Electronic Supplementary Information

Donor-Acceptor Complex Enables Synthesis of *E*-Olefins from Alcohols, Amines and Carboxylic Acids

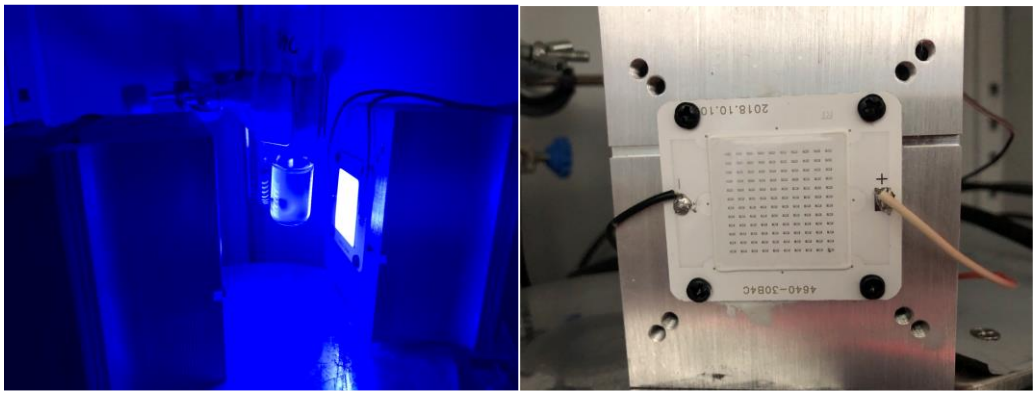
Kun-Quan Chen[a], Jie Shen[a], Zhi-Xiang Wang[a]*, and Xiang-Yu Chen[a]*

School of Chemical Sciences, University of Chinese Academy of Sciences, Beijing100049 (China)

Table of Contents

1. General information

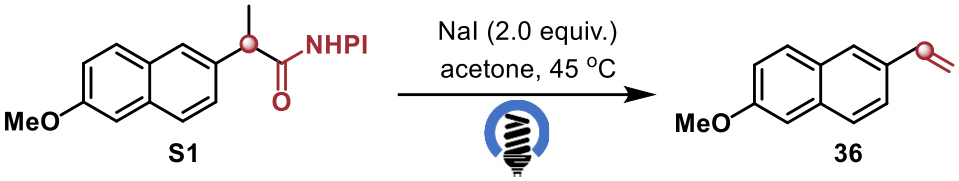
- Chemicals were purchased from Alfa or Bidepharmand used without further purification unless otherwise noted. Solvents were purified from purification systems made by Vigor. N-hydroxyphthalimide esters, oxyisoindoline-1,3-dione compounds, 4-nitrobenzoate compounds and pyridinium salts were prepared according to literature methods.[1-3]
- Chromatographic purification of the products was performed on silica gel (200-300 mesh, flash).
- IR spectra were taken on a Vertex 70 spectrophotometer and reported as wave numbers (cm^{-1}).
- UV-vis absorption spectra were acquired on UV-2550 spectrophotometer (Shimadzu, Japan).
- The GC-MS TQ8040 was used in the detection of the reaction mixture.
- ^{1}H- and ^{13}C- NMR spectra were recorded at ambient temperature on a Shimadzu Avance 400/500 Spectrometer. The chemical shifts are reported in ppm downfield of tetramethylsilane (TMS) and referenced to residual solvent peaks resonance as internal standard. The order of citation in parentheses is a) multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, dd= doublet of doublet, ddd= doublet of doublet of doublet, td = triplet of doublet, m = multiplet), b) coupling constants, c) number of protons. Coupling constants (*J*) are reported in Hertz (Hz).
- Photochemical experiments were performed magnetically stirred in 10 mL glass Schlenk tubes, sealed with a rubber septum. The tubes were irradiated with blue light (460 nm,) using a LED lamp with a power output of 50 W. The distance from the light source to the irradiation vessel is 1 cm to keep the reaction temperature at 45 °C (The purchase link for LED lamp is https://item.m.jd.com/product/47264027233.html).



- The mass analysis mode of the HRMS was orbitrap.

2. Photoinduced defunctionalizations for the synthesis of olefins

Table S1. Optimization of the reaction conditions of decarboxylation.

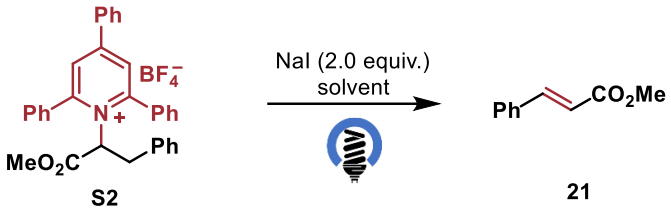


Entry	Conditions	Yield (%)[a]
1	--	98
2	NaI (0.2 equiv.)	17
3	THF as the solvent	98
4	DCM as the solvent	60
5	DMSO as the solvent	trace
6	DME as the solvent	39
7	MeCN as the solvent	95
8	without NaI	NR
9	without light	NR
10	IPr.HCl (0.2 equiv) collidine (0.2 equiv)	90

[a]Yield of isolated product

General procedure A: To a dry Schlenk tube equipped with a stirring bar, the NHPI ester (0.2 mmol), NaI (0.4 mmol, 60.0 mg, 2.0 equiv.) were added. The tube was evacuated and filled with argon (three times). After the addition of acetone (2.0 mL) to the mixture via gastight syringe. The mixture was stirred overnight at 45 °C under a 50W blue LED (460 nm) lamp spaced 1 cm apart. Then the reaction mixture was subjected to silica gel chromatography to afford the desired product (PE:EA = 200:1 – 5:1).

Table S2. Optimization of the reaction conditions of deaminations.

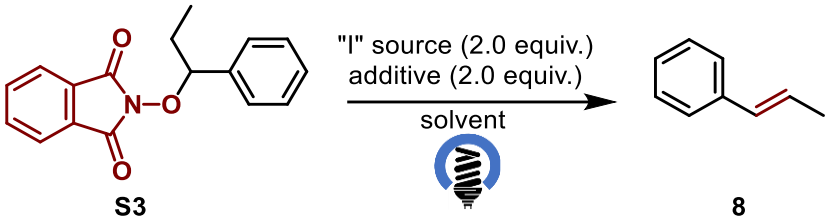


Entry	Solvent	Yield (%)[a]	*E/Z*
1	acetone	trace	--
2	DCM	trace	--
3	DMF	17	98/2
4	DMA	29	98/2
5	THF	NR	--
6	MeCN	NR	--
7	DMSO	78	98/2
8[b]	DMSO	63	98/2
9[c]	DMSO	NR	--

[a]Yield of isolated product. [b]0.2 equivalent of NaI was used in the reaction. [c]without light.

General procedure B: To a dry Schlenk tube equipped with a stirring bar, the katritzky salt (0.1 mmol), NaI (0.2 mmol, 30.0 mg, 2.0 equiv.) were added. The tube was evacuated and filled with argon (three times). After the addition of DMSO (1.0 mL) to the mixture via gastight syringe. The mixture was stirred overnight at 45 °C under a 50W blue LED (460 nm) lamp spaced 2 cm apart. Then the reaction mixture was subjected to silica gel chromatography to afford the desired product (PE:EA = 200:1 – 2:1 and one drop of NEt_3).

Table S3. Optimization of the reaction conditions of dehydrations.

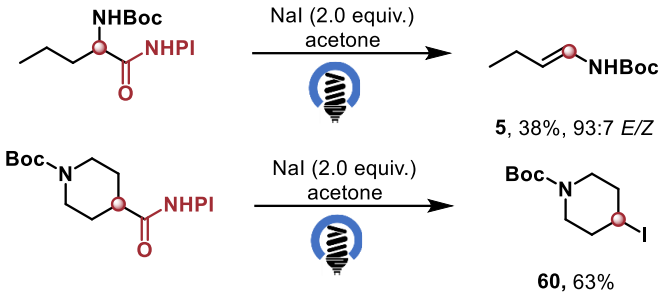


Entry	Additive	"I" source	Solvent	Yield (%)[a]	*E/Z*
1	PPh_3	NaI	acetone	47	98/2
2	PPh_3	NaI (0.2 equiv.)	acetone	trace	--
3[b]	PPh_3	NaI	acetone	NR	--
4	no	NaI	acetone	NR	--
5	PPh_3	no	acetone	NR	--
6	$P(OPh)_3$	NaI	acetone	NR	--
7	TsCl	NaI	acetone	NR	--
8	$PhI(OAc)_2$	NaI	acetone	57	98/2
9	$PhI(OTf)_2$	NaI	acetone	trace	--
10	$Ph_2I^+OTf^-$	NaI	acetone	trace	--
11	$SbPh_3$	NaI	acetone	trace	--
12	$BiPh_3$	NaI	acetone	trace	--
13	$NaBF_4$	NaI	acetone	trace	--
14	KBF_4	NaI	acetone	trace	--
15	$LiBF_4$	NaI	acetone	67	98/2
16[c]	$LiBF_4$	NaI	acetone	21	98/2--
17[d]	$LiBF_4$	NaI	acetone	15	98/2
18	$LiBF_4$	NaI	DCM	17	98/2
19	$LiBF_4$	NaI	THF	37	98/2
20	$LiBF_4$	NaI	MeCN	25	98/2
21	$LiBF_4$	NaI	Et_2O, DMF, toluene, DME	trace	--
22	$LiPF_6$	NaI	acetone	55	98/2
23	$LiBF_4$	LiI	acetone	19	98/2
24	$LiBF_4$	CsI, CuI, Me_4NI	acetone	trace	--
25[e]	$LiBF_4$	NaI	acetone	29	98/2

[a]Yield of isolated product. [b]without light. [c]0.2 equivalent of $LiBF_4$ was used. [d]0.2 equivalent of NaI was used. [e] 5.0 equivalent of TEMPO was added to the reaction.

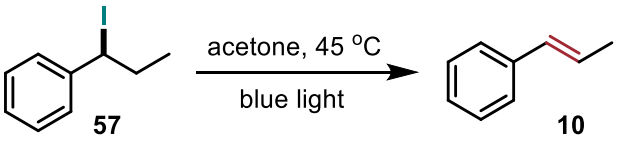
General procedure C: To a dry Schlenk tube equipped with a stirring bar, the NHPI ether or 4-nitrobenzoate (0.2 mmol), NaI (0.4 mmol, 60.0 mg, 2.0 equiv.) and $LiBF_4$ (0.4 mmol, 37.6 mg, 2.0 equiv.) were added. The tube was evacuated and filled with argon (three times). After the addition of acetone (2.0 mL) to the mixture via gastight syringe. The mixture was stirred overnight at 45 °C under a 50W blue LED (460 nm) lamp spaced 1 cm apart. Then the reaction mixture was subjected to silica gel chromatography to afford the desired product (PE:EA = 200:1 – 5:1).

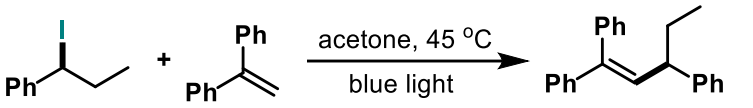
The reaction of aliphatic substrates.[a]



[a]Yield of isolated product.

3. Mechanistic studies



Entry	Variants	Yield and *E/Z* selectivity
1	no light	trace, --
2	no light, phthK (2.0 equiv.)	trace, --
3	none	67%, 98.5:1.5
4	phthK (1.0 equiv.)	62%, 98.5:1.5
5	NaI (2.0 equiv.)	86%, 98.5:1.5
6	TEMPO (3.0 equiv.)	23%, 98.5:1.5
7		observed by GCMS

The control reactions were carried out following the general procedure A, using (1-iodopropyl)benzene **57** as the substrate.

UV-vis absorption spectra of the reactions:

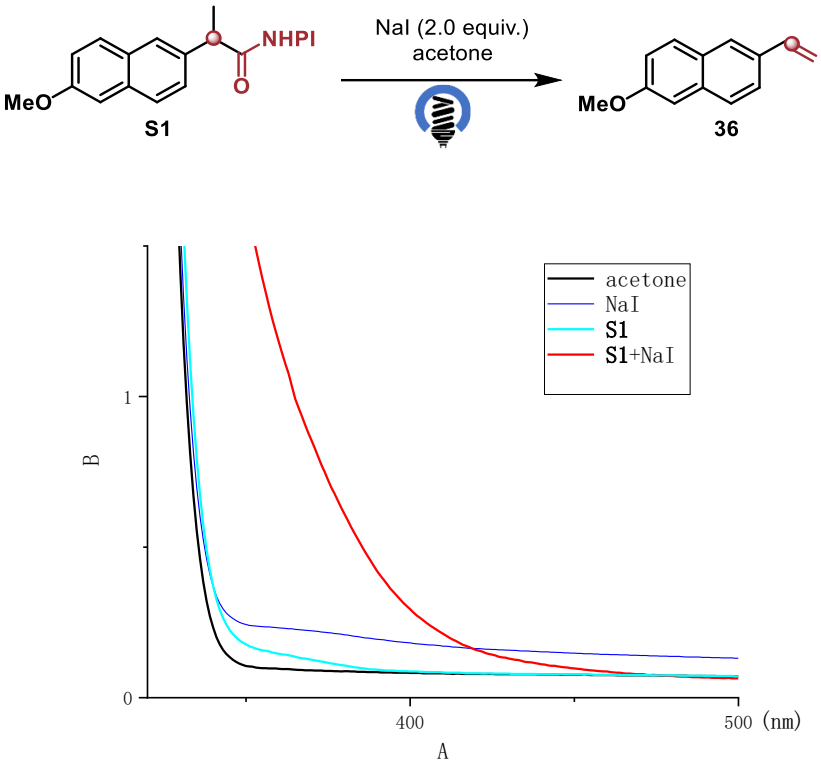


Figure S1. UV-vis absorption spectra of the reaction of S1

UV-vis absorption spectra of N-hydroxyphthalimide ester **S1** (0.5 M in acetone), NaI (0.5 M in acetone) and the mixture of **S1** and NaI (0.5 M in acetone). An obvious red-shift of absorption was observed in the spectrum of the reaction mixture **S1** and NaI.

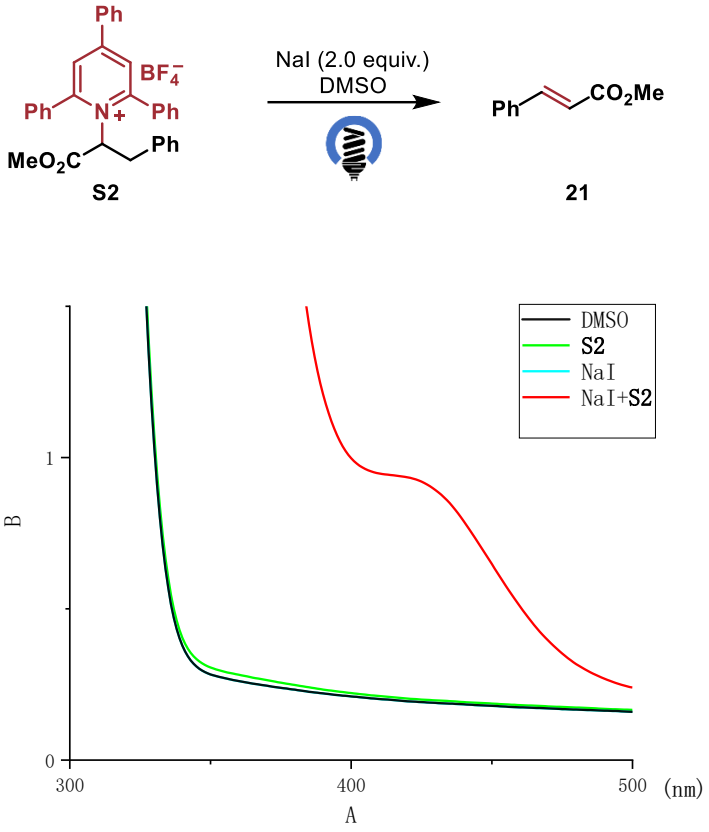


Figure S2. UV-vis absorption spectra of the reaction of S2

UV-vis absorption spectra of katritzky salt **S2** (0.5 M in DMSO), NaI (0.5 M in DMSO) and the mixture of **S2** and NaI (0.5 M in DMSO). An obvious red-shift of absorption was observed in the spectrum of the reaction mixture **S2** and NaI.

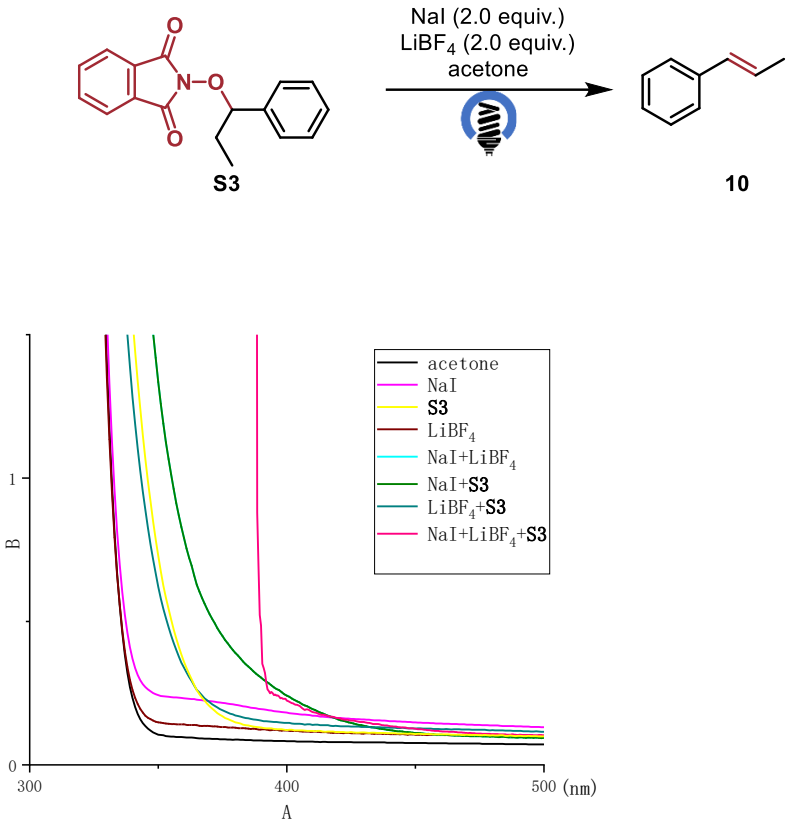


Figure S3. UV-vis absorption spectra of the reaction of S3

UV-vis absorption spectra of NaI (0.5 M in acetone), 2-(1-phenylpropoxy)isoindoline-1,3-dione **S3** (0.5 M in acetone), $LiBF_4$ (0.5 M in acetone), the mixture of NaI and $LiBF_4$ (0.5 M in acetone), the mixture of NaI and **S3** (0.5 M in acetone), the mixture of **S3** and $LiBF_4$ (0.5 M in acetone) and the mixture of **S3**, NaI and $LiBF_4$ (0.5 M in acetone). An obvious red-shift of absorption was observed in the spectrum of the reaction mixture **S3,** NaI and $LiBF_4$.

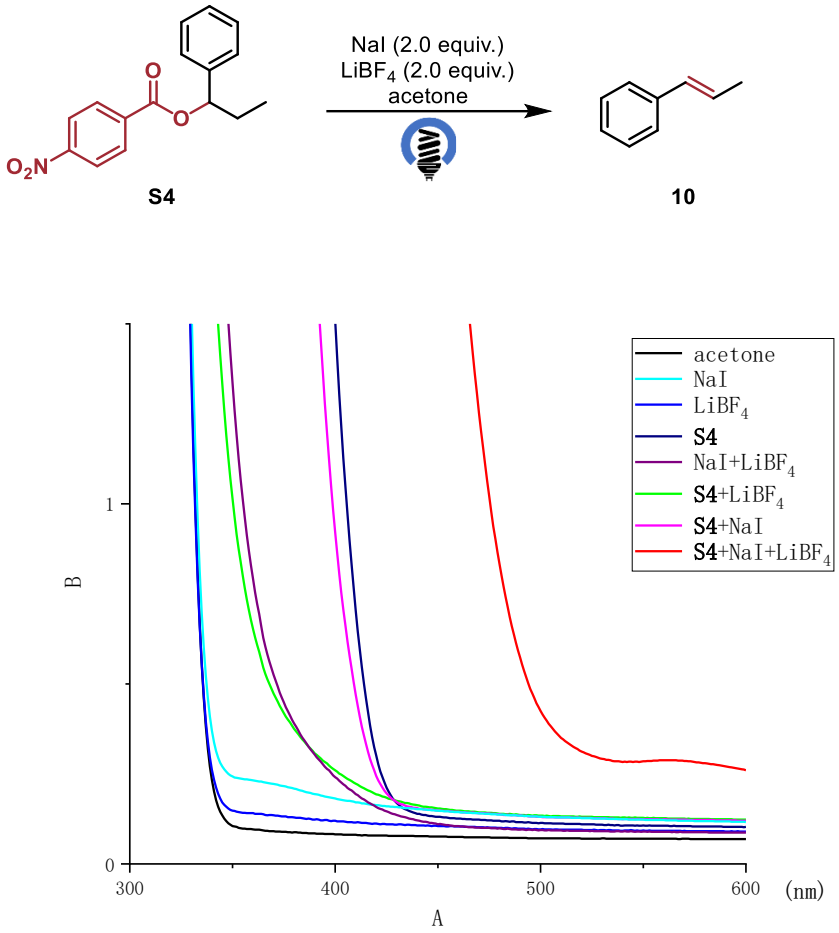
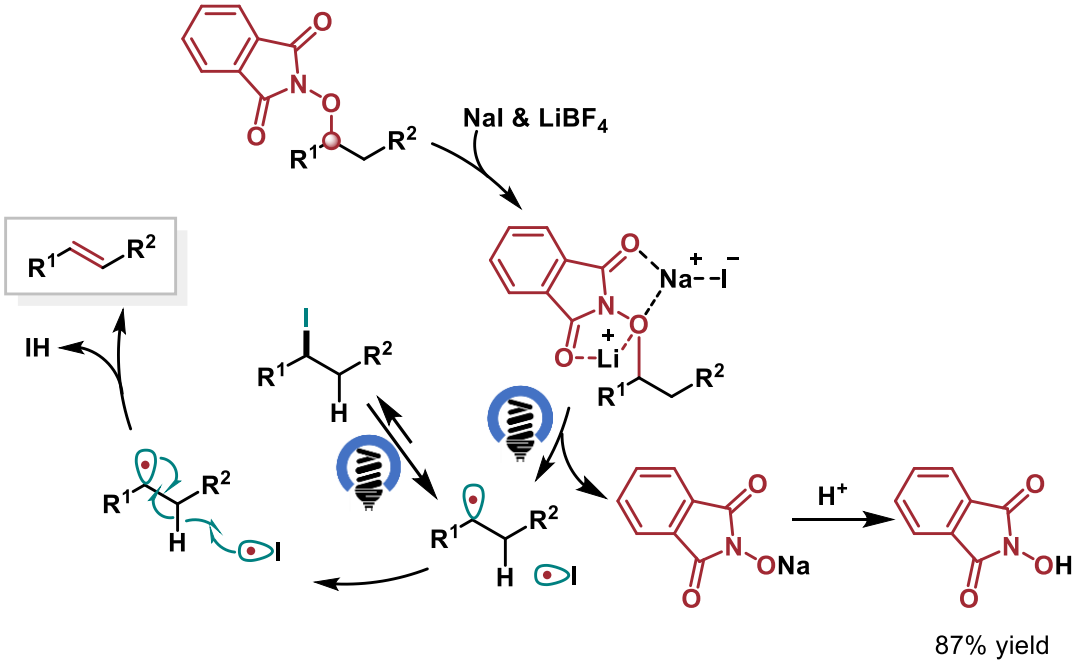


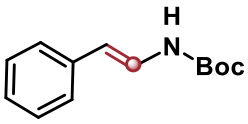
Figure S4. UV-vis absorption spectra of the reaction of S4

UV-vis spectra of NaI (0.5 M in acetone), $LiBF_4$ (0.5 M in acetone), 1-phenylpropyl 4-nitrobenzoate **S4** (0.5 M in acetone), NaI and $LiBF_4$ (0.5 M in acetone), **S4** and $LiBF_4$ (0.5 M in acetone), NaI and **S4** (0.5 M in acetone) and the mixture of **S4**, NaI and $LiBF_4$ (0.5 M in acetone). An obvious red-shift of absorption was observed in the spectrum of the reaction mixture **S4**, NaI and $LiBF_4$.

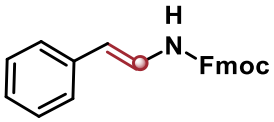


Scheme S1. Proposed mechanism in Scheme 5c.

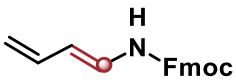
4. Compound characterization data



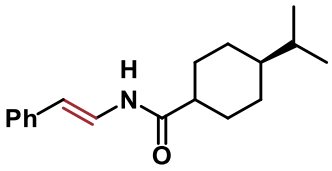
***tert*-butyl (*E*)-styrylcarbamate (1):** Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (26 mg, 0.118 mmol, 59%, *E/Z* = 92/8). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.25 – 7.04 (m, 5H), 6.41 (s, 1H), 5.89 (d, *J* = 14.5 Hz, 1H), 1.49 (s, 9H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 136.6, 128.7, 126.2, 125.3, 124.3, 109.7, 81.0, 28.4. These data are in agreement with those reported previously in the literature.[4]



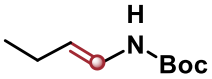
(9H-fluoren-9-yl)methyl (*E*)-styrylcarbamate (2): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 5:1) as a white solid (59 mg, 0.136 mmol, 87%, *E/Z* = 92/8). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.82 – 7.74 (m, 2H), 7.60 (dd, *J* = 7.6, 1.2 Hz, 2H), 7.44 – 7.36 (m, 3H), 7.34 – 7.30 (m, 3H), 7.27 (d, *J* = 4.3 Hz, 3H), 7.23 – 7.10 (m, 2H), 6.62 (d, *J* = 11.0 Hz, 1H), 5.97 (d, *J* = 14.6 Hz, 1H), 4.52 (d, *J* = 6.7 Hz, 2H), 4.24 (t, *J* = 6.7 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 143.6, 141.4, 134.5, 127.9, 127.2, 126.9, 125.0, 120.2, 113.8, 112.3, 67.3, 47.1. These data are in agreement with those reported previously in the literature.[4]



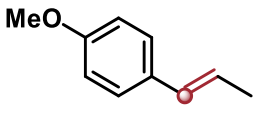
(9H-fluoren-9-yl)methyl (*E*)-buta-1,3-dien-1-ylcarbamate (3): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a white solid (49 mg, 0.158 mmol, 79%, *E/Z* = 99/1). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.79 – 7.73 (m, 3H), 7.60 – 7.55 (m, 3H), 7.45 – 7.37 (m, 3H), 7.34 – 7.30 (m, 3H), 6.73 (dd, *J* = 14.0, 11.1 Hz, 1H), 6.48 (d, *J* = 11.1 Hz, 1H), 6.31 – 6.26 m, 1H), 5.72 – 5.66 (m, 1H), 5.03 (d, *J* = 16.9 Hz, 1H), 4.91 (d, *J* = 10.2 Hz, 1H), 4.48 (d, *J* = 6.8 Hz, 2H), 4.22 (t, *J* = 6.7 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 153.4, 143.6, 141.4, 134.5, 127.9, 127.2, 126.9, 125.0, 120.2, 113.8, 112.4, 67.3, 47.1. These data are in agreement with those reported previously in the literature.[5]



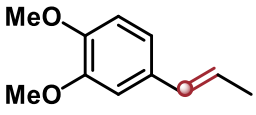
(*E*)-4-isopropyl-N-styrylcyclohexane-1-carboxamide (4): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 7:1) as a white solid (37 mg, 0.136 mmol, 68%, *E/Z* = 99/1). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.52 (dd, *J* = 14.6, 10.8 Hz, 1H), 7.34 (d, *J* = 11.3 Hz, 1H), 7.32 – 7.21 (m, 4H), 7.19 – 7.10 (m, 1H), 6.08 (d, *J* = 14.6 Hz, 1H), 2.11 – 2.05 (m, 1H), 2.04 – 1.91 (m, 2H), 1.91 – 1.74 (m, 2H), 1.64 (s, 1H), 1.58 – 1.31 (m, 3H), 1.18 – 0.92 (m, 2H), 0.86 (s, 3H), 0.85 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 173.6, 136.2, 128.7, 126.6, 125.6, 122.9, 112.5, 45.9, 43.3, 32.8, 29.7, 29.0, 19.8. **IR (ATR)** ν 3256, 3047, 1653, 1632, 874; **HRMS (ESI)** $[M+H]^+$ calcd for $C_{18}H_{26}NO$ 272.2006, found 272.2009.



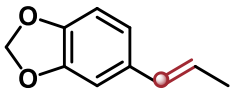
***tert*-butyl (*E*)-but-1-en-1-ylcarbamate (5):** Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil (13 mg, 0.076 mmol, 38%, *E/Z* = 93/7). **^{1}H NMR** (400 MHz, Chloroform-d) δ 6.48 – 6.35 (m, 1H), 6.08 (s, 1H), 4.97 (dt, J = 13.8, 6.7 Hz, 1H), 2.06 – 1.89 (m, 3H), 1.44 (s, 9H), 0.96 (t, J = 7.4 Hz, 3H).. **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 153.0, 122.9, 111.7, 80.2, 28.4, 22.9, 14.5.These data are in agreement with those reported previously in the literature.[6]



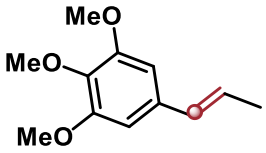
(*E*)-1-methoxy-4-(prop-1-en-1-yl)benzene (6): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (25 mg, 0.174 mmol, 87%, *E/Z* = 97/3). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.26 – 7.23 (m, 2H), 6.82 (d, *J* = 8.7 Hz, 2H), 6.33 (dt, *J* = 15.8, 1.8 Hz, 1H), 6.25 – 5.93 (m, 1H), 3.78 (s, 3H), 1.84 (dd, *J* = 6.6, 1.7 Hz, 3H).**^{13}C NMR** (101 MHz, Chloroform-*d*) δ 158.7, 130.9, 130.4, 126.9, 123.6, 114.0, 55.3, 18.5. These data are in agreement with those reported previously in the literature.[7]



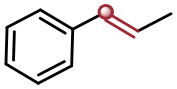
(*E*)-1,2-dimethoxy-4-(prop-1-en-1-yl)benzene (7): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (23 mg, 0.130 mmol, 65% *E/Z* = 99/1). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.96 – 6.69 (m, 3H), 6.33 (dq, *J* = 15.7, 1.8 Hz, 1H), 6.09 – 6.05 (m, 1H), 3.86 (s, 3H), 3.85 (s, 3H), 1.85 (dd, *J* = 6.6, 1.7 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 149.1, 148.3, 131.3, 130.7, 123.9, 118.7, 111.3, 108.6, 56.0, 55.8, 18.4. These data are in agreement with those reported previously in the literature.[7]



(*E*)-5-(prop-1-en-1-yl)benzo[d][1,3]dioxole (8): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (24 mg, 0.150 mmol, 75%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.89 – 6.78 (m, 1H), 6.73 – 6.72 (m, 2H), 6.30 (dd, *J* = 15.7, 1.7 Hz, 1H), 6.09 – 5.93 (m, 1H), 5.92 (s, 2H), 1.84 (dd, *J* = 6.6, 1.7 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 148.0, 146.6, 132.6, 130.6, 124.0, 120.1, 108.3, 105.4, 101.0, 18.4. These data are in agreement with those reported previously in the literature.[8]

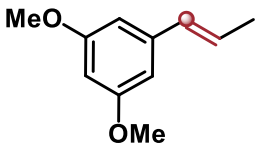


(*E*)-1,2,3-trimethoxy-5-(prop-1-en-1-yl)benzene (9): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 5:1) as a colorless oil (40 mg, 0.192 mmol, 96%, *E/Z* = 94/6). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.54 (s, 2H), 6.35 – 6.29 (m, 1H), 6.18 – 6.10 (m, 1H), 3.85 (s, 7H), 3.82 (s, 3H), 1.86 (dd, *J* = 6.5, 1.6 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 153.3, 137.1, 133.9, 131.0, 125.5, 102.8, 61.0, 56.1, 18.5. These data are in agreement with those reported previously in the literature.[9]

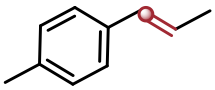


(*E*)-prop-1-en-1-ylbenzene (10): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (20 mg, 0.170

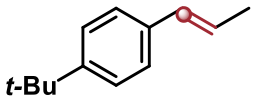
mmol, 85%, *E/Z* = 99/1). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.40 – 7.27 (m, 4H), 7.24 – 7.17 (m, 1H), 6.44 -6.41 (m, 1H), 6.39 – 6.21 (m, 1H), 1.90 (dd, *J* = 6.6, 1.6 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 138.0, 131.1, 128.6, 126.9, 125.9, 125.8, 18.7. These data are in agreement with those reported previously in the literature.[8]



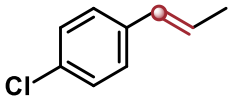
(*E*)-1,3-dimethoxy-5-(prop-1-en-1-yl)benzene (11): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (28 mg, 0.158 mmol, 79%, *E/Z* = 95/5). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.48 (d, *J* = 2.3 Hz, 2H), 6.37 – 6.28 (m, 2H), 6.22 – 6.17 (m, 1H), 3.78 (s, 6H), 1.86 (dt, *J* = 6.4, 1.0 Hz, 3H).**^{13}C NMR** (101 MHz, Chloroform-*d*) δ 160.9, 140.1, 131.1, 126.5, 104.0, 99.1, 55.4, 18.5.These data are in agreement with those reported previously in the literature.[10]



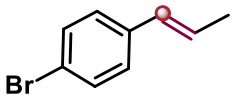
(*E*)-1-methyl-4-(prop-1-en-1-yl)benzene (12): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (22 mg, 0.166 mmol, 83%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Cyclohexane-d_{12}) δ 7.22 (dd, *J* = 8.2, 2.3 Hz, 2H), 7.09 (dd, *J* = 8.2, 2.3 Hz, 2H), 6.36 (dt, *J* = 15.8, 1.9 Hz, 1H), 6.24 – 6.15 (dm, 1H), 2.32 (s, 3H), 1.86 (dt, *J* = 6.5, 2.0 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 138.0, 131.1, 128.6, 126.9, 125.9, 125.8, 18.7. These data are in agreement with those reported previously in the literature.[11]



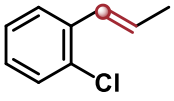
(*E*)-1-(tert-butyl)-4-(prop-1-en-1-yl)benzene (13): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (29 mg, 0.164 mmol, 82%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.33 – 7.24 (m, 4H), 6.45 – 6.38 (m, 1H), 6.29 – 5.95 (m, 1H), 1.86 (dd, *J* = 6.5, 1.7 Hz, 3H), 1.31 (s, 9H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 149.8, 135.3, 130.8, 125.6, 125.5, 125.0, 34.6, 18.6. These data are in agreement with those reported previously in the literature.[12]



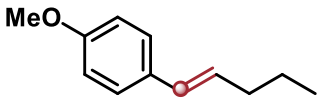
(*E*)-1-chloro-4-(prop-1-en-1-yl)benzene (14): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (20 mg, 0.134 mmol, 67%, *E/Z* = 96/4). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.26 – 7.23 (m, 4H), 6.37 – 6.31 (m, 1H), 6.29 – 5.98 (m, 1H), 1.87 (dq, *J* = 6.5, 1.5 Hz, 3H).**^{13}C NMR** (101 MHz, Chloroform-*d*) δ 136.5, 132.3, 130.0, 128.7, 127.1, 126.5, 18.5. These data are in agreement with those reported previously in the literature.[11]



(*E*)-1-bromo-4-(prop-1-en-1-yl)benzene (15): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (29 mg, 0.144 mmol, 74%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.42 – 7.34 (m, 2H), 7.23 – 7.09 (m, 2H), 6.35 – 6.30 (m, 1H), 6.26 – 6.17 (m, 1H), 1.86 (dd, *J* = 6.4, 1.5 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 134.3, 132.1, 126.3, 124.6, 123.8, 121.0, 39.1. These data are in agreement with those reported previously in the literature.[11]

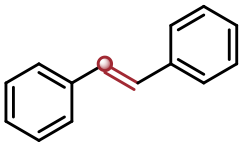


(*E*)-1-chloro-2-(prop-1-en-1-yl)benzene (16): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (29 mg, 0.124 mmol, 62%, *E/Z* = 99/1). **^{1}H NMR** (400 MHz, Chloroform-*d*)δ 7.48 – 7.45 (m, 1H), 7.33 – 7.20 (m, 1H), 7.22 – 7.03 (m, 2H), 6.79 – 6.75 (m, 1H), 6.26 -6.17 (m, 1H), 1.92 (dd, J = 6.7, 1.8 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 136.0, 132.5, 129.7, 128.9, 127.9, 127.4, 126.9, 126.7, 18.9. These data are in agreement with those reported previously in the literature.[13]

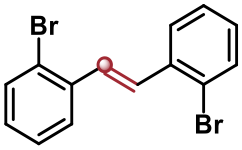


(*E*)-1-methoxy-4-(pent-1-en-1-yl)benzene (17): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc 7:1-5:1) as white solid (34 mg, 0.122 mmol, 61%). **^{1}H NMR** (400 MHz, Chloroform-d) δ 7.69 (d, *J* = 7.6 Hz, 1H), 7.64 – 7.58 (m, 1H), 7.49 – 7.47 (m, 1H), 7.25 – 7.21 (m, 2H), 7.21 – 7.09 (m, 3H), 3.82 – 3.41 (m, 2H), 2.78 – 2.60 (m, 2H), 2.49 (s, 3H), 2.15 – 1.81 (m, 2H). **^{13}C NMR** (101

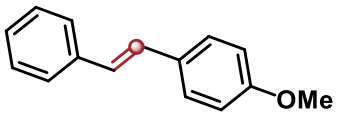
MHz, Chloroform-d) δ 168.7, 168.5, 145.3, 141.2, 134.5, 132.6, 129.6, 128.5, 128.5, 126.1, 123.9, 123.2, 37.9, 33.30 30.1, 22.2. These data are in agreement with those reported previously in the literature.[12]



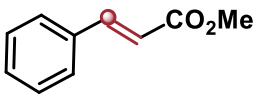
(*E*)-1,2-diphenylethene (18): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a white solid (32 mg, 0.176 mmol, 88%, *E/Z* = 97/3). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.40 – 7.03 (m, 10H), 6.61 (s, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 137.4, 130.4, 129.0, 128.3, 127.2. These data are in agreement with those reported previously in the literature. [14]



(*E*)-1,2-bis(2-bromophenyl)ethene (19): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a shite solid (58 mg, 0.176 mmol, 88% *E/Z* = 95/5). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.72 (dd, *J* = 7.9, 1.7 Hz, 2H), 7.58 (dd, *J* = 8.0, 1.3 Hz, 2H), 7.39 (s, 2H), 7.36 – 7.30 (m, 2H), 7.17 – 7.10 (m, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 136.9, 133.2, 130.2, 129.3, 127.8, 127.3, 124.4. These data are in agreement with those reported previously in the literature.[15]

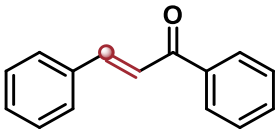


(*E*)-1-methoxy-4-styrylbenzene (20): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (35 mg, 0.170 mmol, 85%, *E/Z* = 97/3). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.60 – 7.41 (m, 4H), 7.38 – 7.30 (m, 2H), 7.25 – 7.20 (m, 1H), 7.10 – 6.94 (m, 2H), 6.94 – 6.83 (m, 2H), 3.83 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 159.4, 137.8, 130.3, 128.7, 128.3, 127.8, 127.3, 126.7, 126.3, 114.2, 55.4. These data are in agreement with those reported previously in the literature.[14]

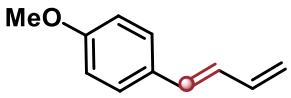


methyl cinnamate (21): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil

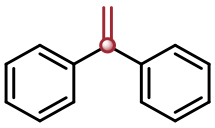
(20 mg, 0.134 mmol, 67% *E/Z* = 96/4). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.69 (d, *J* = 16.1 Hz, 1H), 7.58 – 7.45 (m, 2H), 7.45 – 7.30 (m, 3H), 6.43 (d, *J* = 16.0 Hz, 1H), 3.80 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 167.5, 145.0, 134.5, 130.4, 129.0, 128.2, 117.9, 51.8. These data are in agreement with those reported previously in the literature.[16]



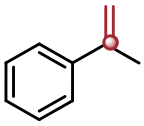
(E)-chalcone (22): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a yellow solid (35 mg, 0.172 mmol, 86% *E/Z* = 96/4). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.02 (d, *J* = 7.6 Hz, 2H), 7.82 (d, *J* = 15.7 Hz, 1H), 7.69 – 7.45 (m, 6H), 7.41 (dd, *J* = 4.7, 2.2 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 190.7, 145.0, 138.3, 135.0, 133.0, 130.7, 129.1, 128.8, 128.6, 128.6, 122.1. These data are in agreement with those reported previously in the literature.[17]



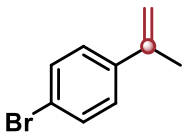
(*E*)-1-(buta-1,3-dien-1-yl)-4-methoxybenzene (23): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (29 mg, 0.182 mmol, 91%, *E/Z* = 96/4). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.36 – 7.32 (m, 2H), 6.87 – 6.83 (m, 2H), 6.74 – 6.59 (m, 1H), 6.56 – 6.28 (m, 2H), 5.40 – 5.21 (m, 1H), 5.21 – 4.94 (m, 1H), 3.80 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 159.4, 137.5, 132.5, 130.4, 130.0, 127.8, 116.5, 114.2, 55.4. These data are in agreement with those reported previously in the literature.[6]



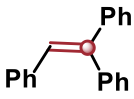
ethene-1,1-diyldibenzene (24) Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (35 mg, 0.196 mmol, 98%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.38 – 7.35 (m, 10H), 5.50 (d, *J* = 1.6 Hz, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 150.2, 141.6, 128.4, 128.3, 127.8, 114.4. These data are in agreement with those reported previously in the literature.[9]



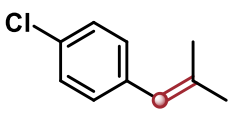
prop-1-en-2-ylbenzene (25): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (20 mg, 0.174 mmol, 87%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.59 – 7.44 (m, 2H), 7.44 – 7.12 (m, 3H), 5.42 (d, *J* = 8.6 Hz, 1H), 5.13 (d, *J* = 8.2 Hz, 1H), 2.20 (d, *J* = 8.7 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 143.4, 141.3, 128.4, 127.6, 125.6, 112.6, 22.0. These data are in agreement with those reported previously in the literature.[9]



1-bromo-4-(prop-1-en-2-yl)benzene (26): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (36 mg, 0.182 mmol, 91%). **^{1}H NMR** (400 MHz, Chloroform-*d*)fδ 8.24 – 7.05 (m, 4H), 5.36 (d, J = 7.2 Hz, 1H), 5.11 (d, J = 13.6 Hz, 1H), 2.12 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 142.3, 140.2, 131.4, 127.3, 121.4, 113.2, 21.8. These data are in agreement with those reported previously in the literature.[9]

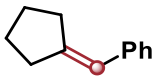


ethene-1,1,2-triyltribenzene (27): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a white solid (45 mg, 0.178 mmol, 89%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.41 – 7.31 (m, 8H), 7.29 – 7.23 (m, 2H), 7.21 – 7.13 (m, 3H), 7.11 – 7.06 (m, 2H). 7.02 (s, 1H) **^{13}C NMR** (1f01 MHz, Chloroform-*d*) δ 143.6, 142.7, 140.5, 137.5, 130.6, 129.7, 128.8, 128.4, 128.3, 128.1, 127.8, 127.7, 127.6, 126.9. These data are in agreement with those reported previously in the literature.[18]

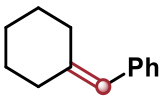


1-chloro-4-(2-methylprop-1-en-1-yl)benzene (28): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (28 mg, 0.170 mmol, 85%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.35 – 7.17 (m, 3H), 7.13 (d, *J* = 8.4 Hz, 2H), 6.20 (s, 1H), 1.89 (d, *J* = 1.5 Hz, 3H), 1.83 (d, *J* = 1.3 Hz, 3H). **^{13}C NMR** (101

