Supporting Information

Visible Light Induced Beckmann Rearrangement by Organic Photoredox Catalysis

Li Tang, Zhi-Lv Wang, Hai-Lan Wan, Yan-Hong He,* and Zhi Guan*

Key Laboratory of Applied Chemistry of Chongqing Municipality, School of Chemistry and Chemical Engineering, Southwest University, Chongqing 400715, China

E-mails: heyh@swu.edu.cn (for Y.-H. He); guanzhi@swu.edu.cn (for Z. Guan)

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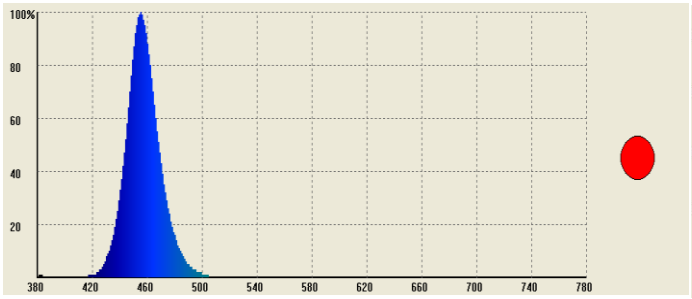
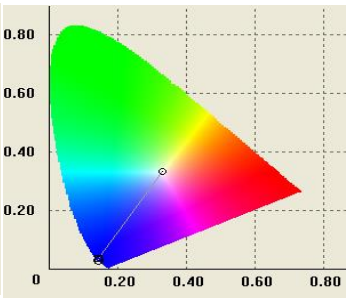
1. General Experimental Details

The solvents were purchased from Adamas Reagent, Ltd. The acetophenone oxime were purchased from shanghai aladdin biochemical technology Co., Ltd. The 10-methyl-9-phenylacridinium perchlorate (**PC-3**) was purchased from Tokyo Chemical industry Co., Ltd.The ketoximes were prepared according to the literature[1]. The solvents were dried by molecular sieves. The 9 W blue LEDs was purchased from Epistar, and the detail information has been showed on Table S1. No filters are used in this reaction. The distance from the light source to the irradiation vessel (Beijing Synthware Glass) about 3 cm. Unless otherwise noted, all reagents were purchased from commercial suppliers and used without further purification. Reactions were monitored by thin-layer chromatography (TLC) with Hailang GF 254 silica gel plates (Qingdao Hailang chemical industry Co Ltd, Qingdao, China) using UV light and phosphomolybdic acid as visualizing agents. Flash column chromatography was performed using 200–300 mesh silica gel at increased pressure. ^{1}H NMR spectra and ^{13}C NMR spectra were recorded respectively on 600 MHz and 150 MHz NMR spectrometers. Chemical shifts (δ) were expressed in ppm with TMS as the internal standard and coupling constants (*J*) were reported in Hz. High-resolution mass spectra were obtained by using ESI ionization sources (Varian 7.0 T FTICR-MS) and ESI-TOF. Melting points were taken on a WPX-4 apparatus (Yice instrument equipment Co Ltd, Shanghai) and were uncorrected.

Table S1 The detail information of 9W blue LEDs



Spectrum distribution



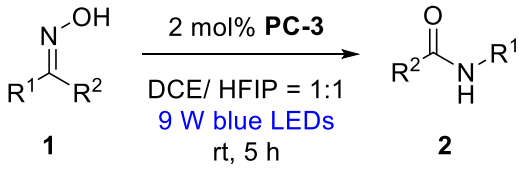
chromaticity diagram

Chromaticity Coordinates	x=0.1466 y=0.0363 u=0.1865 v=0.1040

Temperature	>25000K	Peak Wavelength	456nm
SDCM	0	Main Wavelength	460nm
Color Shift	0.000000 duv	Wavelength Width	0nm
Red Ratio	0	Color Purty	98.00%
Luminous Flux	1.317e3lux	Radiant Flux	2.875e4w/m2
Rendering Flux	Ra=50.0 R1=12.0 R2=48.0 R3=99.0 R4=88.0 R5=2.0 R6=60.0 R7=53.0 R8=39.0 R9=99.0 R10=99.0 R11=99.0 R12=99.0 R13=33.0 R14=33.0		

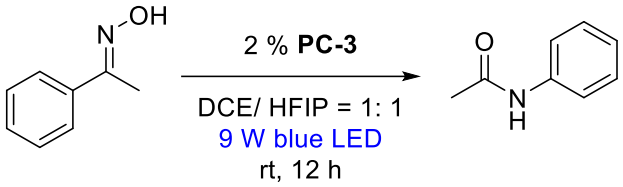
2. Experimental Procedures

2.1. General Procedure for The Synthesis of Products 2



Ketoxime **1** (0.50 mmol), 10-methyl-9-phenylacridinium (**PC-3**) perchlorate (3.7 mg), DCE (2.5 mL) and HFIP (2.5 mL) were combined and added into a tube equipped with a magnetic stirring bar, and the tube was sealed. After the reaction mixture was irradiated by 9 W blue LEDs for 5 hours, it was concentrated in vacuo. The desired amide **2** was obtained after purification of the concentrate by flash chromatography on silica gel with petroleum ether/ethyl acetate (9:1 to 1:1) as the eluent.

2.2. Procedure for Gram Scale Reaction.



1a
10.0 mmol, 1.35 g

2a
1.26 g, 93%

Acetophenone oxime **1a** (10.0 mmol), 10-methyl-9-phenylacridinium (**PC-3**) perchlorate (73.7 mg), DCE (50.0 mL), and HFIP (50.0 mL) were combined and added into a round bottom flask equipped with a magnetic stirring bar. The reaction mixture was irradiated under 9 W blue LEDs until **1a** was consumed up. Then, the reaction mixture was concentrated in vacuo. The desired amide **2a** was obtained (1.26 g, 93% yield) after purification of the concentrate by flash chromatography on silica gel with petroleum ether/ethyl acetate (2:1 to 1:1) as the eluent.

2.3. Determination of Quantum Yield.

Kessil LED PR160-456 nm (25 W) was used for measurement of quantum yield.

According to a procedure previously reported by Yoon, [2] the photon flux of the blue LED was determined by standard ferrioxalate actinometry. A 0.15 M solution of ferrioxalate was prepared by dissolving 0.737 g of potassium ferrioxalate hydrate in 10 mL of 0.05 M H_2SO_4. A buffered solution of phenanthroline was prepared by dissolving 5.0 mg of phenanthroline and 1.13 g of sodium acetate in 5.0 mL of 0.5 M H_2SO_4. Both solutions were stored in the dark. To determine the photon flux of the spectrophotometer, 2.0 mL of the ferrioxalate solution was placed in a cuvette and irradiated for 90.0 seconds at $\lambda = 455$ nm. After irradiation, 0.35 mL of the phenanthroline solution was added to the cuvette. The solution was then allowed to rest for 1 h to allow the ferrous ions to completely coordinate to the phenanthroline. The absorbance of the solution was measured at 510 nm. A non-irradiated sample was also prepared and the absorbance at 510 nm measured. Conversion was calculated using Eq 1,

$$mol\ of\ Fe^{2+} = \frac{V \bullet \Delta A}{l \bullet \varepsilon} \qquad \text{Eq 1}$$

$$mol\ of\ Fe^{2+} = \frac{0.00235\ L \bullet 0.51}{1.000\ cm \bullet 11100\ mol^{-1}cm^{-1}} = 1.08 \times 10^{-7}\ mol$$

where V is the total volume (0.00235 L) of the solution after addition of phenanthroline, ΔA is the difference in absorbance at 510 nm between the irradiated and non-irradiated

solutions, l is the path length (1.000 cm), and ε is the molar absorptivity at 510 nm (11100 L mol^{-1} cm^{-1}). The photon flux can be calculated using Eq 2,

$$photon\ flux = \frac{\text{mol } Fe^{2+}}{\Phi \bullet t \bullet f} \qquad \text{Eq 2}$$

$$photon\ flux = \frac{1.08 \times 10^{-7} \text{ mol}}{0.84 \bullet 90 \text{ s} \bullet 0.967} = 1.48 \text{ x } 10\text{-}9 \text{ einstein/s}$$

where Φ is the quantum yield for the ferrioxalate actinometer (0.84 at λ = 455 nm)[3], ***t*** is the time (90 s), and ***f*** (*f* = 0.967) is the fraction of light absorbed reported by Lakhdar[4].

A cuvette was charged with Acetophenone oxime **1a** (0.2 mmol), 10-methyl-9-phenylacridinium (**PC-3**) perchlorate (1.5 mg), DCE (1.0 mL), and HFIP (1.0 mL). The cuvette was stirred and irradiated (Kessil LED PR160-456 nm (25 W)) for 2400 s (40 min). After irradiation, the yield was obtained by column chromatography in 9.8 mg (0.000725 mol, yield: 36%,), The quantum yield was determined using Eq 3. Essentially all incident light (f > 0.999, *vide infra*) is absorbed by the 10-methyl-9-phenylacridinium (**PC-3**) perchlorate at the reaction conditions described above.

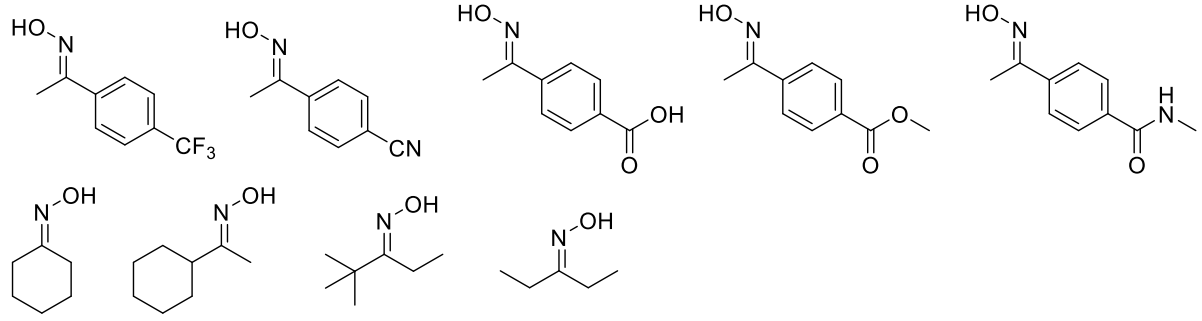
$$\Phi = \frac{\text{mol product}}{\text{photon flux} \bullet t \bullet f} \qquad \text{Eq 3}$$

$$\Phi = \frac{7.25 \times 10^{-5} \text{mol}}{1.48 \times 10^{-9} \text{ einstein s}^{-1} \bullet 2400 \text{ s} \bullet 1.00} = 20.4$$

3. Unsuccessful Substrates

Despite the success of photoredox Beckmann rearrangement for most oximes, there were some particular types of oximes that were not observed for rearrangement. Under standard conditions, aromatic oximes with strong electron-withdrawing groups (such as CN, CF_3, ester, carboxylic acid and amide) as well as dialkyl ketones did not work.

unsuccessful substrates



4. UV-Vis experiments

The UV-Vis experiments of acetophenone oxime **1a** & **PC-3** showed that **1a** solution (DCE/HFIP = 10:1) has no absorption peak in the visible wavelength range while **PC-3** has absorption at 420 nm – 490 nm. This result indicates that **PC-3** is necessary in this reaction.

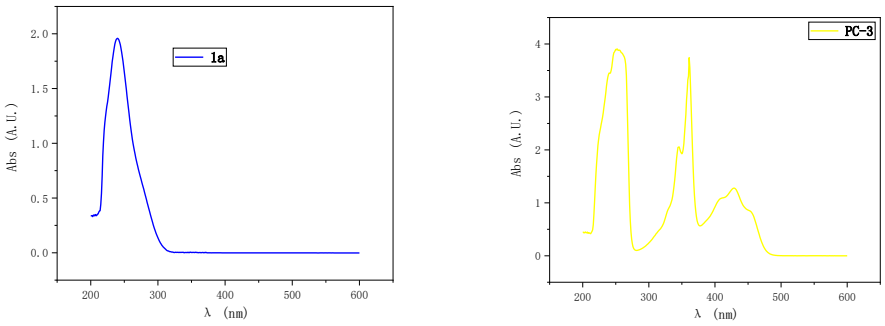


Figure S1. UV-Vis experiments of acetophenone oxime **1a** & **PC-3**.

5. Emission Quenching Experiments

The quenching of the excited state Ph-Acr-Me^{+}ClO$_4^{-}$ (**PC-3***) by the acetophenone oxime **1a** was conducted in a mixed solvent of DCE/HFIP = 1:1 (**Figures S2**). The results revealed that **1a** could significantly quench **PC-3***. (excitation wavelength 451 nm; emission wavelength 467 - 690 nm.)

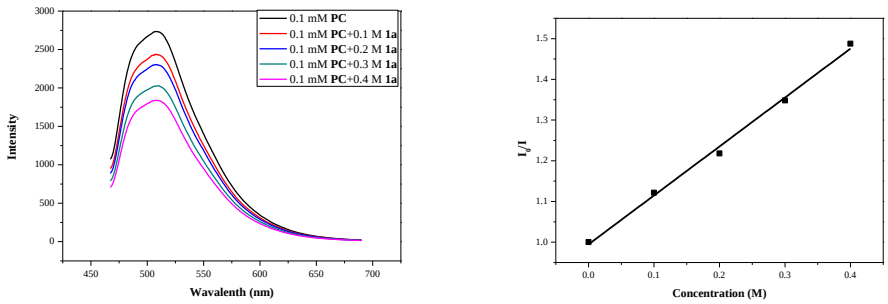


Figure S2. Fluorescence quenching of 5 μM **PC-3** (DCE/HFIP=1:1) by increasing concentration of **1a**.

The quenching of the excited state Ph-Acr-Me^{+}ClO$_4^{-}$ (**PC-3***) by the acetophenone oxime **1a** was set up in DCE (**Figures S3**). The results revealed that **1a** also significantly quench **PC-3***. (excitation wavelength 437 nm; emission wavelength 450 - 600 nm.)

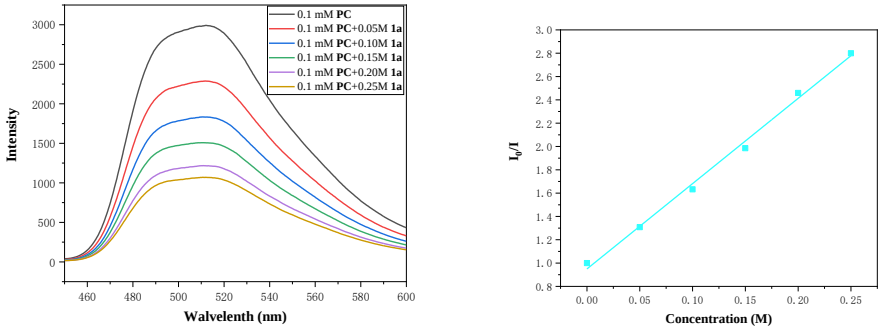
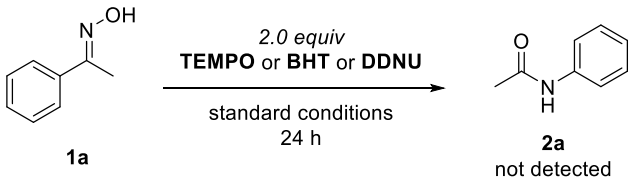


Figure S3. Fluorescence quenching of 5 μM **PC-3** (DCE) by increasing concentration of **1a**.

6. Radical Trapping Experiments

To verify whether the reaction undergoes a radical mechanism, radical trapping and inhibition experiments were performed. The commonly used radical scavengers 2,2,6,6-tetramethylpiperidinooxy (TEMPO), 2,6-di-tert-butyl-4-methylphenol (BHT) and 1,1-diphenylethylene (DDNU) were used in the model reaction, respectively. It was found that in the presence of these radical scavengers, no amide product 2a was formed, starting material was not consumed, and no any side product from coupling with TEMPO or other radical scavenger was detected by high resolution mass spectrometry (HRMS) (Scheme S1). This result indicated that the reaction was completely inhibited by the free radical scavengers, suggesting that a radical process may be involved.



