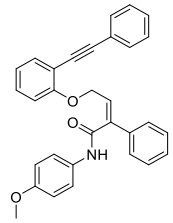
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 159.5 – 160.6 °C; 39.2 mg, 82% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.47 – 7.42 (m, 2H), 7.41 – 7.37 (m, 2H), 7.37 – 7.30 (m, 6H), 7.30 – 7.21 (m, 4H), 7.13 (dd, *J* = 8.6, 2.8 Hz, 1H), 6.95 – 6.85 (m, 2H), 6.79 – 6.72 (m, 2H), 6.38 (t, *J* = 5.6 Hz, 1H), 5.11 (d, *J* = 5.7 Hz, 2H), 3.71 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.3, 156.9, 156.9 (d, *J* = 241.0 Hz), 155.4 (d, *J* = 2.1 Hz), 139.3, 137.0, 135.1, 131.8, 130.5, 129.2, 129.0, 128.6, 128.5, 128.2, 123.2, 122.0, 119.8 (d, *J* = 24.4 Hz), 116.4 (d, *J* = 23.0 Hz), 114.5 (d, *J* = 9.9 Hz), 114.4, 114.3 (d, *J* = 8.8 Hz), 114.3, 94.6, 84.9 (d, *J* = 2.9 Hz), 68.1, 55.6.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}FNO_3Na$ 500.1638; found: 500.1632.

(*Z*)-*N*-(4-methoxyphenyl)-2-phenyl-4-(2-(phenylethynyl)phenoxy)but-2-enamide (4g)



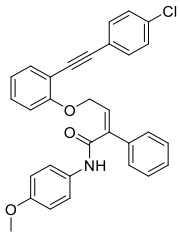
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 141.2 – 142.5 °C; 31.7 mg, 69% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.47 – 7.36 (m, 6H), 7.35 – 7.28 (m, 5H), 7.23 – 7.15 (m, 4H), 6.95 – 6.84 (m, 2H), 6.76 – 6.70 (m, 2H), 6.39 (t, *J* = 5.7 Hz, 1H), 5.10 (d, *J* = 5.7 Hz, 2H), 3.68 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.3, 158.9, 156.9, 139.5, 137.0, 134.6, 133.7, 131.7, 130.5, 130.0, 129.1, 128.9, 128.4, 128.3, 128.1, 123.6, 122.0, 121.2, 114.3, 113.2, 112.9, 93.8, 86.0, 67.1, 55.6.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{25}NO_3Na$ 482.1732; found: 482.1725.

(*Z*)-4-(2-((4-chlorophenyl)ethynyl)phenoxy)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (4h)



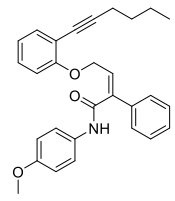
Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 114.3 – 114.9 °C; 45.9 mg, 93% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.44 – 7.29 (m, 11H), 7.23 – 7.16 (m, 3H), 6.96 – 6.84 (m, 2H), 6.79 – 6.70 (m, 2H), 6.37 (t, *J* = 5.6 Hz, 1H), 5.12 (d, *J* = 5.6 Hz, 2H), 3.69 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.3, 158.9, 156.9, 139.3, 137.0, 135.0, 134.2, 133.7, 132.9, 130.5, 130.2, 129.2, 129.0, 128.7, 128.2, 122.2, 122.0, 121.2, 114.3, 112.9, 112.8, 92.6, 87.0, 67.2, 55.6.

HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{31}H_{24}ClNO_3Na$ 516.1343, 518.1313; found: 516.1340, 518.1326.

(*Z*)-4-(2-(hex-1-yn-1-yl)phenoxy)-*N*-(4-methoxyphenyl)-2-phenylbut-2-enamide (4i)

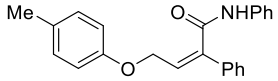


Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 111.2 – 112.1 °C; 31.2 mg, 71% yield; *Z*/*E* = 5.9:1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 (m, 3H), 7.37 – 7.29 (m, 6H), 7.15 (m, 1H), 6.90 – 6.80 (m, 2H), 6.80 – 6.75 (m, 2H), 6.38 (t, *J* = 5.8 Hz, 1H), 5.06 (d, *J* = 5.8 Hz, 2H), 3.71 (s, 3H), 2.37 (t, *J* = 6.9 Hz, 2H), 1.51 – 1.29 (m, 4H), 0.82 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.4, 158.8, 156.9, 139.5, 137.0, 134.7, 133.8, 130.6, 129.1, 129.1, 128.9, 128.2, 122.0, 121.1, 114.3, 113.9, 112.7, 95.0, 67.0, 55.6, 31.0, 22.1, 19.6, 13.8.
HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{29}H_{29}NO_3Na$ 462.2045; found: 462.2040.

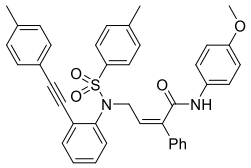
(*Z*)-*N*,2-diphenyl-4-(*p*-tolyloxy)but-2-enamide (4j)



Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 5:1). White solid, m.p. 113.5 – 114.2 °C; 30.2 mg, 88% yield; *Z*/*E* = 8:1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 – 7.30 (m, 8H), 7.23 (m, 2H), 7.02 (m, 3H), 6.78 (d, *J* = 8.2 Hz, 2H), 6.31 (t, *J* = 5.6 Hz, 1H), 4.99 (d, *J* = 5.5 Hz, 2H), 2.20 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 156.3, 138.8, 137.5, 136.9, 135.9, 130.4, 130.1, 129.2, 129.1, 128.9, 128.1, 124.9, 120.1, 114.7, 66.4, 20.6.
HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{23}H_{21}NO_2Na$ 366.1470; found: 366.1463.

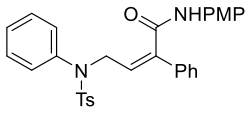
(*Z*)-*N*-(4-methoxyphenyl)-4-((4-methyl-*N*-(2-(*p*-tolylethynyl)phenyl)phenyl)sulfonamido)-2-phenylbut-2-enamide (7a)



Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 3:1). Yellow solid, m.p. 99.1 – 100.0 °C; 39.5 mg, 63% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.53 (s, 1H), 7.50 (d, *J* = 8.1 Hz, 2H), 7.41 – 7.35 (m, 3H), 7.30 – 7.27 (m, 3H), 7.23 (m, 2H), 7.21 – 7.17 (m, 3H), 7.05 (d, *J* = 8.0 Hz, 2H), 6.97 (dd, *J* = 8.1, 6.4 Hz, 4H), 6.78 – 6.73 (m, 2H), 6.21 (t, *J* = 7.0 Hz, 1H), 4.65 (d, *J* = 7.0 Hz, 2H), 3.72 (s, 3H), 2.28 (s, 3H), 2.14 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.8, 156.7, 143.6, 140.6, 139.8, 138.9, 136.9, 136.5, 133.6, 131.9, 131.6, 130.9, 129.7, 129.5, 129.0, 129.0, 128.8, 128.6, 128.5, 127.7, 127.2, 124.4, 121.8, 119.6, 114.2, 95.2, 85.6, 55.6, 51.0, 21.7, 21.5.
HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{39}H_{35}N_2O_4S$ 627.2318; found: 627.2315.

(*Z*)-*N*-(4-methoxyphenyl)-4-((4-methyl-*N*-phenylphenyl)sulfonamido)-2-phenylbut-2-enamide (7b)

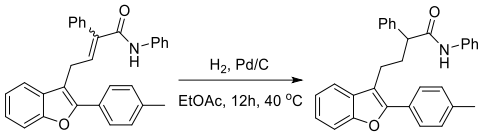


Following the general procedure, the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 3:1). Colorless oil; 43.5 mg, 85% yield; *Z*/*E* = 7:1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 – 7.29 (m, 5H), 7.26 (m, 5H), 7.20 (m, 3H), 7.11 (d, *J* = 8.0 Hz, 2H), 7.06 – 7.01 (m, 2H), 6.80 – 6.75 (m, 2H), 6.07 (t, *J* = 6.6 Hz, 1H), 4.56 (d, *J* = 6.6 Hz, 2H), 3.71 (s, 3H), 2.31 (s, 3H).
^{13}C NMR (101 MHz, Chloroform-*d*) δ 165.5, 156.7, 143.8, 140.0, 139.4, 136.6, 135.2, 131.6, 130.6, 129.6, 129.3, 129.0, 128.8, 128.8, 128.1, 127.7, 127.5, 121.8, 114.2, 55.6, 51.0, 21.6.
HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{30}H_{28}N_2O_4SNa$ 535.1668; found: 535.1666.

7. Further transformation of the products

7.1 The procedure for the synthesis of compound 8

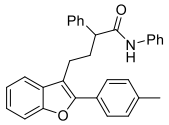


Z/E = 1:1.4
3ba

84% yield
8

3ba (22.2 mg, 0.05 mmol) and palladium on activated carbon (10.0 mg, 10% wet) were stirred in EA (2.0 mL). The mixture was degassed, and charged with hydrogen balloon and stirred at 40 ℃ for 12 h. Then the mixture was filtered through a short pad of Celite, which was rinsed with EA concentrated and purified by flash chromatography on silica gel (ethyl acetate/petroleum ether = 1:10) to afford product **8**.

***N*,2-diphenyl-4-(2-(*p*-tolyl)benzofuran-3-yl)butanamide (8)**



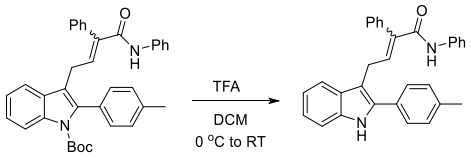
White solid, m.p. 167.2 – 168.0 °C; 18.7 mg, 84% yield.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.51 (d, *J* = 8.2 Hz, 2H), 7.47 – 7.43 (m, 1H), 7.40 (d, *J* = 8.0 Hz, 1H), 7.34 – 7.26 (m, 3H), 7.25 – 7.16 (m, 7H), 7.16 – 7.08 (m, 3H), 6.99 (t, *J* = 7.4 Hz, 1H), 6.90 (s, 1H), 3.44 (t, *J* = 7.3 Hz, 1H), 2.89 (m, 2H), 2.74 – 2.60 (m, 1H), 2.28 (s, 3H), 2.14 (m 1H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 171.2, 154.0, 151.4, 139.5, 138.3, 137.9, 130.5, 129.5, 129.2, 129.0, 128.4, 128.1, 127.8, 126.9, 124.4, 124.3, 122.5, 119.9, 119.7, 114.6, 111.1, 53.7, 33.1, 22.4, 21.5.

HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{31}H_{28}NO_2$ 446.2121; found: 446.2116.

7.2 The procedure for the synthesis of compound 9

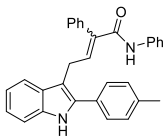


Z/*E* = 1:1.5
6a

91% yield
Z/*E* = 1:1.4
9

TFA (0.5 mL) was added cautiously to a stirred solution of **6a** (27.1 mg, 0.05 mmol) in DCM (2 mL) at 0 ℃. The solution was stirred at room temperature for 12h. The reaction mixture was quenched with $NaHCO_3$, diluted with DCM and washed with water and brine. The organic layer was dried over $MgSO_4$ and concentrated in vacuo. Purification by silica gel column chromatography (ethyl acetate/petroleum ether = 1:5) gave **9**.

***N*,2-diphenyl-4-(2-(*p*-tolyl)-1*H*-indol-3-yl)but-2-enamide (9)**



Colorless oil; 20.1 mg, 91 % yield; *Z*/*E* = 1:1.4.

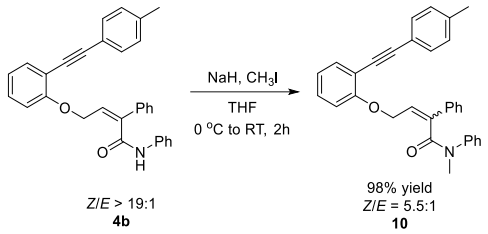
Mixture of ***Z*** and ***E*** (*Z*/*E* = 1:1.4), **^{1}H NMR (400 MHz, Chloroform-*d*)** δ 8.16 (s, 1H) (*E*), 8.10 (s, 0.7H) (*Z*), 7.61 (d, *J* = 7.9 Hz, 1H) (*E*), 7.44 – 7.28 (m, 10.5H) (*Z*+*E*), 7.28 – 7.14 (m, 15.6H) (*Z*+*E*),

7.08 – 7.00 (m, 6.5H) (*Z*+*E*), 6.22 (t, *J* = 7.1 Hz, 0.7H) (*Z*), 4.05 (d, *J* = 7.1 Hz, 1.5H) (*Z*), 3.52 (d, *J* = 7.3 Hz, 2H) (*E*), 2.29 (s, 3H) (*E*), 2.24 (s, 2.2H) (*Z*).

Mixture of ***Z*** and ***E***, **^{13}C NMR (101 MHz, Chloroform-*d*)** δ 166.91, 164.89, 141.30, 137.96, 137.82, 137.60, 137.35, 137.31, 136.09, 135.91, 135.89, 135.66, 135.23, 135.16, 135.12, 130.17, 129.98, 129.92, 129.70, 129.57, 129.33, 129.17, 129.10, 129.04, 128.99, 128.86, 128.66, 128.16, 128.11, 128.06, 127.20, 124.62, 124.42, 122.37, 122.31, 120.05, 119.96, 119.77, 119.19, 119.02, 110.98, 110.94, 110.32, 109.34, 25.60, 25.35, 21.38, 21.35.

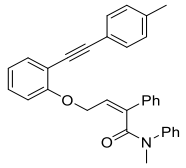
HRMS (ESI) m/z: $[M + H]^+$ Calc. for $C_{31}H_{27}N_2O$ 443.2124; found: 443.2118.

7.3 The procedure for the synthesis of compound 10



To a Schlenk tube, **4b** (0.05 mmol, 22.2 mg) was dissolved in anhydrous THF (2.0 mL) under an atmosphere of nitrogen and cooled to 0 °C. NaH (60 % in mineral oil, 0.06 mmol, 2.4 mg) was added portion wise and the resulting suspension was stirred for 15 mins before the addition of iodomethane (0.06 mmol, 3.4 μL). The reaction mixture was warmed and stirred at rt for 2 hours, after which time it was quenched with H_2O and extracted with DCM. The combined organic layers were washed H_2O, brine, dried over $MgSO_4$ and concentrated in vacuo. Purification by silica gel column chromatography (ethyl acetate/petroleum ether = 1:5) gave **10**.

(*Z*)-*N*-methyl-*N*,2-diphenyl-4-(2-(*p*-tolylethynyl)phenoxy)but-2-enamide (10)



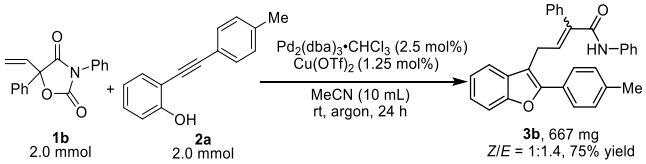
Colorless oil; 22.4 mg, 98 % yield; *Z*/*E* = 5.5:1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.43 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.35 (m, 3H), 7.25 – 7.16 (m, 2H), 7.11 – 7.04 (m, 4H), 7.02 – 6.97 (m, 4H), 6.95 – 6.88 (m, 2H), 6.81 – 6.74 (m, 2H), 5.95 (t, *J* = 6.3 Hz, 1H), 4.81 (d, *J* = 6.3 Hz, 2H), 3.32 (s, 3H), 2.29 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.0, 159.0, 142.6, 141.2, 138.3, 136.9, 133.6, 131.7, 129.8, 129.2, 128.9, 128.5, 128.0, 127.4, 127.0, 126.8, 126.1, 121.1, 120.7, 113.4, 112.9, 93.9, 85.4, 66.9, 37.0, 21.7.

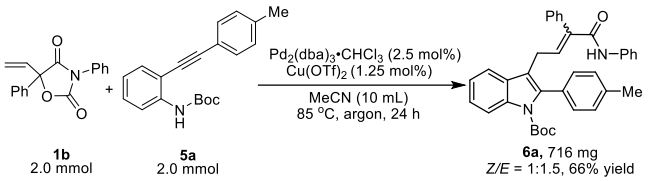
HRMS (ESI) m/z: $[M + Na]^+$ Calc. for $C_{32}H_{27}NO_2Na$ 480.1940; found: 480.1937.

8. Scale-up experiment

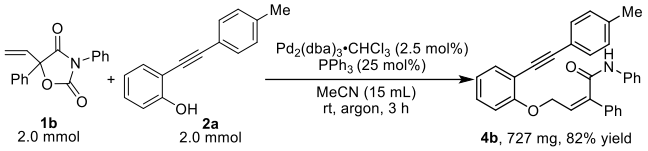


A round-bottom flask (50 mL) containing a stirring bar was charged with **1b** (558 mg, 2.0 mmol, 1.0 equiv.), **2a** (416 mg, 2.0 mmol, 1.0 equiv.), $Pd_2(dba)_3CHCl_3$ (2.5 mol%) and $Cu(OTf)_2$ (1.25 mol%), and acetonitrile (10.0 mL). The resulting mixture was stirred at 25 °C for 17 h. After completion of the reaction (monitored by TLC), the reaction mixture was concentrated. The reaction

mixture was directly purified by silica gel column chromatography (petroleum ether/ethyl acetate as eluent) to afford the desired product **3b** in 75% yield.



A 25 mL of Schlenk tube containing a stirring bar was charged with **1b** (558 mg, 2.0 mmol, 1.0 equiv.), **5a** (614 mg, 2.0 mmol, 1.0 equiv.), $Pd_2(dba)_3CHCl_3$ (2.5 mol%) and $Cu(OTf)_2$ (1.25 mol%), and acetonitrile (10.0 mL). The resulting mixture was stirred at 85 °C for 24 h. After completion of the reaction (monitored by TLC), the reaction mixture was concentrated. The reaction mixture was directly purified by silica gel column chromatography (petroleum ether/ethyl acetate as eluent) to afford the desired product **6a** in 66% yield.



A round-bottom flask (50 mL) containing a stirring bar was added $Pd_2(dba)_3CHCl_3$ (2.5 mol%) and PPh_3 (25 mol%), acetonitrile (10.0 mL) under argon atmosphere and stirred for 0.5 h. **1b** (558 mg, 2.0 mmol, 1.0 equiv.), **2a** (416 mg, 2.0 mmol, 1.0 equiv.) and acetonitrile (5.0 mL) were added under argon atmosphere. The resulting mixture was stirred at 25 °C for 3 h. After completion of the reaction (monitored by TLC), the reaction mixture was concentrated. The reaction mixture was directly purified by silica gel column chromatography (petroleum ether/ethyl acetate as eluent) to afford the desired product **4b** in 82% yield.

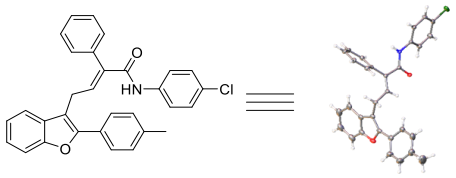
9. Reference

1. Li, K.; Zhen, S.; Wang, W.; Du, J.; Yu, S.; Wu, Y.; Guo, H. Fungicide-inspired precursors of π-allylpalladium intermediates for palladium-catalyzed decarboxylative cycloadditions. *Chemical Science* **2023**, *14*, 3024-3029.

2. Scuiller, A.; Casaretto, N.; Archambeau, A. Diastereo- and Enantioselective (3 + 2) Cycloaddition of a New Aza-π-Allylpalladium Zwitterionic Intermediate. *The Journal of Organic Chemistry* **2023**, *88*, 9941-9945.

10. X-ray crystallographic data of 3e and 4a.

Single crystals of compound **3e** was prepared through dissolving the sample in mixture solvent of EtOH/EA (1:1) at room temperature and crystalizing by slow evaporation of solvent.



3e CCDC 2410445

Table 1 Crystal data and structure refinement for 3e.

Identification code	**3e**
Empirical formula	$C_{31}H_{24}ClNO_2$
Formula weight	477.96
Temperature/K	149.99(10)
Crystal system	orthorhombic
Space group	Pbca
a/Å	19.1841(4)
b/Å	10.0695(2)
c/Å	26.0275(5)
α/°	90
β/°	90
γ/°	90
Volume/Å^3	5027.84(17)
Z	8
ρ_{calc}g/cm^3	1.263
μ/mm^{-1}	1.563
F(000)	2000.0
Crystal size/mm^3	0.14 × 0.11 × 0.09
Radiation	Cu Kα (λ = 1.54184)
2Θ range for data collection/°	6.792 to 147.134
Index ranges	-16 ≤ h ≤ 23, -12 ≤ k ≤ 8, -25 ≤ l ≤ 32
Reflections collected	12648
Independent reflections	4957 [R_{int}= 0.0390, R_{sigma}= 0.0418]
Data/restraints/parameters	4957/0/321
Goodness-of-fit on F^2	1.016
Final R indexes [I>=2σ (I)]	R_1= 0.0577, wR_2= 0.1574
Final R indexes [all data]	R_1= 0.0684, wR_2= 0.1700
Largest diff. peak/hole / e Å^{-3}	0.36/-0.30

Single crystals of compound **4a** was prepared through dissolving the sample in mixture solvent of EtOH/EA (1:1) at room temperature and crystalizing by slow evaporation of solvent.

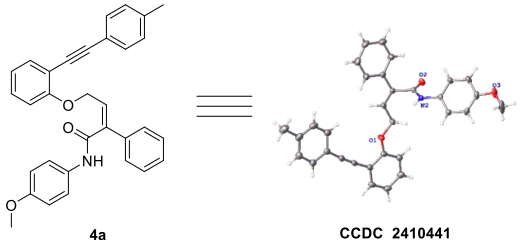
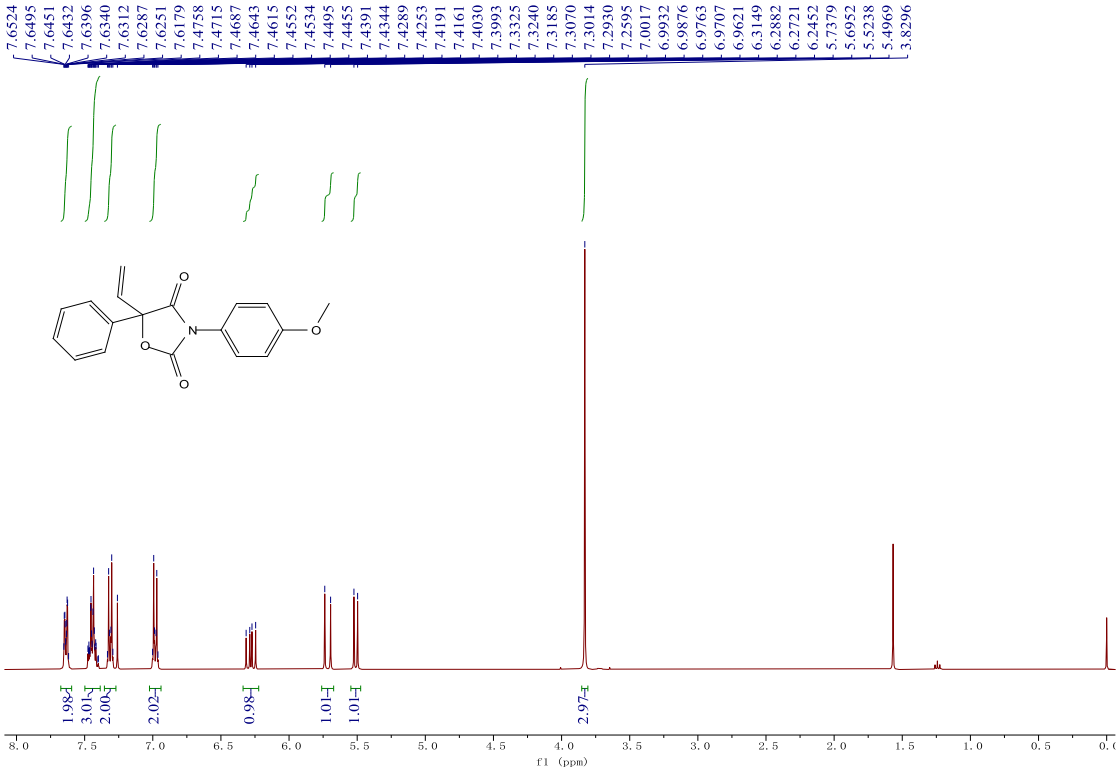


Table 2 Crystal data and structure refinement for 4a.

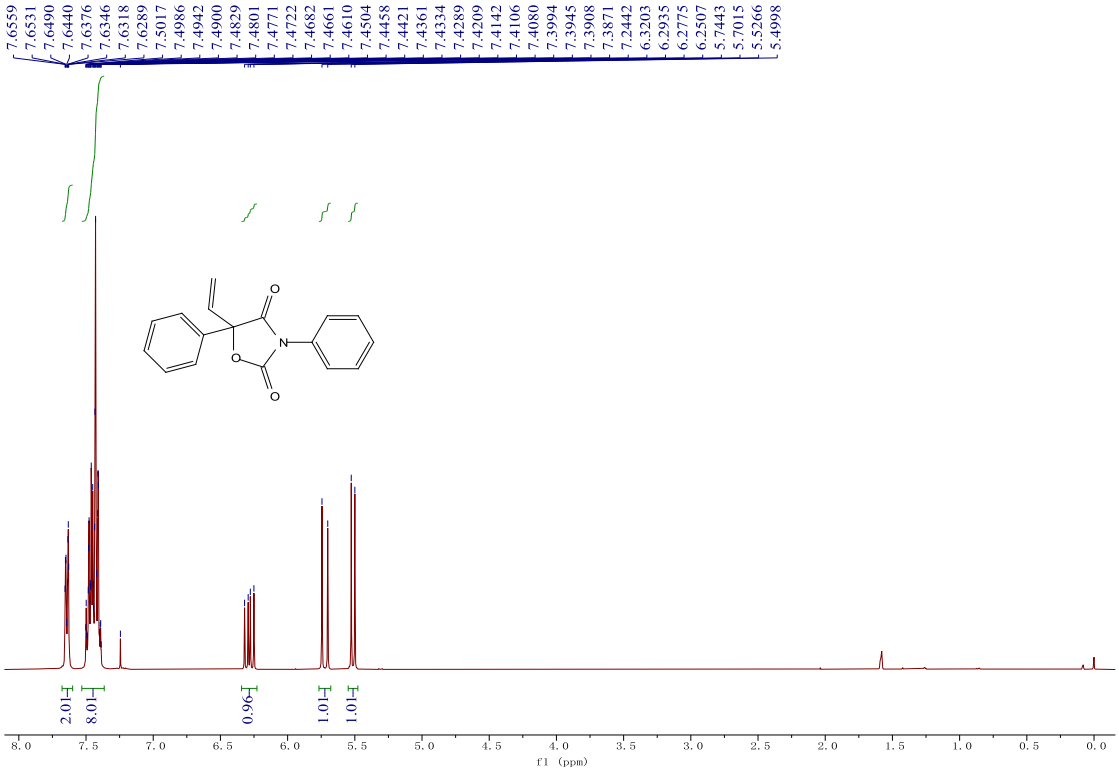
Identification code	**4a**
Empirical formula	$C_{32}H_{27}NO_3$
Formula weight	473.54
Temperature/K	169.98(10)
Crystal system	tetragonal
Space group	I-4
a/Å	32.4772(4)
b/Å	32.4772(4)
c/Å	5.00380(10)
α/°	90
β/°	90
γ/°	90
Volume/Å^3	5277.85(17)
Z	8
ρ_{calc}g/cm^3	1.192
μ/mm^{-1}	0.603
F(000)	2000.0
Crystal size/mm^3	0.14 × 0.12 × 0.1
Radiation	Cu Kα (λ = 1.54184)
2Θ range for data collection/°	5.442 to 146.832
Index ranges	-39 ≤ h ≤ 27, -39 ≤ k ≤ 23, -5 ≤ l ≤ 5
Reflections collected	9975
Independent reflections	4583 [R_{int}= 0.0181, R_{sigma}= 0.0224]
Data/restraints/parameters	4583/0/331
Goodness-of-fit on F^2	1.062
Final R indexes [I>=2σ (I)]	R_1= 0.0323, wR_2= 0.0827
Final R indexes [all data]	R_1= 0.0334, wR_2= 0.0836
Largest diff. peak/hole / e Å^{-3}	0.17/-0.16
Flack/Hooft parameter	0.02(7)/0.03(8)

11. NMR spectra of substrates and products

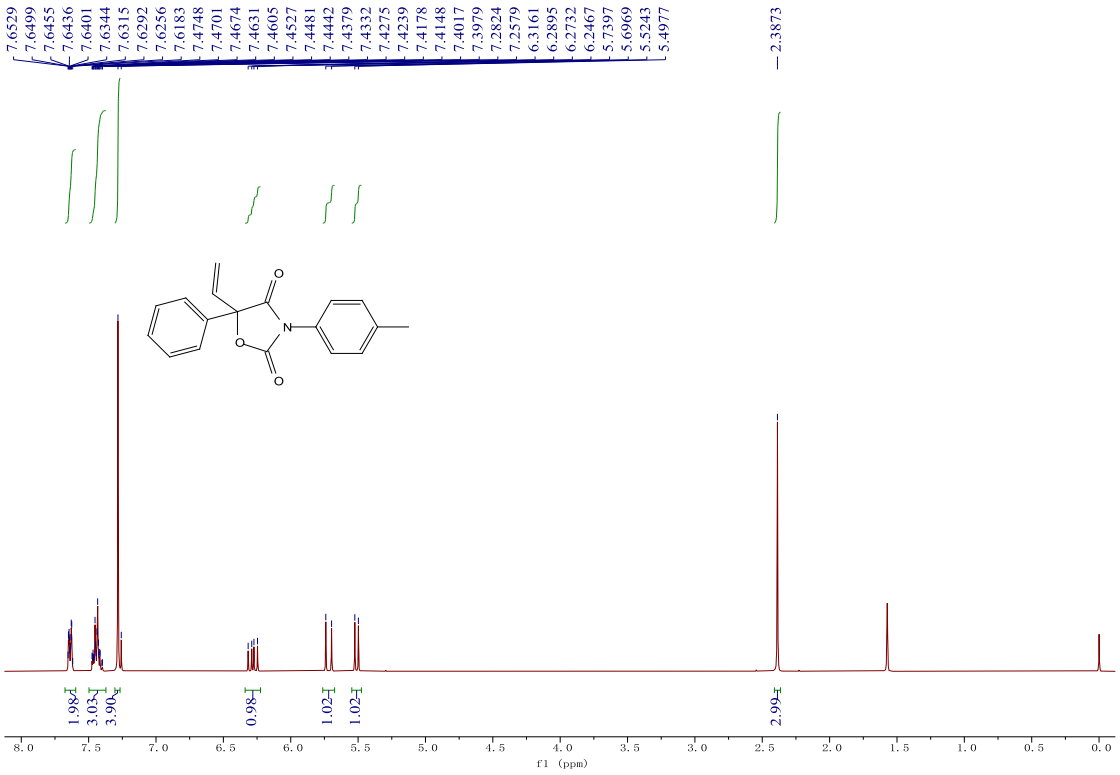
^{1}H NMR (400 MHz, Chloroform-*d*) of 1a



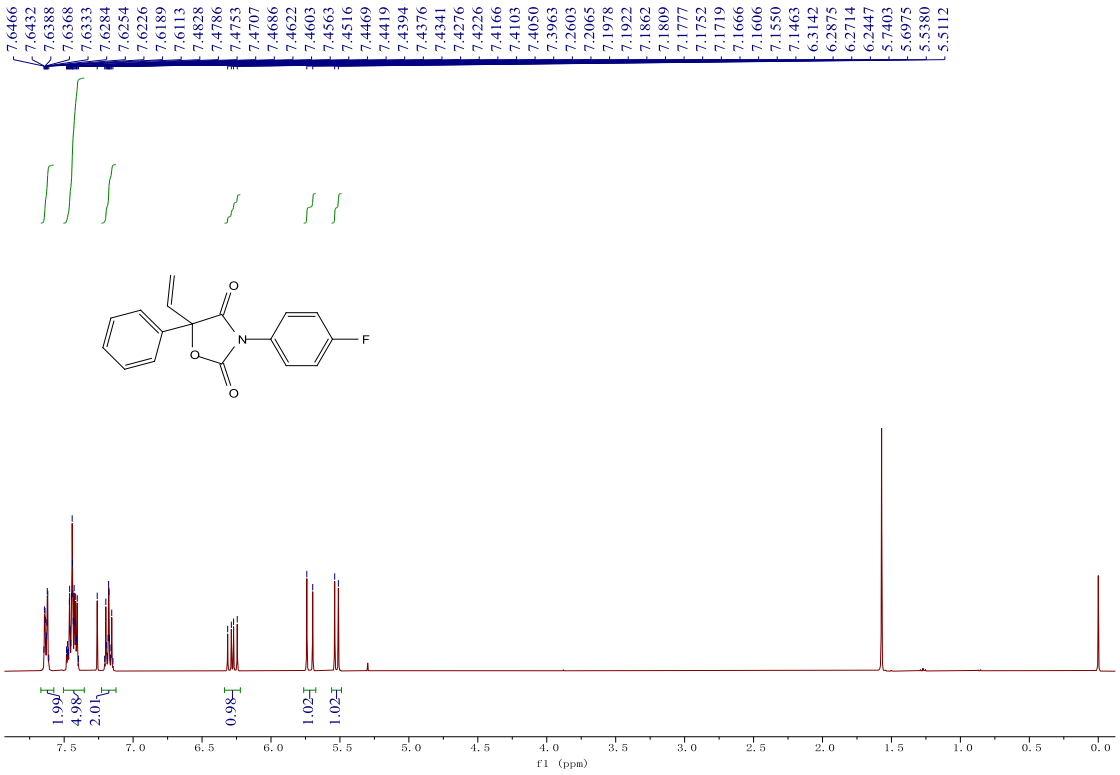
^{1}H NMR (400 MHz, Chloroform-*d*) of 1b



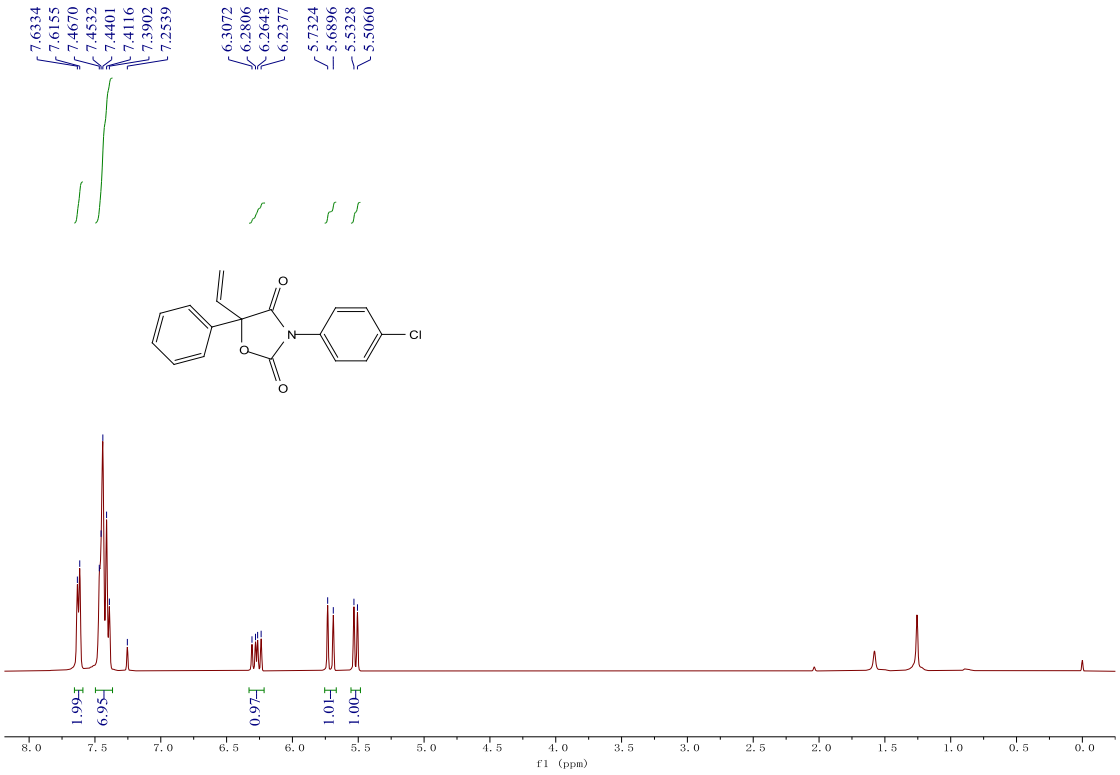
^{1}H NMR (400 MHz, Chloroform-*d*) of 1c



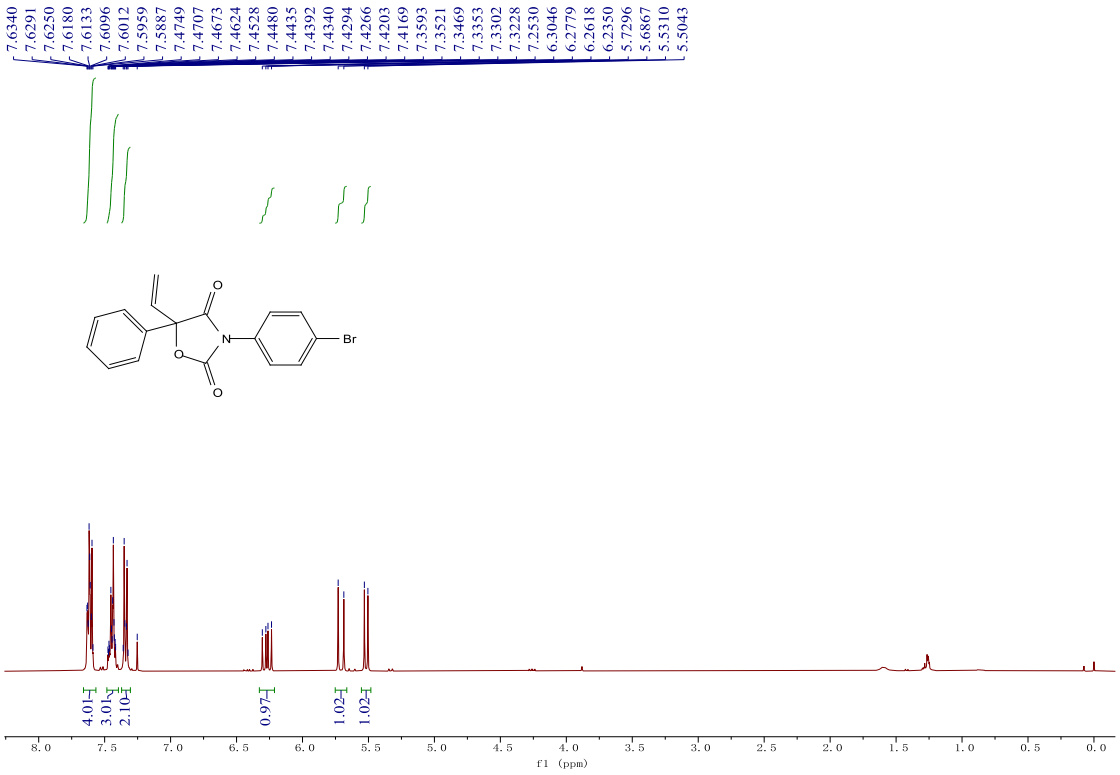
^{1}H NMR (400 MHz, Chloroform-*d*) of 1d



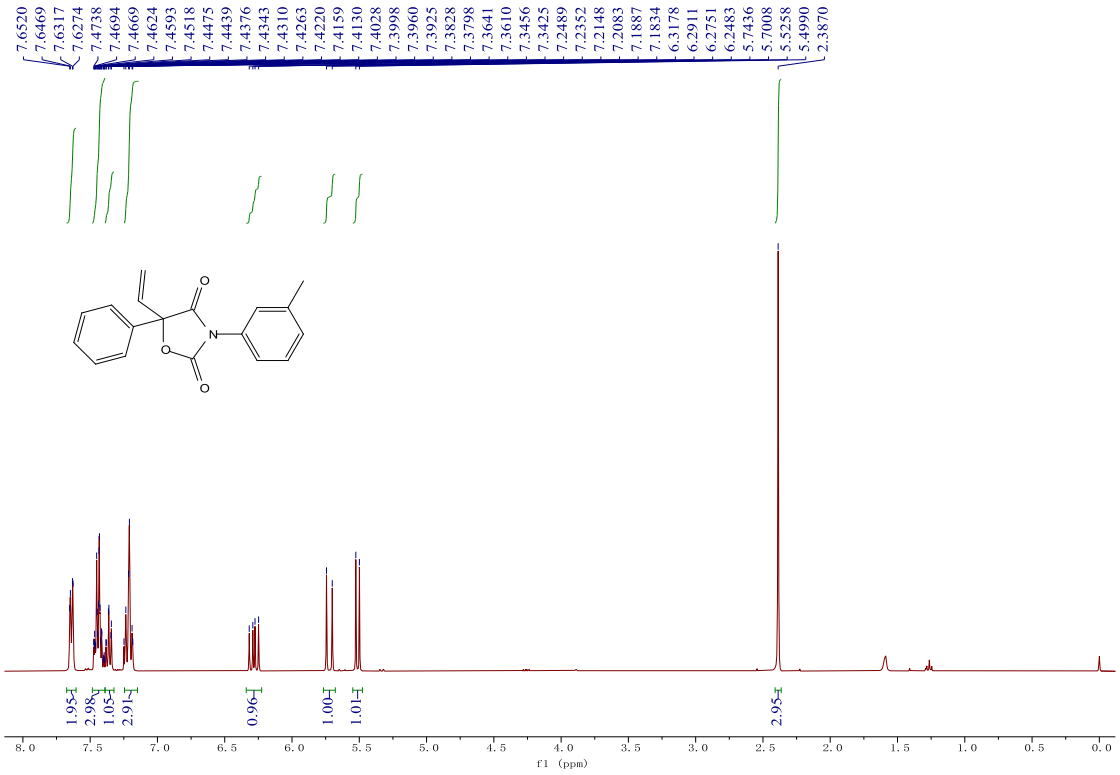
^{1}H NMR (400 MHz, Chloroform-*d*) of 1e



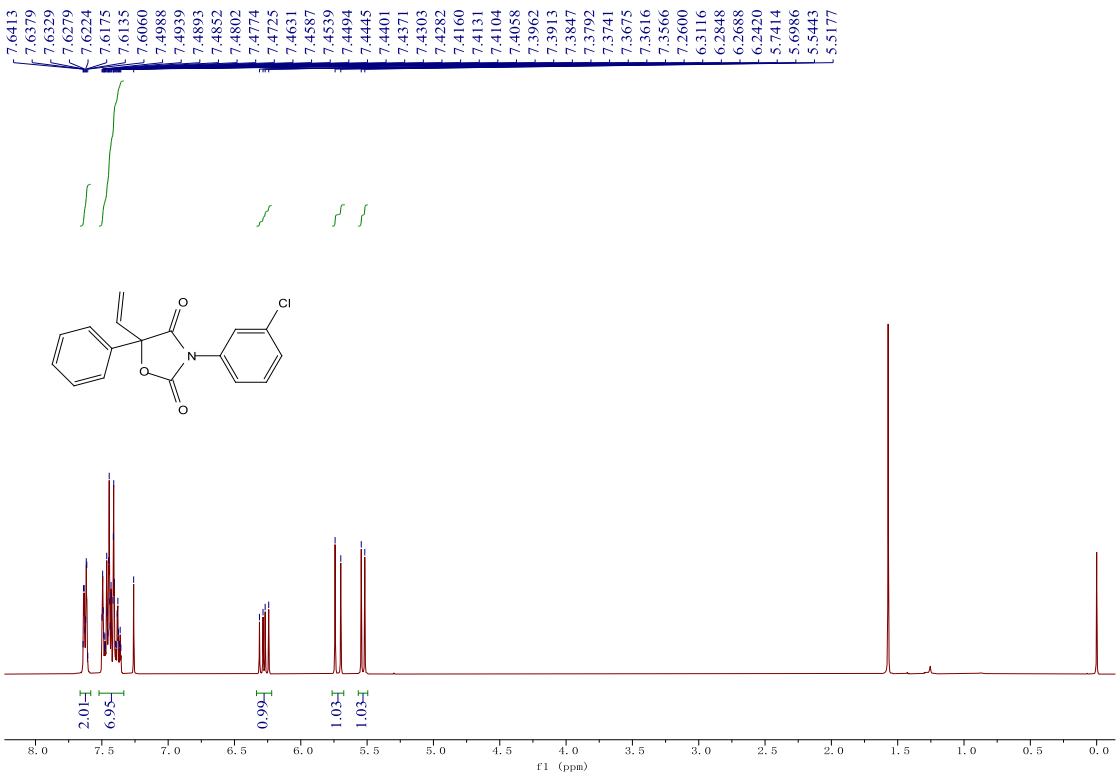
^{1}H NMR (400 MHz, Chloroform-*d*) of 1f



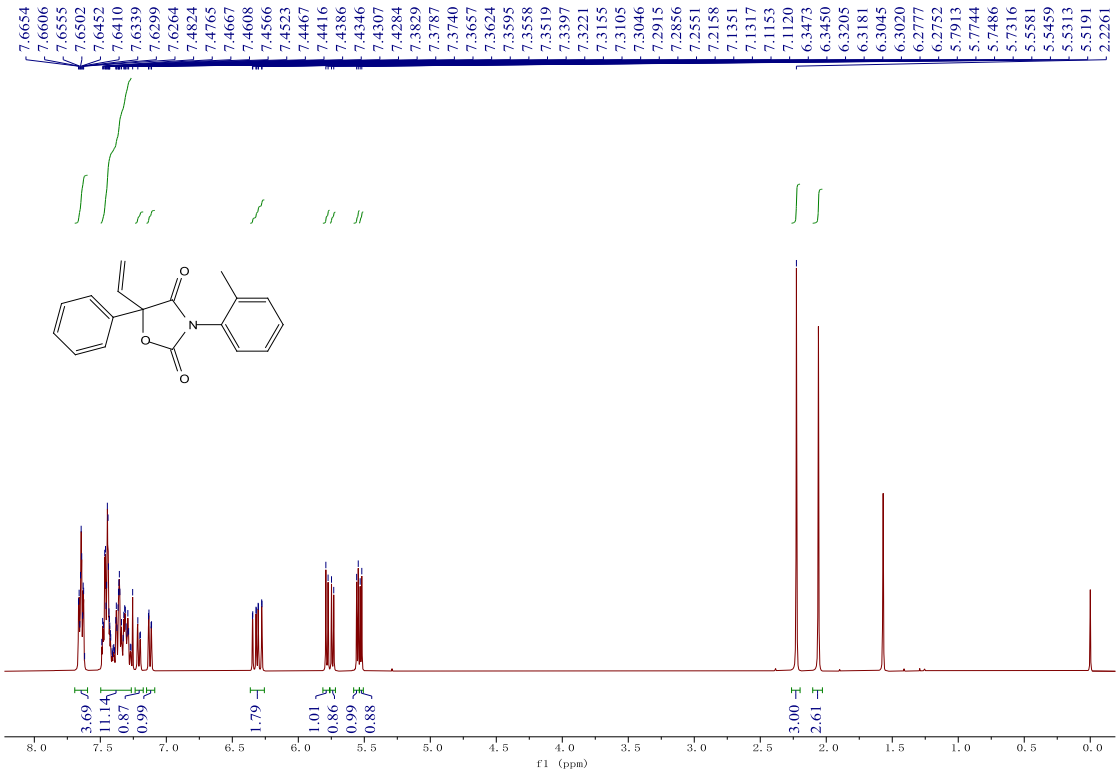
^{1}H NMR (400 MHz, Chloroform-*d*) of 1g



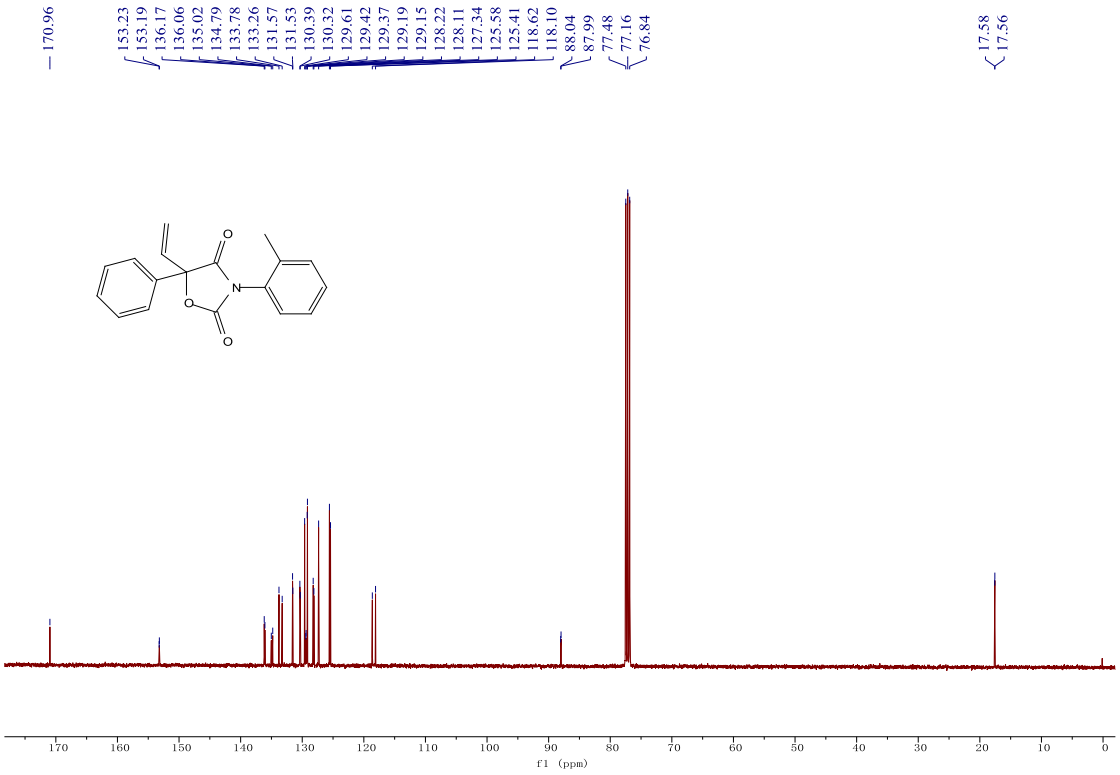
^{1}H NMR (400 MHz, Chloroform-*d*) of 1h



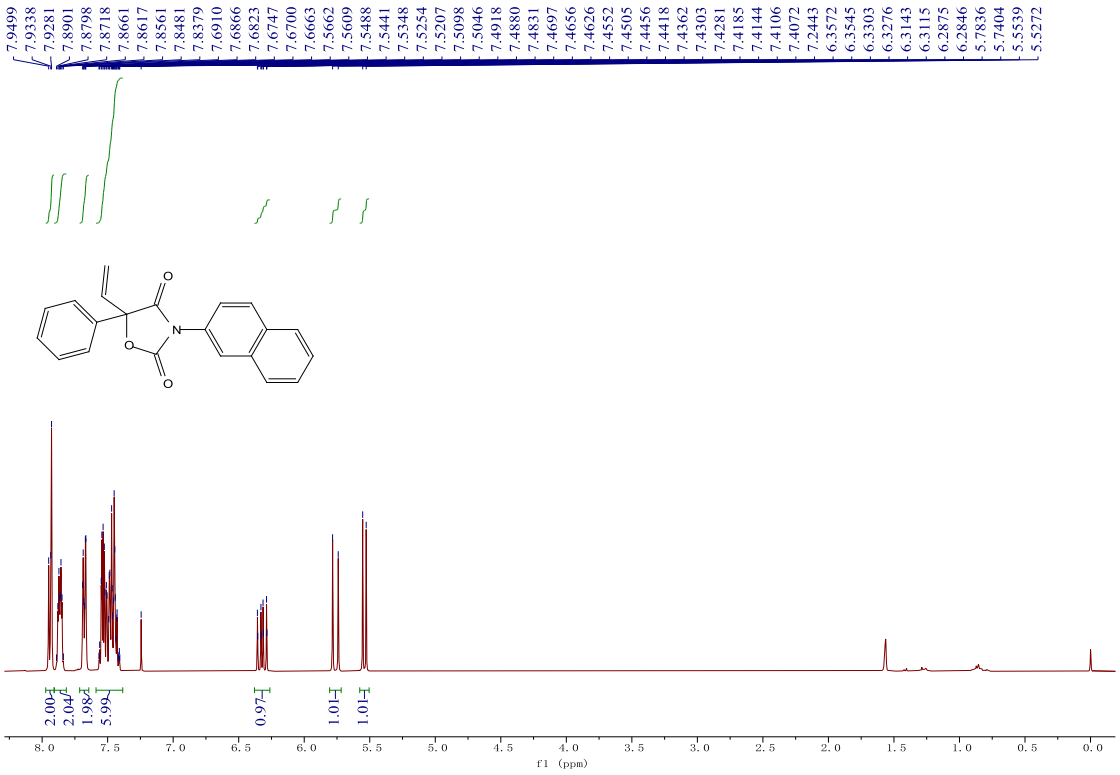
^{1}H NMR (400 MHz, Chloroform-*d*) of 1i