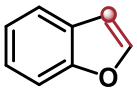
MHz, Chloroform-*d*) δ 137.2, 136.4, 131.5, 130.1, 128.2, 124.1, 26.9, 19.4. These data are in agreement with those reported previously in the literature[19]



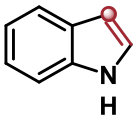
(cyclopentylidenemethyl)benzene (29): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (28 mg, 0.178 mmol, 89%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.37 – 7.29 (m, 4H), 7.21 – 7.09 (m, 1H), 6.37 (p, *J* = 2.3 Hz, 1H), 2.60 – 2.55 (m, 2H), 2.54 – 2.45 (m, 2H), 1.88 – 1.74 (m, 2H), 1.74 – 1.63 (m, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 147.3, 139.0, 128.3, 128.0, 125.7, 120.9, 36.1, 31.3, 27.3, 25.8. These data are in agreement with those reported previously in the literature.[20]



(cyclohexylidenemethyl)benzene (30): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (28 mg, 0.144 mmol, 81%). **^{1}H NMR** (500 MHz, Chloroform-*d*) δ 7.33 – 7.27 (m, 2H), 7.24 – 7.12 (m, 3H), 6.22 (s, 1H), 2.79 – 2.35 (m, 2H), 2.35 – 2.09 (m, 2H), 1.90 – 1.57 (m, 6H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 143.6, 138.5, 129.0, 128.1, 125.9, 122.0, 37.8, 29.5, 28.7, 28.0, 26.8.[20]

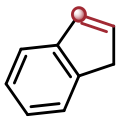


benzofuran (31): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (17 mg, 0.144 mmol, 72%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.66 – 7.56 (m, 2H), 7.53 – 7.45 (m, 1H), 7.33 – 7.27 (m, 1H), 7.24 – 7.19 (m, 1H), 6.77 (dd, *J* = 2.2, 1.0 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 155.0, 145.0, 127.5, 124.3, 122.8, 121.2, 111.5, 106.6. These data are in agreement with those reported previously in the literature.[21]

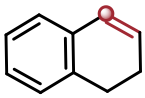


1H-indole (32): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a yellow solid (18 mg, 0.154 mmol, 77%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.11 – 7.64 (m, 2H), 7.58 – 7.21 (m, 3H), 7.18 – 7.08 (m,

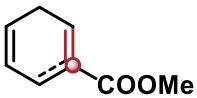
1H), 6.80 – 6.43 (m, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 135.9, 128.0, 124.4, 122.1, 120.9, 120.0, 111.2, 102.7 These data are in agreement with those reported previously in the literature.[22]



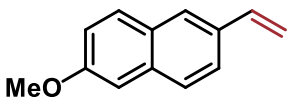
1H-indene (33): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (17 mg, 0.138 mmol, 69%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.50 – 7.42 (dq, *J* = 7.3, 0.9 Hz, 1H), 7.41 – 7.40 (m, 1H), 7.32 – 7.26 (m, 1H), 7.22 – 7.16 (m, 1H), 6.91 – 6.85 (m, 1H), 6.56 (dt, *J* = 5.5, 2.0 Hz, 1H), 3.74 – 3.25 (m, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 137.0, 131.6, 131.3, 130.5, 130.0, 127.5, 126.7, 120.4, 18.6. These data are in agreement with those reported previously in the literature.[23]



1,2-dihydronaphthalene (34): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (15 mg, 0.116 mmol, 58%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.20 – 7.07 (m, 3H), 7.03 (dd, *J* = 6.7, 1.8 Hz, 1H), 6.47 (dt, *J* = 9.6, 1.9 Hz, 1H), 6.04 (dt, *J* = 9.6, 4.4 Hz, 1H), 2.86 – 2.74 (m, 2H), 2.37 – 2.29 (m, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 135.6, 134.2, 128.8, 127.9, 127.6, 127.0, 126.5, 126.0, 27.6, 23.3. These data are in agreement with those reported previously in the literature.[21]

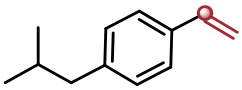


methyl cyclohexa-1,4-diene-1-carboxylate (35): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (20 mg, 0.146 mmol, 73%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.96 – 6.90 (m, 1H), 5.82 – 5.69 (m, 1H), 5.69 – 5.54 (m, 1H), 3.72 (s, 3H), 2.98 – 2.75 (m, 4H).**^{13}C NMR** (101 MHz, Chloroform-*d*) δ 167.6, 136.6, 127.6, 124.4, 122.4, 51.7, 27.1, 25.2. These data are in agreement with those reported previously in the literature.[24]

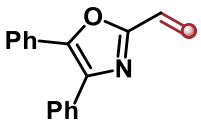


2-methoxy-6-vinylnaphthalene (36): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a

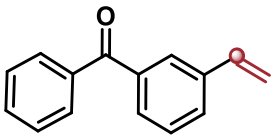
white solid (35 mg, 0.192 mmol, 96%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.86 – 7.66 (m, 3H), 7.66 – 7.53 (m, 1H), 7.24 – 7.02 (m, 2H), 6.85 (dd, *J* = 17.5, 10.9 Hz, 1H), 5.82 (dd, *J* = 17.6, 1.0 Hz, 1H), 5.28 (dd, *J* = 10.9, 1.0 Hz, 1H), 3.91 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 157.9, 137.0, 134.4, 133.1, 129.7, 129.0, 127.1, 126.3, 123.9, 119.1, 113.2, 106.0, 55.4. These data are in agreement with those reported previously in the literature.[14]



1-isobutyl-4-vinylbenzene (37): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (23 mg, 0.144 mmol, 72%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.40 – 7.29 (m, 2H), 7.19 – 6.98 (m, 2H), 6.69 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.70 (dd, *J* = 17.6, 1.0 Hz, 1H), 5.18 (dd, *J* = 10.9, 1.0 Hz, 1H), 2.45 (d, *J* = 7.2 Hz, 2H), 1.85 (dt, *J* = 13.3, 6.7 Hz, 1H), 0.89 (d, *J* = 6.6 Hz, 7H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 141.6, 136.8, 135.1, 129.4, 126.1, 112.9, 45.3, 30.3, 22.5. These data are in agreement with those reported previously in the literature.[21]

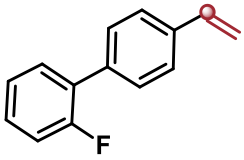


4,5-diphenyl-2-vinyloxazole (38): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (26 mg, 0.106 mmol, 53%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.71 – 7.58 (m, 4H), 7.48 – 7.29 (m, 6H), 6.67 (dd, *J* = 17.7, 11.2 Hz, 1H), 6.27 (dd, *J* = 17.6, 1.0 Hz, 1H), 5.67 (dd, *J* = 11.2, 1.0 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 159.6, 145.4, 136.6, 132.5, 128.9, 128.8, 128.7, 128.3, 128.1, 126.7, 123.4, 122.0. These data are in agreement with those reported previously in the literature.[25]

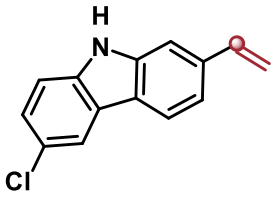


phenyl(4-vinylphenyl)methanone (39): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil (73 mg, 0.158 mmol, 79%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.85 – 7.77 (m, 3H), 7.69 – 7.57 (m, 3H), 7.57 – 7.37 (m, 3H), 6.75 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.80 (dd, *J* = 17.5, 0.7 Hz,

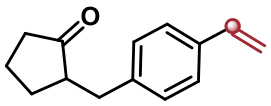
1H), 5.32 (dd, *J* = 10.9, 0.7 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 196.8, 138.0, 137.9, 137.6, 136.1, 132.6, 130.2, 130.0, 129.5, 128.5, 128.4, 127.8, 115.4. These data are in agreement with those reported previously in the literature.[21]



2-fluoro-4'-vinyl-1,1'-biphenyl (40): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (28 mg, 0.142 mmol, 71%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.57 – 7.54 (m, 2H), 7.50 – 7.34 (m, 4H), 7.25 – 7.16 (m, 2H), 6.70 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.79 (d, *J* = 17.5 Hz, 1H), 5.32 (d, *J* = 10.9 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 161.3, 158.8, 139.0, 138.9, 135.6, 130.8, 130.8, 129.0, 129.0, 128.6, 128.3, 127.8, 122.5, 122.5, 115.3, 113.6, 113.4. These data are in agreement with those reported previously in the literature.[26]

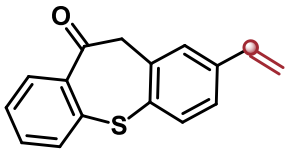


6-chloro-2-vinyl-9H-carbazole (41): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (35 mg, 0.156 mmol, 78%). **^{1}H NMR** (400 MHz, Acetone-d_6) δ 10.50 (s, 1H), 8.23 – 7.93 (m, 2H), 7.56 (d, *J* = 1.4 Hz, 1H), 7.48 (d, *J* = 8.6 Hz, 1H), 7.36 – 7.32 (m, 2H), 6.87 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.85 (dd, *J* = 17.6, 1.0 Hz, 1H), 5.23 (dd, *J* = 10.9, 1.0 Hz, 1H).**^{13}C NMR** (101 MHz, Acetone-d_6) δ 141.2, 139.1, 137.8, 136.3, 125.5, 124.3, 124.0, 122.1, 120.6, 119.7, 117.7, 112.9, 112.3, 109.1. **IR (ATR)** v 3674, 2987, 1736, 1450, 1054, 892 cm-1. **HRMS (ESI)** $[M-H]^-$ calcd for $C_{14}H_9NCl$ 226.0429, found 226.0425.

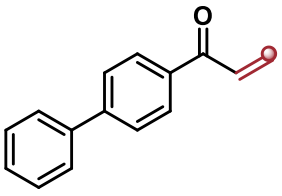


2-(4-vinylbenzyl)cyclopentan-1-one (42): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil (34 mg, 0.170 mmol, 85%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.53 – 7.30 (m, 2H),

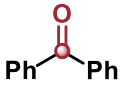
7.21 – 7.01 (m, 2H), 6.68 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.70 (dd, *J* = 17.6, 1.0 Hz, 1H), 5.19 (dd, *J* = 10.9, 1.0 Hz, 1H), 3.11 (dd, *J* = 13.9, 4.2 Hz, 1H), 2.53 (dd, *J* = 13.9, 9.4 Hz, 1H), 2.42 – 2.26 (m, 2H), 2.17 – 2.01 (m, 2H), 2.01 – 1.90 (m, 1H), 1.80 – 1.66 (m, 1H), 1.54 (dtd, *J* = 12.6, 10.8, 6.6 Hz, 1H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 220.3, 139.8, 136.6, 135.7, 129.2, 126.4, 113.3, 51.0, 38.3, 35.4, 29.2, 20.6. These data are in agreement with those reported previously in the literature.[27]



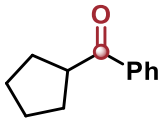
2-vinyldibenzo[b,f]thiepin-10(11H)-one (43): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (34 mg, 0.134 mmol, 67%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.19 (dd, *J* = 8.0, 1.7 Hz, 1H), 7.63 – 7.55 (m, 2H), 7.47 (d, *J* = 1.9 Hz, 1H), 7.43 – 7.39 (m, 1H), 7.32 - 27 (m, 1H), 7.22 (dd, *J* = 8.0, 1.9 Hz, 1H), 6.67 (dd, *J* = 17.6, 10.9 Hz, 1H), 5.78 (dd, *J* = 17.5, 0.7 Hz, 1H), 5.30 (dd, *J* = 10.9, 0.8 Hz, 1H), 4.36 (s, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 191.5, 140.4, 139.5, 137.9, 136.2, 135.7, 133.7, 132.6, 131.6, 131.5, 130.9, 127.1, 126.9, 125.1, 115.6, 51.1. **IR (ATR)** v 3674, 2987, 1406, 1066, 725 cm-1. **HRMS (ESI)** $[M+H]^+$ calcd for $C_{16}H_{13}OS$ 253.0682, found 253.0682.



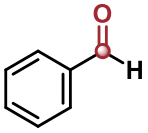
1-([1,1'-biphenyl]-4-yl)prop-2-en-1-one (44): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil (32 mg, 0.154 mmol, 77%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.09 – 7.94 (m, 2H), 7.75 – 7.67 (m, 2H), 7.66 – 7.56 (m, 2H), 7.51 – 7.43 (m, 2H), 7.40 (d, *J* = 7.1 Hz, 1H), 7.22 – 7.13 (m, 1H), 6.54 – 6.37 (m, 1H), 5.94 (dt, *J* = 10.6, 2.0 Hz, 1H) **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 190.6, 145.8, 140.0, 136.1, 132.4, 130.2, 129.5, 129.4, 129.1, 128.4, 127.4. These data are in agreement with those reported previously in the literature.[28]



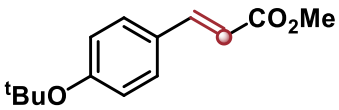
benzophenone (45): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a colorless oil (32 mg, 0.176 mmol, 88%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.96 – 7.69 (m, 4H), 7.68 – 7.53 (m, 2H), 7.53 – 7.39 (m, 4H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 196.9, 137.7, 132.6, 130.2, 128.4. These data are in agreement with those reported previously in the literature.[29]



cyclopentyl(phenyl)methanone (46): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (28 mg, 0.160 mmol, 80%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 8.03 – 7.87 (m, 2H), 7.57 – 7.48 (m, 1H), 7.48 – 7.37 (m, 2H), 3.70 (p, *J* = 7.9 Hz, 1H), 2.03 – 1.82 (m, 4H), 1.82 – 1.46 (m, 4H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 202.9, 137.0, 132.8, 128.6, 128.5, 46.4, 30.1, 26.4. These data are in agreement with those reported previously in the literature.[29]

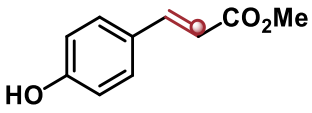


benzaldehyde (47): Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (18 mg, 0.170 mmol, 85%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 9.93 (s, 1H), 7.81 – 7.77 (m, 2H), 7.67 – 7.51 (m, 1H), 7.51 – 7.26 (m, 2H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 192.4, 136.5, 134.5, 129.7, 129.0. These data are in agreement with those reported previously in the literature.[29]

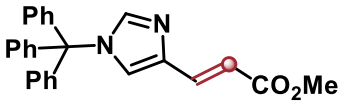


methyl (*E*)-3-(4-(*tert*-butoxy)phenyl)acrylate (48): Following the general procedure B, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (19 mg, 0.085 mmol, 85%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.65 (d, J = 16.0 Hz, 1H), 7.43 (d, J = 8.7 Hz, 2H), 6.98 (d, J = 8.7 Hz, 2H), 6.44 – 6.22 (m, 1H), 3.78 (s, 3H), 1.37 (s, 9H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 167.8, 157.9, 144.6, 129.3,

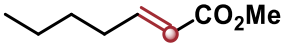
129.1, 123.9, 116.2, 79.4, 51.7, 29.0. These data are in agreement with those reported previously in the literature.[30]



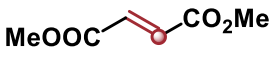
methyl (*E*)-3-(4-hydroxyphenyl)acrylate (49): Following the general procedure B, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (13 mg, 0.074 mmol, 74%, *E/Z* = 97/3). **^{1}H NMR** (500 MHz, Acetonitrile-*d3*) δ 7.57 (d, J = 16.0 Hz, 1H), 7.54 – 7.22 (m, 3H), 6.93 – 6.69 (m, 2H), 6.31 (dd, J = 16.0, 1.2 Hz, 1H), 3.69 (s, 3H). **^{13}C NMR** (126 MHz, Acetonitrile-*d3*) δ 167.5, 159.2, 144.5, 130.2, 126.4, 115.8, 114.8, 51.1. These data are in agreement with those reported previously in the literature.[31]



methyl (*E*)-3-(1-trityl-1*H*-imidazol-4-yl)acrylate (50): Following the general procedure B, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (18 mg, 0.047 mmol, 47%, *E/Z* = 99/1). **^{1}H NMR** (500 MHz, Chloroform-*d*) δ 7.55 – 7.43 (m, 2H), 7.38 – 7.30 (m, 9H), 7.17 – 7.07 (m, 6H), 7.01 (d, J = 1.3 Hz, 1H), 6.53 (d, J = 15.6 Hz, 1H), 3.74 (s, 3H). **^{13}C NMR** (126 MHz, Chloroform-*d*) δ 168.1, 142.0, 140.4, 137.1, 136.5, 129.8, 128.4, 128.3, 124.2, 115.8, 75.8, 51.6. These data are in agreement with those reported previously in the literature.[32]

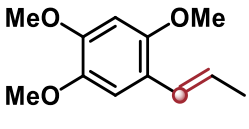


methyl (*E*)-hept-2-enoate (51): Following the general procedure B, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (13 mg, 0.051 mmol, 51%, *E/Z* = 98/2). **^{1}H NMR** (500 MHz, Chloroform-*d*)δ 6.92 (dt, J = 15.7, 7.0 Hz, 1H), 5.77 (dt, J = 15.6, 1.6 Hz, 1H), 3.67 (s, 3H), 2.25 – 2.04 (m, 2H), 1.43 (h, J = 7.4 Hz, 2H), 0.88 (t, J = 7.4 Hz, 3H). **^{13}C NMR** (126 MHz, Chloroform-*d*) δ 167.2, 149.6, 121.0, 51.4, 34.3, 21.3, 13.7. These data are in agreement with those reported previously in the literature.[33]

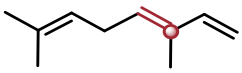


dimethyl fumarate (52): Following the general procedure B, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 10:1) as a colorless oil (9.5 mg, 0.066 mmol, 66%, *E/Z* = 96/4). **^{1}H NMR** (500 MHz, Chloroform-*d*) δ 6.80 (s, 2H), 3.75 (s,

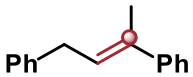
6H). **^{13}C NMR** (126 MHz, Chloroform-*d*) δ 165.4, 133.5, 52.4. These data are in agreement with those reported previously in the literature.[34]



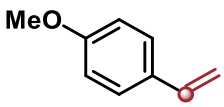
(*E*)-1,2,4-trimethoxy-5-(prop-1-en-1-yl)benzene(53): Following the general procedure C, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 5:1) as a colorless oil (25 mg, 0.124 mmol, 62%, *E/Z* = 96/4). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 6.93 (s, 1H), 6.79 – 6.60 (m, 1H), 6.48 (s, 1H), 6.08 (dq, J = 15.8, 6.6 Hz, 1H), 3.87 (s, 3H), 3.84 (s, 3H), 3.81 (s, 3H), 1.87 (dd, J = 6.6, 1.8 Hz, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 150.6, 148.7, 143.3, 125.1, 124.5, 118.9, 109.6, 97.8, 56.8, 56.5, 56.2, 19.0. These data are in agreement with those reported previously in the literature.[12]



(*E*)-3,7-dimethylocta-1,3,6-triene (54): Following the general procedure C, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (19 mg, 0.140 mmol, 70%, *E/Z* = 98/2). **^{1}H NMR** (400 MHz, Chloroform-*d*)δ 6.84 – 6.76 (m, 1H), 5.34 (ddt, J = 9.1, 7.6, 1.5 Hz, 1H), 5.19 (dt, J = 17.3, 1.2 Hz, 1H), 5.15 – 5.01 (m, 2H), 2.99 – 2.71 (m, 2H), 1.81 (s, 3H), 1.69 (s, 3H), 1.63 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ 133.7, 132.2, 132.0, 129.8, 122.6, 113.7, 26.5, 25.8, 19.9, 17.8. These data are in agreement with those reported previously in the literature.[35]

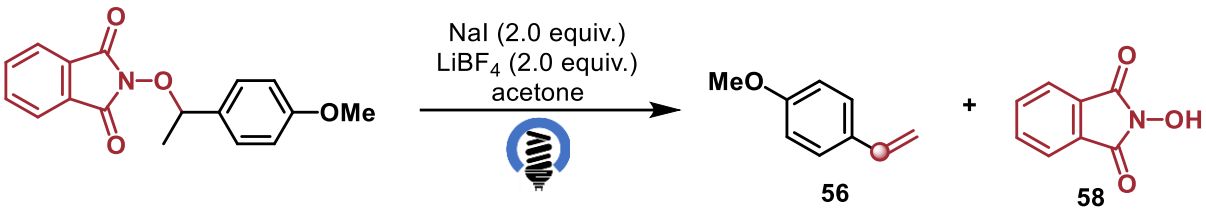


(*E*)-but-2-ene-1,3-diyldibenzene (55): Following the general procedure C, the title product was obtained after purification by column chromatography (Hexane) as a colorless oil (33 mg, 0.162 mmol, 81%, *E/Z* = 91/9). **^{1}H NMR** (500 MHz, Chloroform-*d*) δ 7.43 – 7.39 (m, 2H), 7.37 – 7.27 (m, 5H), 7.24 – 7.17 (m, 3H), 5.99 – 5.97 (m, 1H), 3.57 (d, J = 7.4 Hz, 2H), 2.14 (s, 3H). **^{13}C NMR** (126 MHz, Chloroform-*d*) δ 143.7, 141.1, 135.8, 128.6, 128.5, 128.3, 126.8, 126.2, 126.1, 125.8, 35.1, 16.1.These data are in agreement with those reported previously in the literature.[36]

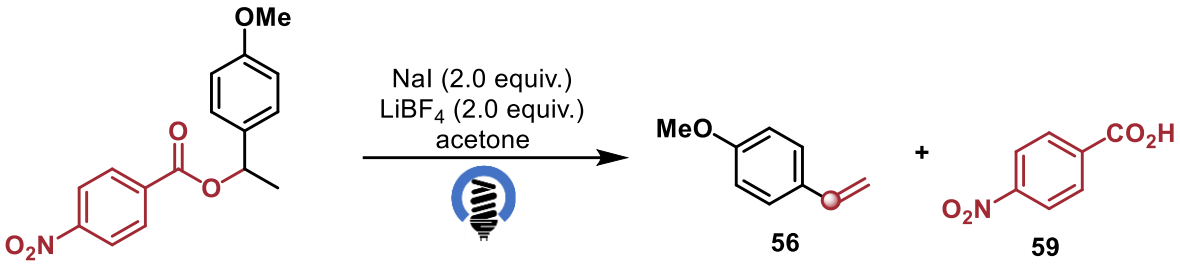


1-methoxy-4-vinylbenzene (56): Following the general procedure C, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 100:1) as a

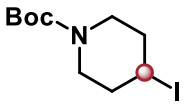
colorless oil (15 mg, 0.116mmol, 58%). **^{1}H NMR** (400 MHz, Chloroform-*d*) δ 7.39 – 7.30 (m, 2H), 6.93 – 6.77 (m, 2H), 6.65 (dd, J = 17.6, 10.9 Hz, 1H), 5.60 (dd, J = 17.6, 1.0 Hz, 1H), 5.12 (dd, J = 10.9, 1.0 Hz, 1H), 3.80 (s, 3H). **^{13}C NMR** (101 MHz, Chloroform-*d*) δ159.4, 136.3, 130.5, 127.5, 114.0, 111.7, 55.4. These data are in agreement with those reported previously in the literature.[37]



2-hydroxyisoindoline-1,3-dione 58 was obtained with 87% yield (28 mg, 0.174mmol). **^{1}H NMR** (400 MHz, DMSO-d6) δ 10.81 (s, 1H), 7.78 (s, 4H). **^{13}C NMR** (101 MHz, DMSO-D6) δ 164.7, 135.1, 129.2, 123.5. These data are in agreement with those reported previously in the literature.[38]



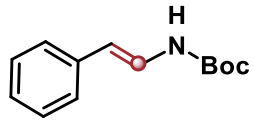
4-nitrobenzoic acid 59 was obtained with 74% yield (25 mg, 0.148mmol). **^{1}H NMR** (400 MHz, DMSO-d6) δ 8.27 (d, J = 8.5 Hz, 2H), 8.24 – 7.93 (d, J = 8.5 Hz, 2H). **^{13}C NMR** (101 MHz, DMSO-D6) δ 166.2, 150.3, 136.6, 131.0, 124.1. These data are in agreement with those reported previously in the literature.[39]

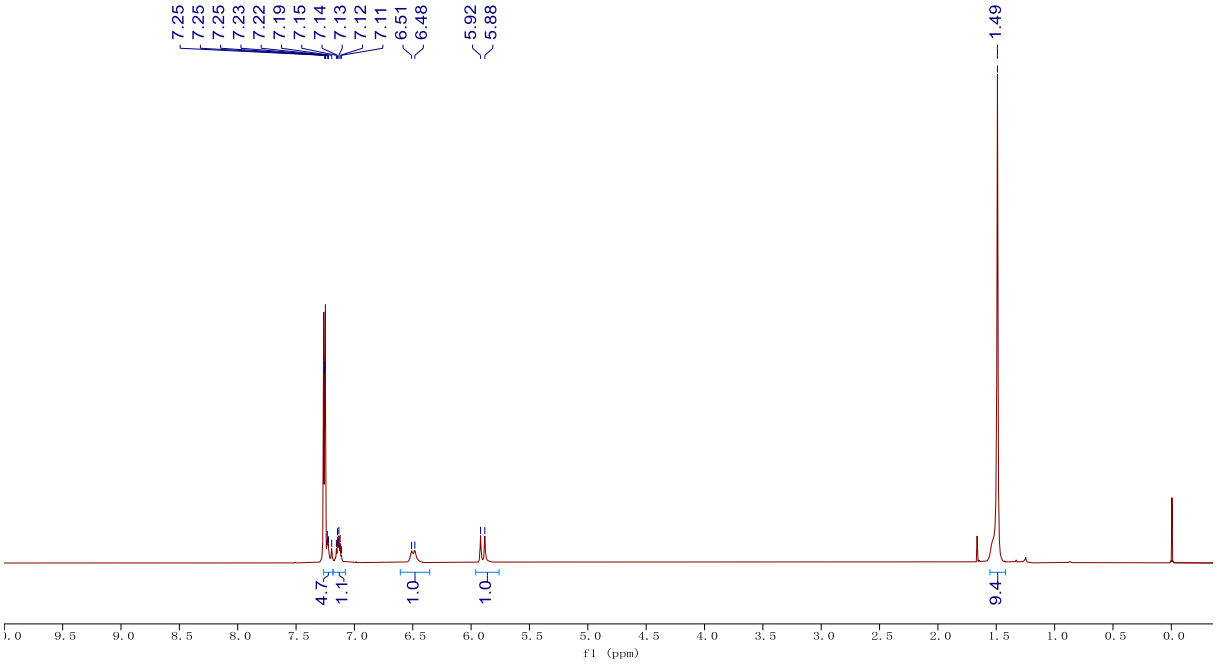


***tert*-butyl 4-iodopiperidine-1-carboxylate(60).** Following the general procedure A, the title product was obtained after purification by column chromatography (Hexane/EtOAc = 50:1) as a colorless oil (39 mg, 0.126mmol, 63%).**^{1}H NMR** (400 MHz, Chloroform-d) δ 4.45 – 4.41 (m, 1H), 3.56 (dt, J = 13.7, 5.1 Hz, 2H), 3.26 (dt, J = 13.7, 5.8 Hz, 2H), 2.00 (q, J = 5.7 Hz, 4H), 1.43 (s, 9H).. **^{13}C NMR** (101 MHz, Chloroform-*d*) δ159.4, 136.3, 130.5, 127.5, 114.0, 111.7, 55.4. These data are in agreement with those reported previously in the literature.[40]

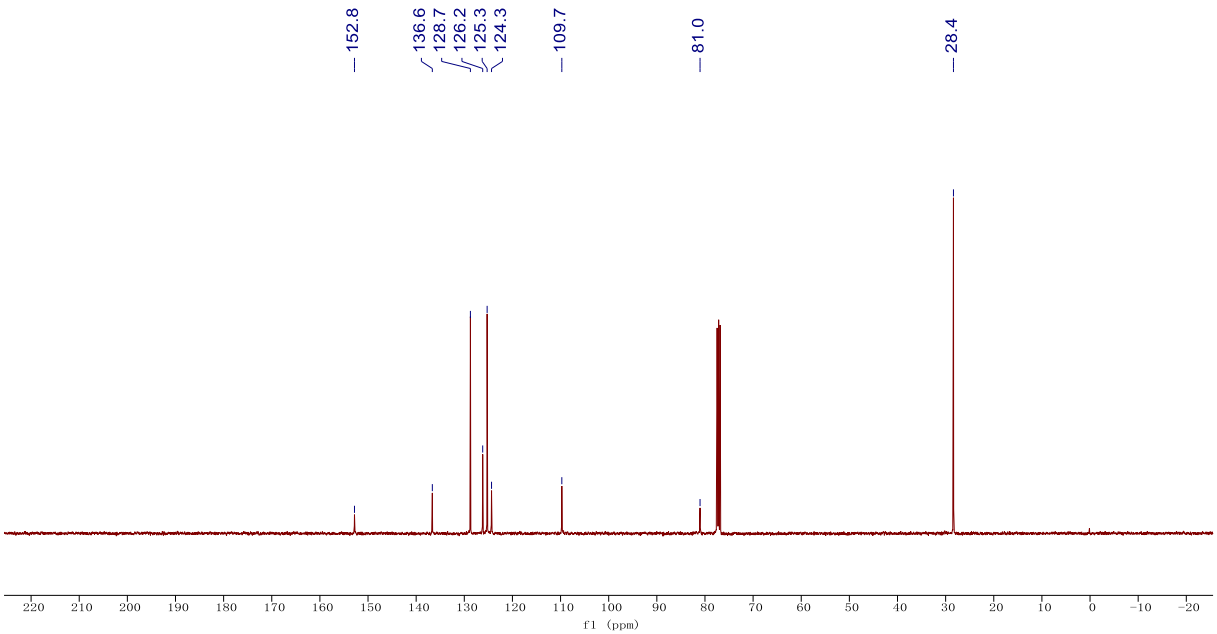
5. NMR spectra

^{1}H NMR of compound **1** (400 MHz in $CDCl_3$)

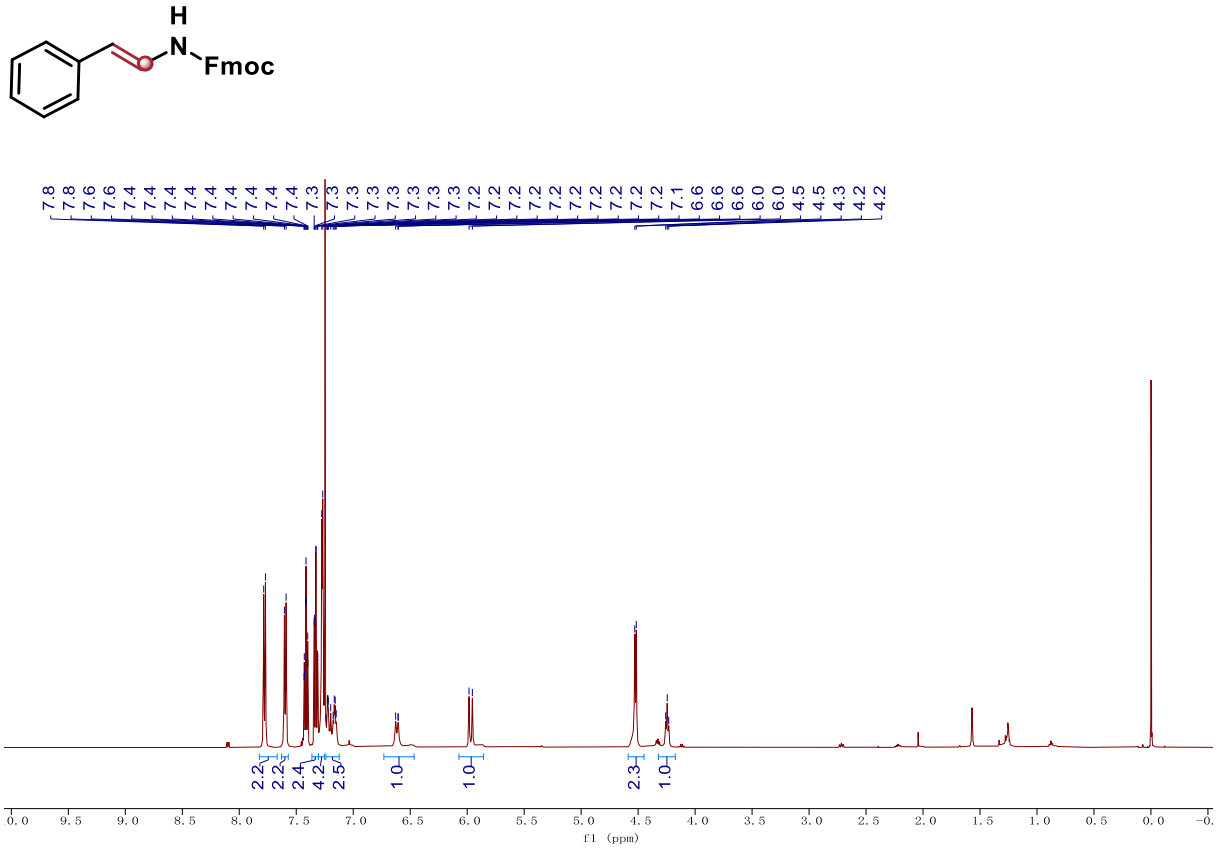




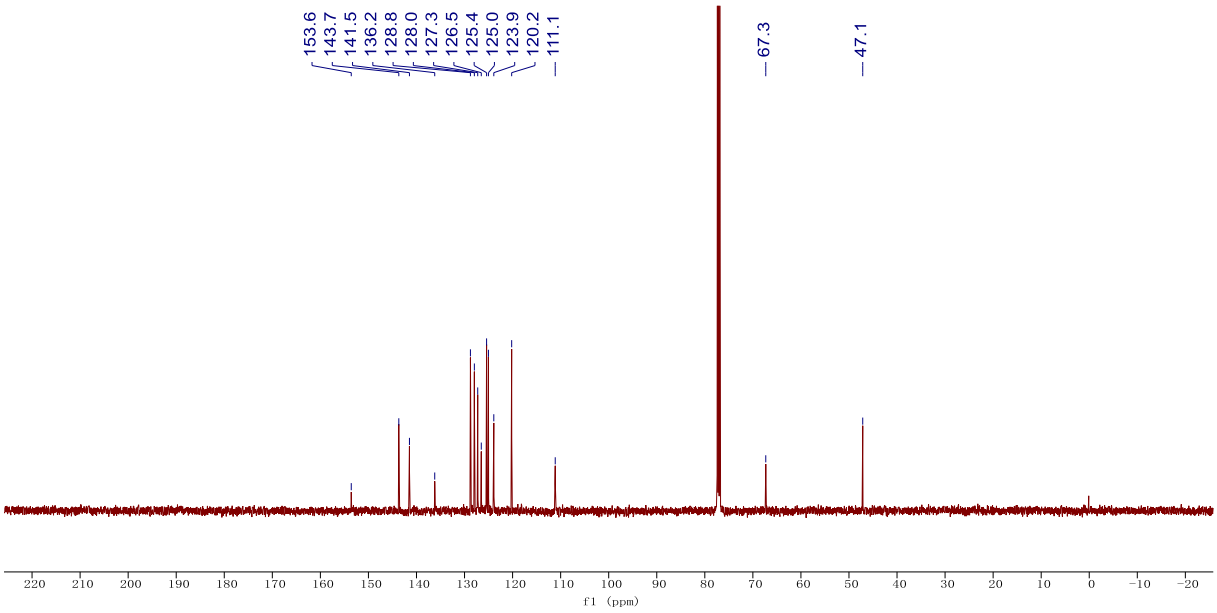
^{13}C NMR of compound **1** (101 MHz in $CDCl_3$)



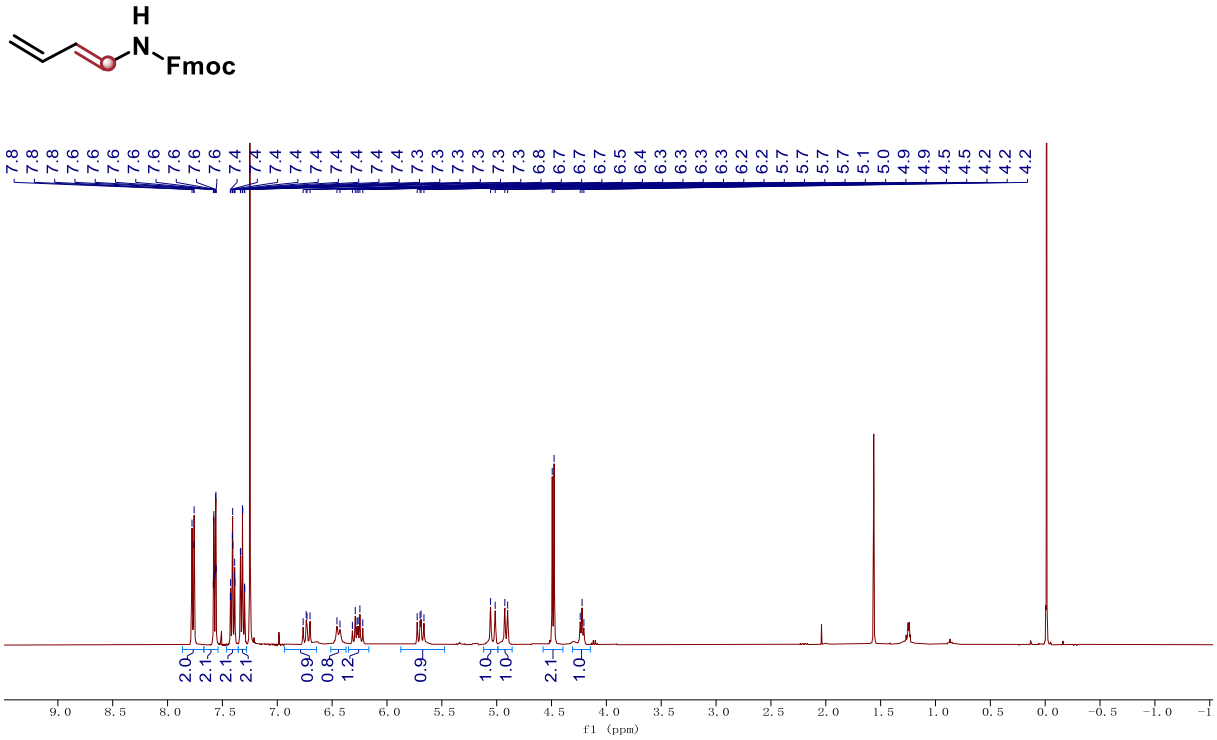
^{1}H NMR of compound **2** (400 MHz in $CDCl_3$)



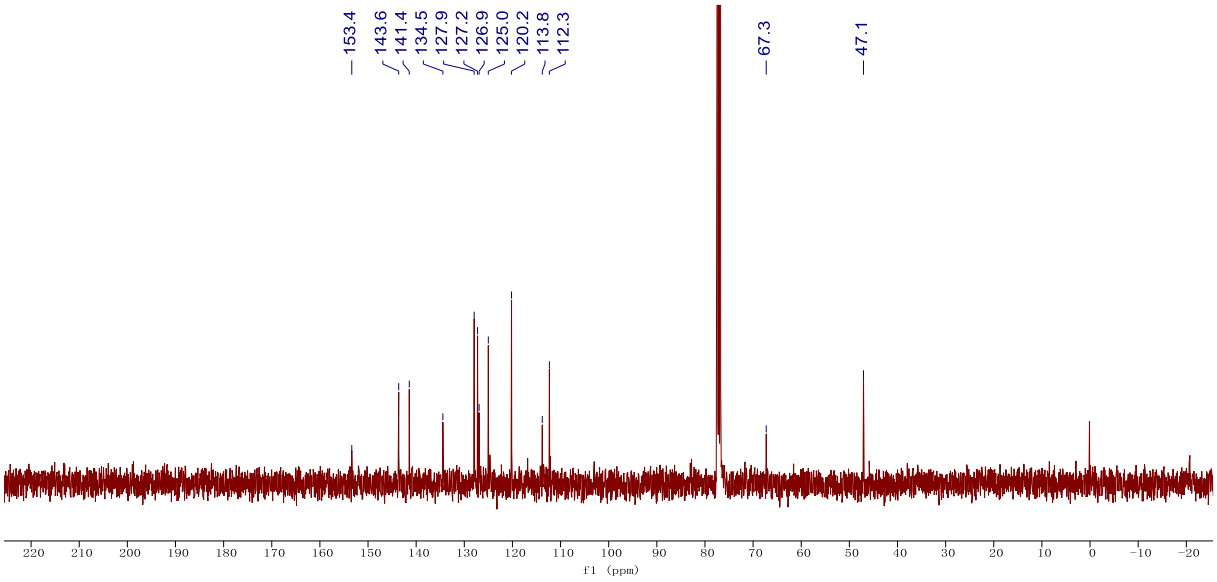
^{13}C NMR of compound **2** (101 MHz in $CDCl_3$)



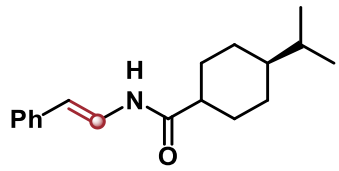
^{1}H NMR of compound **3** (400 MHz in $CDCl_3$)

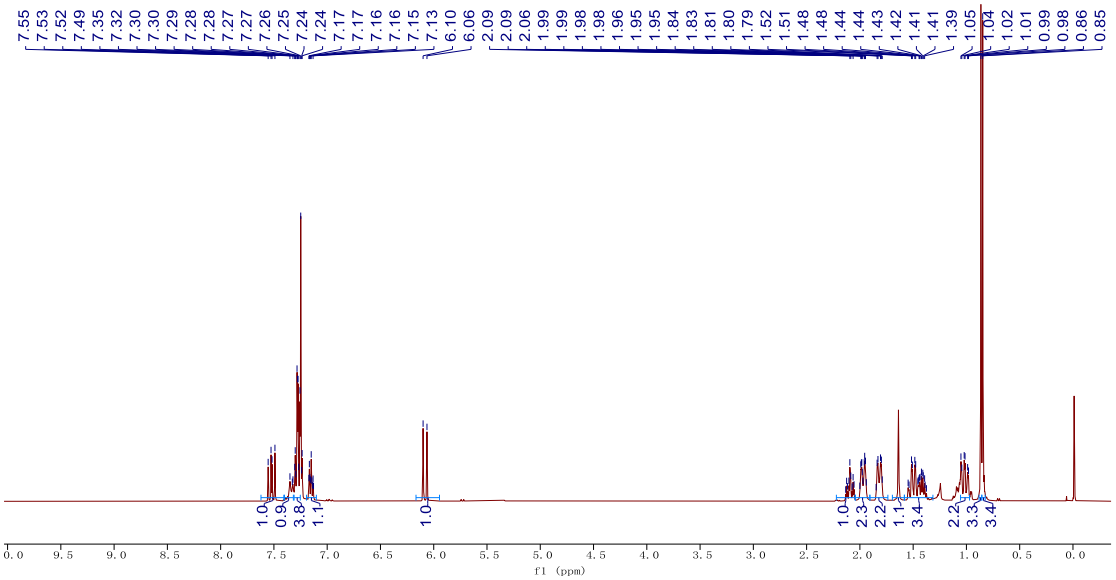


^{13}C NMR of compound **3** (101 MHz in $CDCl_3$)

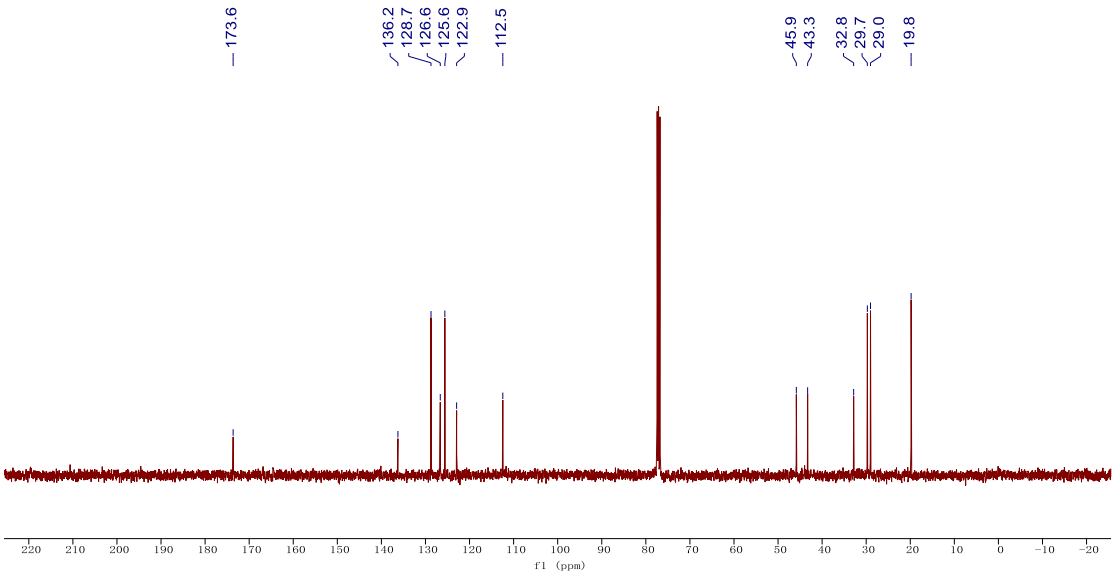


^{1}H NMR of compound **4** (400 MHz in $CDCl_3$)