Scheme S1. Radical Trapping Experiments.

7. Experiments of light and dark

The light/dark experiments (**Figure S3**) showed that there is chain propagation involved in this visible light-induced Beckmann rearrangment.

#	Light (h)	Dark (h)	Light (h)	Dark (h)	Light (h)	Dark (h)	Light (h)	Dark (h)	Yield
1	0-0.5								5%
2	0-0.5	0.5-1							12%
3	0-0.5	0.5-1	1-1.5						22%
4	0-0.5	0.5-1	1-1.5	1.5-2					33%
5	0-0.5	0.5-1	1-1.5	1.5-2	2-2.5				44%
6	0-0.5	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3			62%
7	0-0.5	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5		67%
8	0-0.5	0.5-1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	78%

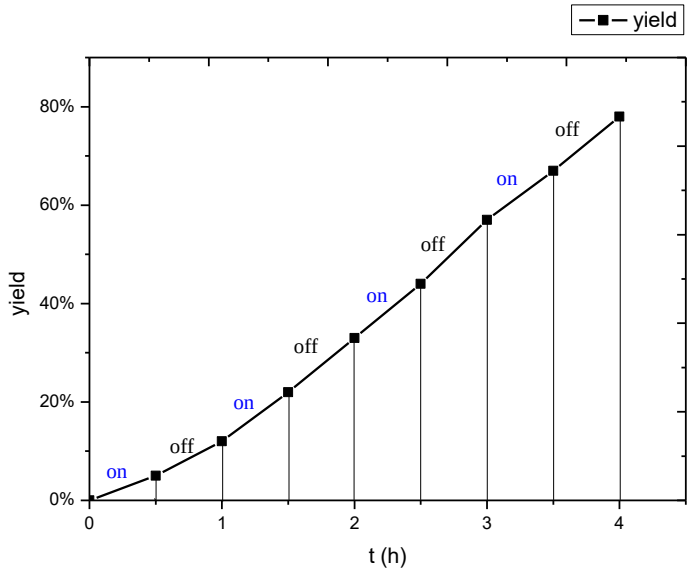
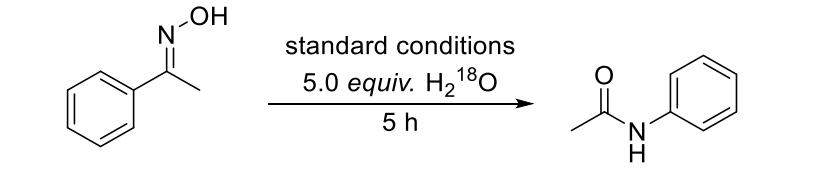


Figure S4. Time profile of model reaction with light on/off.

8. HRMS of ^{18}O-Labeling experiments

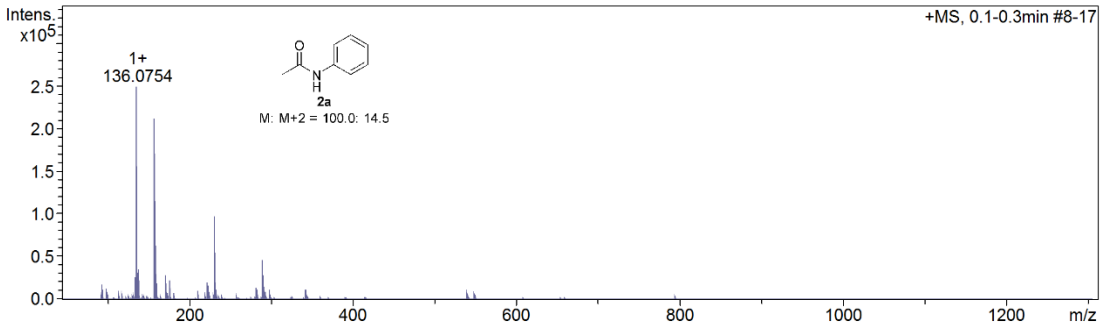
a) $H_2{}^{18}O$ experiment



1a
M : M+2 = 100.0 : 0.7

2a, 34%
M : M+2 = 100.0 : 14.5

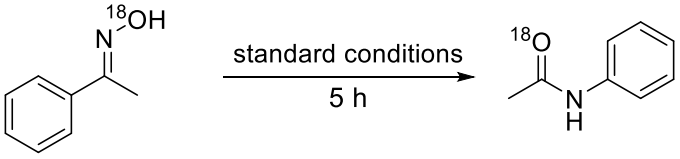
The HRMS of product **2a**:



Meas. m/z	#	Ion Formula	Sum Formula	m/z	Adduct	err [ppm]	z	mSigma	Score	rdb	N-Rule	e¯ Conf
136.0754	1	C8H10NO	C8H9NO	136.0757	M+H	2.3	1+	80.7	100.00	5.0	ok	even
138.0796	1	C8H10N^18O	C8H9N^18O	138.0799	M+H	2.3	1+	4.2	100.00	5.0	ok	even

#	m/z	Res.	S/N	I	I %	FWHM
1	136.0754	19635	17329.7	249894	100.0	0.0069
2	137.0787	20490	1668.5	24032	9.6	0.0067
3	138.0796	20974	2522.5	36355	14.5	0.0066

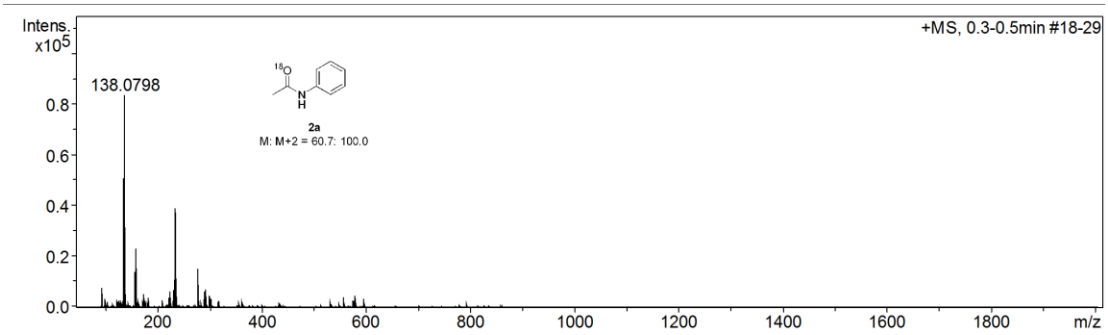
b) ^{18}O-oxime experiment



1a
M : M+2 = 52.4 : 100.0

2a, 92%
M : M+2 = 60.7 : 100.0

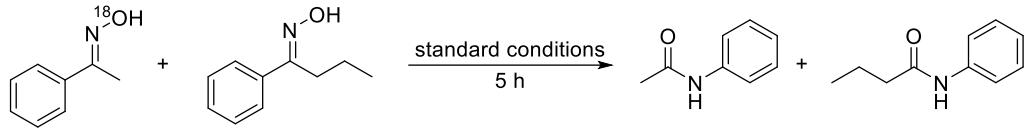
The HRMS of product **2a**:



Meas. m/z	#	Ion Formula	Sum Formula	m/z	Adduct	err [ppm]	z	mSigma	Score	rdb	N-Rule	e¯ Conf
136.0755	1	C8H10NO	C8H9NO	136.0757	M+H	1.5	1+	617.4	100.00	5.0	ok	even
138.0798	1	C8H10N^18O	C8H9N^18O	138.0799	M+H	1.3	1+	3.1	100.00	5.0	ok	even

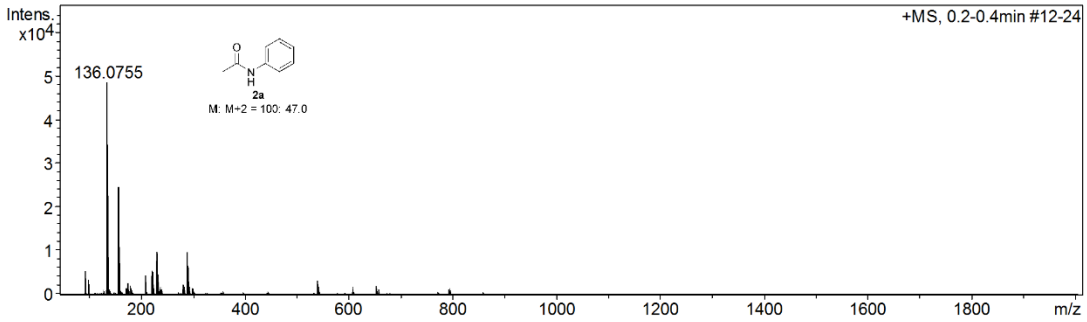
#	m/z	Res.	S/N	I	I %	FWHM
1	136.0755	20519	2993.3	50549	60.7	0.0066
2	137.0789	20410	305.3	5181	6.2	0.0067
3	138.0798	20301	4890.7	83261	100.0	0.0068
4	139.0830	20435	426.2	7278	8.7	0.0068

c) ^{18}O-oxime & ^{16}O-oxime cross-over experiment



1a M : M+2 = 52.4 : 100.0 **1y** M : M+2 = 100.0 : 0.7 **2a**, 90% M : M+2 = 100.0 : 47.0 **2ab**, 85% M : M+2 = 100.0 : 27.6

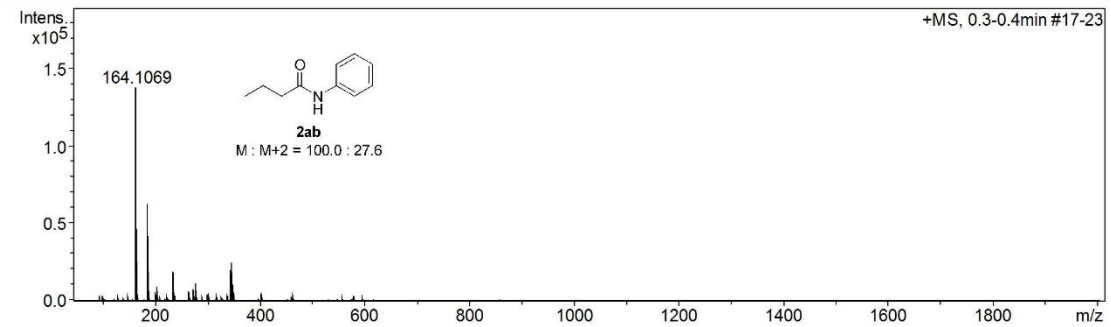
The HRMS of product **2a**:



Meas. m/z	#	Ion Formula	Sum Formula	m/z	Adduct	err [ppm]	z	mSigma	Score	rdb	N-Rule	e⁻ Conf
136.0755	1	C8H10NO	C8H9NO	136.0757	M+H	1.3	1+	267.9	100.00	5.0	ok	even
138.0798	1	C8H10N^18O	C8H9N^18O	138.0799	M+H	0.9	1+	5.1	100.00	5.0	ok	even

#	m/z	Res.	S/N	I	I %	FWHM
1	136.0755	20042	3090.3	48282	100.0	0.0068
2	137.0788	20279	284.5	4476	9.3	0.0068
3	138.0798	21006	1436.8	22687	47.0	0.0066
4	139.0831	19889	119.3	1890	3.9	0.0070

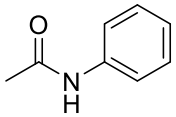
The HRMS of product **2ab**:



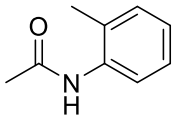
Meas. m/z	#	Ion Formula	Sum Formula	m/z	Adduct	err [ppm]	z	mSigma	Score	rdb	N-Rule	e⁻ Conf
164.1069	1	C10H14NO	C10H13NO	164.1070	M+H	0.7	1+	154.8	100.00	5.0	ok	even
166.1112	1	C10H14N^18O	C10H13N^18O	166.1112	M+H	0.5	1+	3.8	100.00	5.0	ok	even

#	m/z	Res.	S/N	I	I %	FWHM
1	164.1069	22202	7277.7	137429	100.0	0.0074
2	165.1102	21792	833.0	15781	11.5	0.0076
3	166.1112	21531	1995.1	37933	27.6	0.0077
4	167.1144	21339	219.1	4181	3.0	0.0078

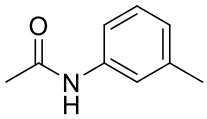
9. Characterization Data of the Products



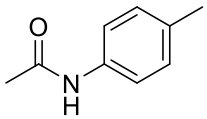
***N*-phenylacetamide (2a)**[5]: 61.4 mg of pale yellow solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 91%; m.p. 113.3 – 115.2 °C; ^{1}H NMR (600 MHz, CDCl3) δ 7.69 (s, 1H), 7.50 (d, *J* = 7.8 Hz, 2H), 7.30 (t, *J* = 7.6 Hz, 2H), 7.09 (t, *J* = 7.3 Hz, 1H), 2.16 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.6, 138.0, 129.0, 124.3, 120.0, 24.5.



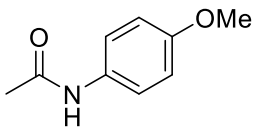
***N*-(*o*-tolyl)acetamide (2b)** [5]: 17.2 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 23%; m.p. 100.2 – 105.3 °C; ^{1}H NMR (600 MHz, CDCl3) δ 7.72 (d, *J* = 7.8 Hz, 1H), 7.17 – 7.21 (m, 3H), 7.08 (t, *J* = 7.1 Hz, 2H), 2.25 (s, 3H), 2.19 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.4, 135.7, 130.5, 129.4, 126.7, 125.4, 123.6, 24.2, 17.8.



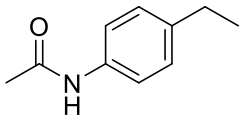
***N*-(*m*-tolyl)acetamide (2c)** [5]: 67.6 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 91%; m.p. 65.5 – 67.1 °C; ^{1}H NMR (600 MHz, CDCl3) δ 8.19 (s, 1H), 7.35 (s, 1H), 7.29 (d, *J* = 7.9 Hz, 1H), 7.15 (t, *J* = 7.7 Hz, 1H), 6.89 (d, *J* = 7.4 Hz, 1H), 2.27 (s, 3H), 2.12 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 169.0, 138.8, 138.0, 128.7, 125.09, 120.9, 117.3, 24.4, 21.4.



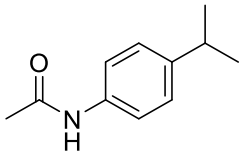
***N*-(*p*-tolyl)acetamide (2d)** [5]: 67.0 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 90%; m.p. 147.4 – 149.6 °C; ^{1}H NMR (600 MHz, CDCl3) δ 7.59 (s, 1H), 7.37 (d, *J* = 8.2 Hz, 2H), 7.10 (d, *J* = 8.1 Hz, 2H), 2.30 (s, 3H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.5, 135.4, 133.9, 129.4, 120.2, 24.4, 20.8.



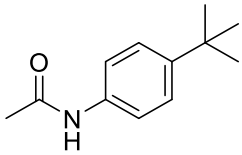
***N*-(4-methoxyphenyl)acetamide (2e)** [5]: 76.7 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 93%; m.p. 127.8 – 129.6 ºC; ^{1}H NMR (600 MHz, CDCl3) δ 7.38 (d, *J* = 8.9 Hz, 2H), 7.35 (s, 1H), 6.84 (d, *J* = 8.8 Hz, 2H), 3.78 (s, 3H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.3, 156.5, 131.0, 122.0, 114.2, 55.5, 24.3.