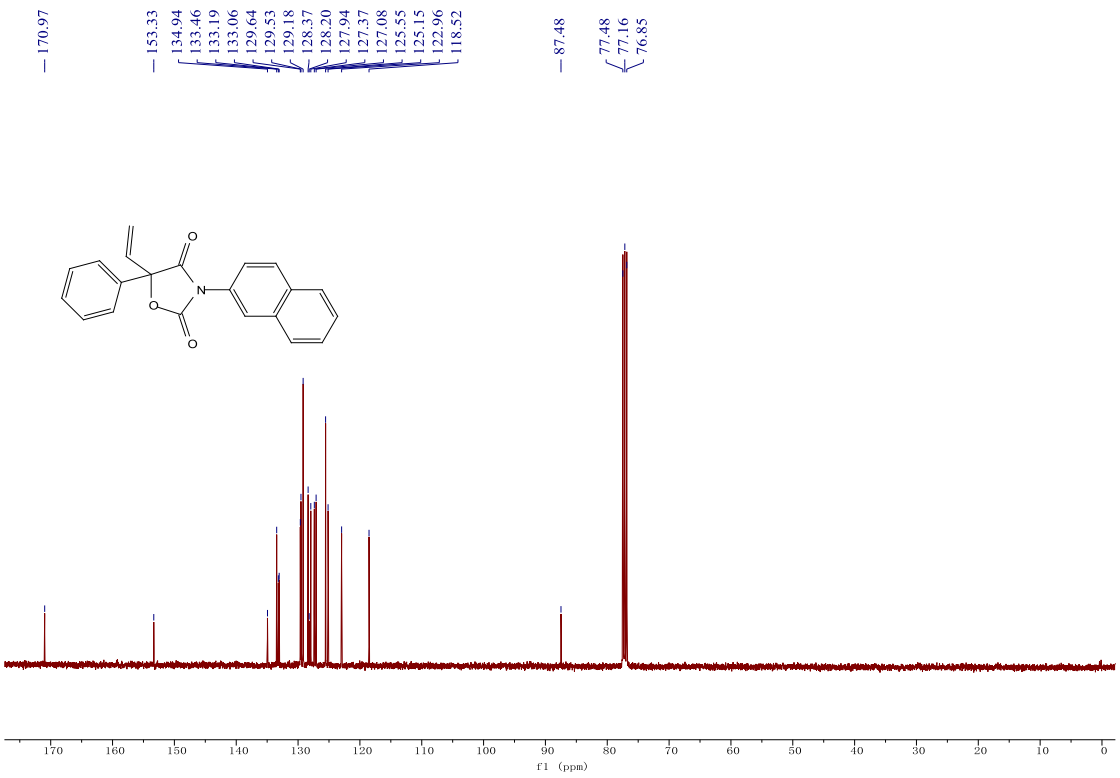
^{13}C NMR (101 MHz, Chloroform-*d*) of 1i



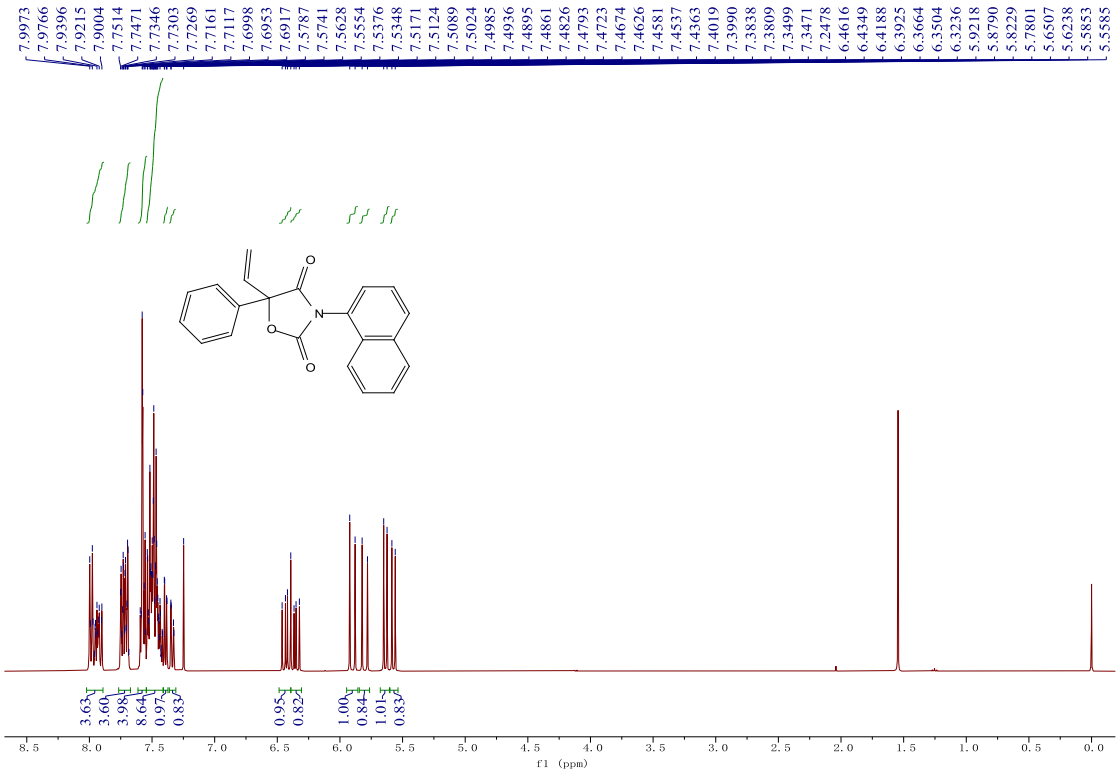
^{1}H NMR (400 MHz, Chloroform-*d*) of 1j



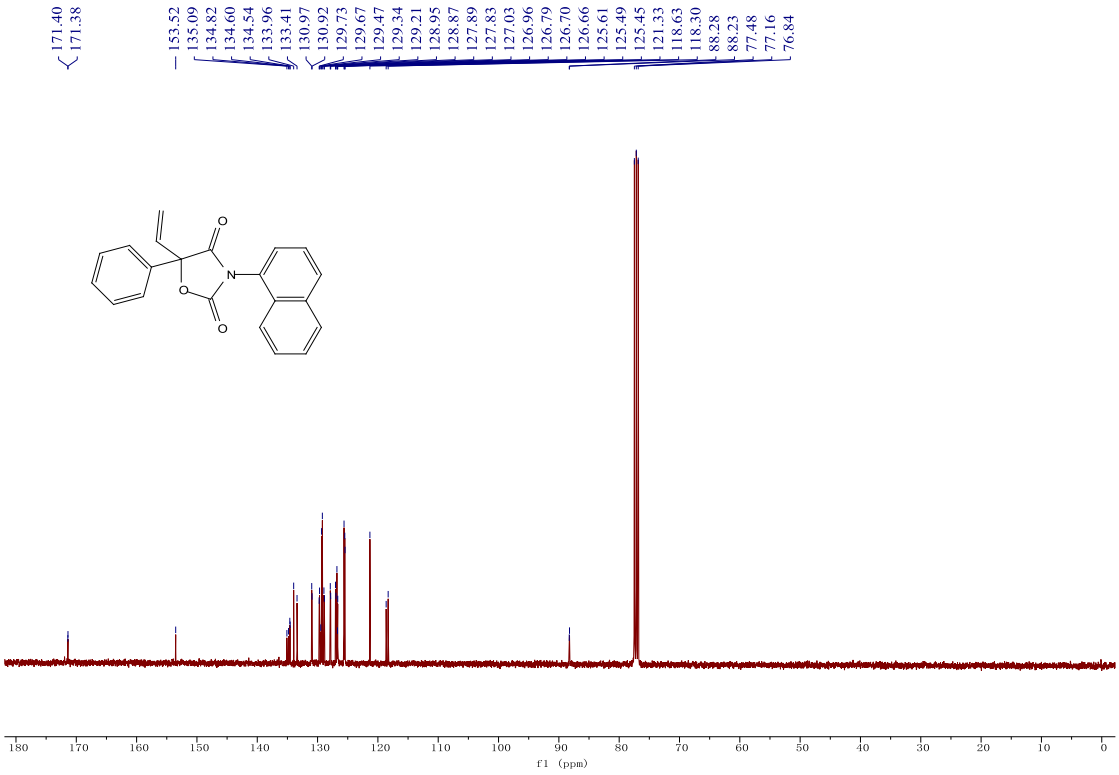
^{13}C NMR (101 MHz, Chloroform-*d*) of 1j



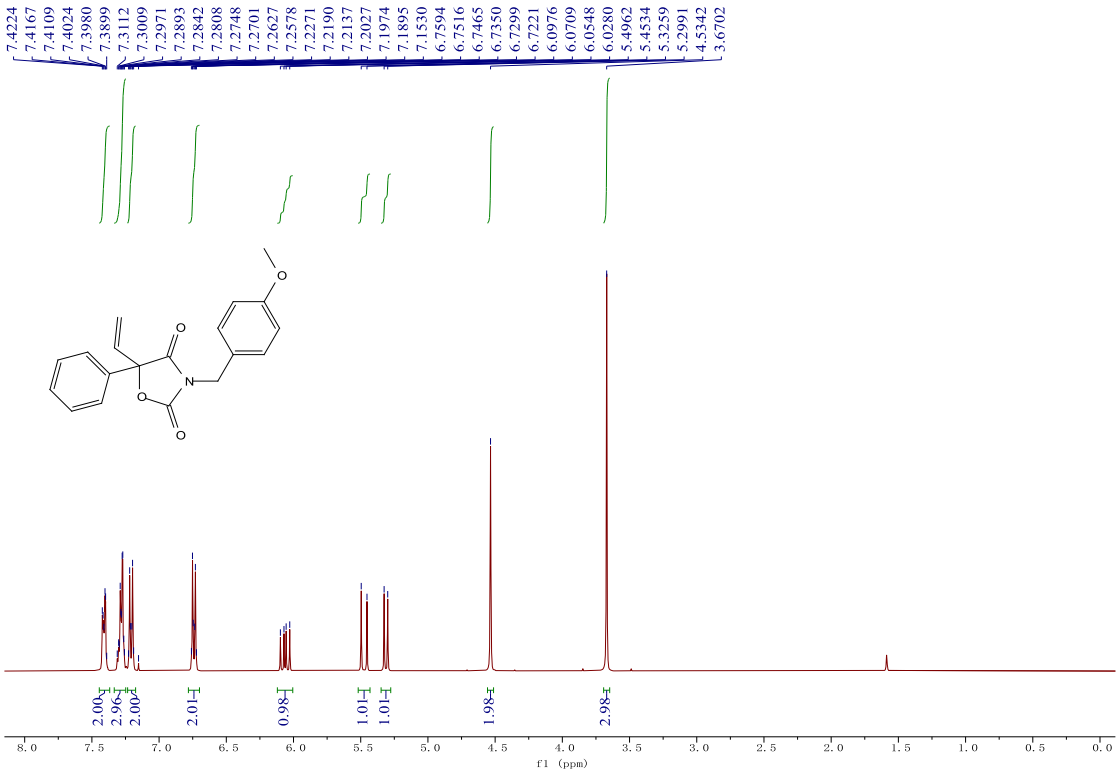
^{1}H NMR (400 MHz, Chloroform-*d*) of 1k



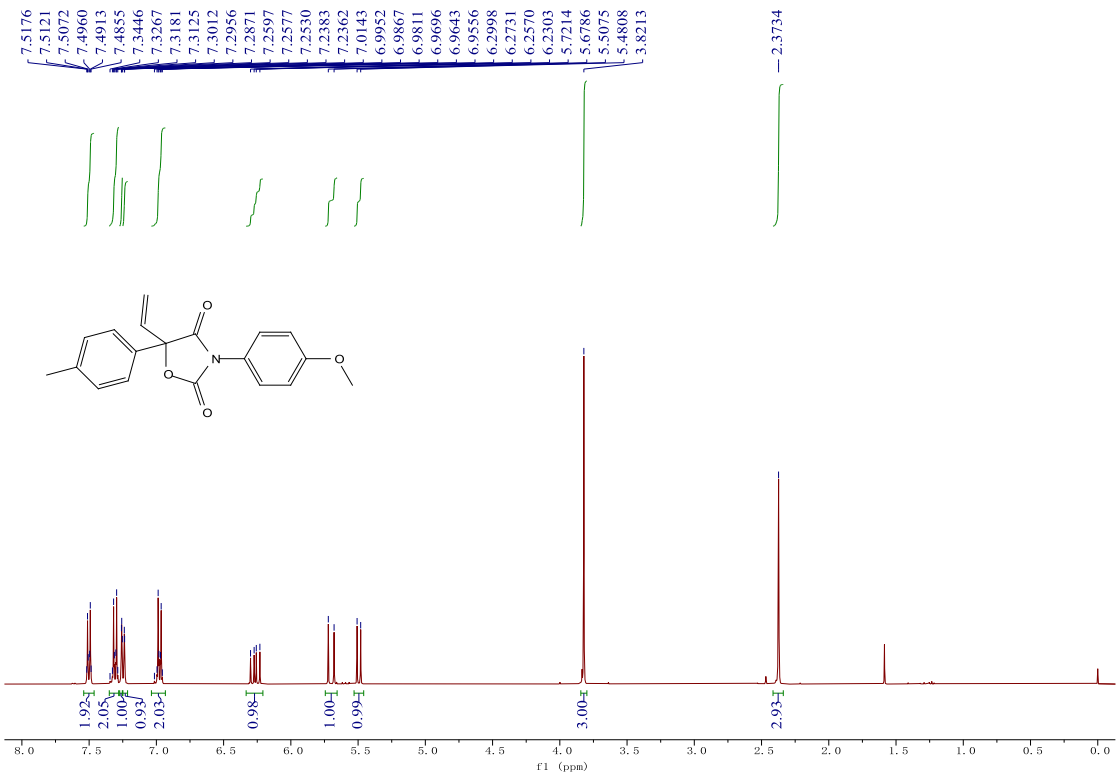
^{13}C NMR (101 MHz, Chloroform-*d*) of 1k



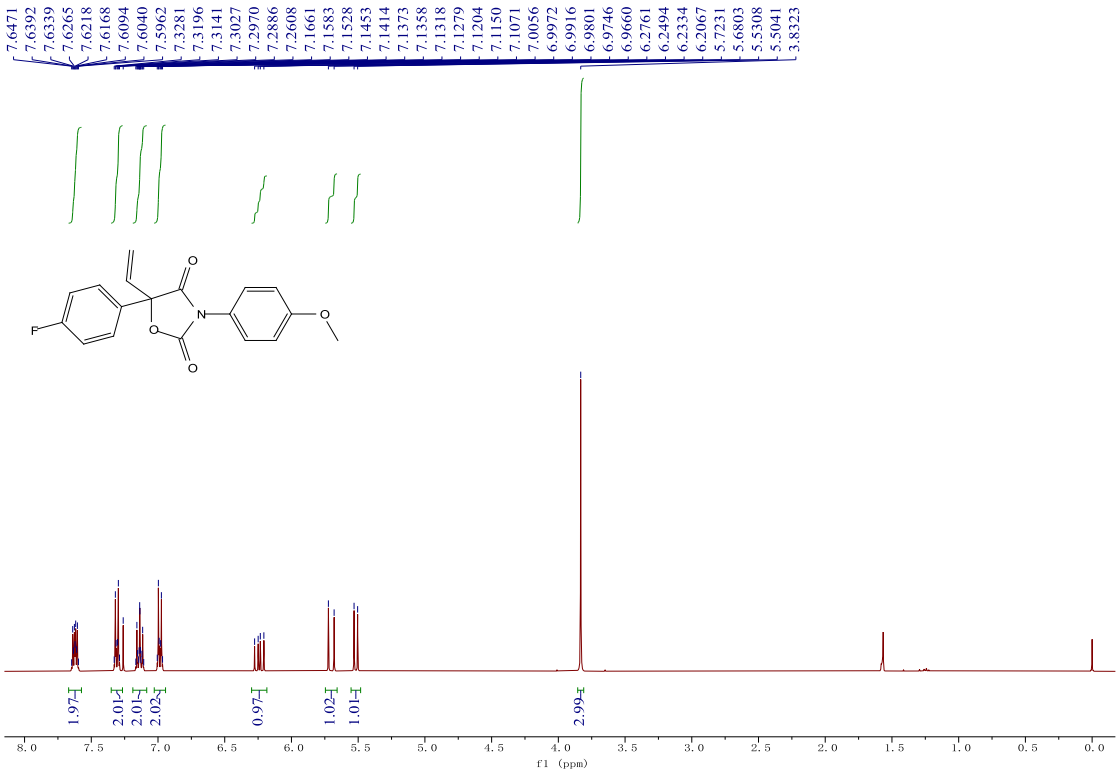
^{1}H NMR (400 MHz, Chloroform-*d*) of 1l



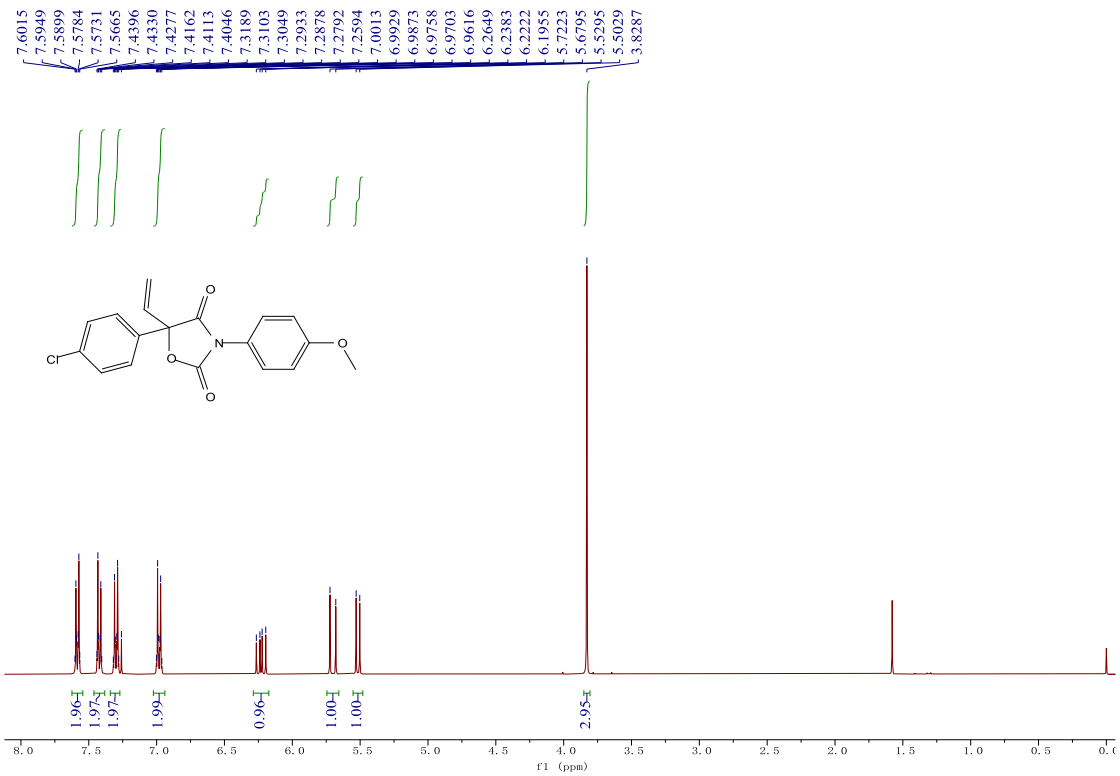
^{1}H NMR (400 MHz, Chloroform-*d*) of 1m



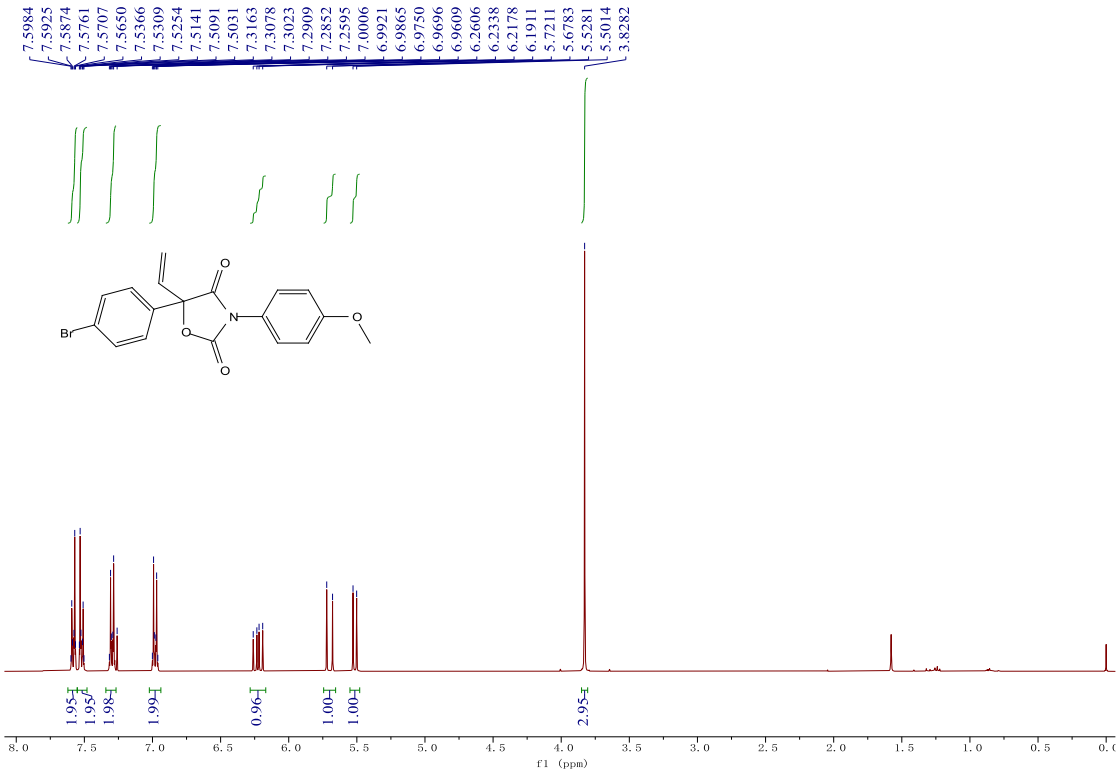
^{1}H NMR (400 MHz, Chloroform-*d*) of 1n



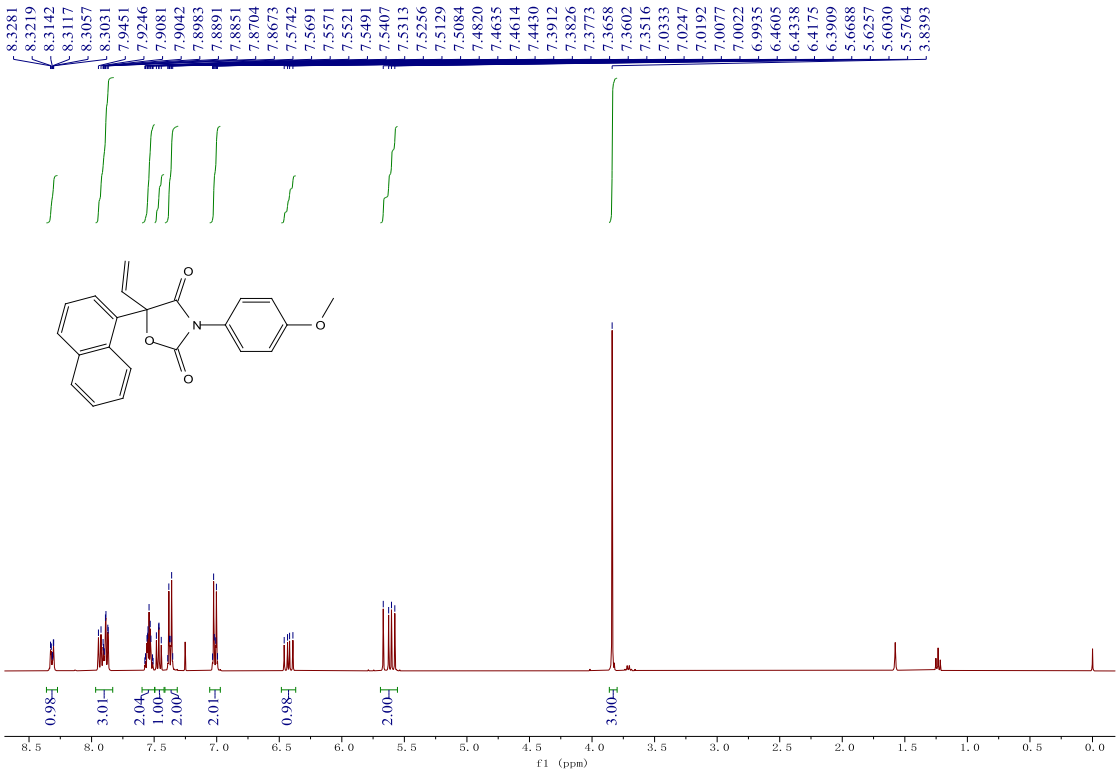
^{1}H NMR (400 MHz, Chloroform-*d*) of 1o



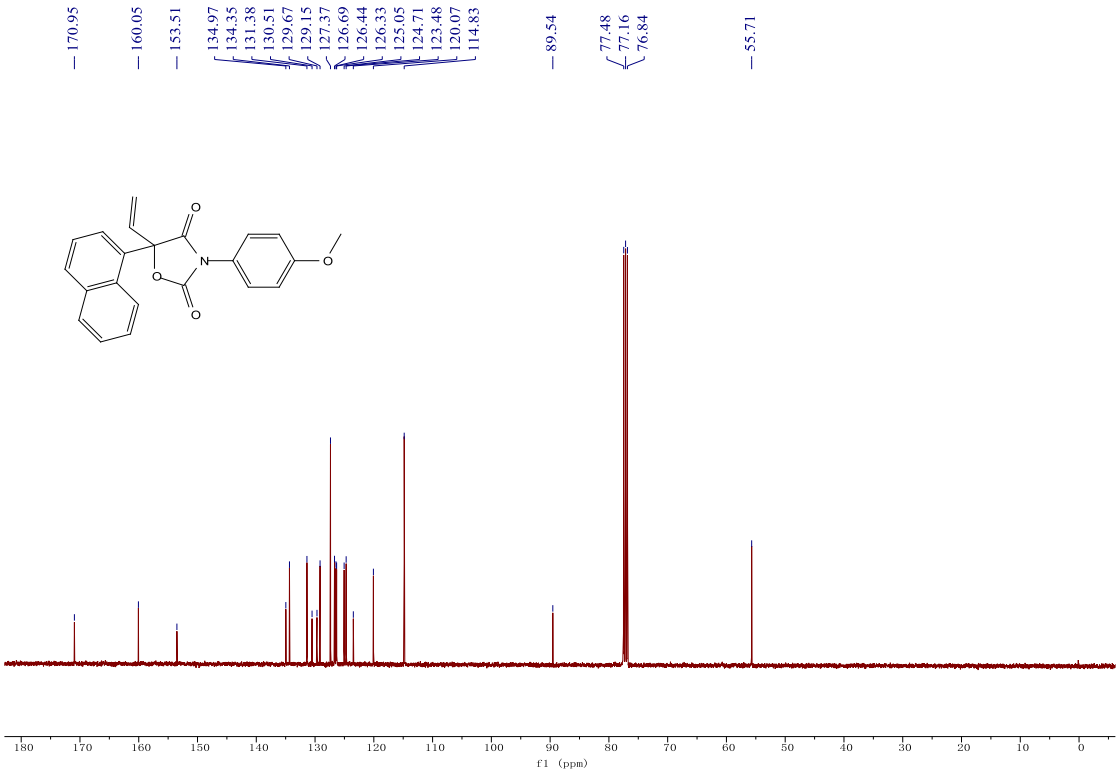
^{1}H NMR (400 MHz, Chloroform-*d*) of 1p



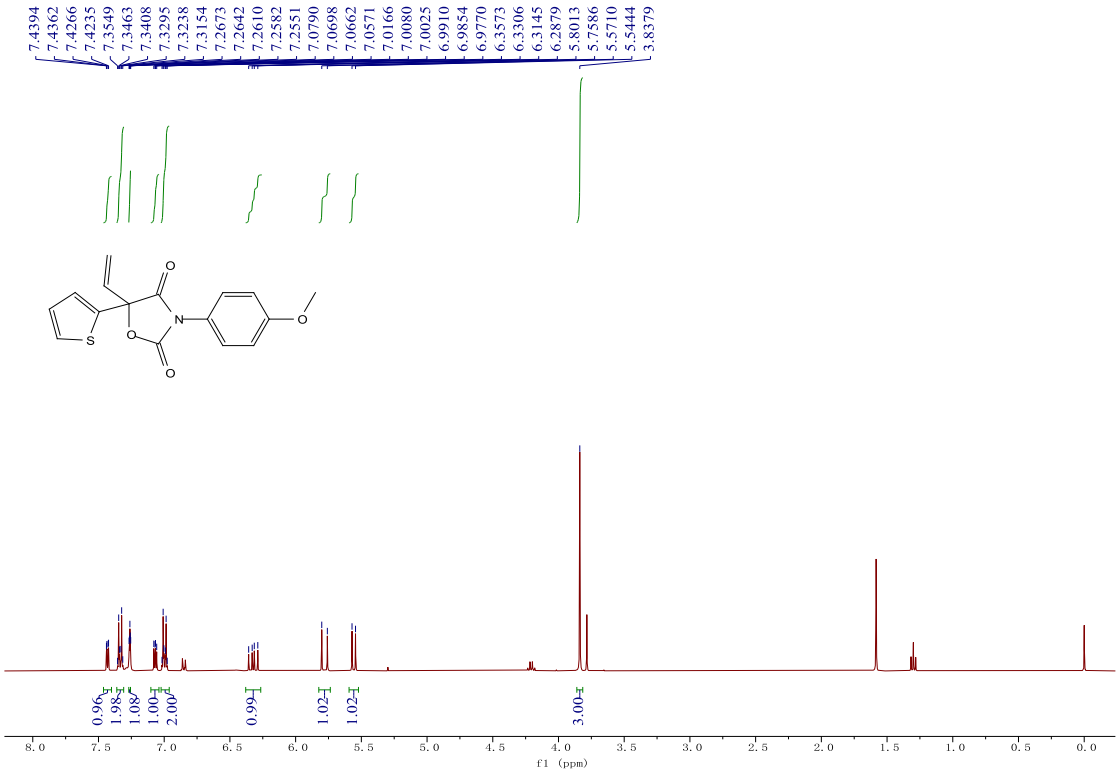
^{1}H NMR (400 MHz, Chloroform-*d*) of 1q



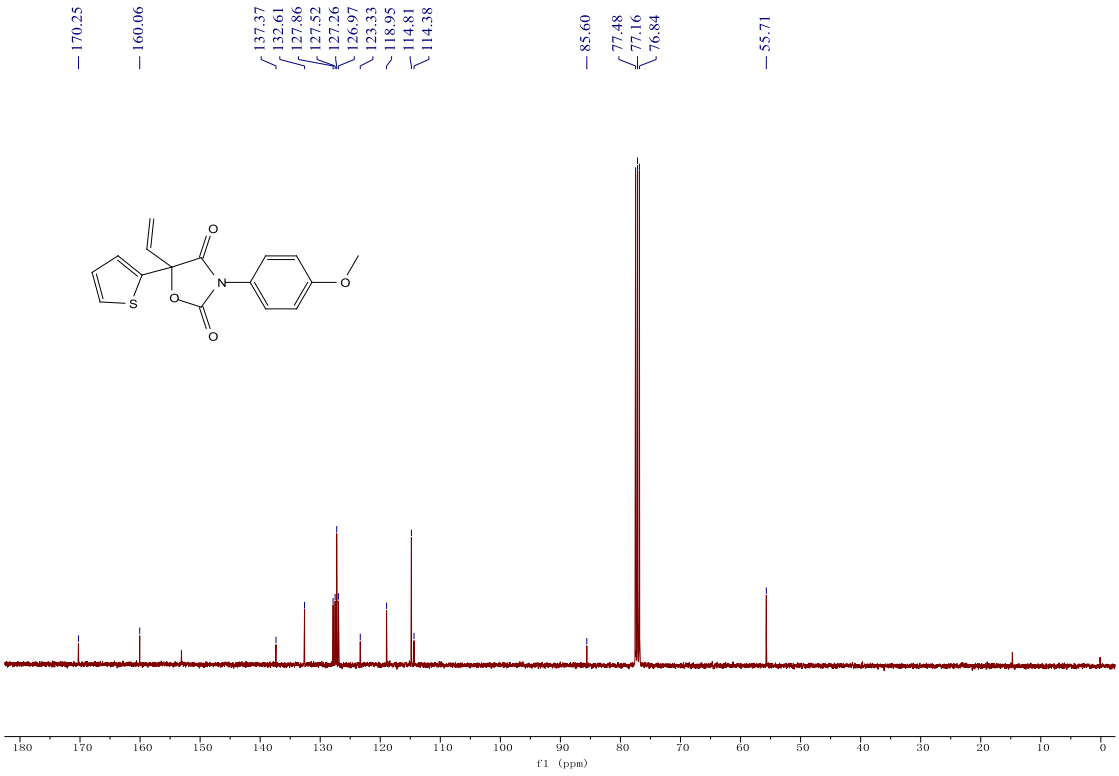
^{13}C NMR (101 MHz, Chloroform-*d*) of 1q



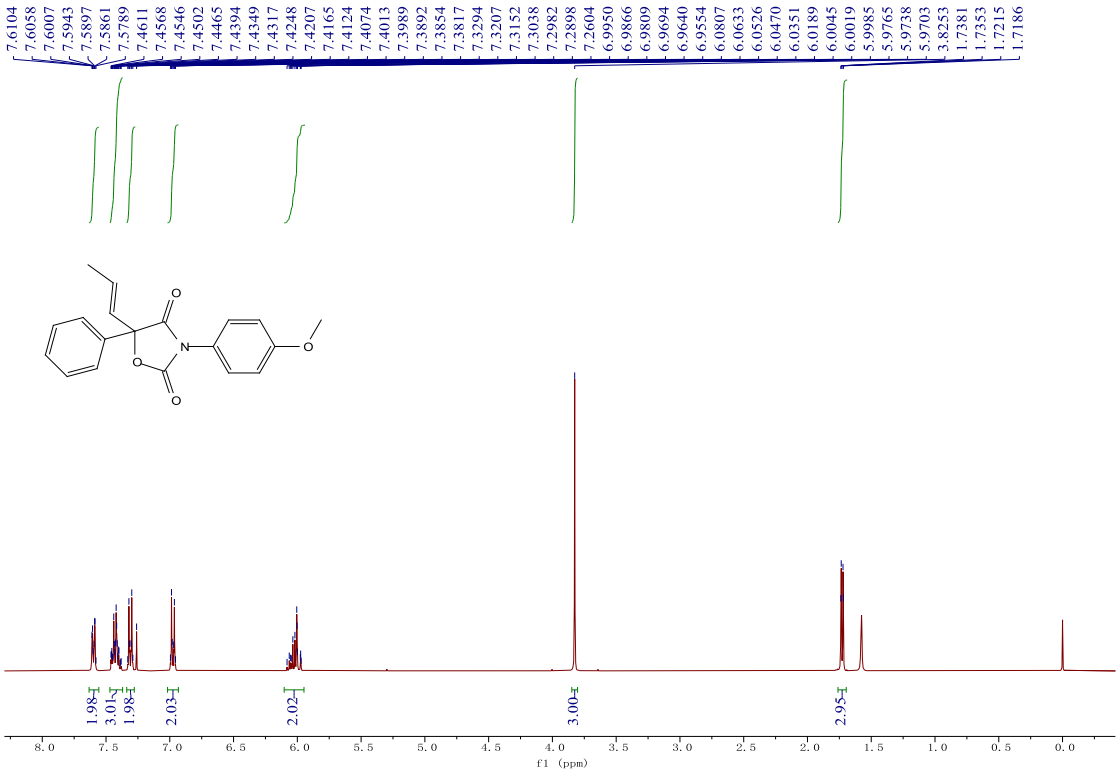
^{1}H NMR (400 MHz, Chloroform-*d*) of 1r



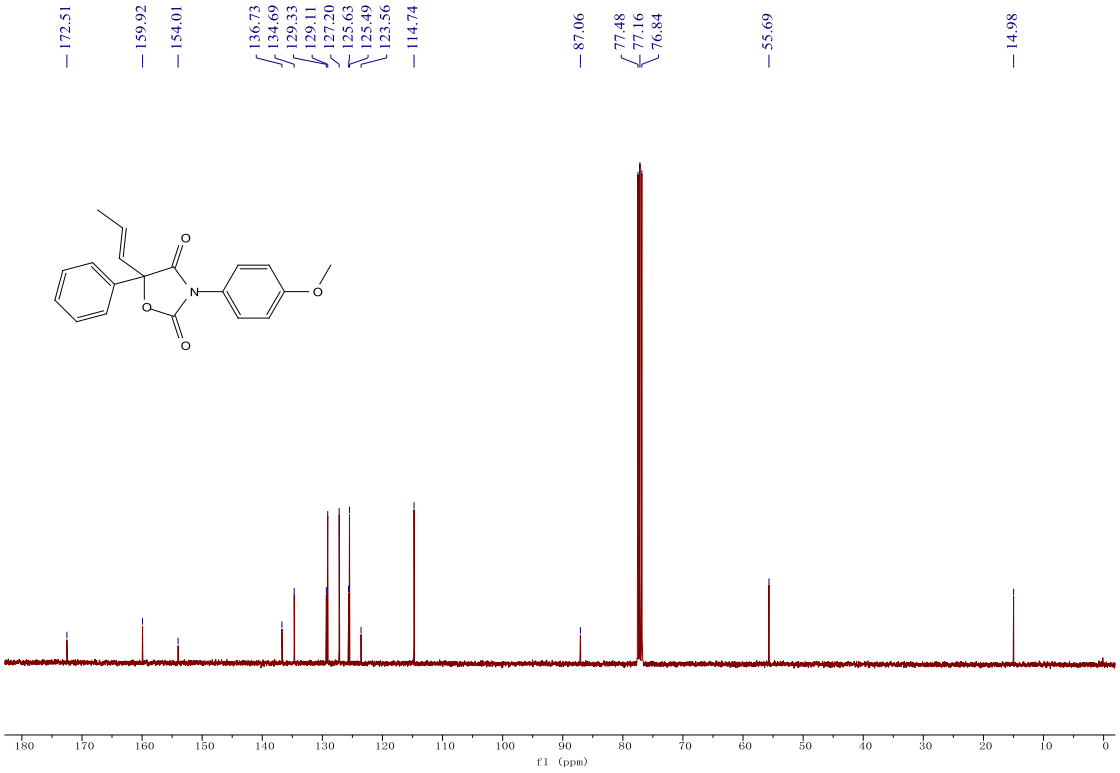
^{13}C NMR (101 MHz, Chloroform-*d*) of 1r



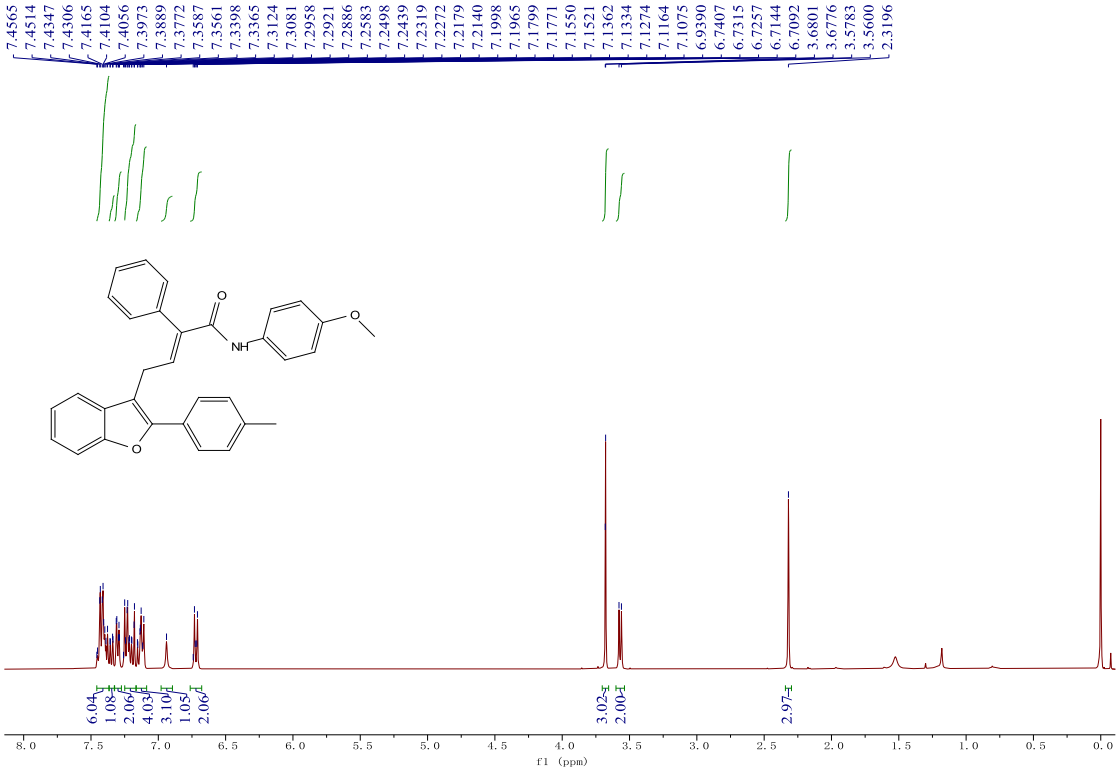
^{1}H NMR (400 MHz, Chloroform-*d*) of 1s

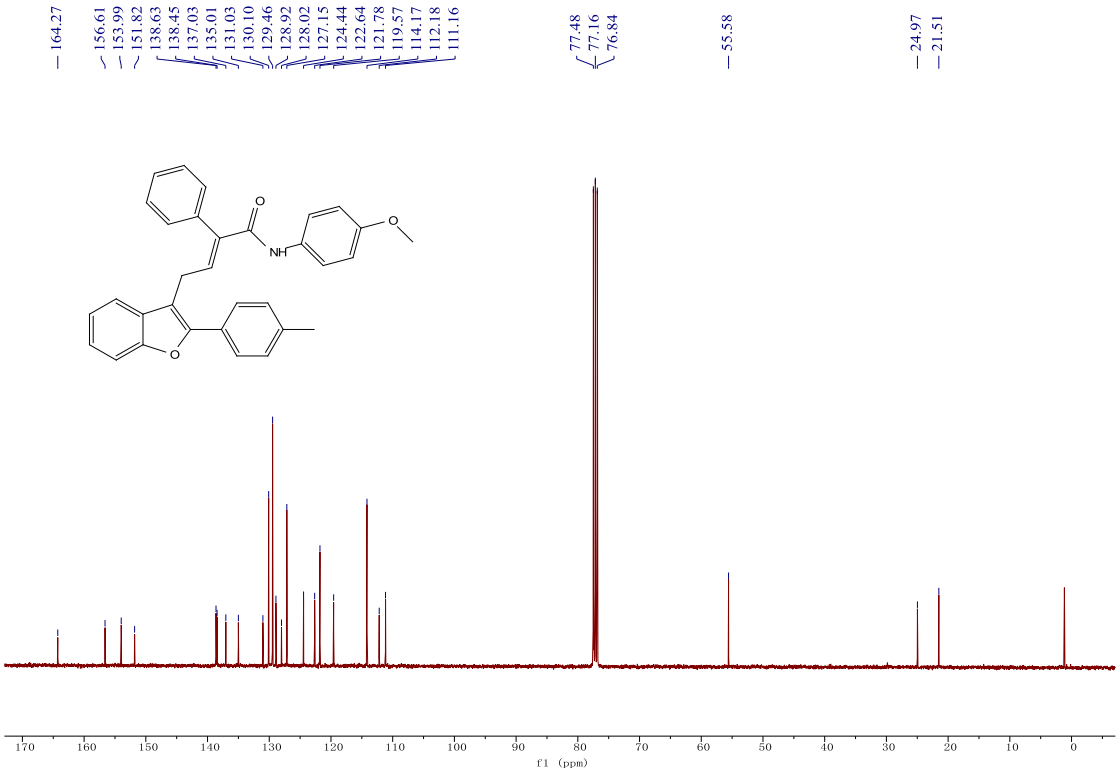


^{13}C NMR (101 MHz, Chloroform-*d*) of 1s

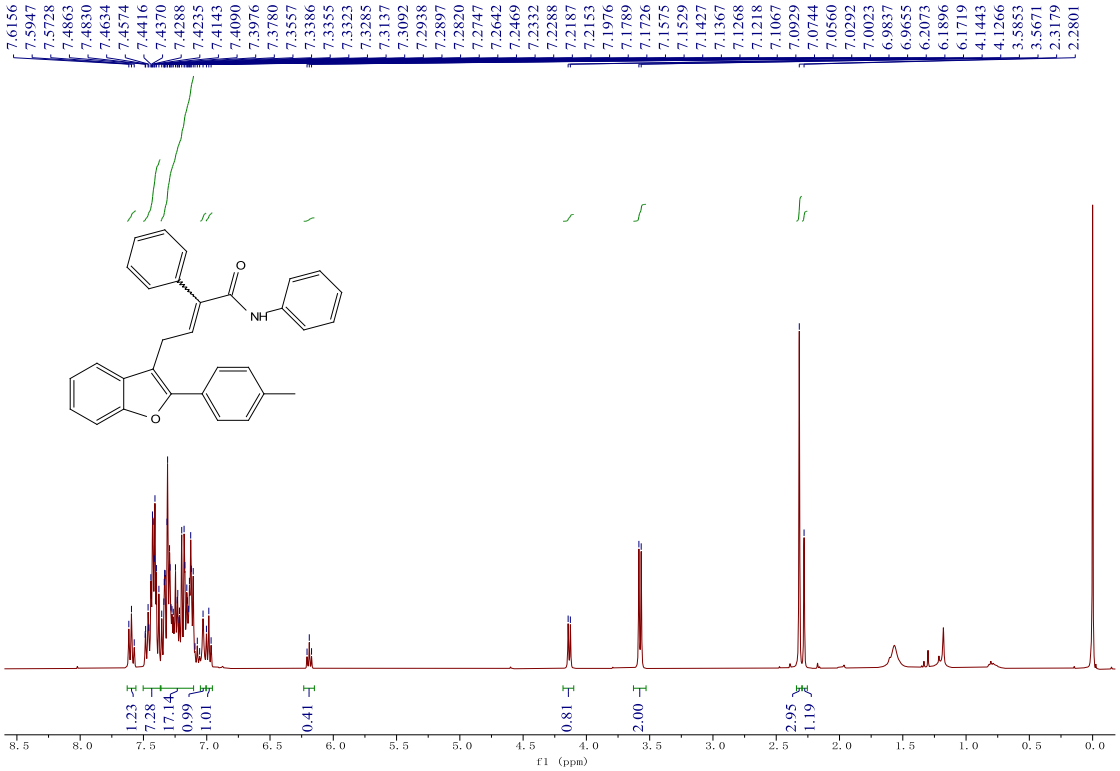


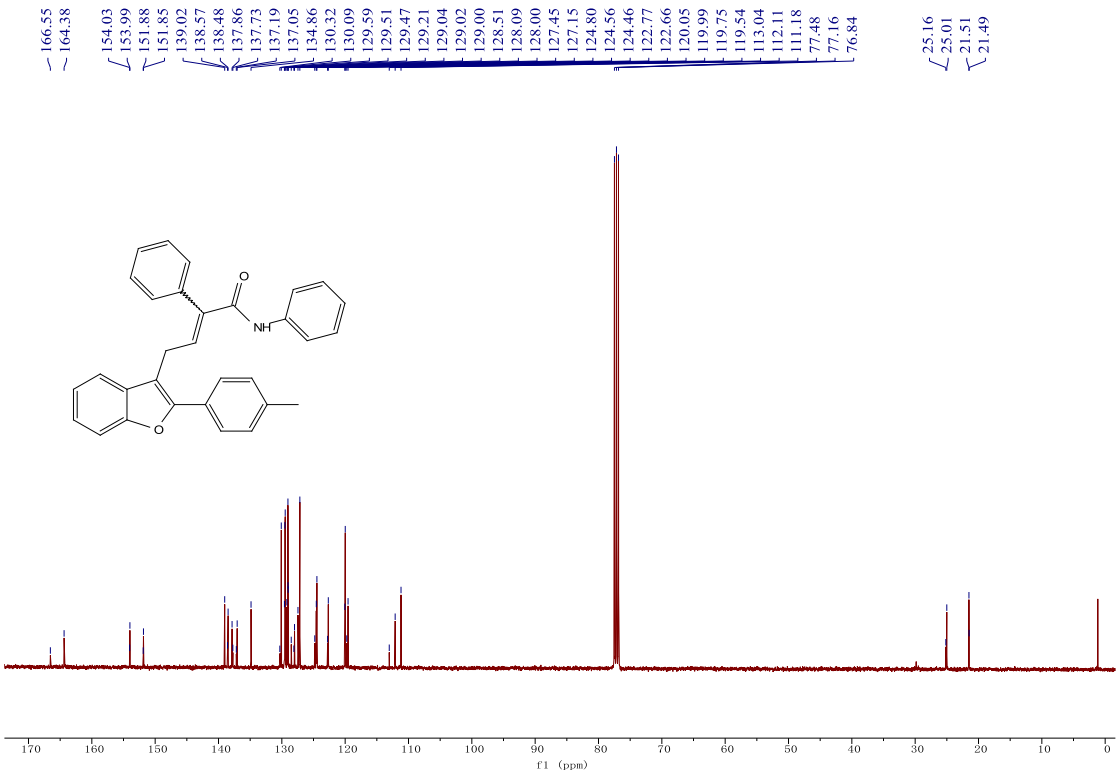
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3a