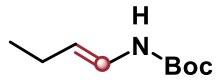


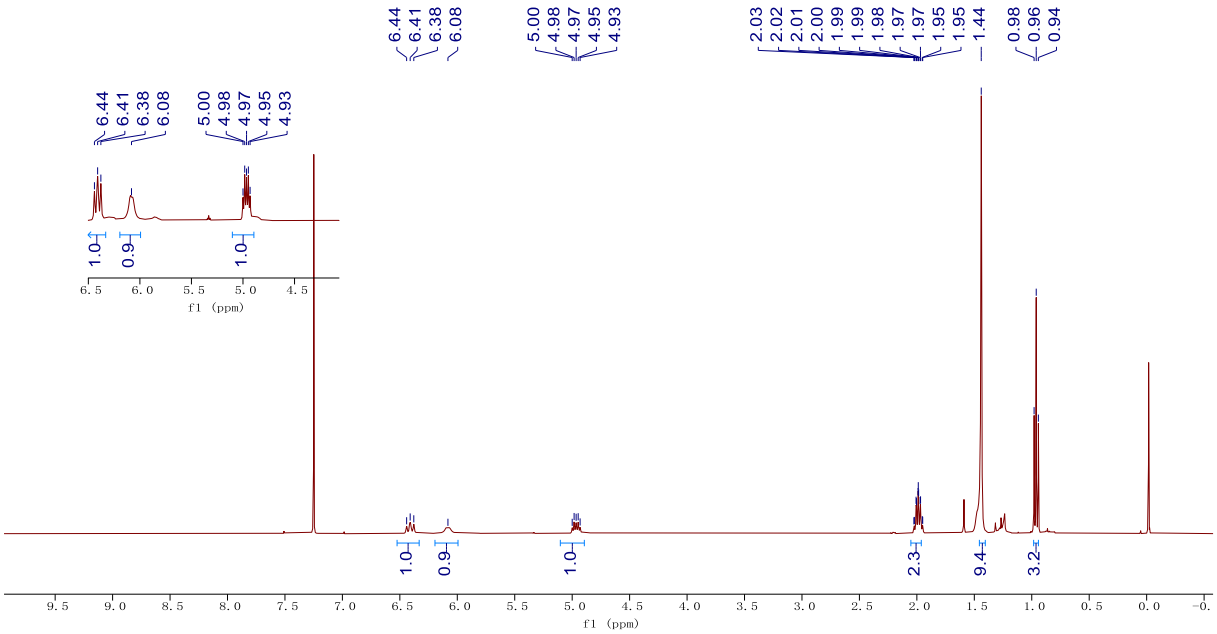


^{13}C NMR of compound **4** (101 MHz in $CDCl_3$)

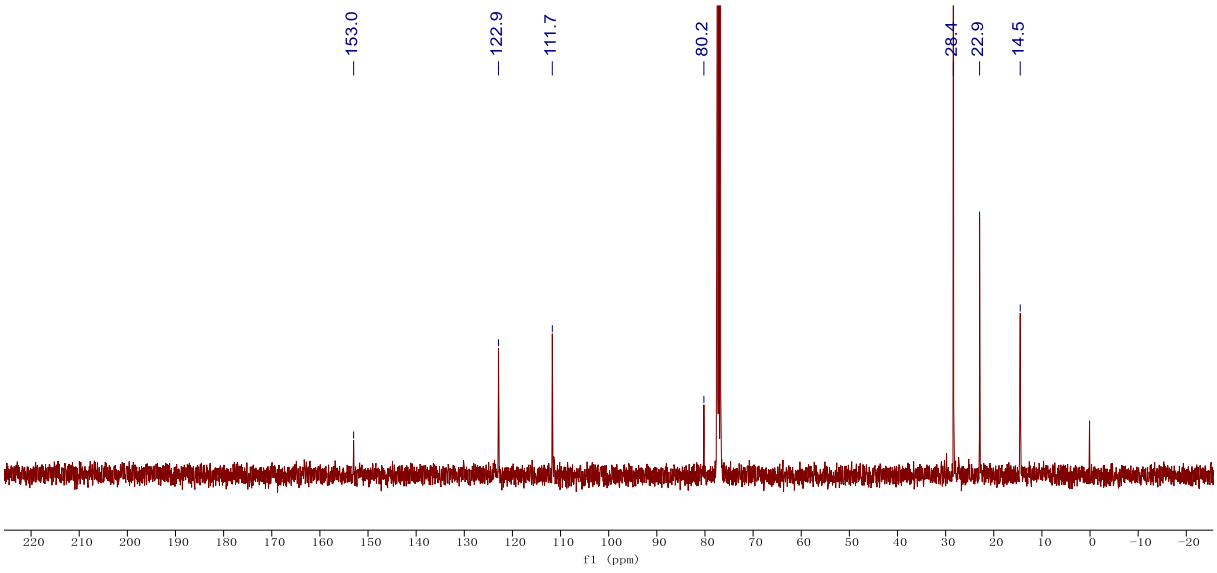


^{1}H NMR of compound **5** (400 MHz in $CDCl_3$)

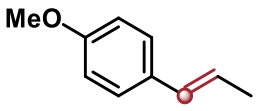


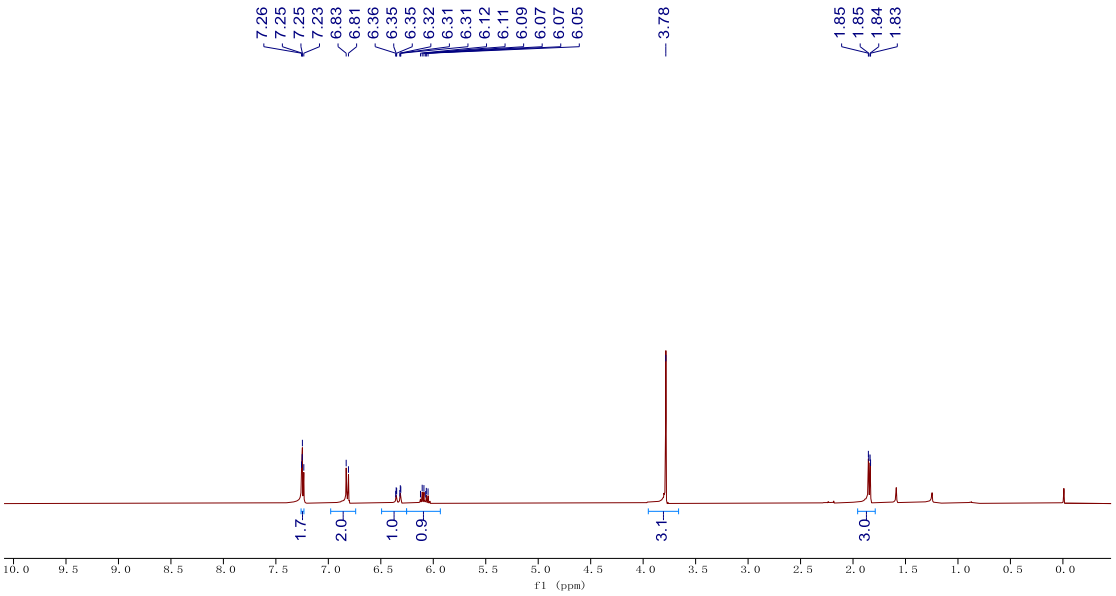


^{13}C NMR of compound **5** (101 MHz in $CDCl_3$)

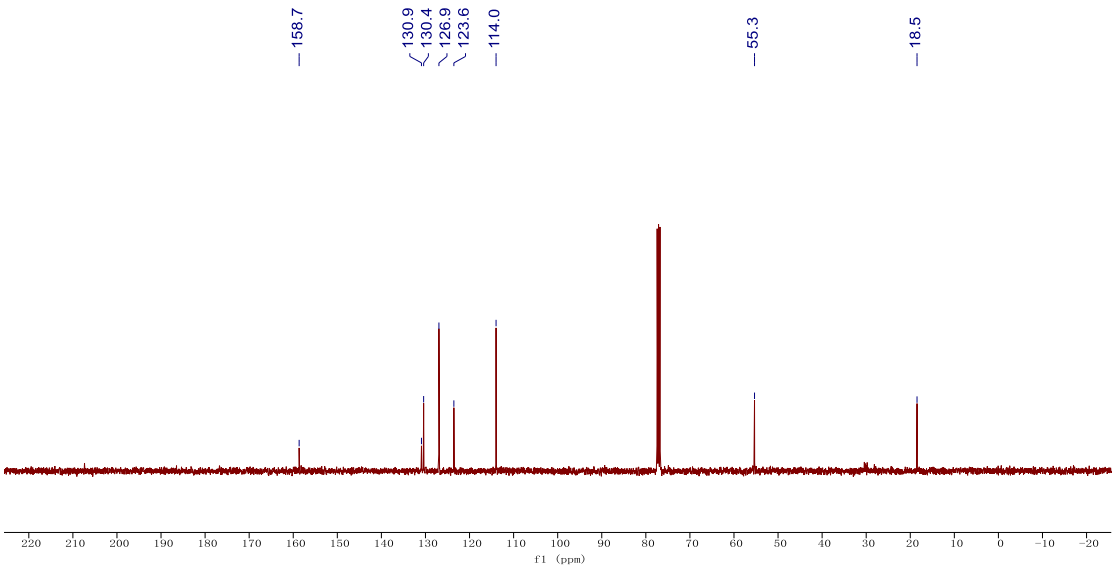


^{1}H NMR of compound **6** (400 MHz in $CDCl_3$)

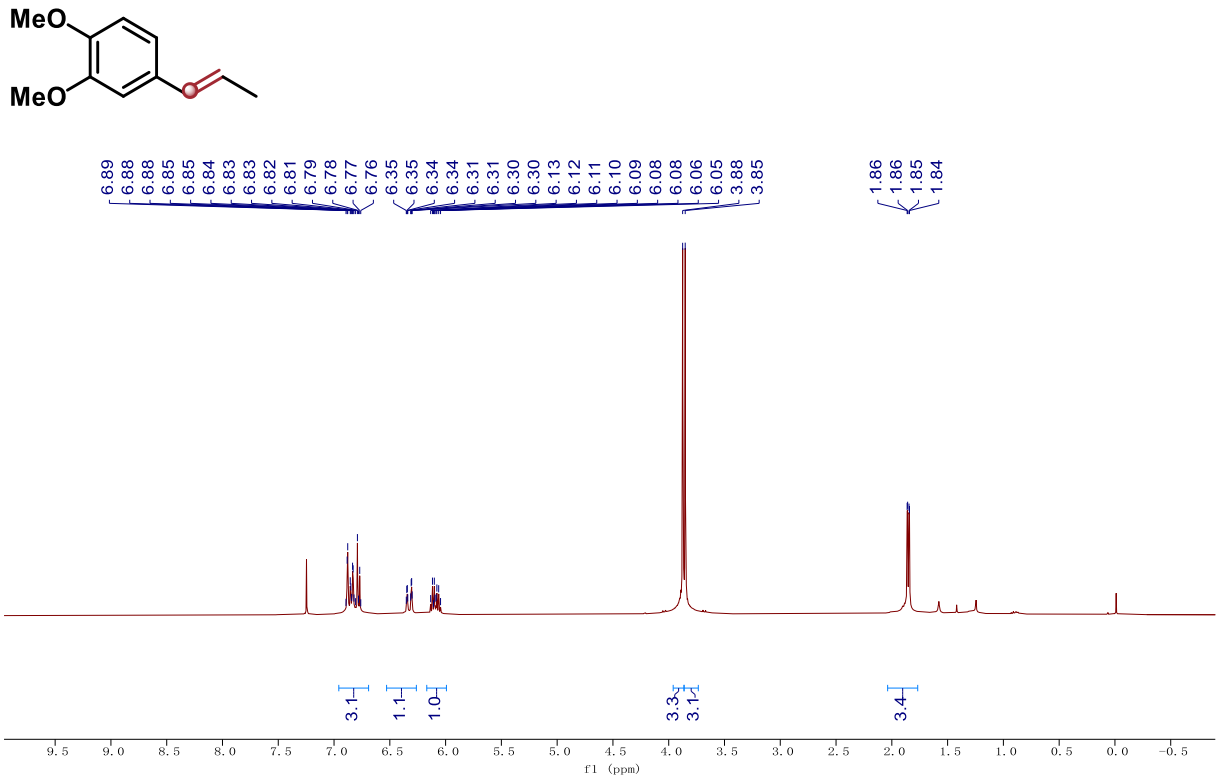




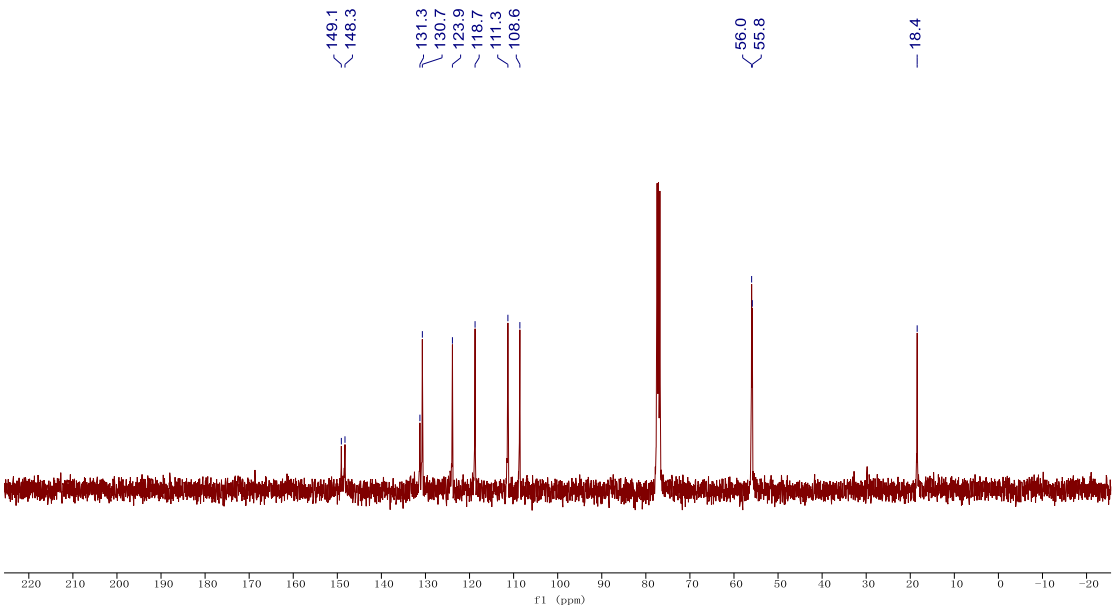
^{13}C NMR of compound **6** (101 MHz in $CDCl_3$)



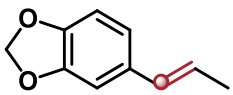
^{1}H NMR of compound **7** (400 MHz in $CDCl_3$)

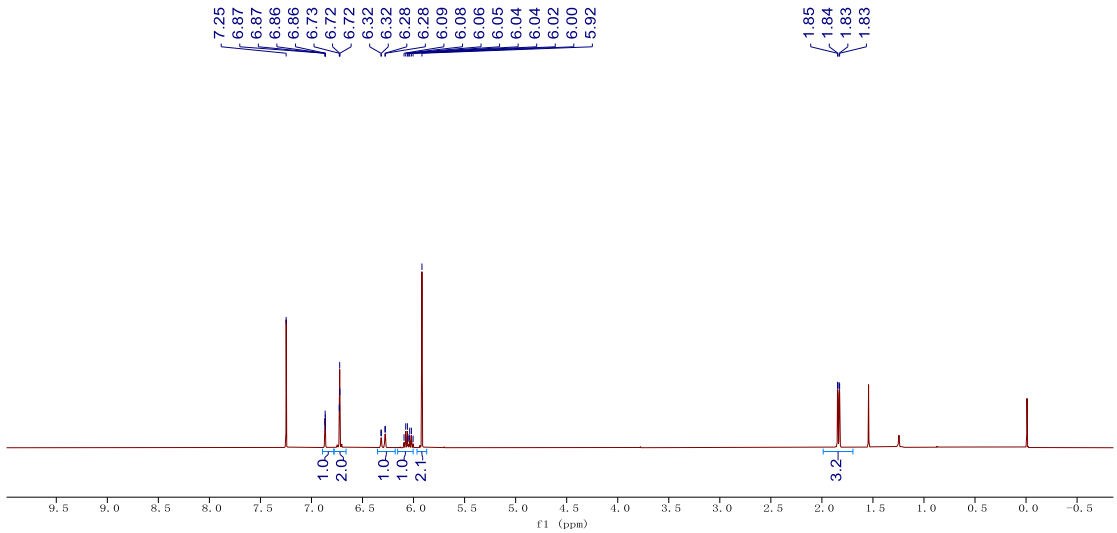


^{13}C NMR of compound **7** (101 MHz in $CDCl_3$)

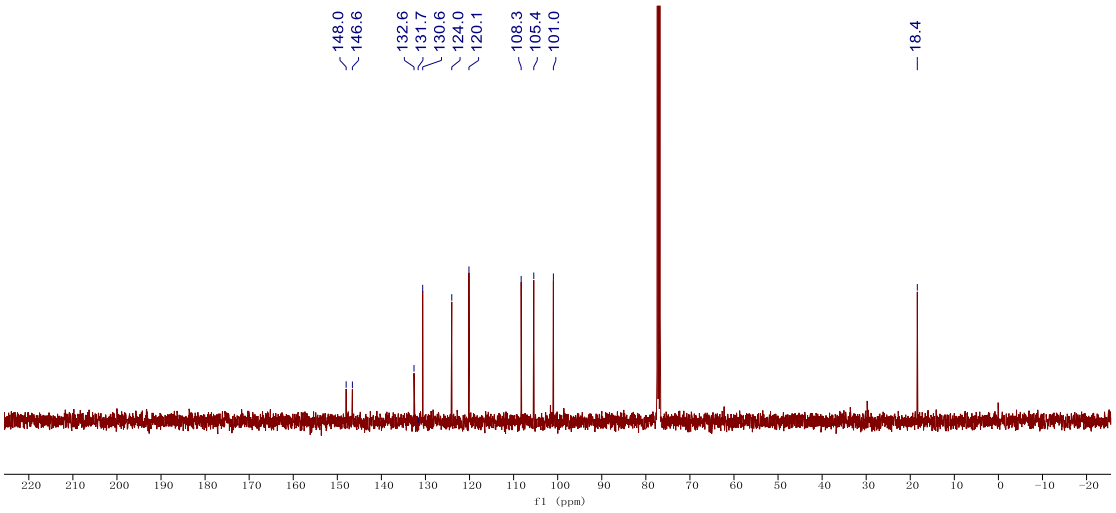


^{1}H NMR of compound **8** (400 MHz in $CDCl_3$)

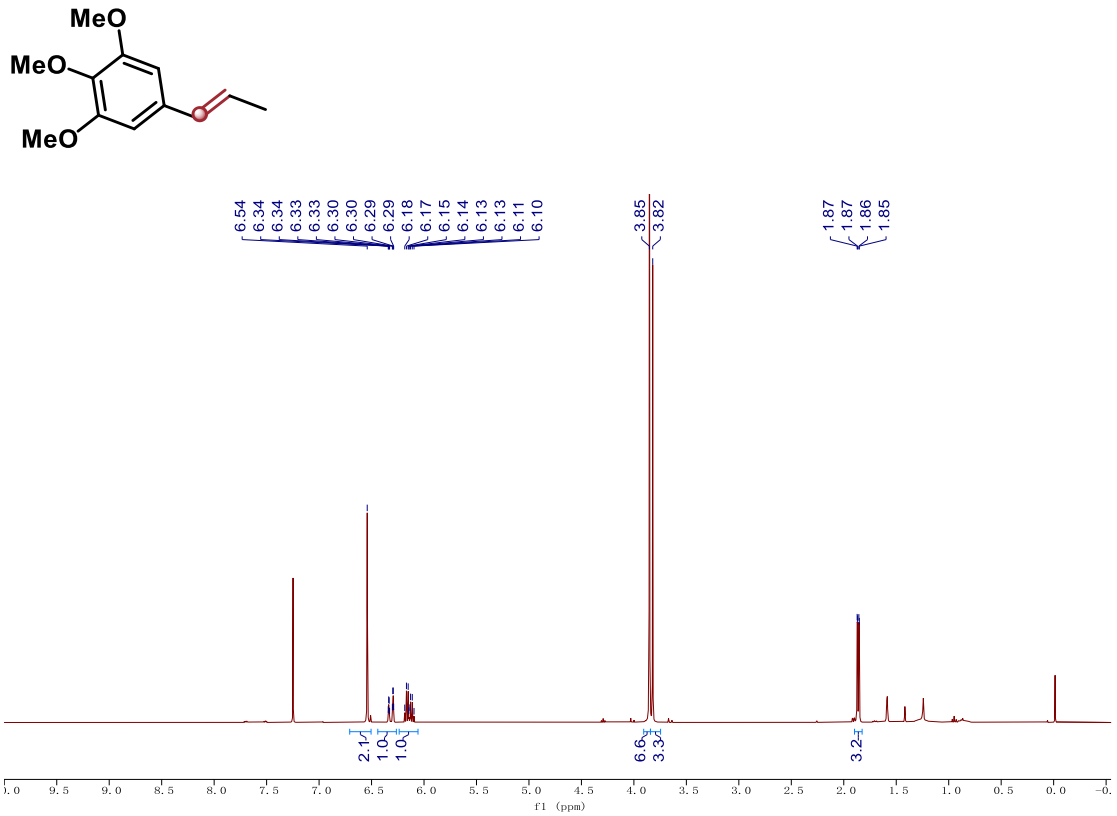




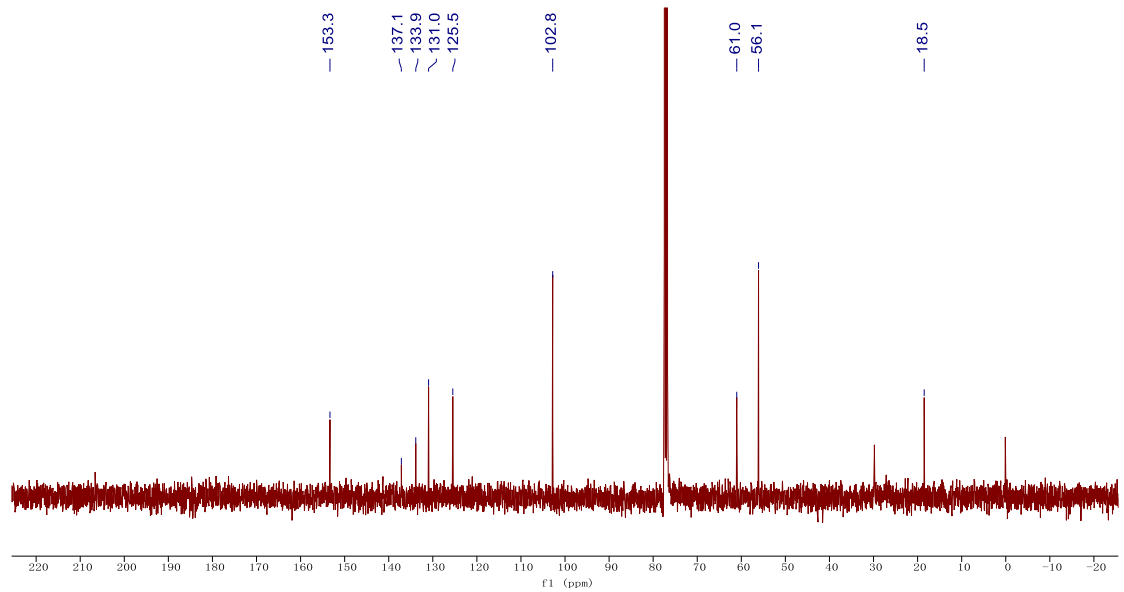
^{13}C NMR of compound **8** (101 MHz in $CDCl_3$)



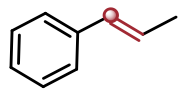
^{1}H NMR of compound **9** (400 MHz in $CDCl_3$)

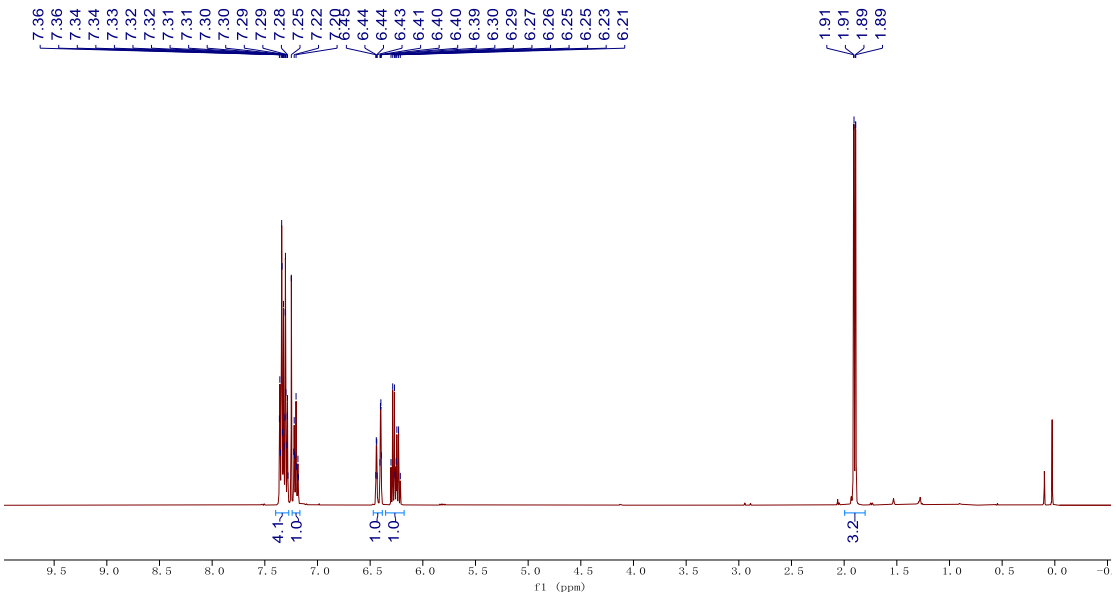


^{13}C NMR of compound **9** (101 MHz in $CDCl_3$)

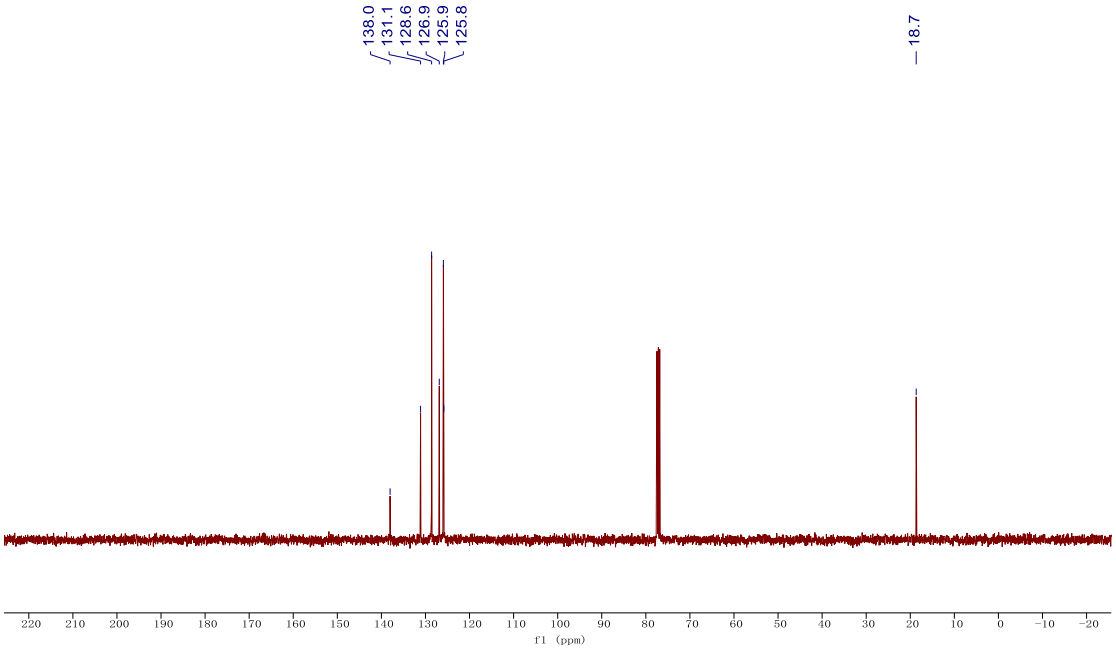


^{1}H NMR of compound **10** (400 MHz in $CDCl_3$)

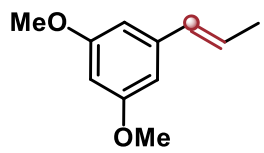


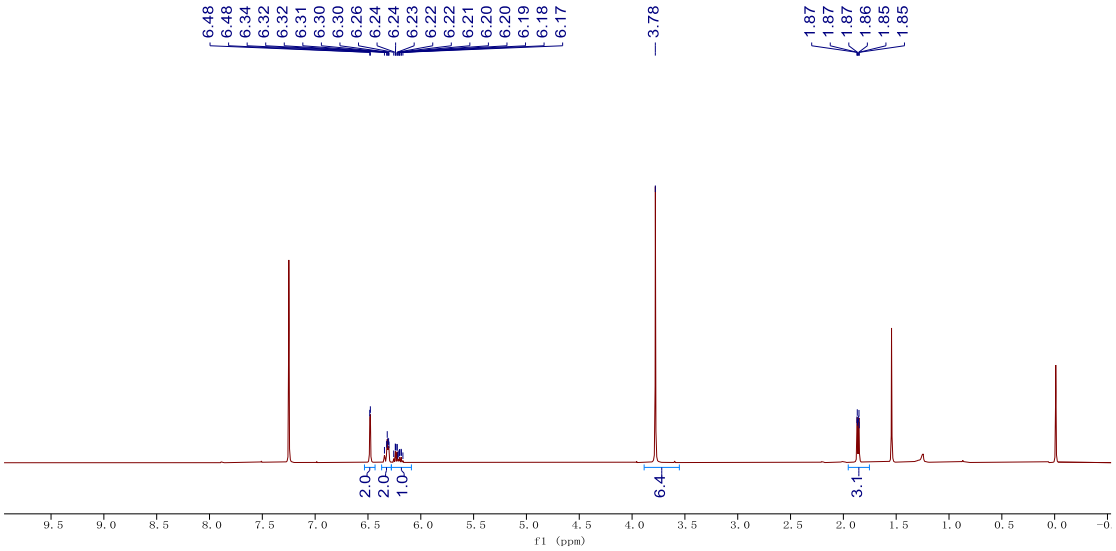


^{13}C NMR of compound **10** (101 MHz in $CDCl_3$)

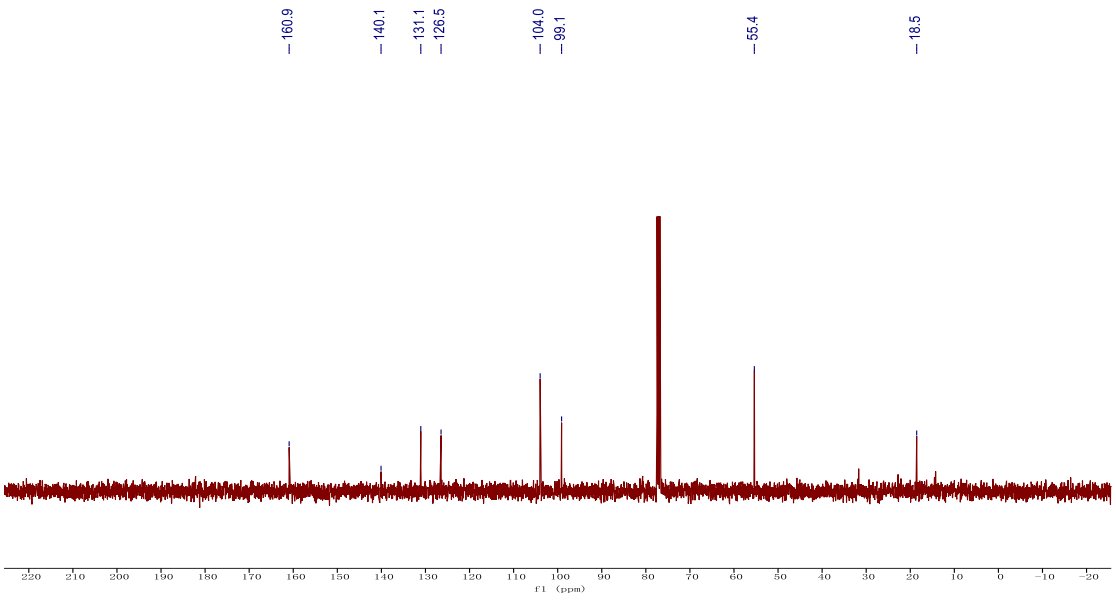


^{1}H NMR of compound **11** (400 MHz in $CDCl_3$)

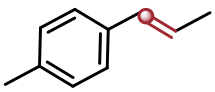


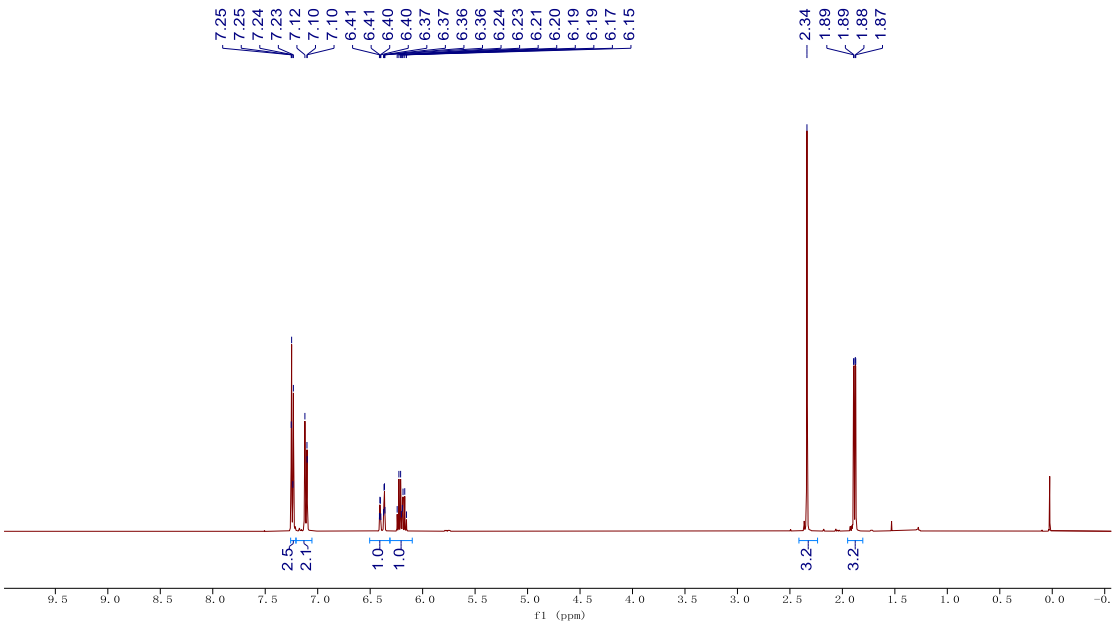


^{13}C NMR of compound **11** (101 MHz in $CDCl_3$)

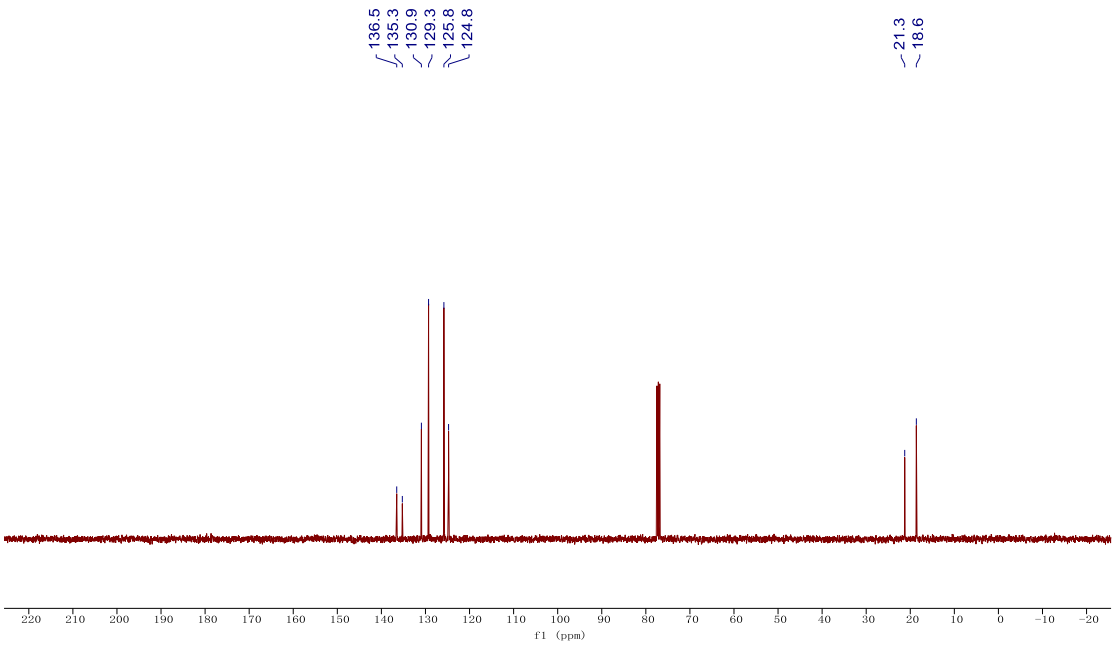


^{1}H NMR of compound **12** (400 MHz in $CDCl_3$)

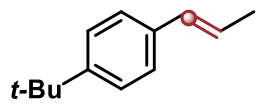


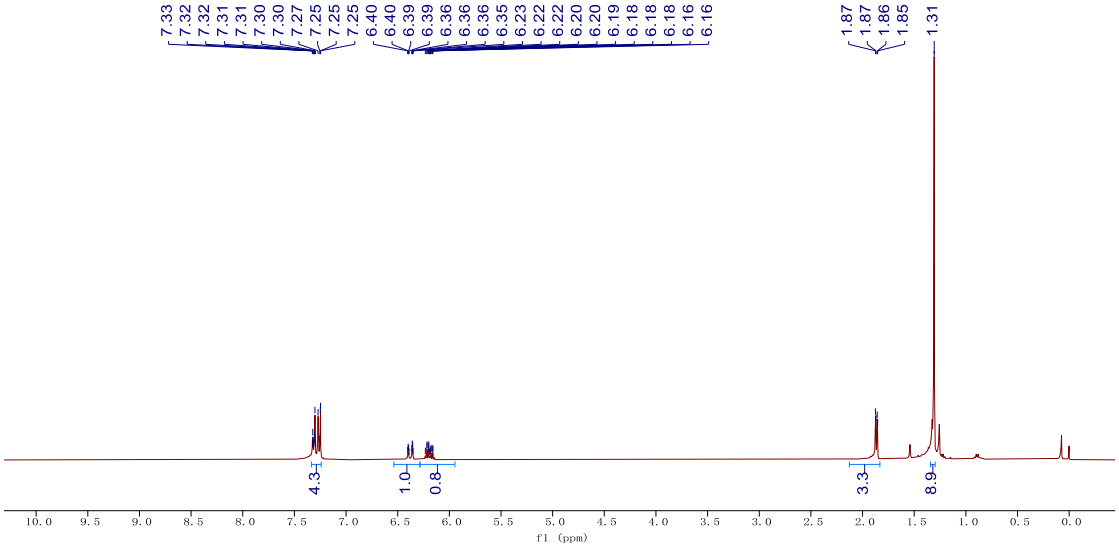


^{13}C NMR of compound **12** (101 MHz in $CDCl_3$)

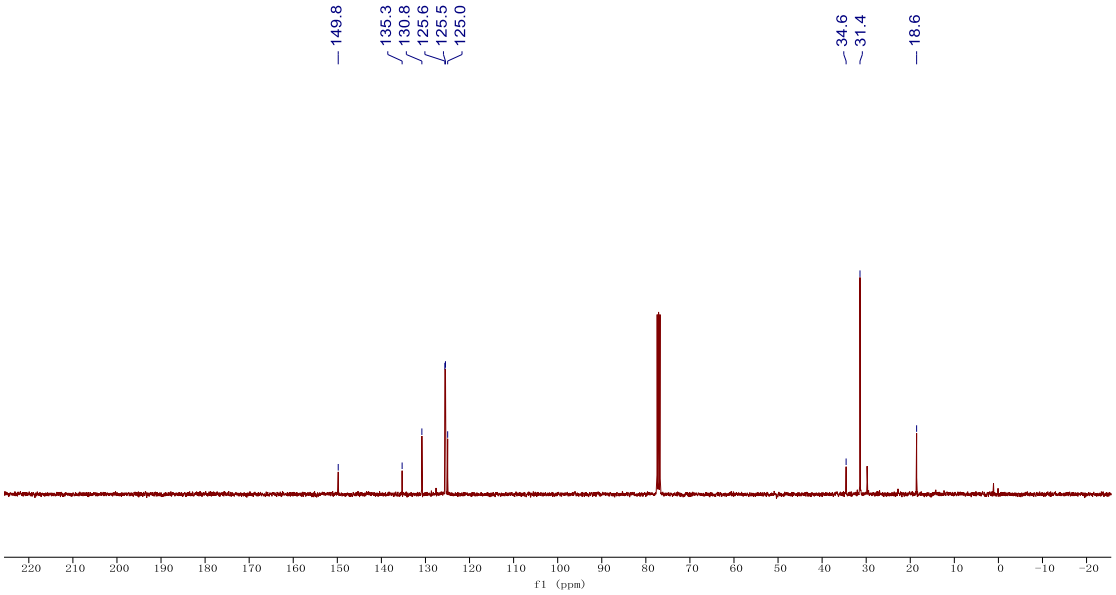


^{1}H NMR of compound **13** (400 MHz in $CDCl_3$)

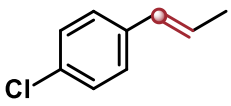


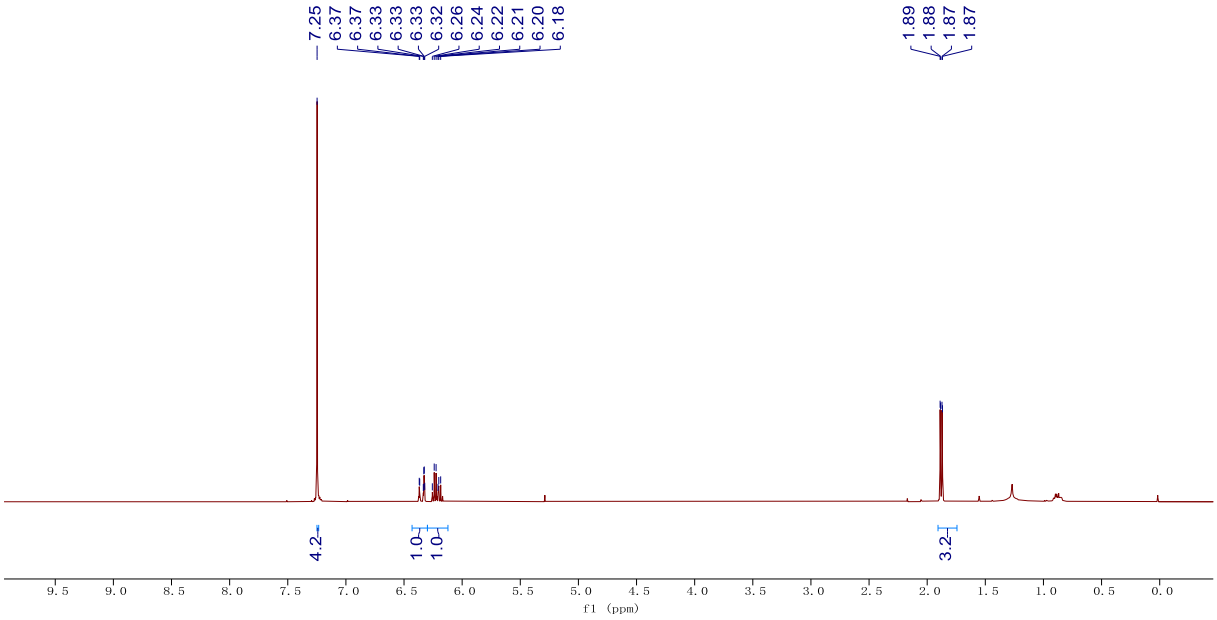


^{13}C NMR of compound **13** (101 MHz in $CDCl_3$)