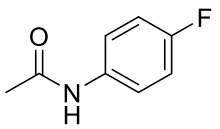
***N*-(4-ethylphenyl)acetamide (2f)** [6]: 77.7 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 3/1 to 3/2), yield: 95%; m.p. 89.0 – 91.7 ºC; ^{1}H NMR (600 MHz, CDCl3) δ 7.57 (s, 1H), 7.39 (d, *J* = 8.3 Hz, 2H), 7.12 (d, *J* = 8.2 Hz, 2H), 2.60 (q, *J* = 7.6 Hz, 2H), 2.14 (s, 3H), 1.20 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.4, 140.4, 135.6, 128.3, 120.2, 28.3, 24.4, 15.6.



***N*-(4-isopropylphenyl)acetamide (2g)** [8]: 85.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 3/1 to 3/2), yield: 97%; m.p. 102.5 – 103.8 ºC; ^{1}H NMR (600 MHz, CDCl3) δ 7.65 (s, 1H), 7.40 (d, *J* = 8.4 Hz, 2H), 7.15 (d, *J* = 8.3 Hz, 2H), 2.86 (hept, *J* = 7.0 Hz, 1H), 2.14 (s, 3H), 1.22 (d, *J* = 6.9 Hz, 6H); ^{13}C NMR (150 MHz, CDCl3) δ 168.5, 145.0, 135.6, 126.8, 120.3, 33.6, 24.4, 24.0.

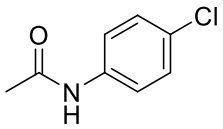


***N*-(4-(*tert*-butyl)phenyl)acetamide (2h)** [5]: 87.9 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 92%; m.p. 170.6 – 171.6 ºC; ^{1}H NMR (600 MHz, CDCl3) δ 7.41 (d, *J* = 8.5 Hz, 2H), 7.37 (s, 1H), 7.32 (d, *J* = 8.5 Hz, 2H), 2.15 (s, 3H), 1.30 (s, 9H); ^{13}C NMR (150 MHz, CDCl3) δ δ 168.3, 147.3, 135.2, 125.8, 119.8, 34.4, 31.4, 24.5.

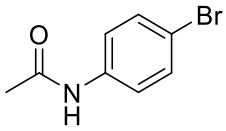


***N*-(4-fluorophenyl)acetamide (2i)**[5]: 51.2 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 67%; m.p. 152.3 – 153.5 ºC; ^{1}H NMR

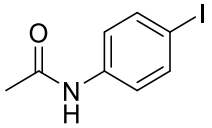
(600 MHz, CDCl3) δ 7.57 (s, 1H), 7.49 – 7.39 (m, 2H), 6.99 (t, *J* = 8.6 Hz, 2H), 2.15 (s, 3H); ^{13}C NMR (150 MHz, CDCl3) δ 168.5 (d, *J* = 15.2 Hz), 159.4 (d, *J* = 243.4 Hz), 133.9 , 121.9 (t, *J* = 7.1 Hz), 115.6 (dd, *J* = 22.6, 3.0 Hz), 24.3 (d, *J* = 5.3 Hz).



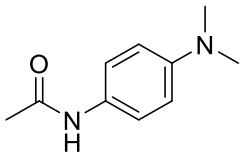
***N*-(4-chlorophenyl)acetamide (2j)** [5]: 29.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 35%; m.p. 175.9 – 177.6 ºC; ^{1}H NMR (600 MHz, CDCl3) δ 7.45 (d, *J* = 8.6 Hz, 2H), 7.31 – 7.23 (m, 3H), 2.17 (s, 3H).; ^{13}C NMR (150 MHz, CDCl3) δ 168.3, 136.5, 129.3, 129.0, 121.1, 24.5.



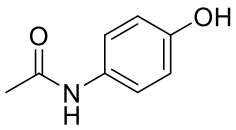
***N*-(4-bromophenyl)acetamide (2k)**[5]: 16.6 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 16%; m.p. 167.1 – 168.3 ºC; ^{1}H NMR (600 MHz, DMSO-*d*$_6$) δ 10.05 (s, 1H), 7.56 (d, *J* = 8.6 Hz, 2H), 7.46 (d, *J* = 8.2 Hz, 2H), 2.05 (s, 3H); ^{13}C NMR (150 MHz, DMSO-*d*$_6$) δ 168.9, 139.1, 131.9, 121.4, 114.9, 24.5.



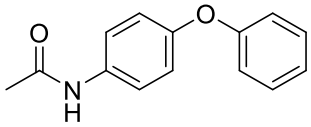
***N*-(4-iodophenyl)acetamide (2l)**[5]: 17.8 mg of brown solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/1), yield: 14%; m.p. 180.7 – 181.5 ºC; ^{1}H NMR (600 MHz, DMSO-*d*$_6$) δ 10.01 (s, 1H), 7.62 (d, *J* = 8.2 Hz, 2H), 7.48 – 7.38 (m, 2H), 2.04 (d, *J* = 1.8 Hz, 3H); ^{13}C NMR (150 MHz, DMSO-*d*$_6$) δ 168.9, 139.6, 137.7, 121.7, 86.7, 24.5.



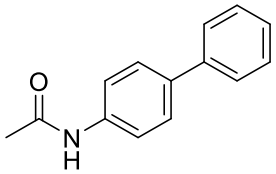
***N*-(4-(dimethylamino)phenyl)acetamide (2m)** [8]: 61.1 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 1/1 to 1/3), yield: 69%; m.p. 128.2 – 129.7 ºC; ^{1}H NMR (600 MHz, DMSO) δ 9.58 (s, 1H), 7.37 (d, *J* = 8.9 Hz, 2H), 6.66 (d, *J* = 9.0 Hz, 2H), 2.83 (s, 6H), 1.98 (s, 3H); ^{13}C NMR (150 MHz, DMSO) δ 167.8, 147.4, 129.8, 121.0, 113.2, 41.0, 24.2.



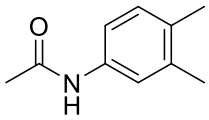
***N*-(4-hydroxyphenyl)acetamide (2n)**[1]: 19.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/3), yield: 26%; m.p. 155.0 – 156.1 °C; ^{1}H NMR (600 MHz, DMSO-d_6) δ 9.65 (s, 1H), 9.14 (s, 1H), 7.35 (d, J = 8.6 Hz, 2H), 6.69 (d, J = 8.6 Hz, 2H), 1.99 (s, 3H); ^{13}C NMR (150 MHz, DMSO) δ 168.0, 153.6, 131.5, 121.4, 115.5, 24.2.



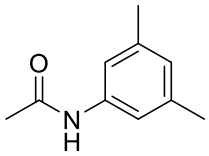
***N*-(4-phenoxyphenyl)acetamide (2o)** [9]: 103.3 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 3/1 to 3/2), yield: 91%; m.p. 129.7 – 130.7 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.83 (s, 1H), 7.44 (d, J = 8.8 Hz, 2H), 7.30 (t, J = 7.8 Hz, 2H), 7.06 (t, J = 7.3 Hz, 1H), 7.00 – 6.86 (m, 4H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.7, 157.5, 153.6, 133.5, 129.7, 123.1, 121.9, 119.5, 118.5, 24.3.



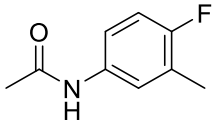
***N*-([1,1'-biphenyl]-4-yl)acetamide (2p)**[10]: 87.0 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 82%; m.p. 169.5 – 170.9 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.60 – 7.46 (m, 7H), 7.41 (t, J = 7.6 Hz, 2H), 7.32 (d, J = 7.3 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.4, 140.5, 137.2, 128.8, 127.6, 127.1, 126.8, 120.3, 24.6.



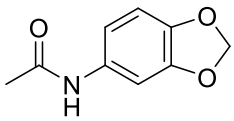
***N*-(3,4-dimethylphenyl)acetamide (2q)** [7]: 76.0 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 93%; m.p. 96.8 – 97.6 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.31 – 7.22 (m, 2H), 7.20 (d, J = 8.0 Hz, 1H), 7.05 (d, J = 8.0 Hz, 1H), 2.23 (s, 3H), 2.21 (s, 3H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.2, 137.2, 135.6, 132.7, 129.9, 121.4, 117.6, 24.5, 19.9, 19.1.



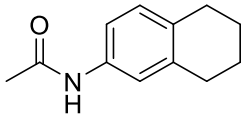
***N*-(3,5-dimethylphenyl)acetamide (2r)** [8]: 74.6 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 91%; m.p. 139.7 – 141.0 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.43 (d, *J* = 21.7 Hz, 1H), 7.12 (s, 2H), 6.74 (s, 1H), 2.27 (s, 6H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.4, 138.6, 137.8, 126.1, 117.7, 24.6, 21.3.



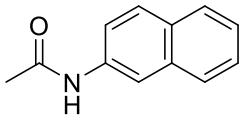
***N*-(4-fluoro-3-methylphenyl)acetamide (2s)**: 59.0 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 71%; m.p. 75.0 – 76.0 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.48 (s, 1H), 7.34 (d, *J* = 4.7 Hz, 1H), 7.25 – 7.17 (m, 1H), 6.92 (t, *J* = 9.0 Hz, 1H), 2.23 (s, 3H), 2.14 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.4 , 158.0 (d, *J* = 242.1 Hz), 133.5 , 125.3 (d, *J* = 18.4 Hz), 123.4 (d, *J* = 4.8 Hz), 119.2 (d, *J* = 7.8 Hz), 115.1 (d, *J* = 23.6 Hz), 24.3 , 14.6 (d, *J* = 3.2 Hz). HRMS (ESI) *m/z*: $[M + H]^+$ Calcd for $C_9H_{11}FNO$ 168.0819; Found 168.0819.



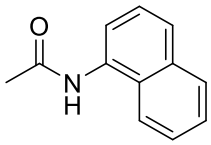
***N*-(benzo[*d*][1,3]dioxol-5-yl)acetamide (2t)** [11]: 65.2 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 73%; m.p. 135.7 – 137.0 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.18 (d, *J* = 1.4 Hz, 1H), 6.77 (dd, *J* = 8.2, 1.5 Hz, 1H), 6.71 (d, *J* = 8.3 Hz, 1H), 5.93 (s, 2H), 2.13 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.4, 147.8, 144.3, 132.2, 113.4, 108.0, 103.1, 101.2, 24.3.



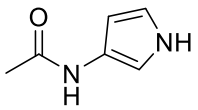
***N*-(5,6,7,8-tetrahydronaphthalen-2-yl)acetamide (2u)** [12]: 91.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 97%; m.p. 104.7 – 105.5 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.39 (s, 1H), 7.22 (s, 1H), 7.15 (d, *J* = 7.9 Hz, 1H), 6.98 (d, *J* = 8.1 Hz, 1H), 2.74 – 2.67 (m, 4H), 2.13 (s, 3H), 1.80 – 1.73 (m, 4H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.3, 137.8, 135.3, 133.4, 129.4, 120.6, 117.7, 29.5, 28.9, 24.5, 23.2, 23.1.



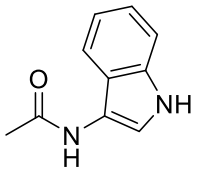
***N*-(naphthalen-2-yl)acetamide (2v)** [13]: 79.7 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 86%; m.p. 130.5 – 131.3 ºC; ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.17 (s, 1H), 7.89 – 7.67 (m, 4H), 7.49 – 7.32 (m, 3H), 2.20 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 168.7, 135.4, 133.8, 130.7, 128.7, 127.6, 127.5, 126.5, 125.0, 120.00, 116.8, 24.6.



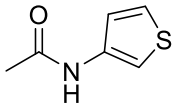
***N*-(naphthalen-1-yl)acetamide (2w)** [13]: 25.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 28%; m.p. 157.0 – 158.2 ºC; ^{1}H NMR (600 MHz, DMSO) δ 9.91 (s, 1H), 8.08 (d, J = 7.6 Hz, 1H), 7.93 (d, J = 6.9 Hz, 1H), 7.75 (d, J = 8.1 Hz, 1H), 7.69 (d, J = 7.3 Hz, 1H), 7.58 – 7.51 (m, 2H), 7.48 (t, J = 7.8 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (150 MHz, DMSO) δ 169.4, 134.2, 134.2, 128.6, 128.2, 126.4, 126.2, 126.0, 125.5, 123.2, 122.0, 24.0.



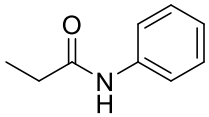
***N*-(1*H*-pyrrol-3-yl)acetamide (2x)**: 43.3 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/2), yield: 70%; m.p. 90.3 – 91.7 ºC; ^{1}H NMR (600 MHz, DMSO-d_6) δ 10.37 (s, 1H), 9.58 (s, 1H), 6.97 (d, J = 1.4 Hz, 1H), 6.57 – 6.47 (m, 1H), 5.92 (d, J = 1.4 Hz, 1H), 1.92 (s, 3H); ^{13}C NMR (150 MHz, DMSO) δ 166.3, 123.7, 115.9, 107.8, 100.5, 23.5. HRMS (ESI) *m/z*: [M + H]+ Calcd for C_6H_9N2O 125.0709; Found 125.0710.



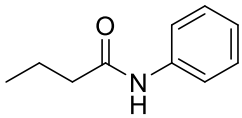
***N*-(1*H*-indol-3-yl)acetamide (2y)** [11]: 75.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 2/1 to 1/2), yield: 87%; m.p. 159.9 – 160.9 ºC; ^{1}H NMR (600 MHz, DMSO-d_6) δ 10.74 (s, 1H), 9.80 (s, 1H), 7.76 (d, J = 7.9 Hz, 1H), 7.69 (s, 1H), 7.32 (d, J = 8.0 Hz, 1H), 7.08 (t, J = 7.5 Hz, 1H), 6.99 (t, J = 7.4 Hz, 1H), 2.09 (s, 3H); ^{13}C NMR (150 MHz, DMSO) δ 167.4, 134.0, 121.8, 120.9, 118.5, 118.3, 115.7, 115.6, 111.8, 23.5. HRMS (ESI) *m/z*: $[M + H]^+$ Calcd for $C_{10}H_{11}N_2O$ 175.0866; Found 175.0865.



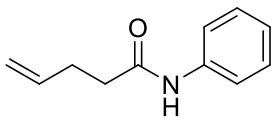
***N*-(thiophen-3-yl)acetamide (2z)**: 51.5 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 73%; m.p. 146.7 – 147.6 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.79 (s, 1H), 7.57 – 7.48 (m, 1H), 7.24 – 7.16 (m, 1H), 6.99 (d, *J* = 5.0 Hz, 1H), 2.15 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 167.7, 135.7, 124.5, 121.1, 110.4, 23.8. HRMS (ESI) *m/z*: [M + H]+ Calcd for C_6H_7NOS 142.0321; Found 142.0321.



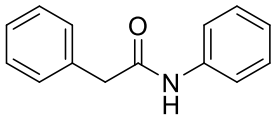
***N*-phenylpropionamide (2aa)** [1]: 71.5 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 5/1 to 2/1), yield: 96%; m.p. 106.3 – 107.3 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.8 Hz, 2H), 7.31 (t, *J* = 7.6 Hz, 3H), 7.09 (t, *J* = 7.2 Hz, 1H), 2.39 (q, *J* = 7.5 Hz, 2H), 1.24 (t, *J* = 7.5 Hz, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 172.0, 138.0, 129.0, 124.2, 119.8, 30.8, 9.7.



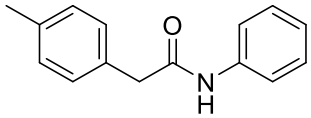
***N*-phenylbutyramide (2ab)**[6]: 75.2 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 92%; m.p. 95.6 – 96.5 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.9 Hz, 2H), 7.49 (s, 1H), 7.30 (t, *J* = 7.6 Hz, 2H), 7.09 (t, *J* = 7.3 Hz, 1H), 2.33 (t, *J* = 7.4 Hz, 2H), 1.75 (h, *J* = 7.5 Hz, 2H), 0.99 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.4, 138.0, 129.0, 124.2, 119.9, 39.7, 19.1, 13.7.