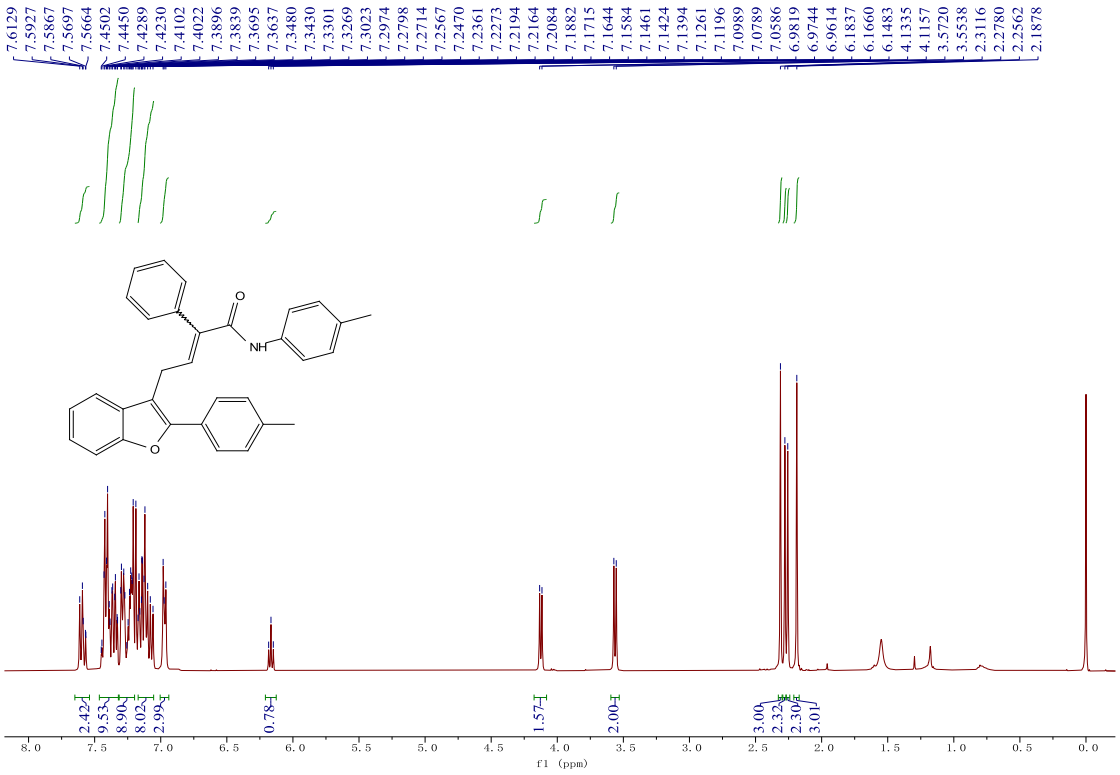


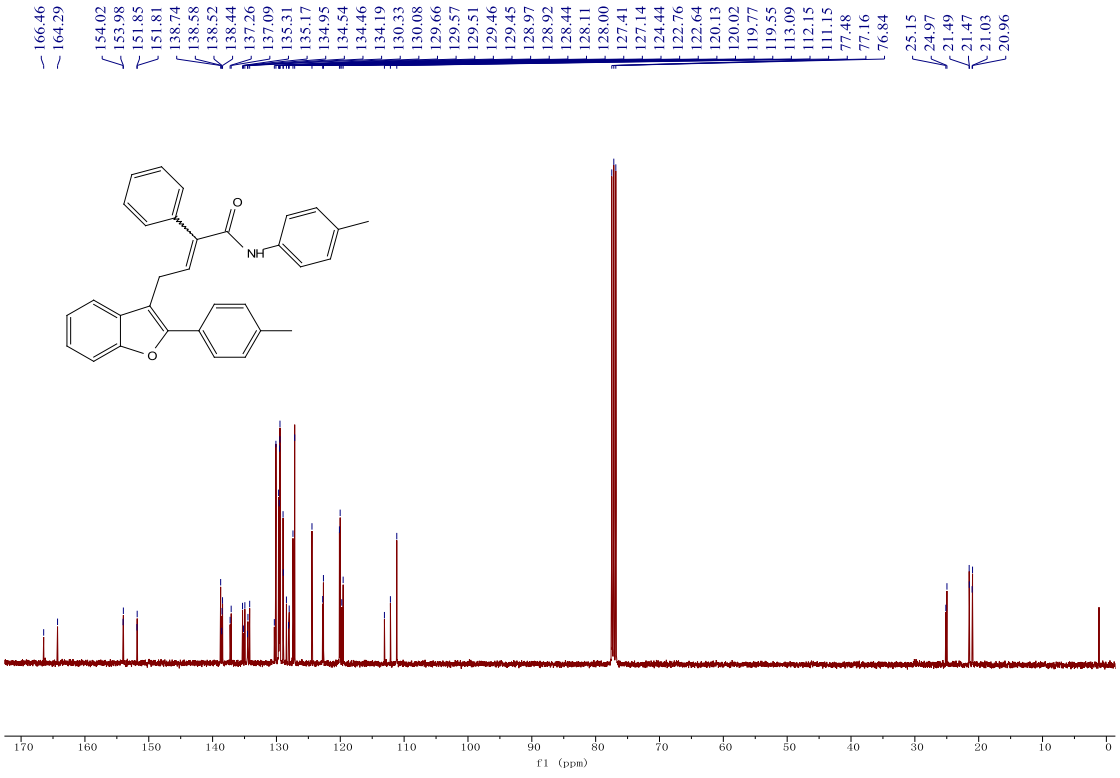
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3b



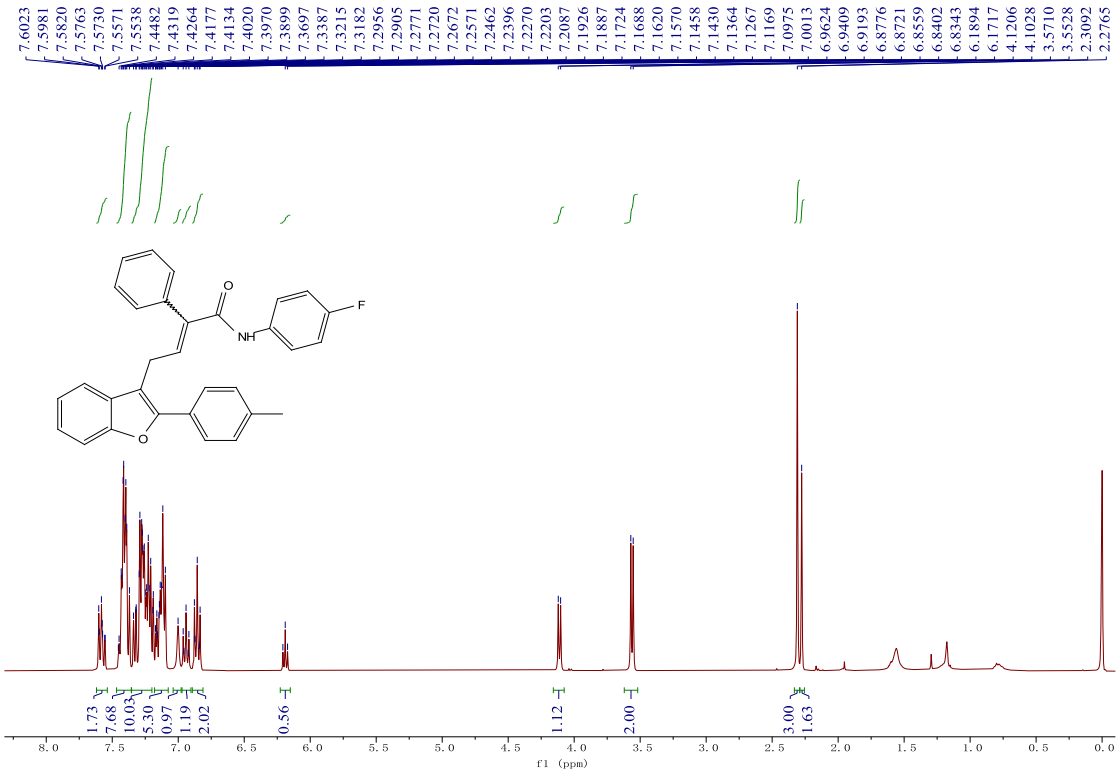


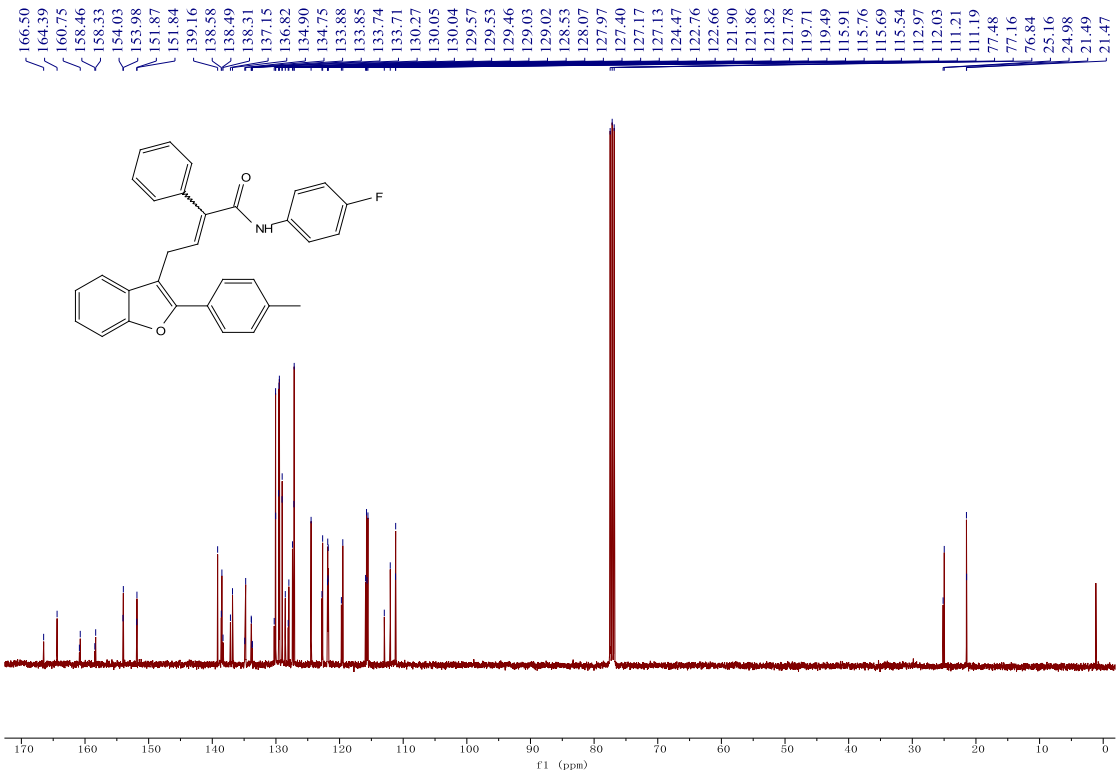
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3c



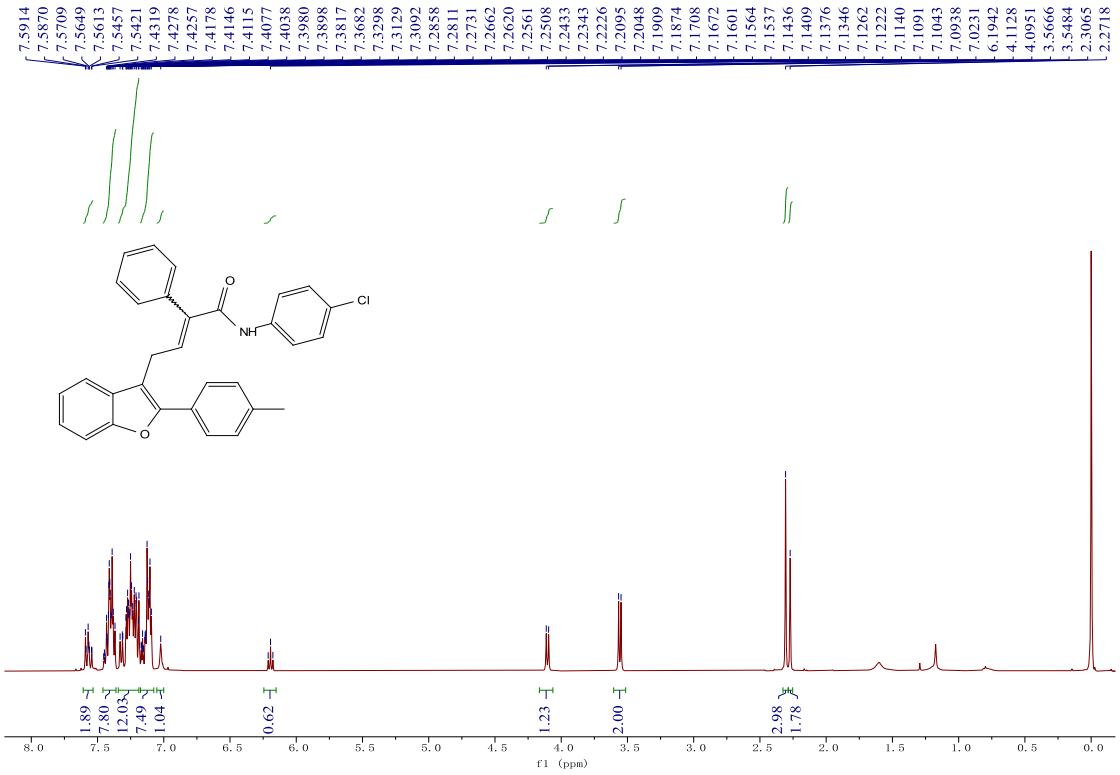


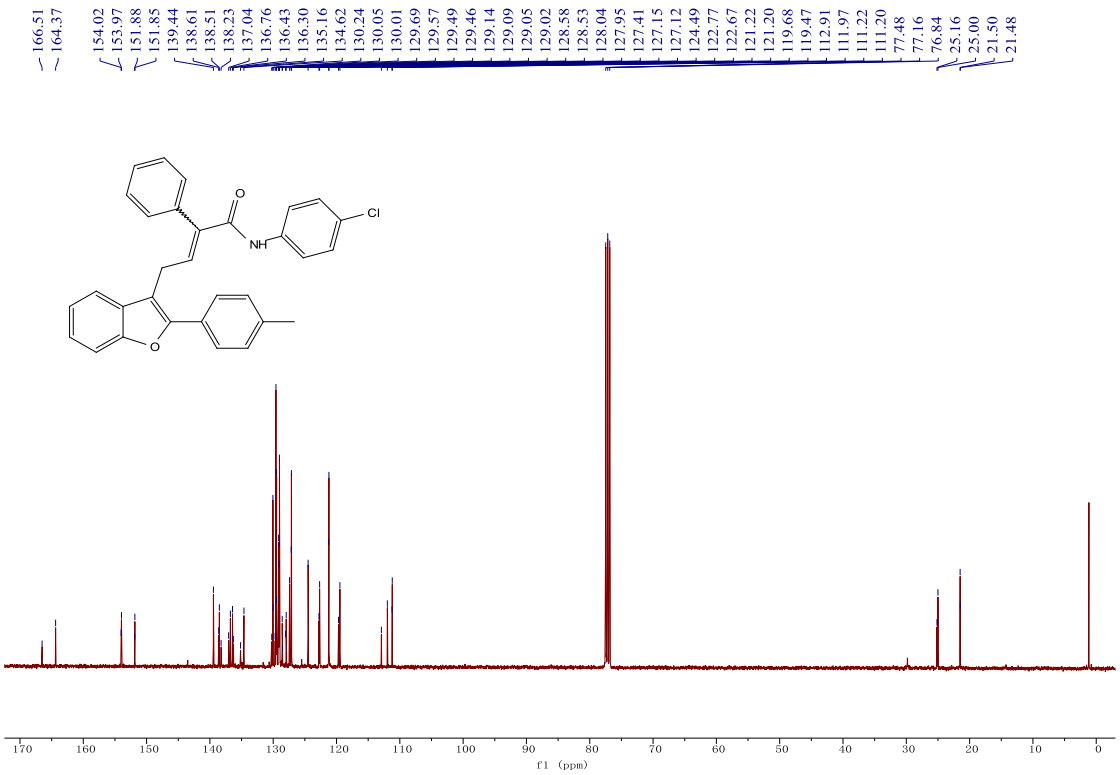
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3d



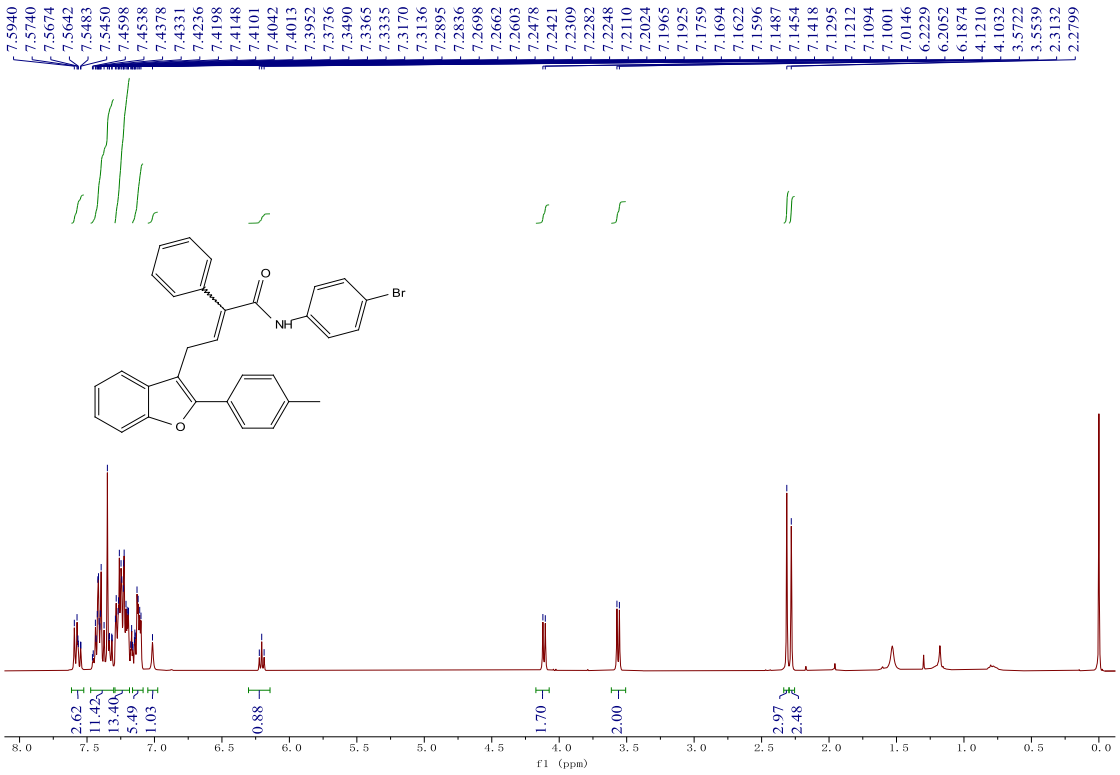


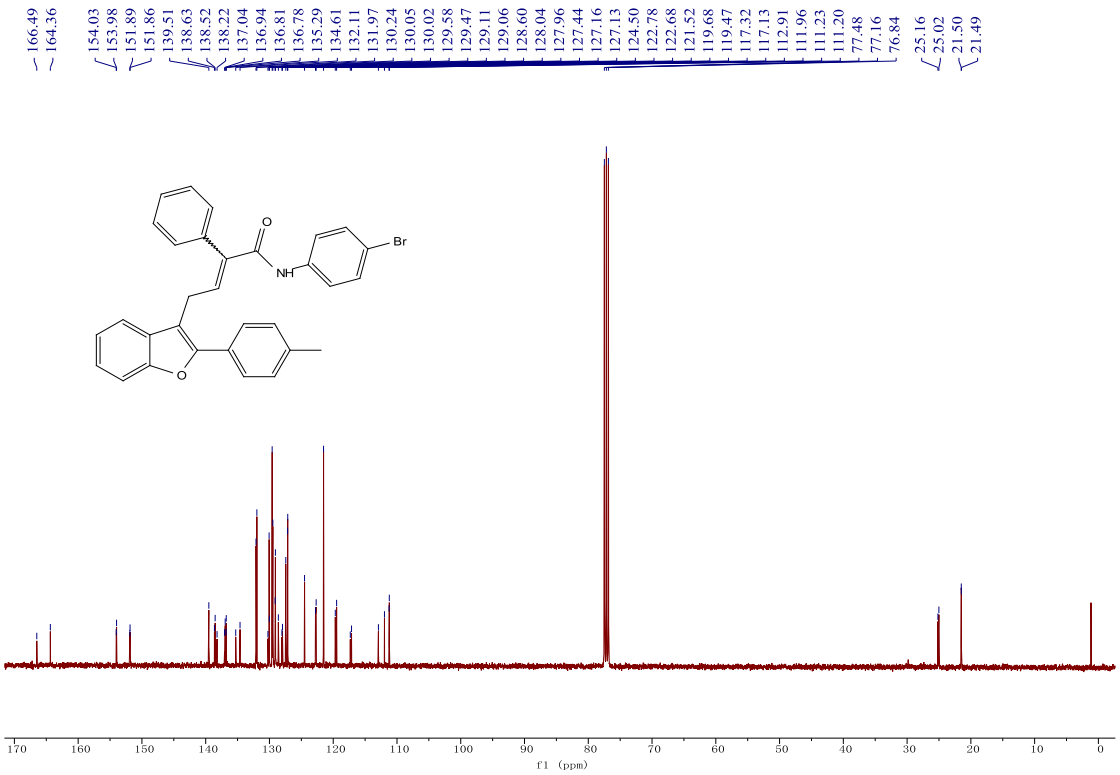
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3e



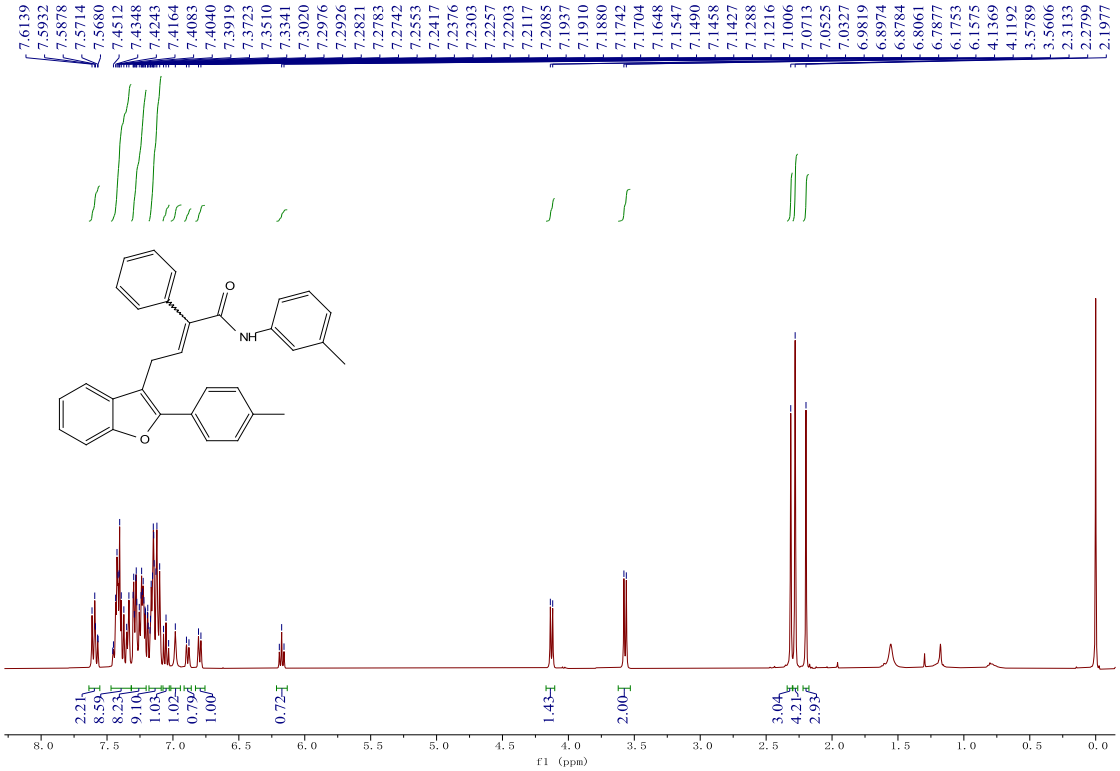


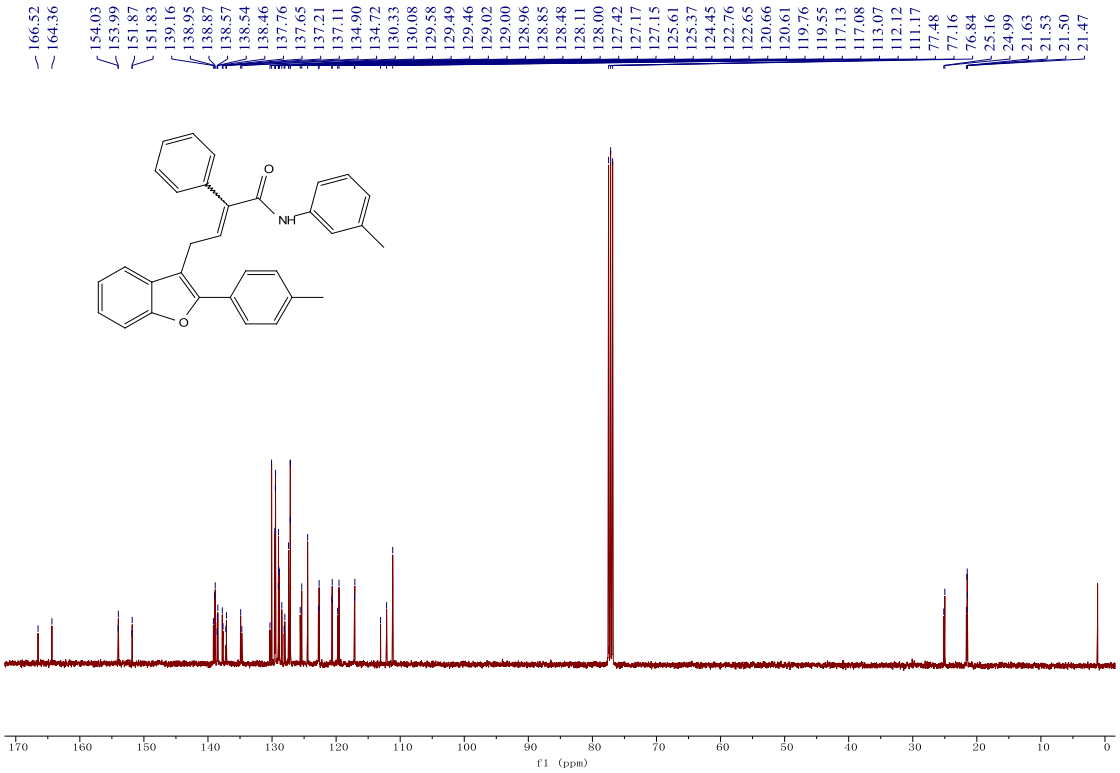
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3f



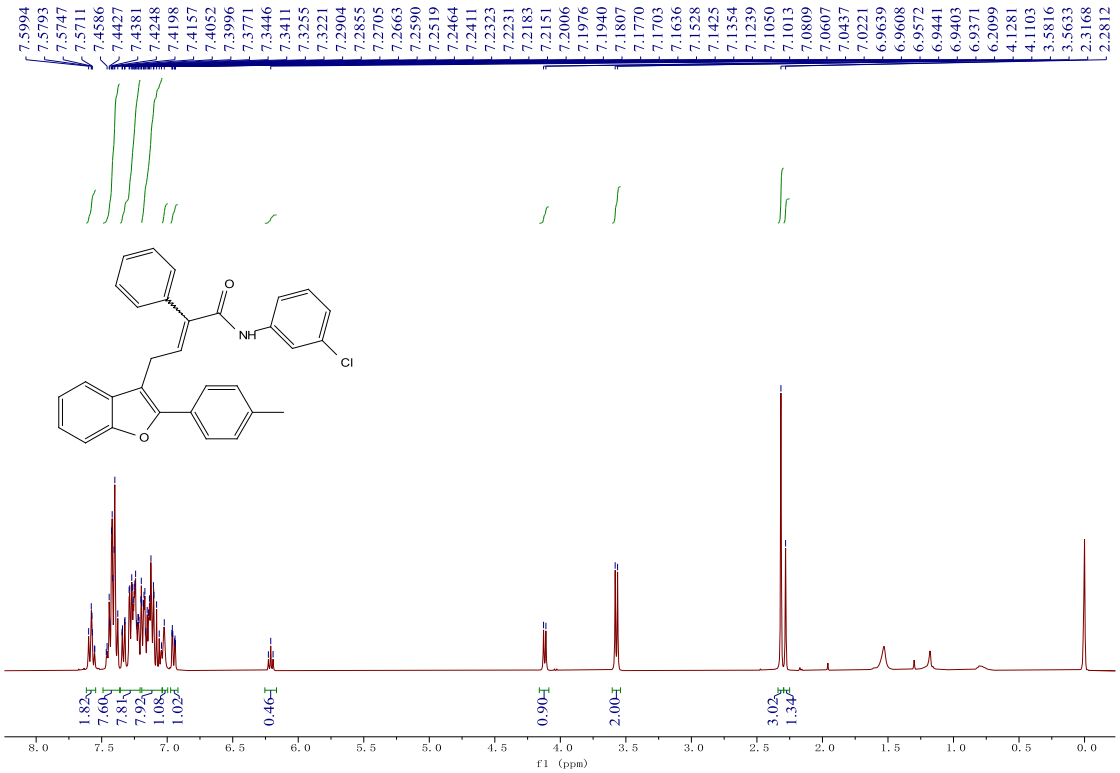


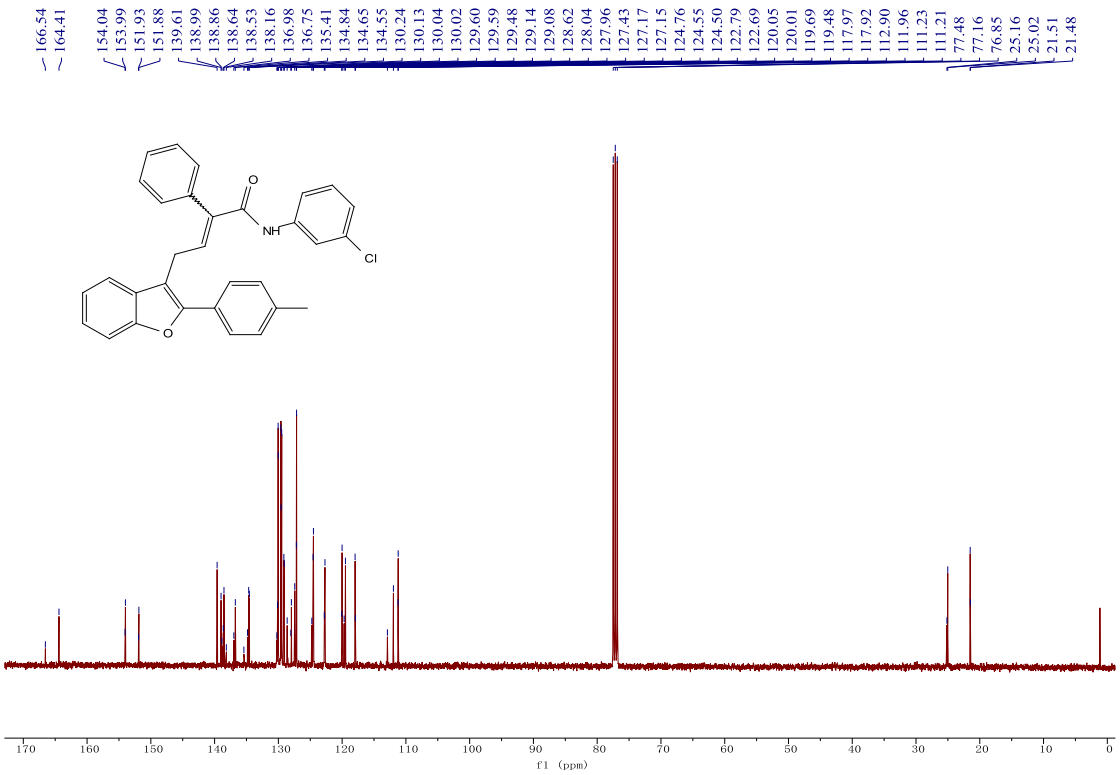
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3g



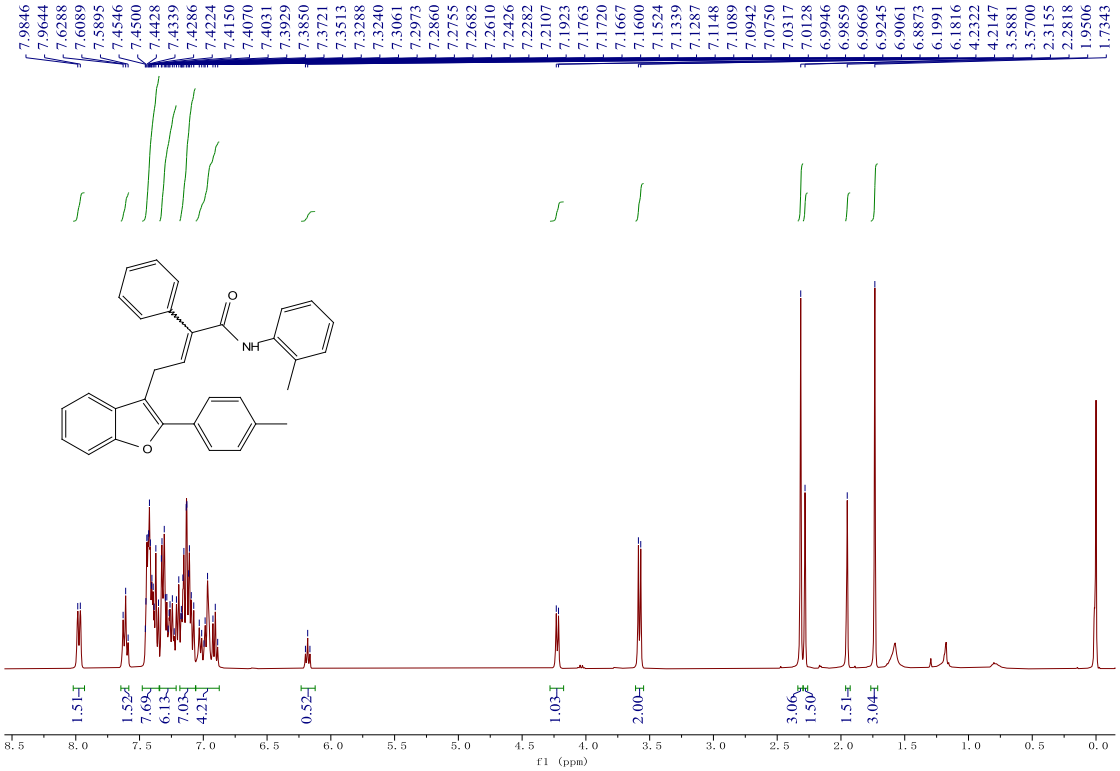


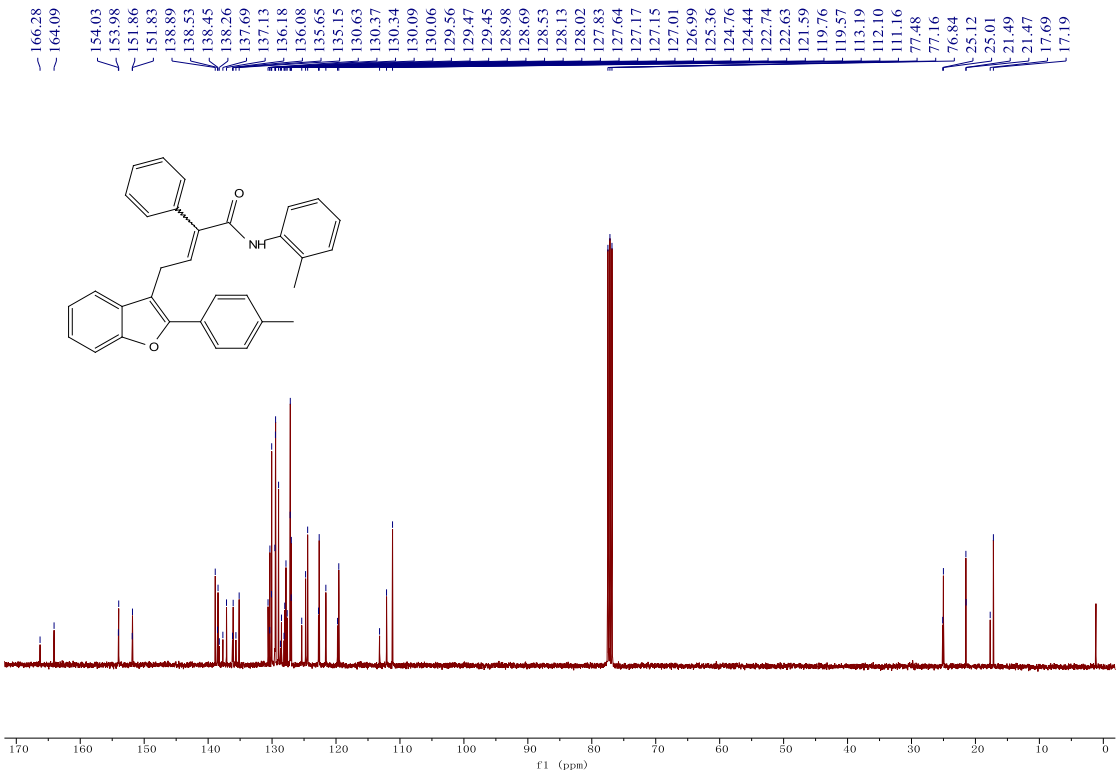
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3h



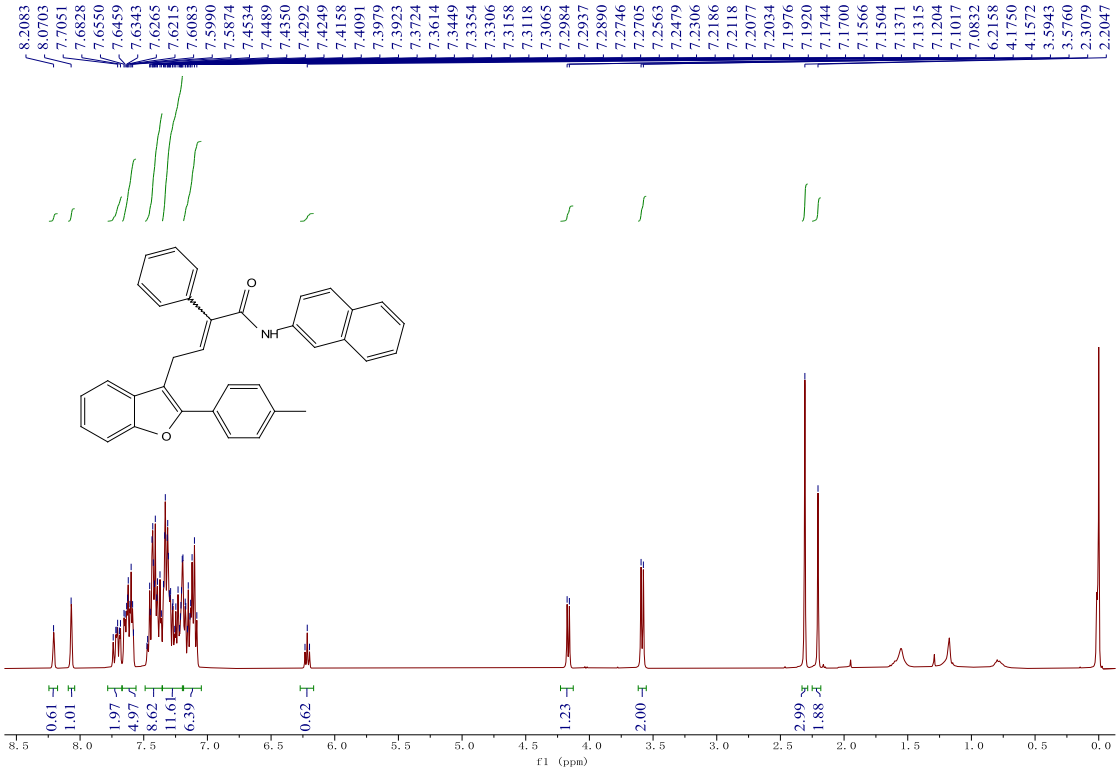


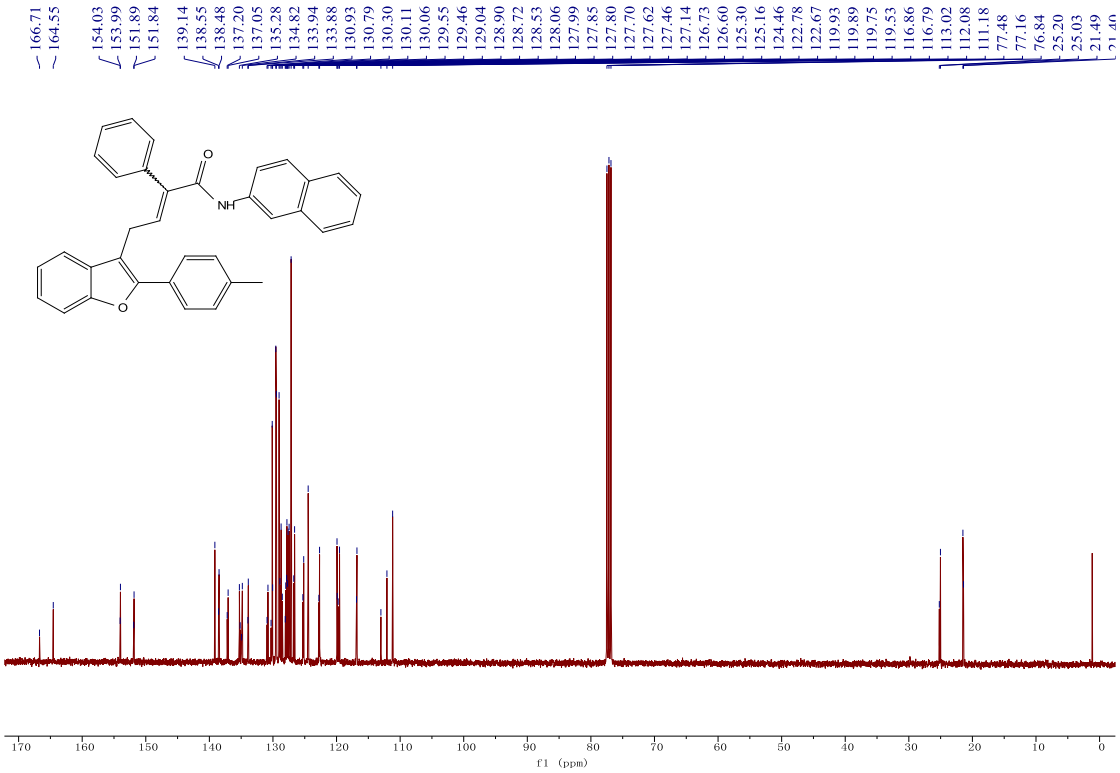
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3i



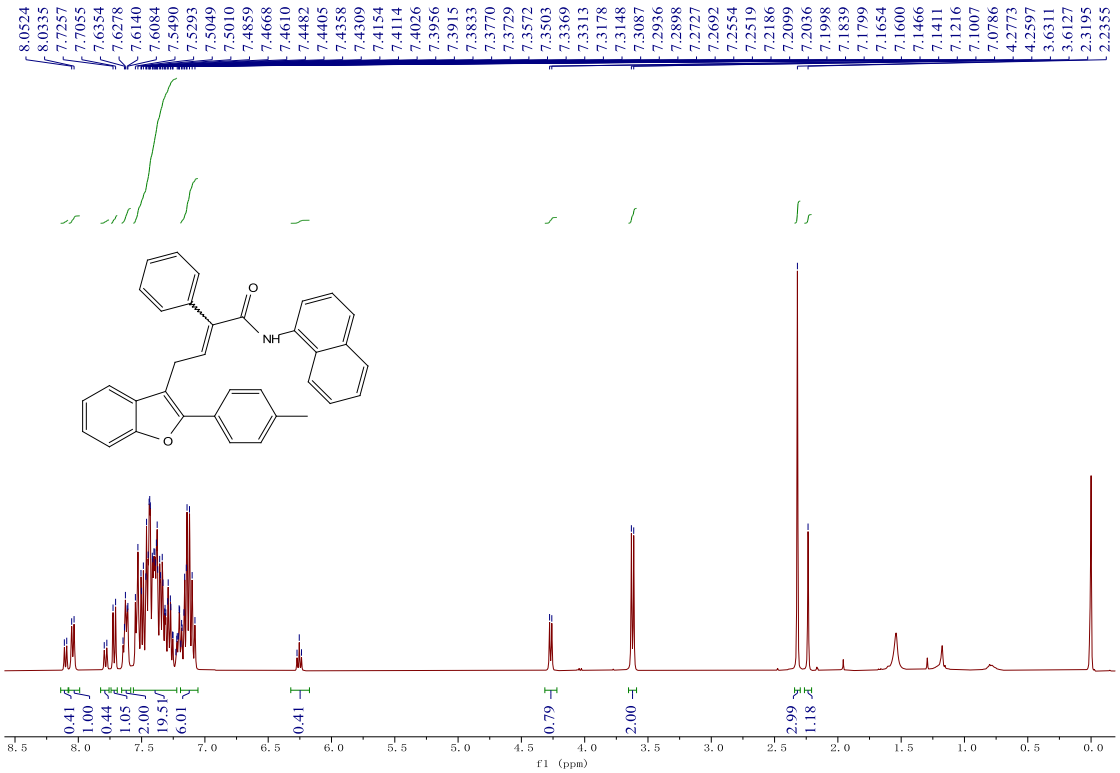


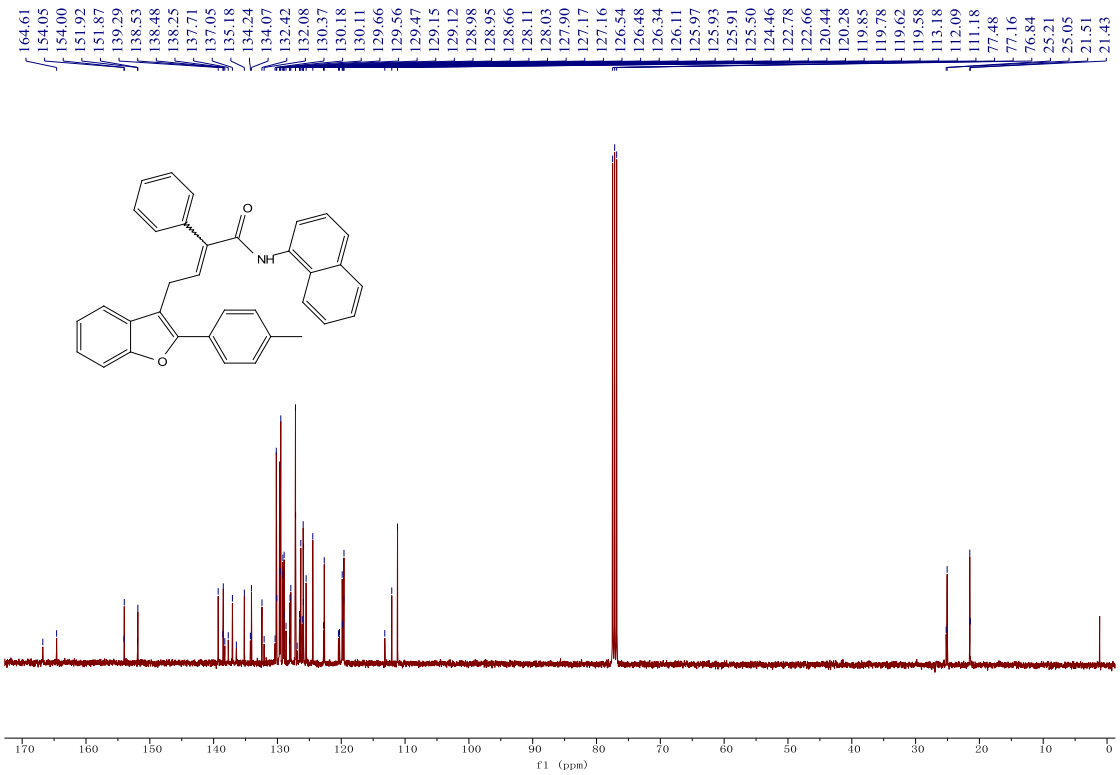
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3j



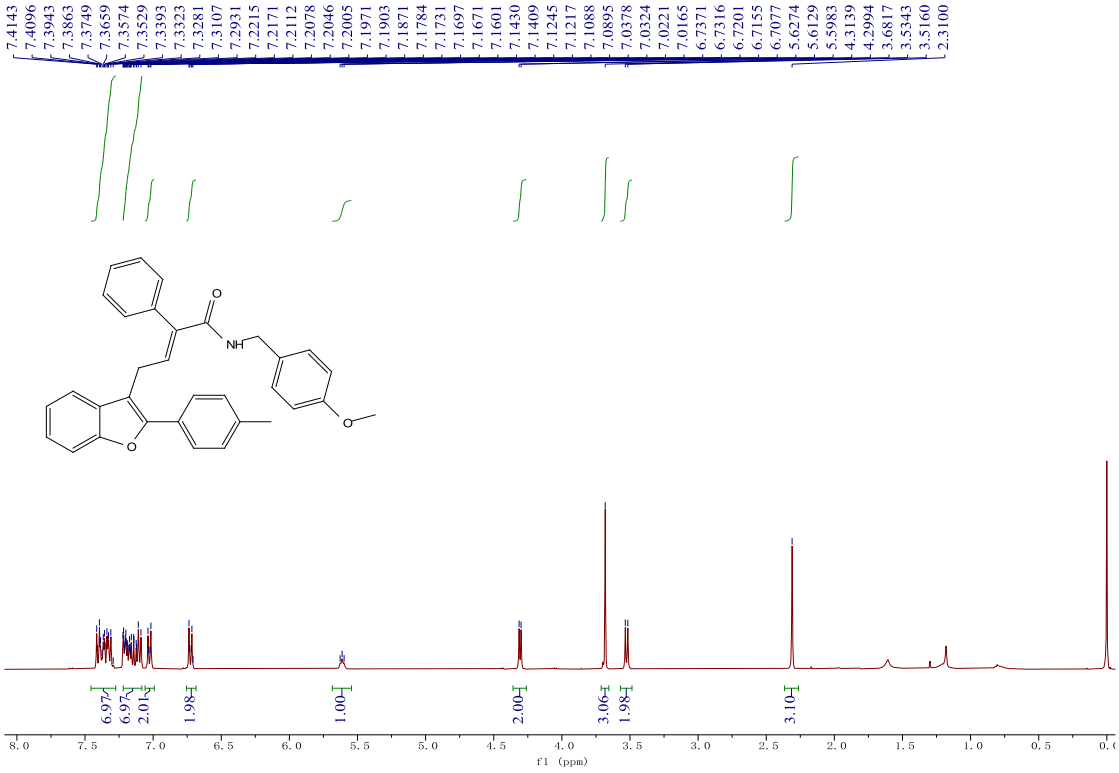


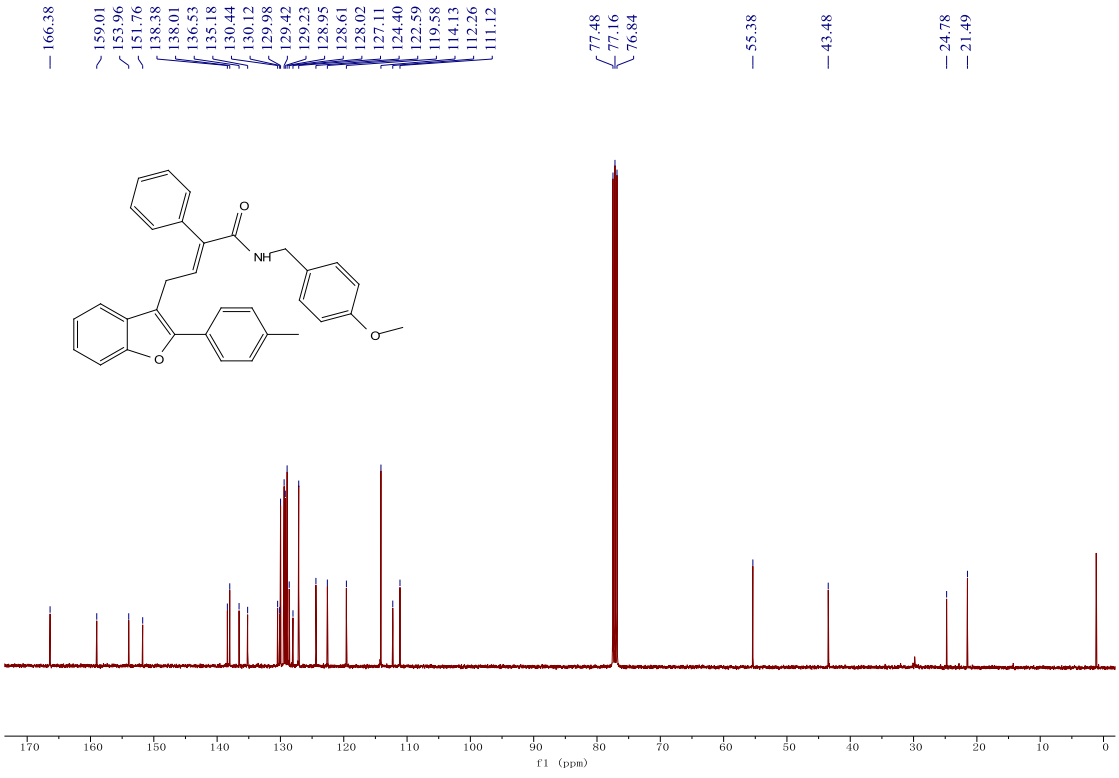
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3k