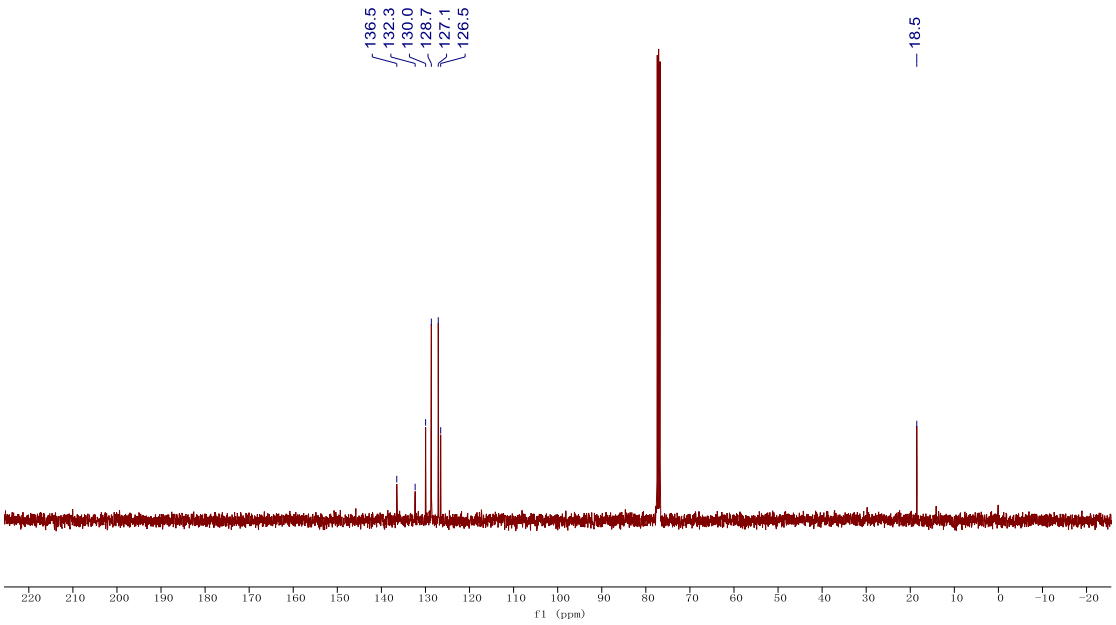


^{1}H NMR of compound **14** (400 MHz in $CDCl_3$)

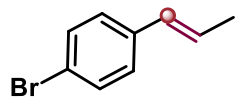


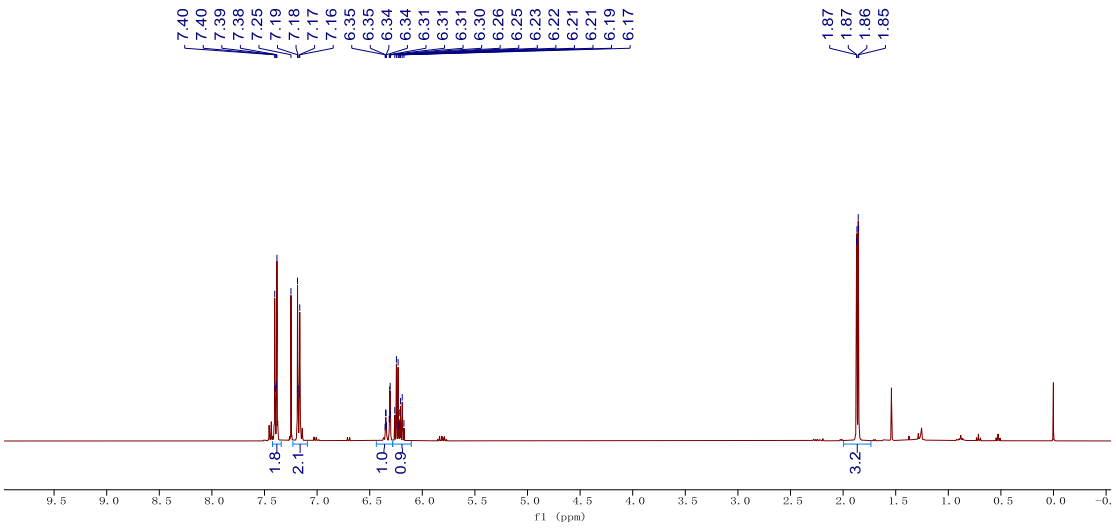


^{13}C NMR of compound **14** (101 MHz in $CDCl_3$)

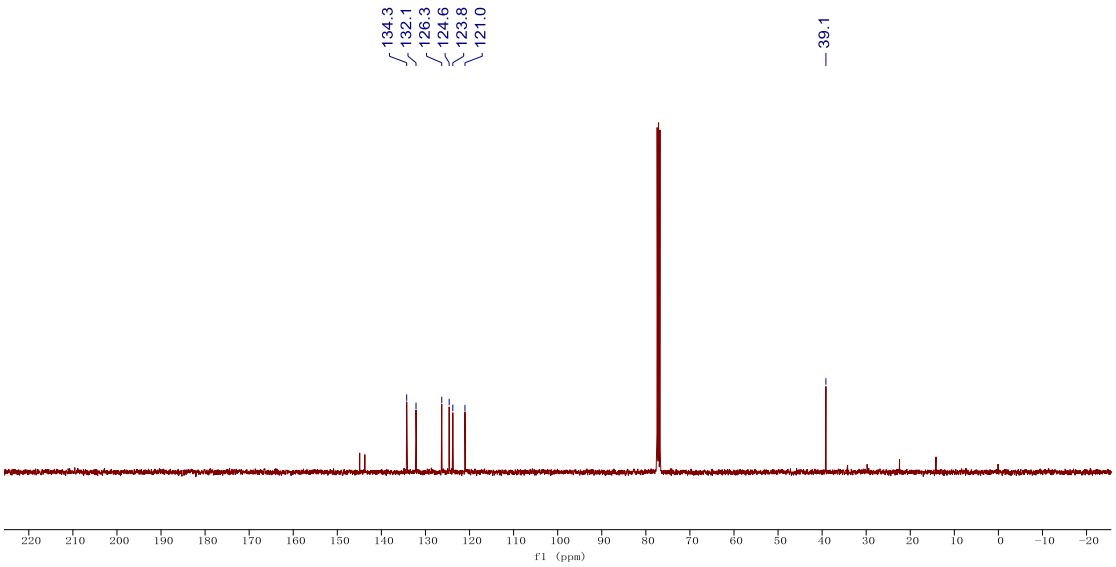


^{1}H NMR of compound **15** (400 MHz in $CDCl_3$)

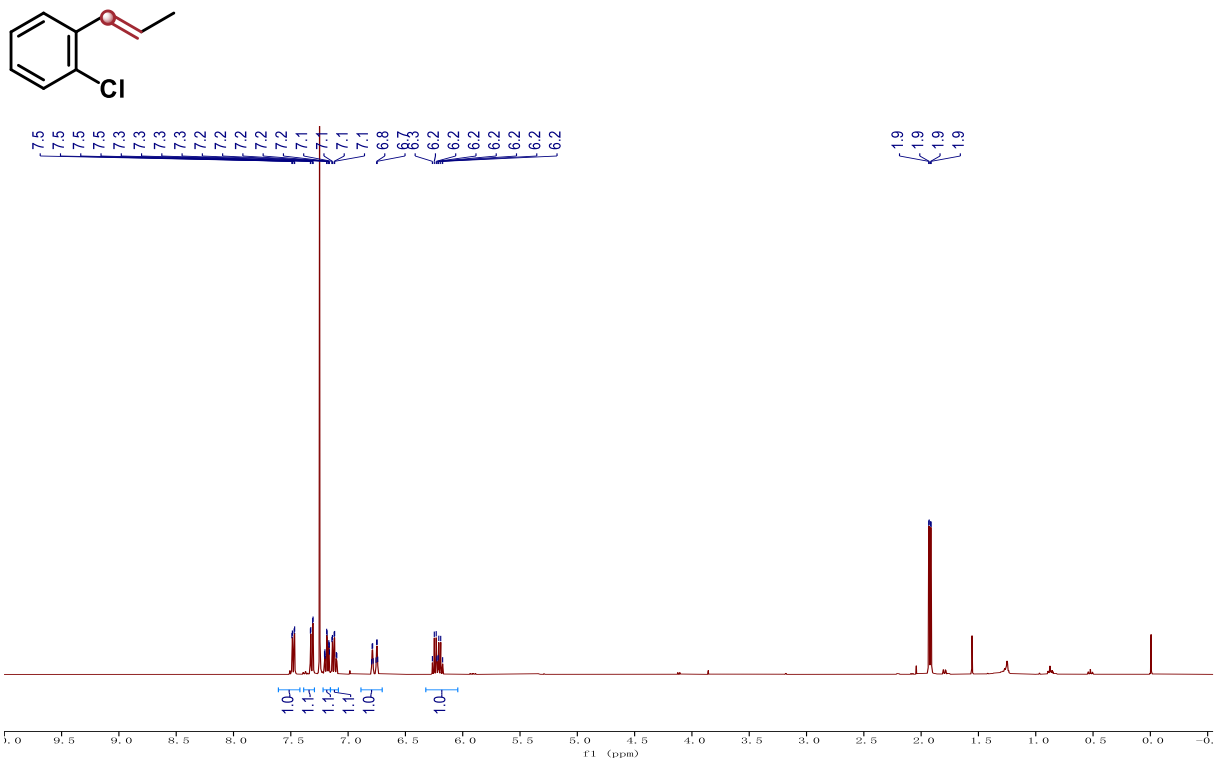




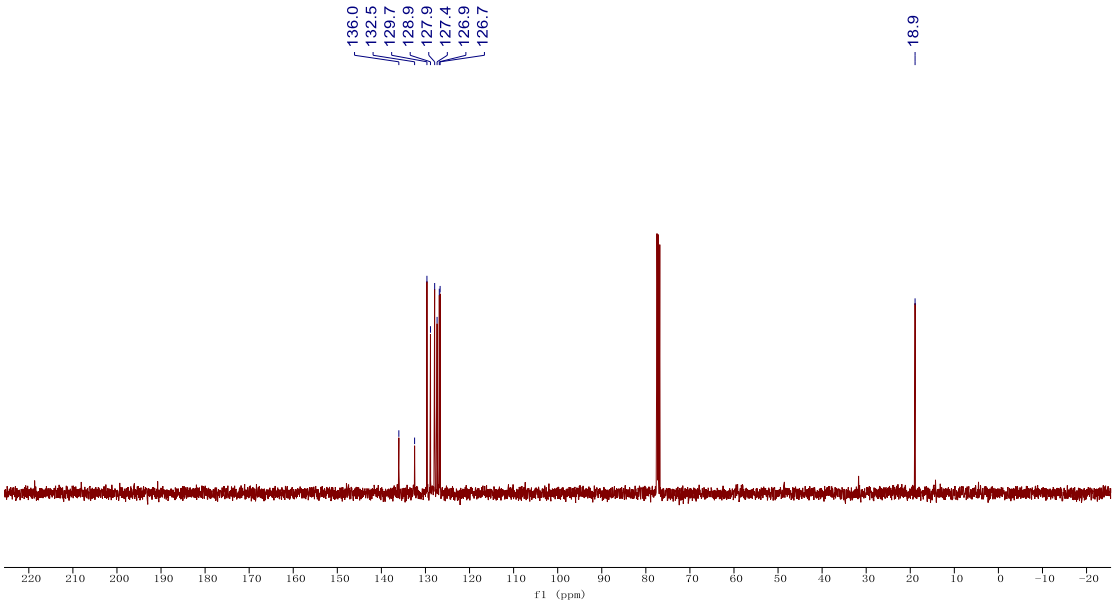
^{13}C NMR of compound **15** (101 MHz in $CDCl_3$)



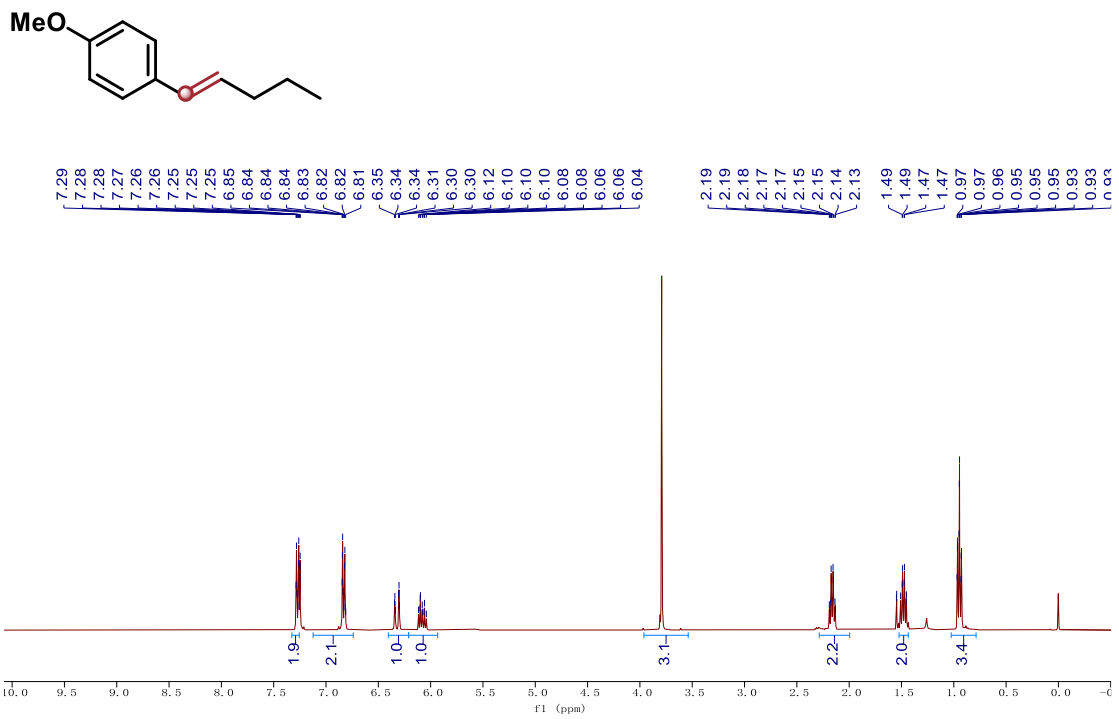
^{1}H NMR of compound **16** (400 MHz in $CDCl_3$)



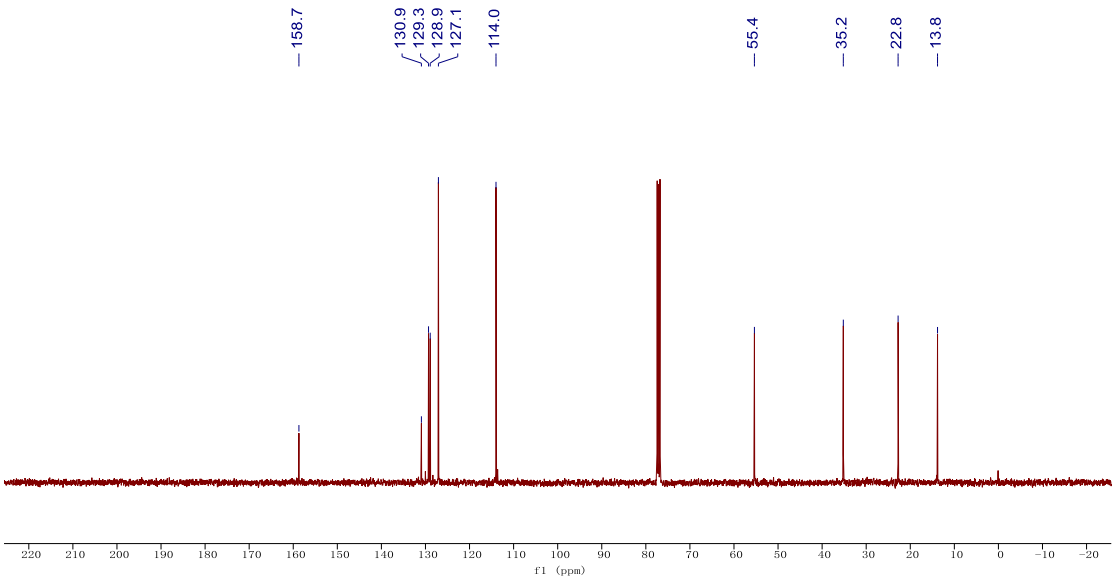
^{13}C NMR of compound **16** (101 MHz in $CDCl_3$)



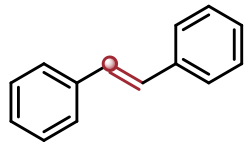
^{1}H NMR of compound **17** (400 MHz in $CDCl_3$)

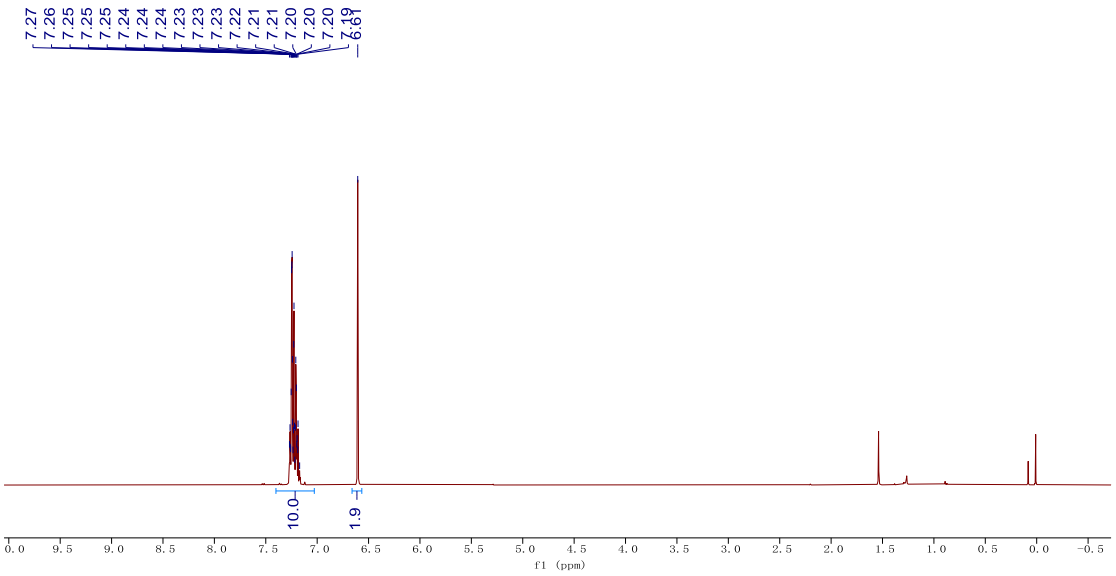


^{13}C NMR of compound **17** (101 MHz in $CDCl_3$)

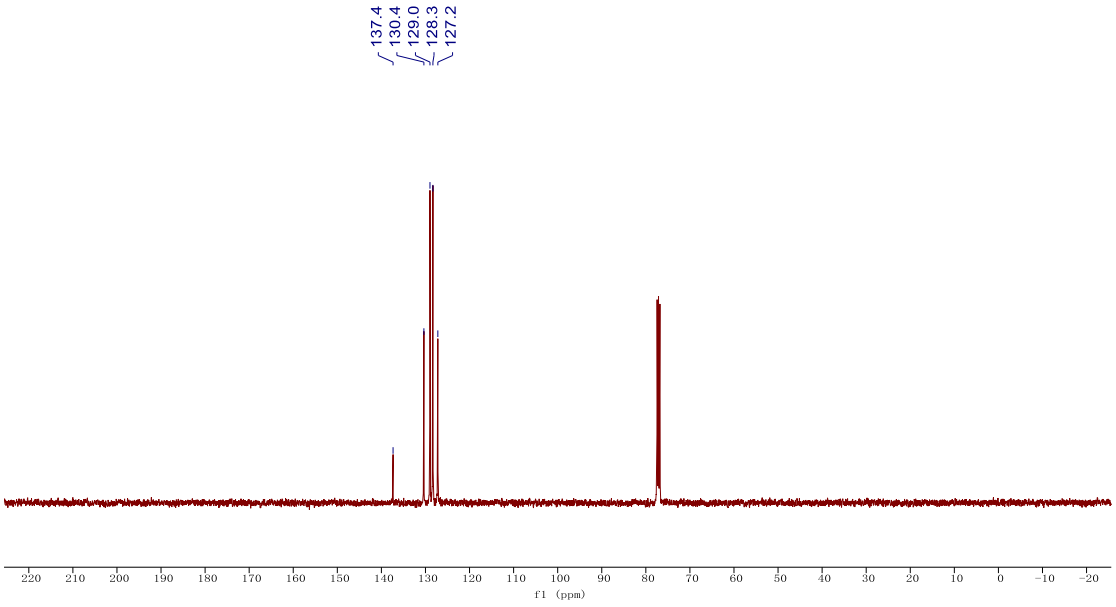


^{1}H NMR of compound **18** (400 MHz in $CDCl_3$)

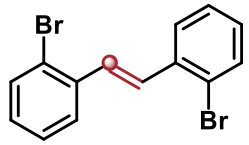


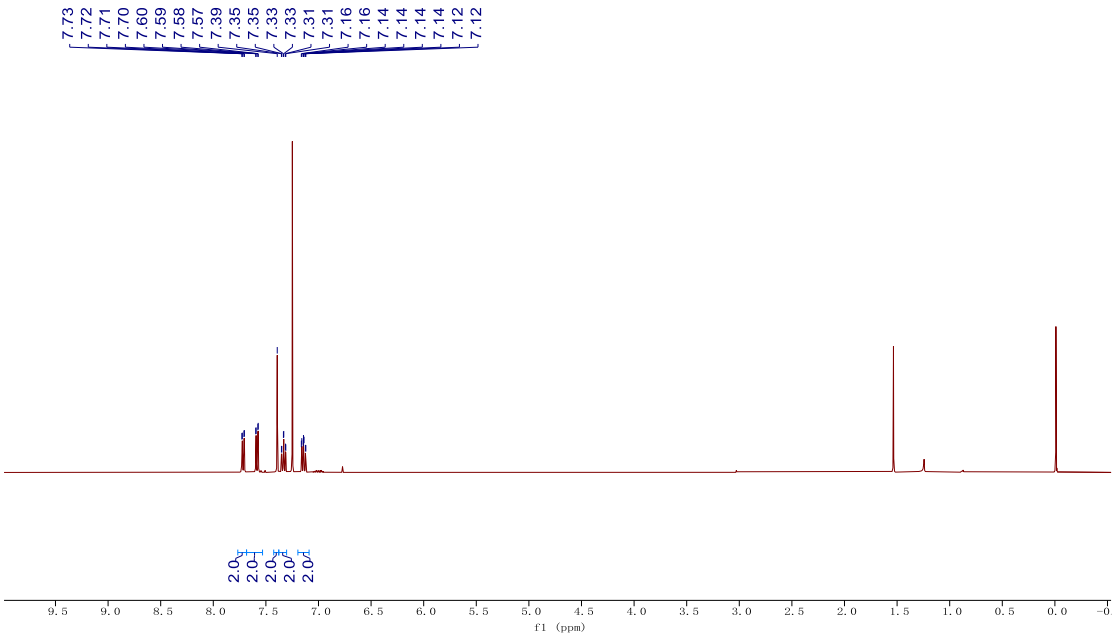


^{13}C NMR of compound **18** (101 MHz in $CDCl_3$)

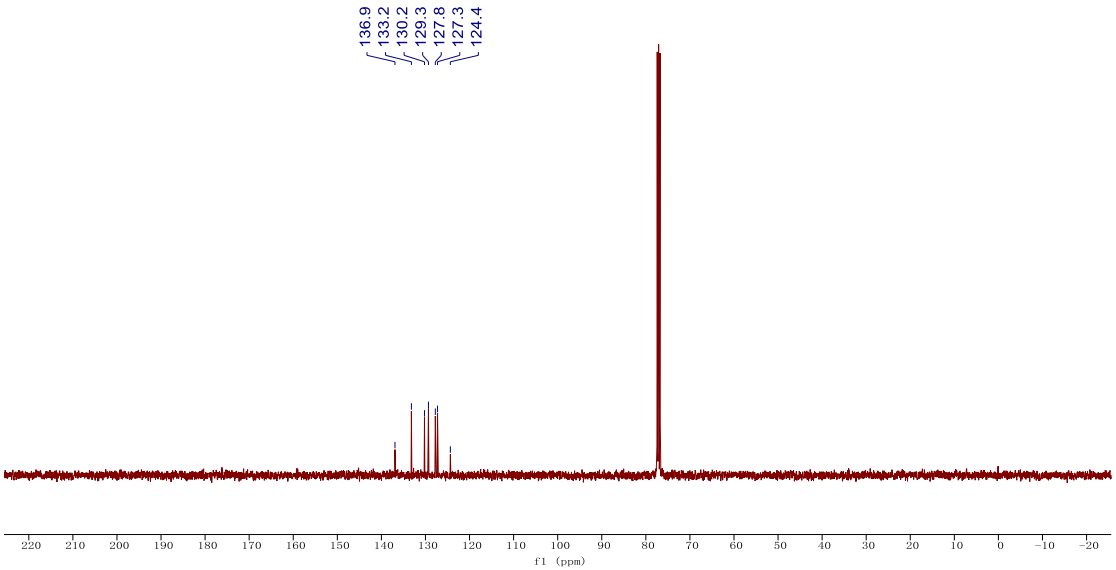


^{1}H NMR of compound **19** (400 MHz in $CDCl_3$)

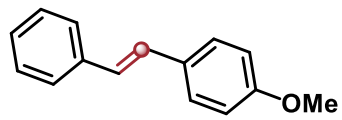


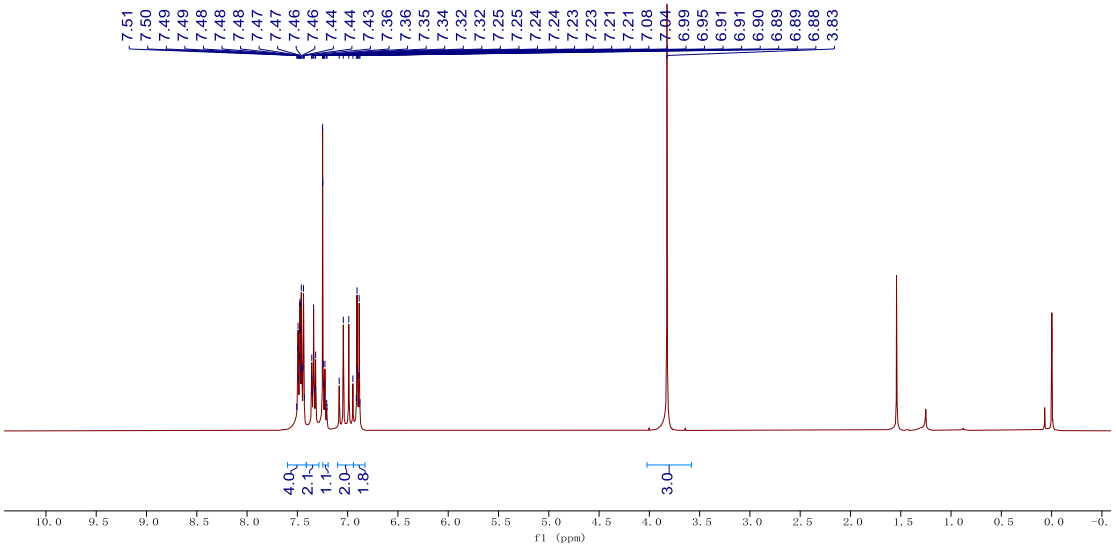


^{13}C NMR of compound **19** (101 MHz in $CDCl_3$)

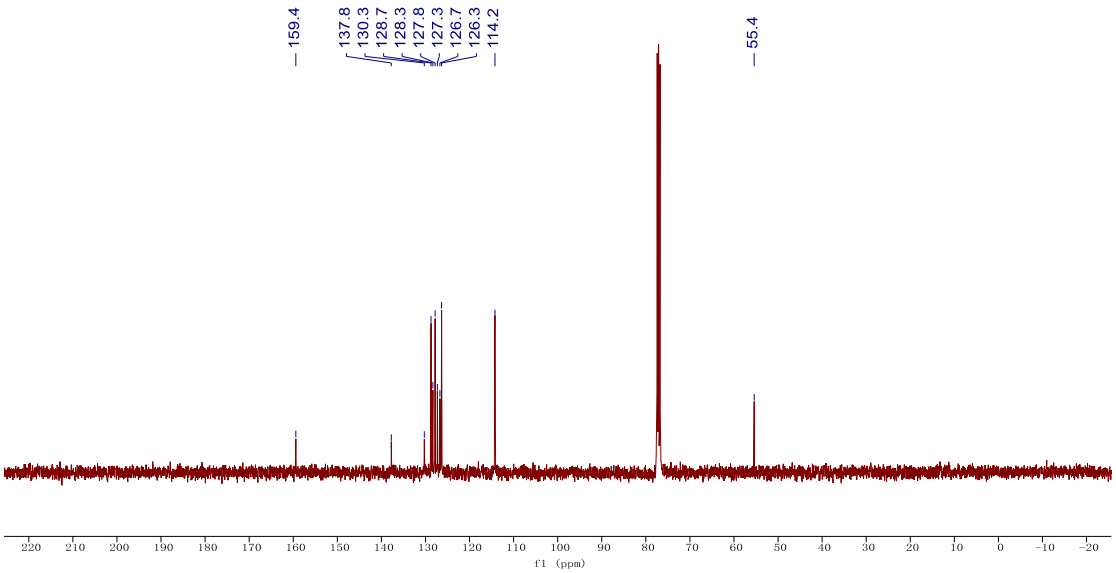


^{1}H NMR of compound **20** (400 MHz in $CDCl_3$)

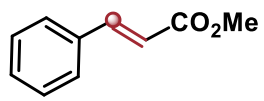


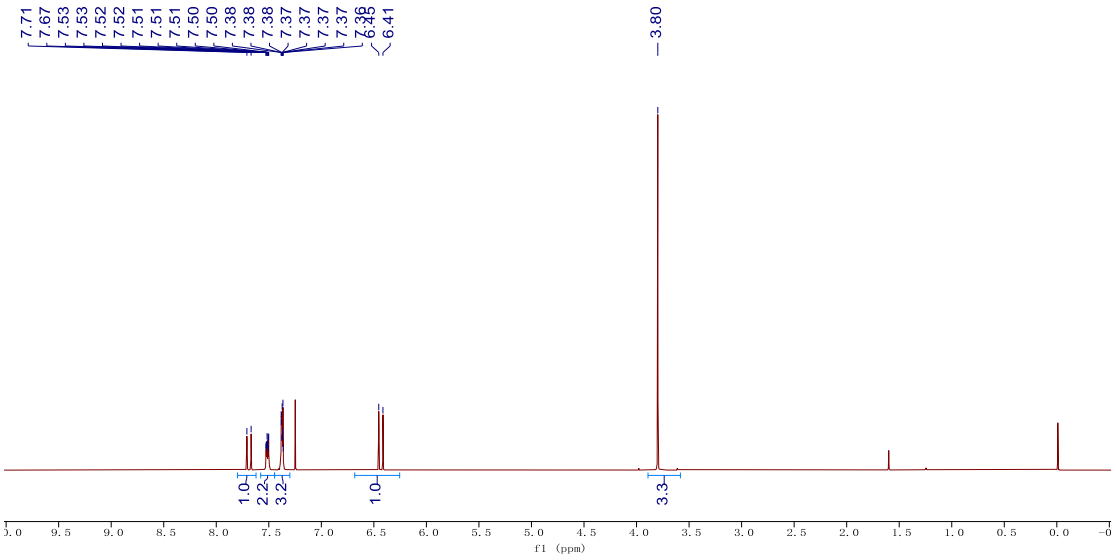


^{13}C NMR of compound **20** (101 MHz in $CDCl_3$)

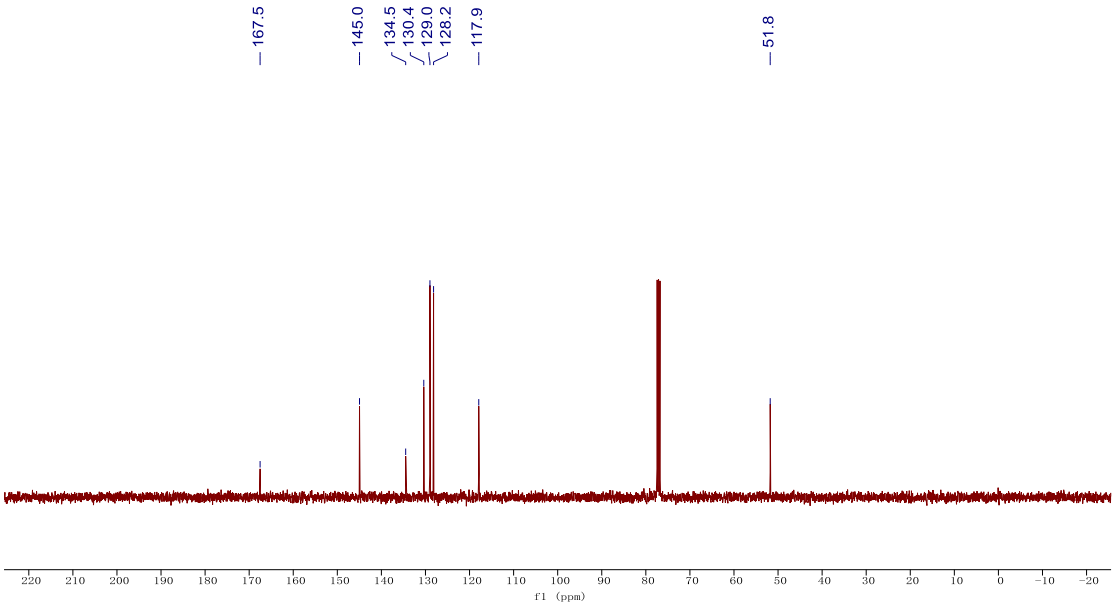


^{1}H NMR of compound **21** (400 MHz in $CDCl_3$)

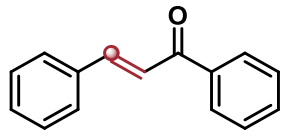


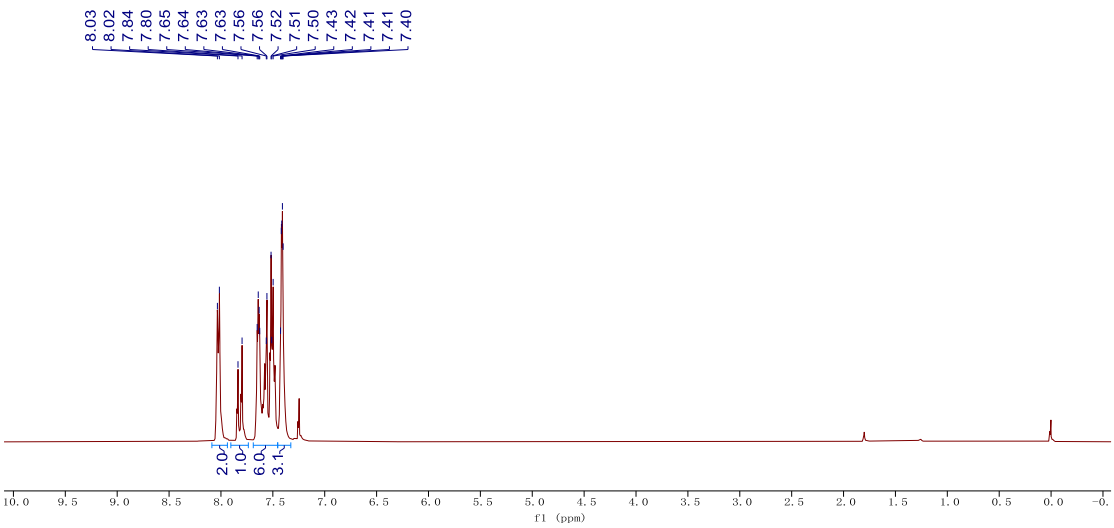


^{13}C NMR of compound **21** (101 MHz in $CDCl_3$)

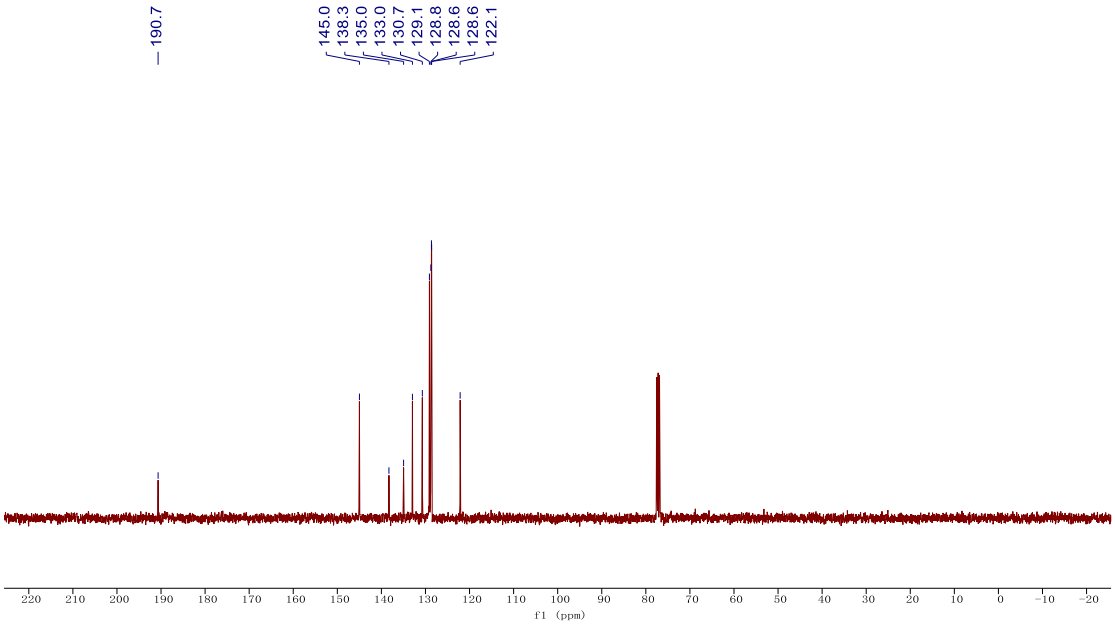


^{1}H NMR of compound **22** (400 MHz in $CDCl_3$)

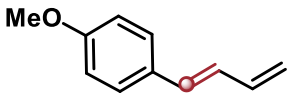


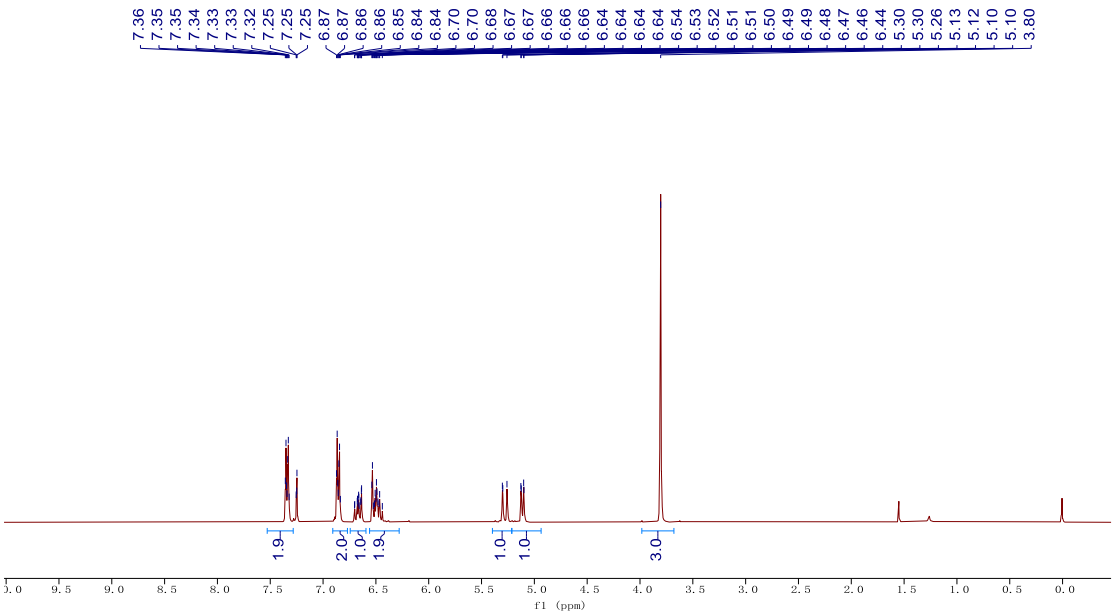


^{13}C NMR of compound **22** (101 MHz in $CDCl_3$)

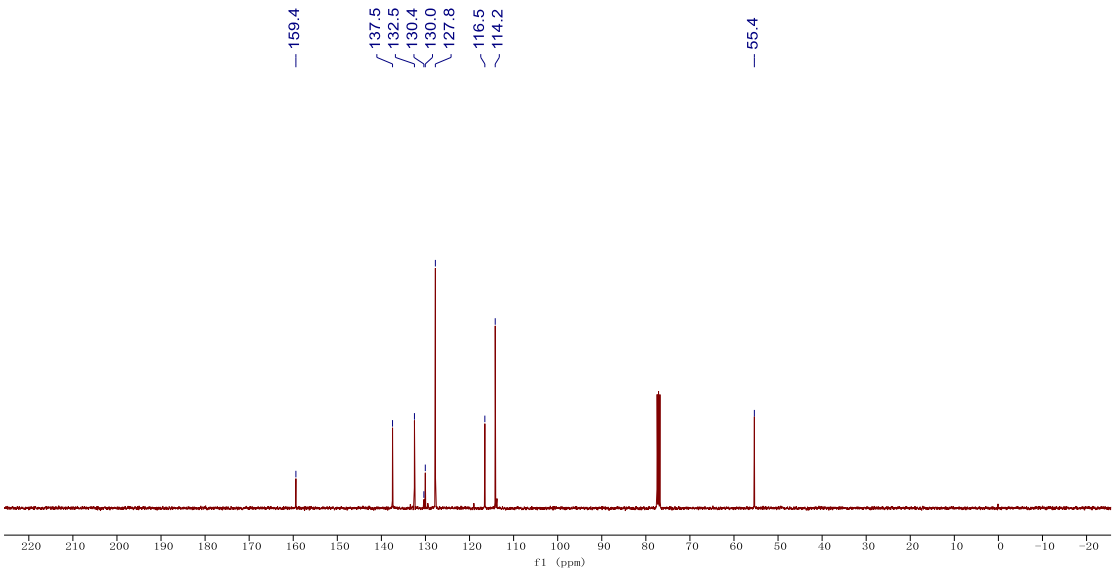


^{1}H NMR of compound **23** (400 MHz in $CDCl_3$)