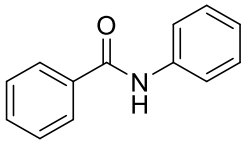
***N*-phenylpent-4-enamide (2ac)** [14]: 57.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 66%; m.p. 89.5 – 91.0 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.57 (s, 1H), 7.50 (d, *J* = 7.9 Hz, 2H), 7.29 (t, *J* = 7.6 Hz, 2H), 7.09 (t, *J* = 7.3 Hz, 1H), 5.97 – 5.68 (m, 1H), 5.11 (d, *J* = 17.1 Hz, 1H), 5.04 (d, *J* = 10.1 Hz, 1H), 2.46 (p, *J* = 6.1 Hz, 4H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 170.7, 137.9, 136.9, 129.0, 124.3, 120.0, 115.9, 36.8, 29.5.



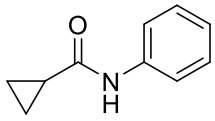
***N*,2-diphenylacetamide (2ad)** [6]: 91.9 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 87%; m.p. 114.7 – 115.5 ºC; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.45 – 7.18 (m, 10H), 7.07 (t, *J* = 7.3 Hz, 1H), 3.70 (s, 2H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 169.2, 137.7, 134.5, 129.5, 129.2, 128.9, 127.6, 124.5, 119.9, 44.8.



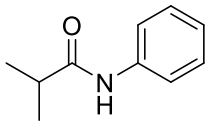
***N*-phenyl-2-(p-tolyl)acetamide (2ae)** [15]: 83.8 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 74%; m.p. 142.1 – 143.1 ºC; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.41 (d, *J* = 7.9 Hz, 2H), 7.29 – 7.24 (m, 2H), 7.24 – 7.18 (m, 4H), 7.16 (s, 1H), 7.07 (t, *J* = 7.3 Hz, 1H), 3.69 (s, 2H), 2.36 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 169.3, 137.7, 137.4, 131.4, 130.0, 129.4, 128.9, 124.4, 119.8, 44.5, 21.1.



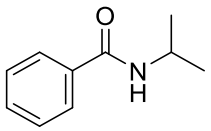
***N*-phenylbenzamide (2af)** [5]: 85.1 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 86%; m.p. 160.8 – 161.5 ºC; ^{1}H NMR (600 MHz, DMSO) δ 10.23 (s, 1H), 7.96 (d, *J* = 7.8 Hz, 2H), 7.78 (d, *J* = 8.2 Hz, 2H), 7.59 (t, *J* = 6.8 Hz, 1H), 7.53 (t, *J* = 7.5 Hz, 2H), 7.35 (t, *J* = 7.6 Hz, 2H), 7.10 (t, *J* = 7.3 Hz, 1H); ^{13}C NMR (150 MHz, DMSO) δ 166.0, 139.7, 135.5, 132.0, 129.1, 128.8, 128.1, 124.1, 120.9.



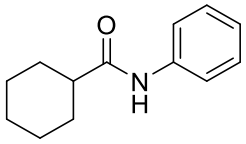
***N*-phenylcyclopropanecarboxamide (2ag)** [5]: 63.6 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 79%; m.p. 109.5 – 110.7 ºC; ^{1}H NMR (600 MHz, DMSO) δ 10.15 (s, 1H), 7.59 (d, *J* = 7.9 Hz, 2H), 7.28 (t, *J* = 7.9 Hz, 2H), 7.01 (t, *J* = 7.3 Hz, 1H), 1.86 – 1.70 (m, 1H), 0.90 – 0.70 (m, 4H); ^{13}C NMR (150 MHz, DMSO) δ 172.0, 139.9, 129.1, 123.3, 119.5, 15.0, 7.5.



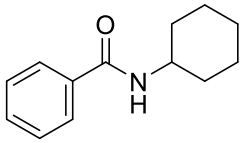
***N*-phenylisobutyramide (2ah-1)**[5]: 32.6 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 40%; m.p. 105.1 – 106.1 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.53 (d, *J* = 7.8 Hz, 2H), 7.30 (t, *J* = 7.8 Hz, 3H), 7.09 (t, *J* = 7.3 Hz, 1H), 2.51 (dt, *J* = 13.6, 6.8 Hz, 1H), 1.25 (d, *J* = 6.8 Hz, 6H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 175.3, 138.1, 129.0, 124.1, 119.9, 36.7, 19.6.



***N*-phenylisobutyramide (2ah-2)** [16]: 12.9 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 16%; m.p. 97.0 – 98.8 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.75 (d, *J* = 7.5 Hz, 2H), 7.48 (t, *J* = 7.3 Hz, 1H), 7.41 (t, *J* = 7.6 Hz, 2H), 6.00 (s, 1H), 4.29 (dd, *J* = 13.7, 6.9 Hz, 1H), 1.26 (d, *J* = 6.6 Hz, 6H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 166.7, 135.1, 131.2, 128.5, 126.8, 42.0, 22.8.



***N*-phenylcyclohexanecarboxamide (2ai-1)** [13]: 35.9 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 35%; m.p. 146.1 – 148.0 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.53 (d, *J* = 7.9 Hz, 2H), 7.38 (s, 1H), 7.30 (t, *J* = 7.8 Hz, 2H), 7.08 (t, *J* = 7.3 Hz, 1H), 2.23 (t, *J* = 11.7 Hz, 1H), 1.99 – 1.91 (m, 2H), 1.85 – 1.78 (m, 2H), 1.72 – 1.64 (m, 1H), 1.59 – 1.46 (m, 2H), 1.33 – 1.21 (m, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 174.5, 138.2, 128.9, 124.1, 119.8, 46.5, 29.7, 25.7.



***N*-cyclohexylbenzamide (2ai-2)** [16]: 31.7 mg of white solid, purified by flash column chromatography (petroleum ether : EtOAc = 9/1 to 3/1), yield: 31%; m.p. 145.1 –146.3 °C; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.75 (d, *J* = 7.4 Hz, 2H), 7.47 (t, *J* = 7.3 Hz, 1H), 7.41 (t, *J* = 7.6 Hz, 2H), 6.06 (s,

1H), 4.04 – 3.92 (m, 1H), 2.07 – 1.97 (m, 2H), 1.80 – 1.71 (m, 2H), 1.69 – 1.61 (m, 1H), 1.47 – 1.37 (m, 2H), 1.29 – 1.15 (m, 4H).; ^{13}C NMR (150 MHz, $CDCl_3$) δ 166.7, 135.2, 131.2, 128.5, 126.8, 48.7, 33.2, 25.6, 24.9.

10. References

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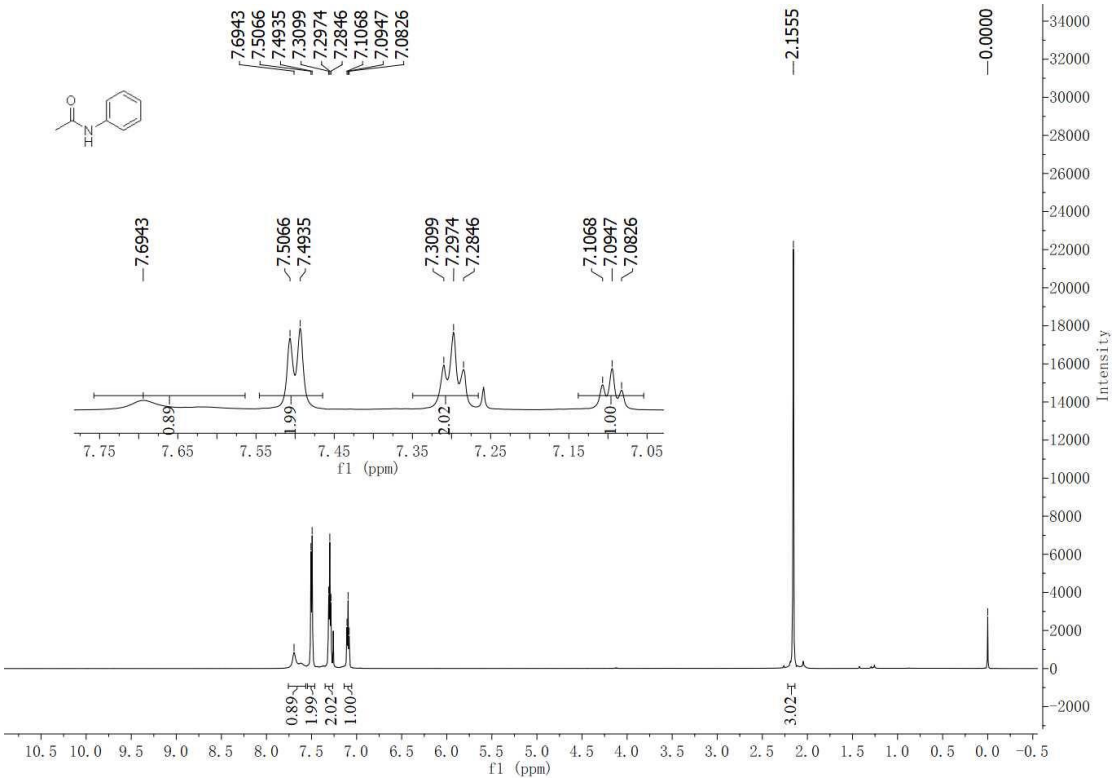
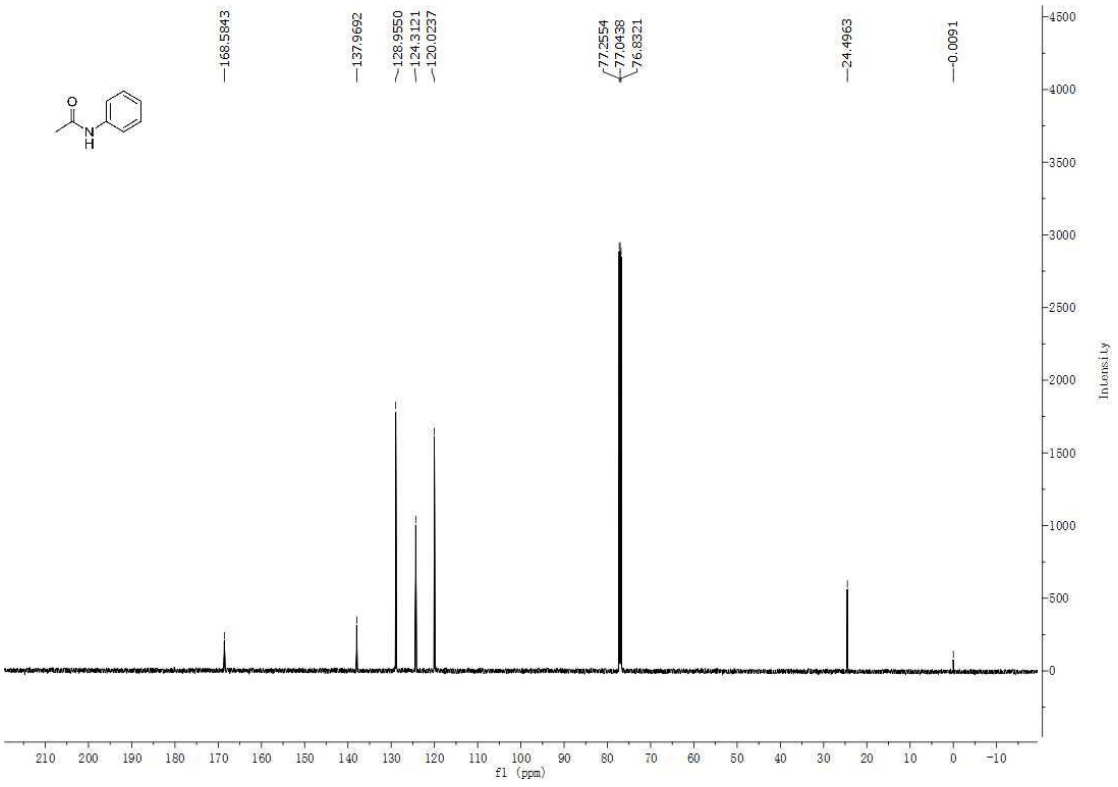
11. ^{1}H-NMR and ^{13}C-NMR Spectra of the Products

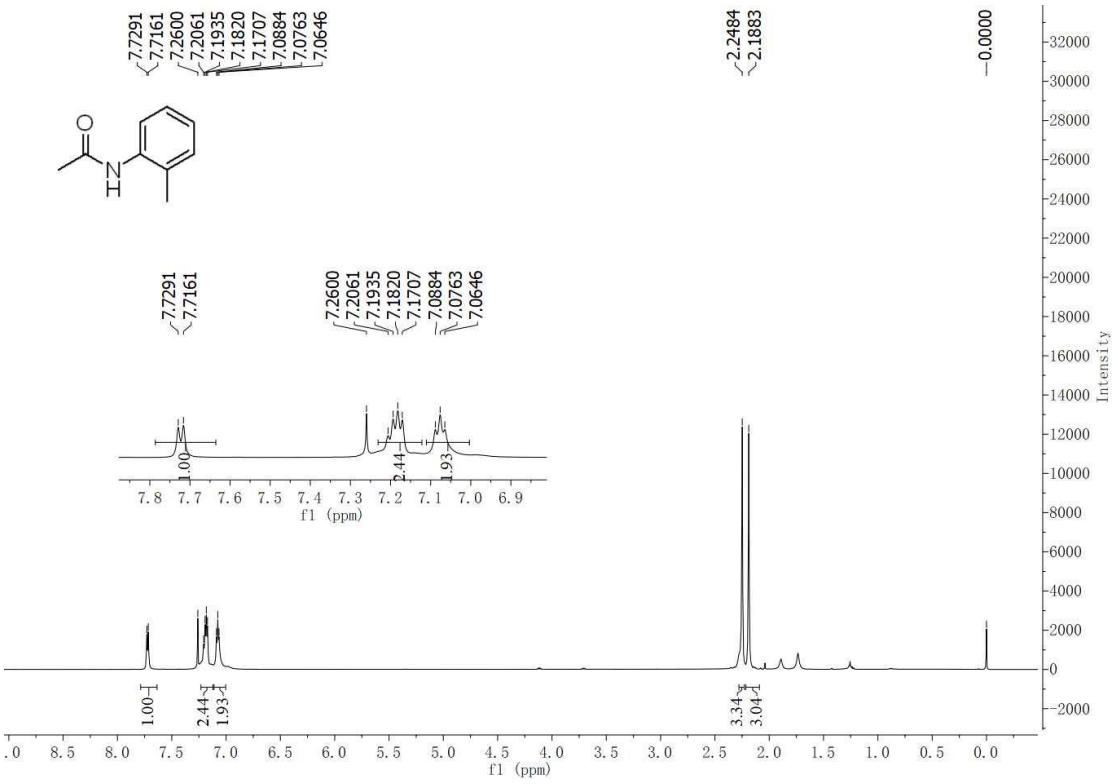
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2a**