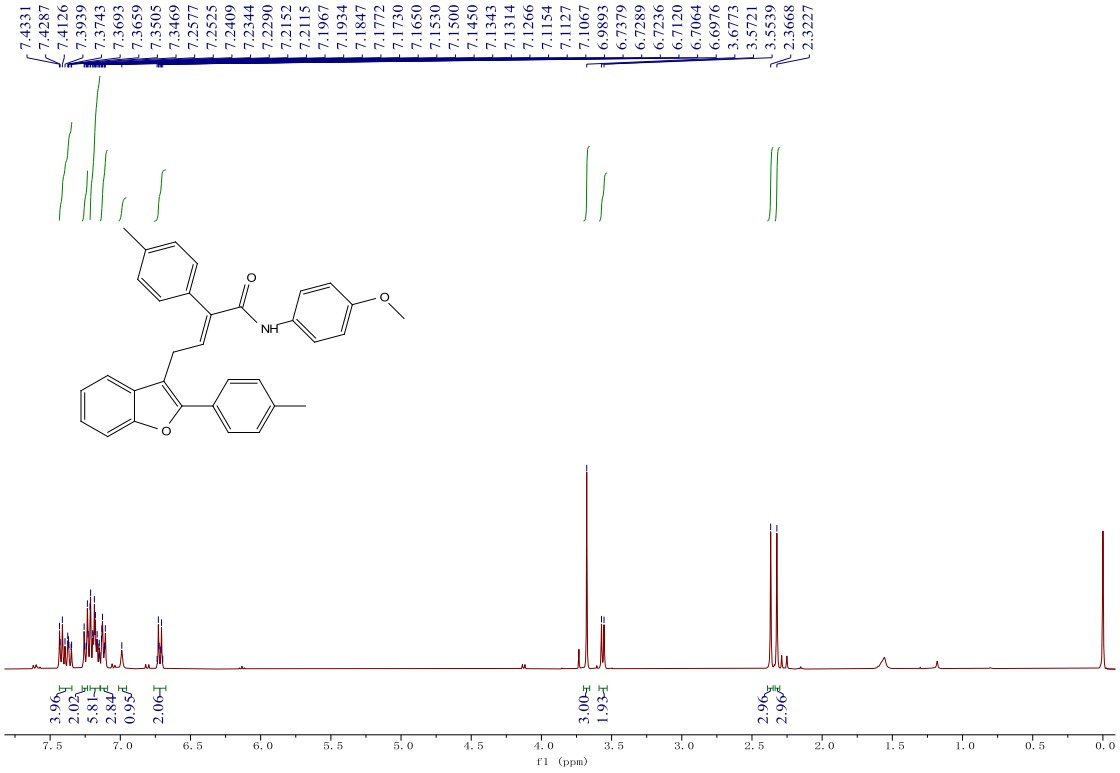


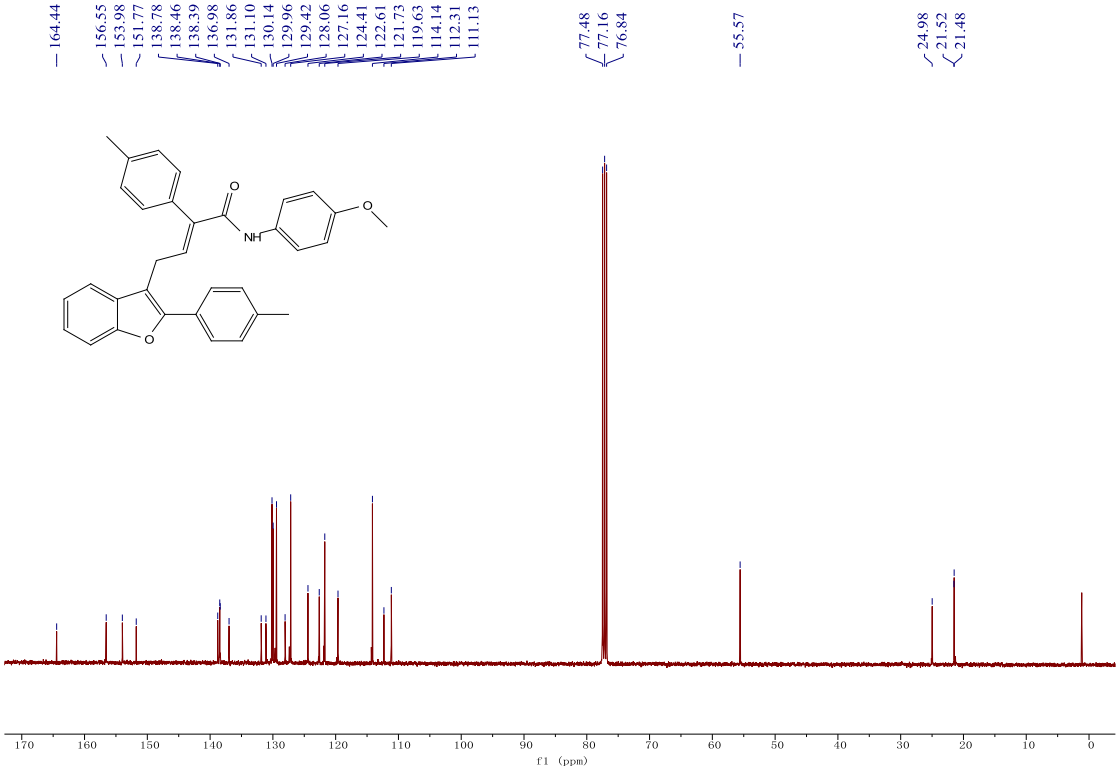
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3l



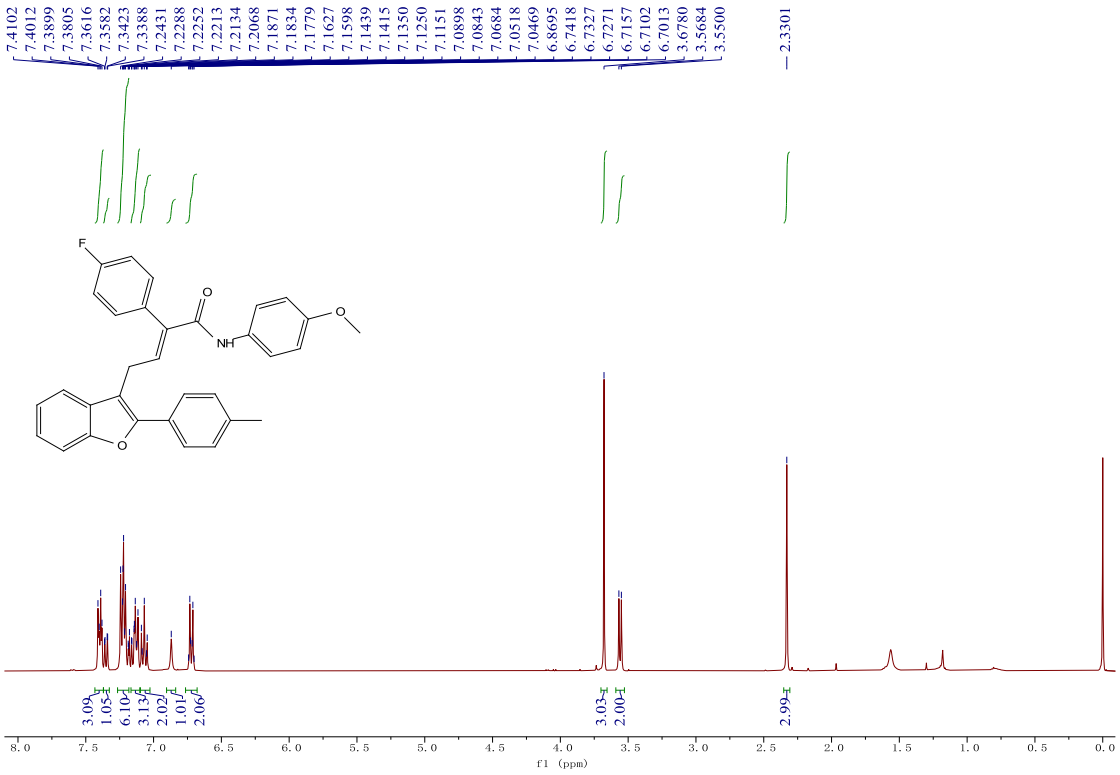


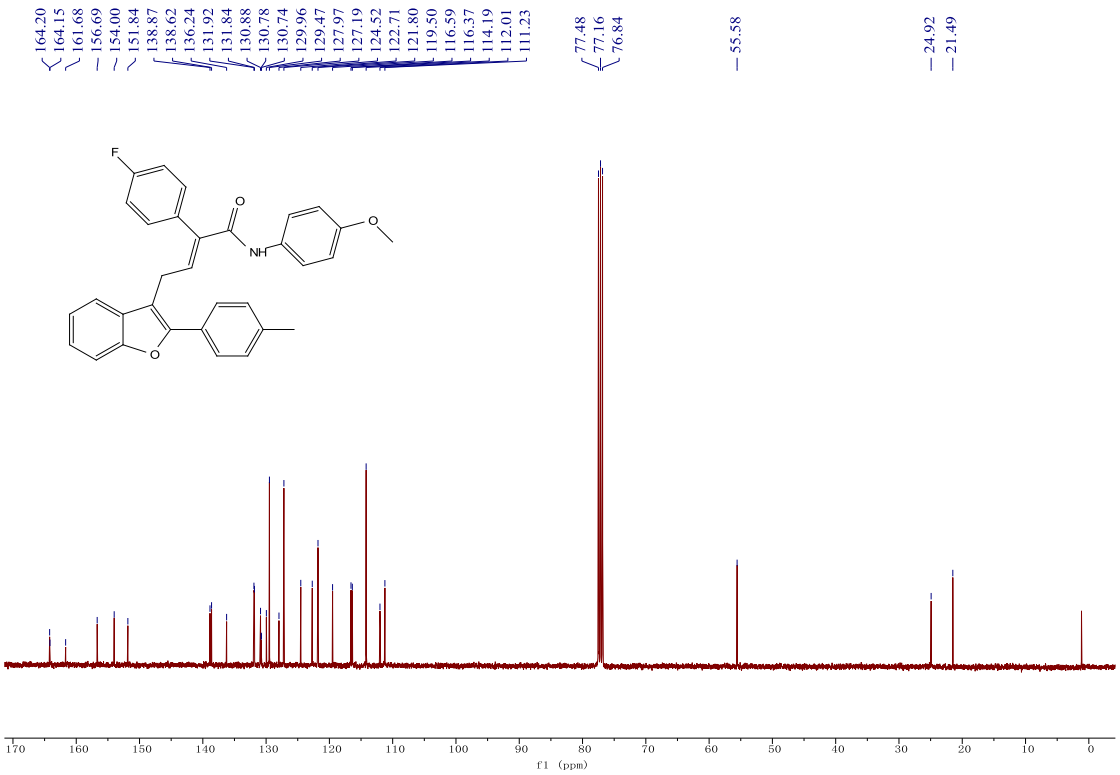
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3m



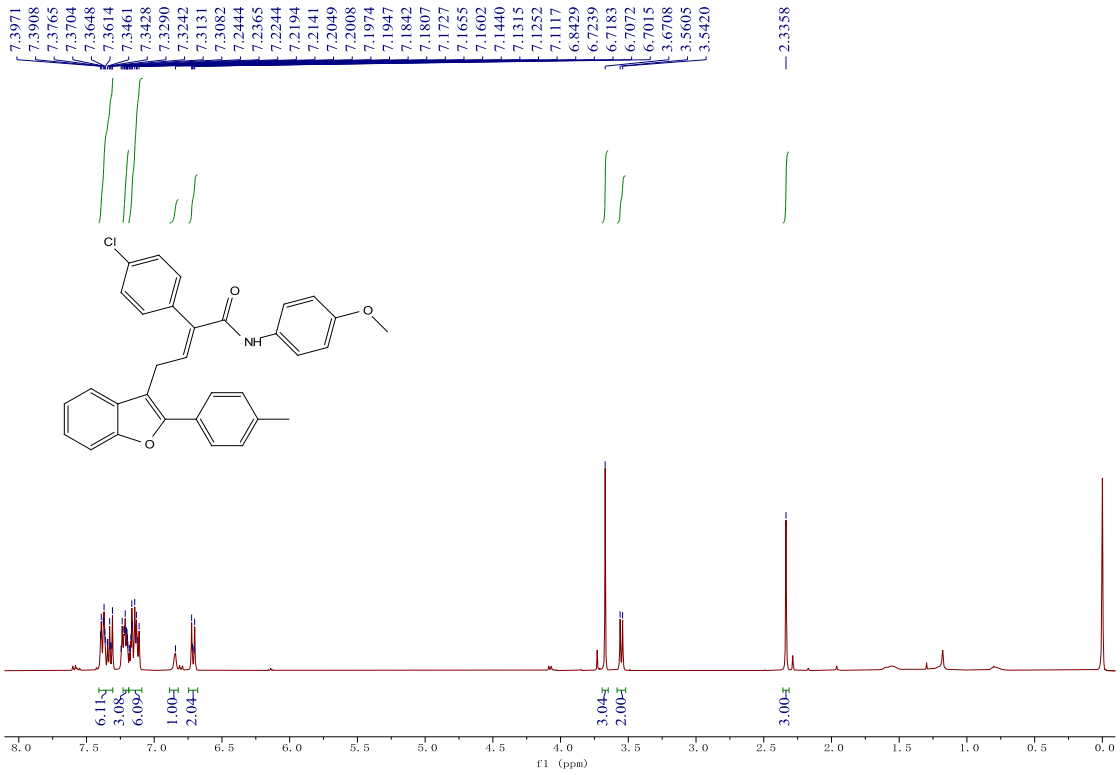


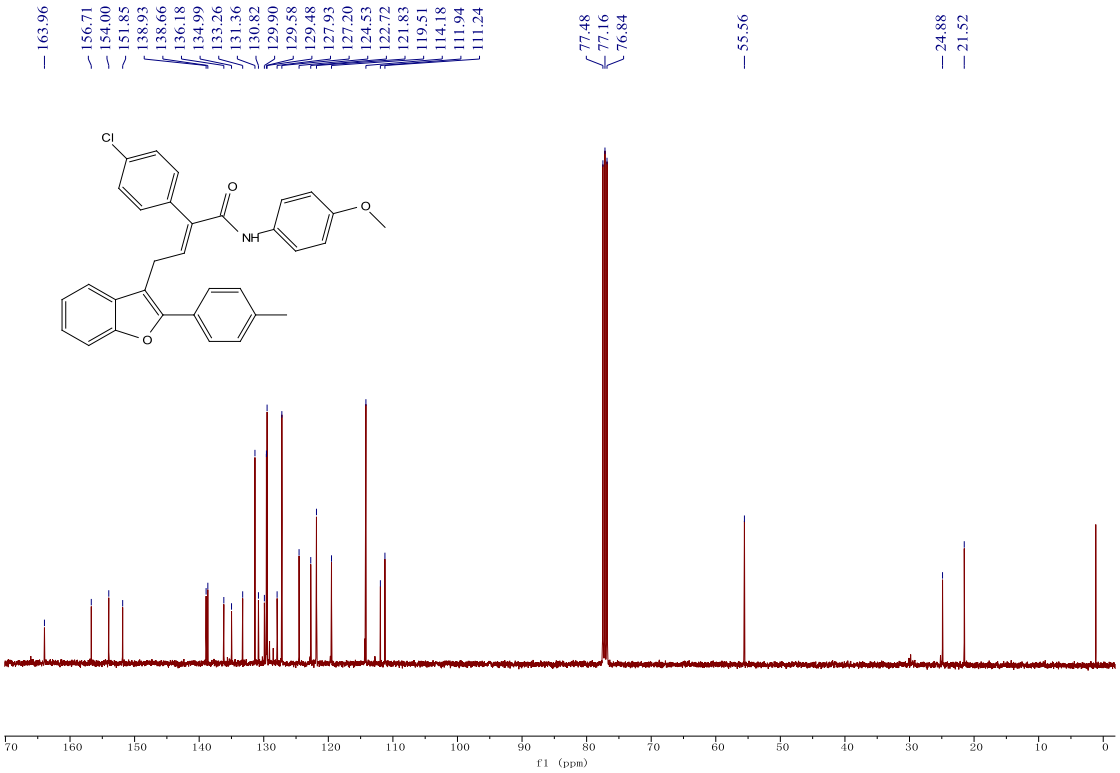
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3n



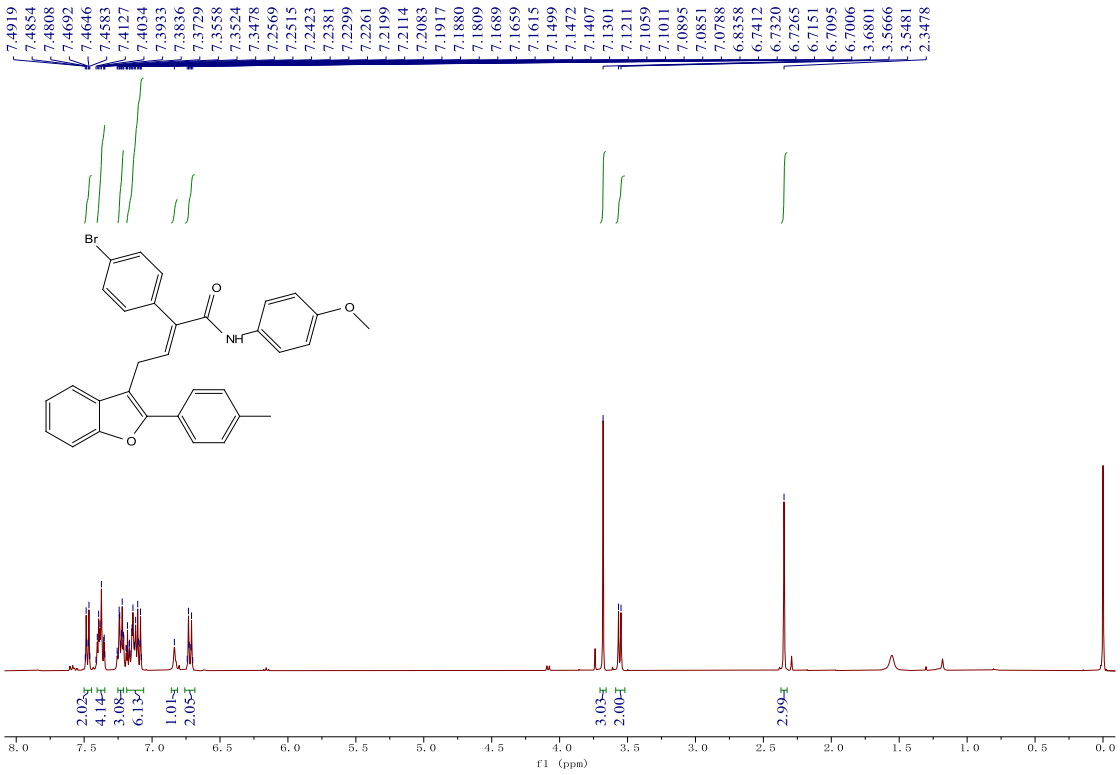


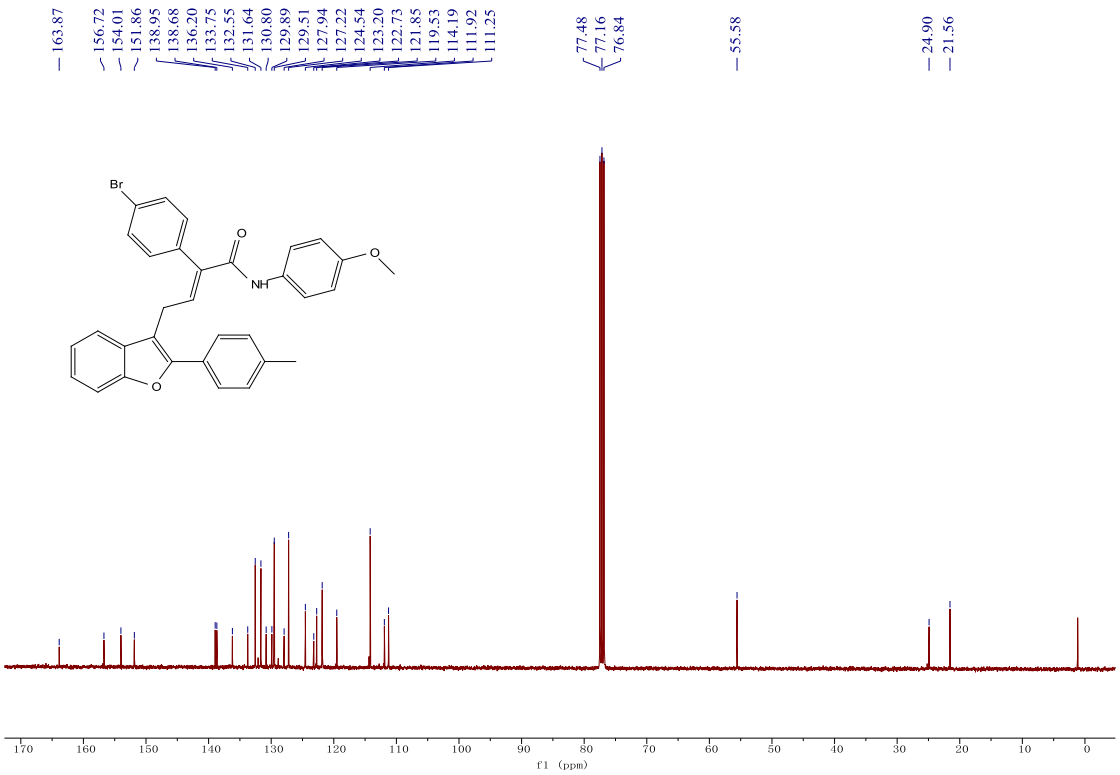
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3o



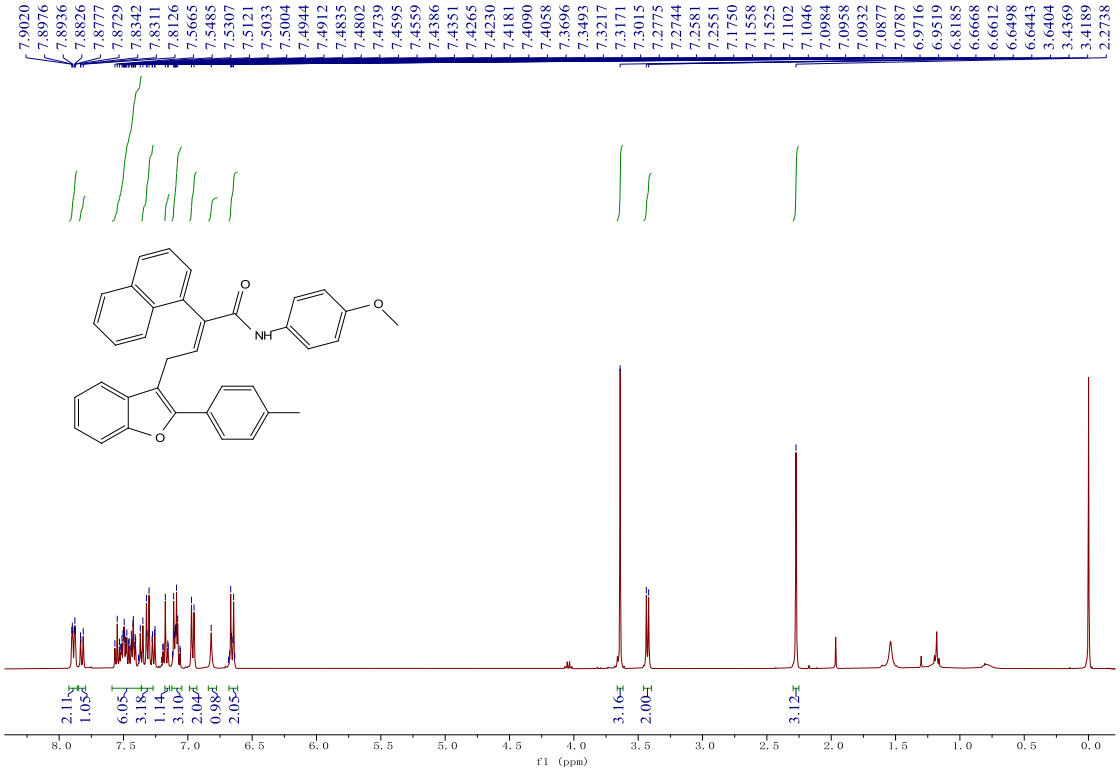


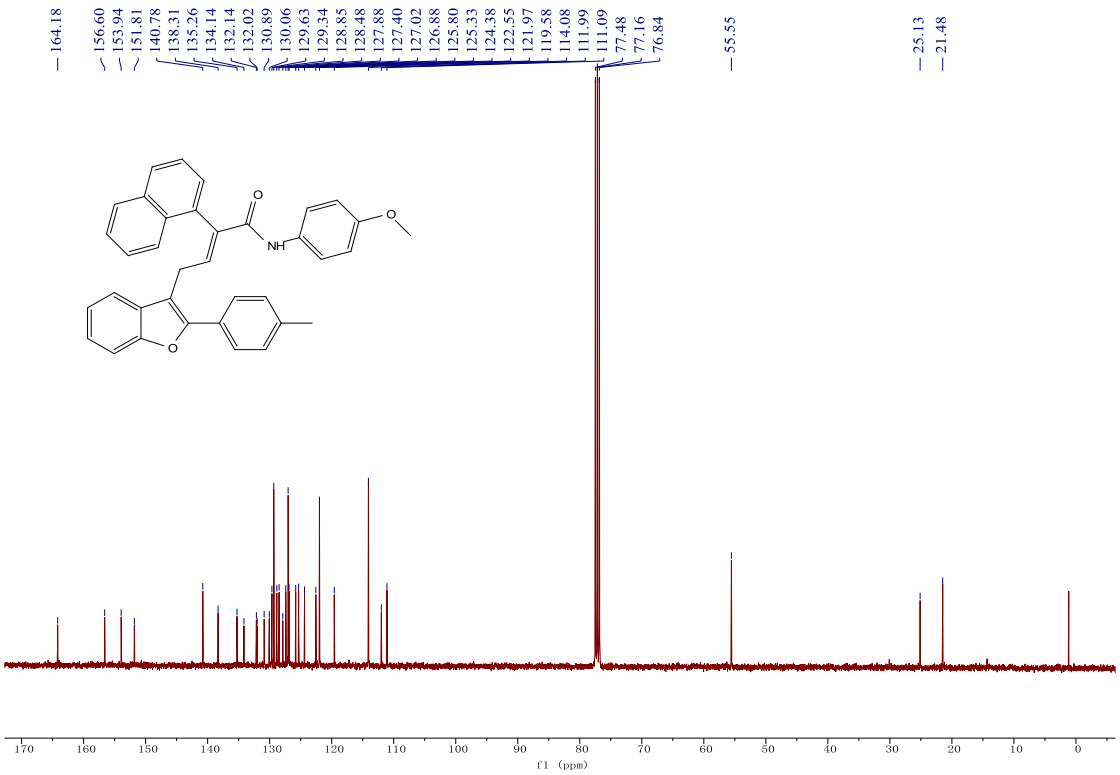
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3p



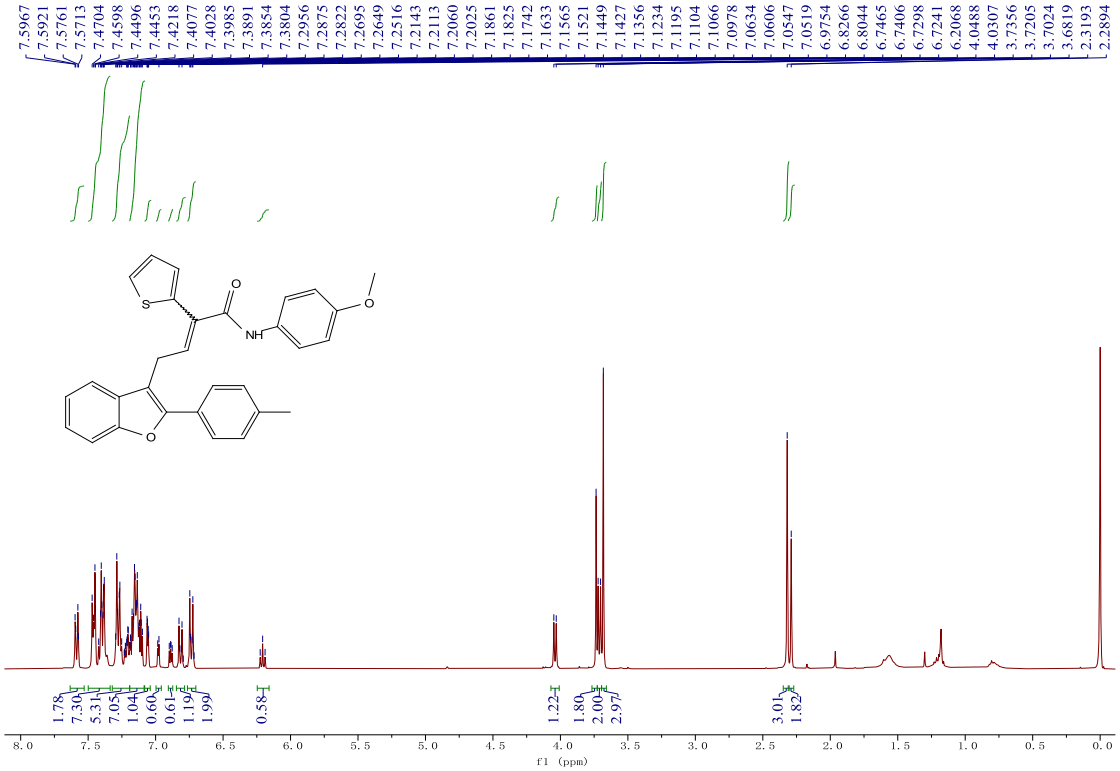


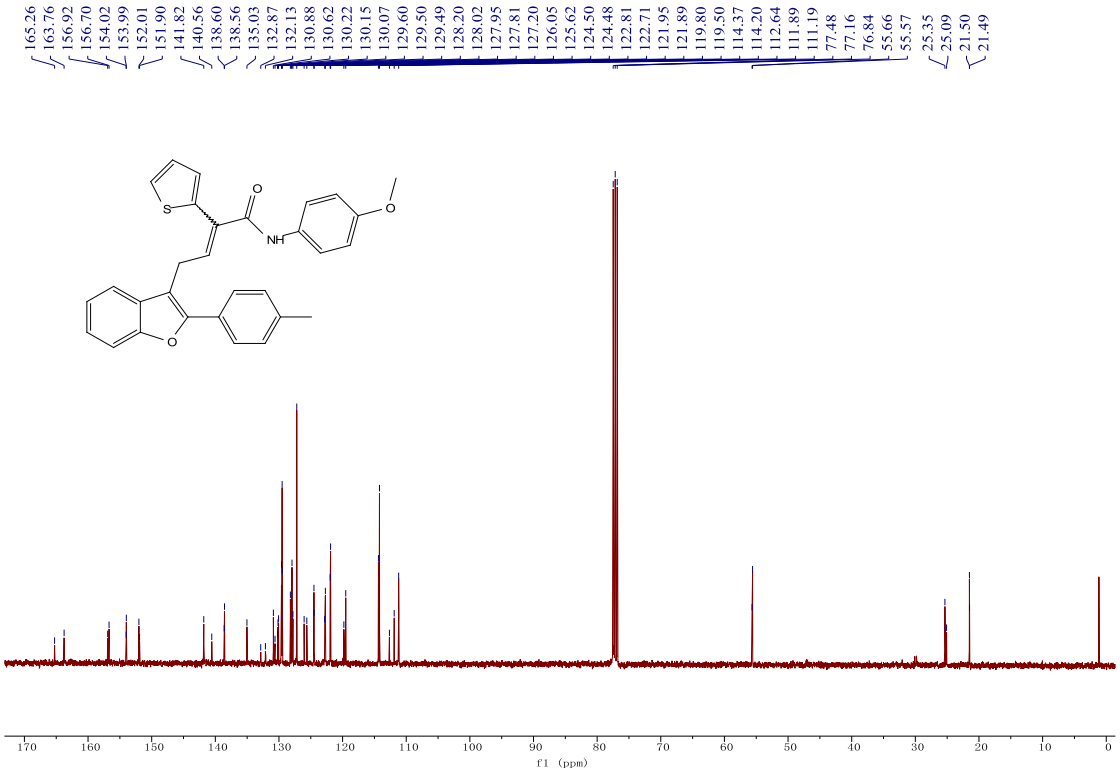
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3q



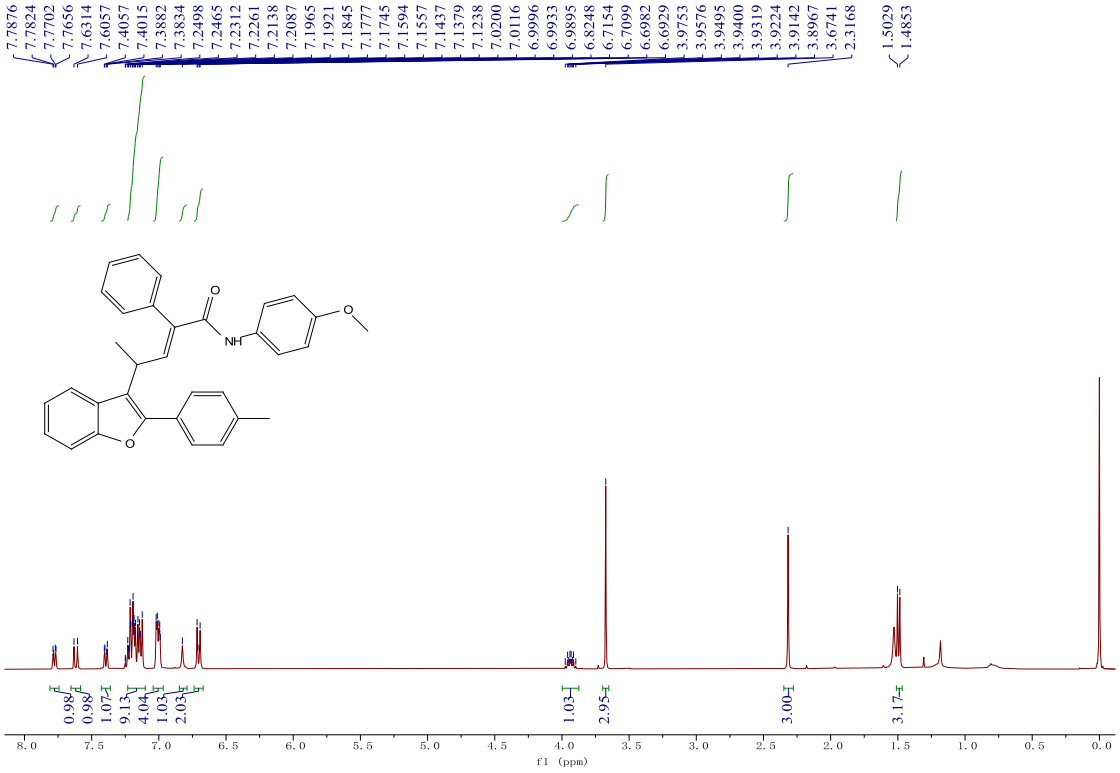


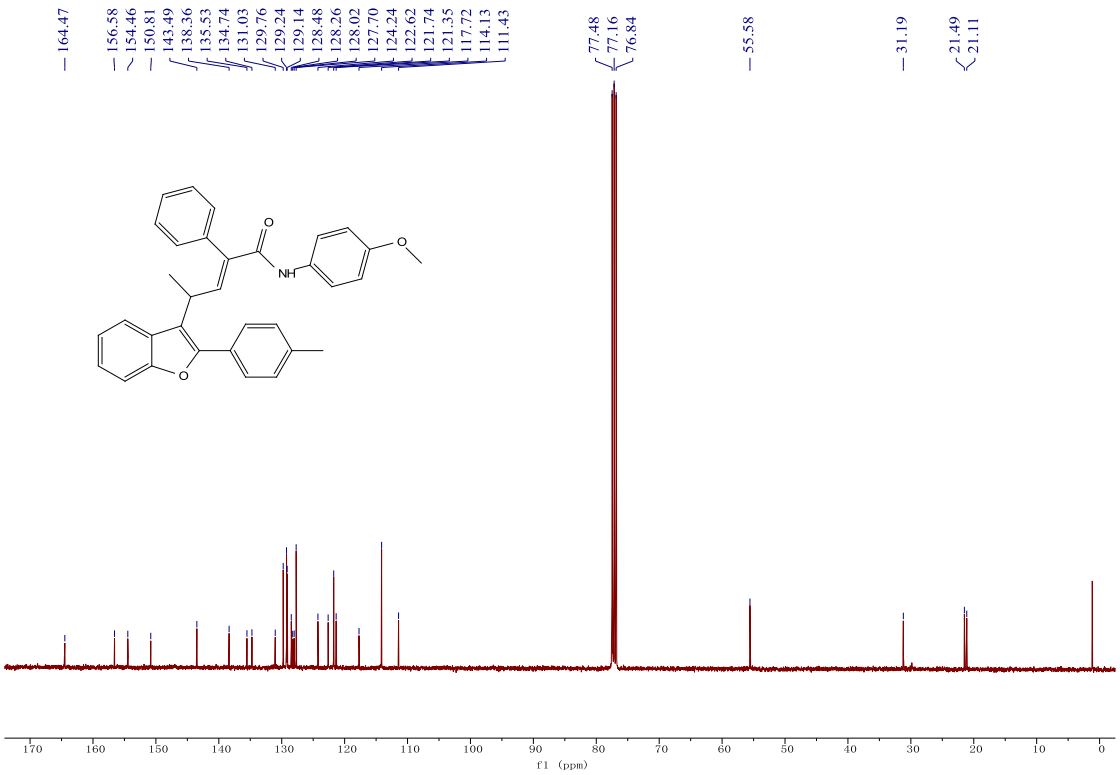
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3r



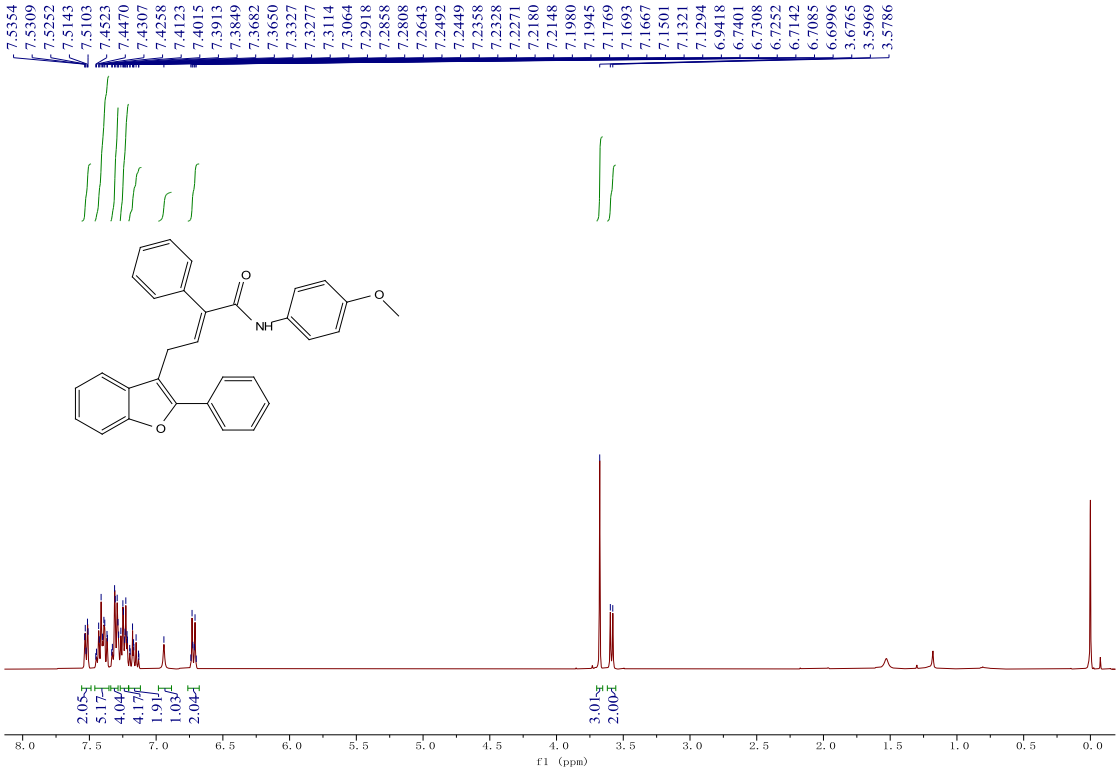


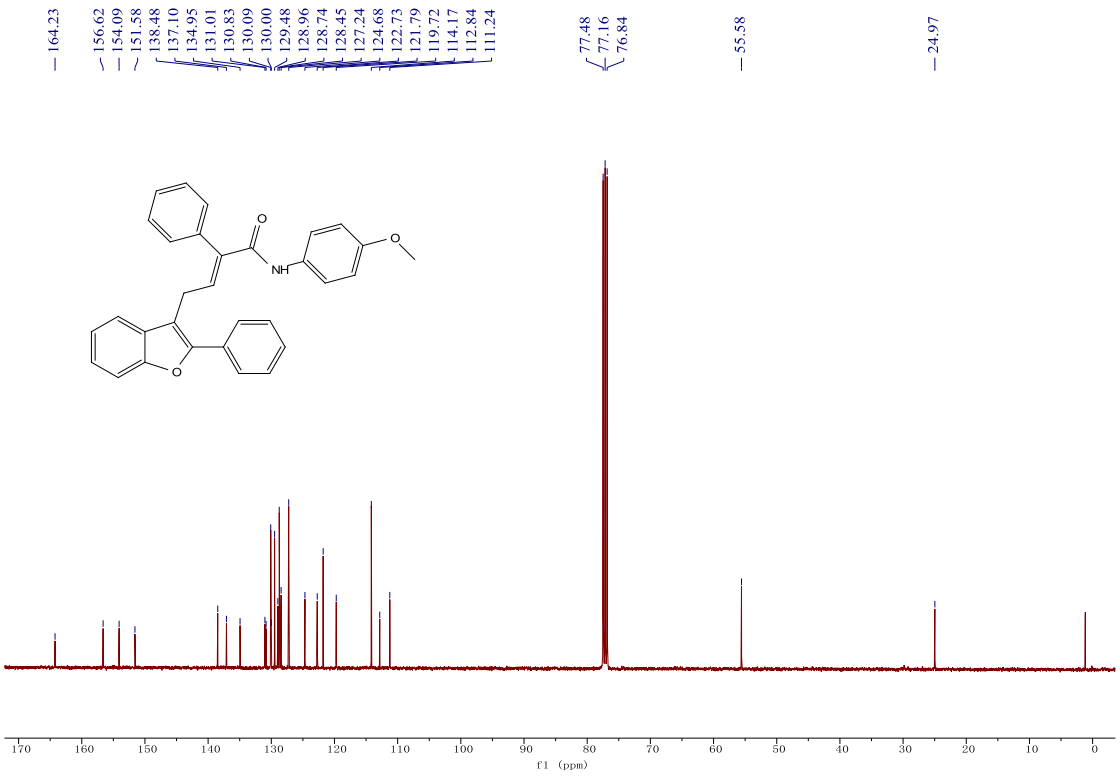
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3s



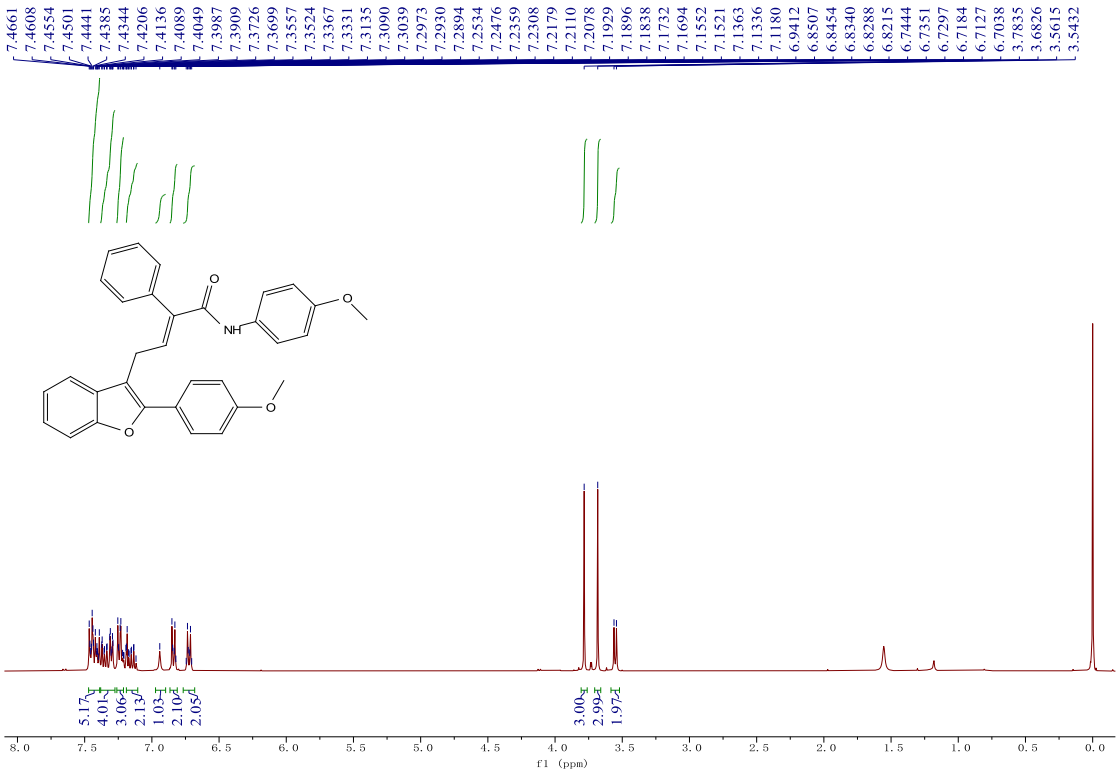


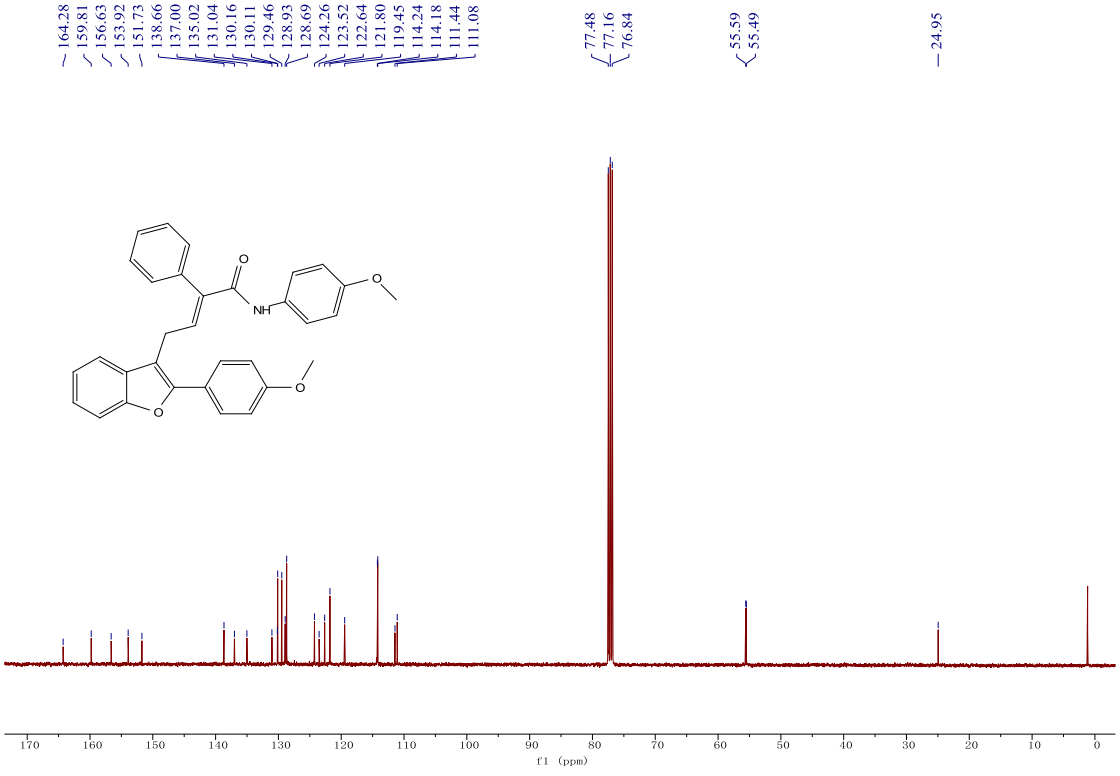
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3t