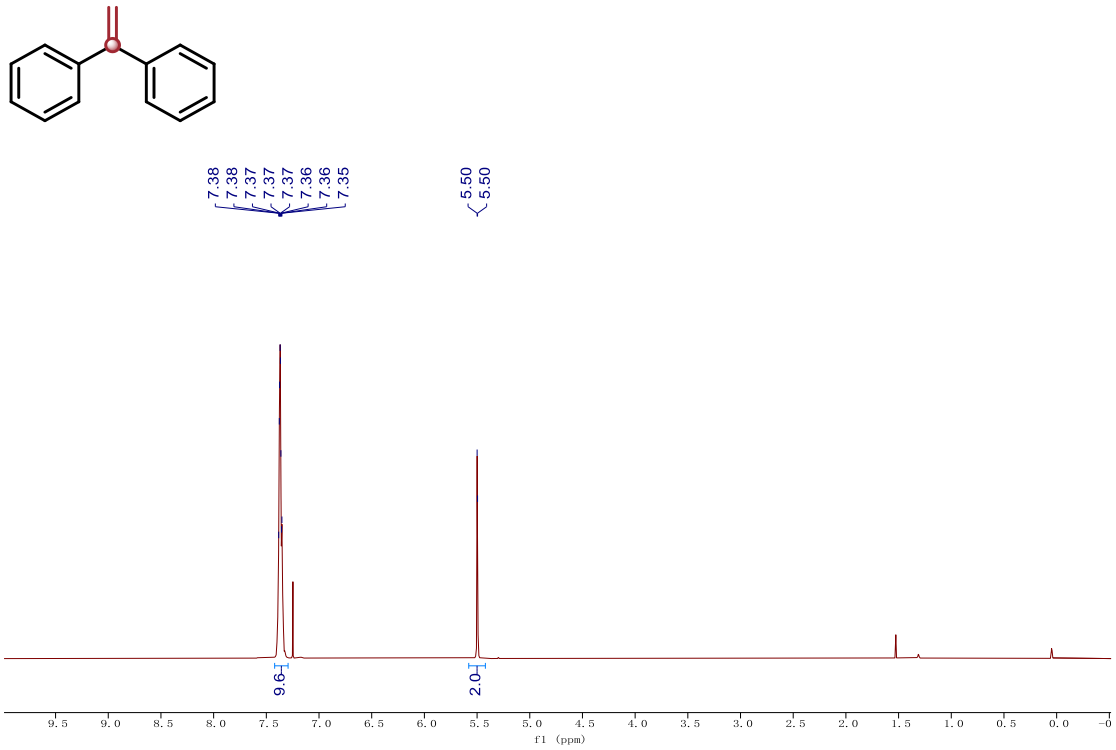




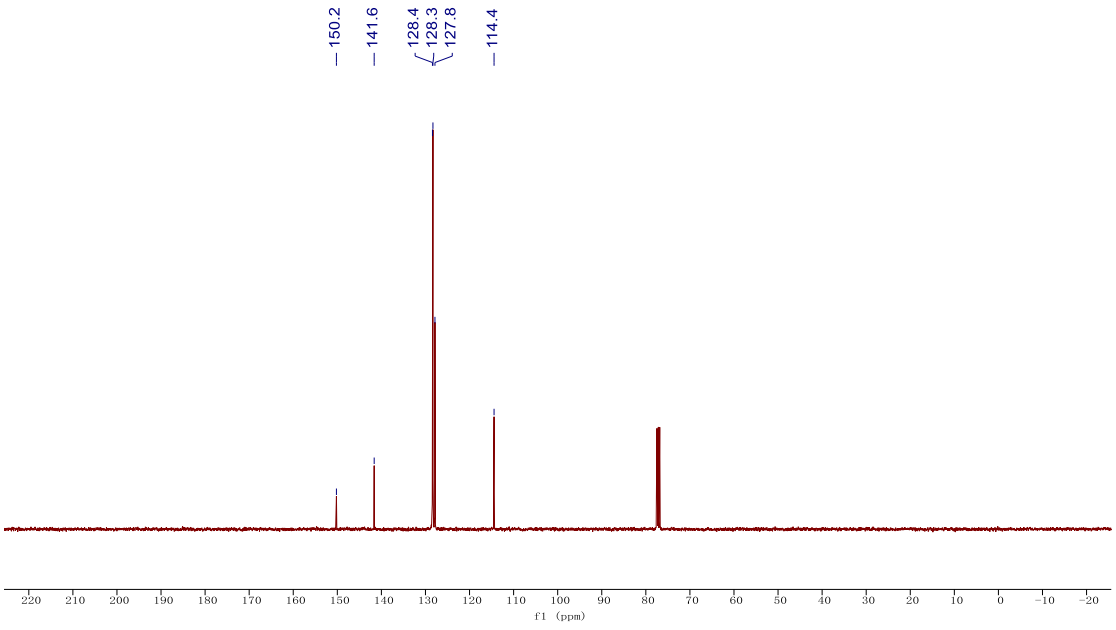
^{13}C NMR of compound **23** (101 MHz in $CDCl_3$)



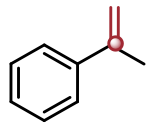
^{1}H NMR of compound **24** (400 MHz in $CDCl_3$)

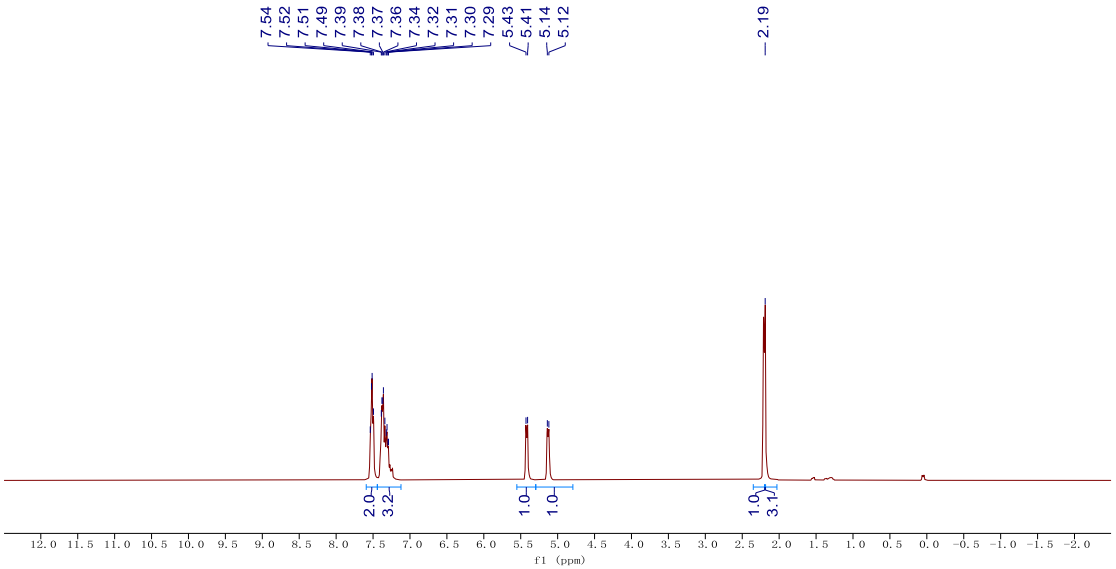


^{13}C NMR of compound **24** (101 MHz in $CDCl_3$)

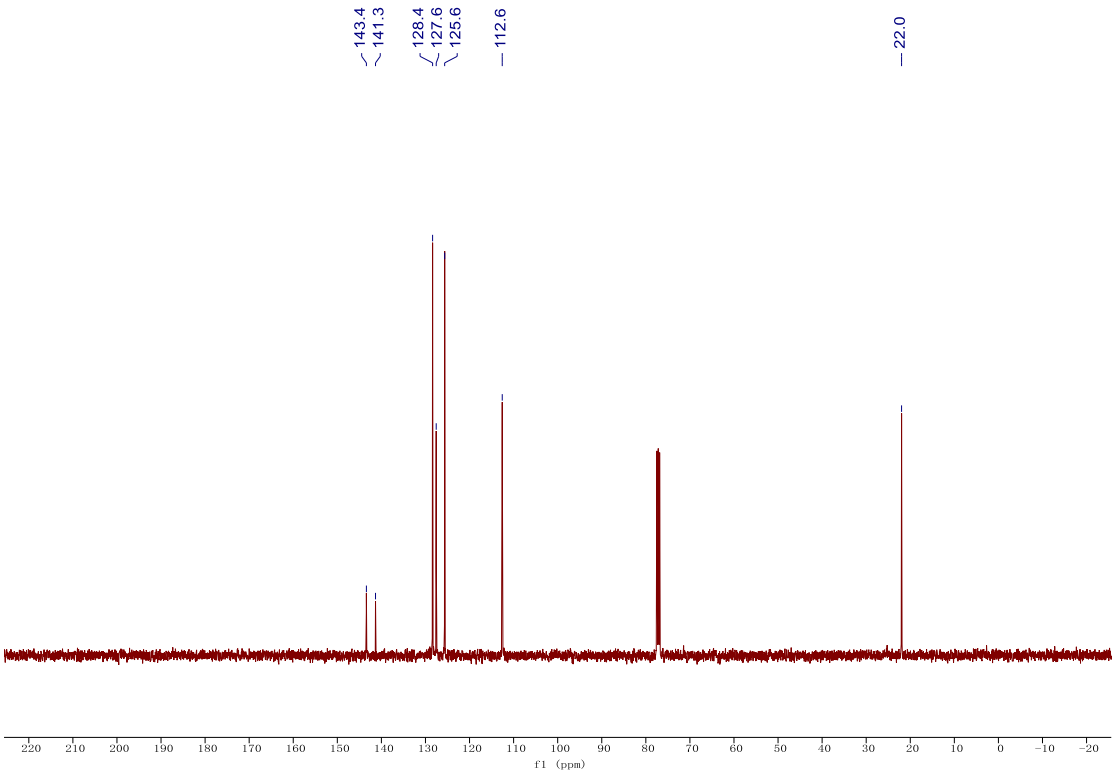


^{1}H NMR of compound **25** (400 MHz in $CDCl_3$)

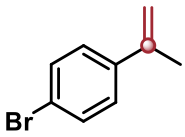


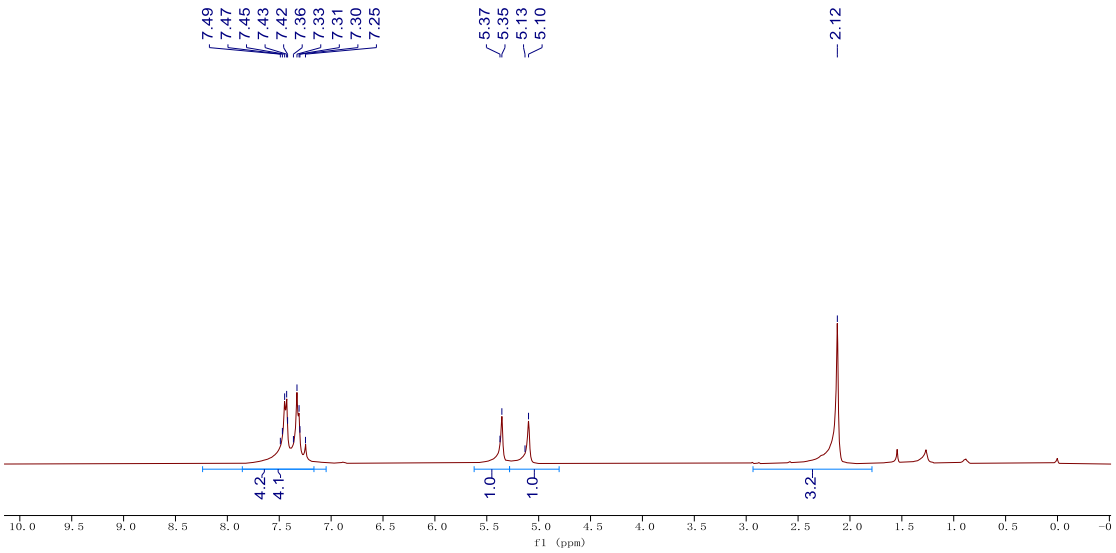


^{13}C NMR of compound **25** (101 MHz in $CDCl_3$)

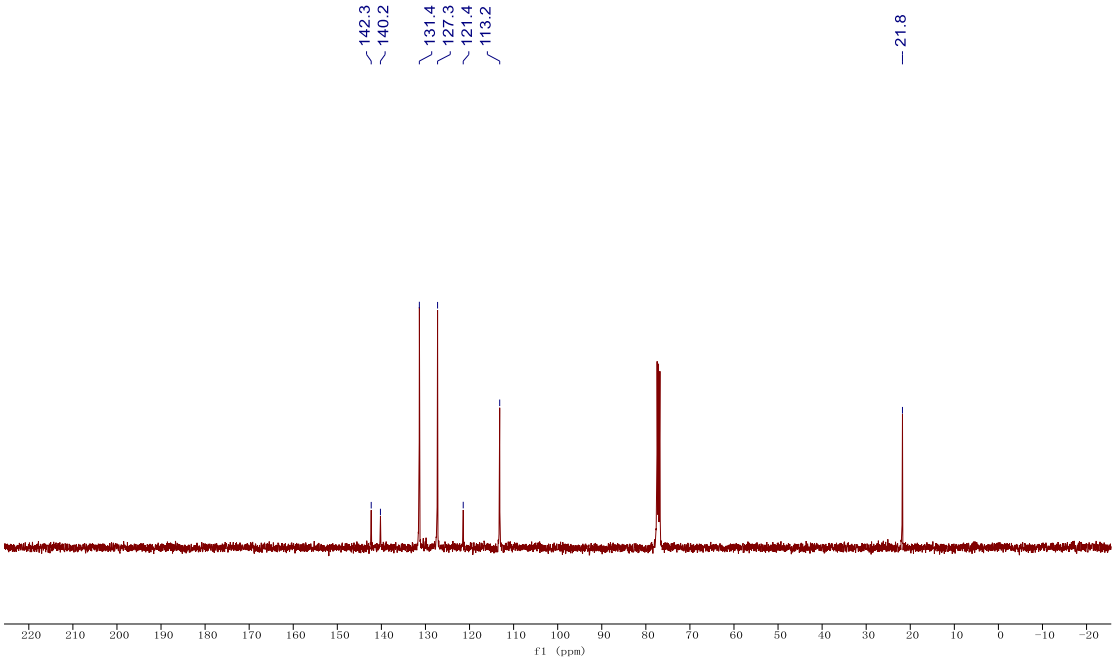


^{1}H NMR of compound **26** (400 MHz in $CDCl_3$)

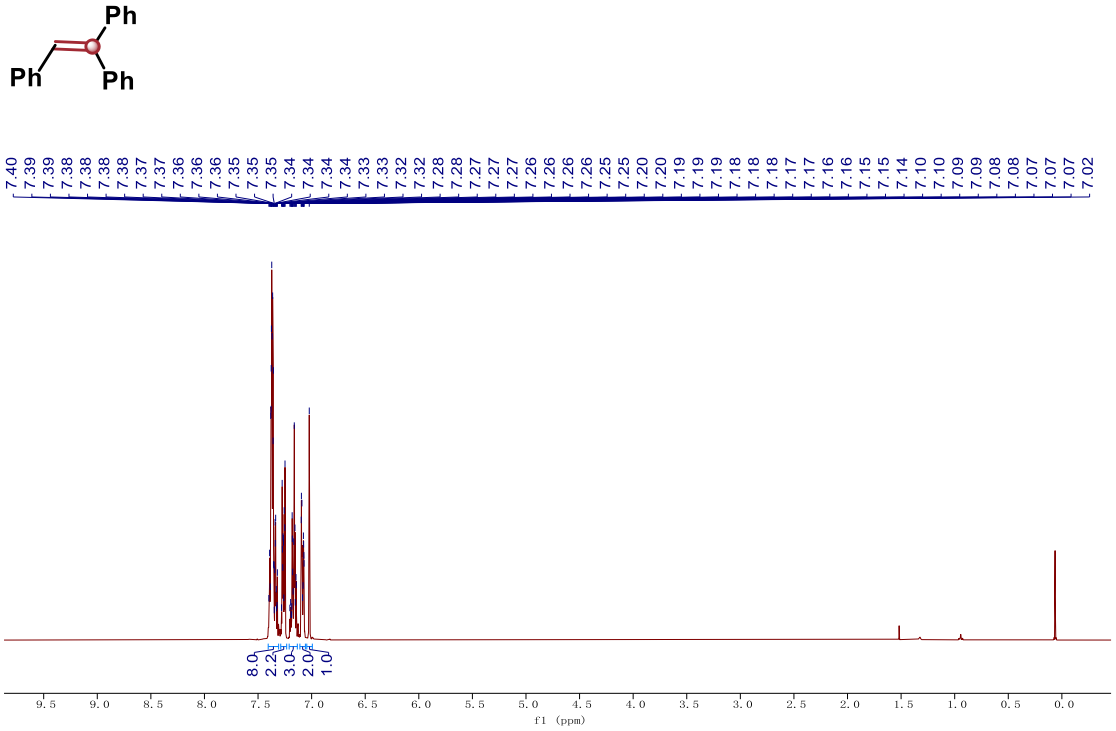




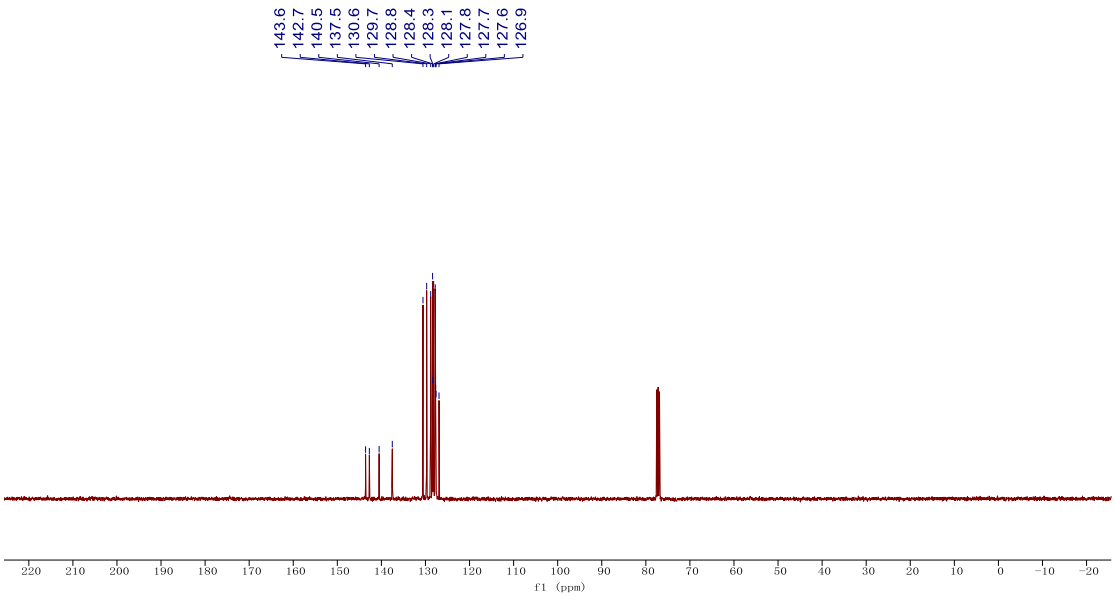
^{13}C NMR of compound **26** (101 MHz in $CDCl_3$)



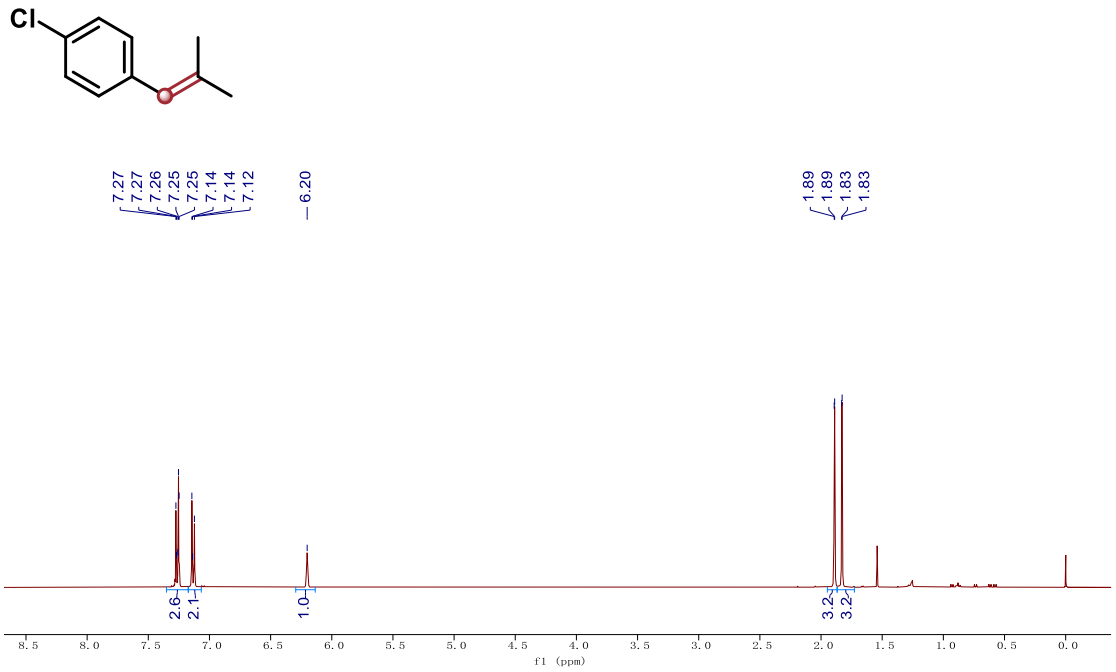
^{1}H NMR of compound **27** (400 MHz in $CDCl_3$)



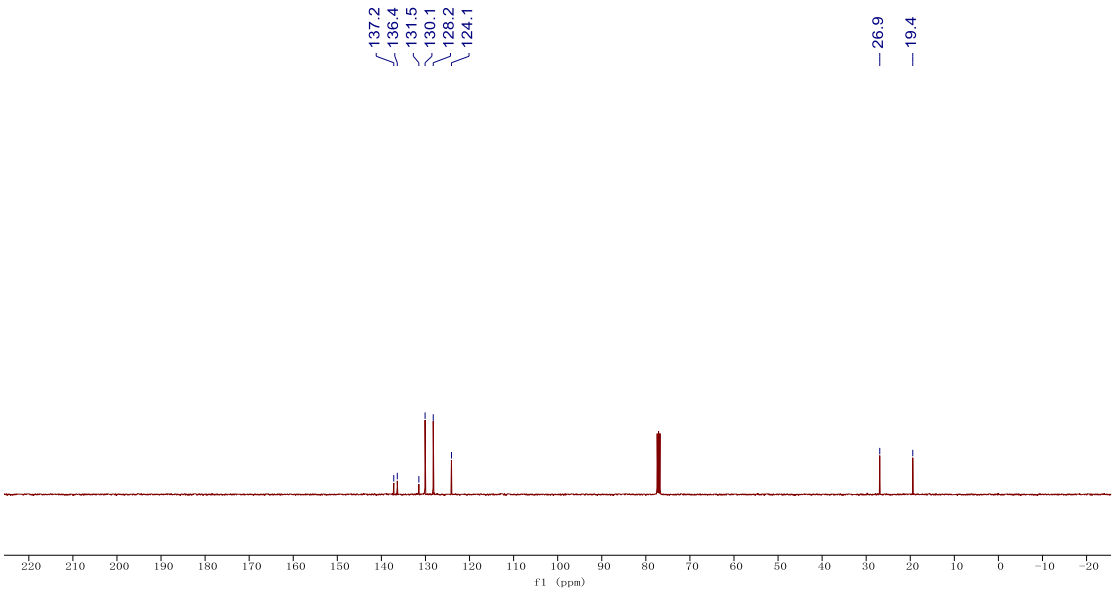
^{13}C NMR of compound **27** (101 MHz in $CDCl_3$)



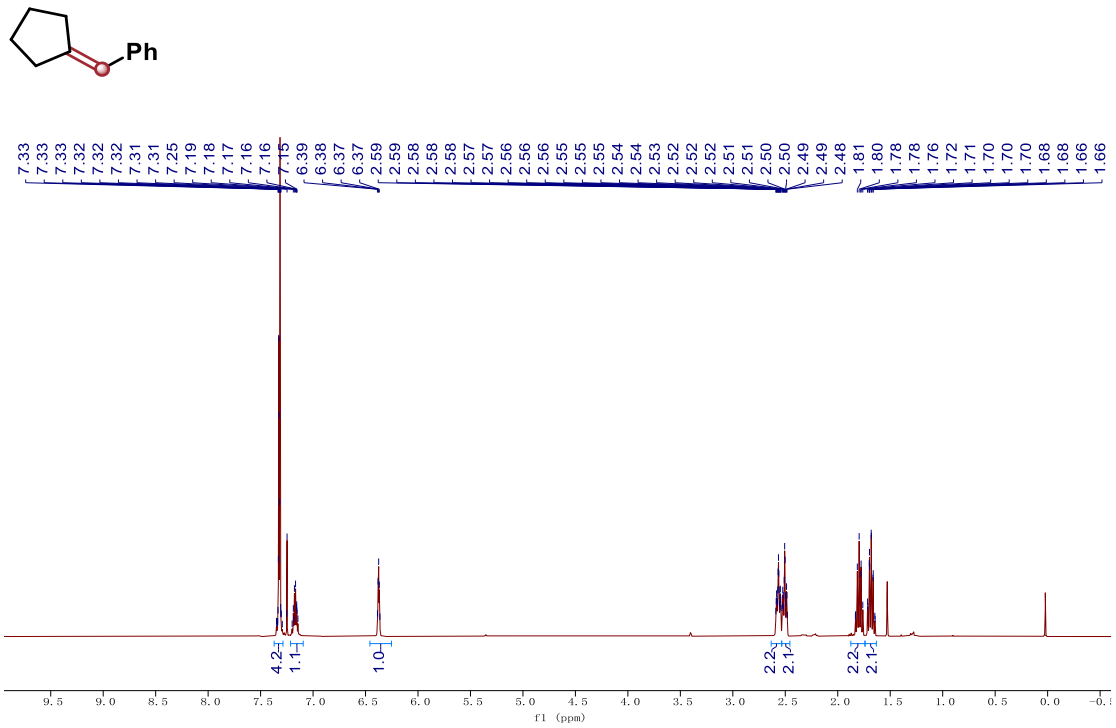
^{1}H NMR of compound **28** (400 MHz in $CDCl_3$)



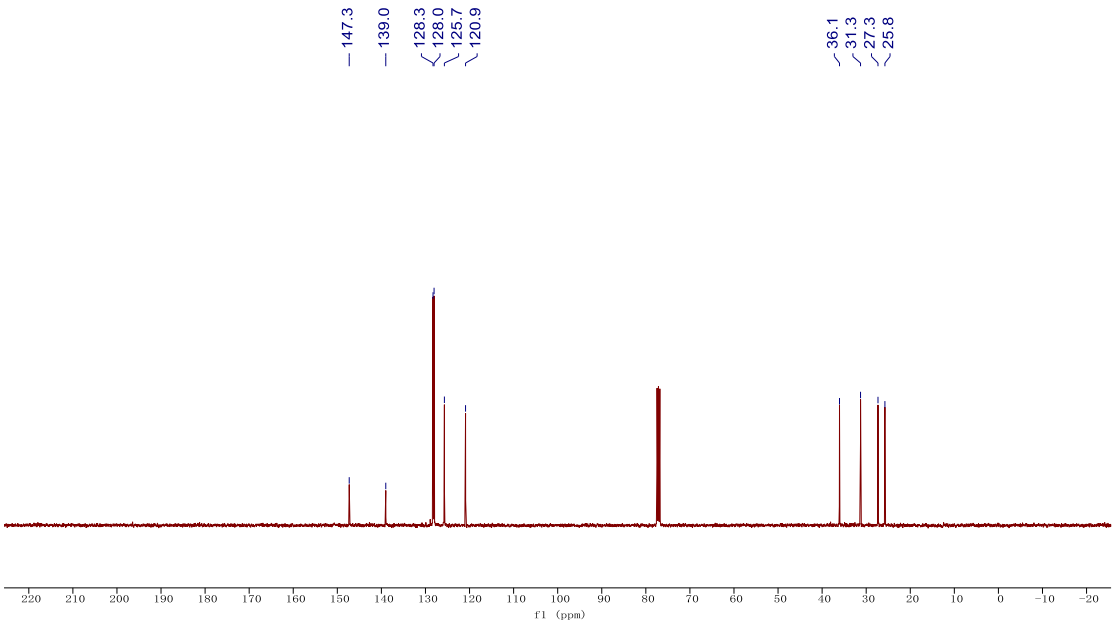
^{13}C NMR of compound **28** (101 MHz in $CDCl_3$)



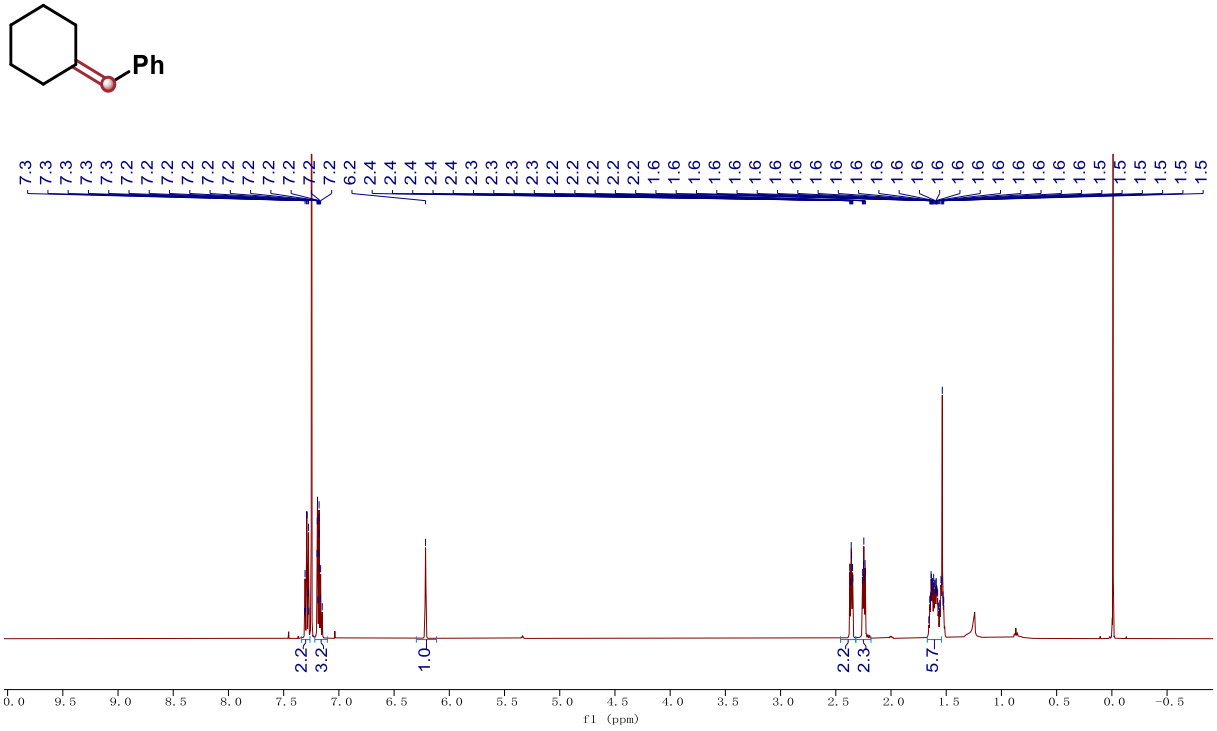
^{1}H NMR of compound **29** (400 MHz in $CDCl_3$)



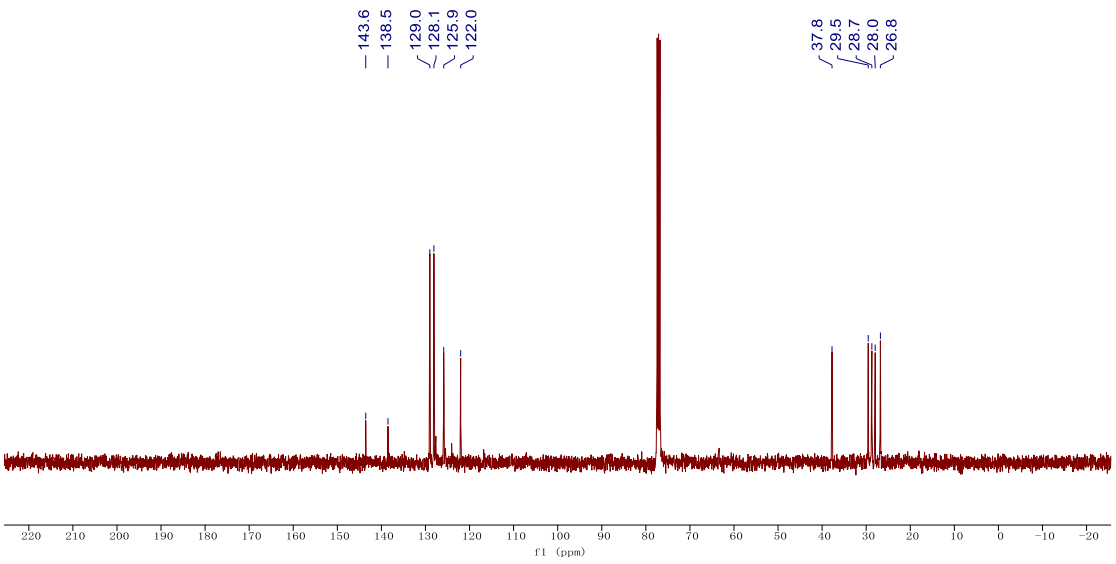
^{13}C NMR of compound **29** (101 MHz in $CDCl_3$)



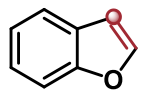
^{1}H NMR of compound **30** (500 MHz in $CDCl_3$)

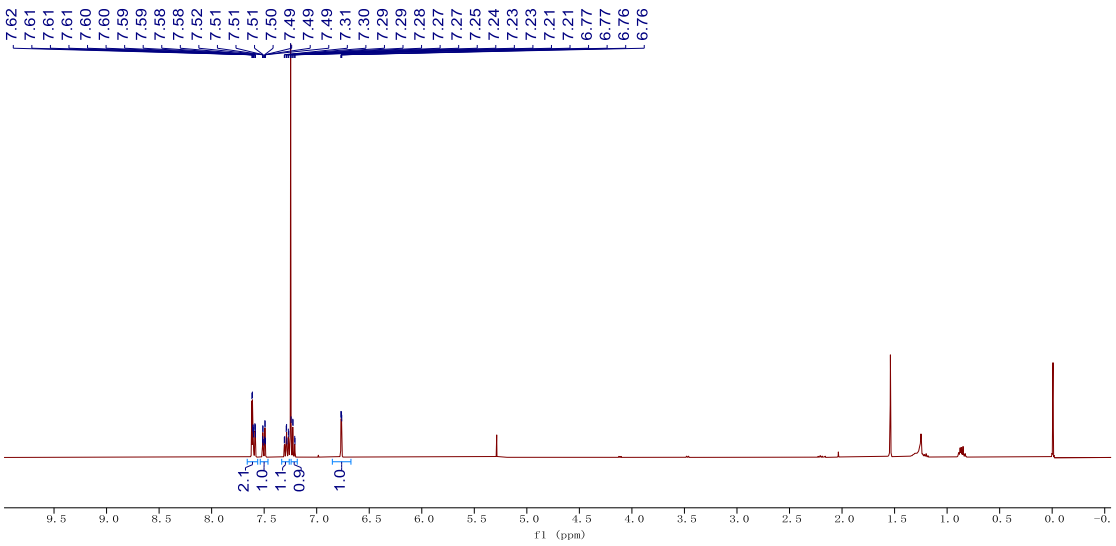


^{13}C NMR of compound **30** (101 MHz in $CDCl_3$)

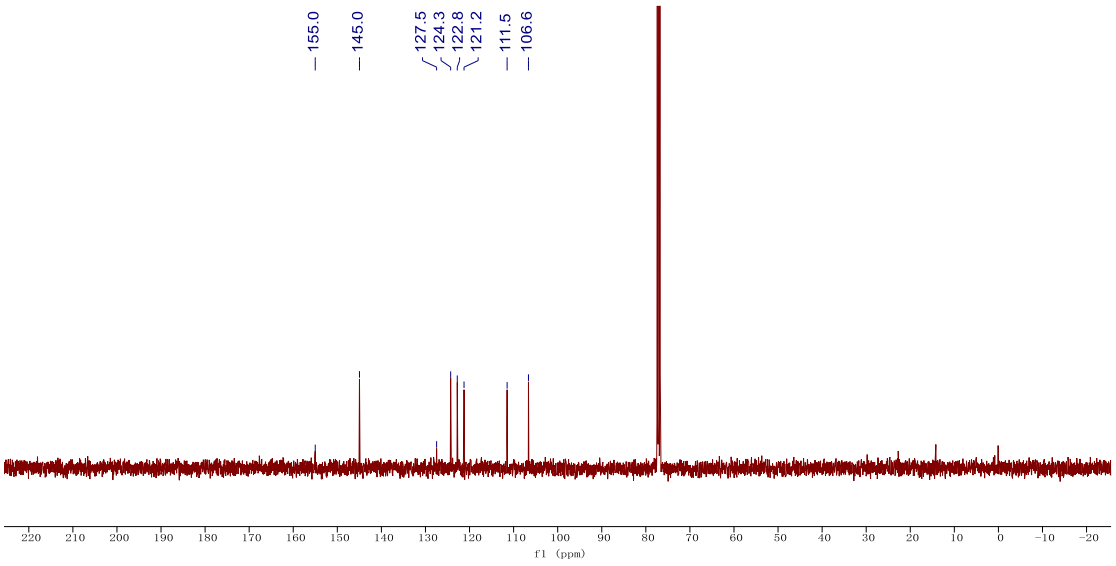


^{1}H NMR of compound **31** (400 MHz in $CDCl_3$)

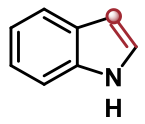


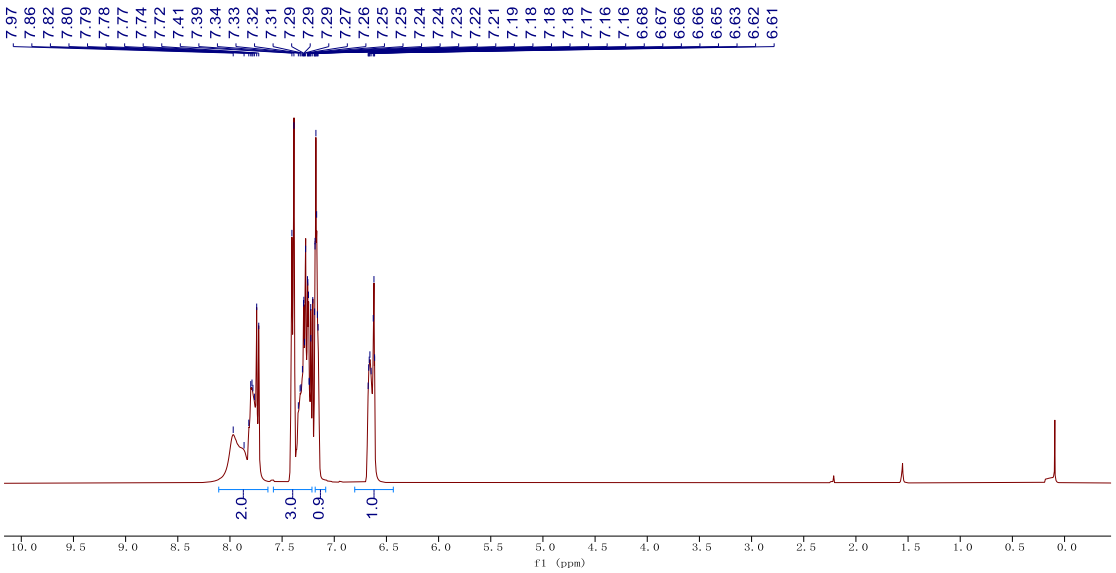


^{13}C NMR of compound **31** (101 MHz in $CDCl_3$)

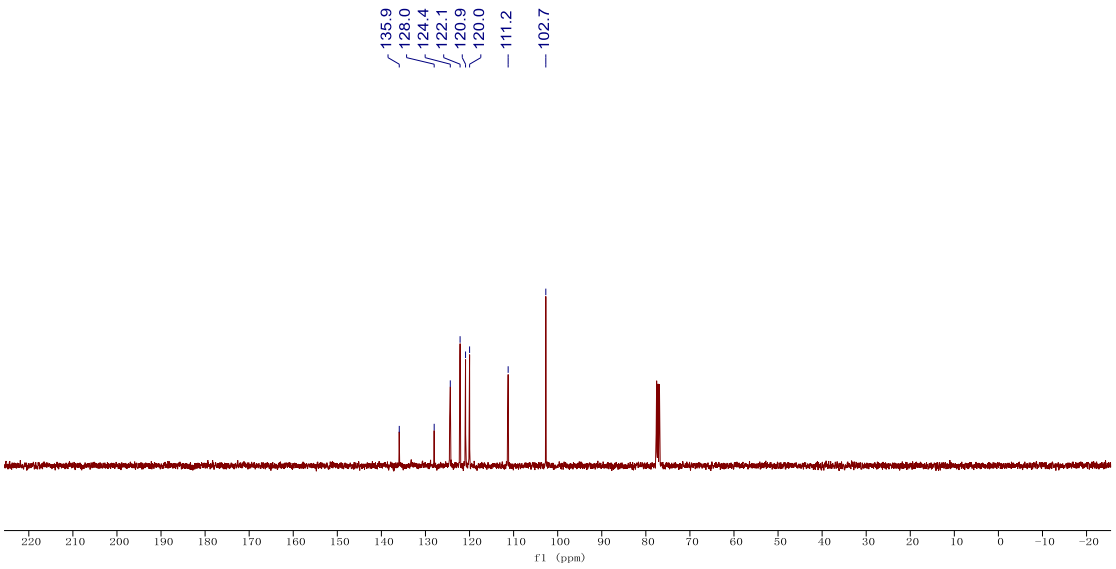


^{1}H NMR of compound **32** (400 MHz in $CDCl_3$)

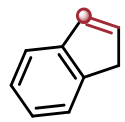


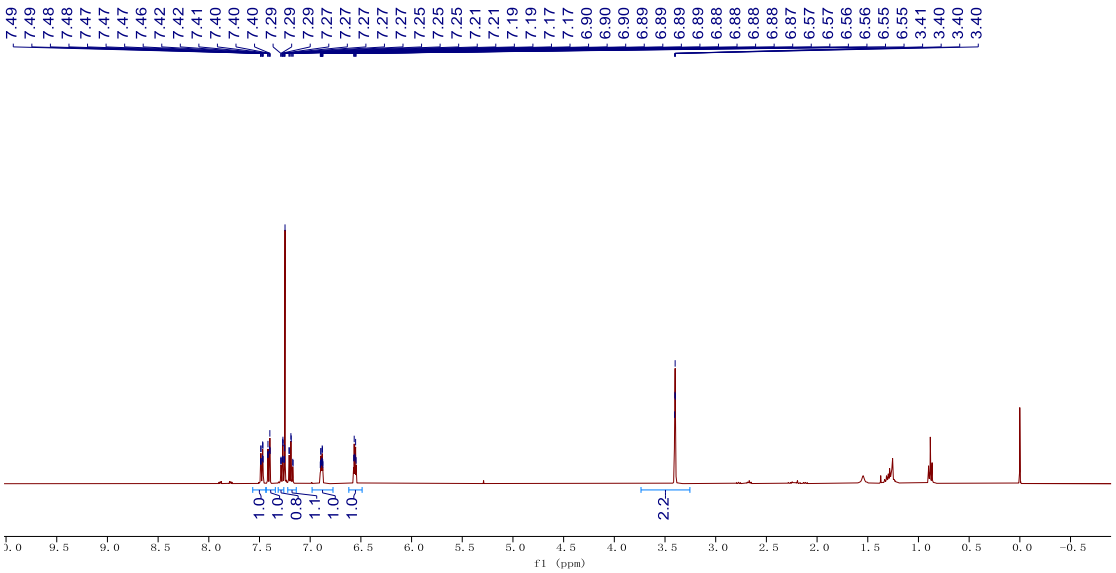


^{13}C NMR of compound **32** (101 MHz in $CDCl_3$)