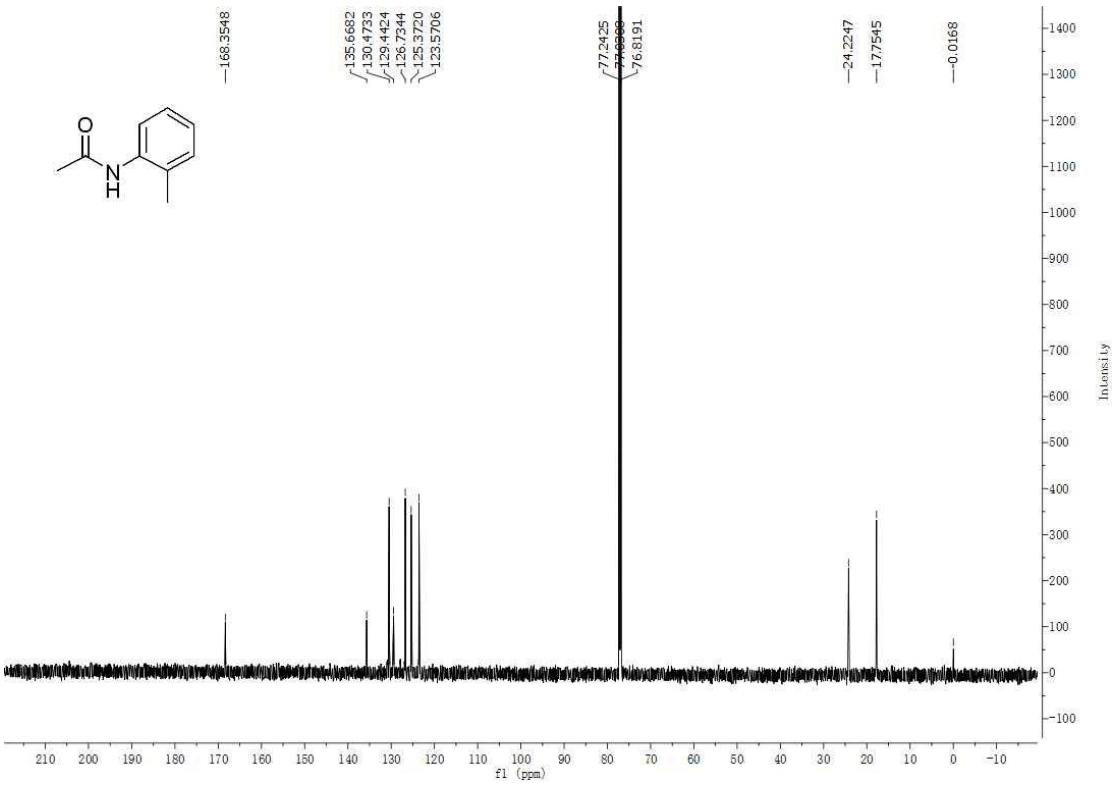
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2a**



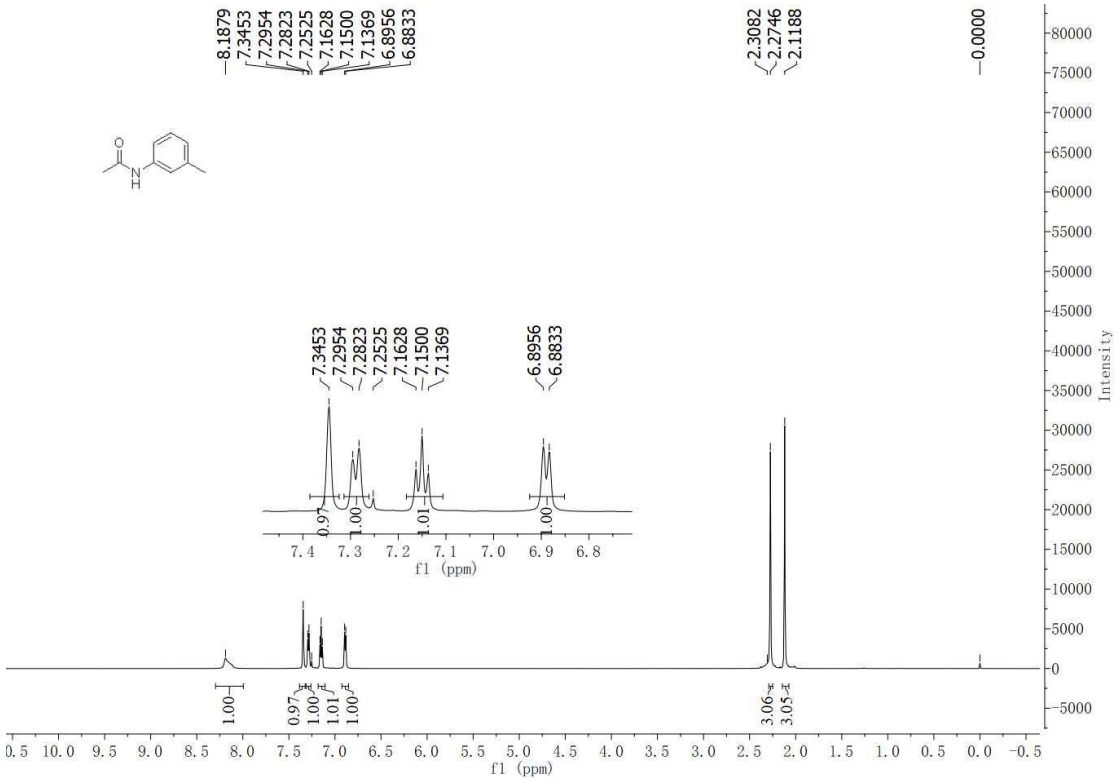
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2b**



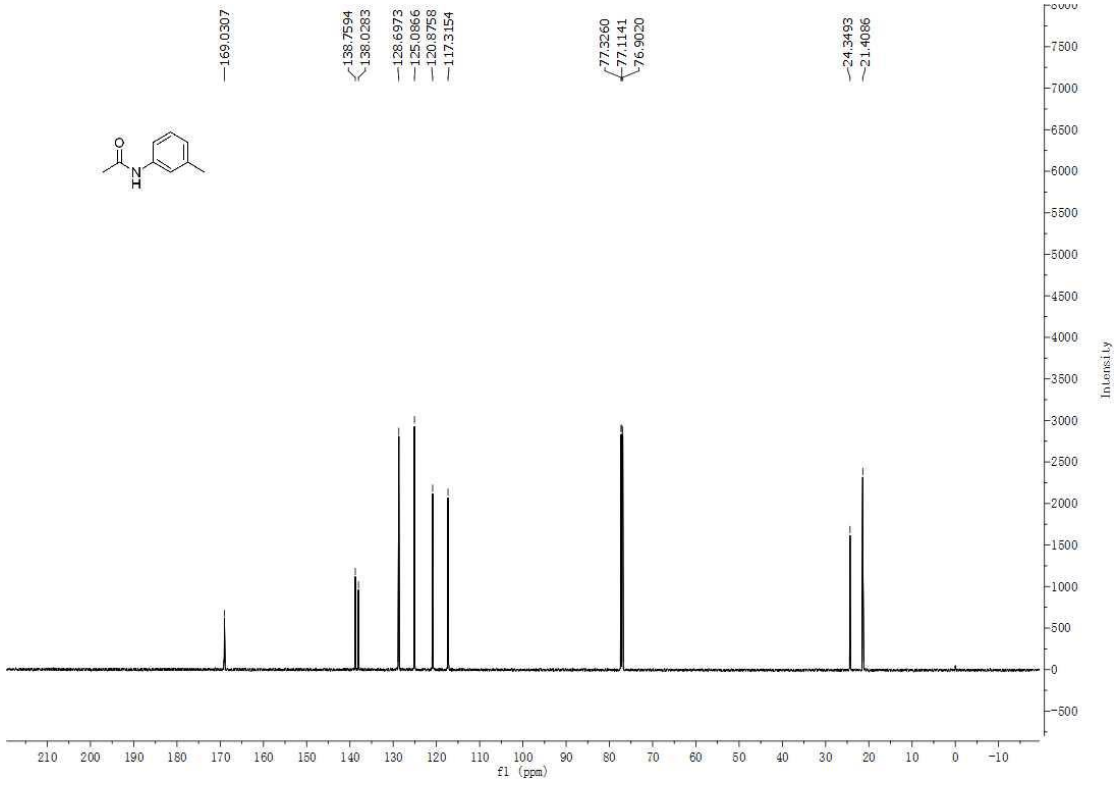
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2b**



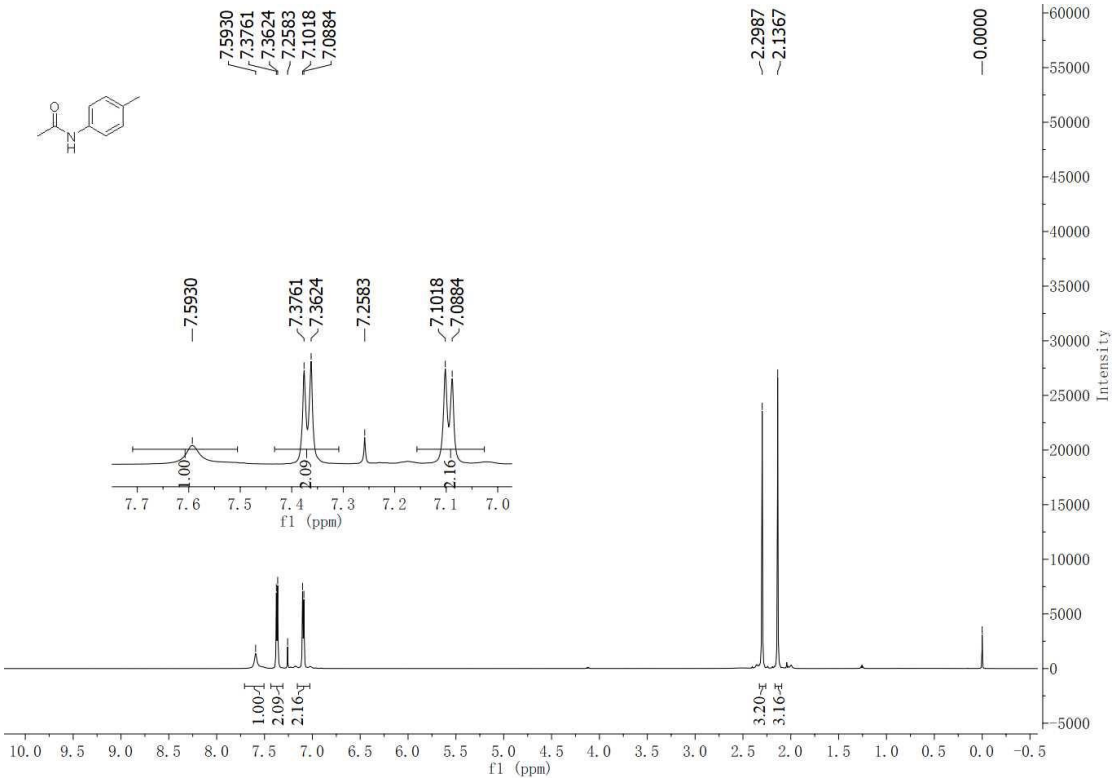
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2c**



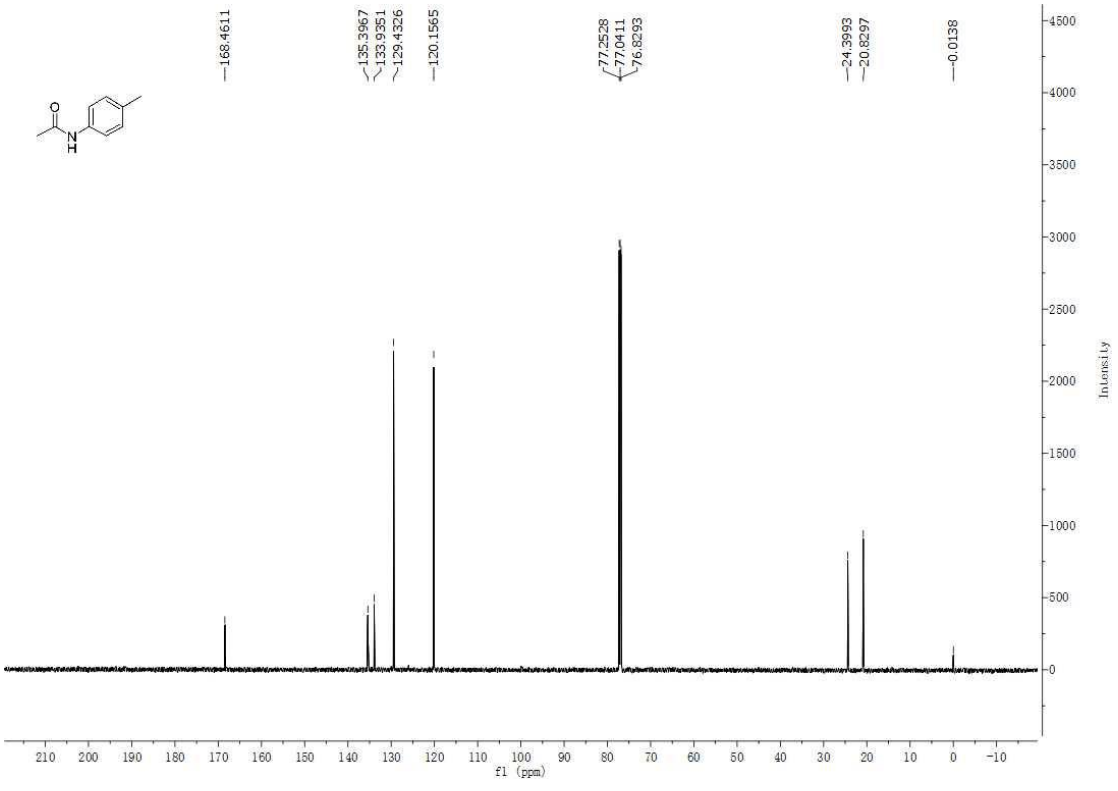
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2c**



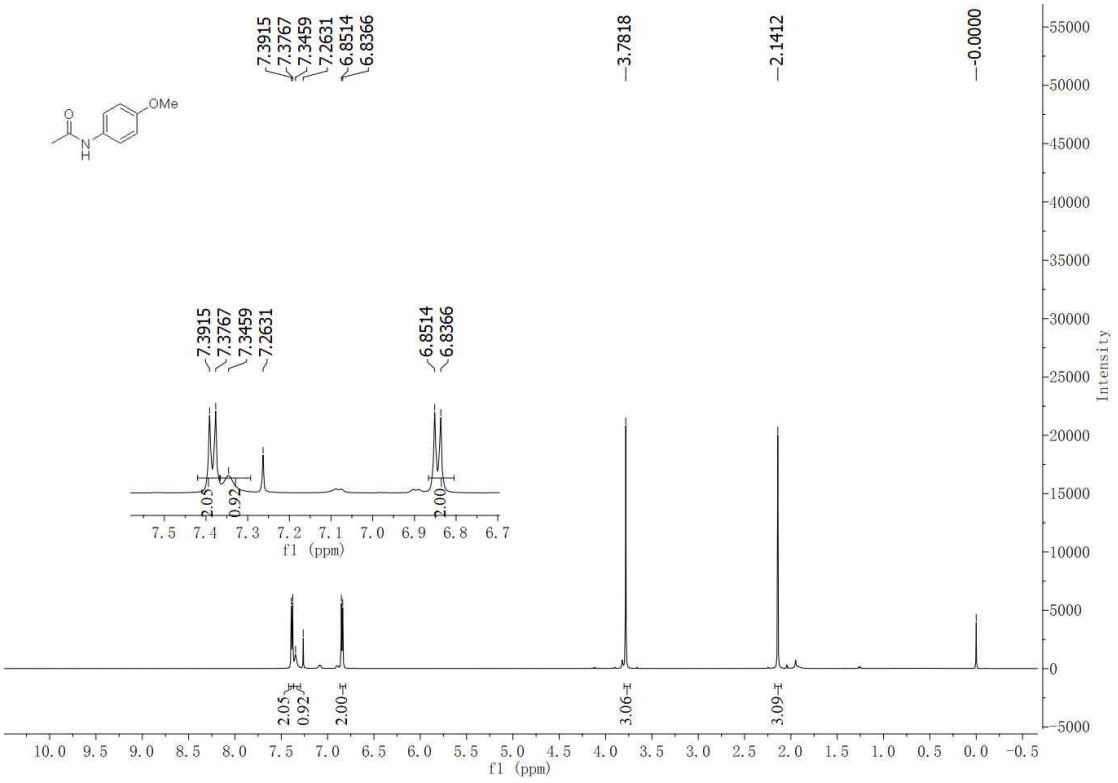
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2d**