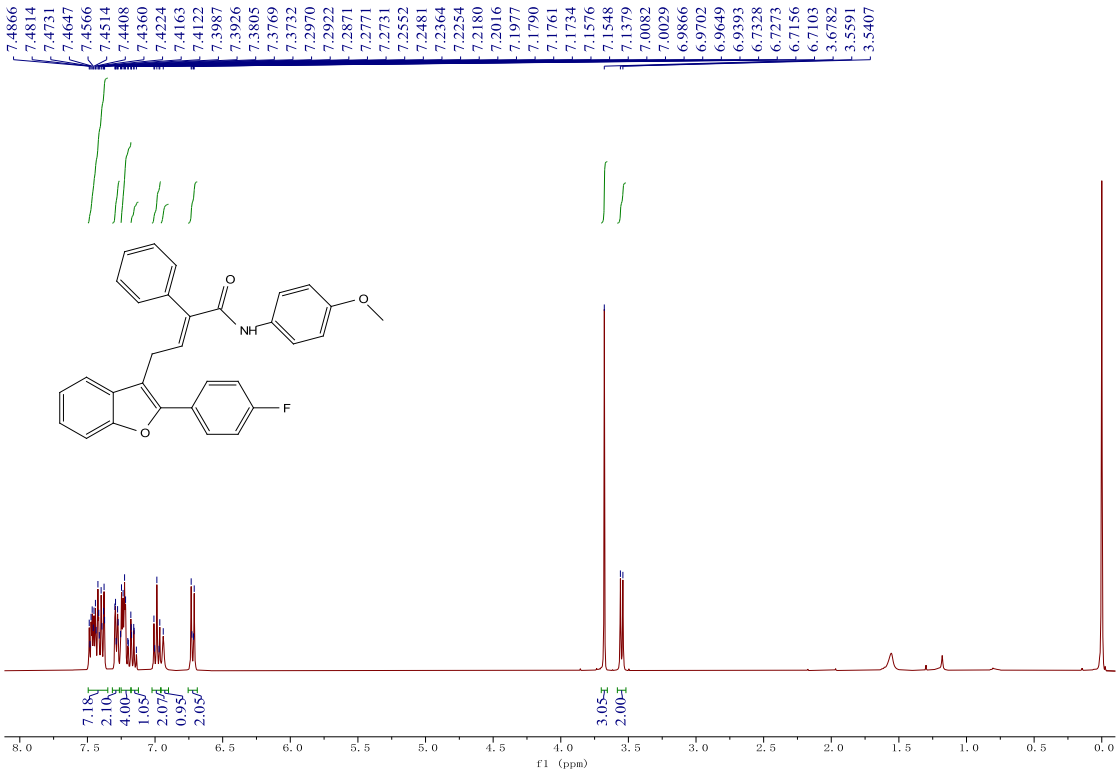


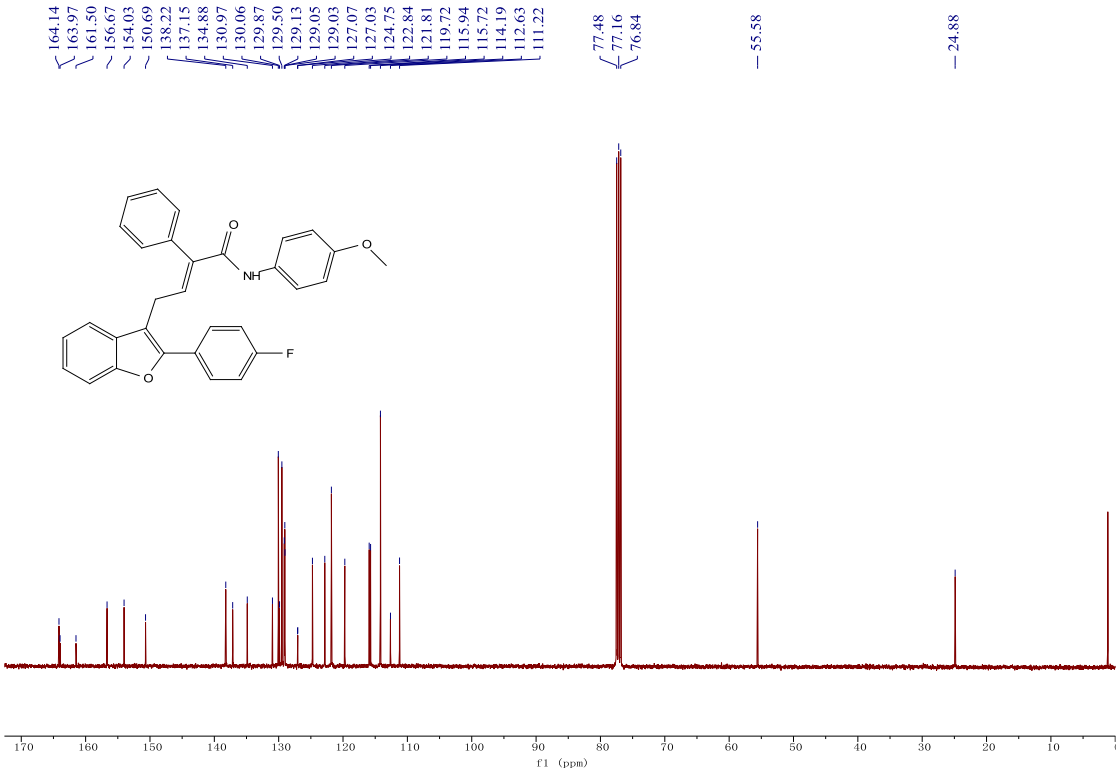
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3u



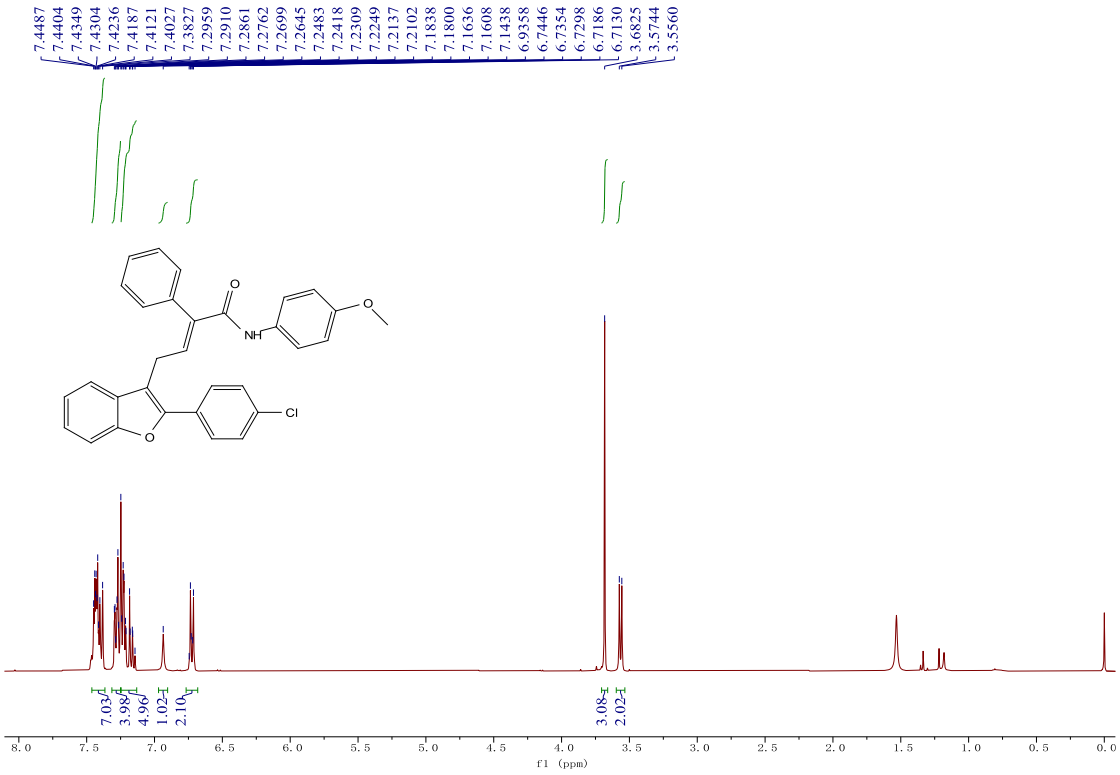


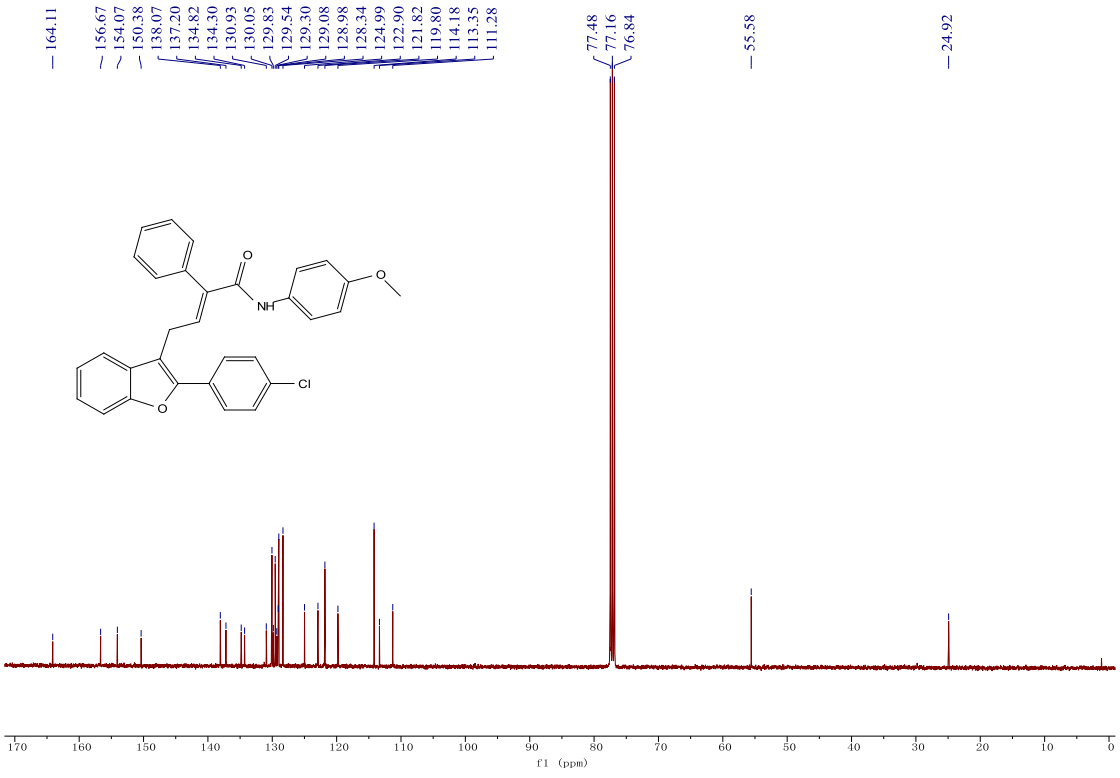
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3v



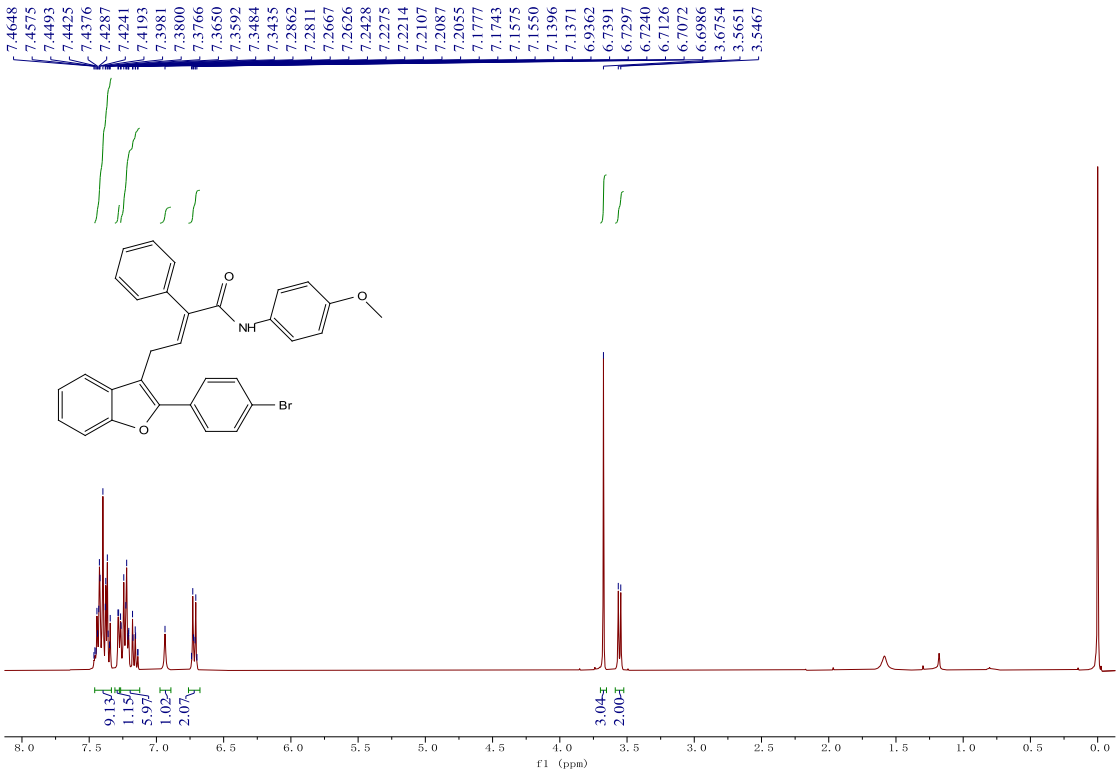


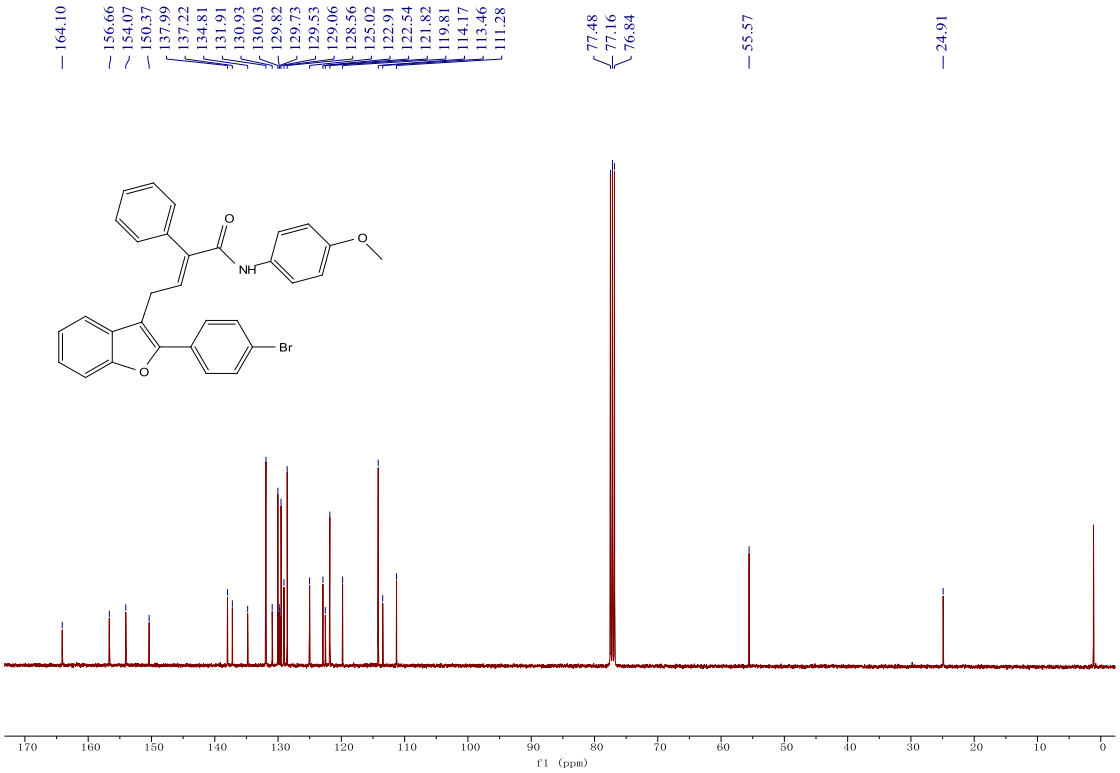
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3w



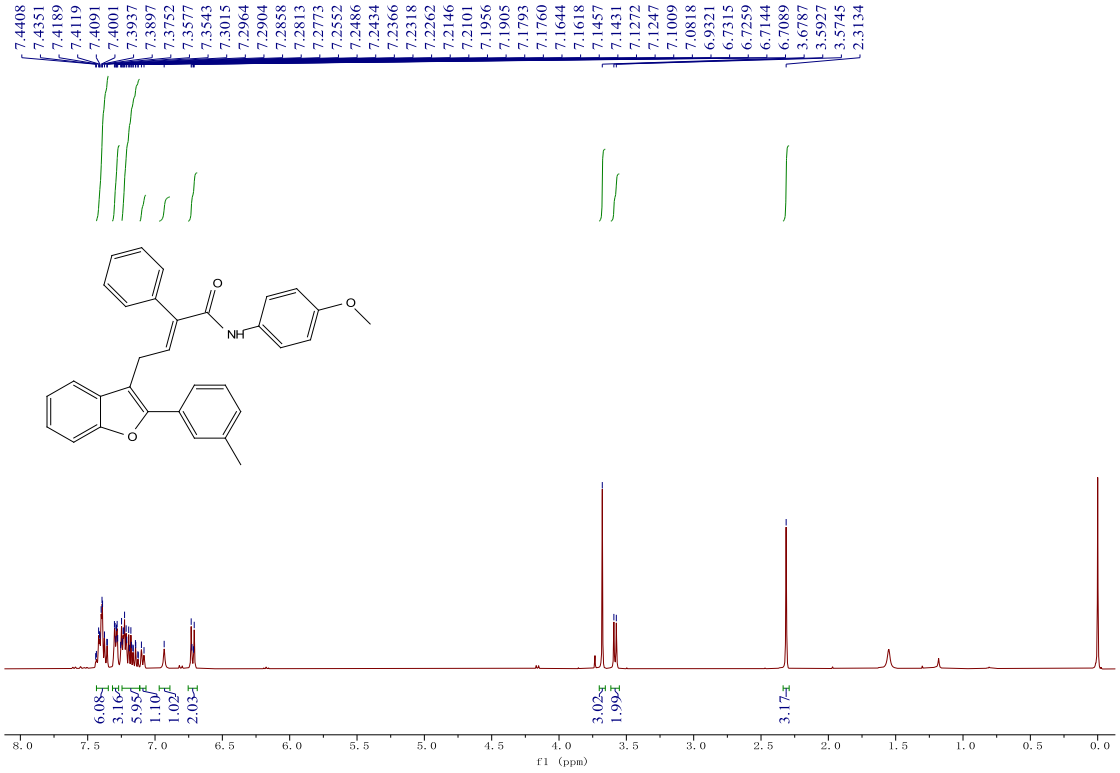


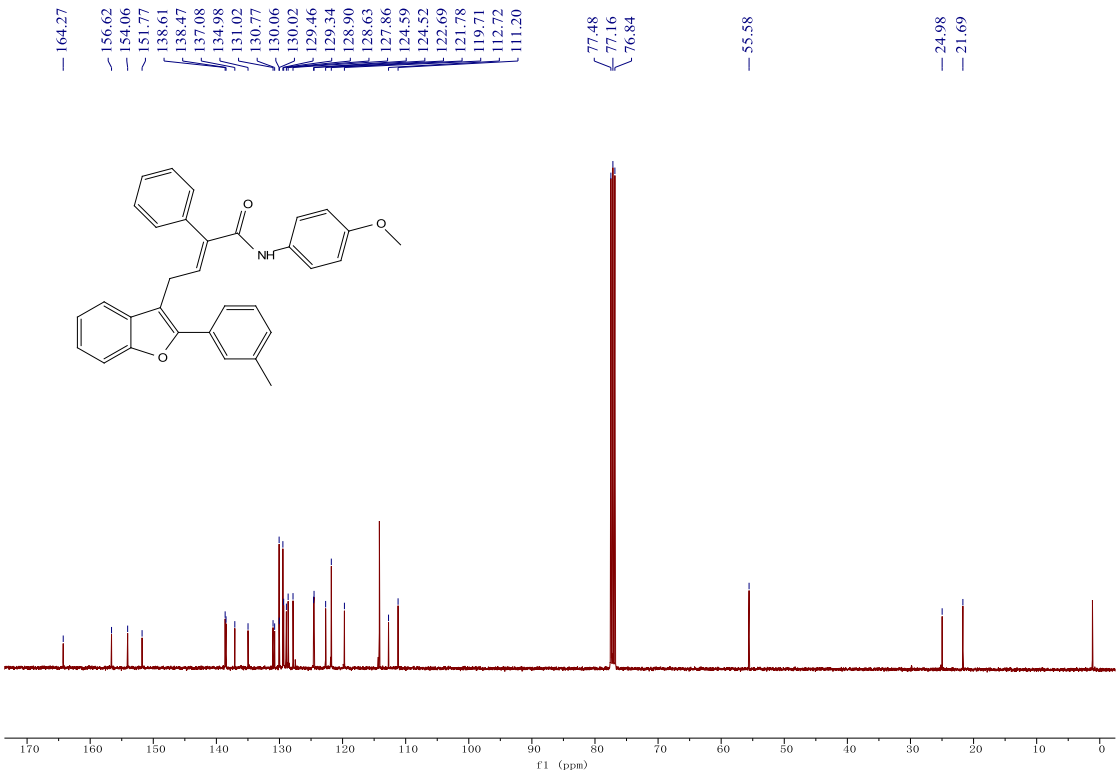
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3x



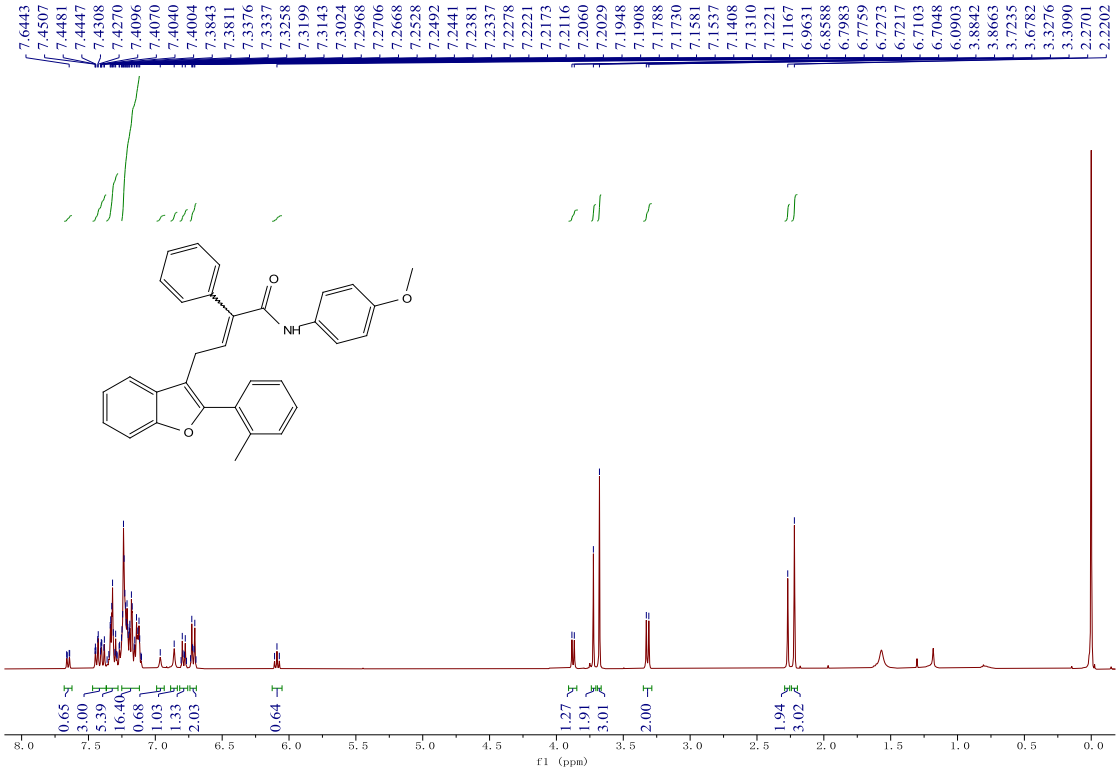


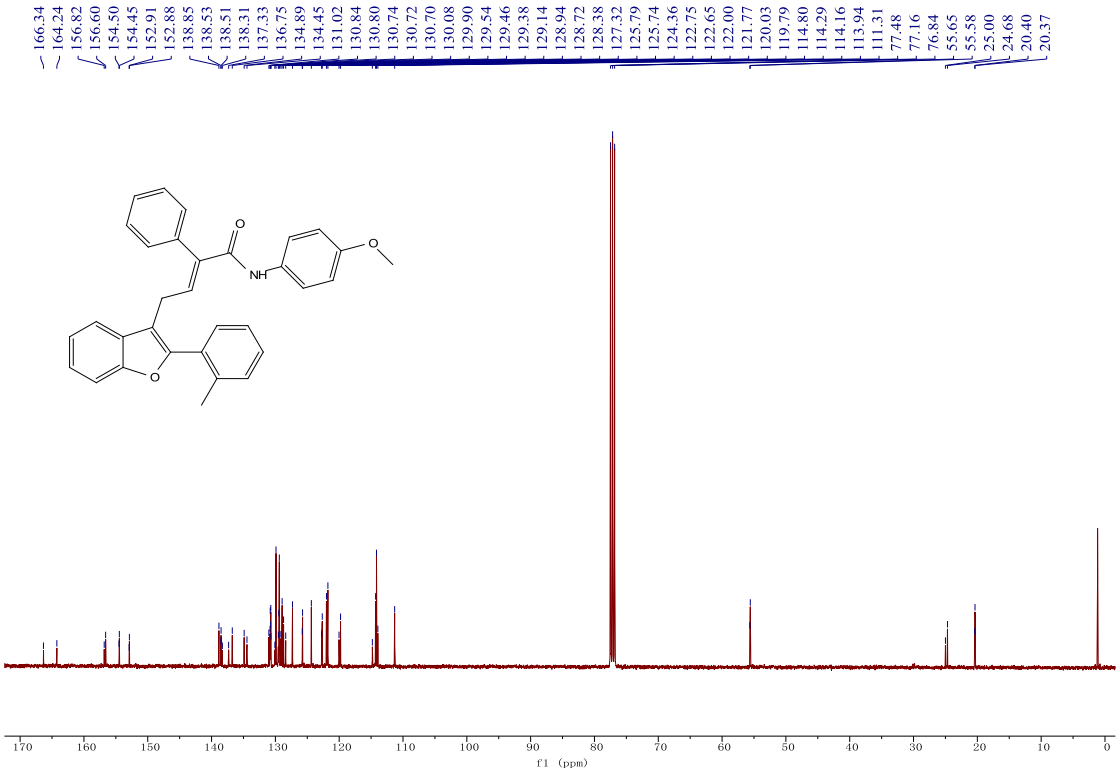
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3y



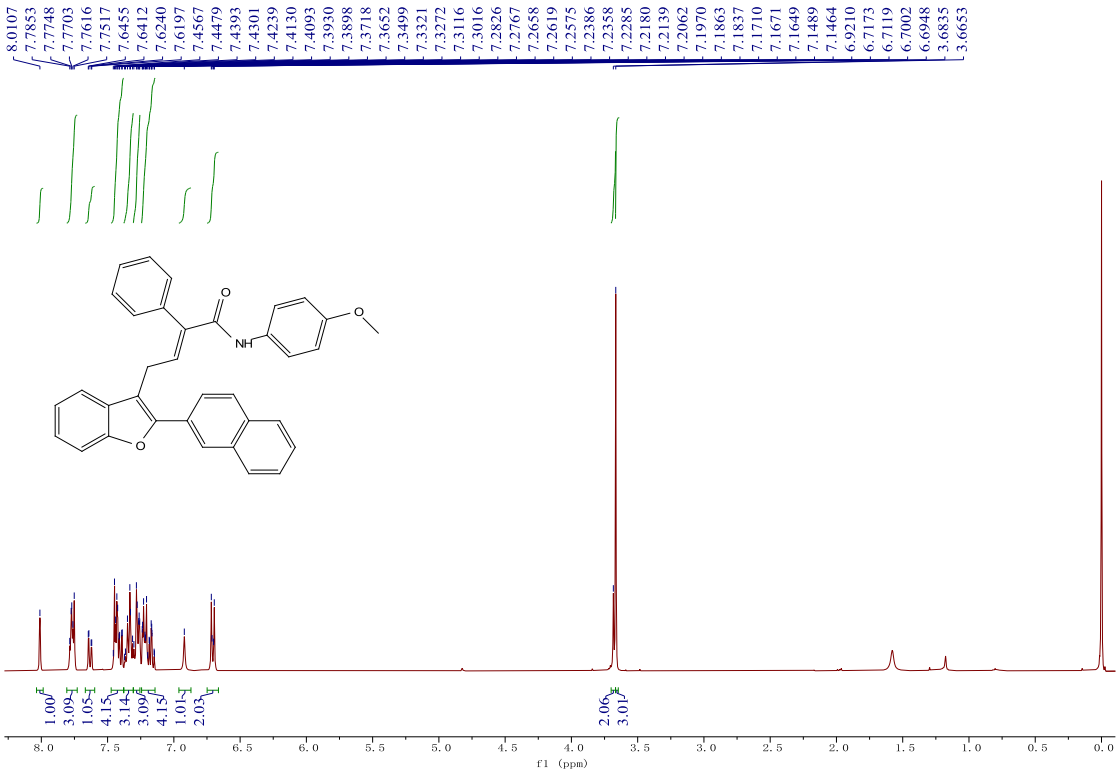


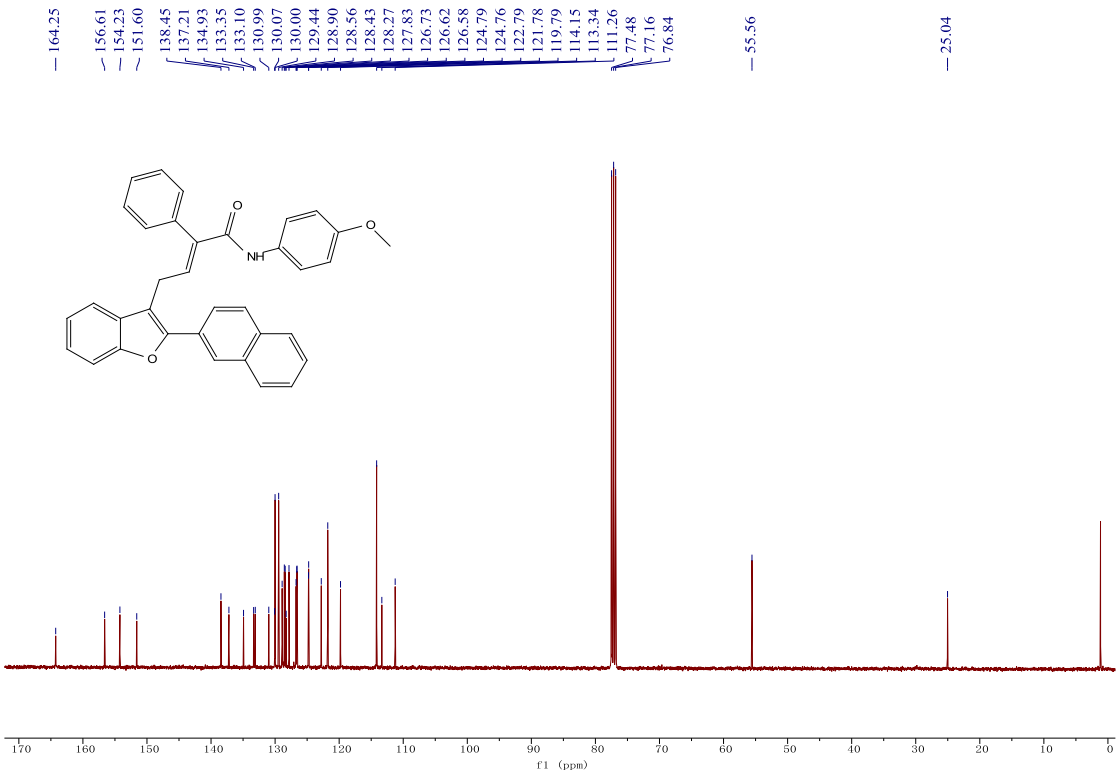
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3z



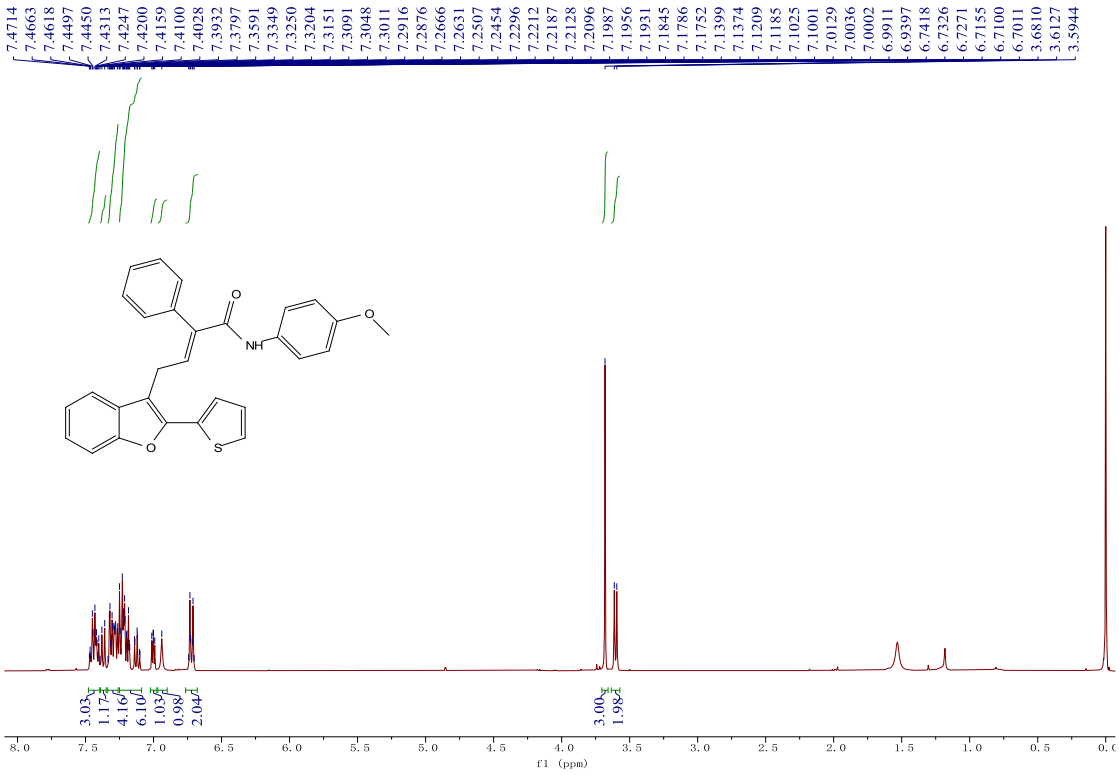


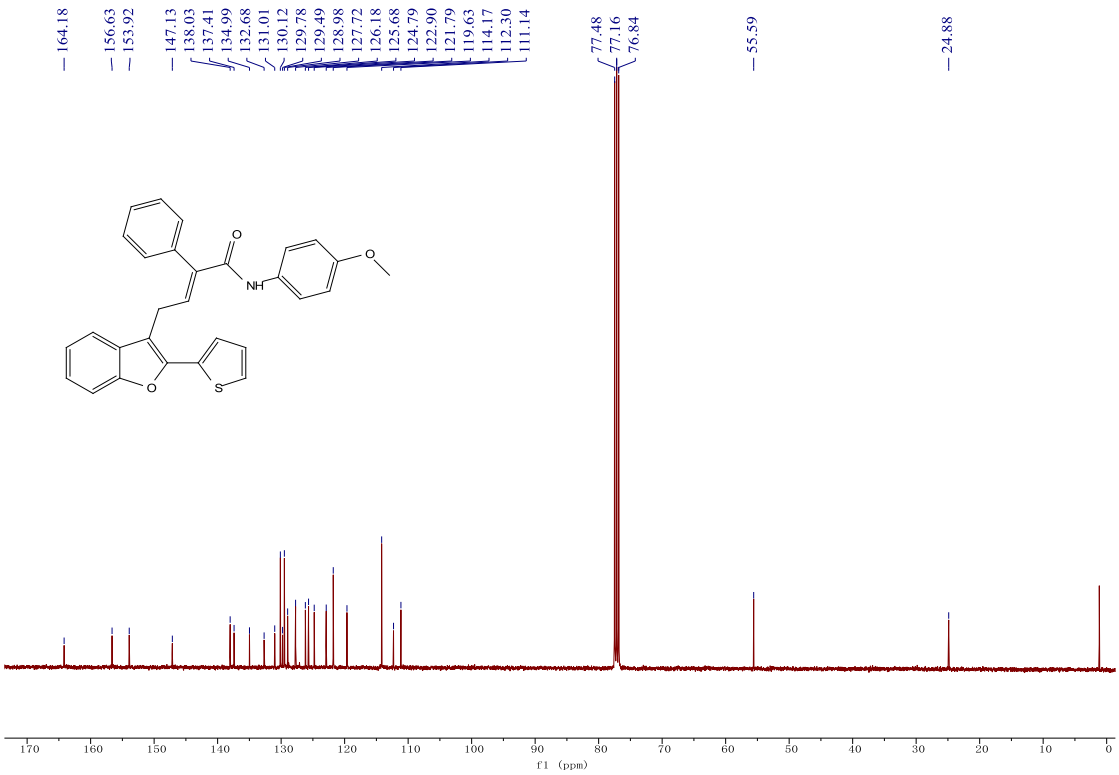
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3a'



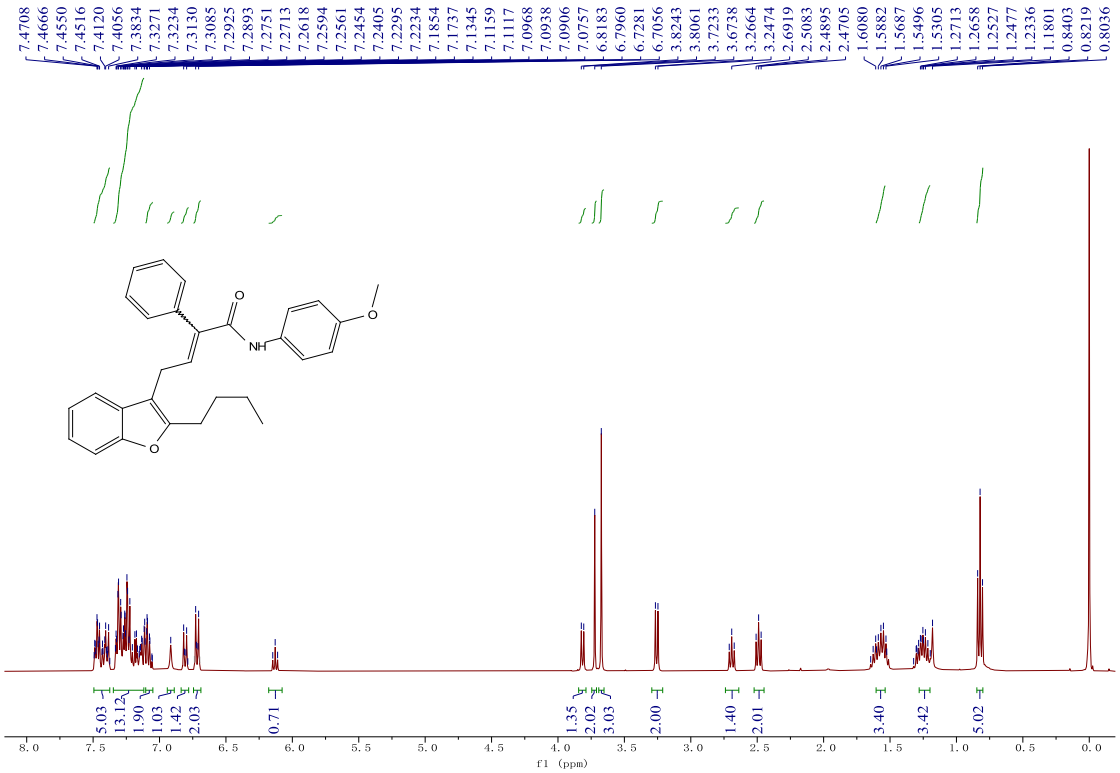


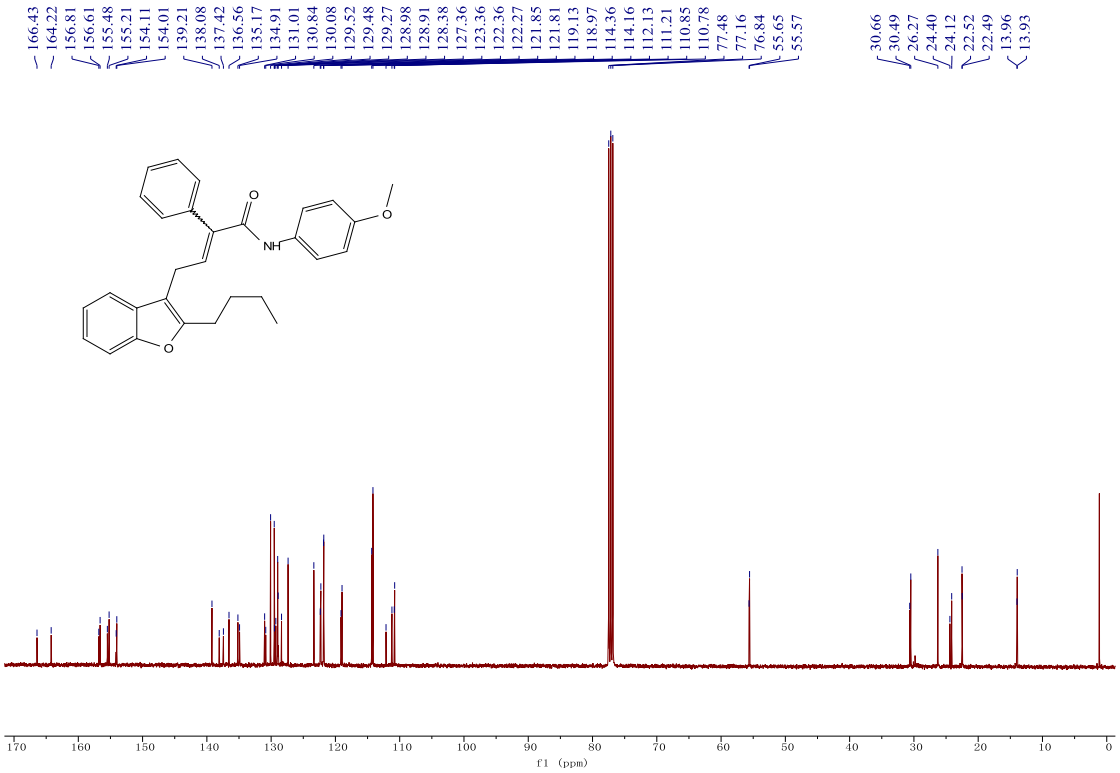
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3b'



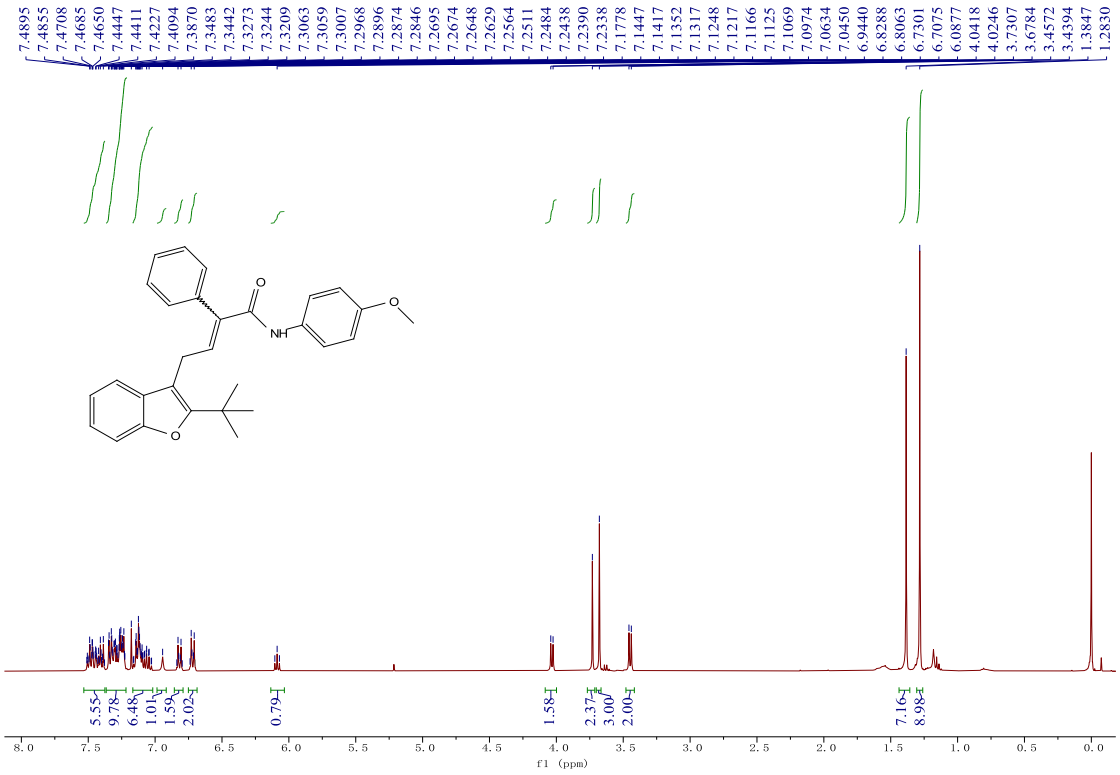


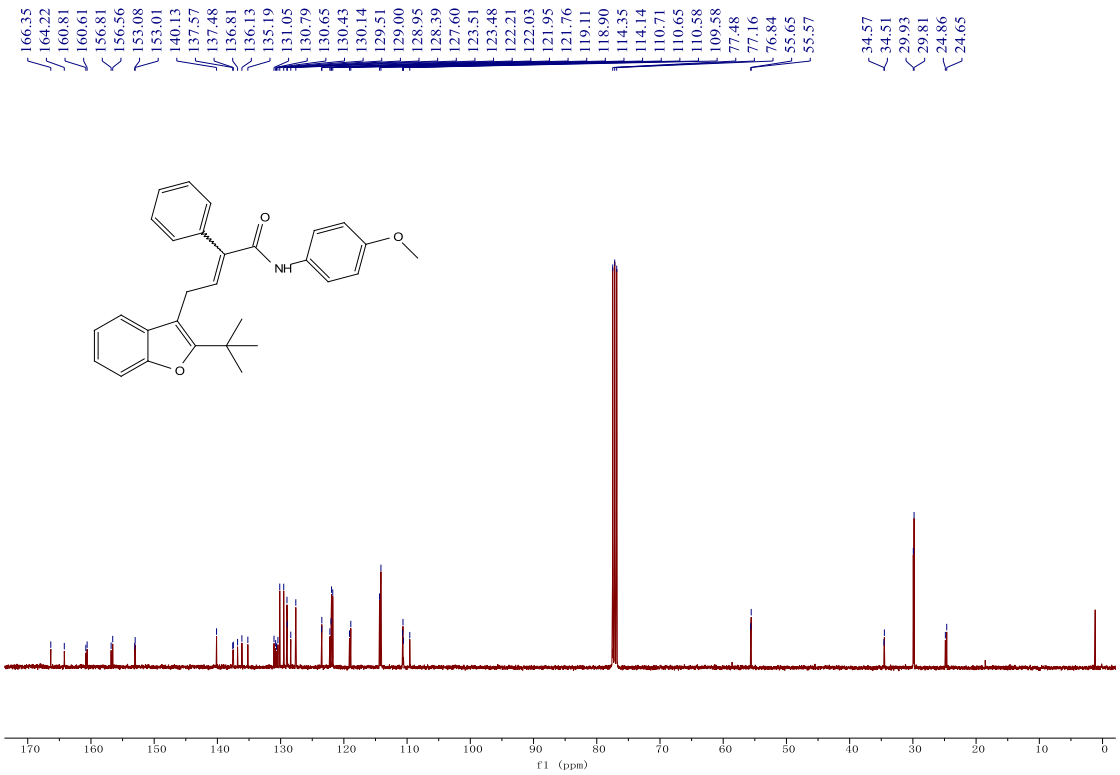
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3c'



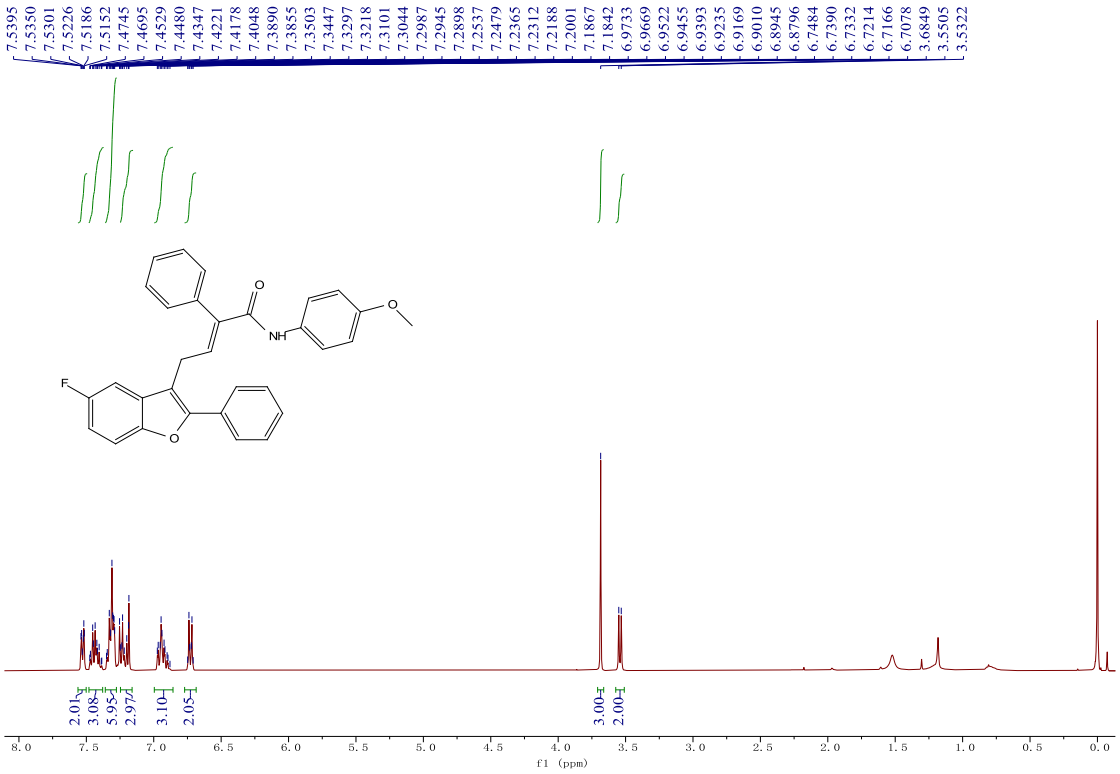


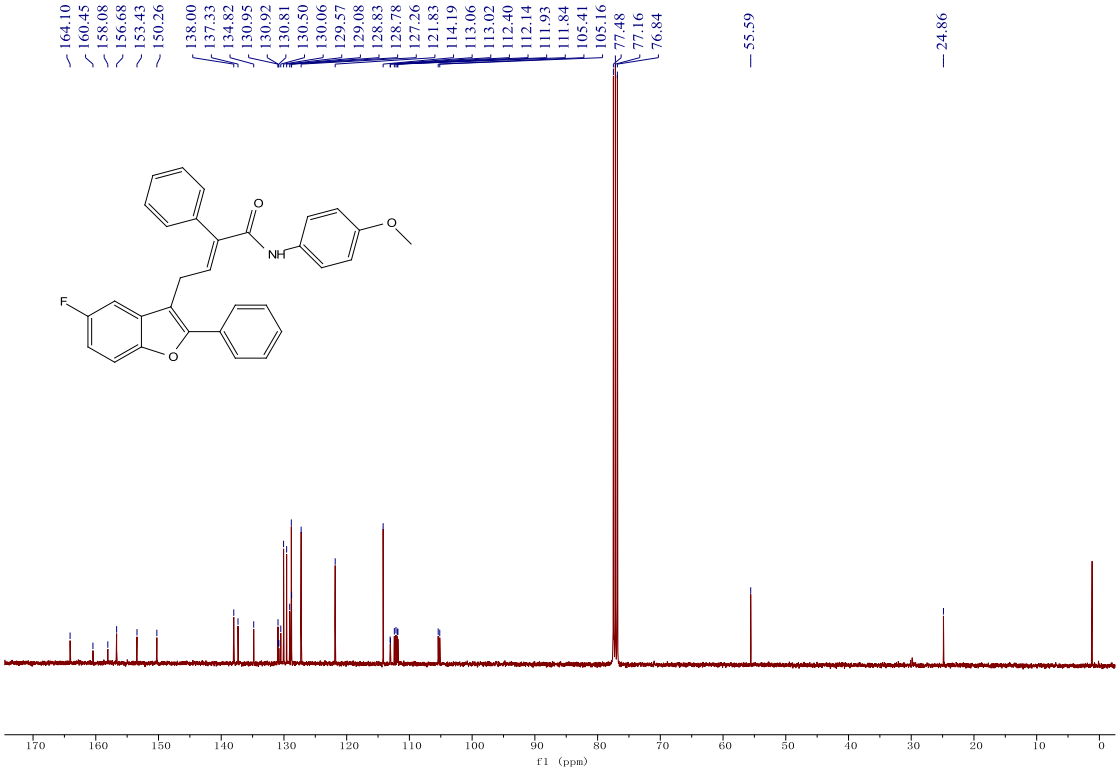
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3d'