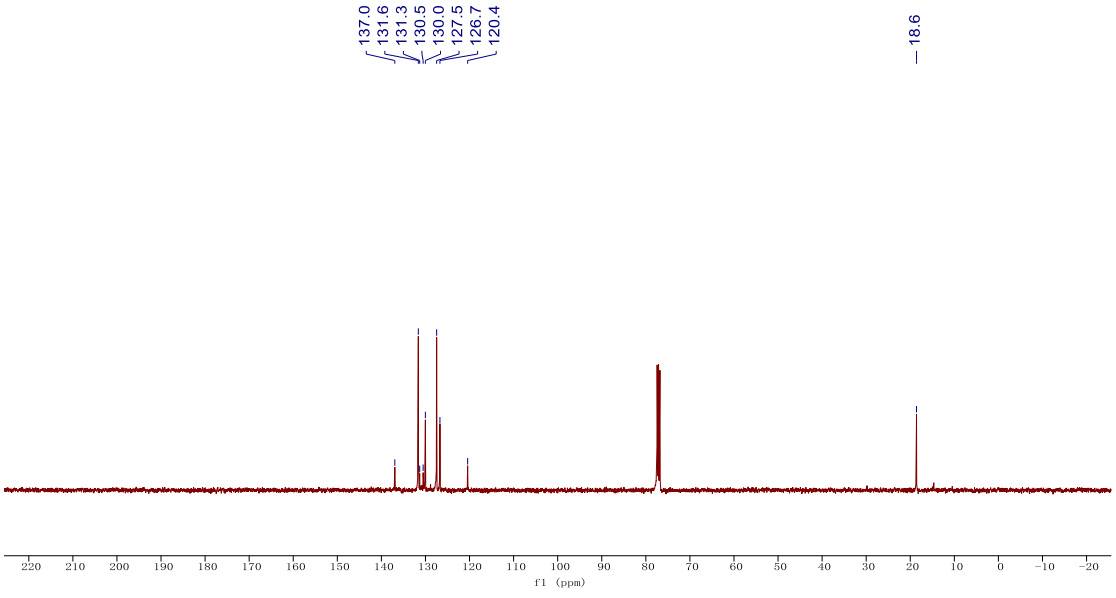


^{1}H NMR of compound **33** (400 MHz in $CDCl_3$)

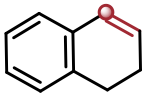


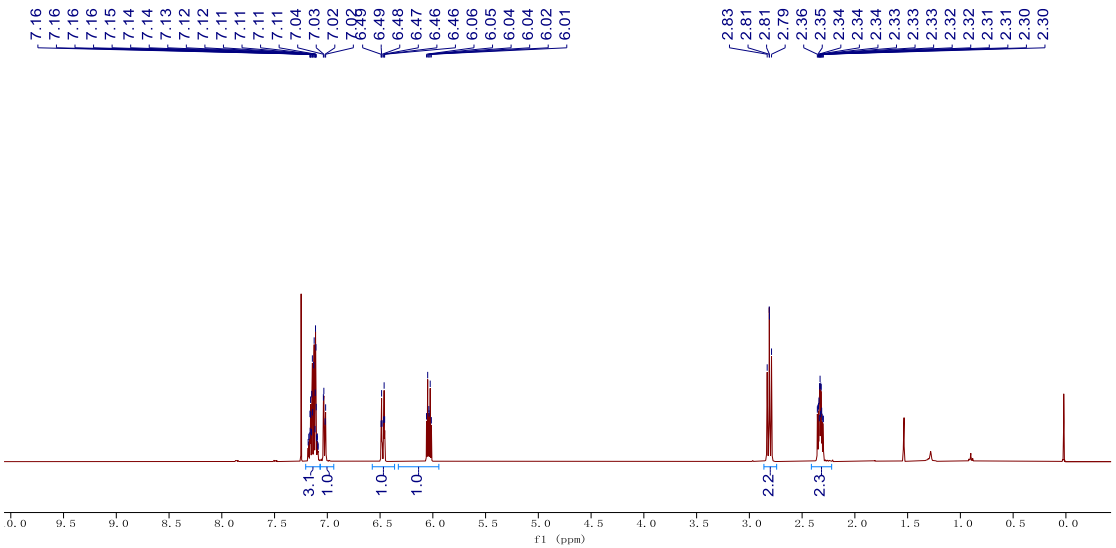


^{13}C NMR of compound **33** (101 MHz in $CDCl_3$)

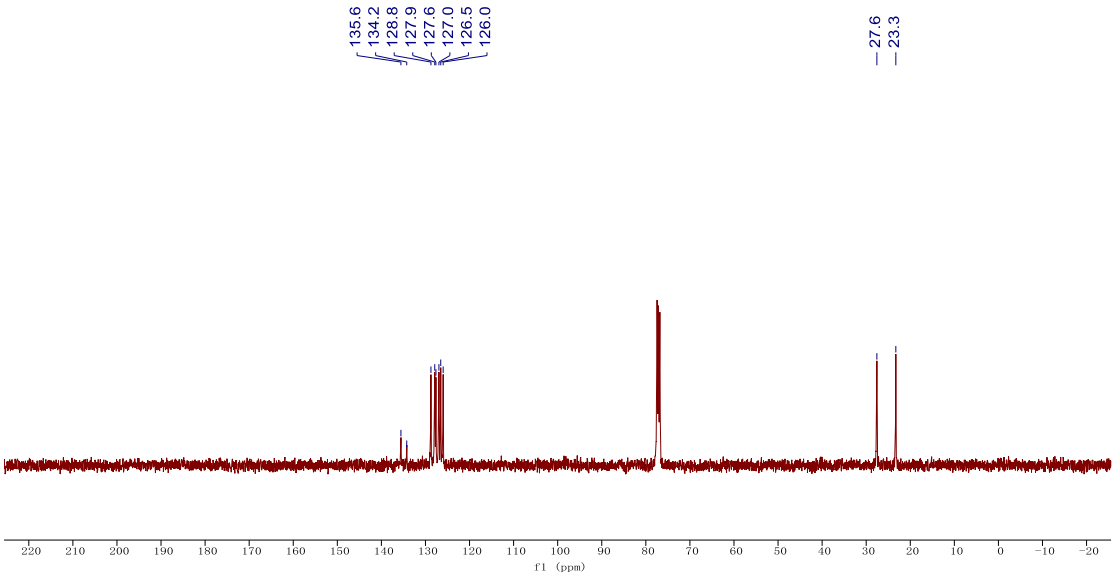


^{1}H NMR of compound **34** (400 MHz in $CDCl_3$)

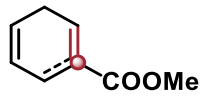


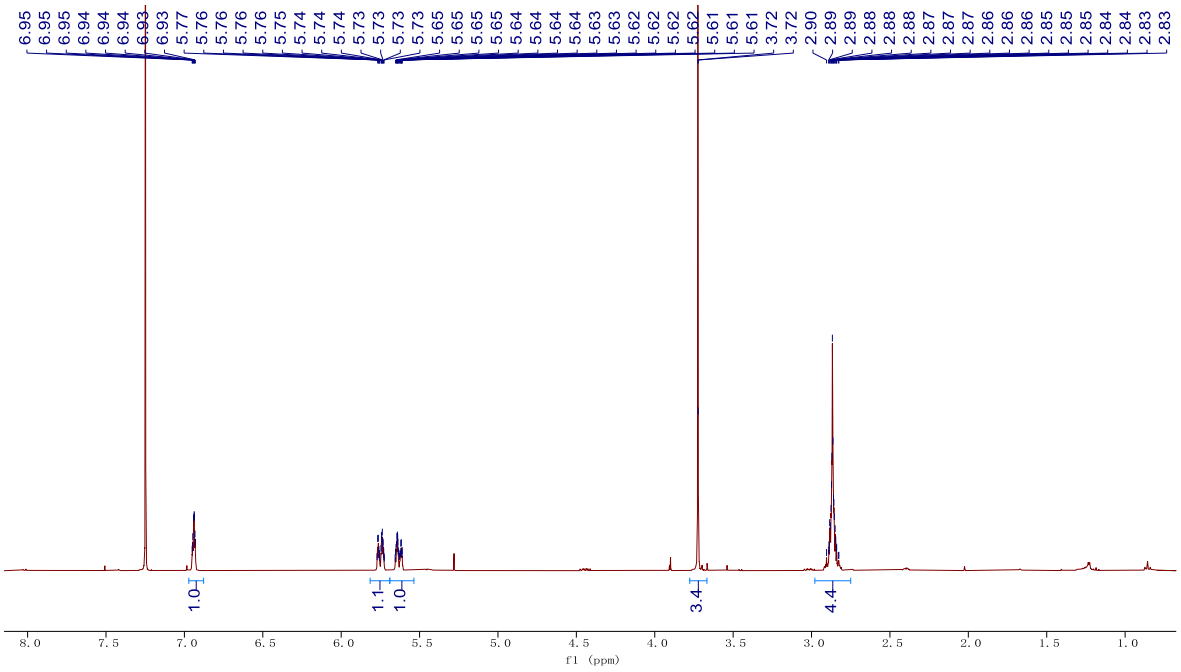


^{13}C NMR of compound **34** (101 MHz in $CDCl_3$)

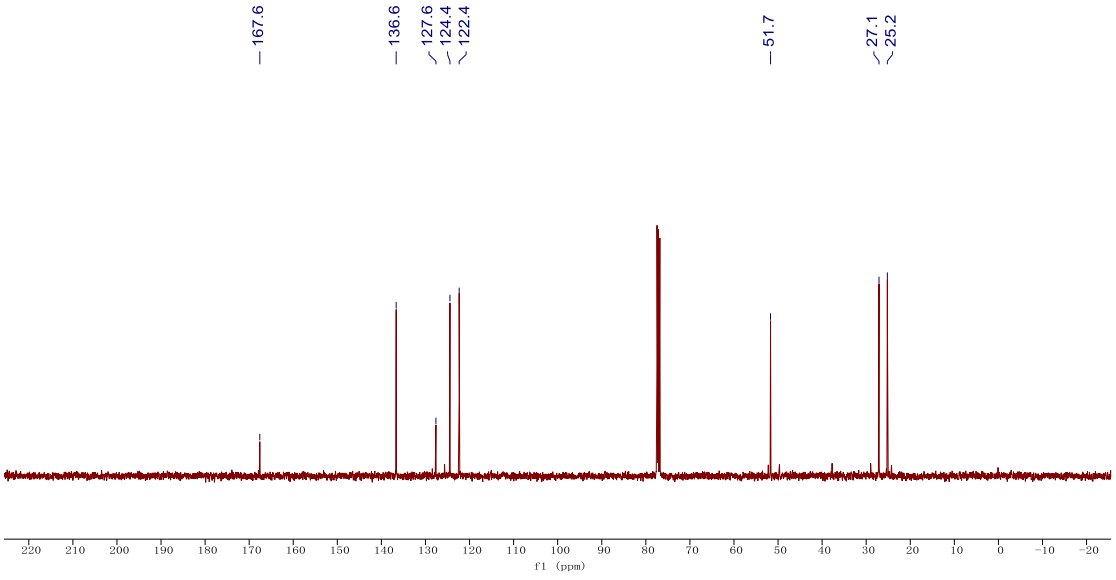


^{1}H NMR of compound **35** (400 MHz in $CDCl_3$)

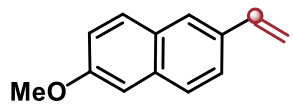


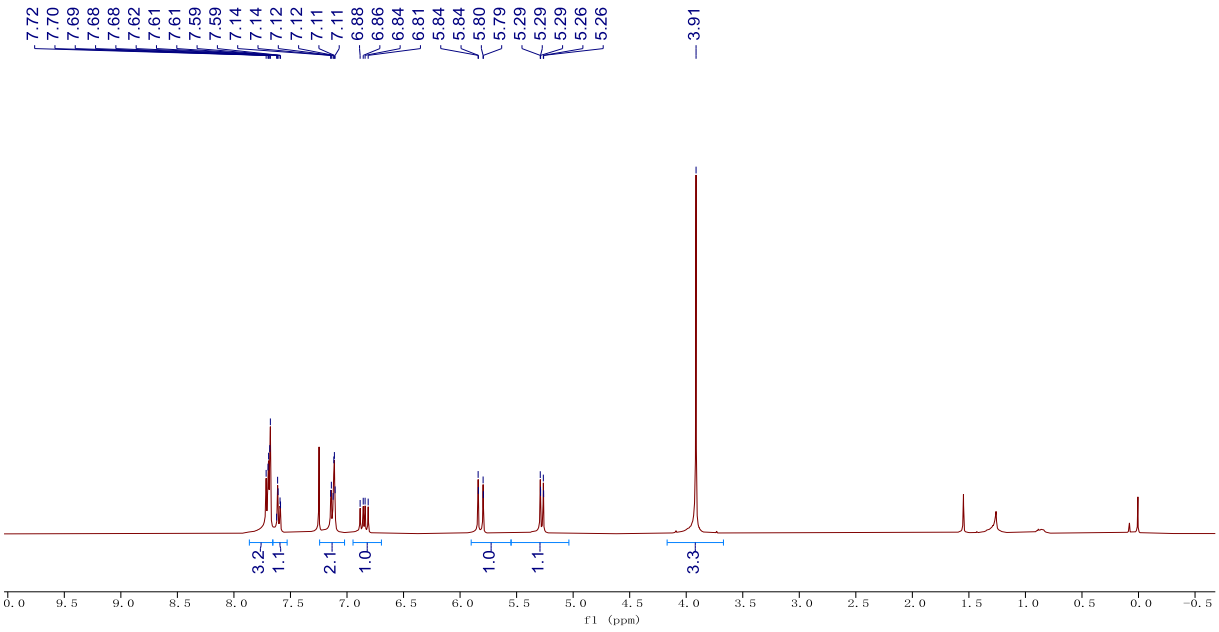


^{13}C NMR of compound **35** (101 MHz in $CDCl_3$)

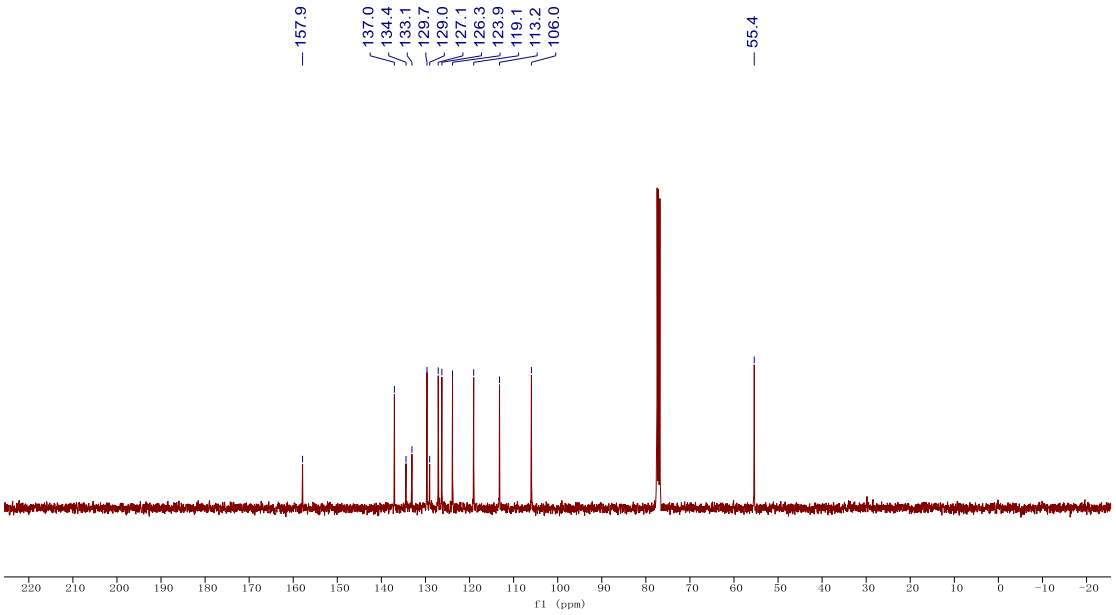


^{1}H NMR of compound **36** (400 MHz in $CDCl_3$)

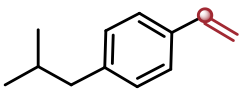


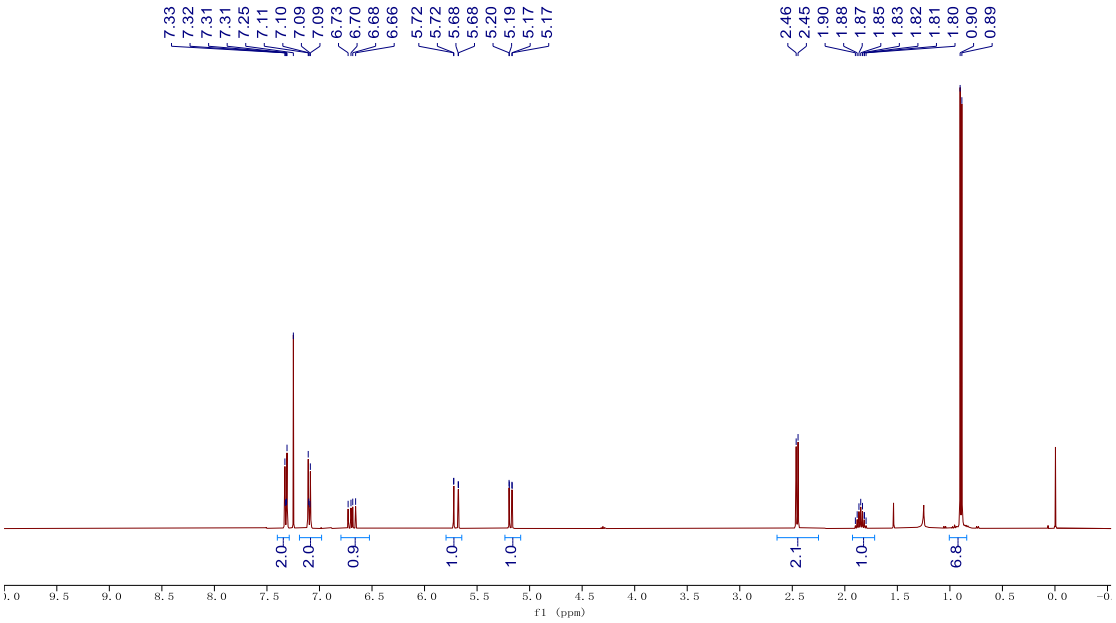


^{13}C NMR of compound **36** (101 MHz in $CDCl_3$)

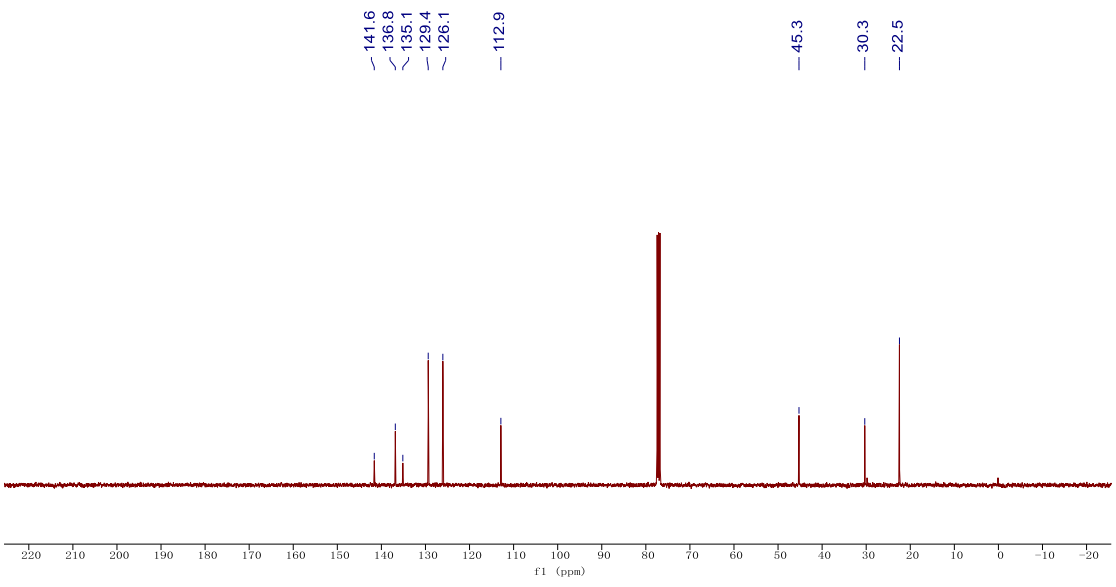


^{1}H NMR of compound **37** (400 MHz in $CDCl_3$)

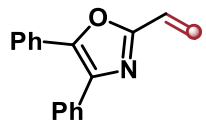


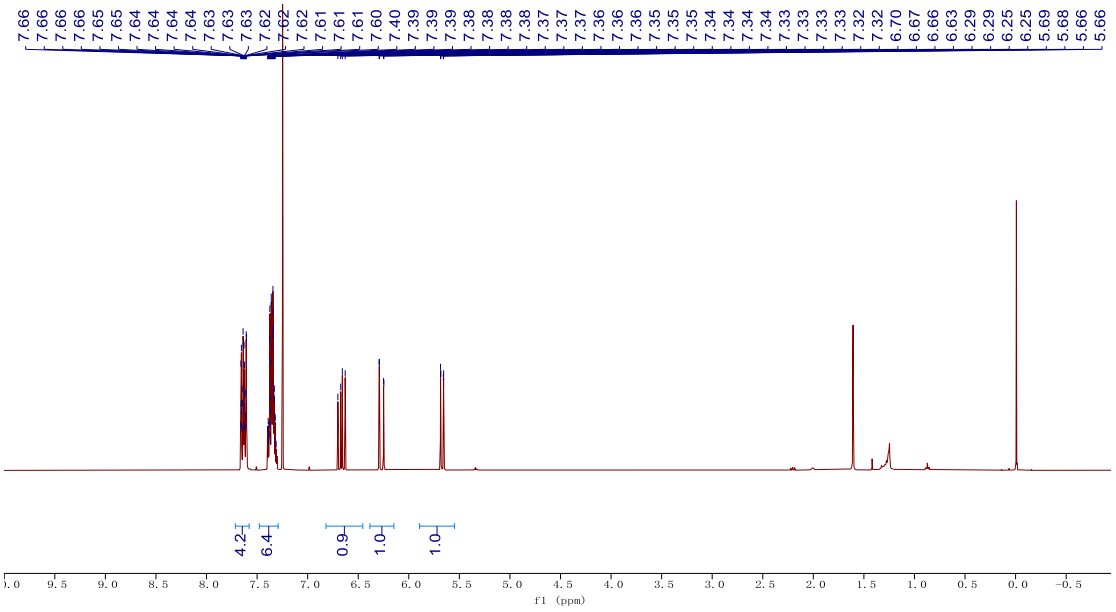


^{13}C NMR of compound **37** (101 MHz in $CDCl_3$)

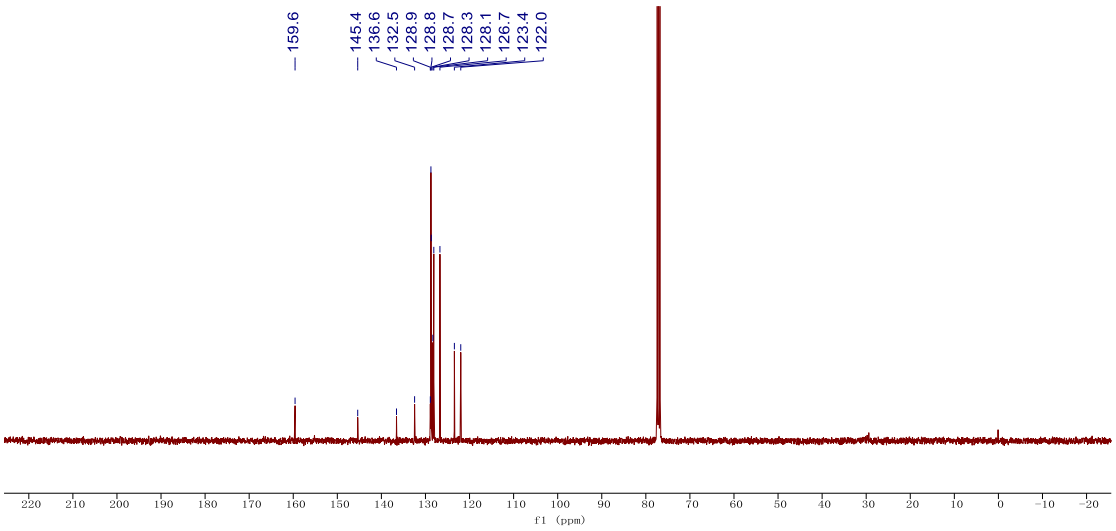


^{1}H NMR of compound **38** (400 MHz in $CDCl_3$)

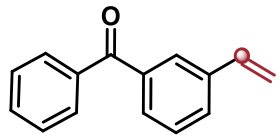


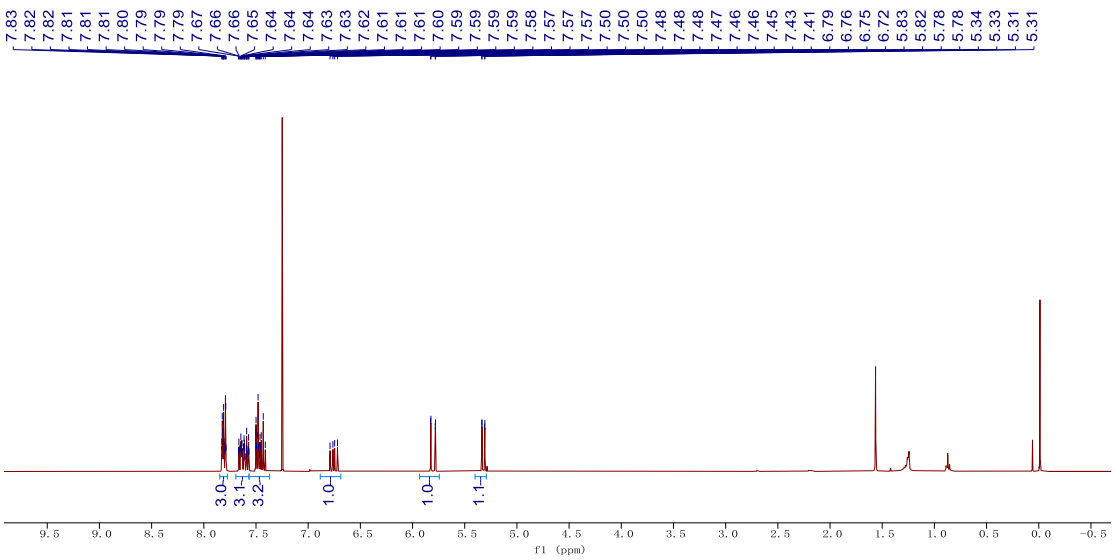


^{13}C NMR of compound **38** (101 MHz in $CDCl_3$)

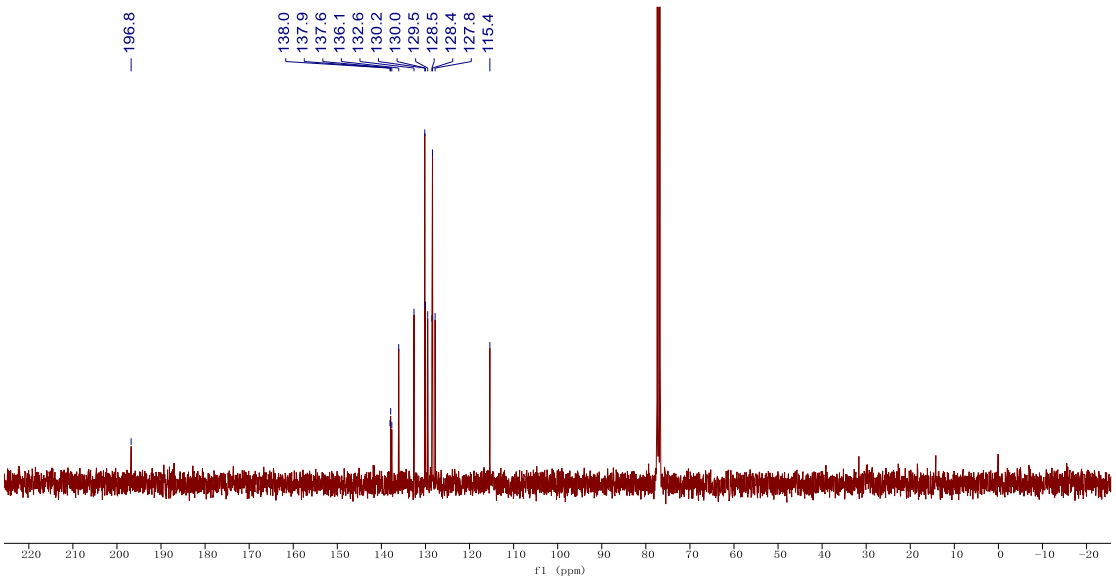


^{1}H NMR of compound **39** (400 MHz in $CDCl_3$)

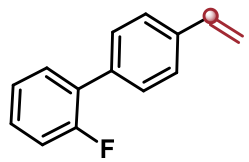


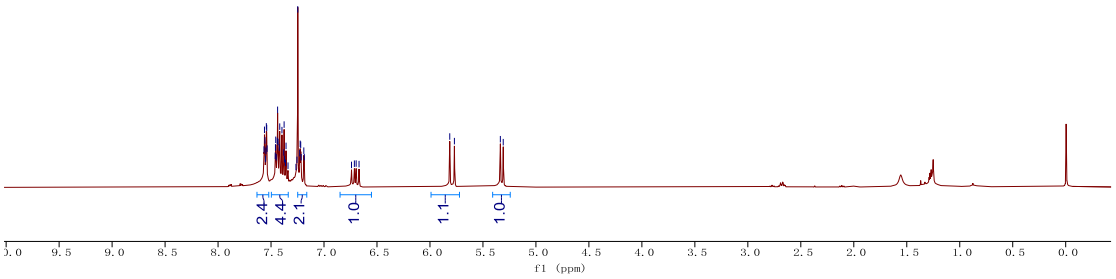


^{13}C NMR of compound **39** (101 MHz in $CDCl_3$)

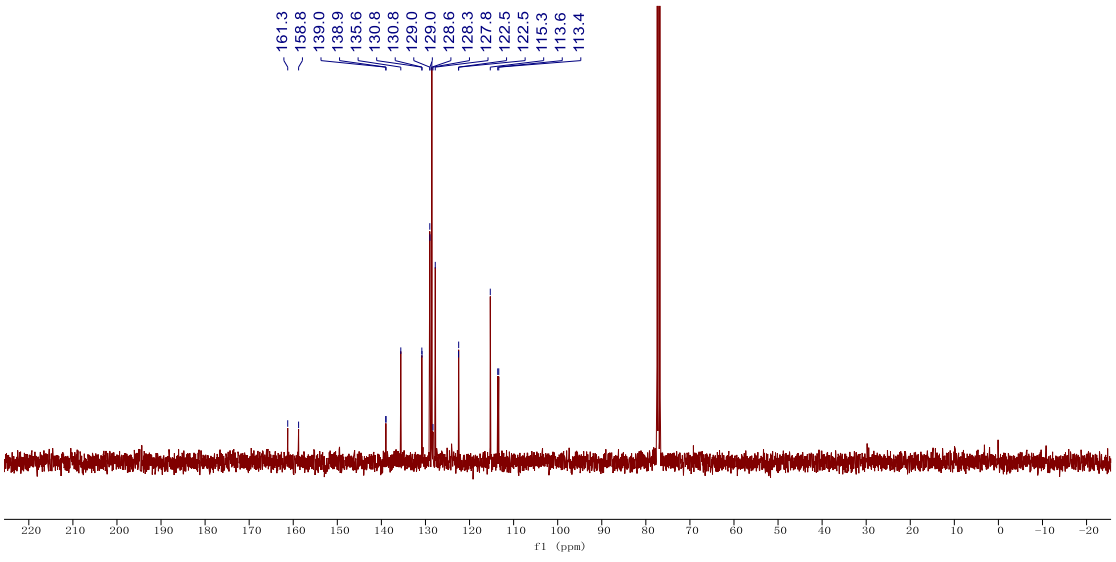


^{1}H NMR of compound **40** (400 MHz in $CDCl_3$)

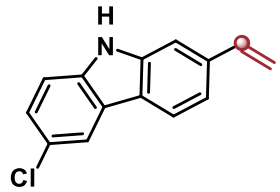


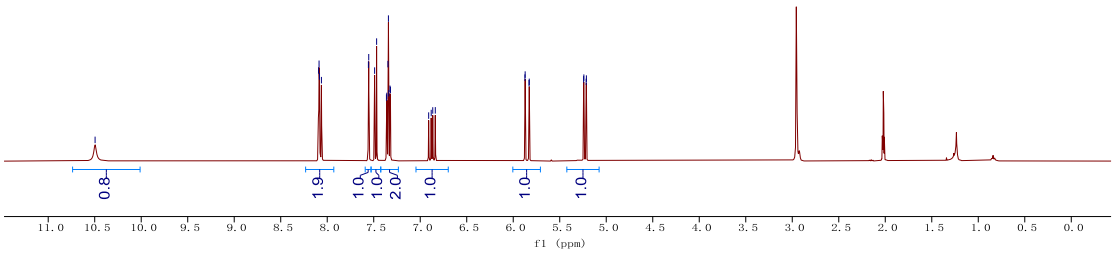


^{13}C NMR of compound **40** (101 MHz in $CDCl_3$)

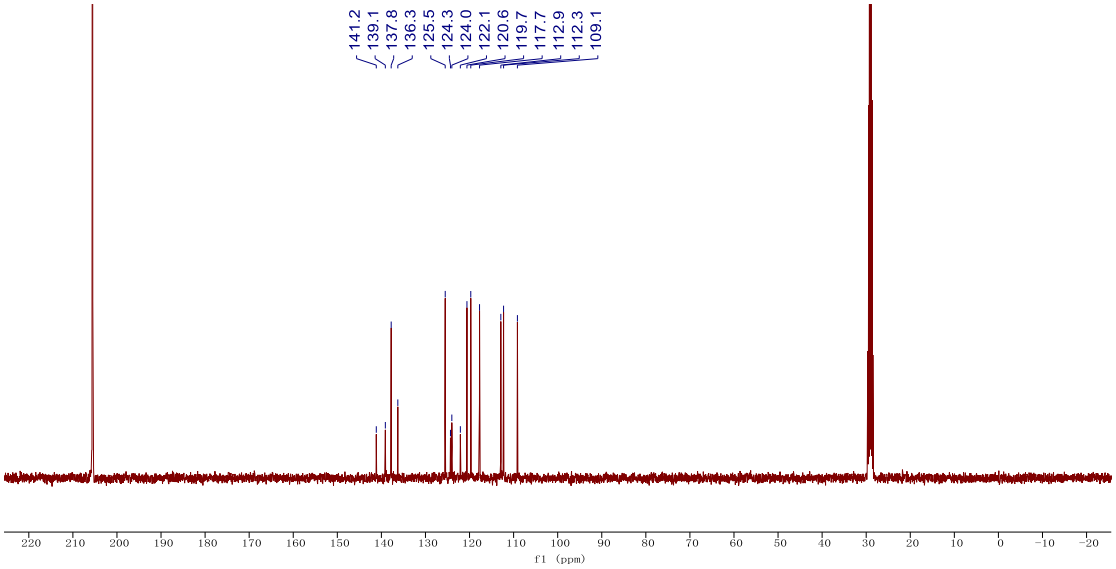


^{1}H NMR of compound **41** (400 MHz in Acetone-d_6)

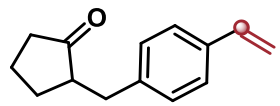


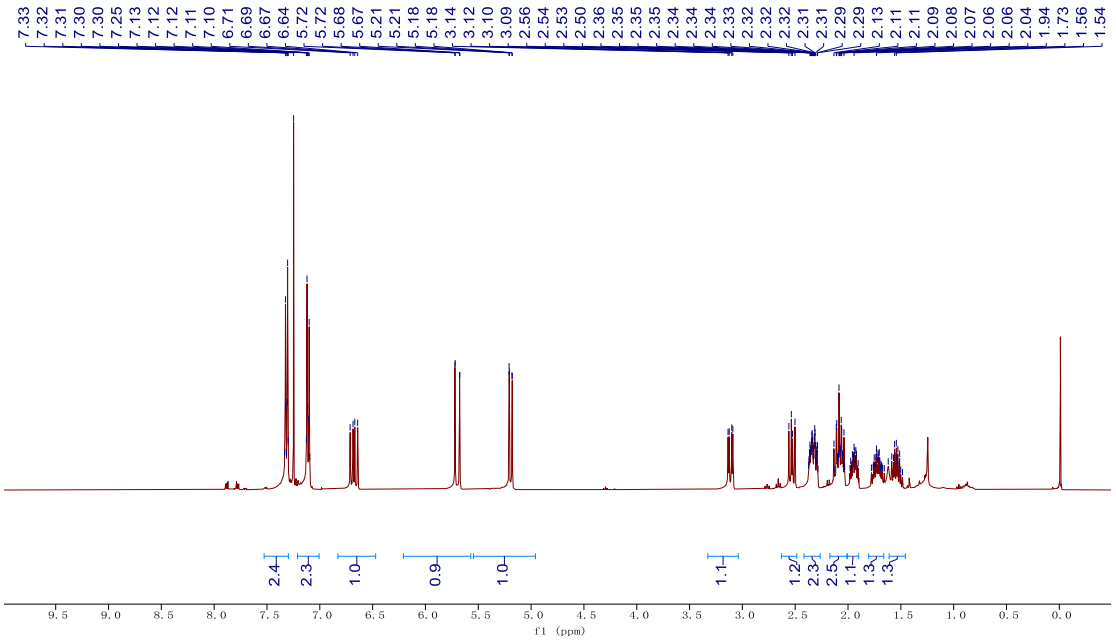


^{13}C NMR of compound **41** (101 MHz in Acetone-d_6)

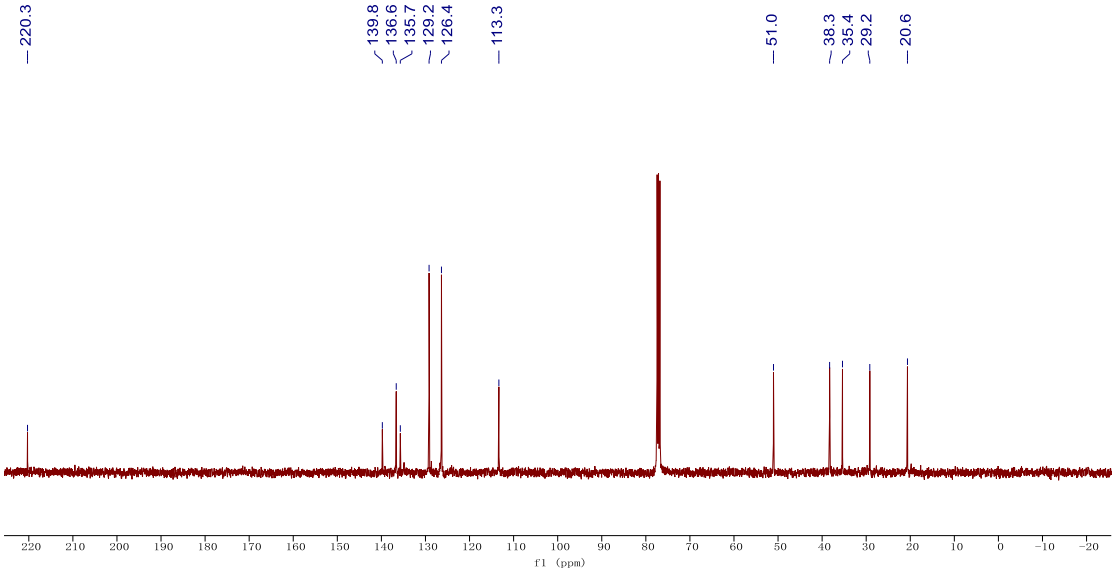


^{1}H NMR of compound **42** (400 MHz in $CDCl_3$)

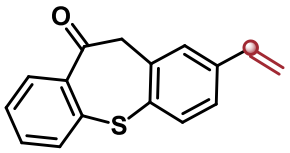


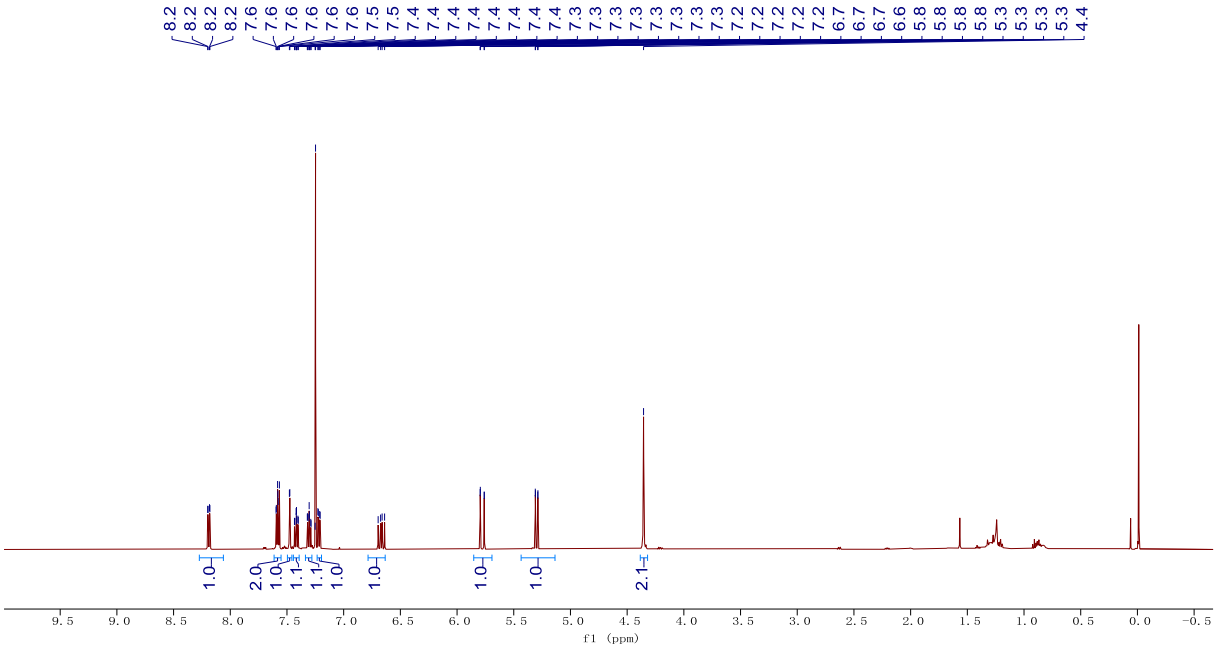


^{13}C NMR of compound **42** (101 MHz in $CDCl_3$)

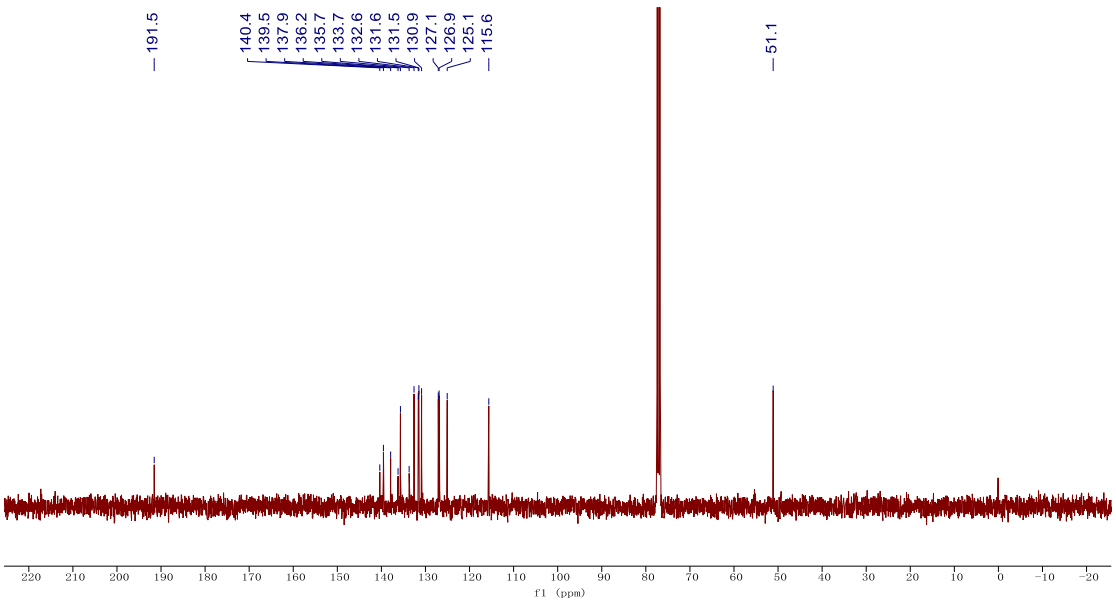


^{1}H NMR of compound **43** (400 MHz in $CDCl_3$)