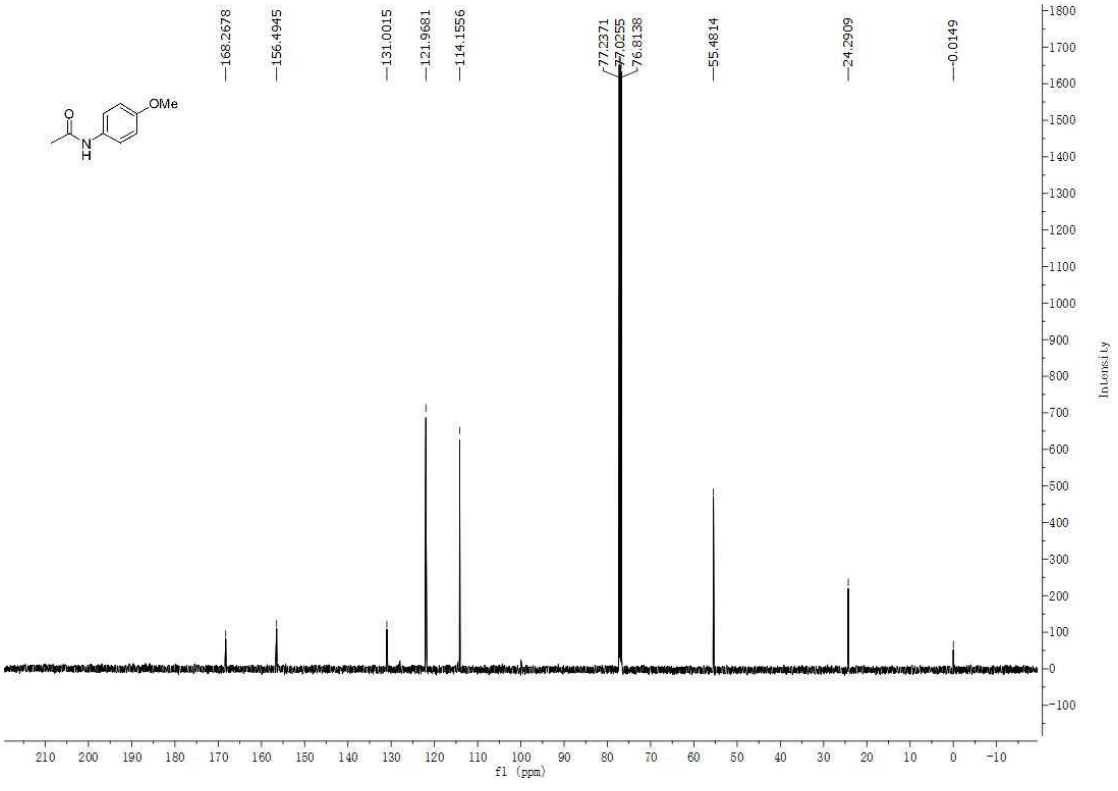
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2d**



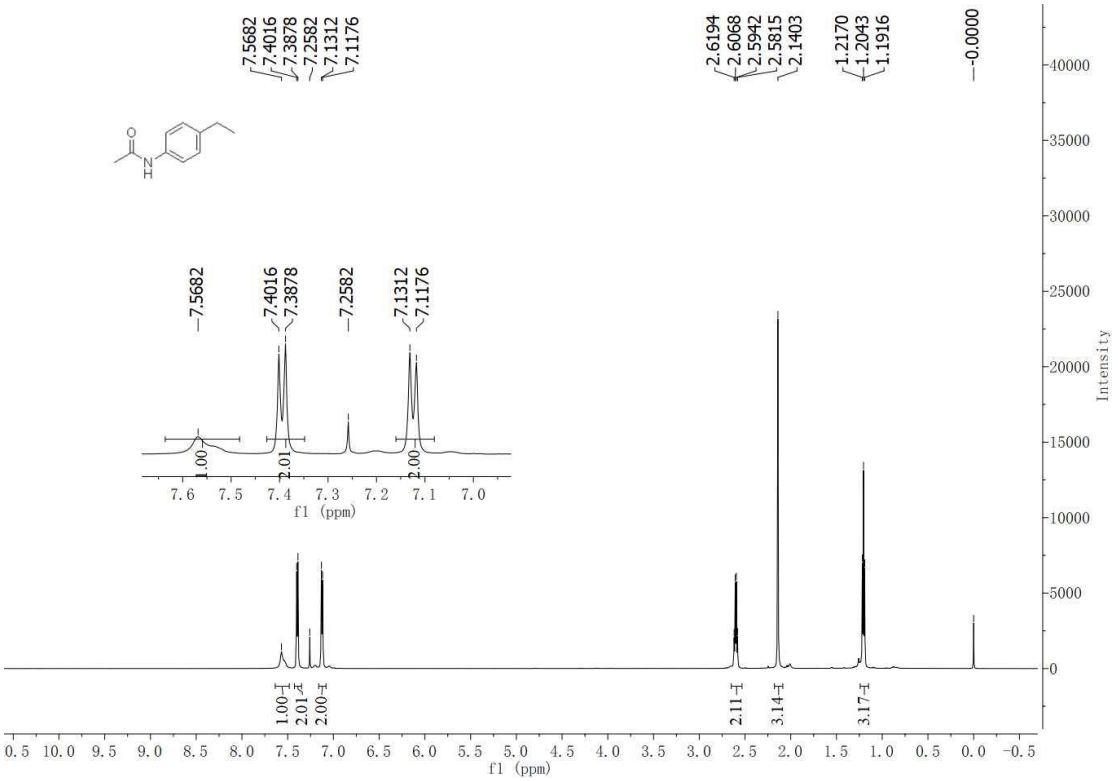
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2e**



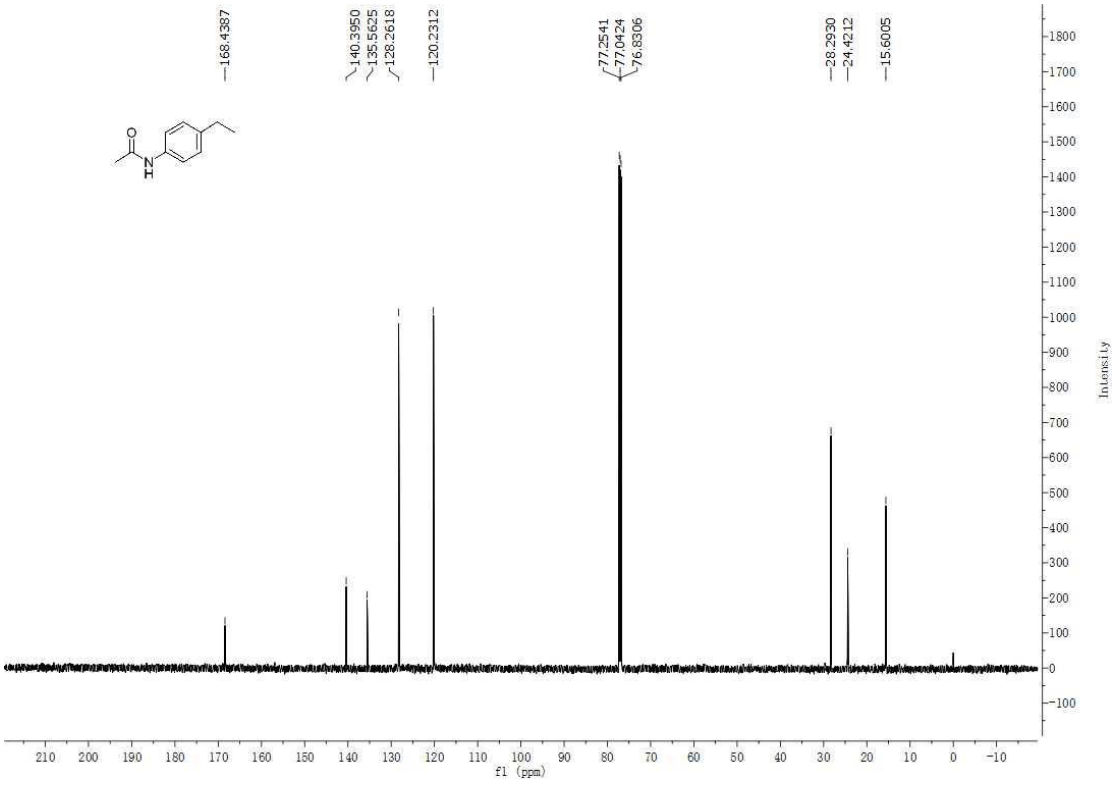
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2e**



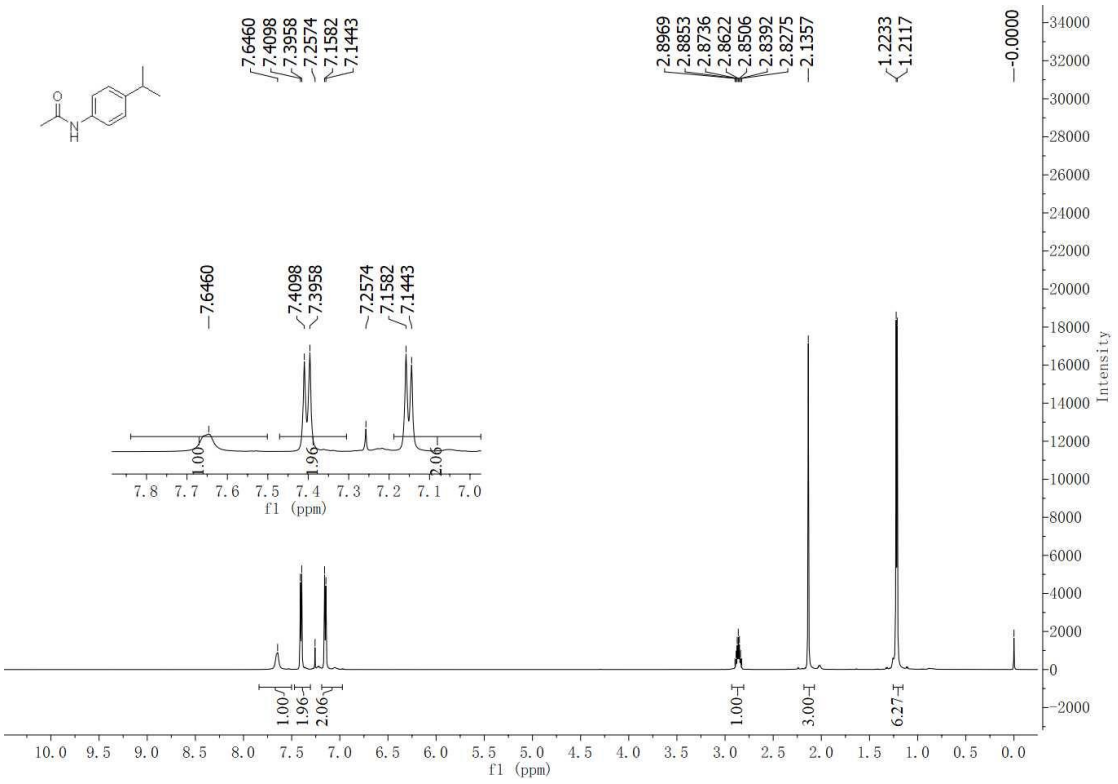
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2f**



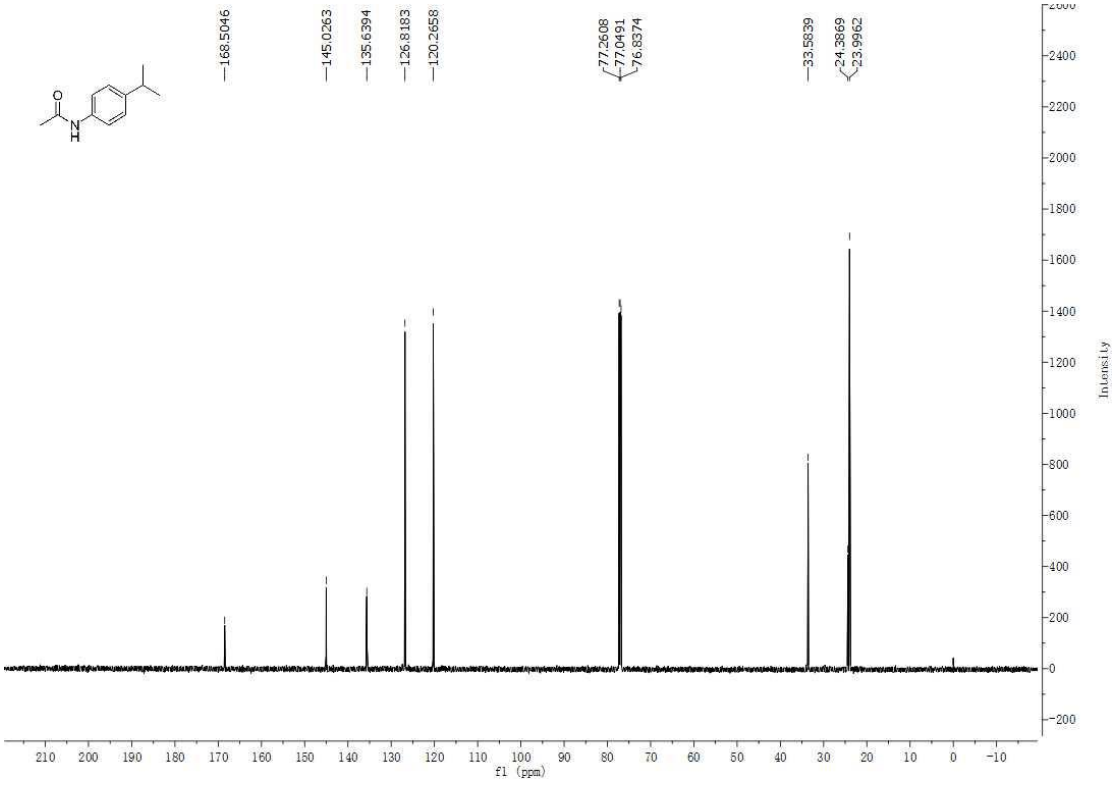
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2f**



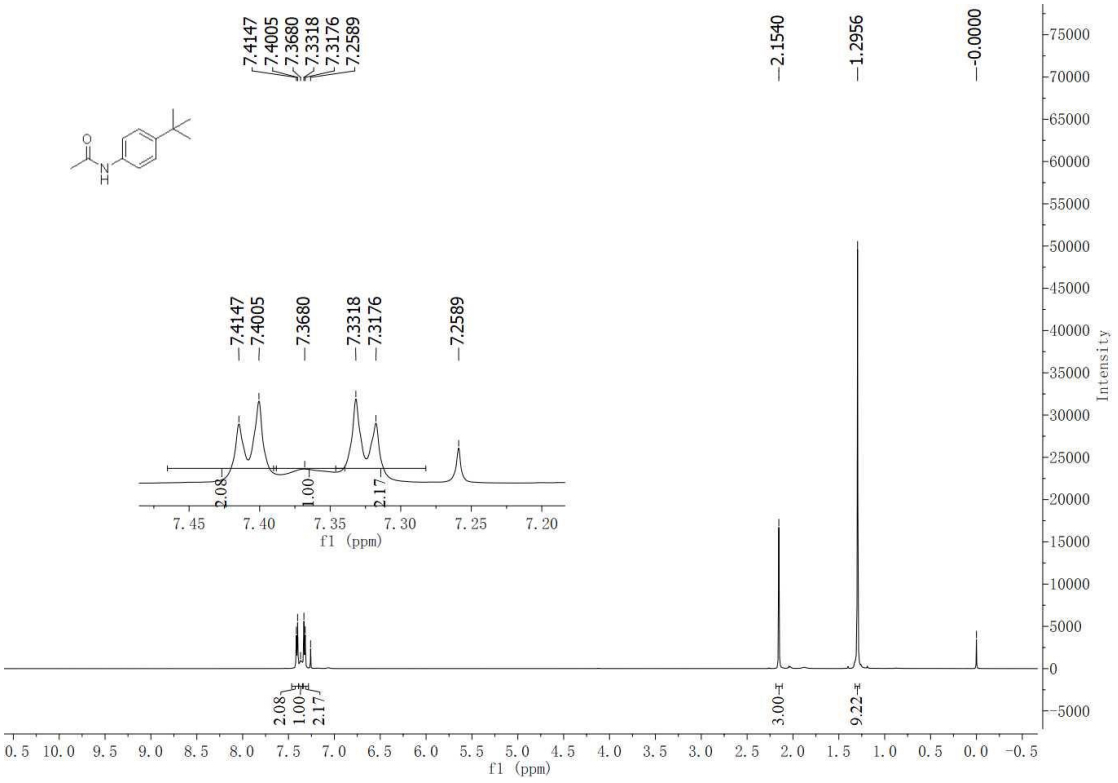
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2g**