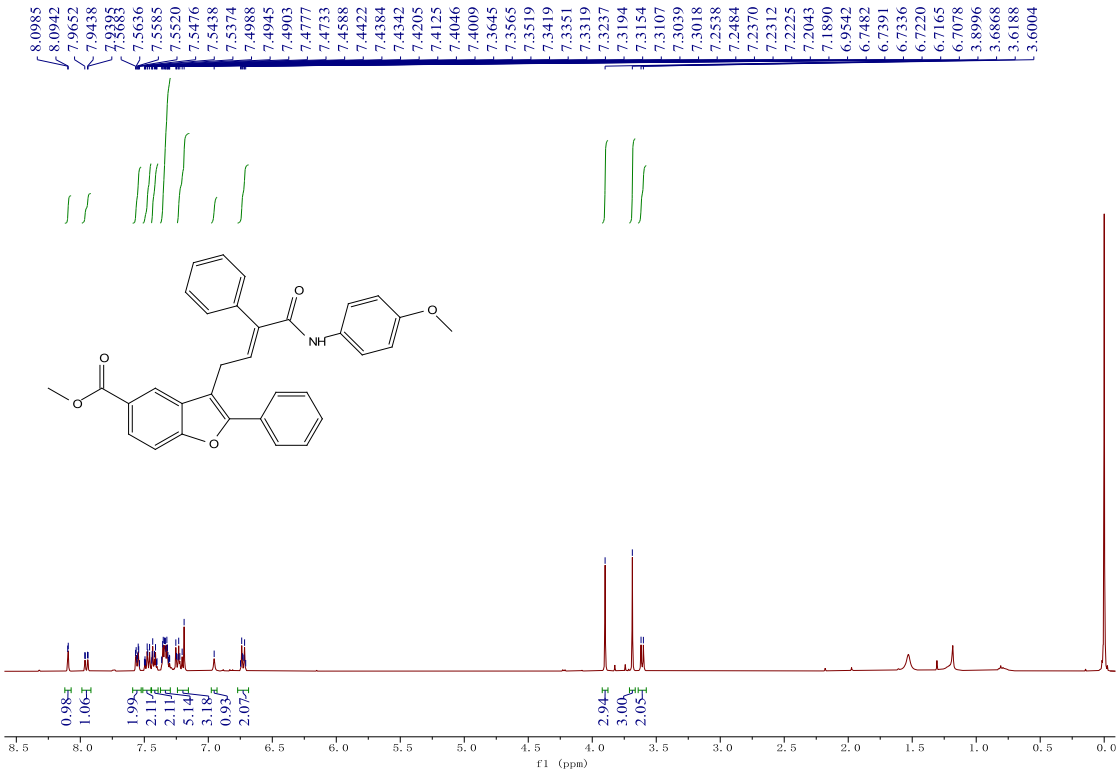


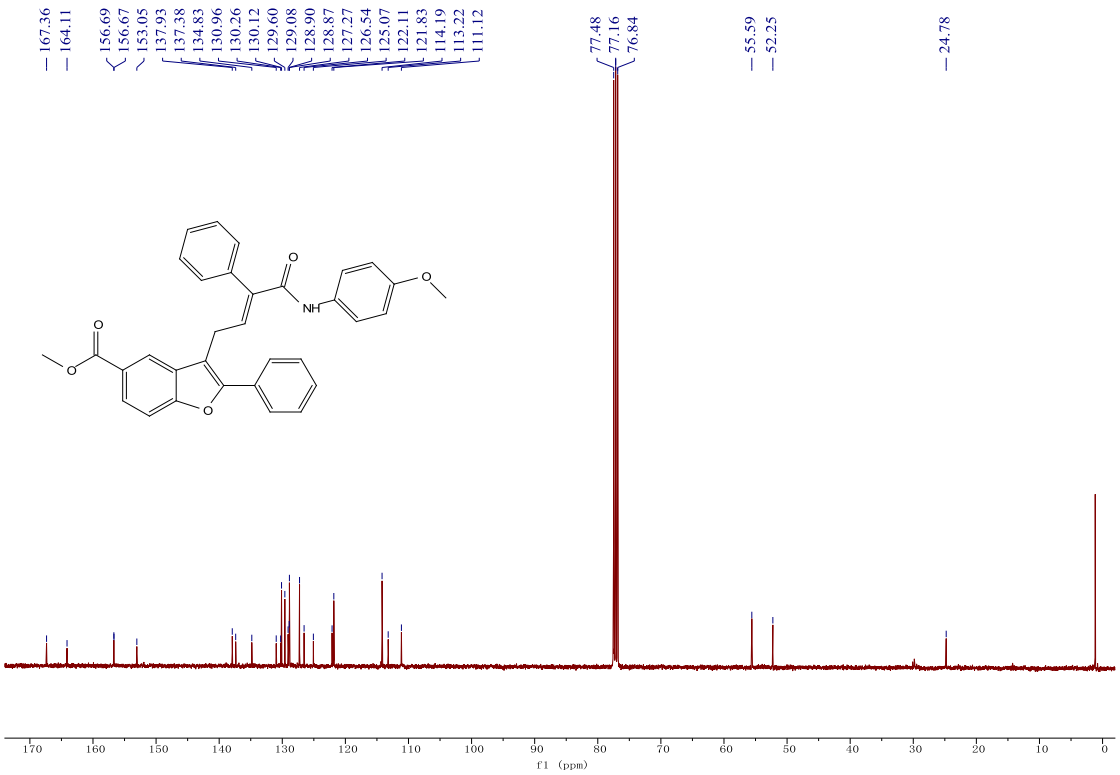
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3e'



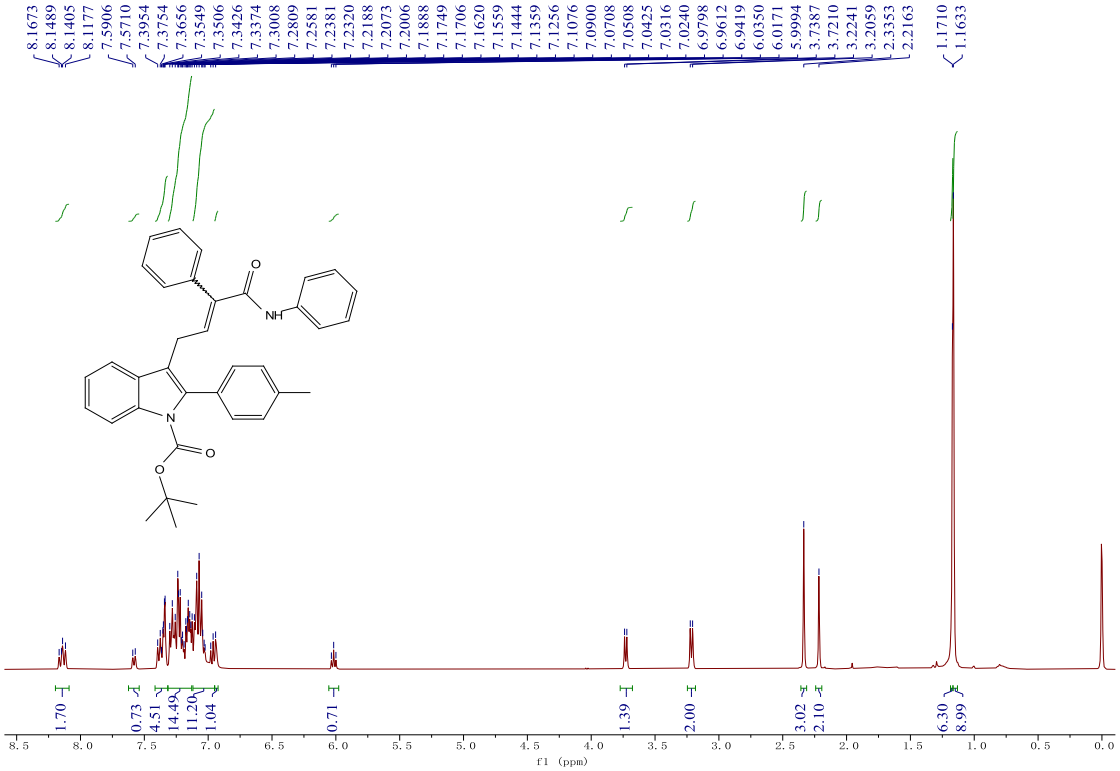


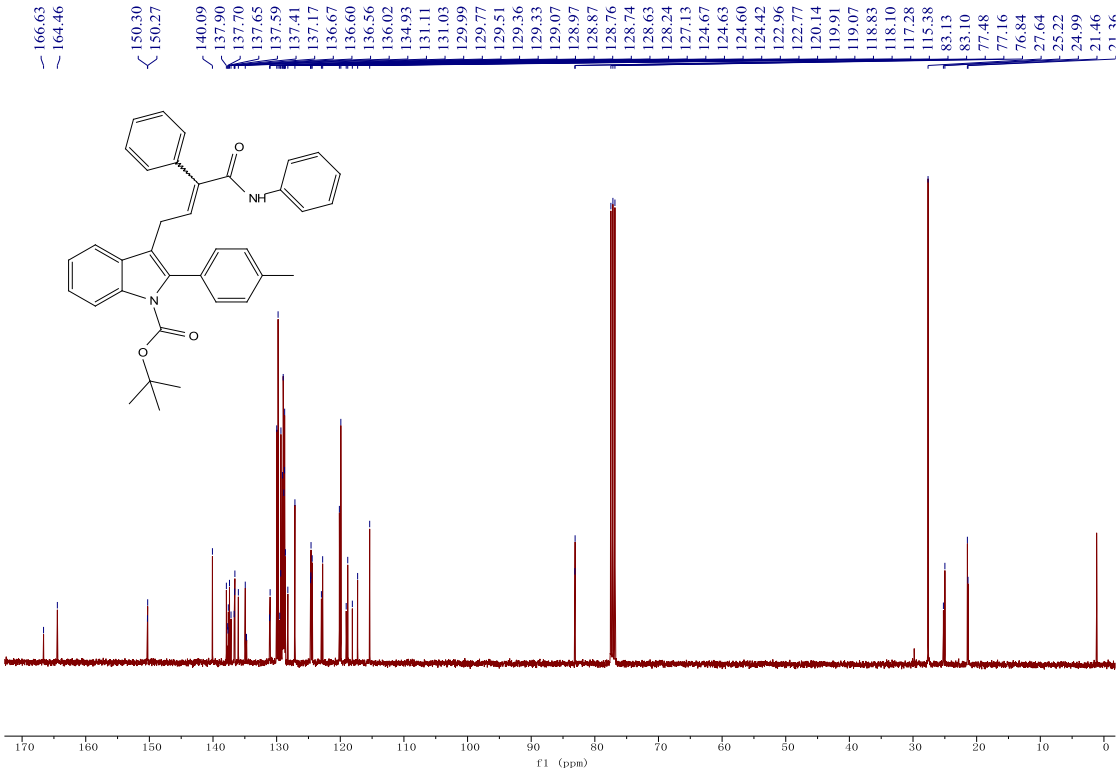
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 3f'



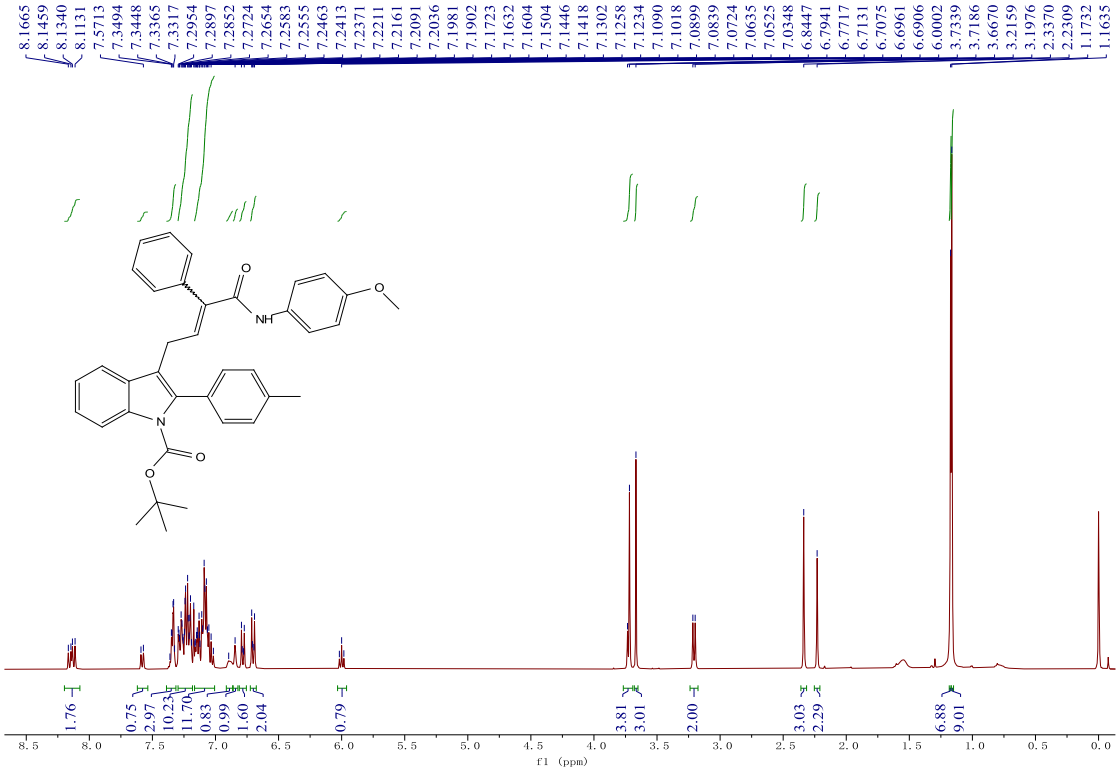


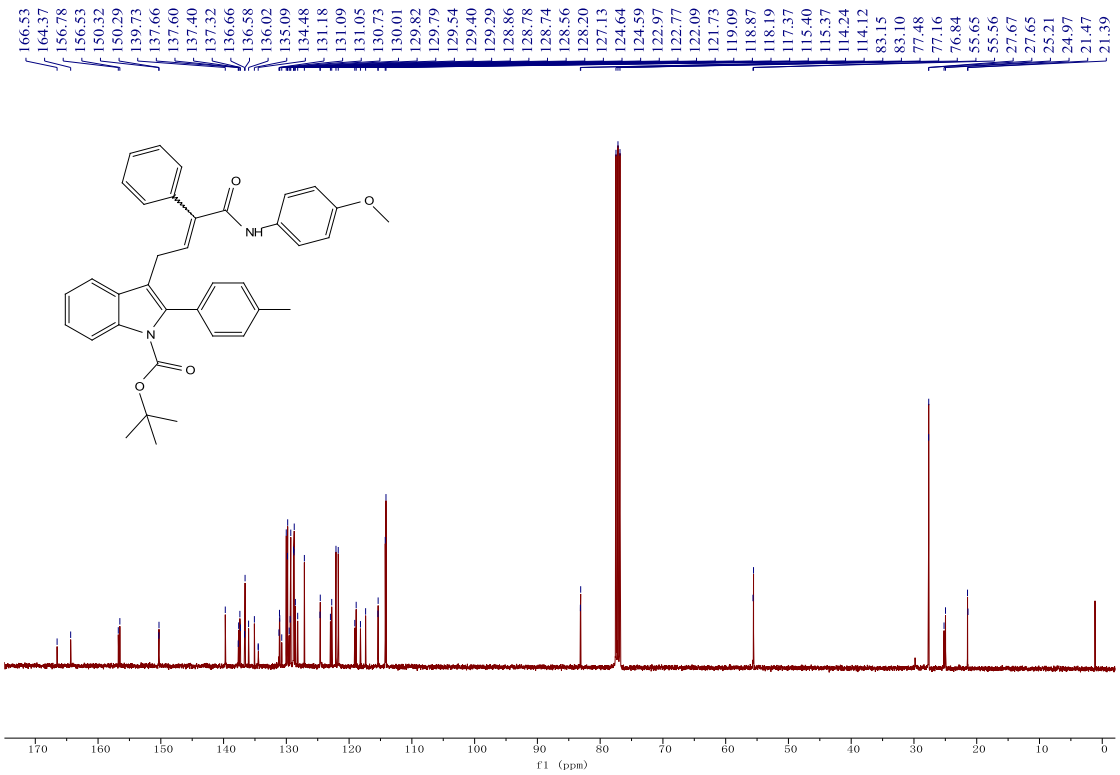
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6a



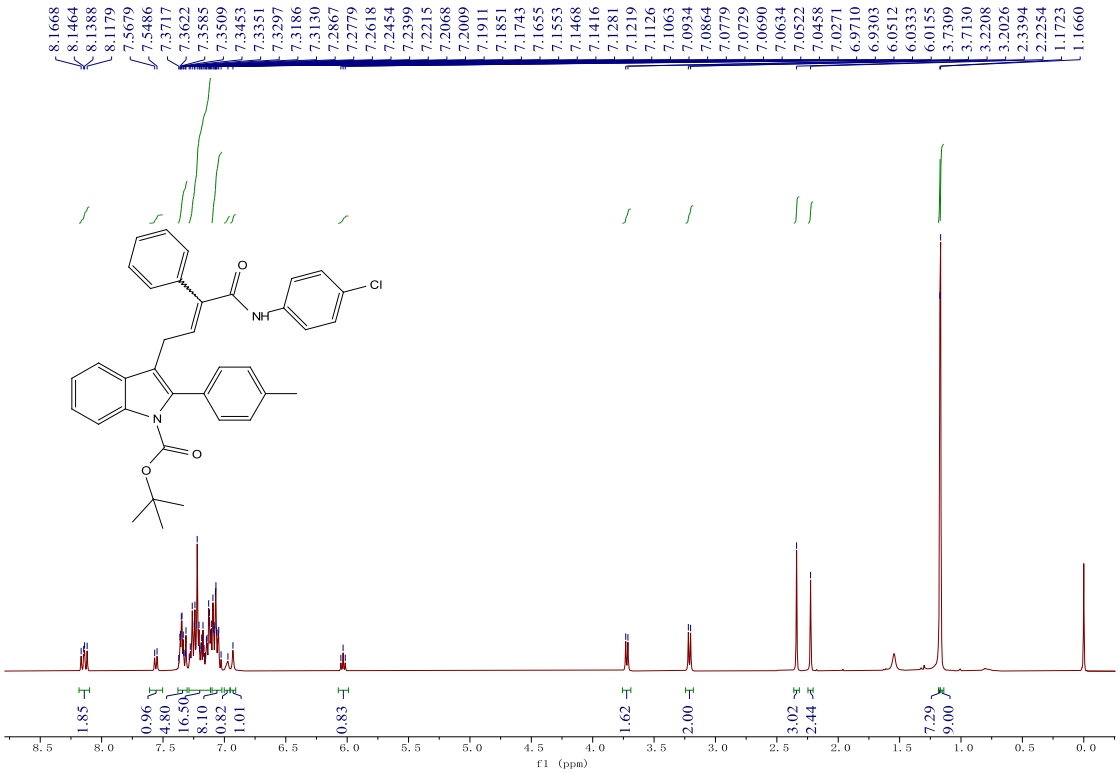


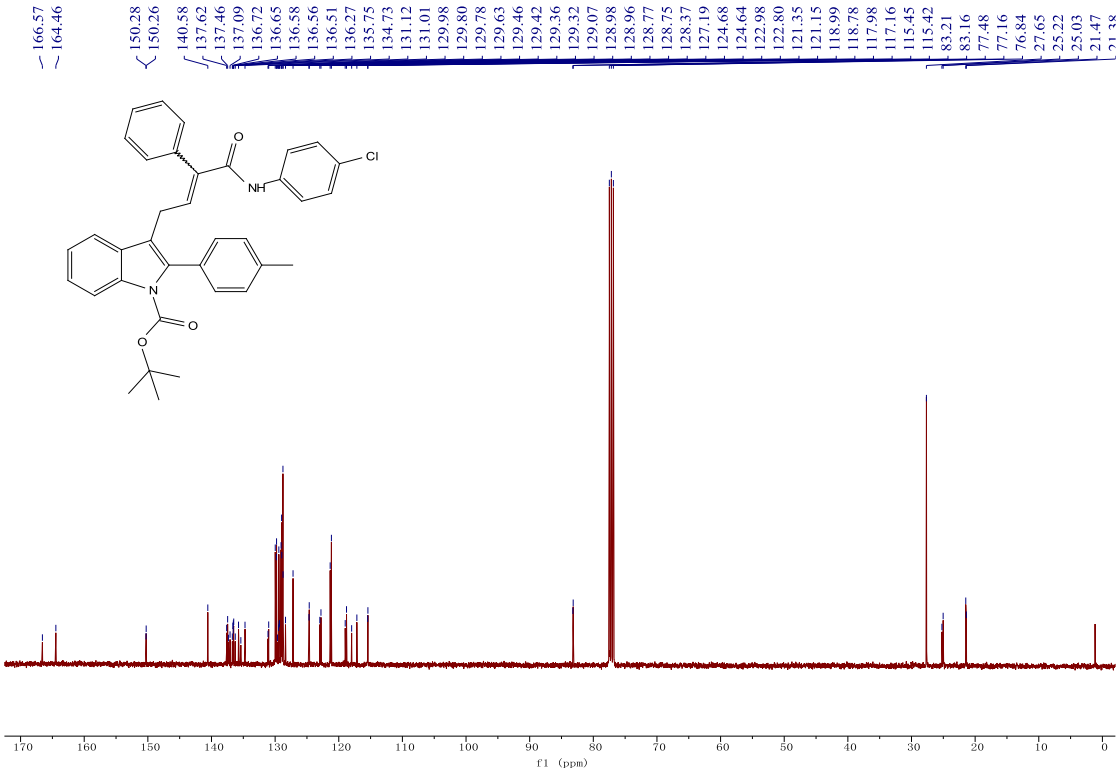
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6b



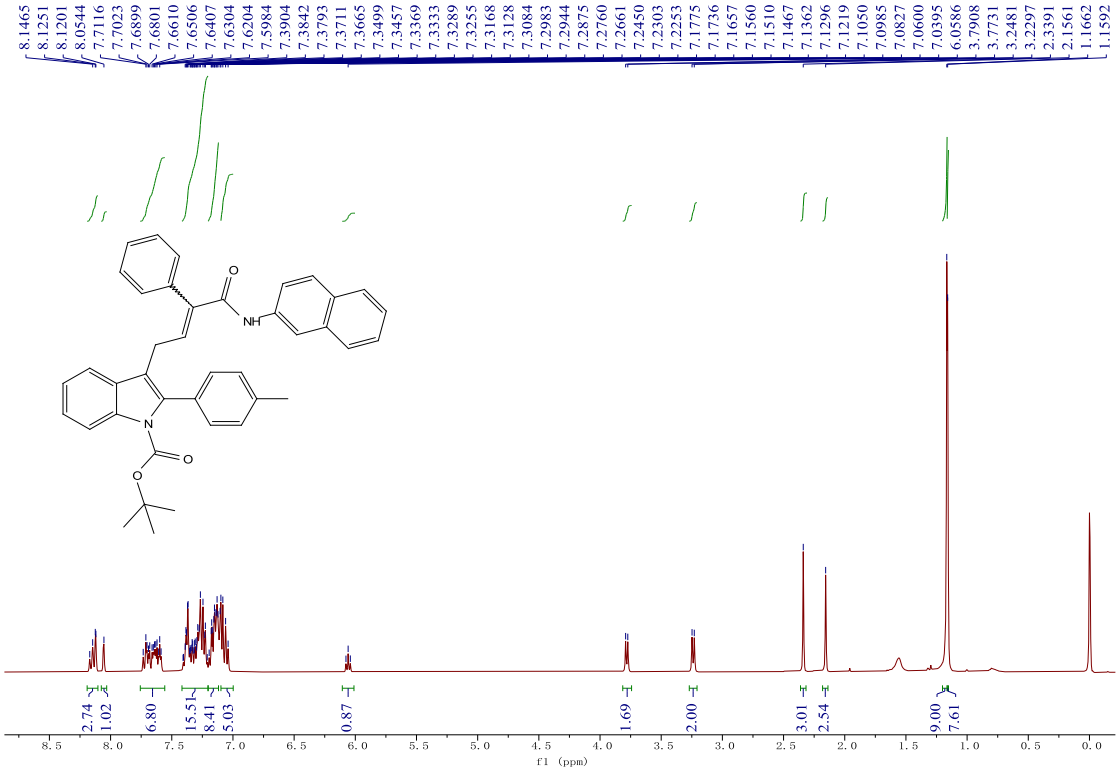


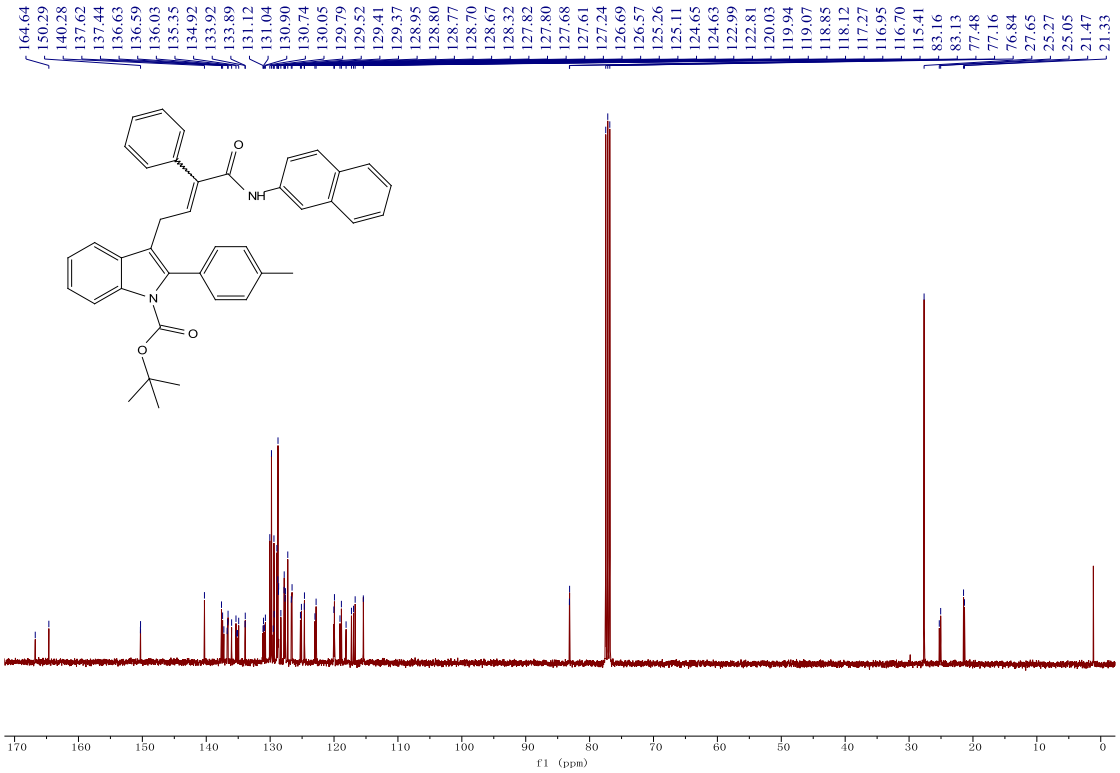
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6c



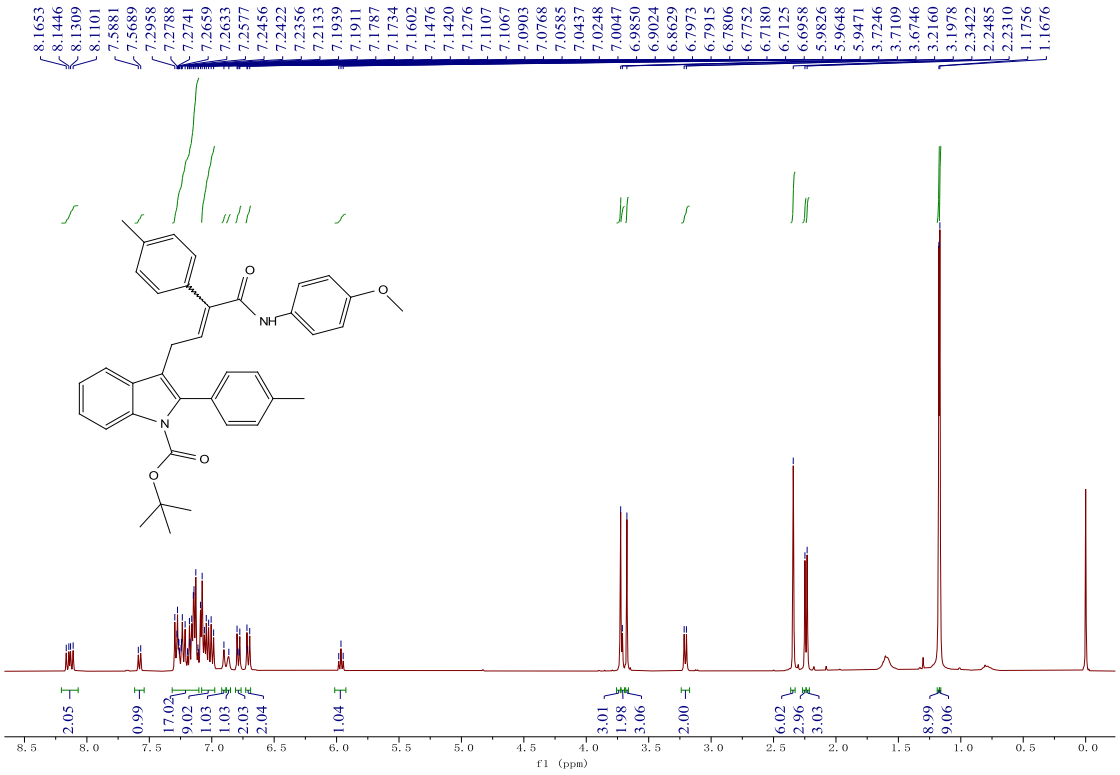


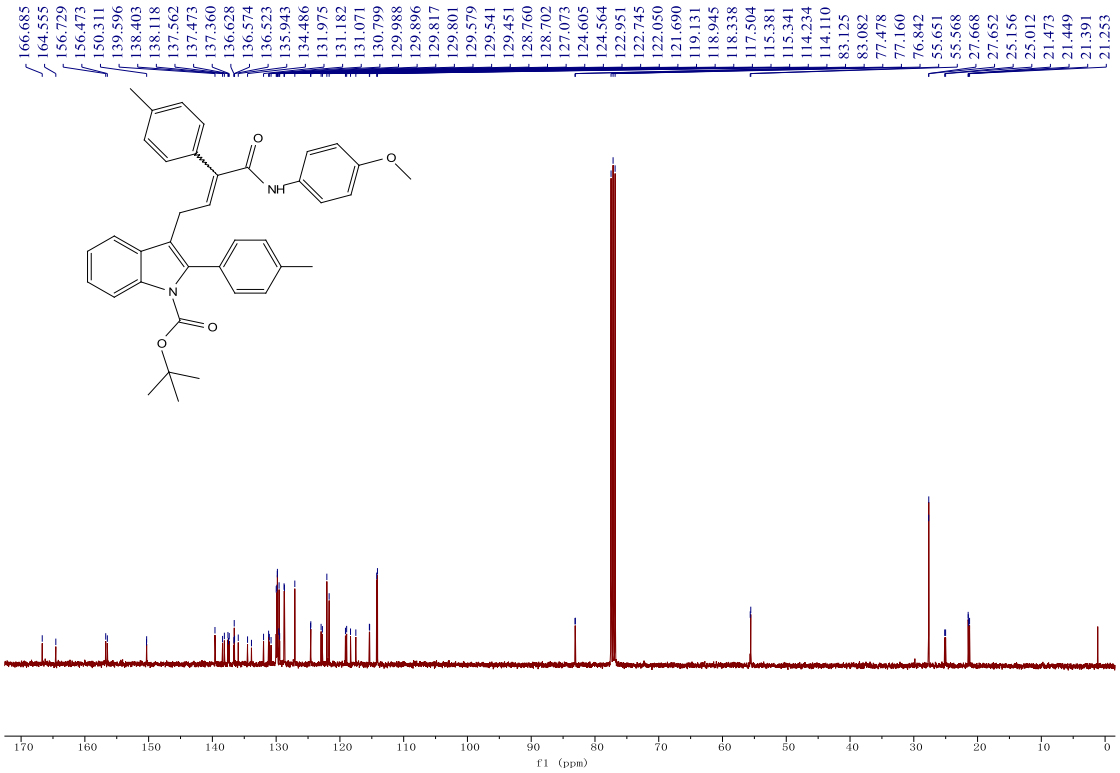
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6d



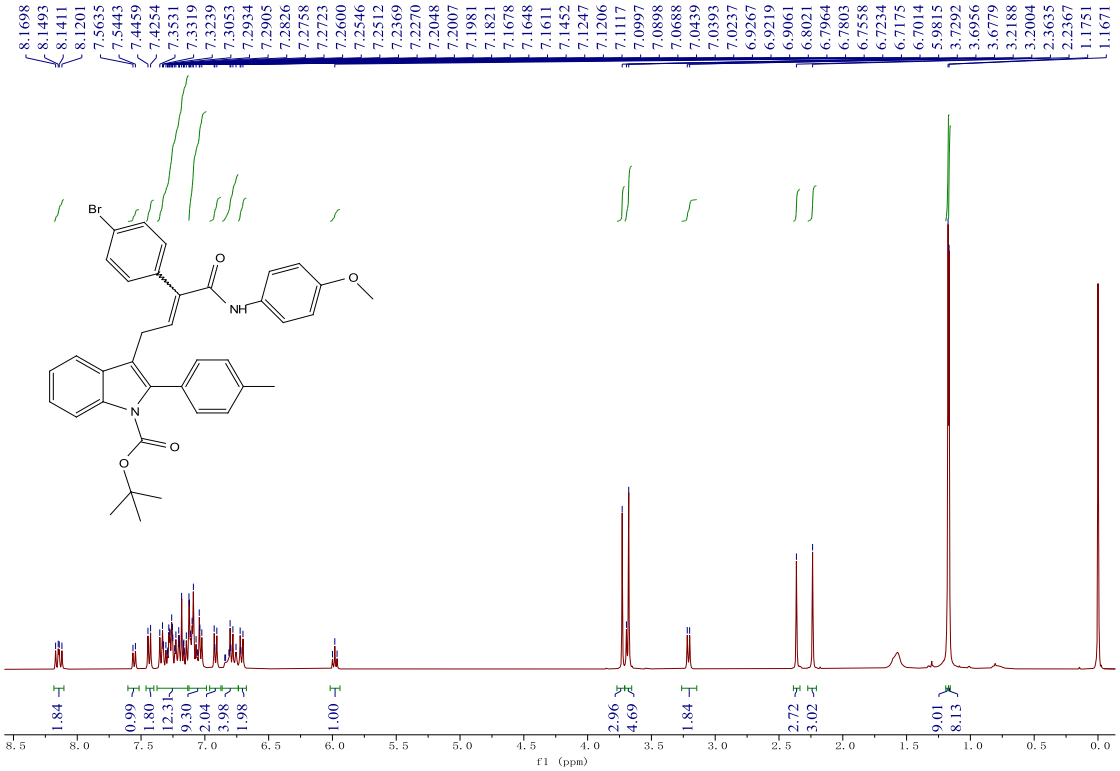


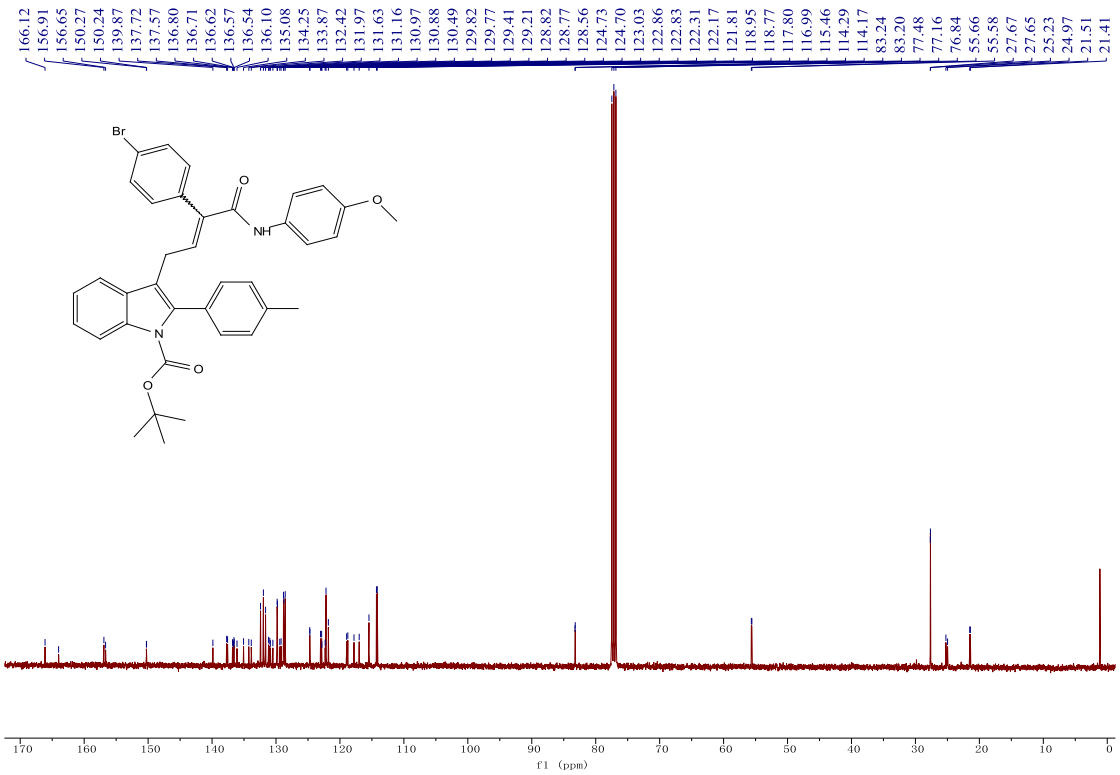
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6e



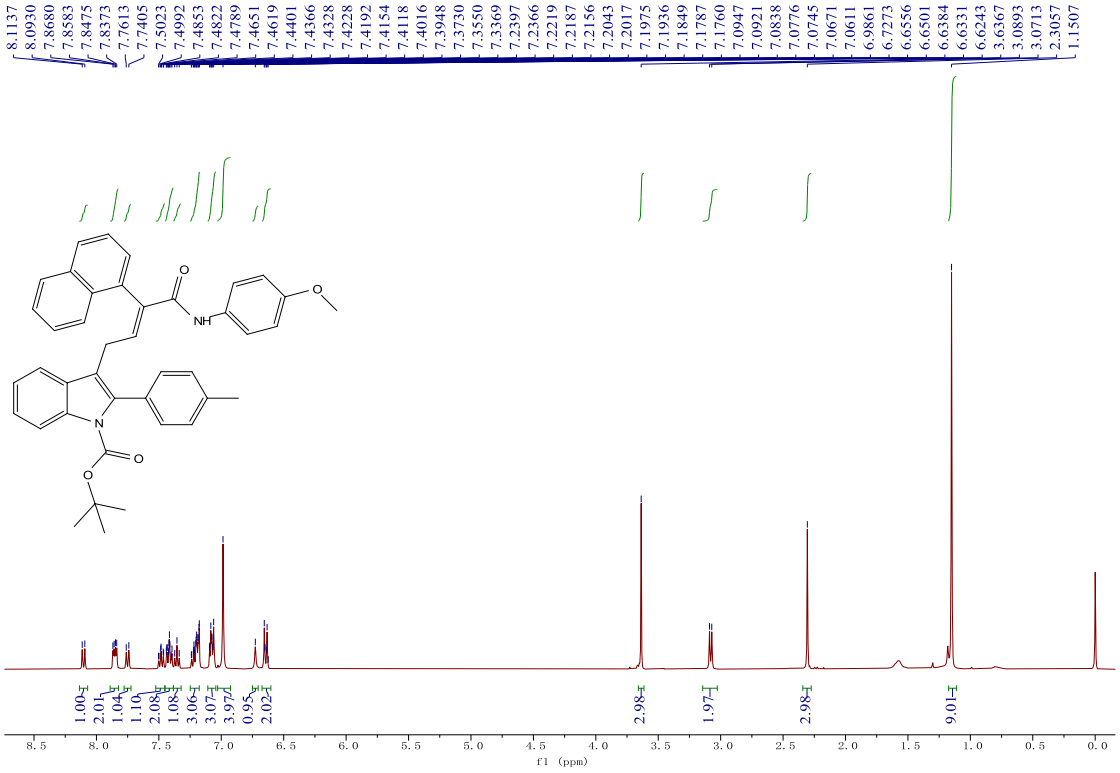


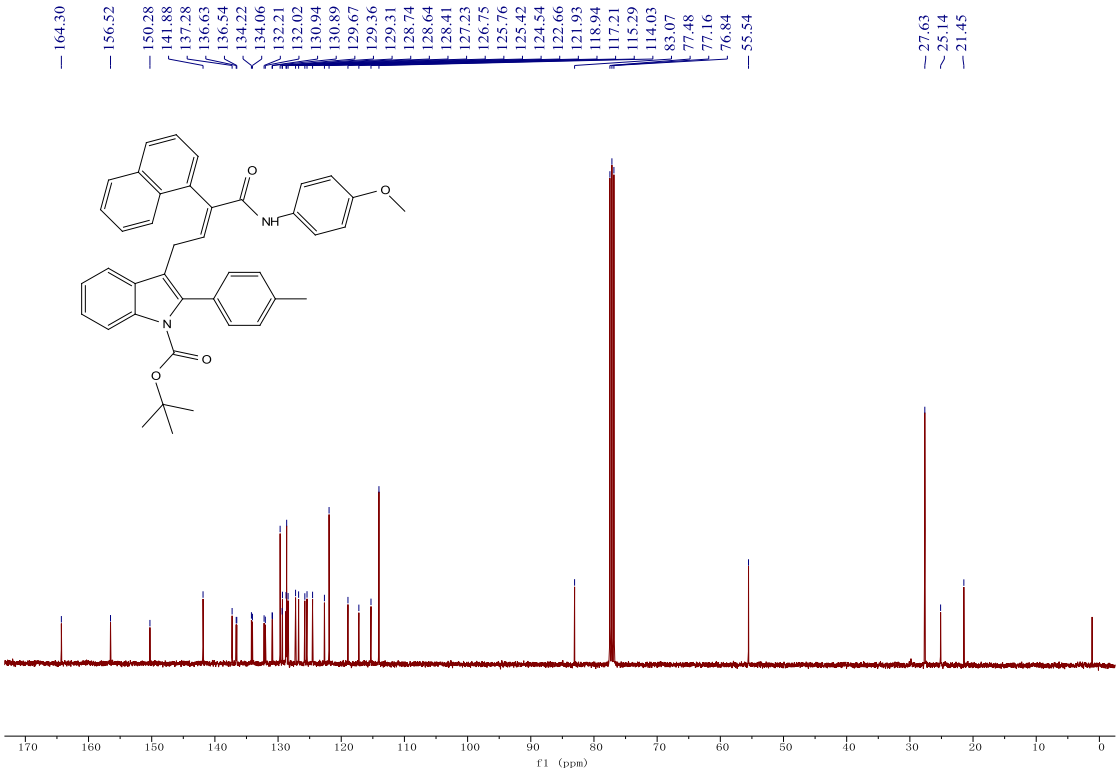
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6f



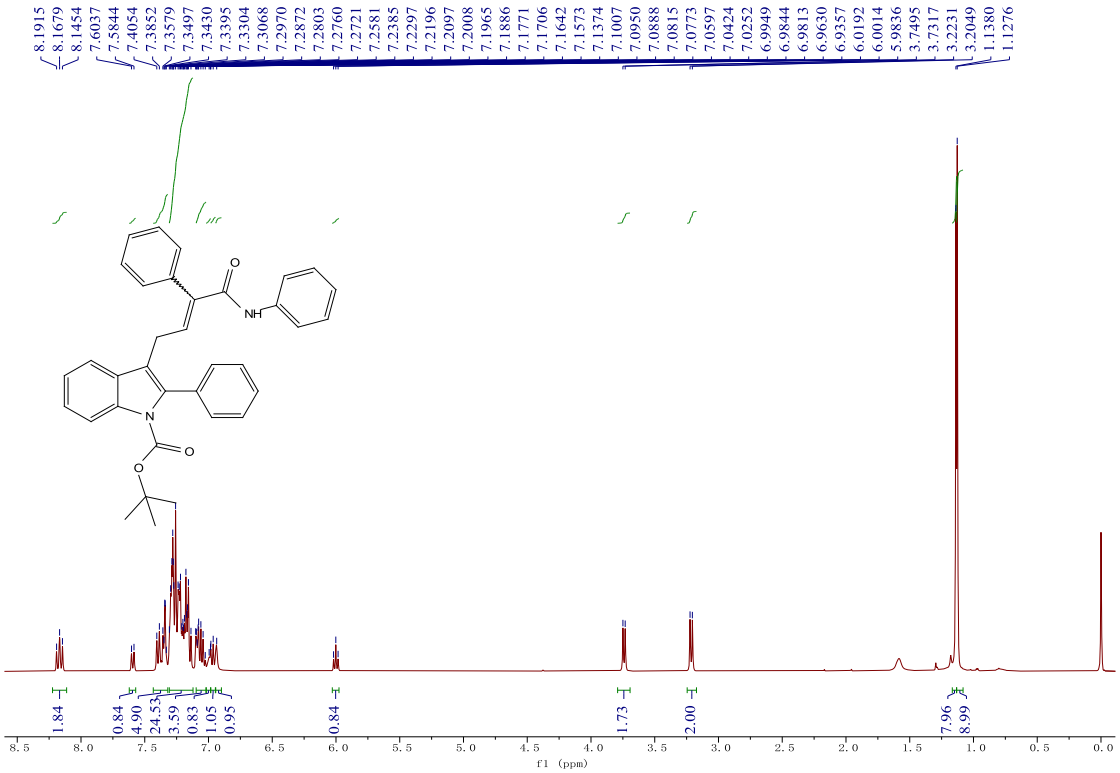


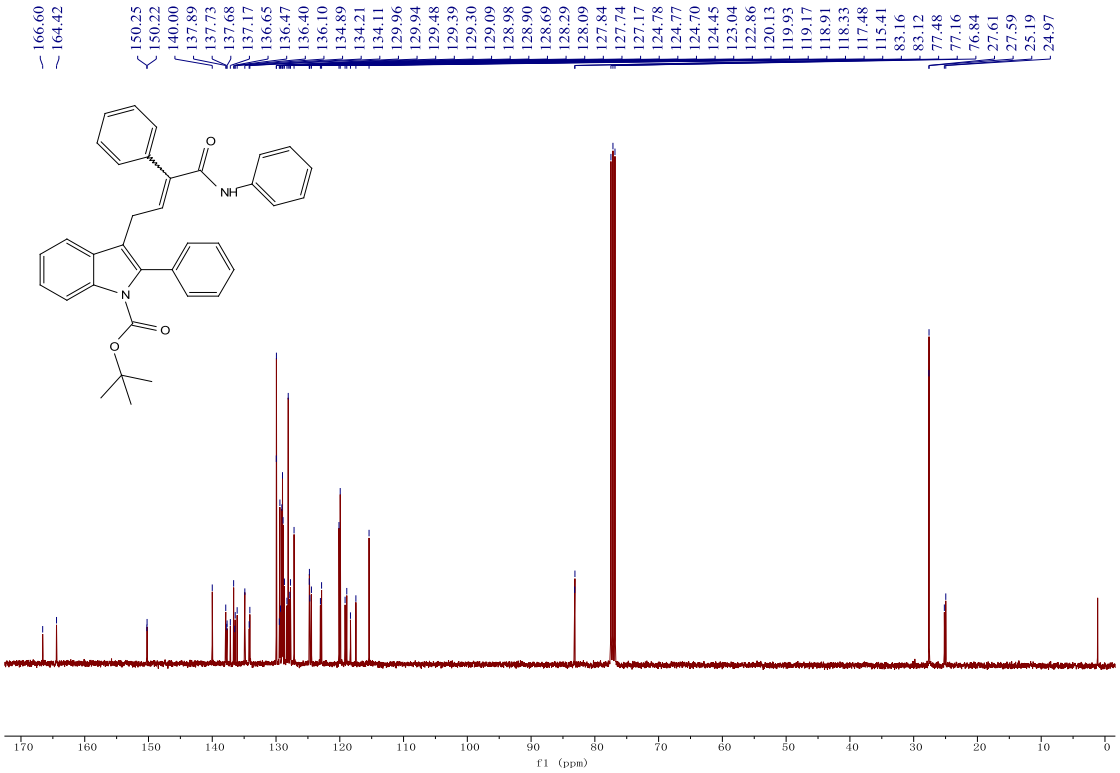
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6g



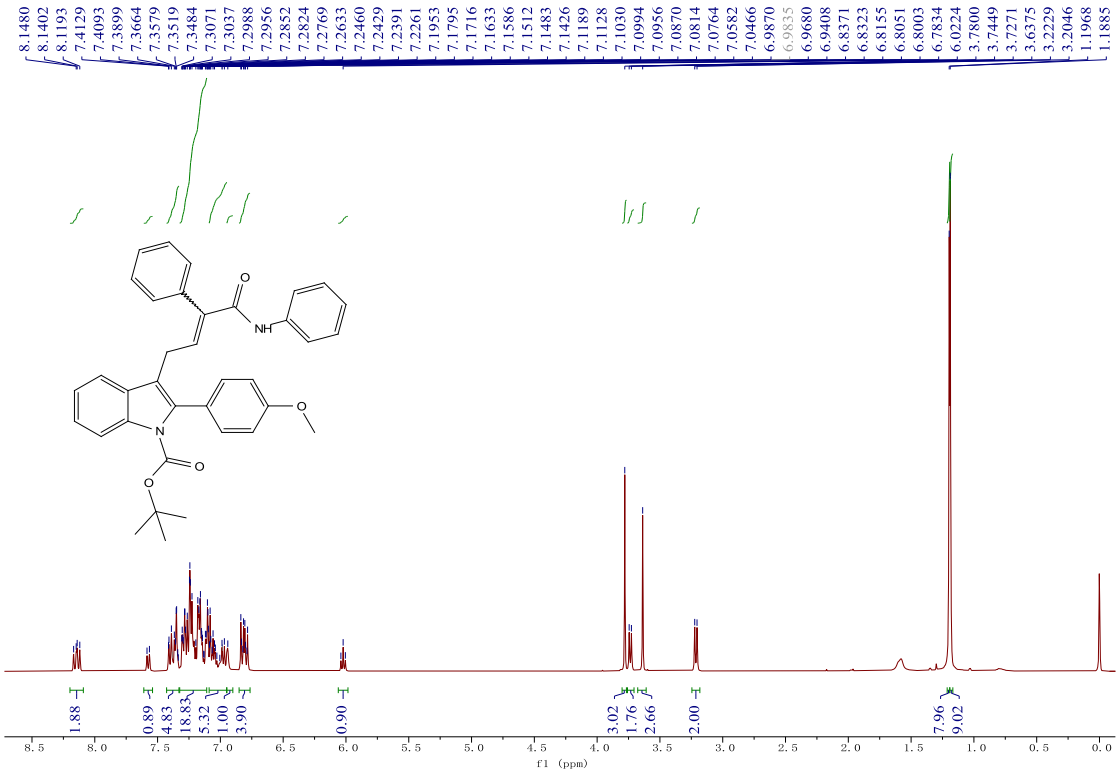


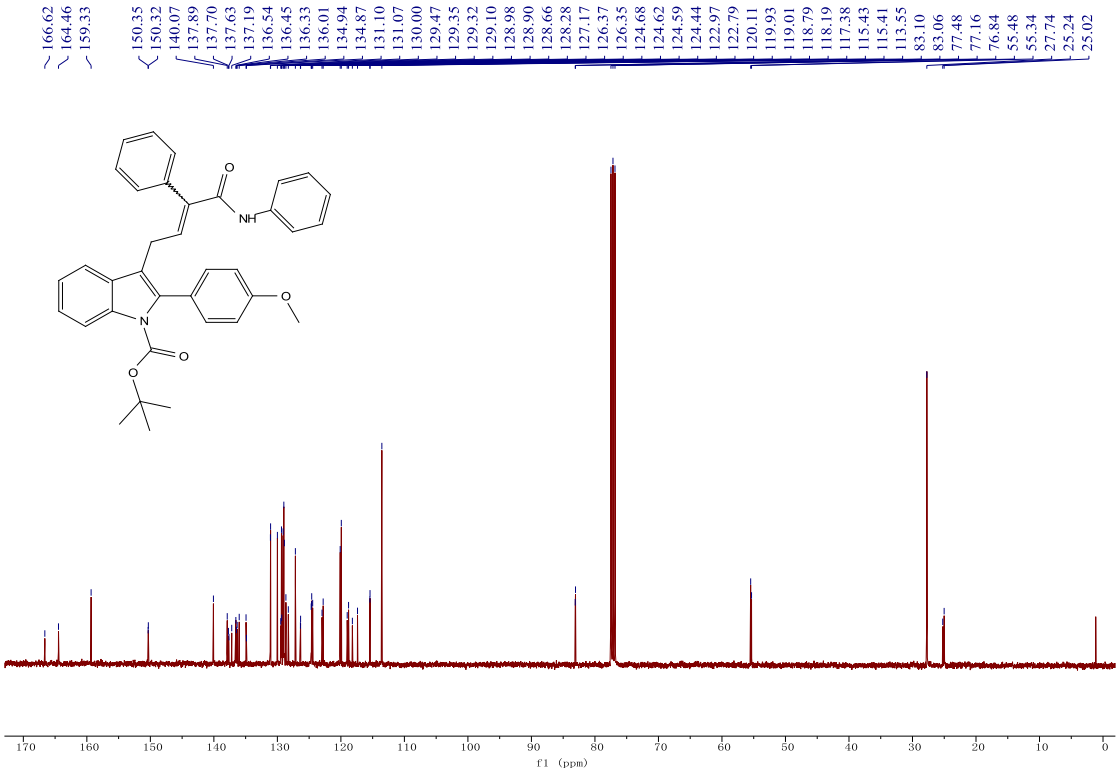
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6h