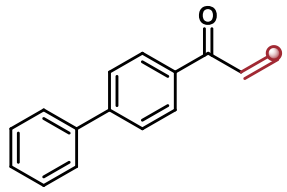


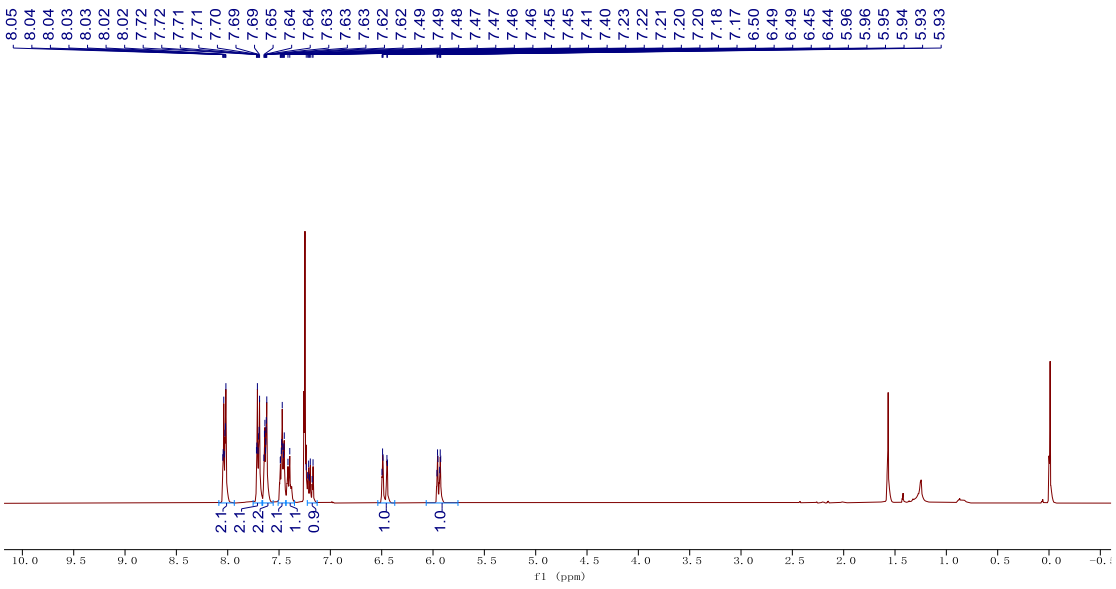


^{13}C NMR of compound **43** (101 MHz in $CDCl_3$)

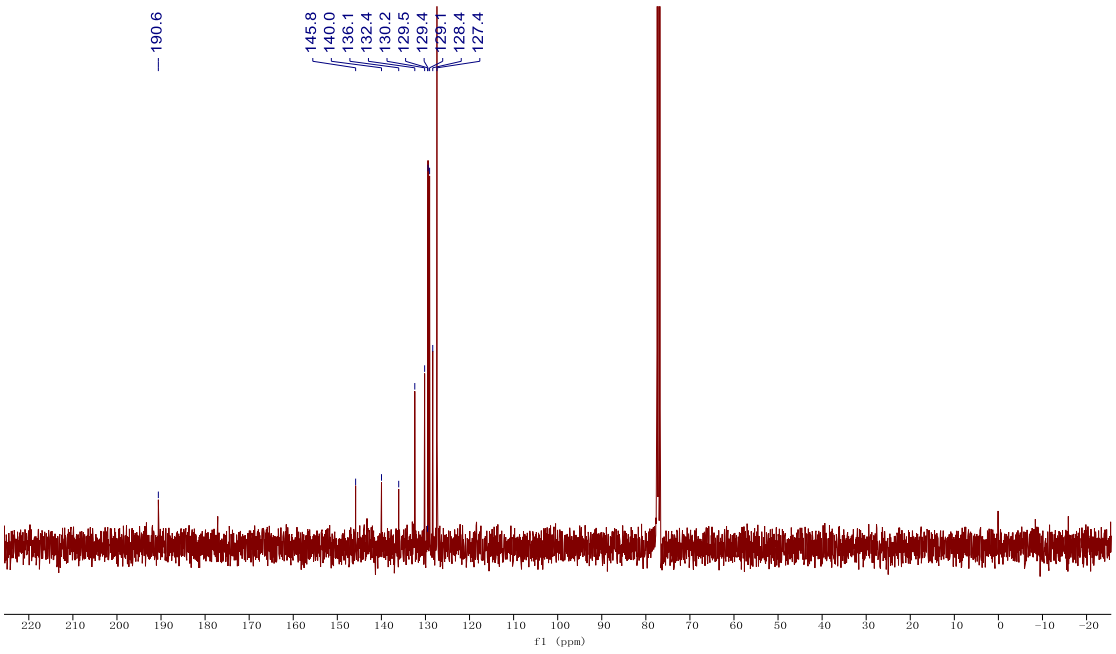


^{1}H NMR of compound **44** (400 MHz in $CDCl_3$)

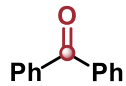


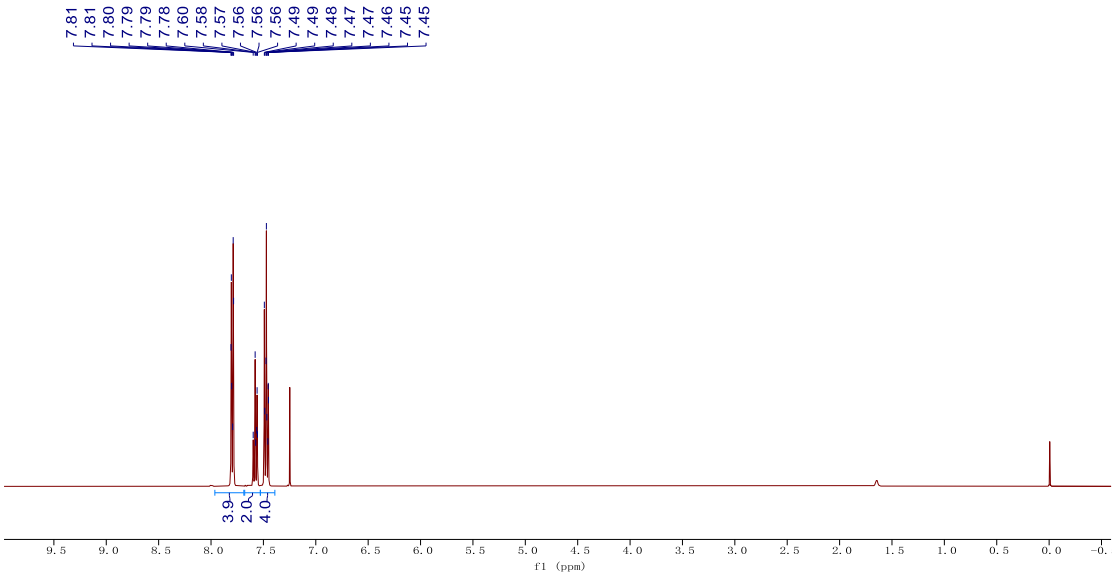


^{13}C NMR of compound **44** (101 MHz in $CDCl_3$)

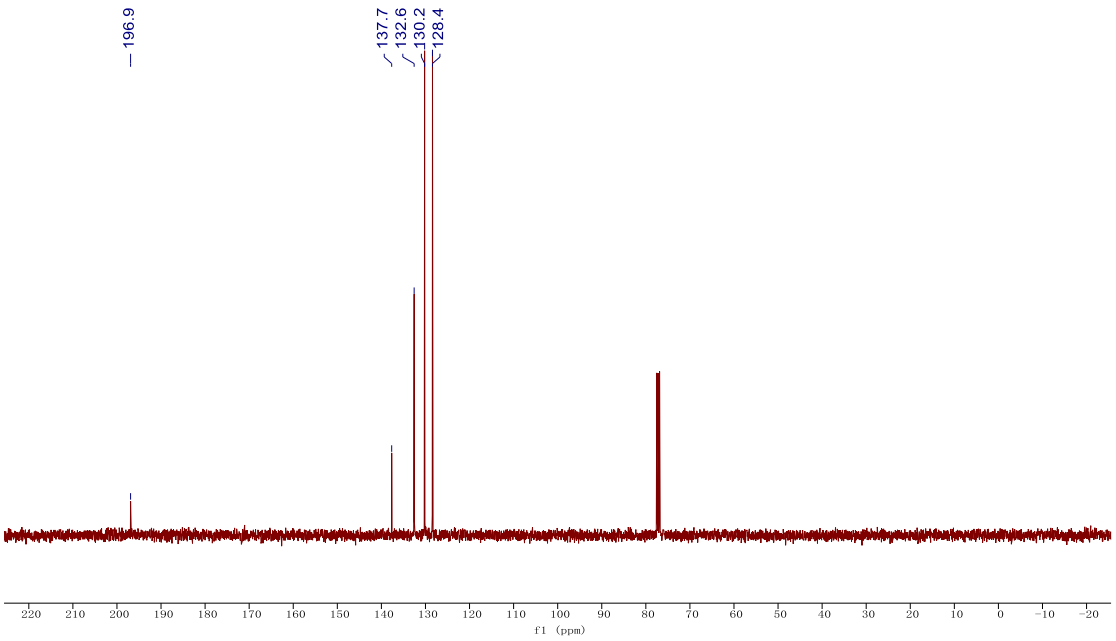


^{1}H NMR of compound **45** (400 MHz in $CDCl_3$)

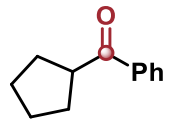


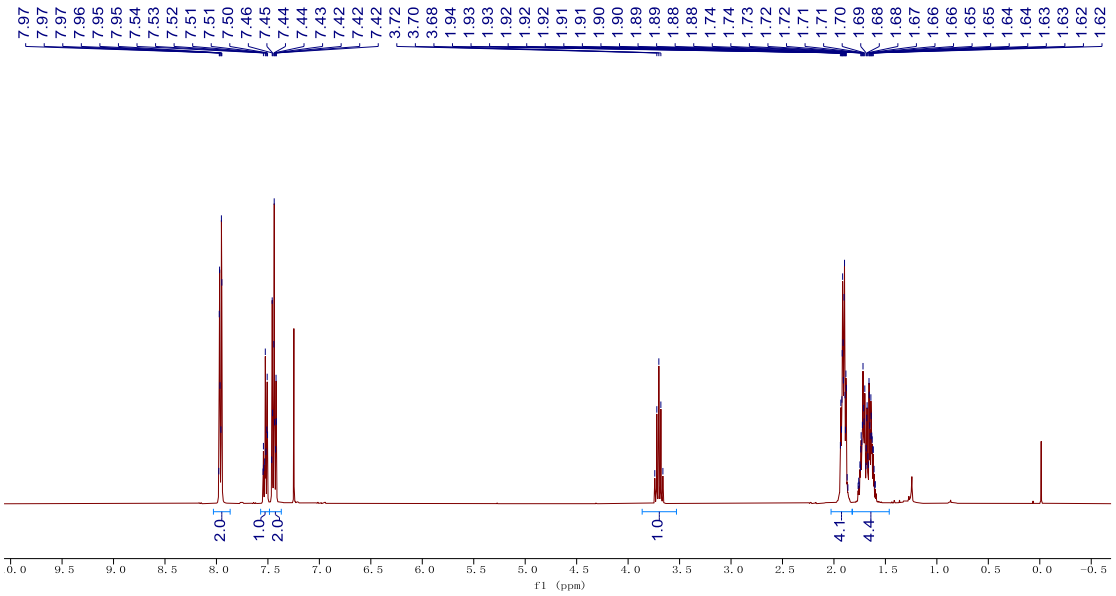


^{13}C NMR of compound **45** (101 MHz in $CDCl_3$)

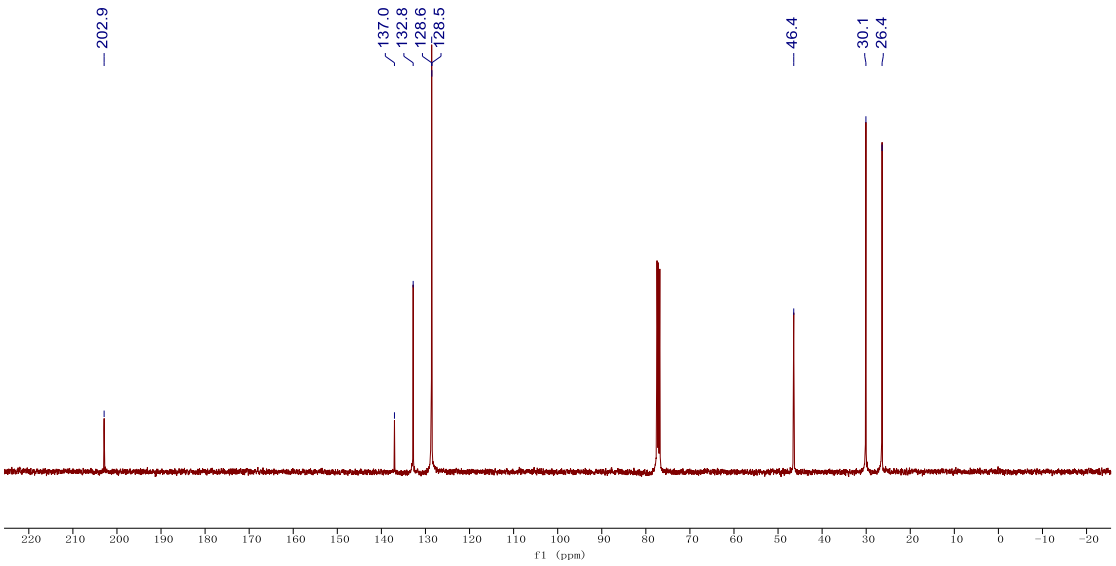


^{1}H NMR of compound **46** (400 MHz in $CDCl_3$)

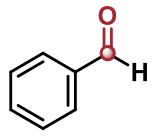


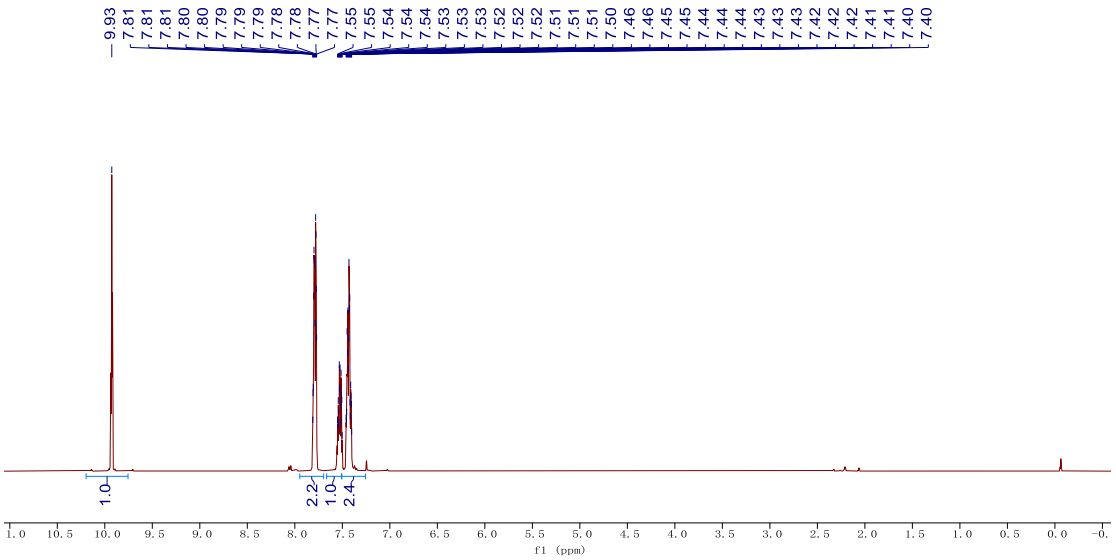


^{13}C NMR of compound **46** (101 MHz in $CDCl_3$)

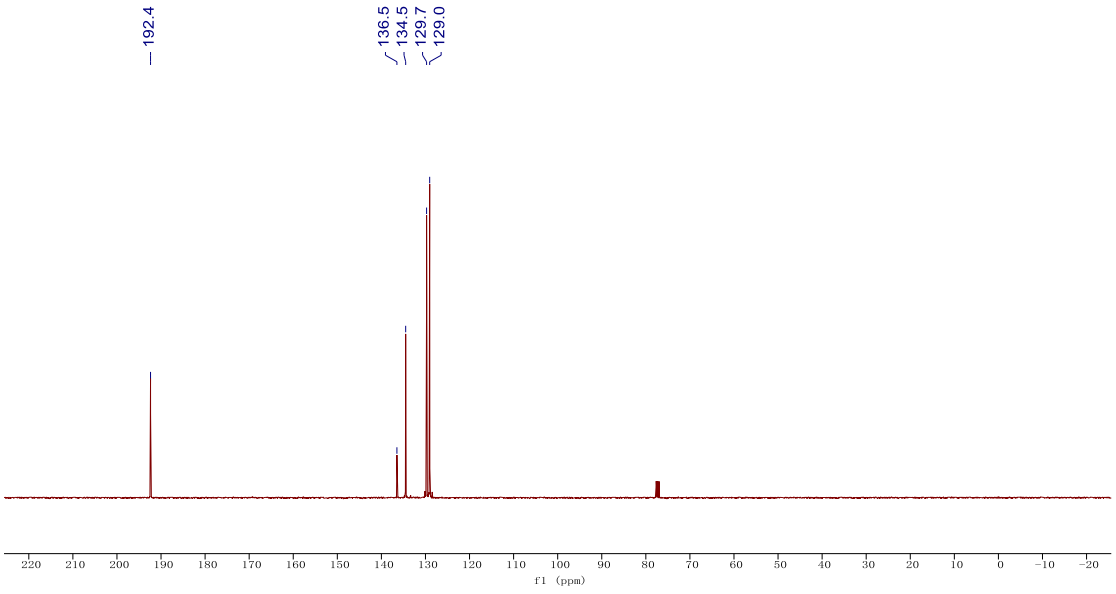


^{1}H NMR of compound **47** (400 MHz in $CDCl_3$)

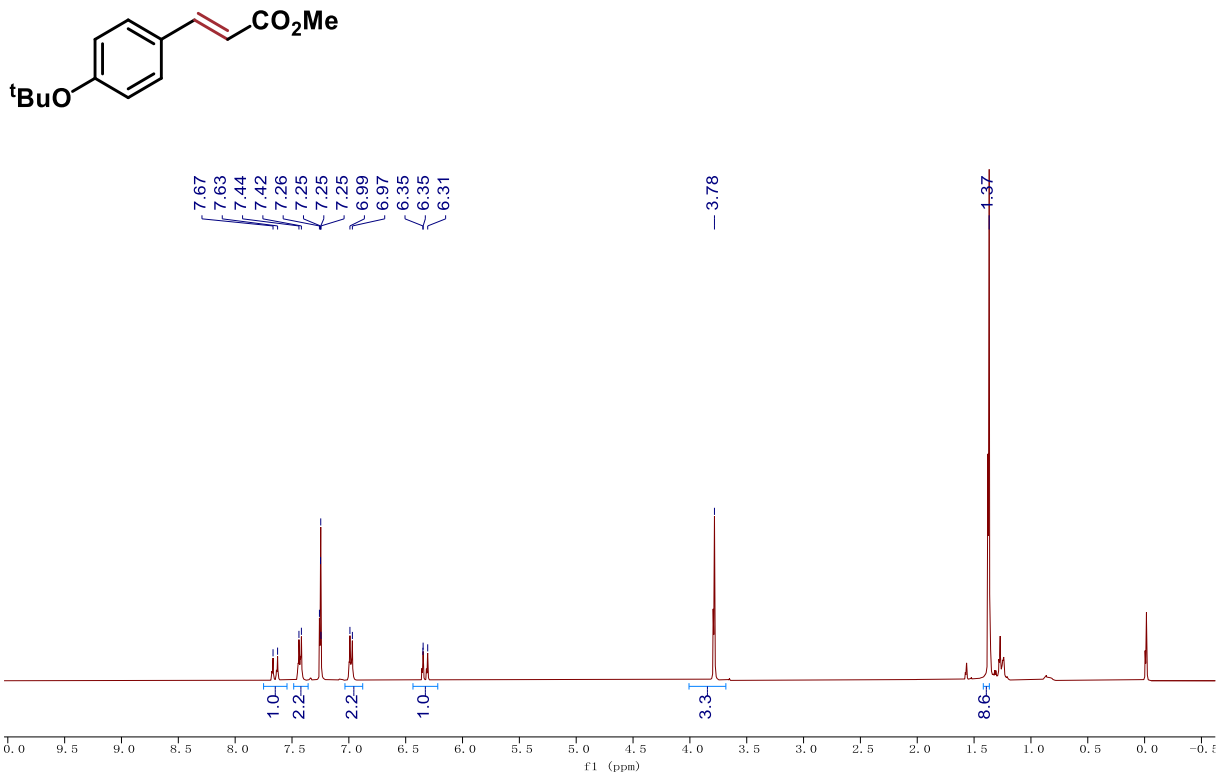




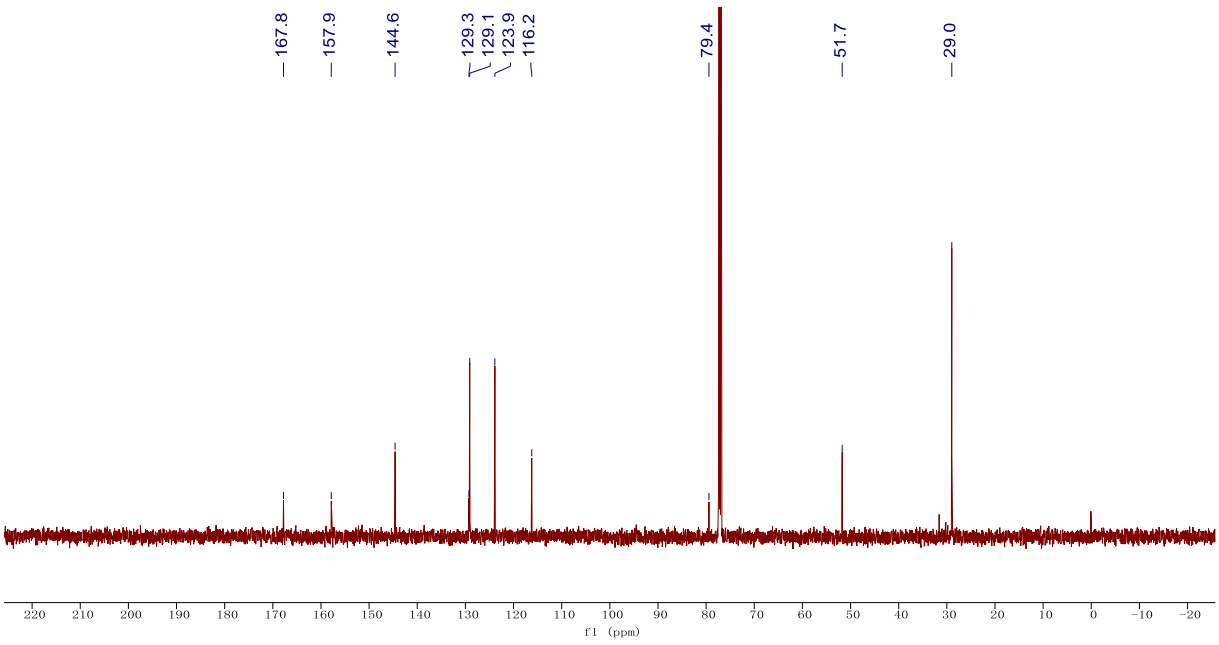
^{13}C NMR of compound **47** (101 MHz in $CDCl_3$)



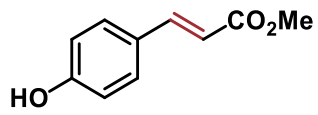
^{1}H NMR of compound **48** (400 MHz in $CDCl_3$)

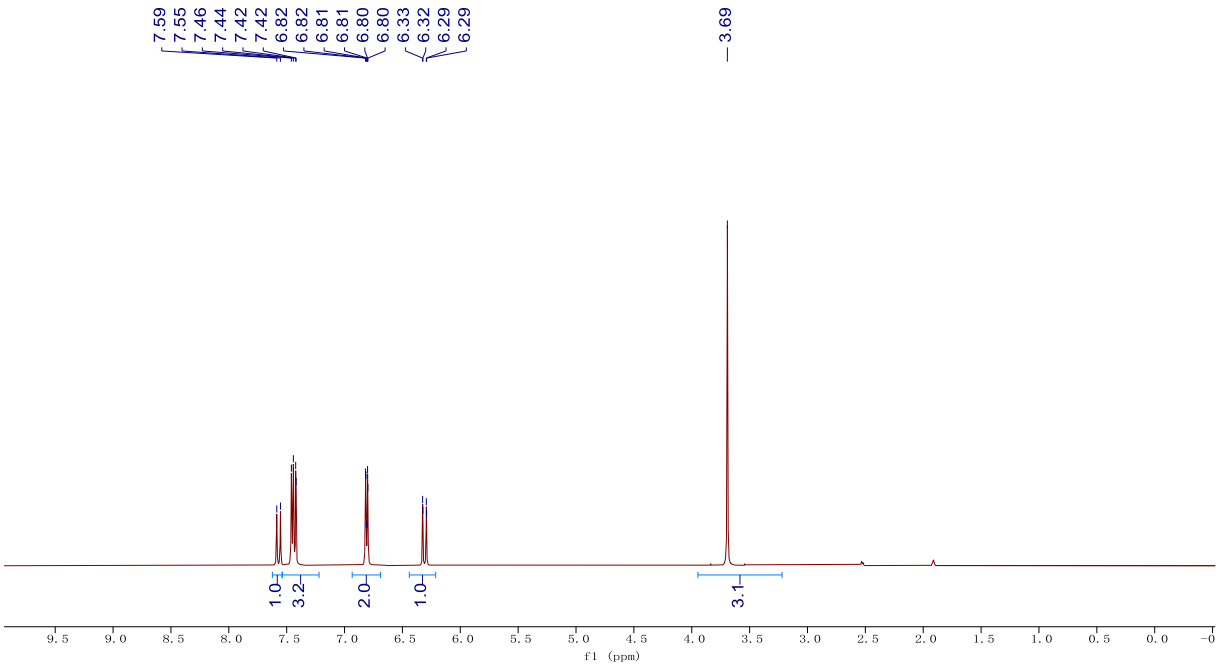


^{13}C NMR of compound **48** (101 MHz in $CDCl_3$)

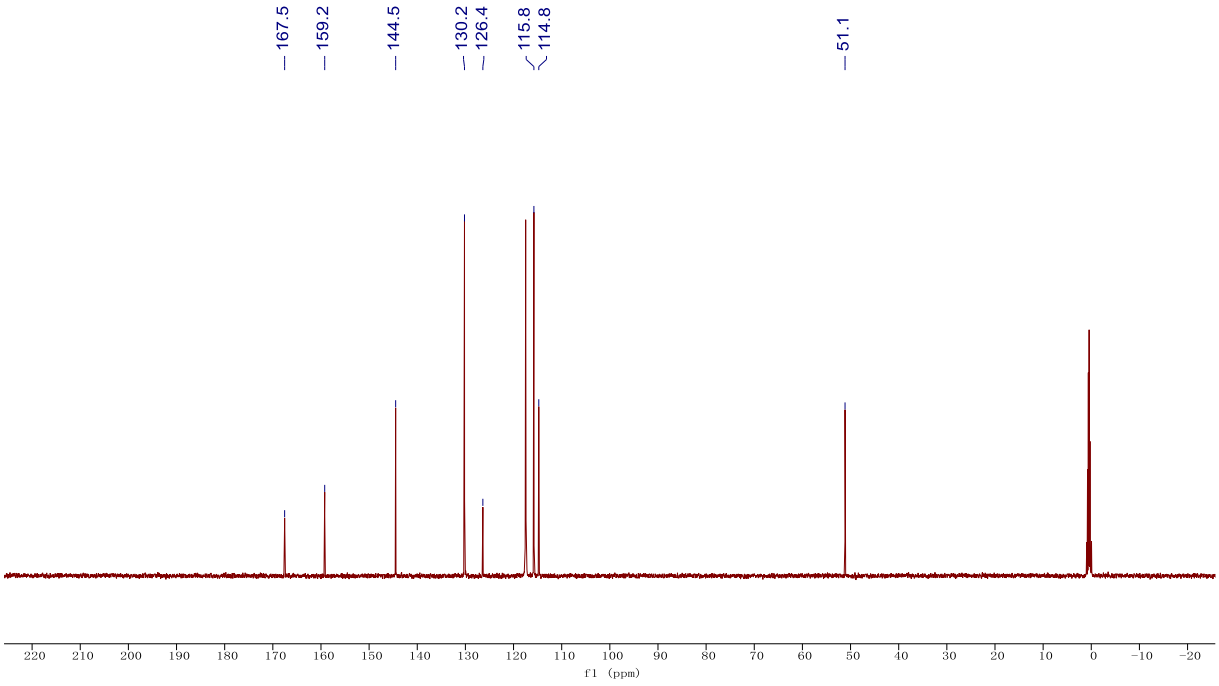


^{1}H NMR of compound **49** (500 MHz in Acetonitrile-*d3*)

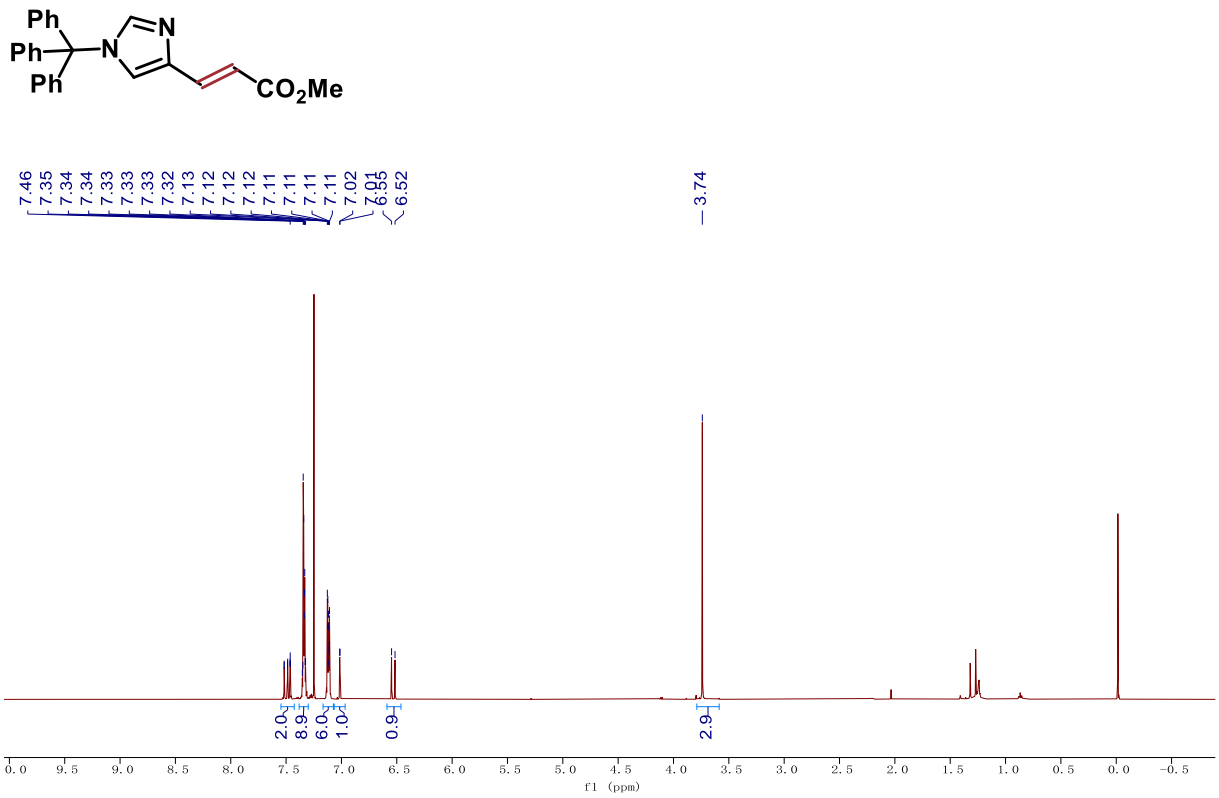




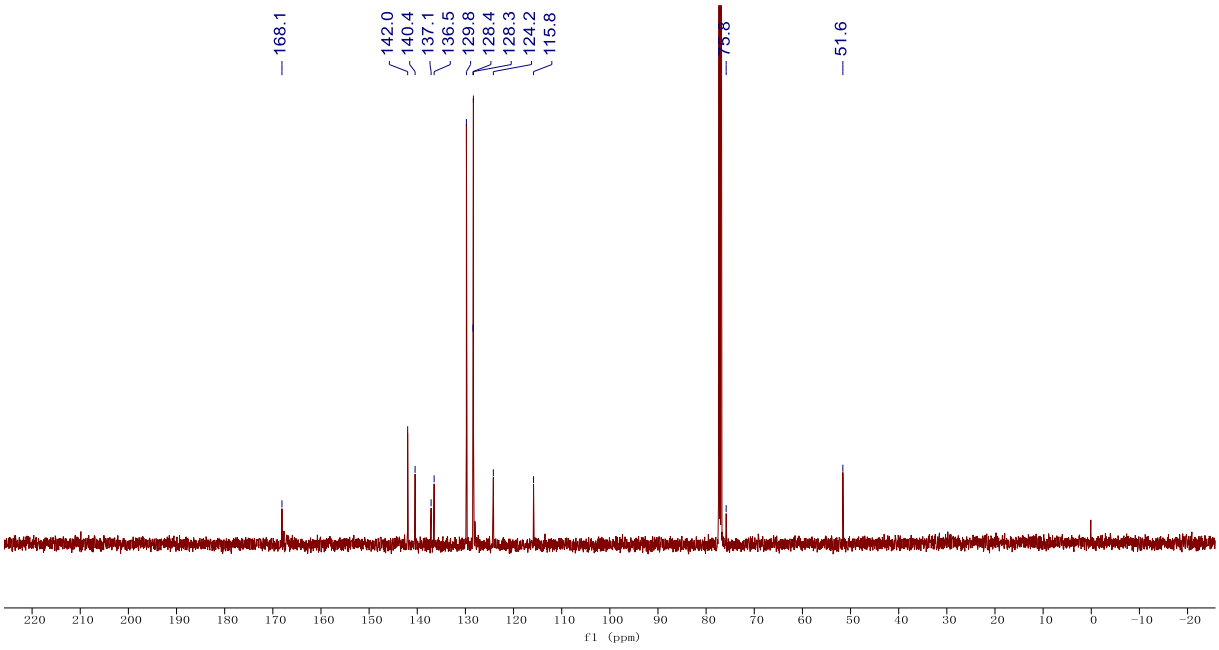
^{13}C NMR of compound 49(126 MHz in Acetonitrile-*d3*)



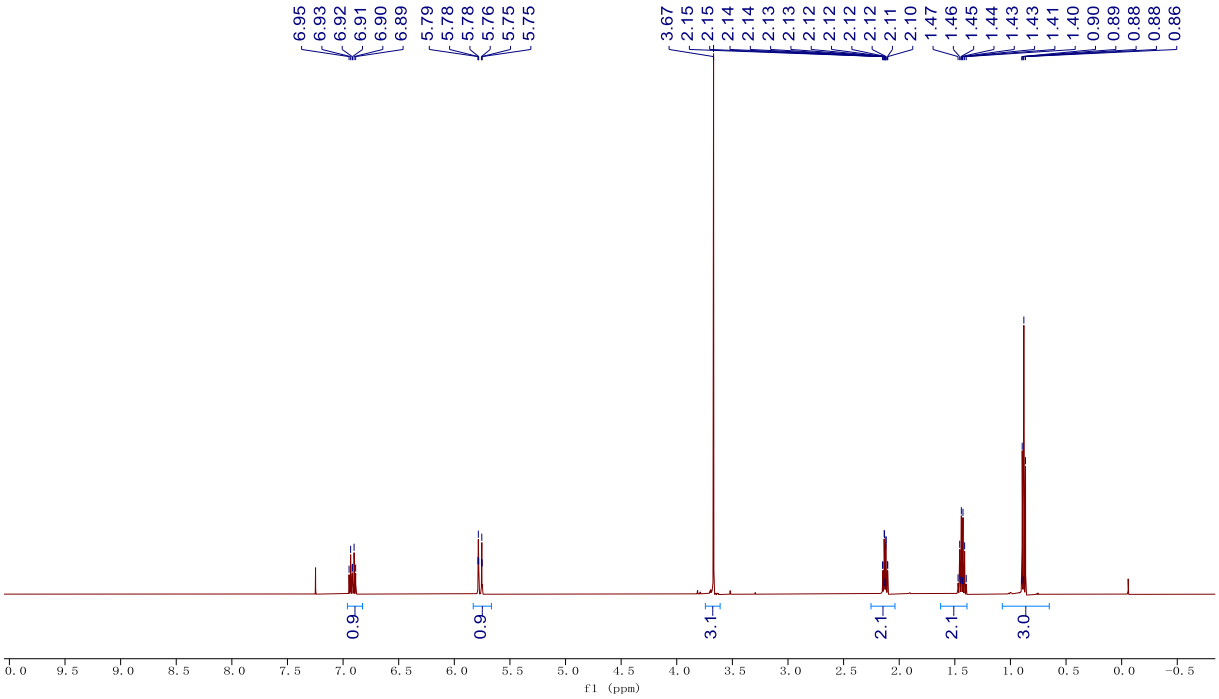
^{1}H NMR of compound **50** (500 MHz in $CDCl_3$)



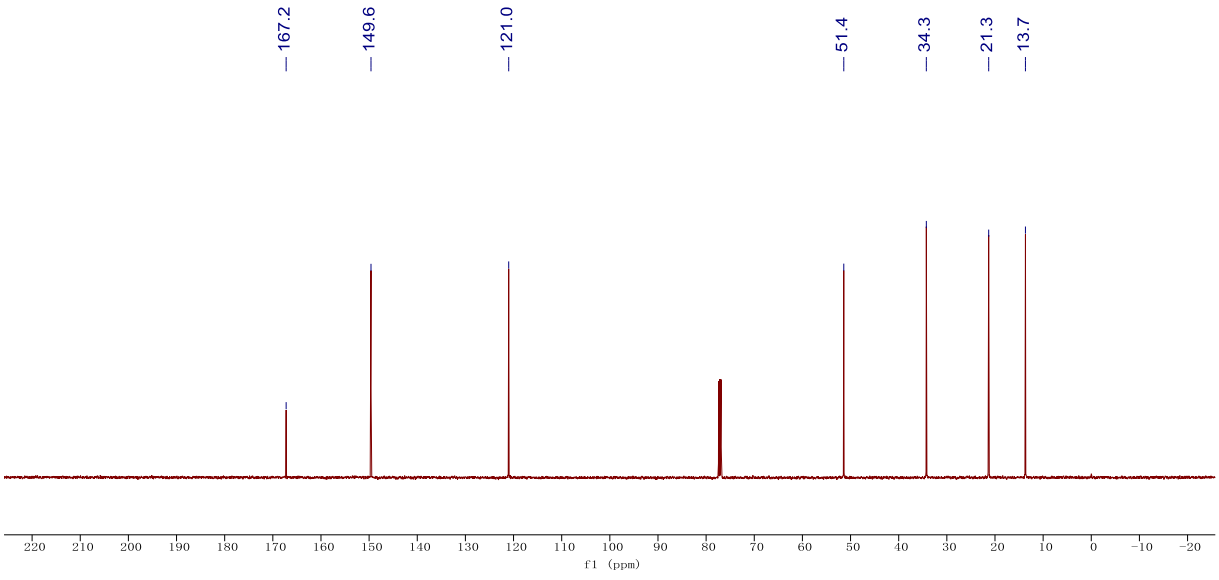
^{13}C NMR of compound **50** (126 MHz in $CDCl_3$)



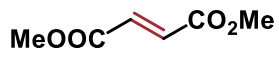
^{1}H NMR of compound **51** (500 MHz in $CDCl_3$)

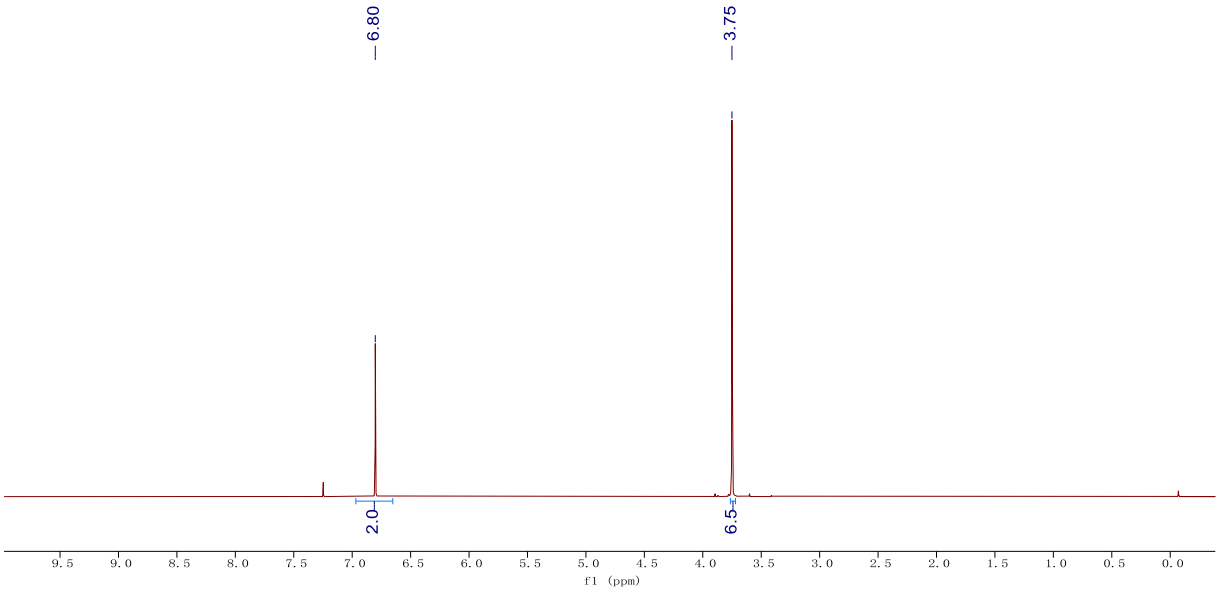


^{13}C NMR of compound **51** (126 MHz in $CDCl_3$)

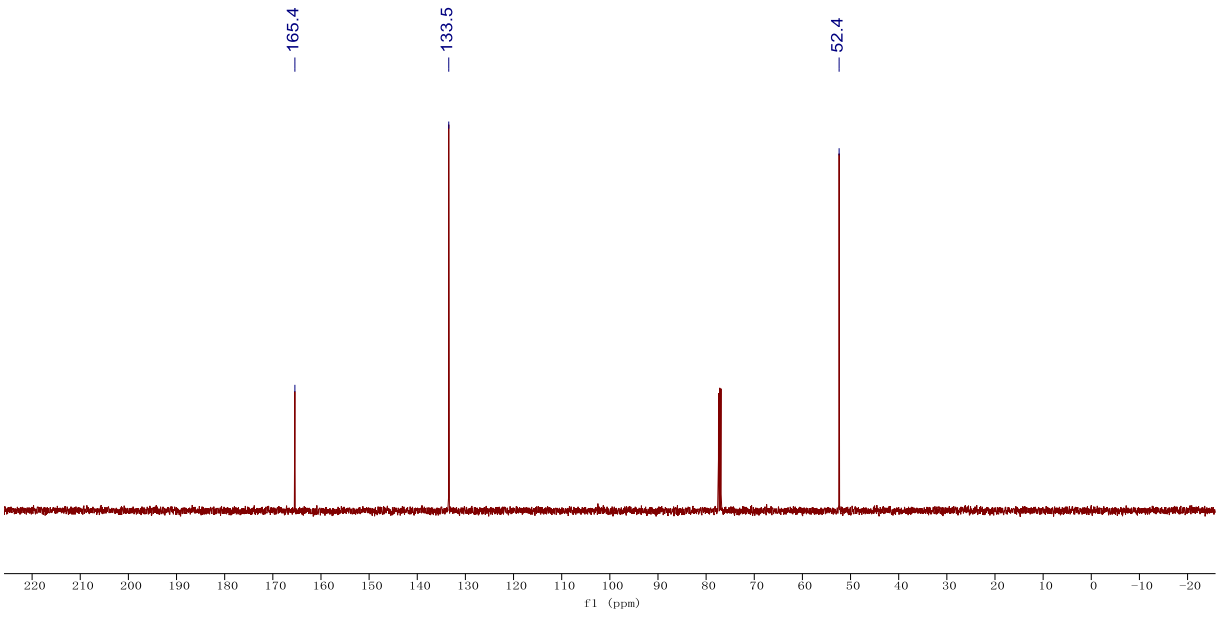


^{1}H NMR of compound **52** (500 MHz in $CDCl_3$)