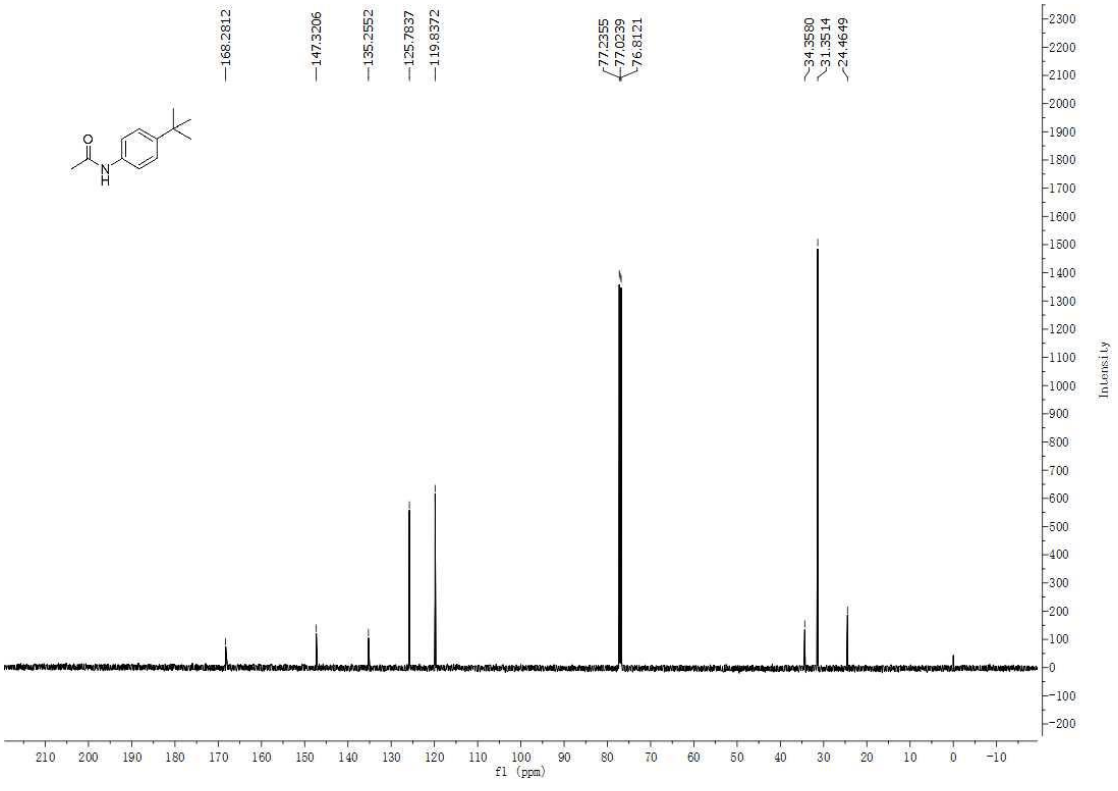
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2g**



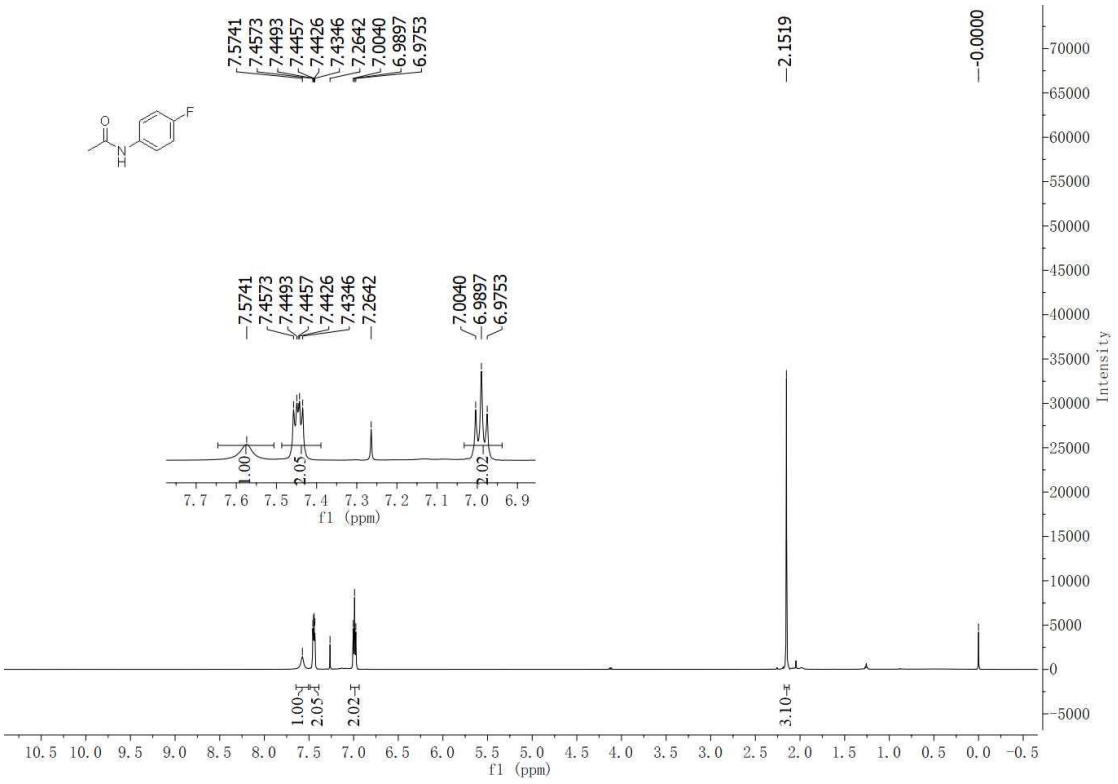
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2h**



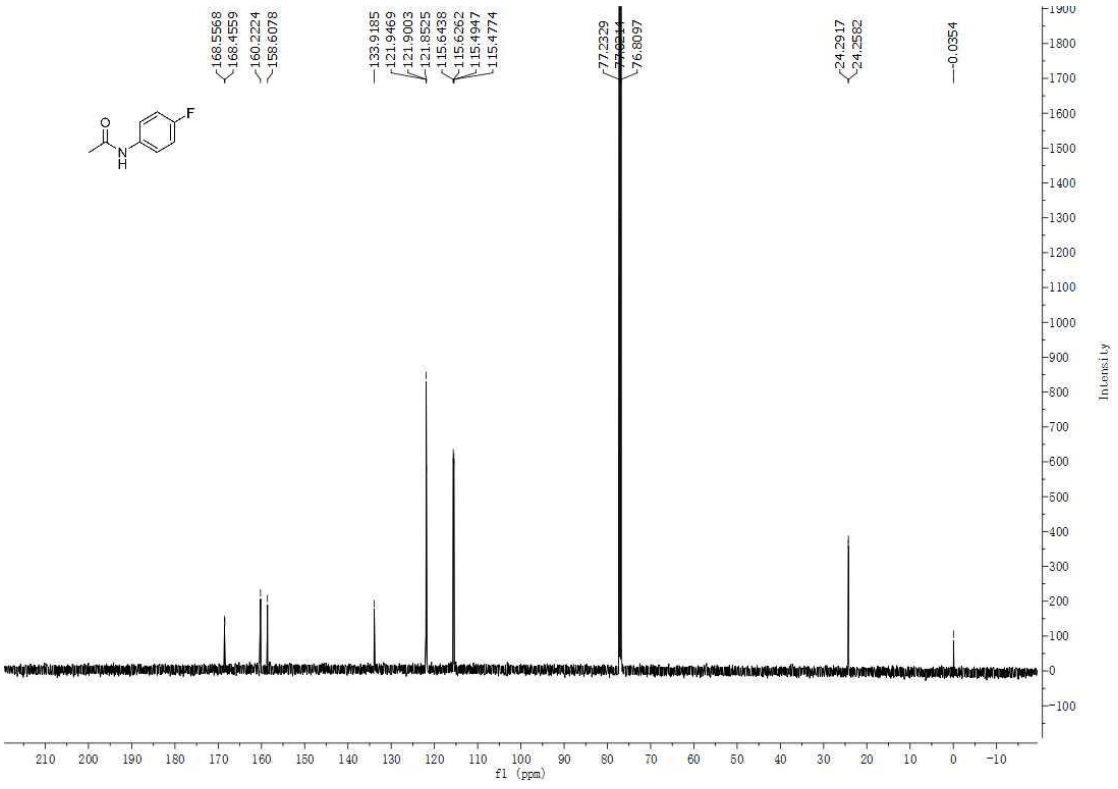
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2h**



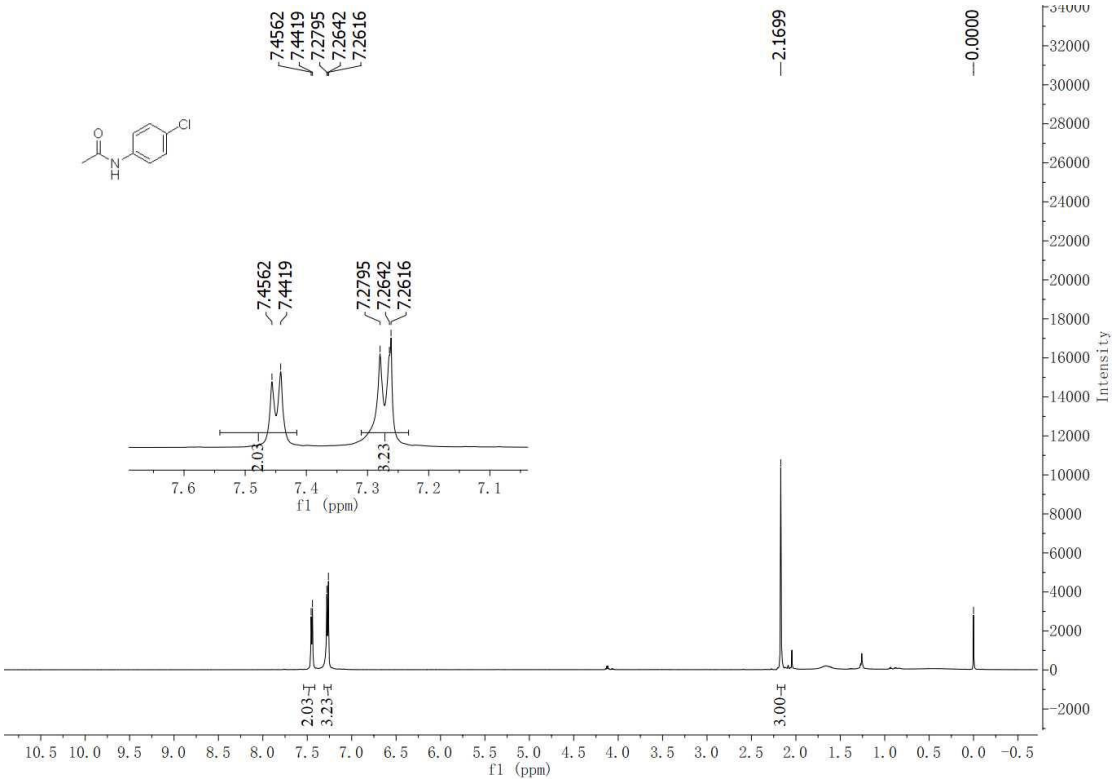
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2i**



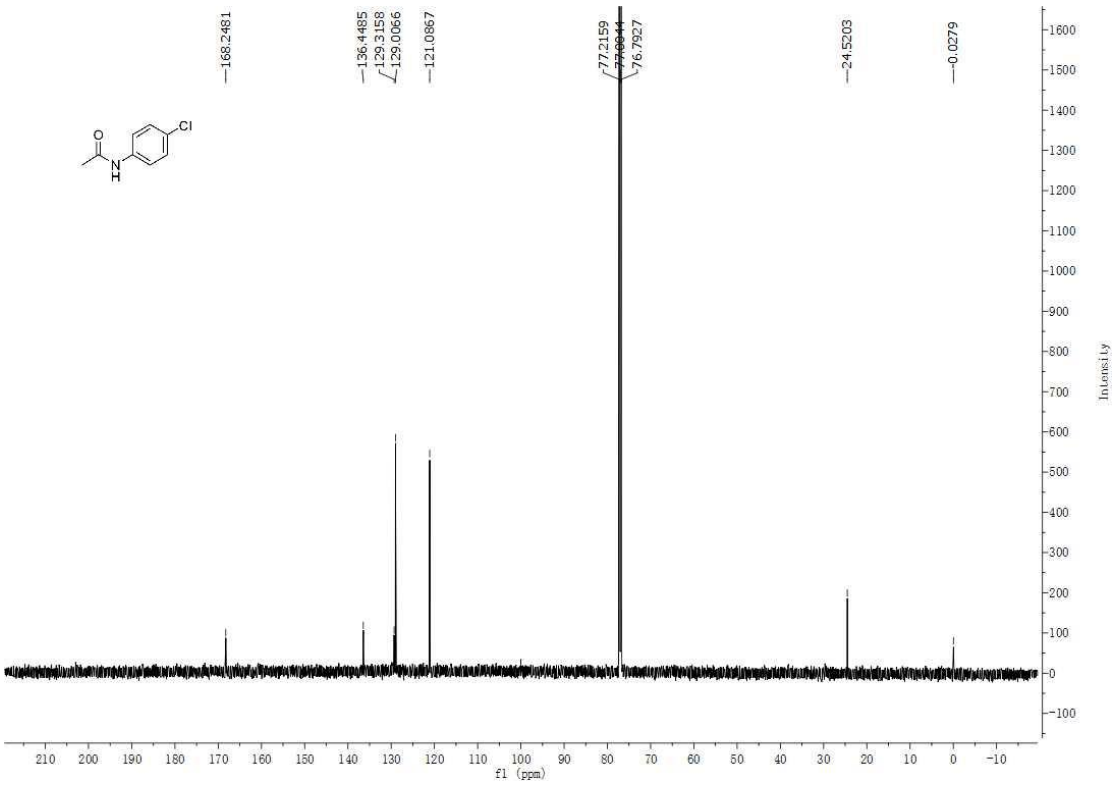
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2i**