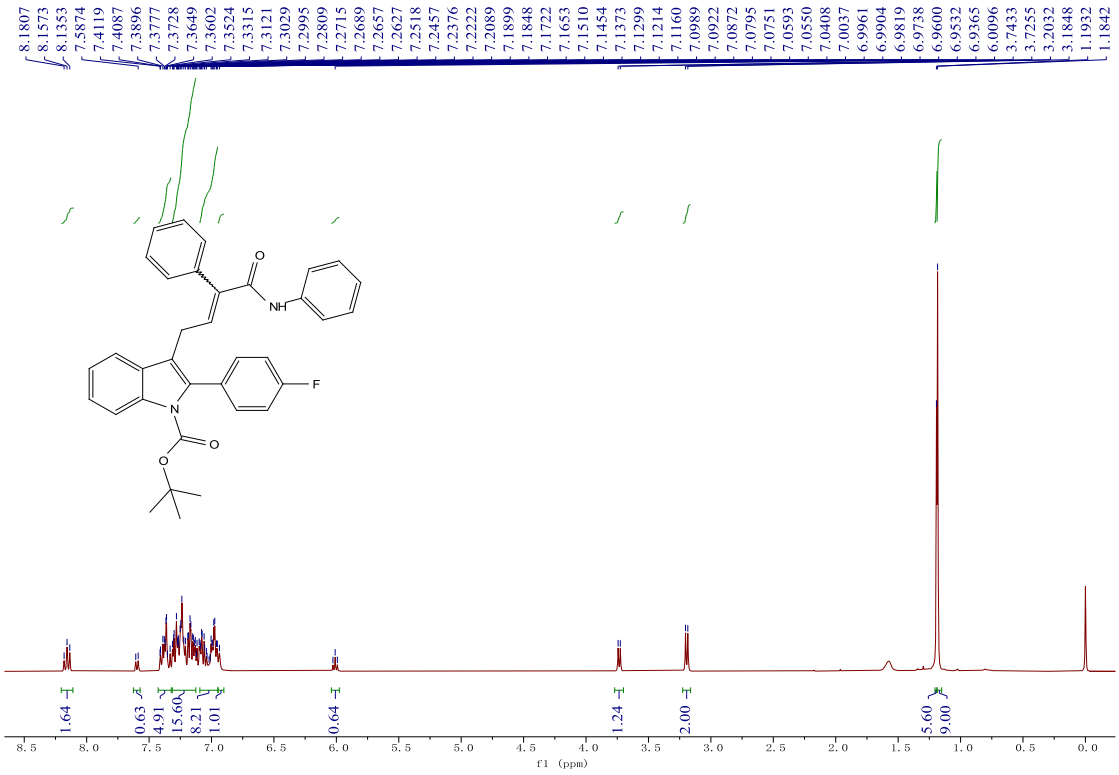


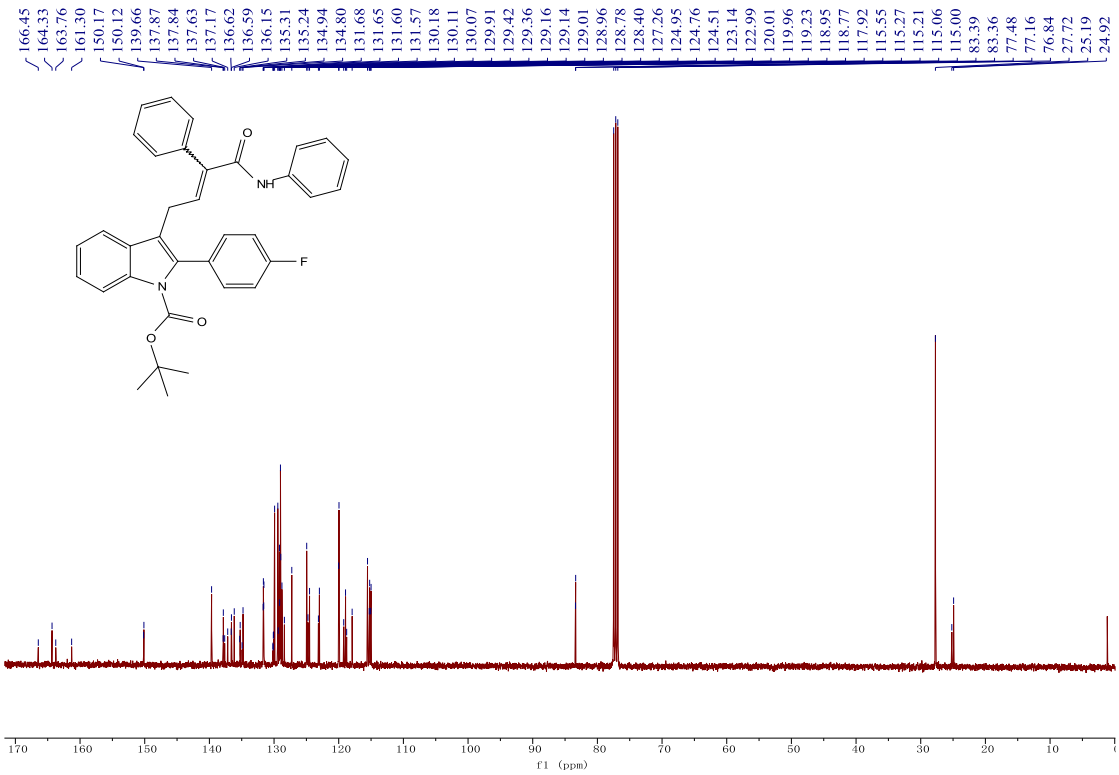
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6i



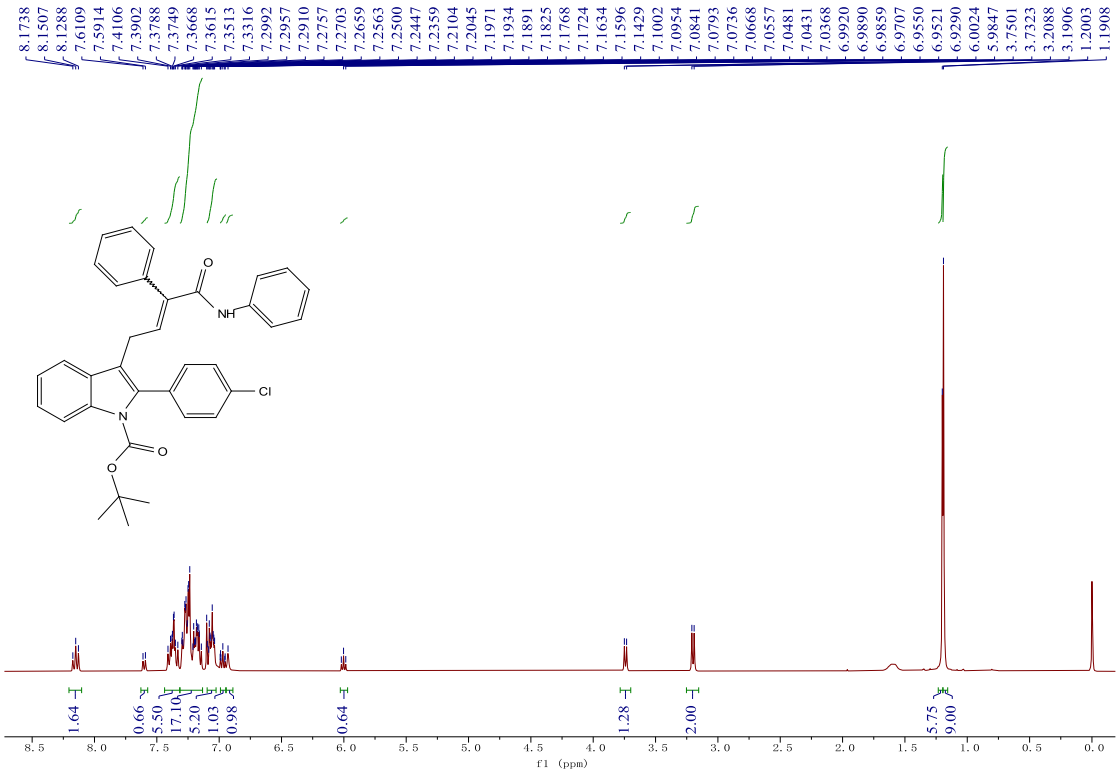


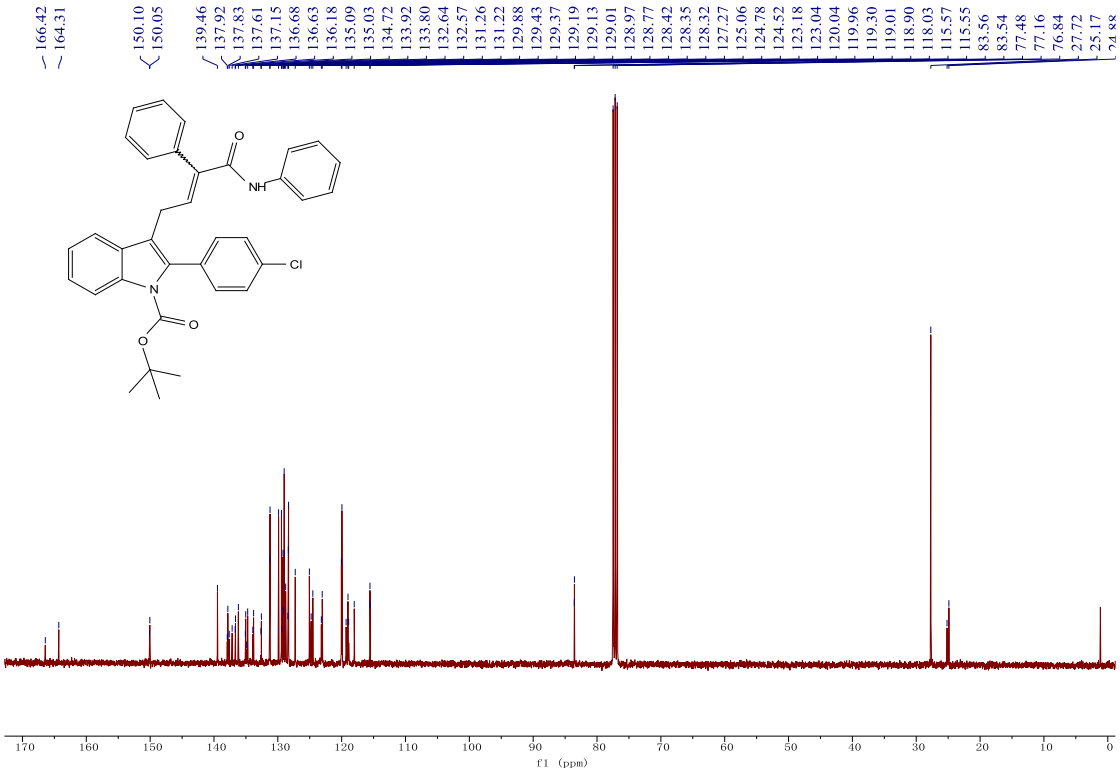
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6j



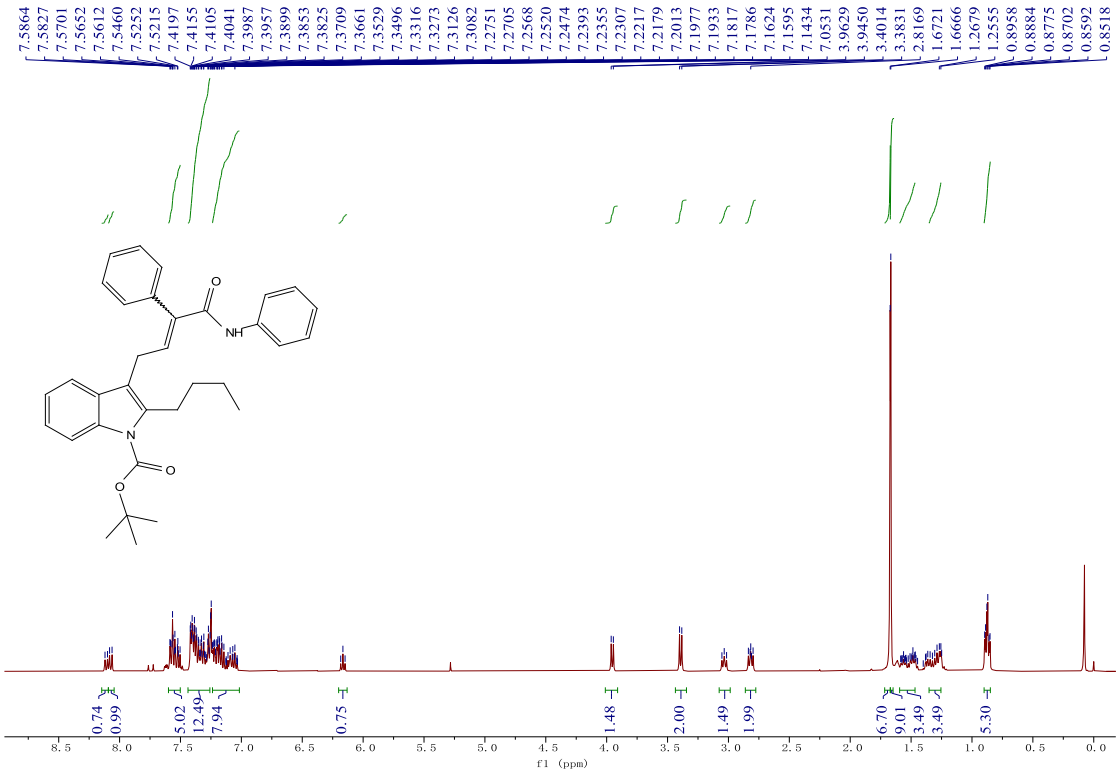


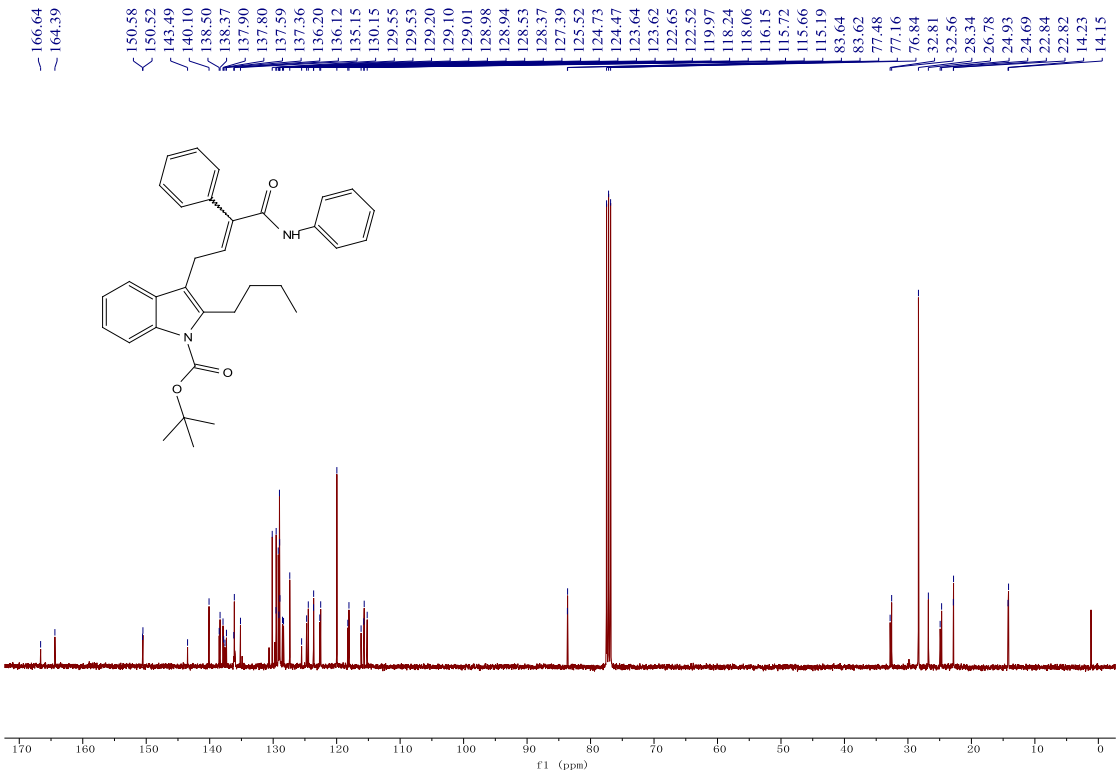
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6k



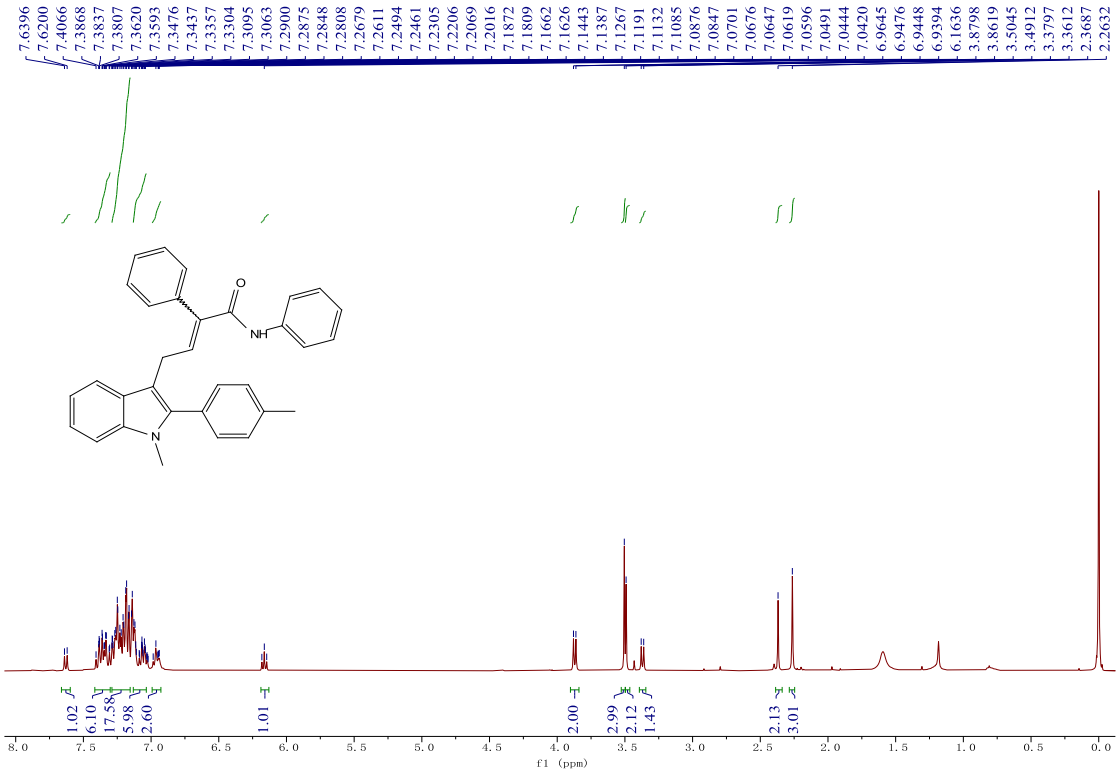


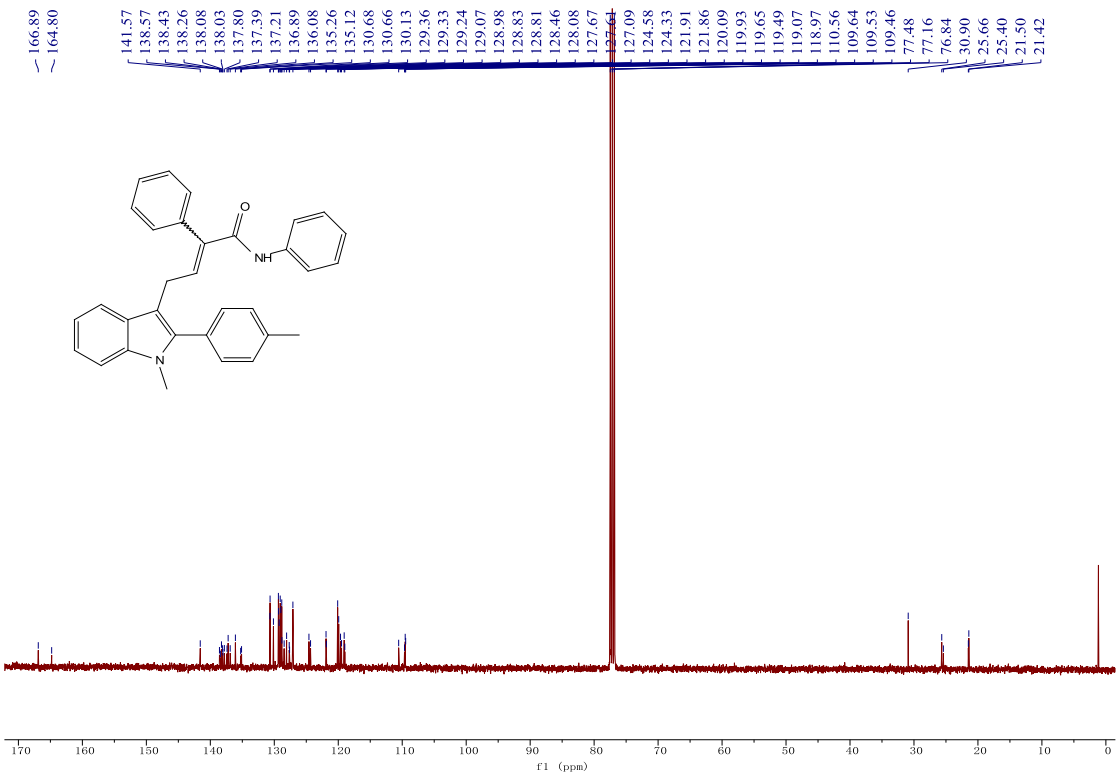
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6l



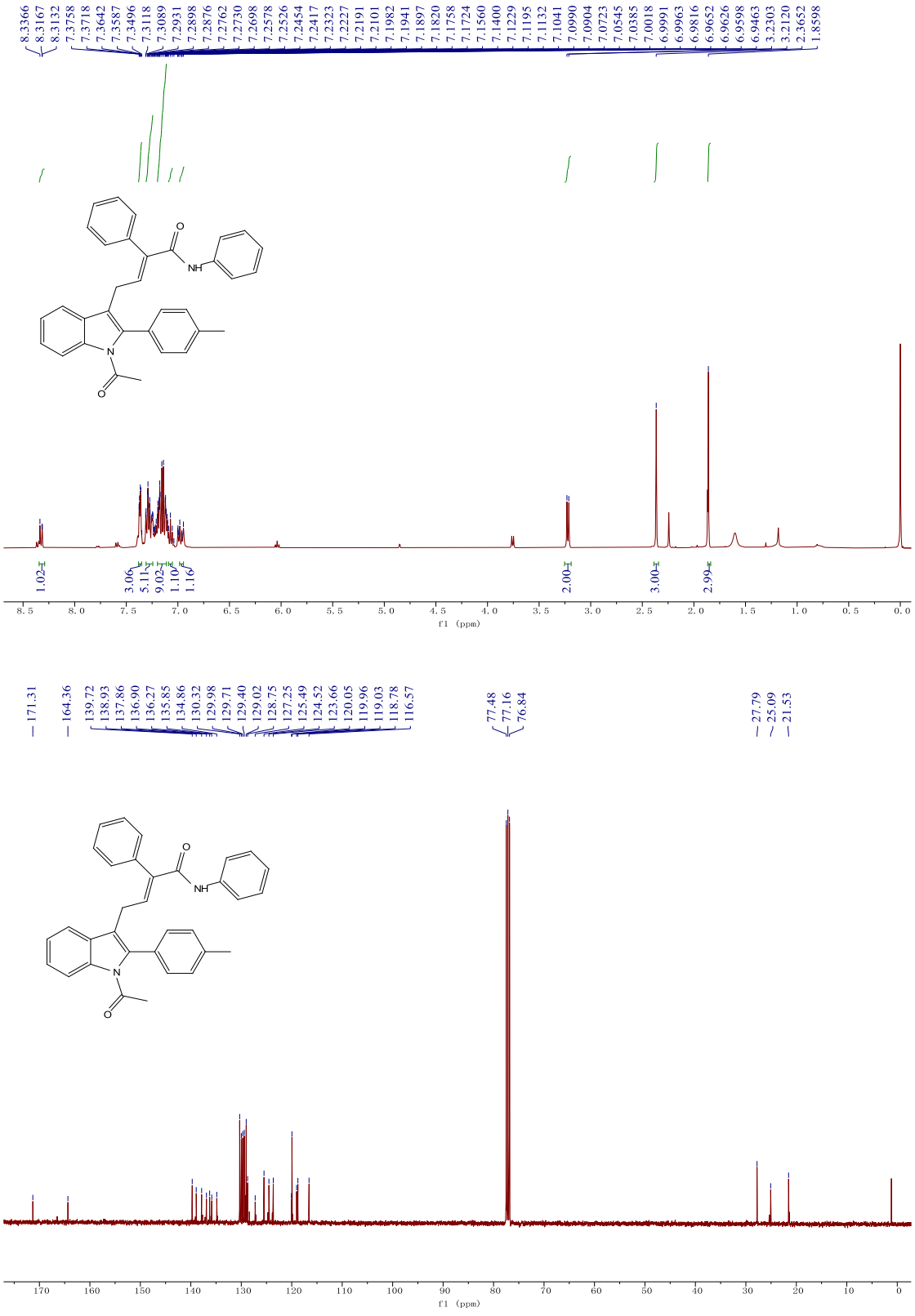


^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6m

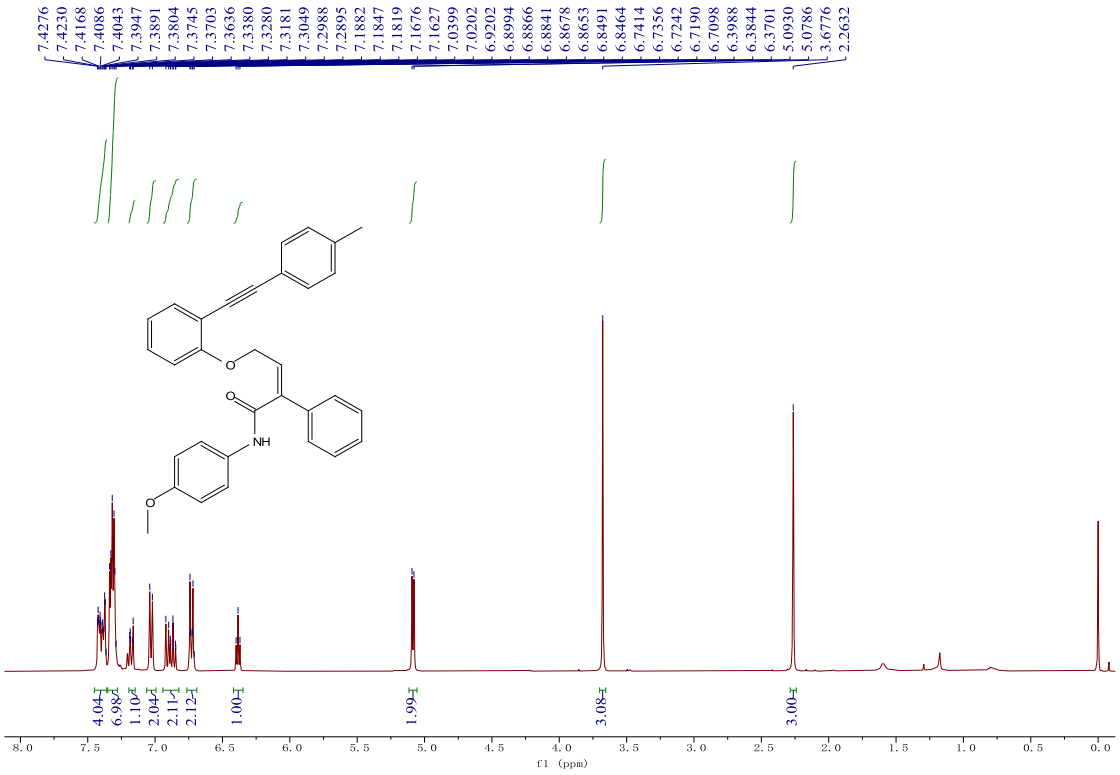


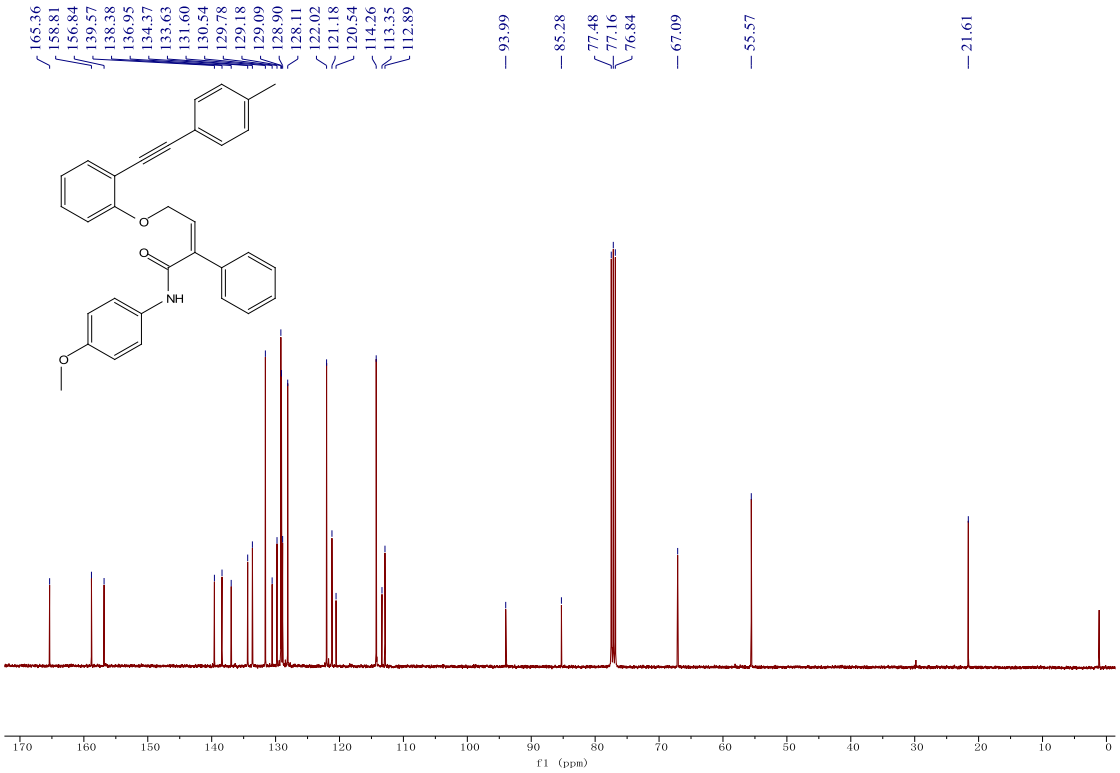


^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 6n

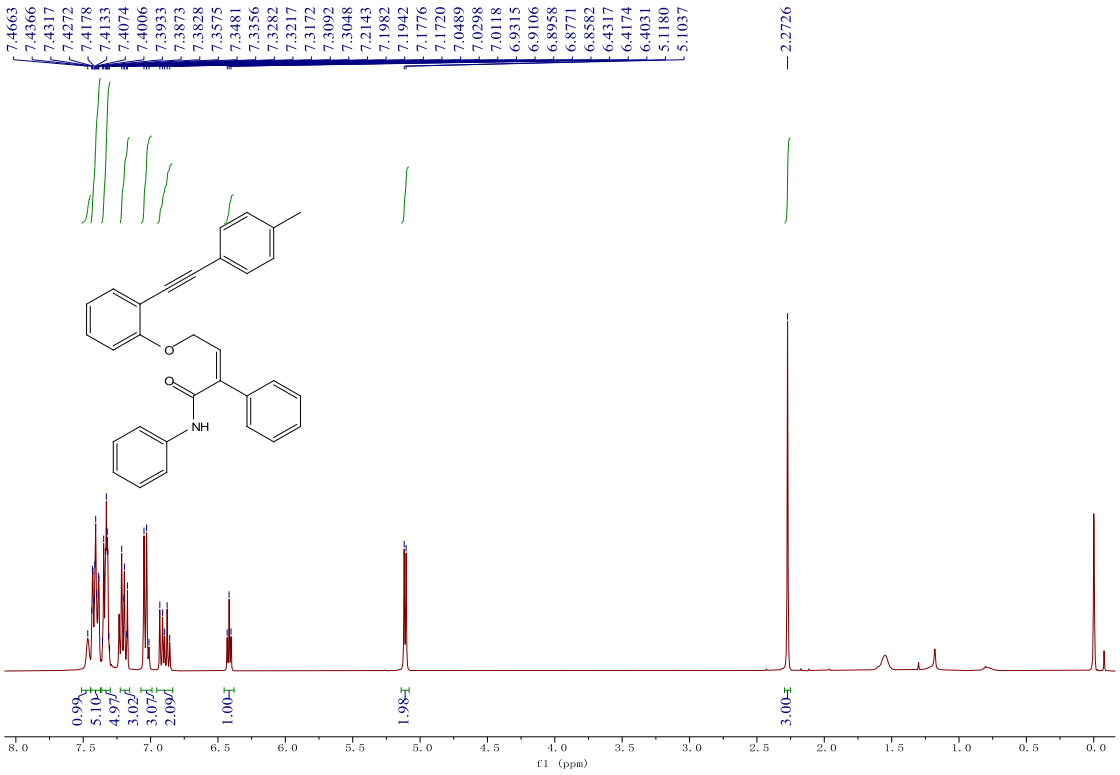


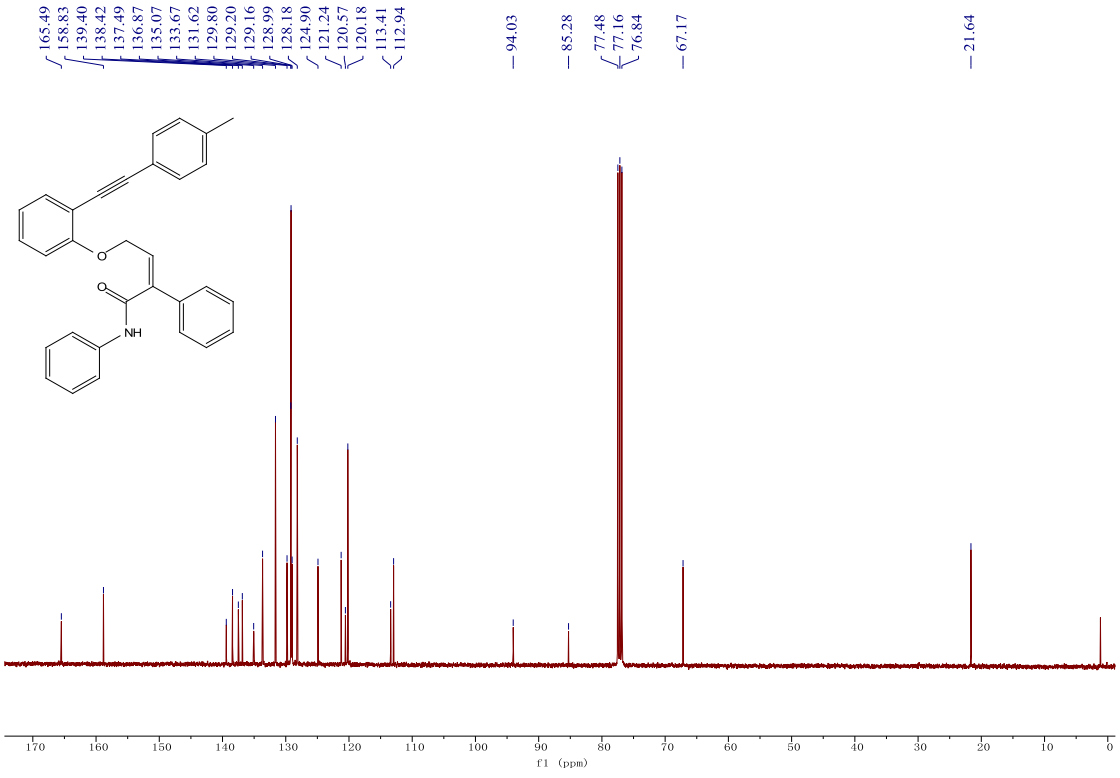
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4a



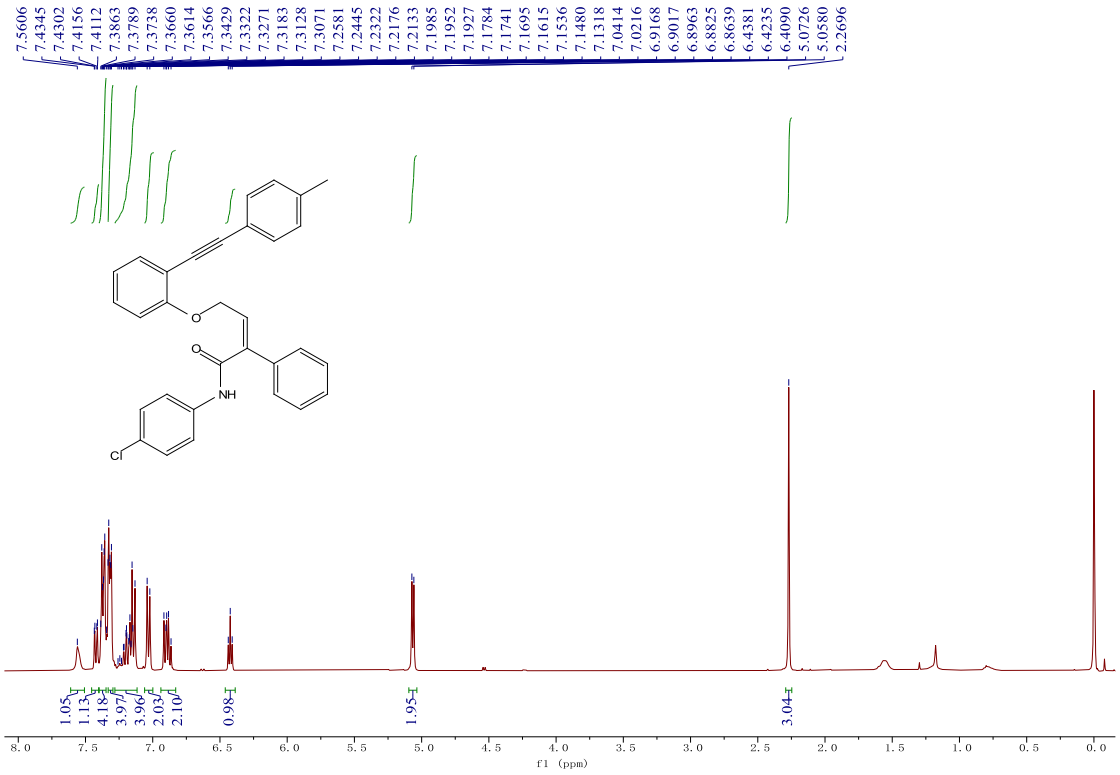


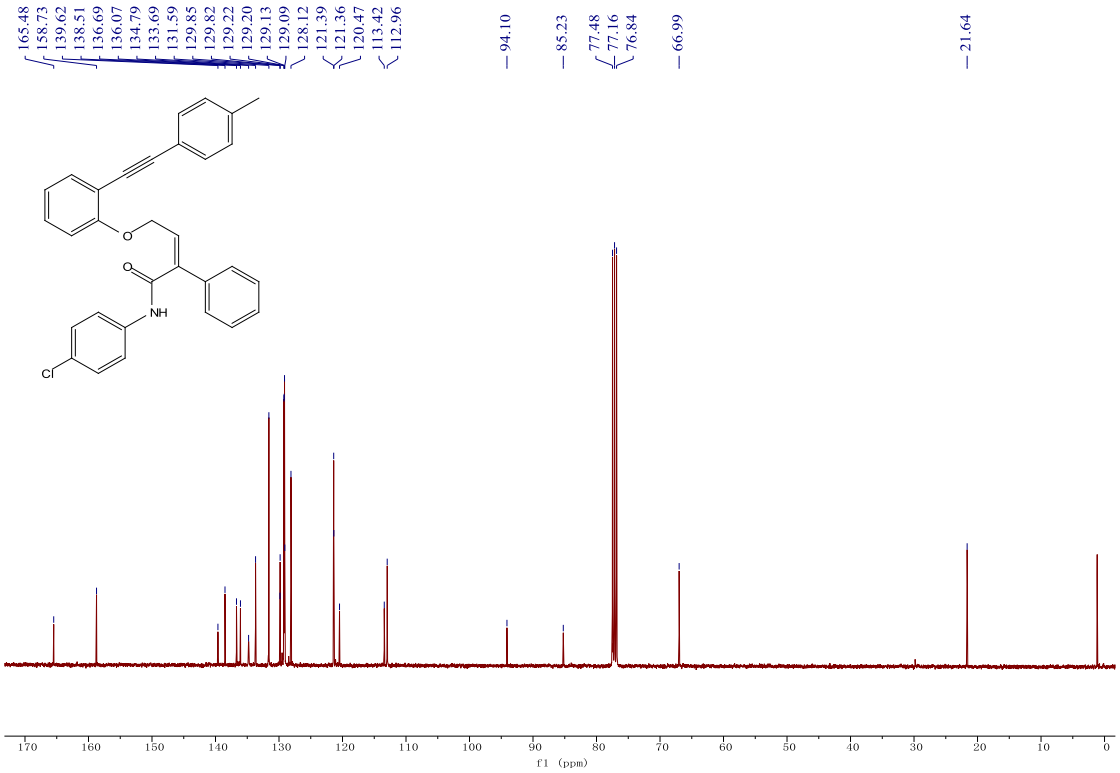
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4b



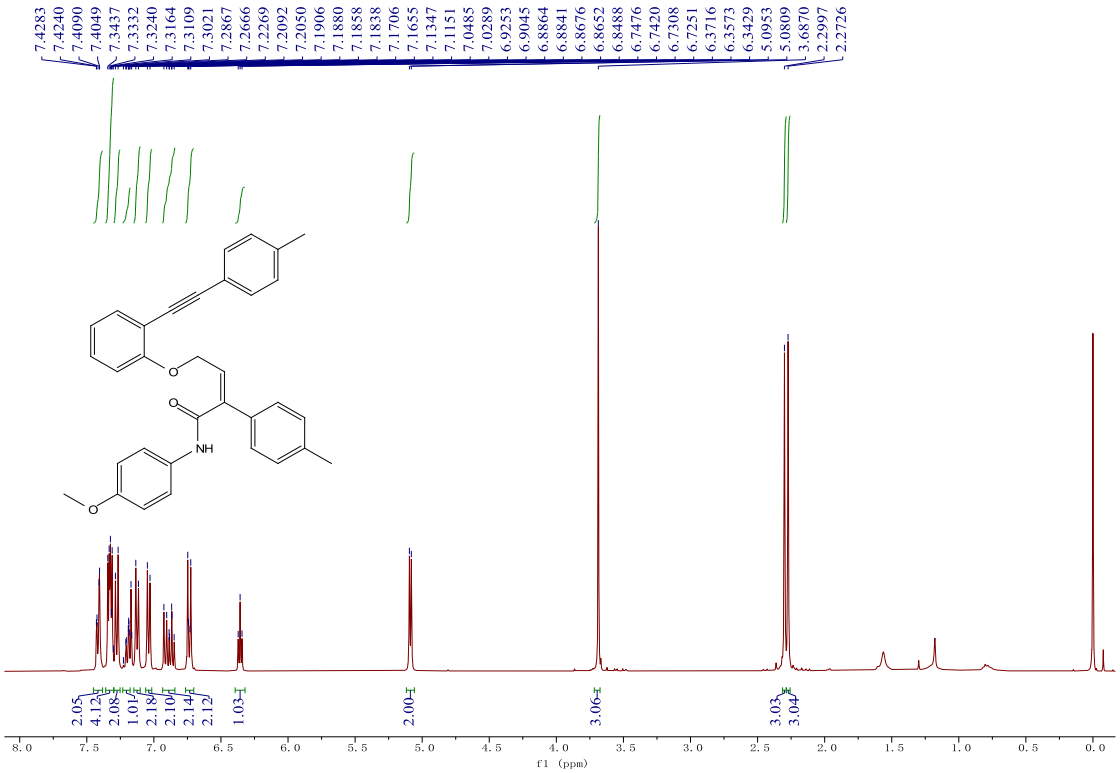


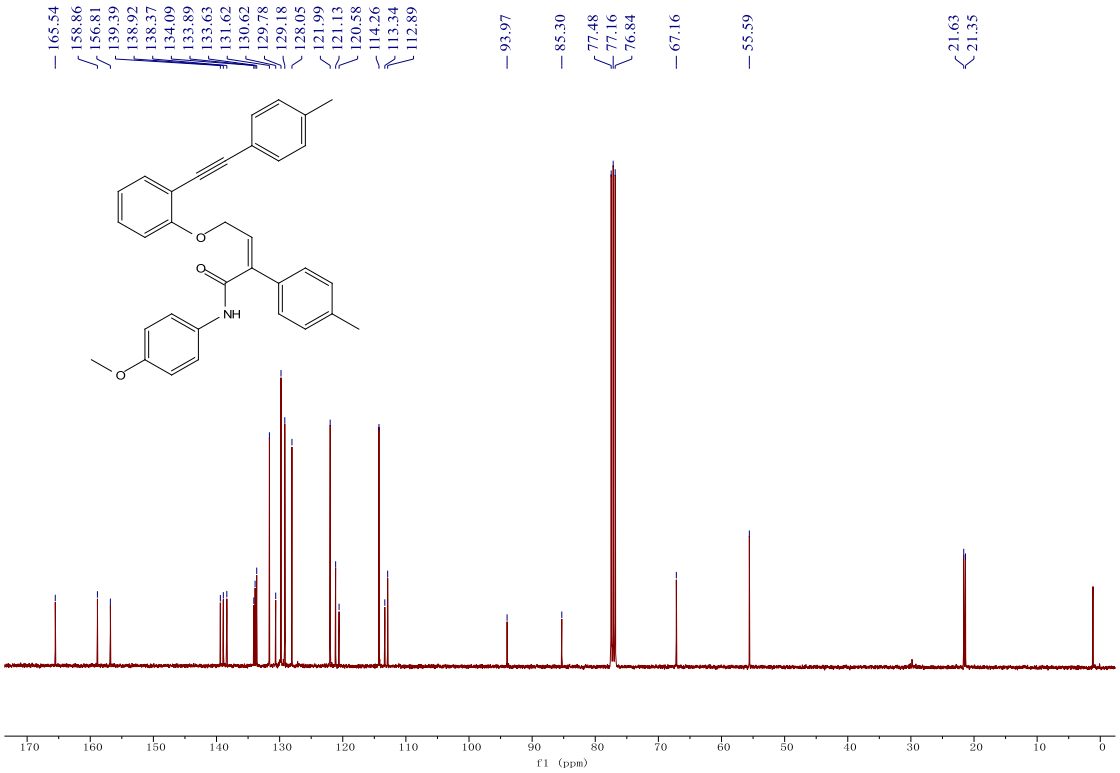
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4c