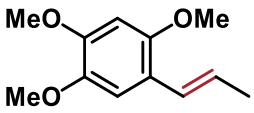


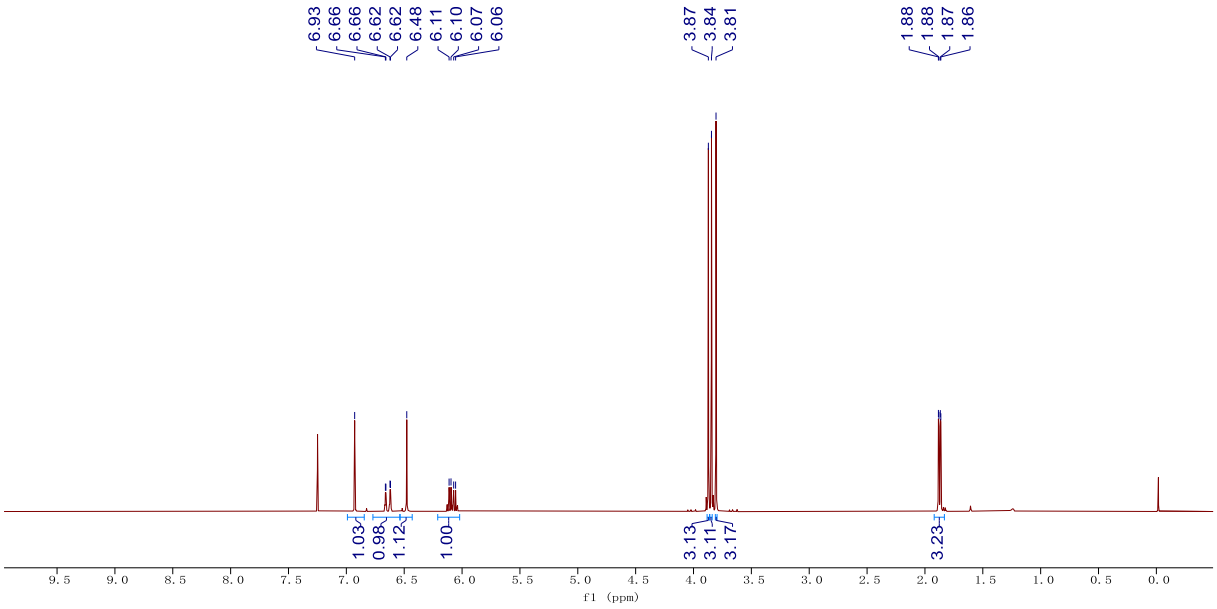


^{13}C NMR of compound **52** (126 MHz in $CDCl_3$)

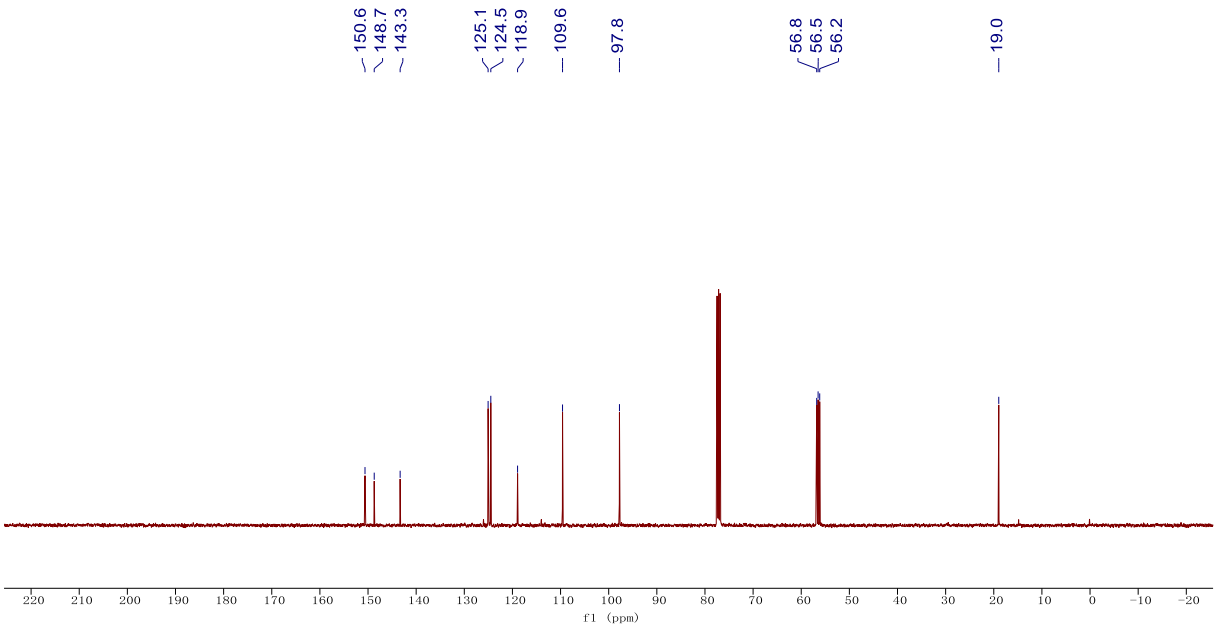


^{1}H NMR of compound **53** (400 MHz in $CDCl_3$)

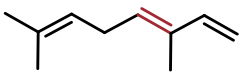


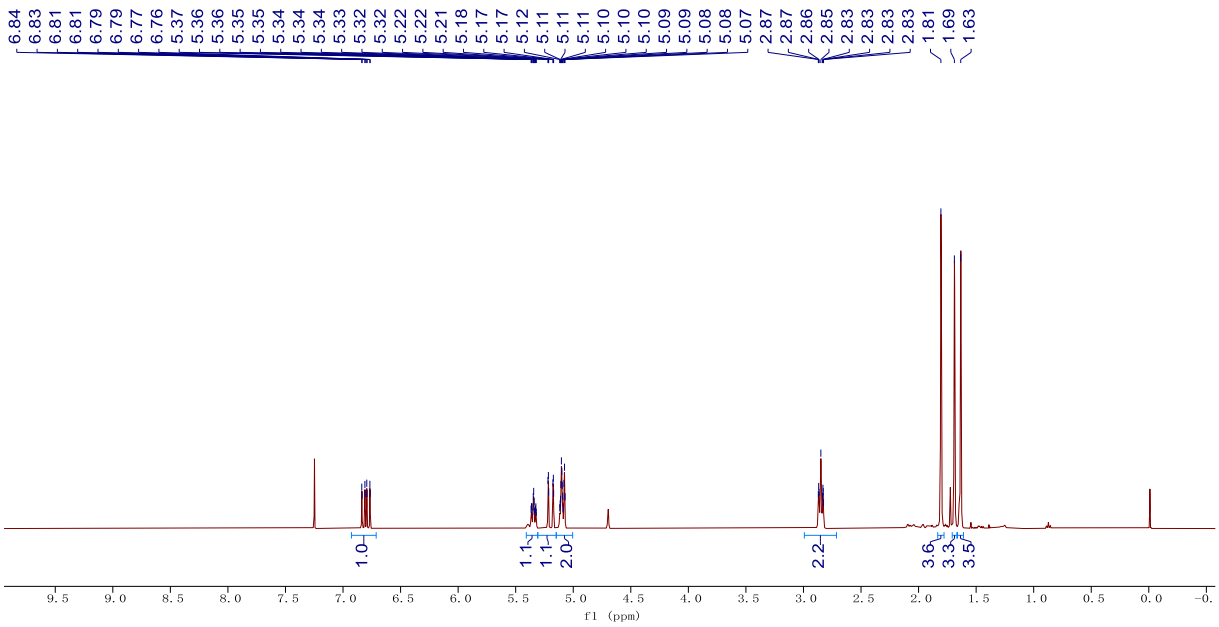


^{13}C NMR of compound **53** (101 MHz in $CDCl_3$)

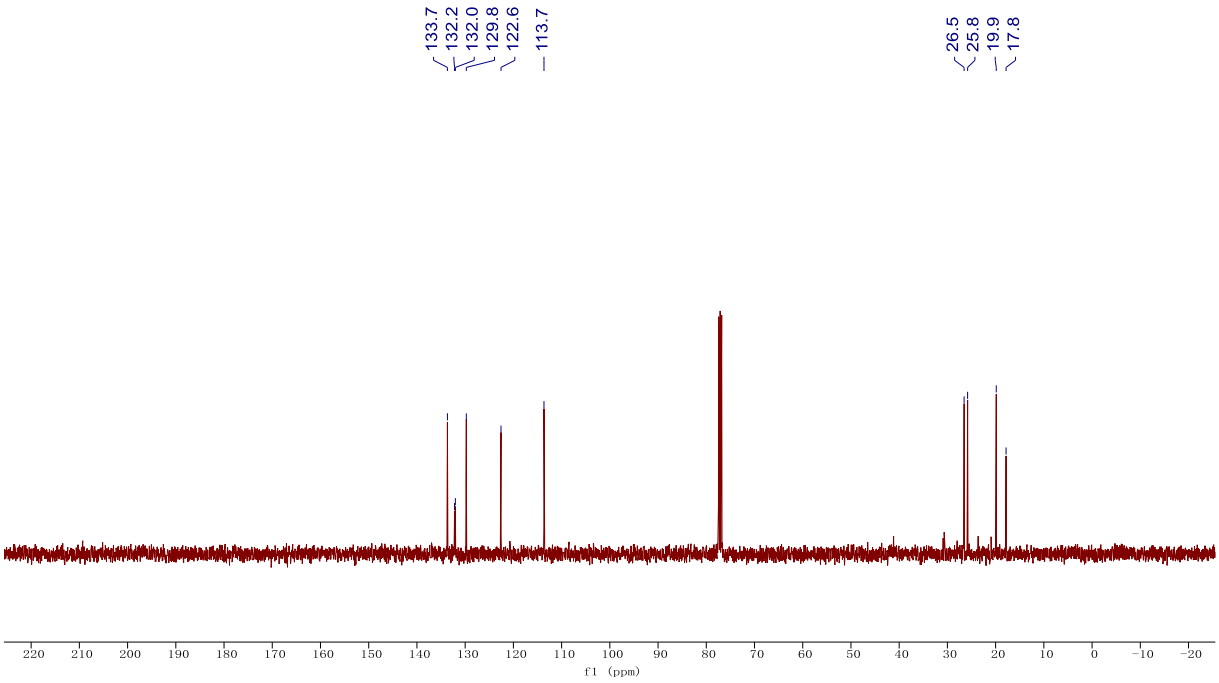


^{1}H NMR of compound **54** (400 MHz in $CDCl_3$)

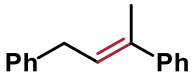


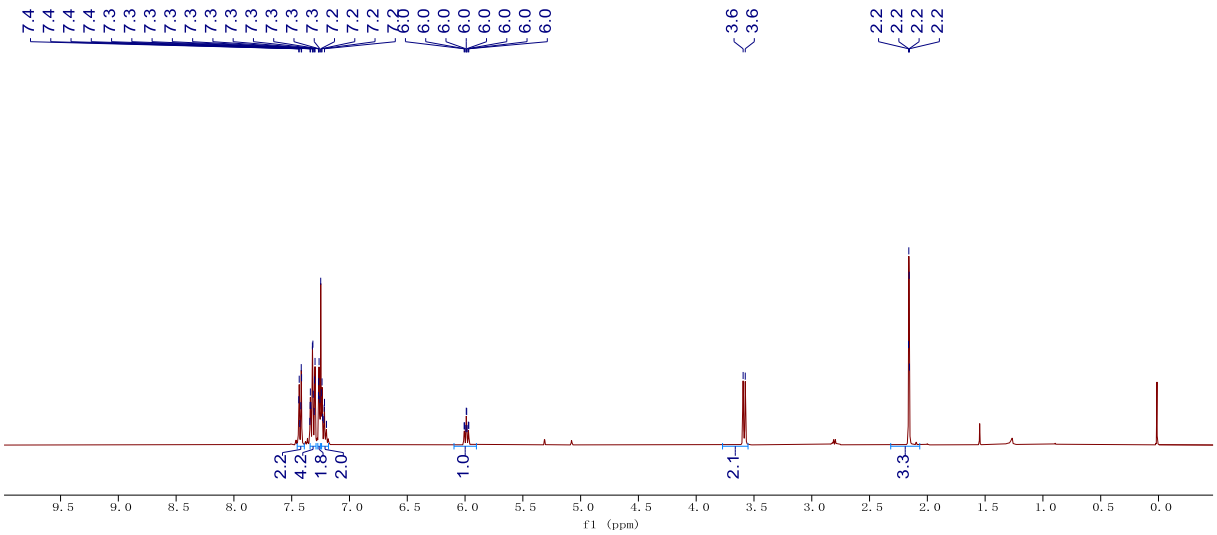


^{13}C NMR of compound **54** (101 MHz in $CDCl_3$)

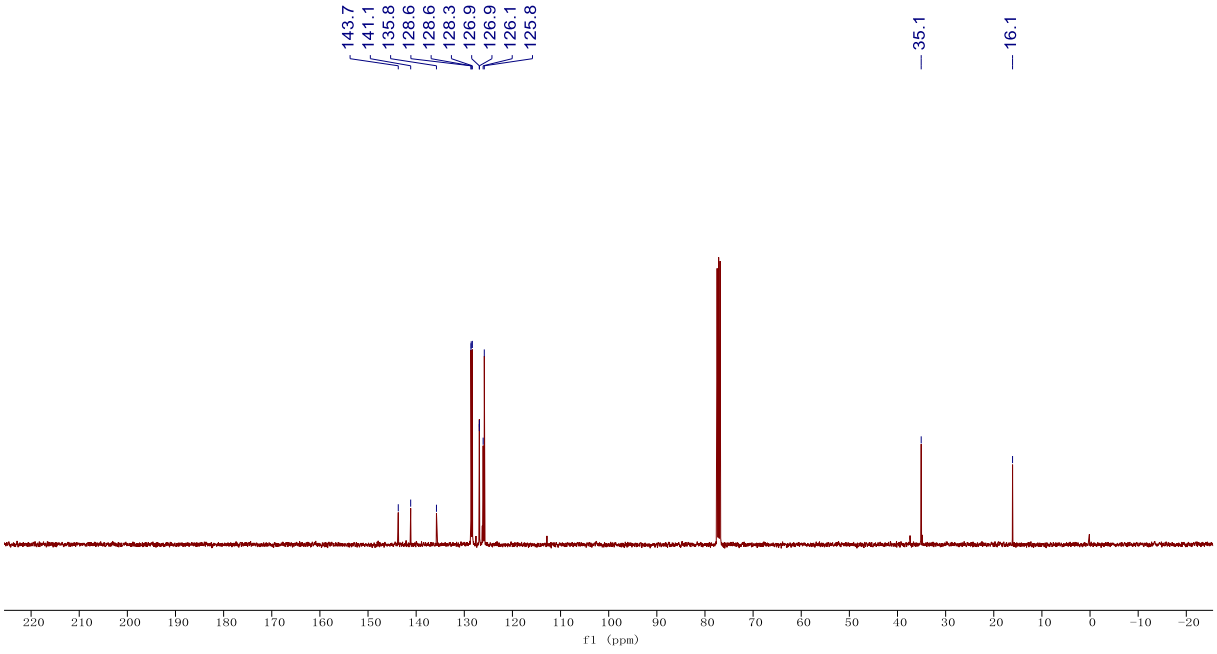


^{1}H NMR of compound **55** (500 MHz in $CDCl_3$)

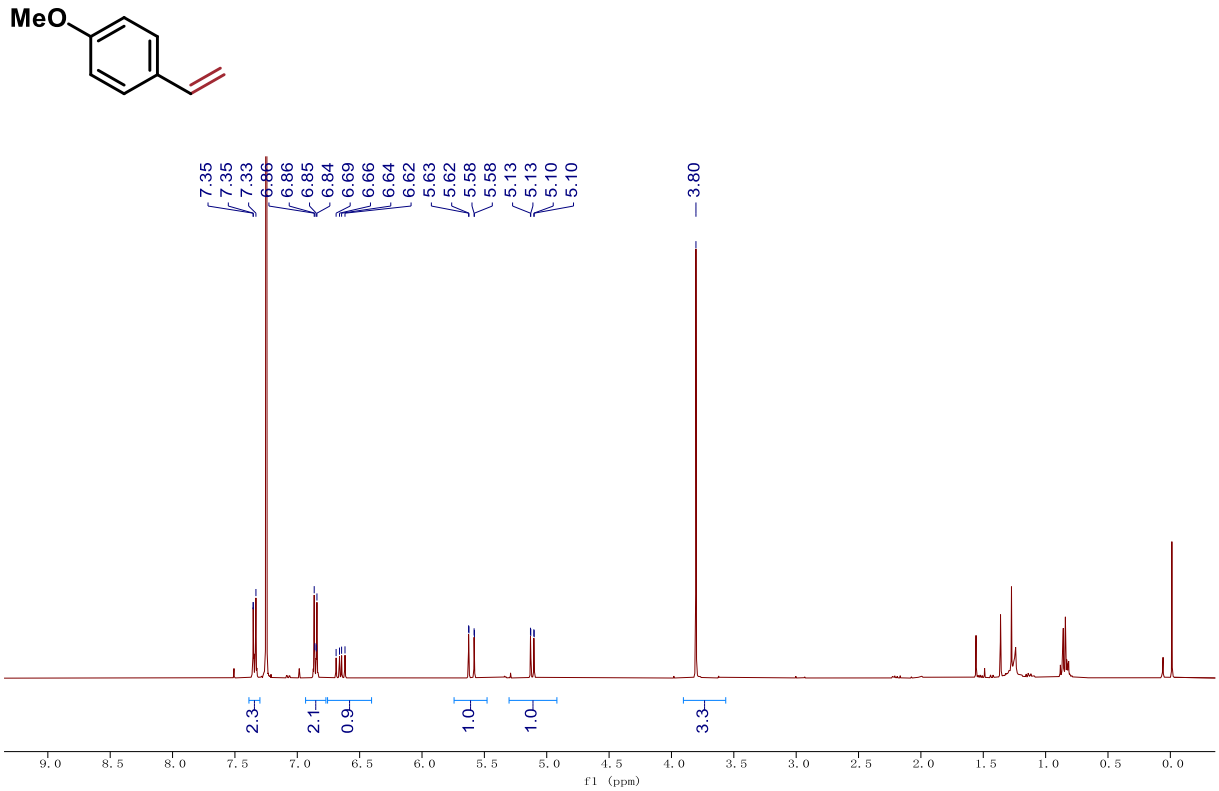




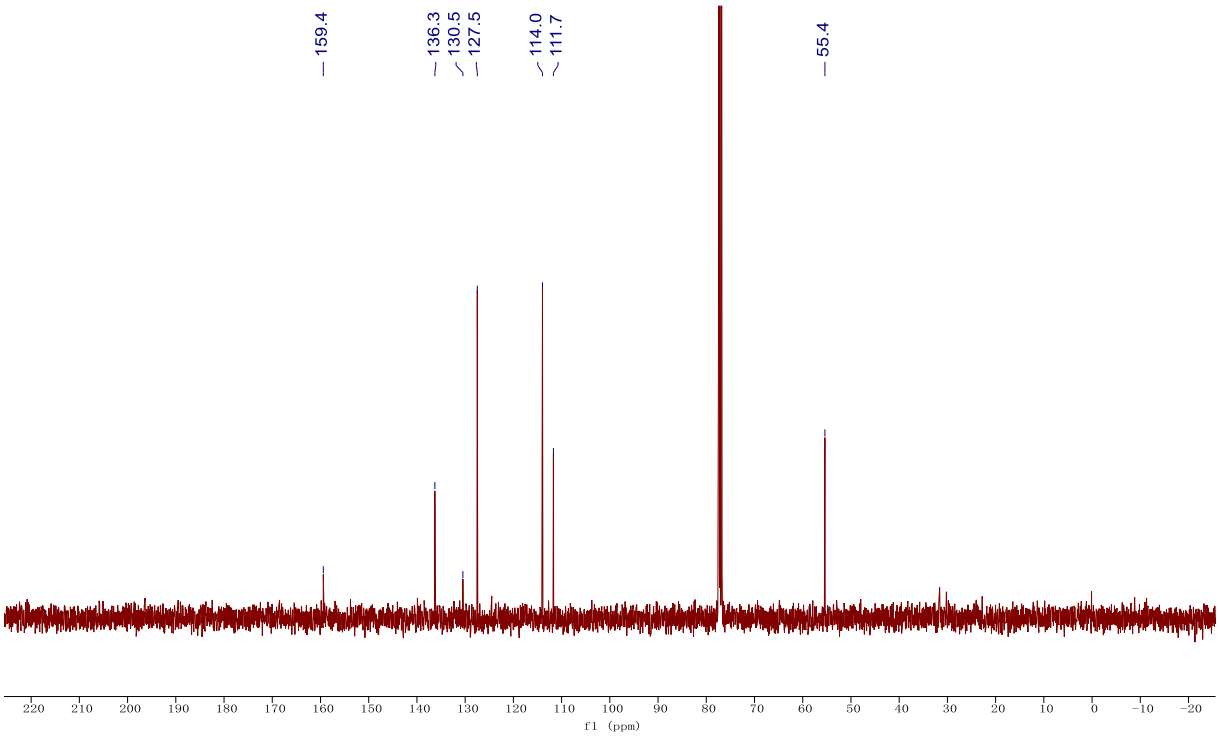
^{13}C NMR of compound **55** (126 MHz in $CDCl_3$)



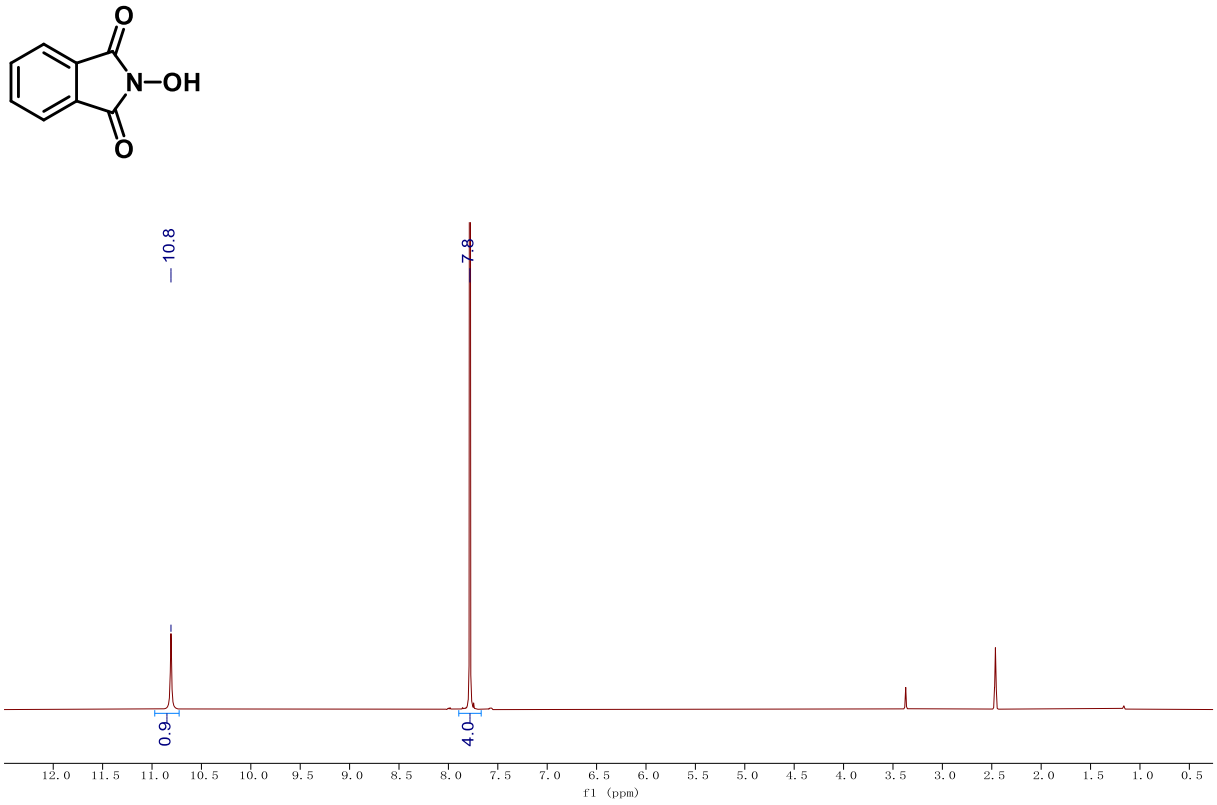
^{1}H NMR of compound **56** (400 MHz in $CDCl_3$)



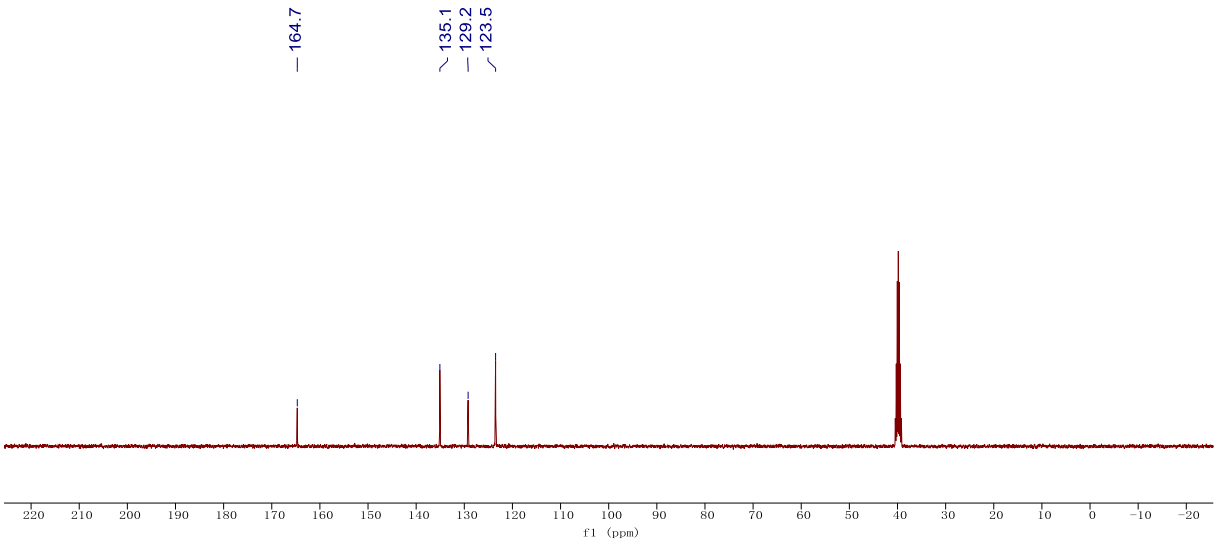
^{13}C NMR of compound **56** (101 MHz in $CDCl_3$)



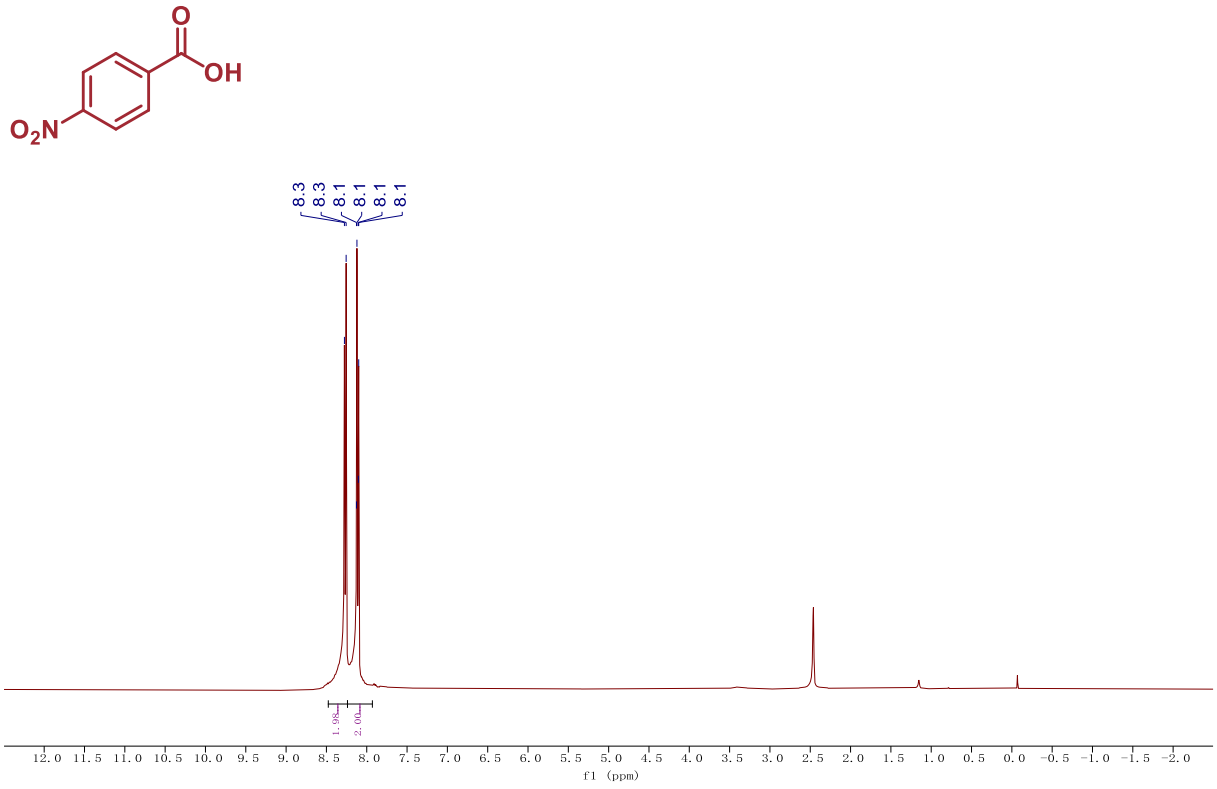
^{1}H NMR of compound **2-hydroxyisoindoline-1,3-dione(58)** (400 MHz in DMSO-d6)



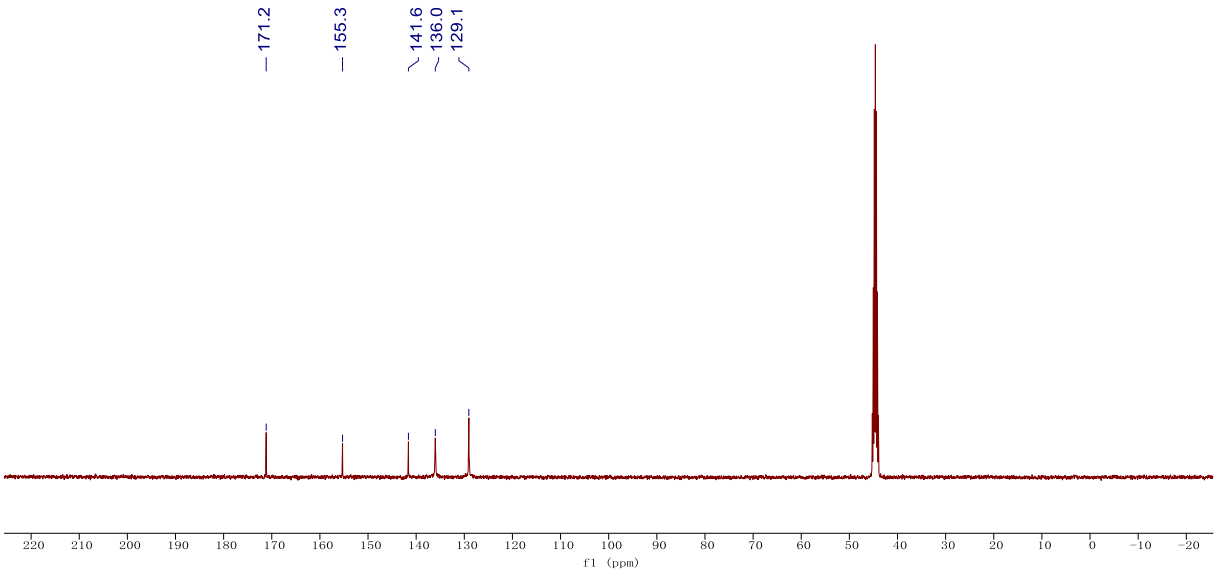
^{13}C NMR of compound **2-hydroxyisoindoline-1,3-dione(58)** (101 MHz, DMSO-D6)



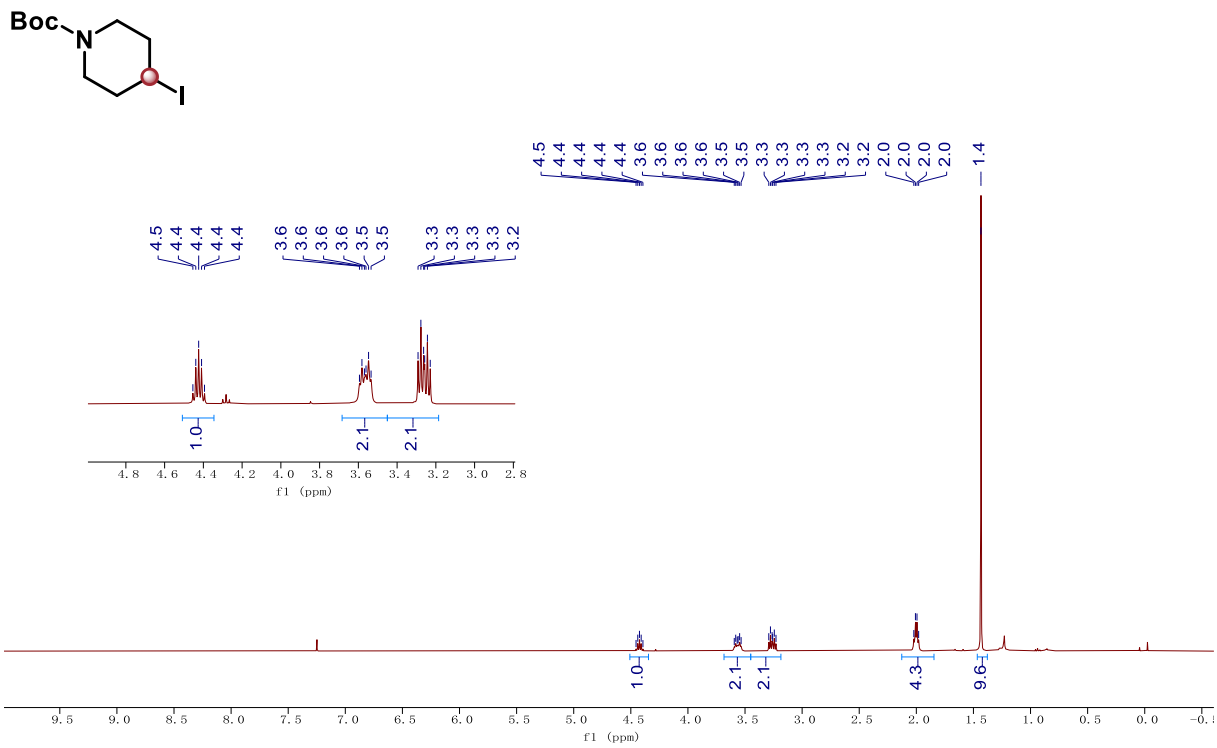
^{1}H NMR of compound **4-nitrobenzoic acid(59)** (400 MHz in DMSO-d6)



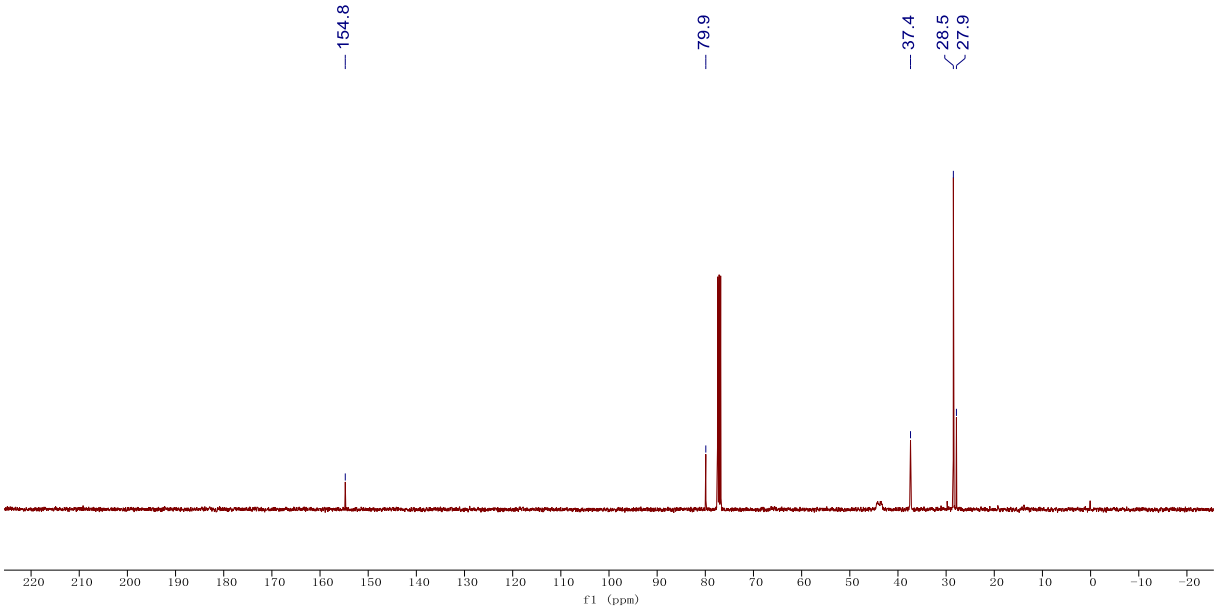
^{13}C NMR of compound **4-nitrobenzoic acid(59)** (101 MHz, DMSO-D6)



^{1}H NMR of compound **60** (400 MHz in Chloroform-d)



^{13}C NMR of compound **60** (101 MHz, Chloroform-d)



6. References

1. W. Zhao, R. P. Wurz, J. C. Peters and G. C. Fu, *J. Am. Chem. Soc.*, 2017, **139**, 12153-12156.
2. J.-B. Han, A. Guo and X.-Y. Tang, *Chem. Eur. J.*, 2019, **25**, 2989-2994.
3. M. E. Hoerrner, K. M. Baker, C. H. Basch, E. M. Bampo and M. P. Watson, *Org. Lett.*, 2019, **21**, 7356-7360.
4. P. García-Reynaga, A. K. Carrillo and M. S. VanNieuwenhze, *Org. Lett.*, 2012, **14**, 1030-1033.
5. Y. Zhou, Y. Lu, X. Hu, H. Mei, L. Lin, X. Liu and X. Feng, *Chem. Commun.*, 2017, **53**, 2060-2063.
6. S. D. Griggs, N. Thompson, D. T. Tape, M. Fabre and P. A. Clarke, *Org. Biomol. Chem*., 2018, **16**, 6663-6674.
7. R. Kumar, A. Sharma, N. Sharma, V. Kumar and A. K. Sinha, *Eur. J. Org. Chem.*, 2008, **2008**, 5577-5582.
8. D. Gauthier, A. T. Lindhardt, E. P. K. Olsen, J. Overgaard and T. Skrydstrup, *J. Am. Chem. Soc.*, 2010, **132**, 7998-8009.
9. S. N. Patil and S. G. Tilve, *Tetrahedron Lett.*, 2016, **57**, 3371-3375.
10. J. C. Roberts and J. A. Pincock, *J. Org. Chem.*, 2006, **71**, 1480-1492.
11. H. Albright, H. L. Vonesh and C. S. Schindler, *Org. Lett.*, 2020, **22**, 3155-3160.
12. H. Liu, M. Xu, C. Cai, J. Chen, Y. Gu and Y. Xia, *Org. Lett.*, 2020, **22**, 1193–1198.
13. G. W. Kabalka, N.-S. Li, D. Tejedor, R. R. Malladi and S. Trotman, *J. Org. Chem.*, 1999, **64**, 3157-3161.
14. E. Richmond and J. Moran, *J. Org. Chem.*, 2015, **80**, 6922-6929.
15. T. Huang, T. Chen and L.-B. Han, *J. Org. Chem.*, 2018, **83**, 2959-2965.
16. K. Li, R. Khan, X. Zhang, Y. Gao, Y. Zhou, H. Tan, J. Chen and B. Fan, *Chem. Commun.*, 2019, **55**, 5663-5666.
17. X.-Q. Chu, W.-B. Cao, X.-P. Xu and S.-J. Ji, *J. Org. Chem.*, 2017, **82**, 1145-1154.
18. S.-W. Wu, J.-L. Liu and F. Liu, *Org. Lett.*, 2016, **18**, 1-3.

19. L. Pitzer, F. Sandfort, F. Strieth-Kalthoff and F. Glorius, *J. Am. Chem. Soc.*, 2017, **139**, 13652-13655.

20. N. Jeedimalla, C. Jacquet, D. Bahneva, J.-J. Youte Tendoung and S. P. Roche, *J. Org. Chem.*, 2018, **83**, 12357-12373.

21. W.-M. Cheng, R. Shang and Y. Fu, *Nat. Commun.*, 2018, **9**, 5215.

22. J. R. Lizza, M. Bremerich, S. R. McCabe and P. Wipf, *Org. Lett.*, 2018, **20**, 6760-6764.

23. L. Zhang, G. Zhang, P. Wang, Y. Li and A. Lei, *Org. Lett.*, 2018, **20**, 7396-7399.

24. D. L. Beach, D. L. Garin, L. A. Kaempfe and K. W. Barnett, *J. Organomet. Chem.*, 1977, **142**, 211-223.

25. N. Basu, K.-i. Oyama and M. Tsukamoto, *Tetrahedron Lett.*, 2017, **58**, 1921-1924.

26. M. W. Renoll, *J. Am. Chem. Soc.*, 1946, **68**, 1159-1161.

27. J. Hu, M. Wang, X. Pu and Z. Shi, *Nat. Commun.*, 2017, **8**, 14993.

28. G. Pandey and J. Vaitla, *Org. Lett.*, 2015, **17**, 4890-4893.

29. Q. Feng and Q. Song, *J. Org. Chem.*, 2014, **79**, 1867-1871.

30. R. Imashiro and M. Seki, *J. Org. Chem.*, 2004, **69**, 4216-4226.

31. V. Percec, M. Peterca, M. J. Sienkowska, M. A. Ilies, E. Aqad, J. Smidrkal and P. A. Heiney, *J. Am. Chem. Soc.*, 2006, **128**, 3324-3334.

32. L. J. Cotterill, R. W. Harrington, W. Clegg and M. J. Hall, *J. Org. Chem.*, 2010, **75**, 4604-4607.

33. J. Dambacher, W. Zhao, A. El-Batta, R. Anness, C. Jiang and M. Bergdahl, *Tetrahedron Lett.*, 2005, **46**, 4473-4477.

34. W. Wang, T. B. Rauchfuss, L. Zhu and G. Zampella, *J. Am. Chem. Soc.*, 2014, **136**, 5773-5782.

35. A. Guerrini, G. Sacchetti, M. Muzzoli, G. Moreno Rueda, A. Medici, E. Besco and R. Bruni, *J. Agric. Food. Chem.*, 2006, **54**, 7778-7788.

36. Y. Wang, Z. Shao, K. Zhang and Q. Liu, *Angew. Chem. Int. Ed.*, 2018, **57**, 15143-15147.

37. T. Iwasaki, Y. Miyata, R. Akimoto, Y. Fujii, H. Kuniyasu and N. Kambe, *J. Am. Chem. Soc.*, 2014, **136**, 9260-9263.

38. K. Singha, S. C. Ghosh, A. B. Panda, *Chem. Asian J.* 2019, **14**, 3205-3212.

39. L. Tang, X. Guo, Y. Li, S. Zhang, Z. Zha and Z. Wang, *Chem. Commun*., 2013, **49**, 5213-5215.

40. V. Soulard, G. Villa, D. P. Vollmar and P. Renaud. *J. Am. Chem. Soc.*, 2018, **140**, 155-158.