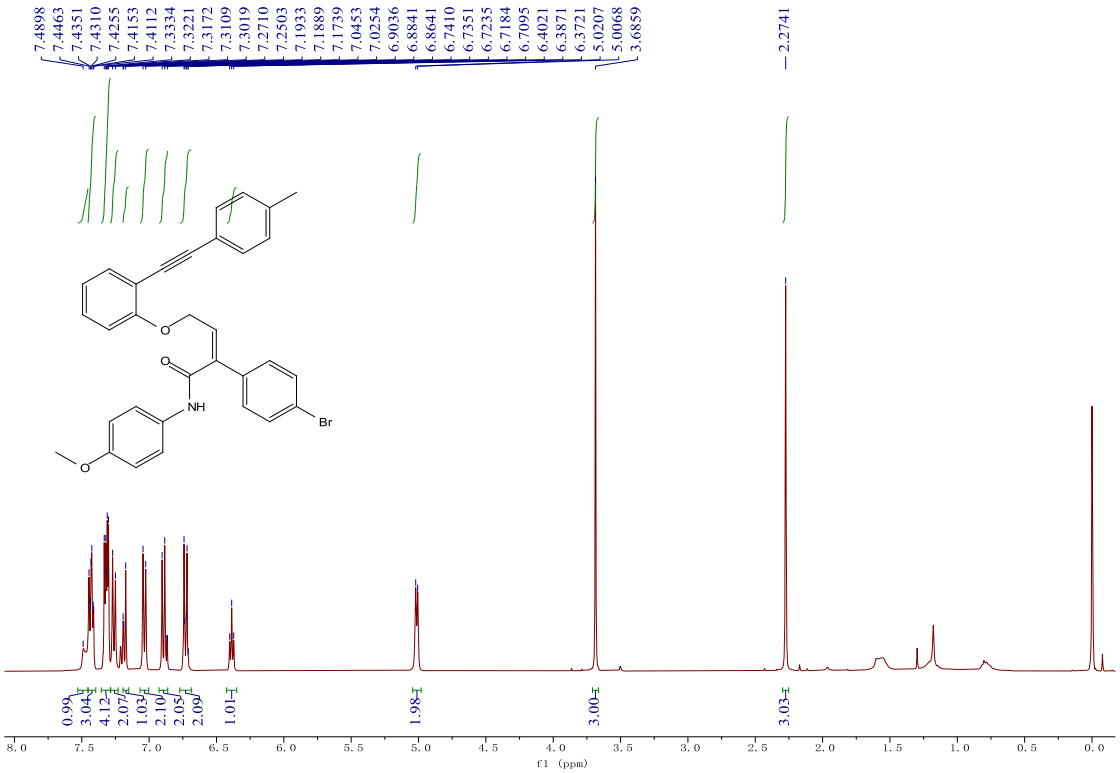


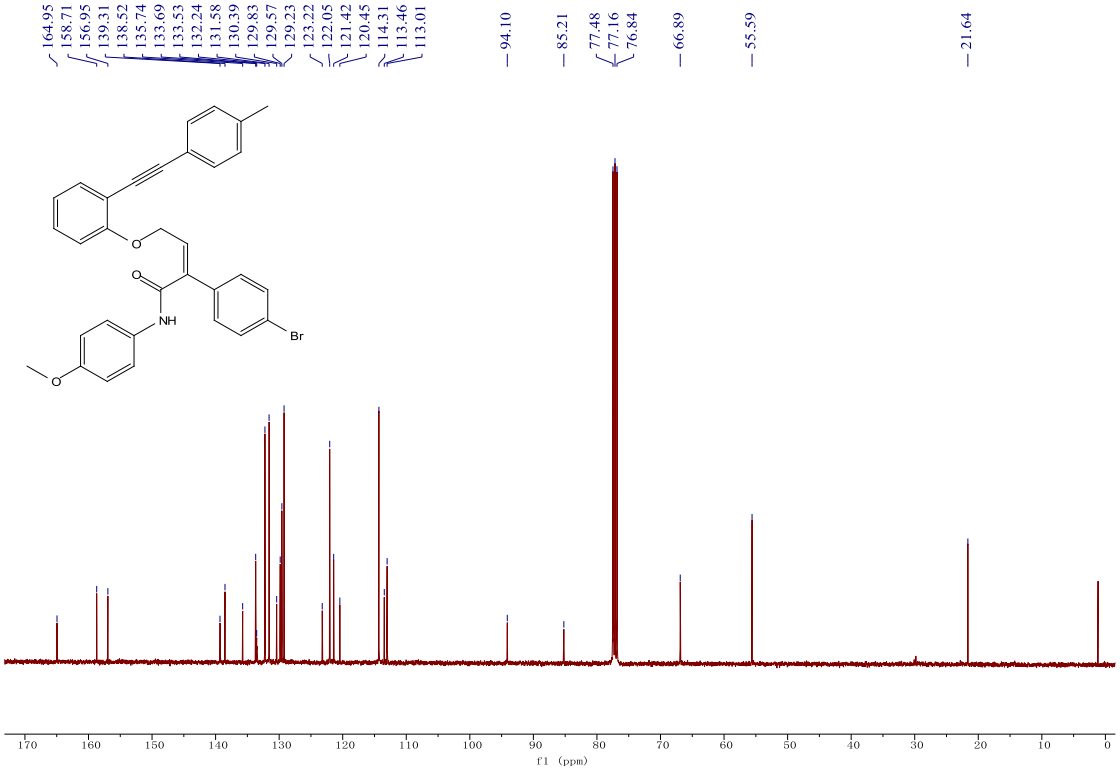
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4d



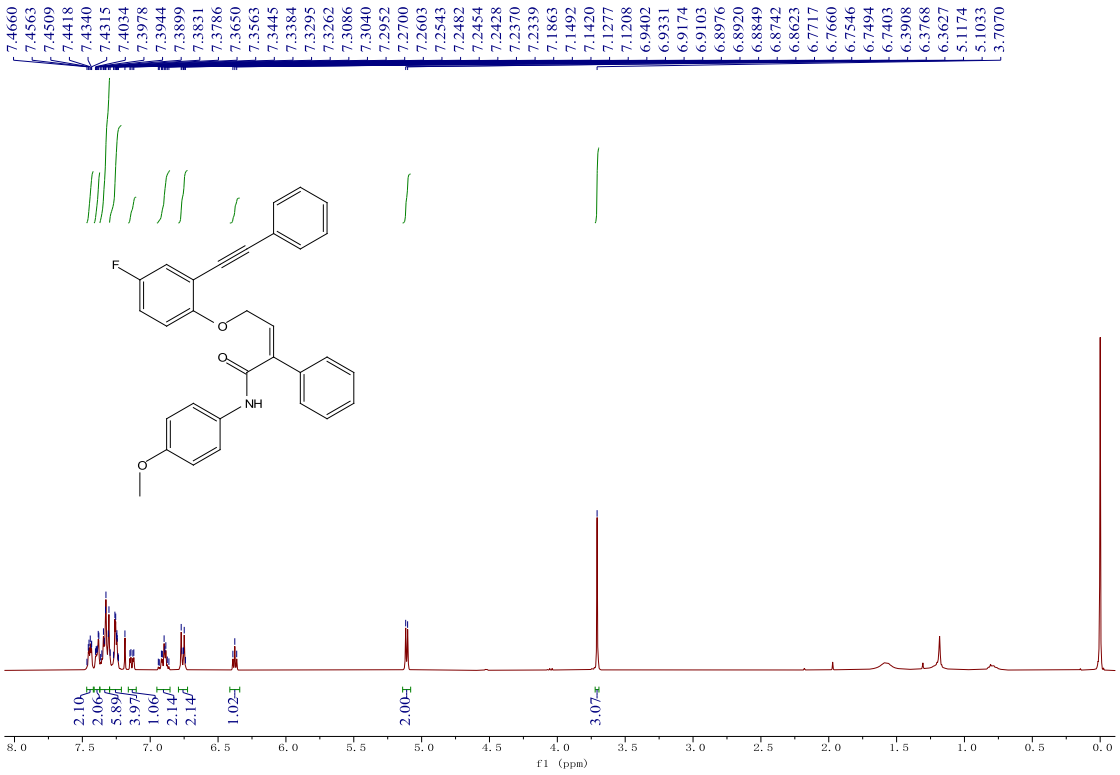


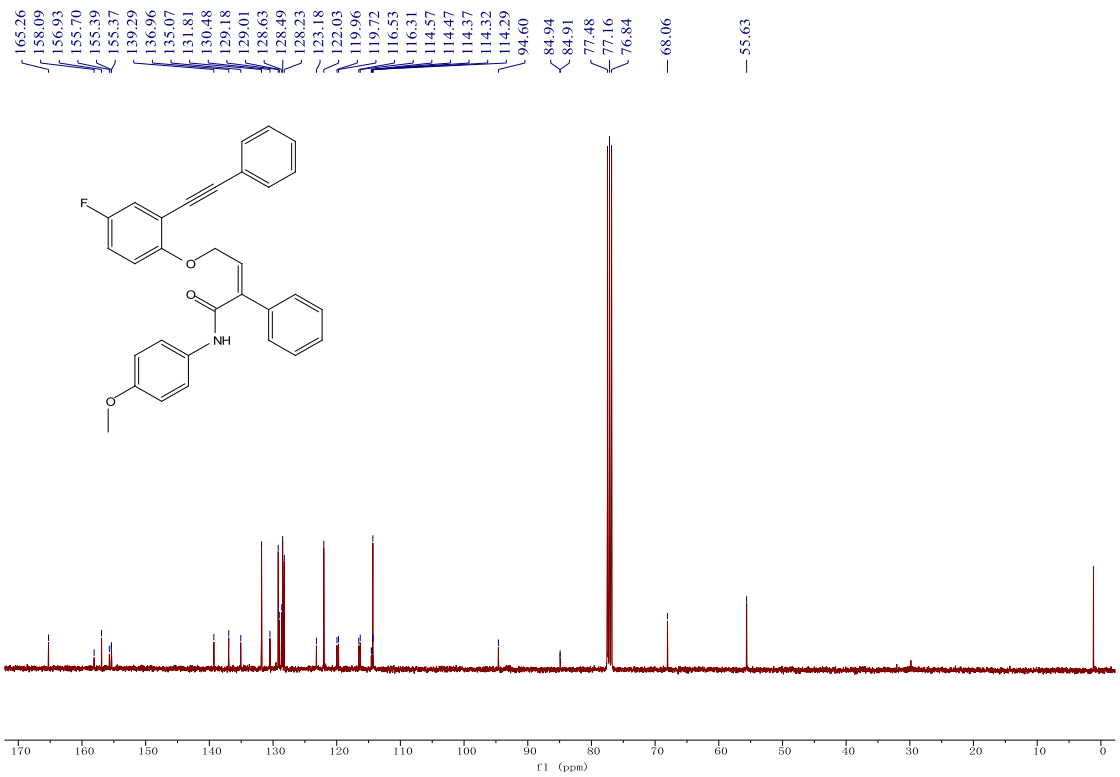
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4e



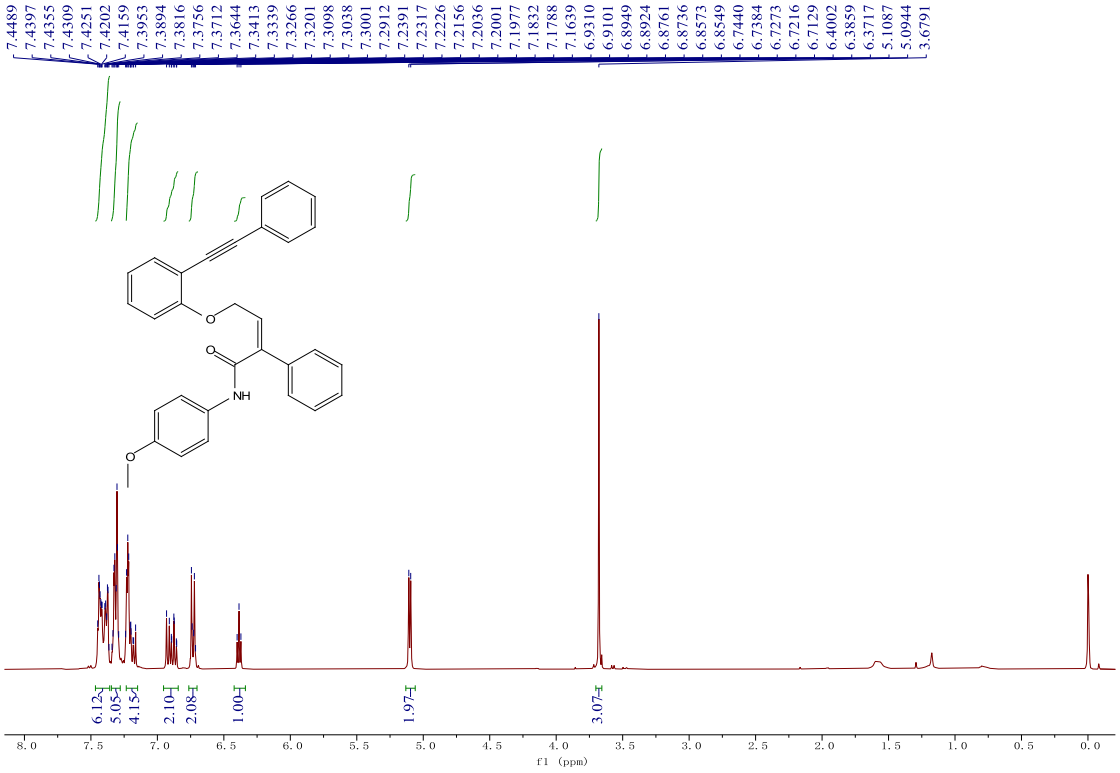


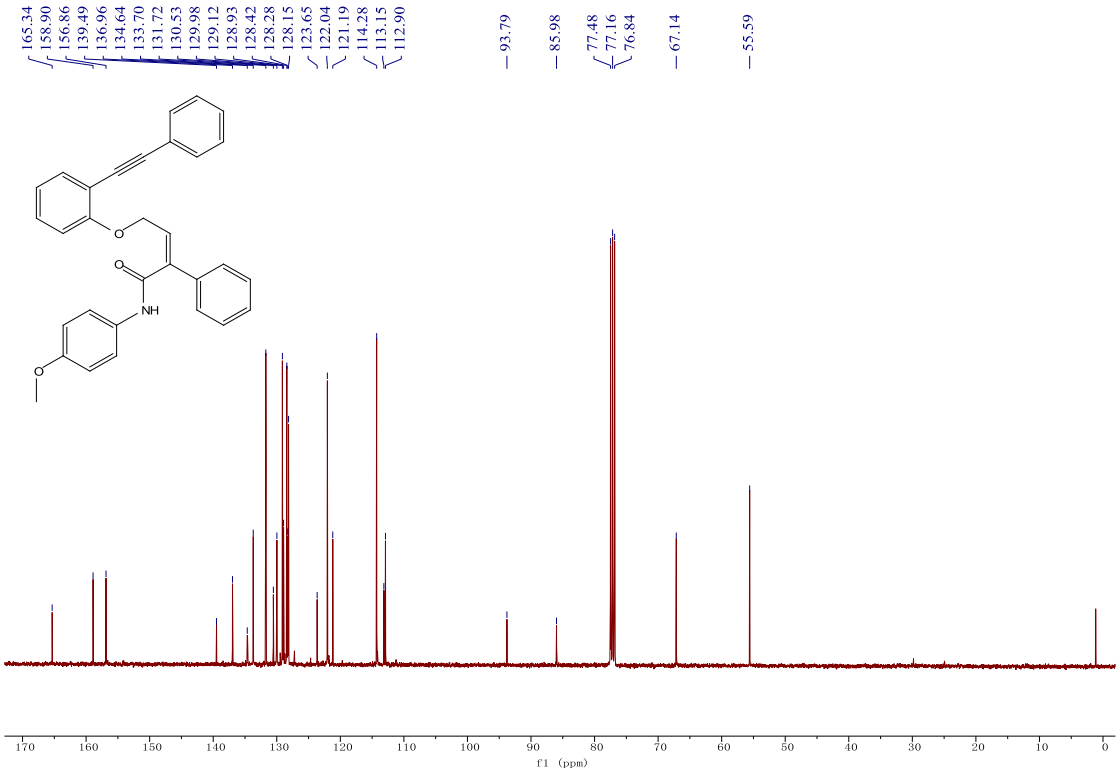
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4f



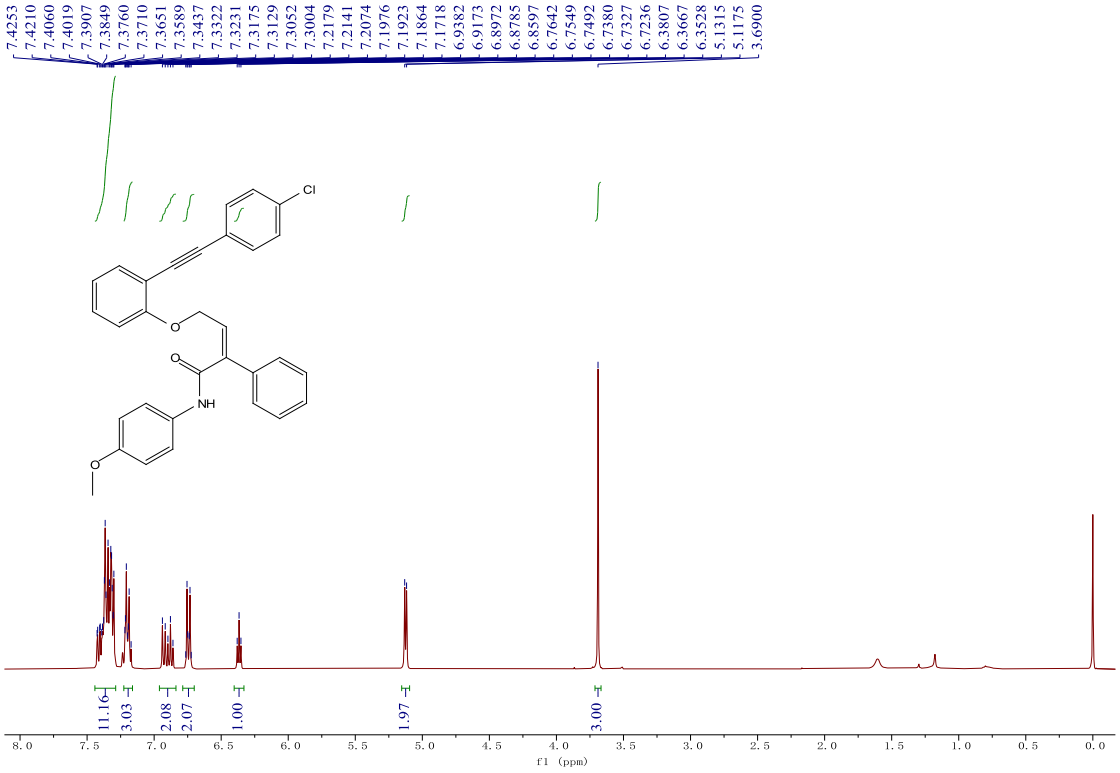


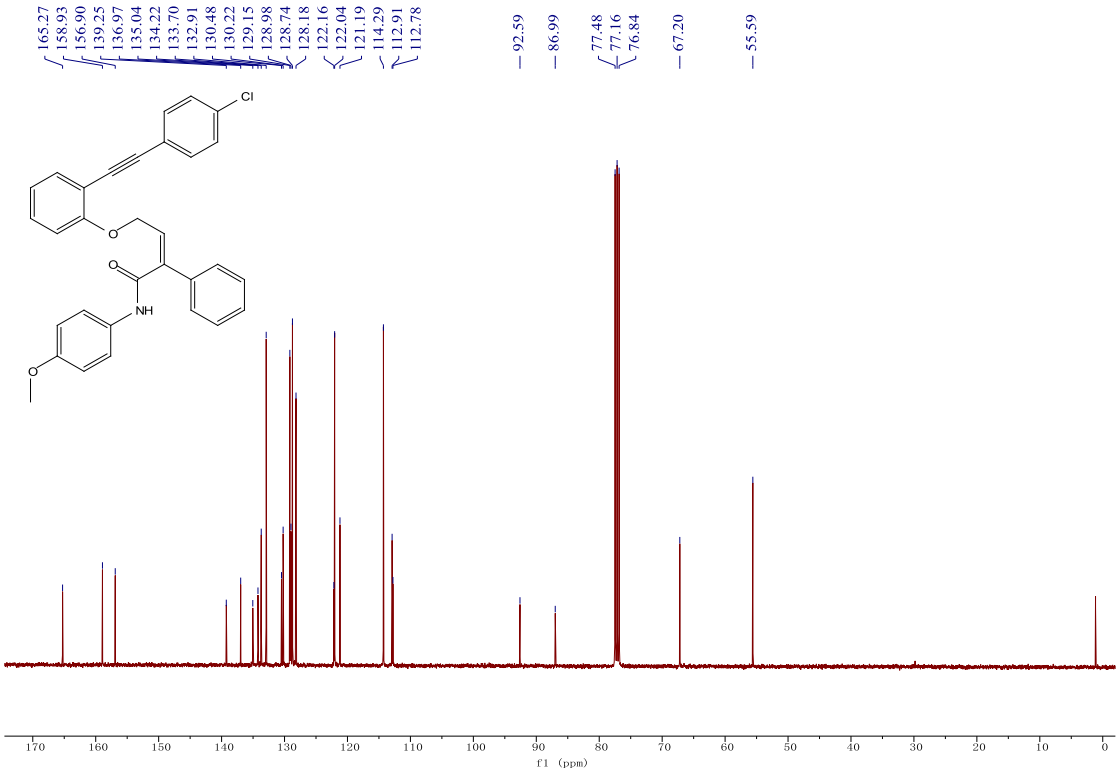
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4g



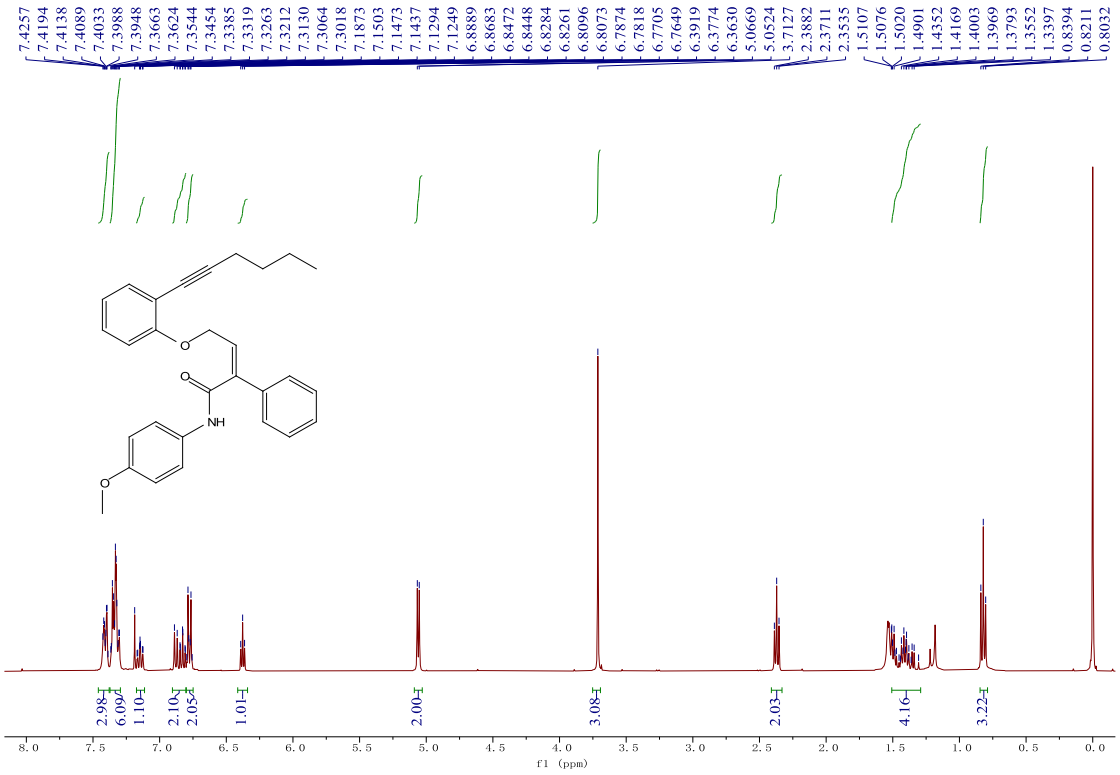


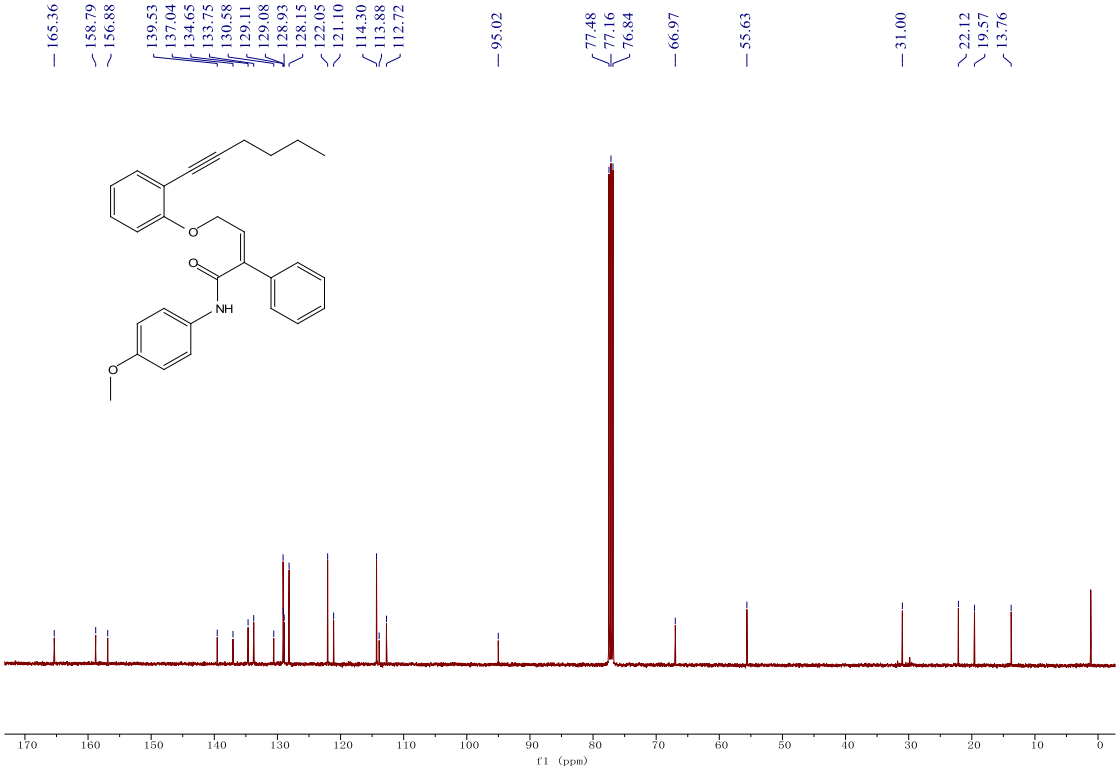
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4h



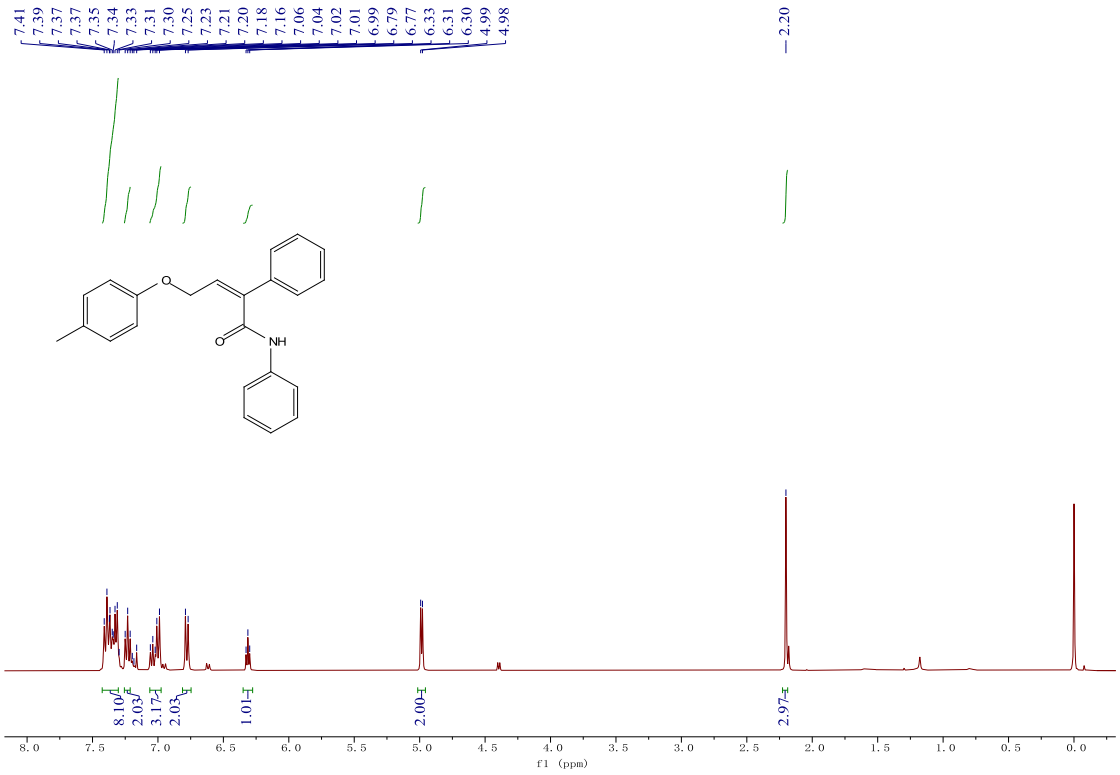


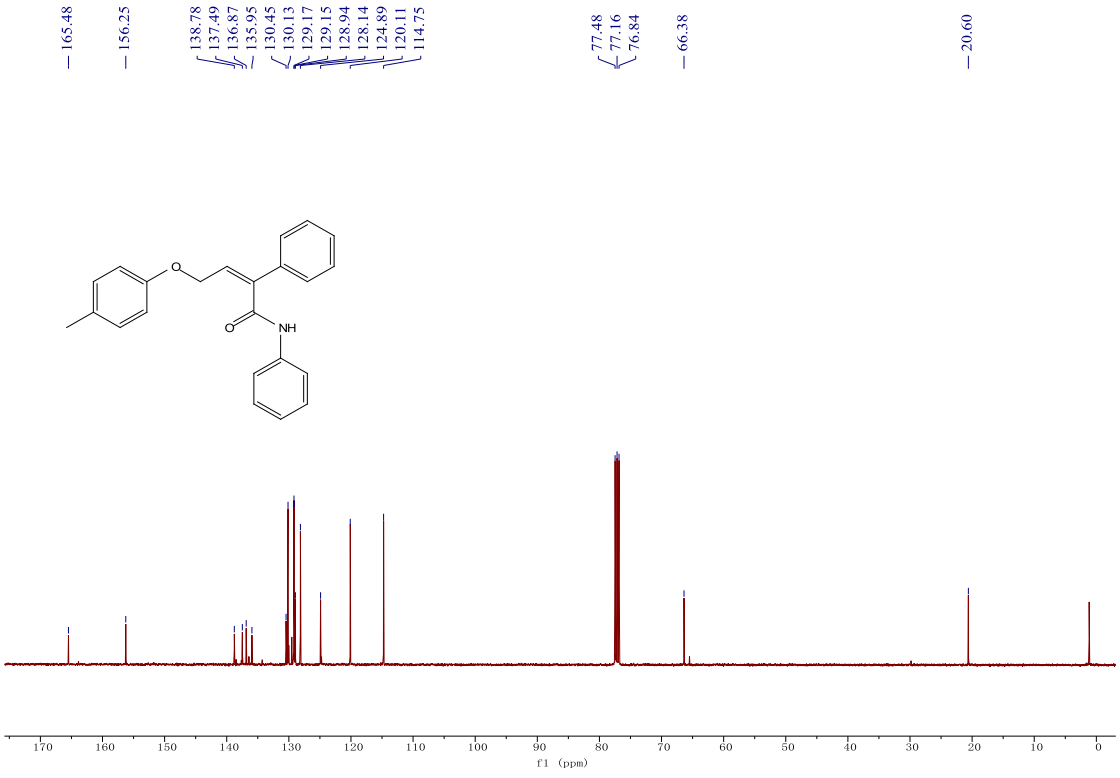
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4i



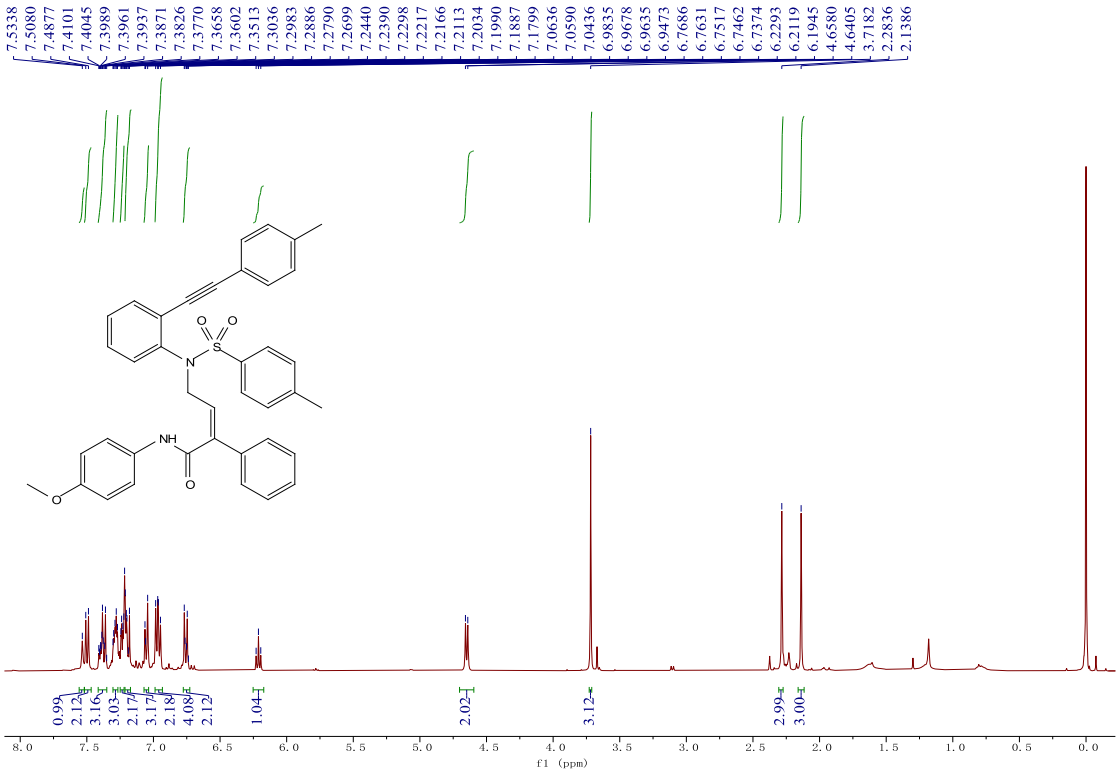


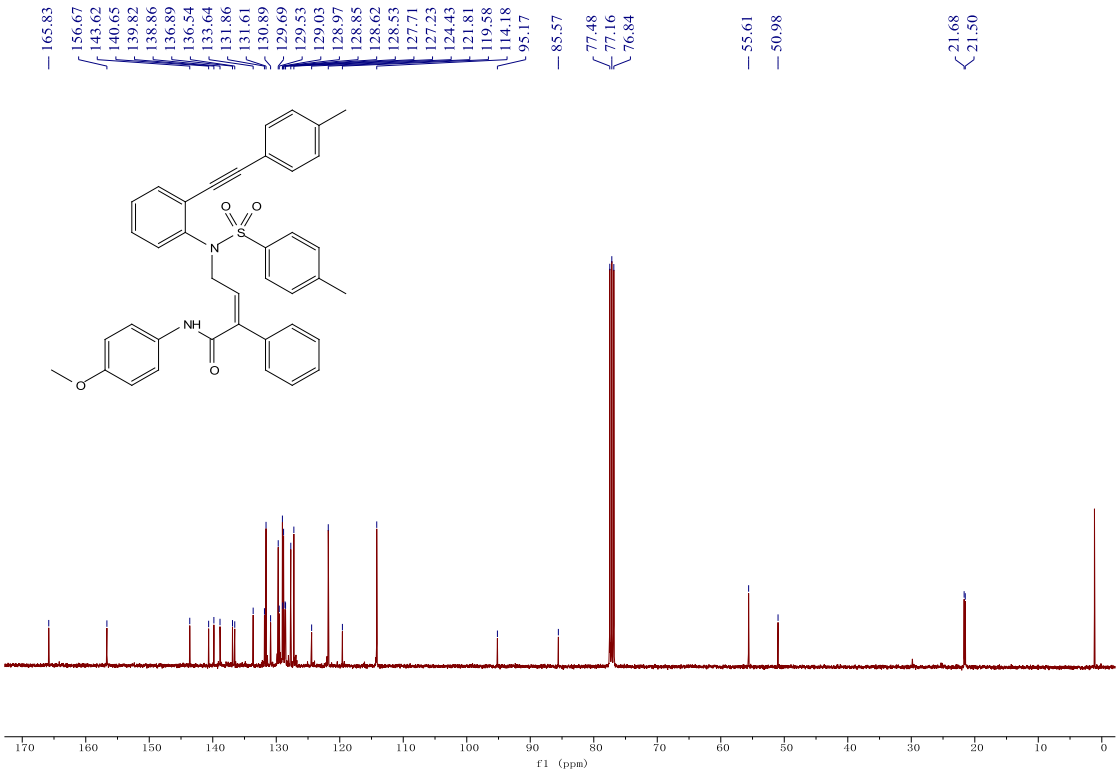
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 4j



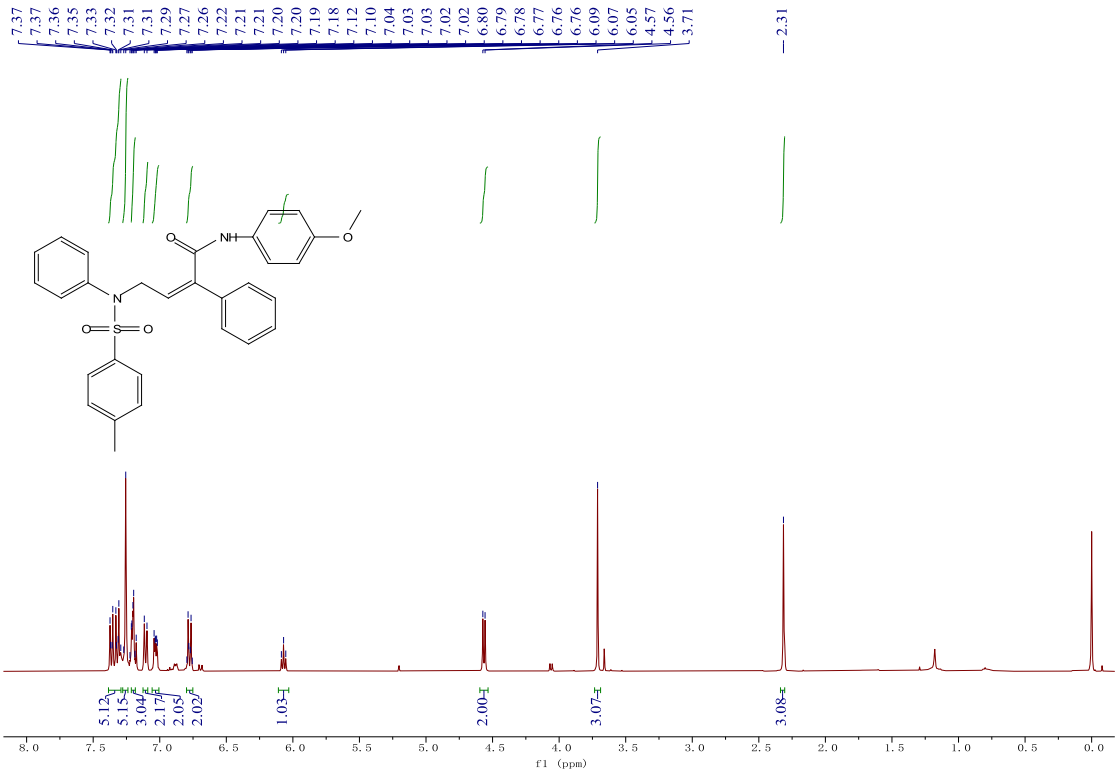


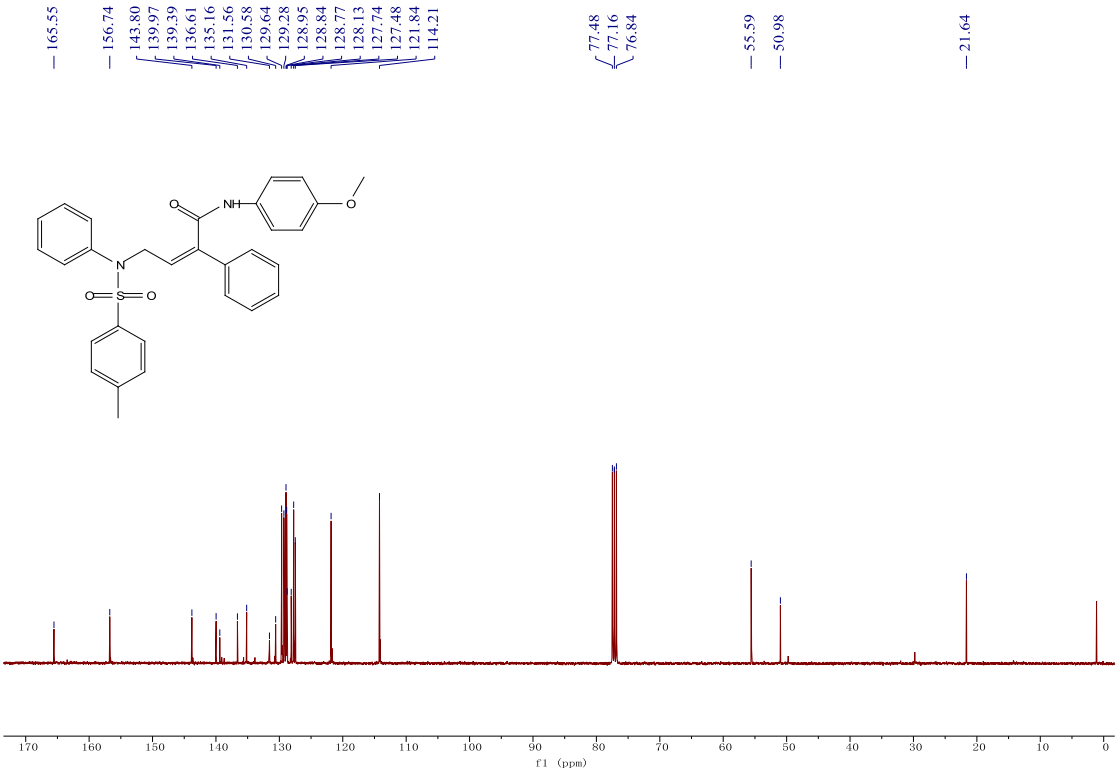
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 7a



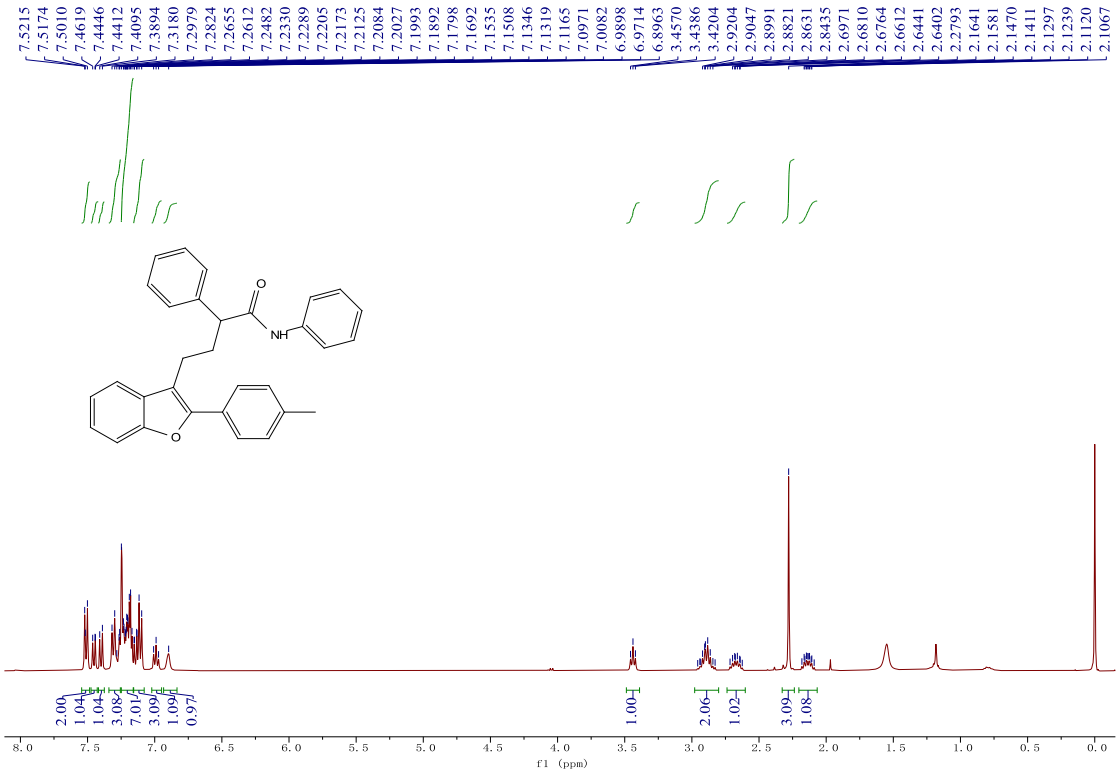


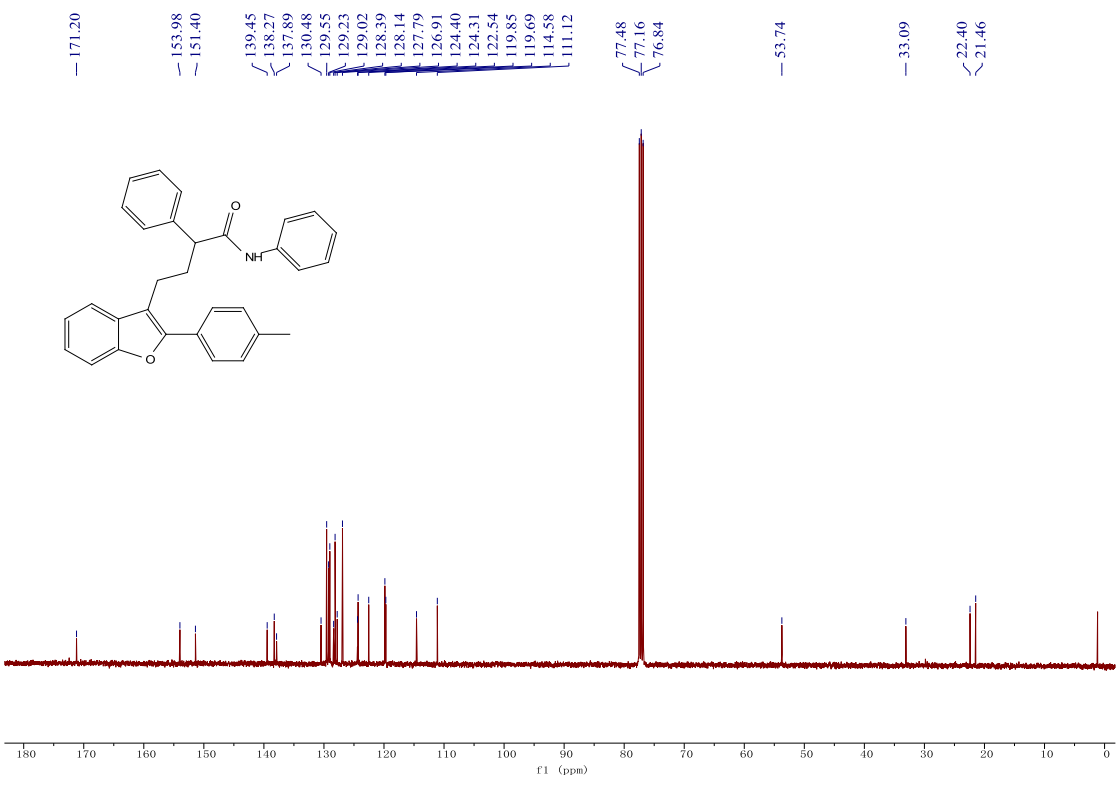
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 7b



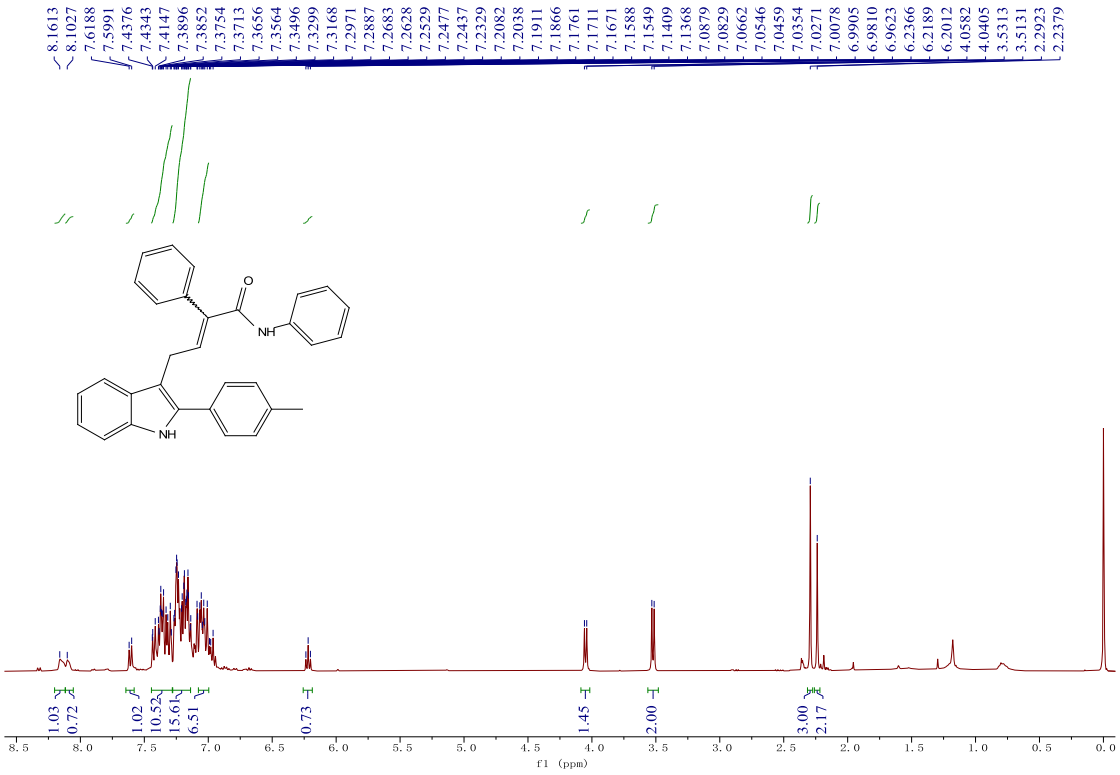


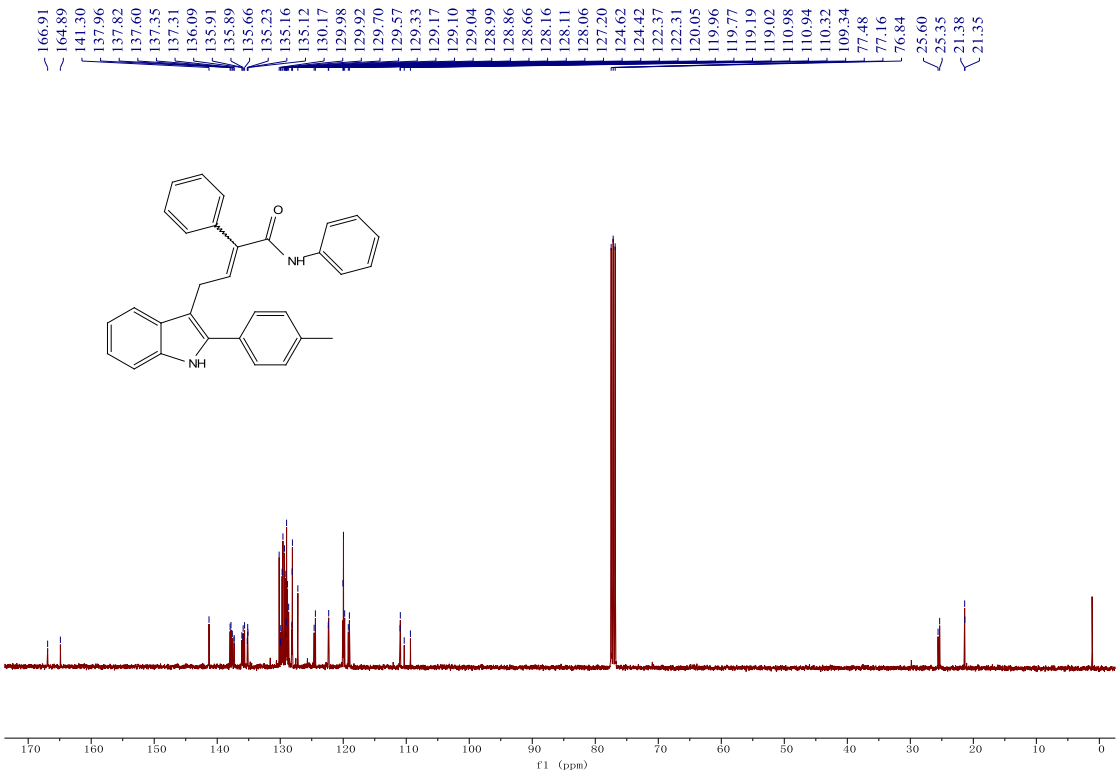
^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 8





^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 9





^{1}H NMR (400 MHz, Chloroform-*d*) and ^{13}C NMR (101 MHz, Chloroform-*d*) of 10