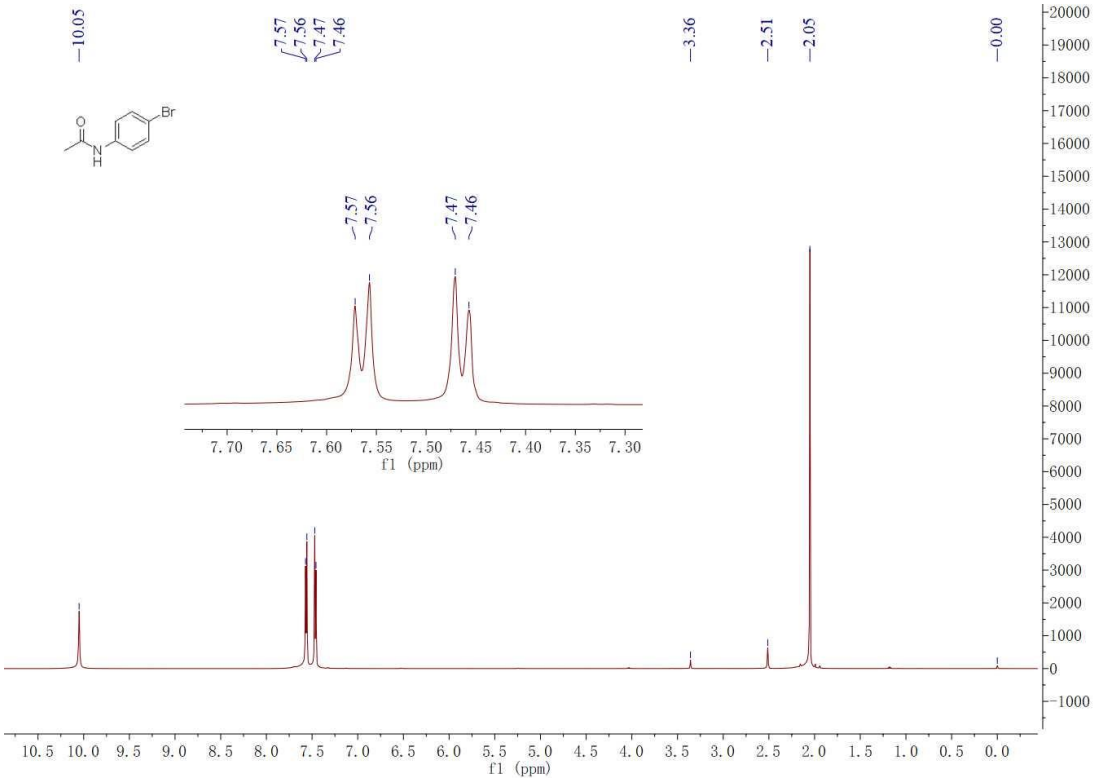
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2j**



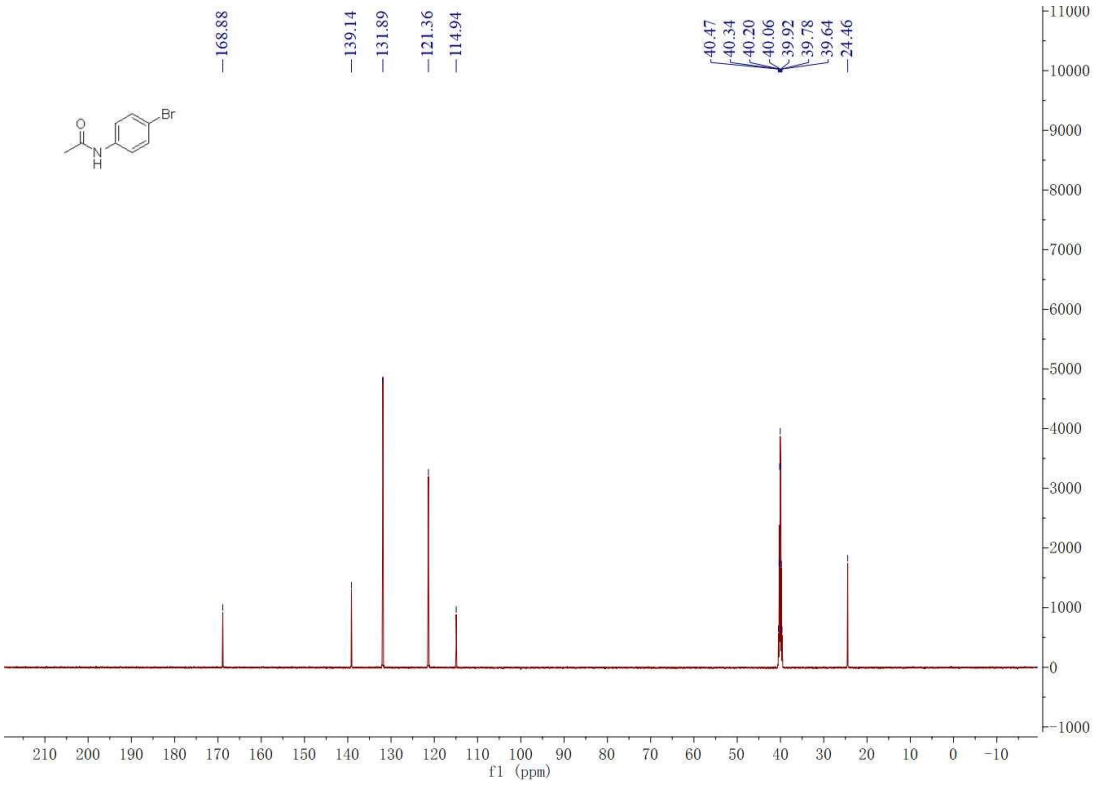
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2j**



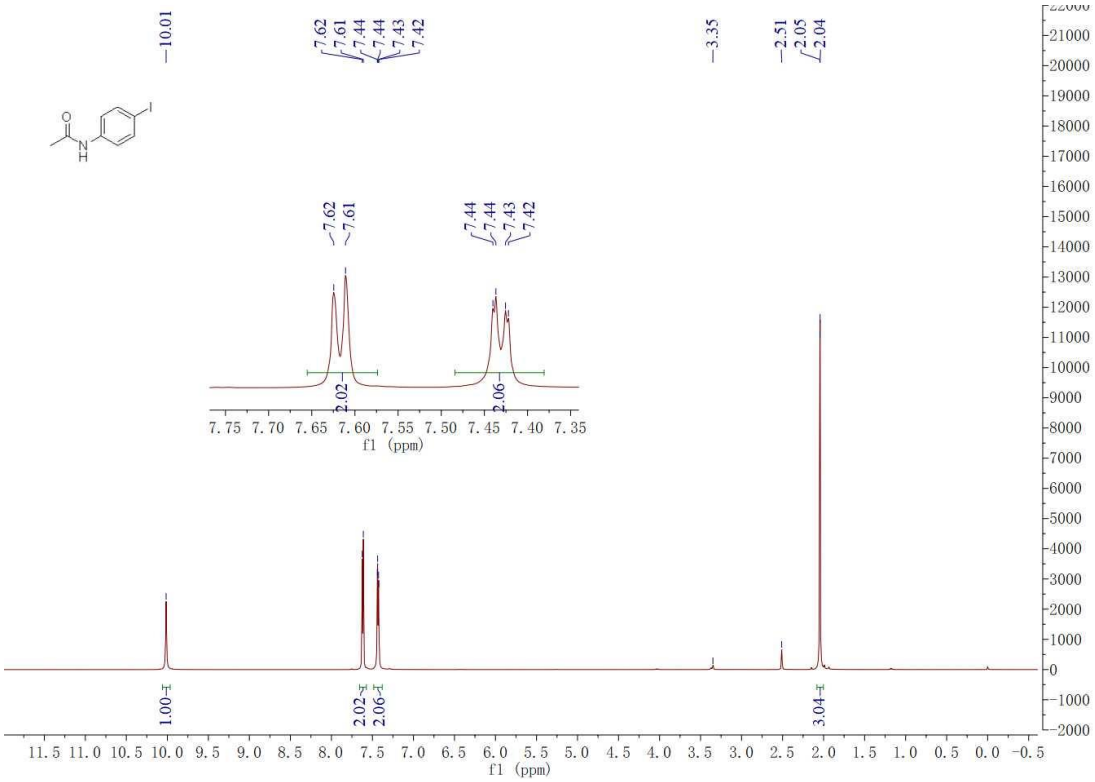
^{1}H-NMR Spectrum (600 MHz, DMSO) of **2k**



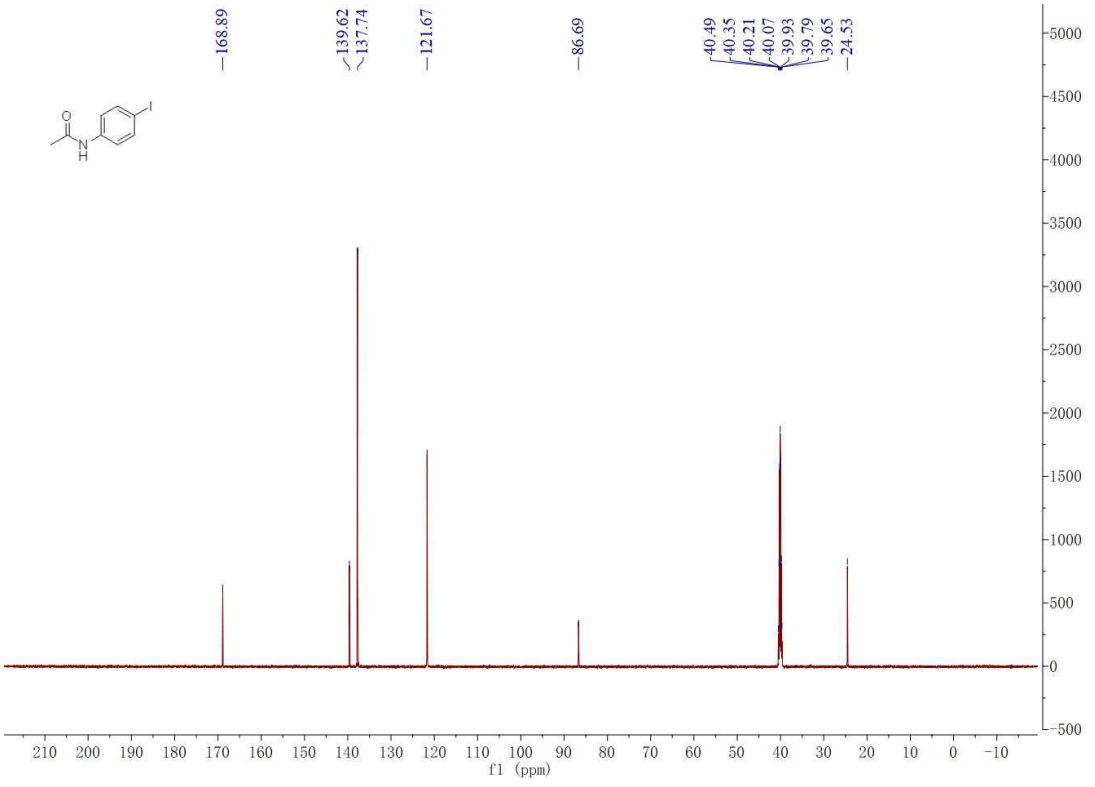
^{13}C-NMR Spectrum (150 MHz, DMSO) of **2k**



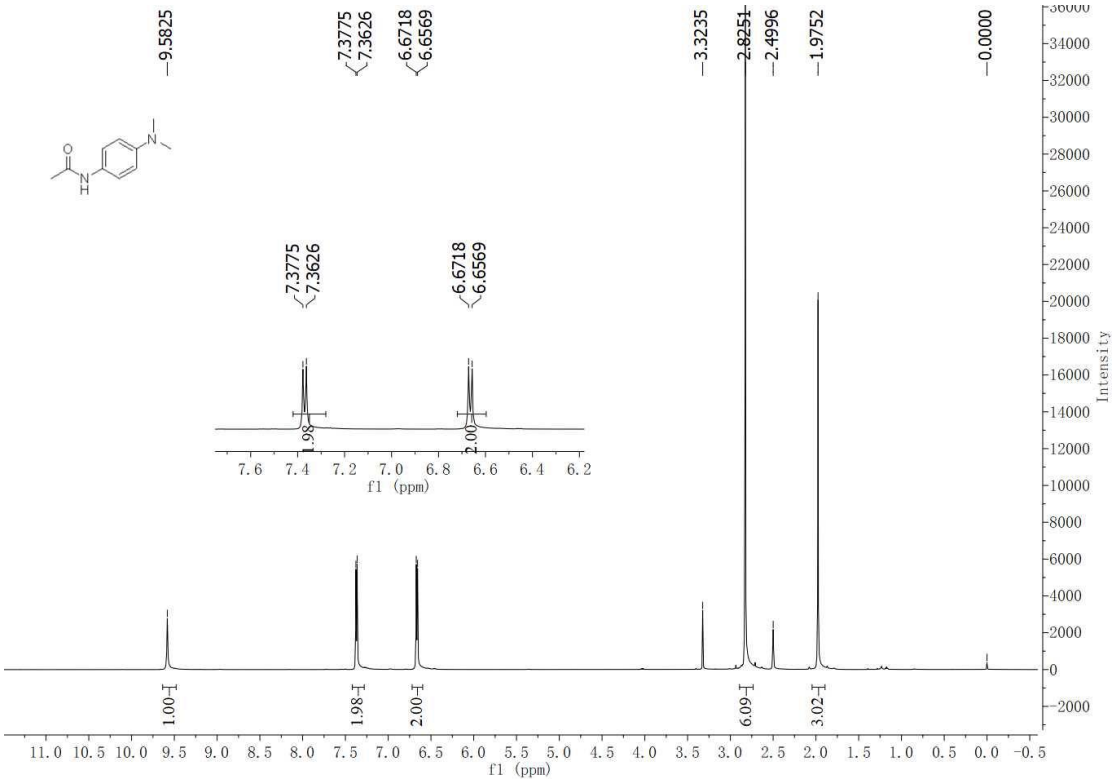
^{1}H-NMR Spectrum (600 MHz, DMSO of **2l**



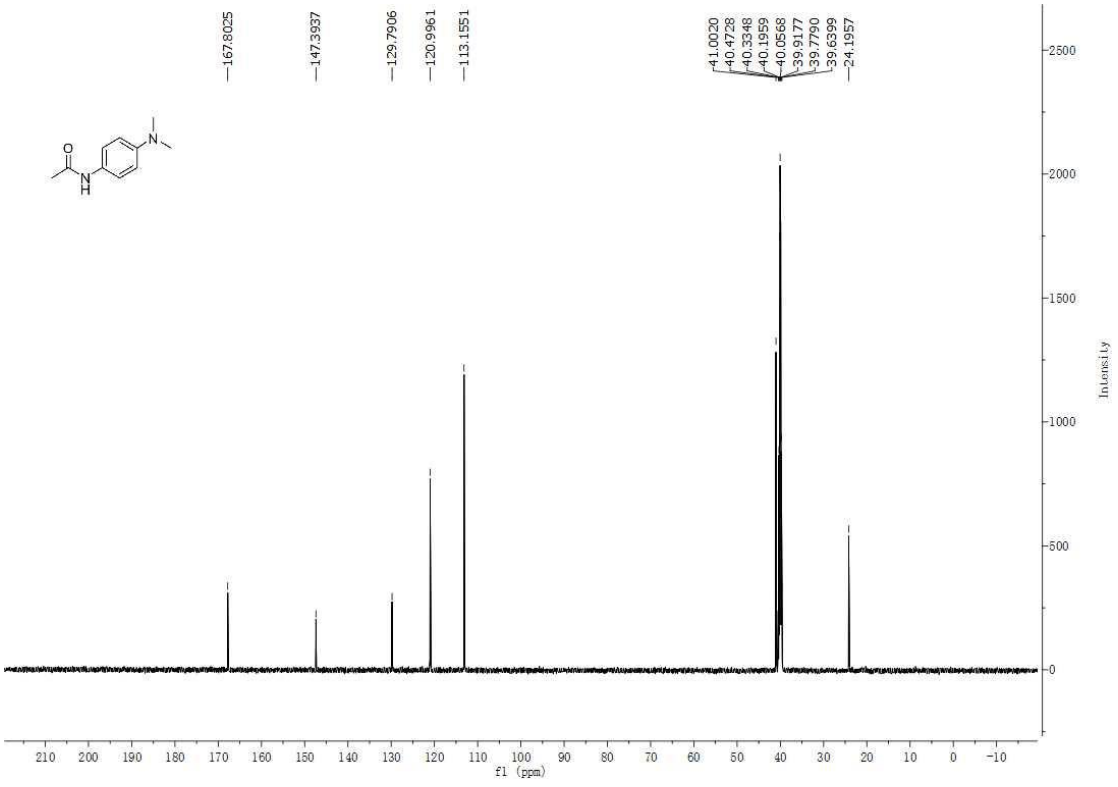
^{13}C-NMR Spectrum (150 MHz, DMSO) of **2l**



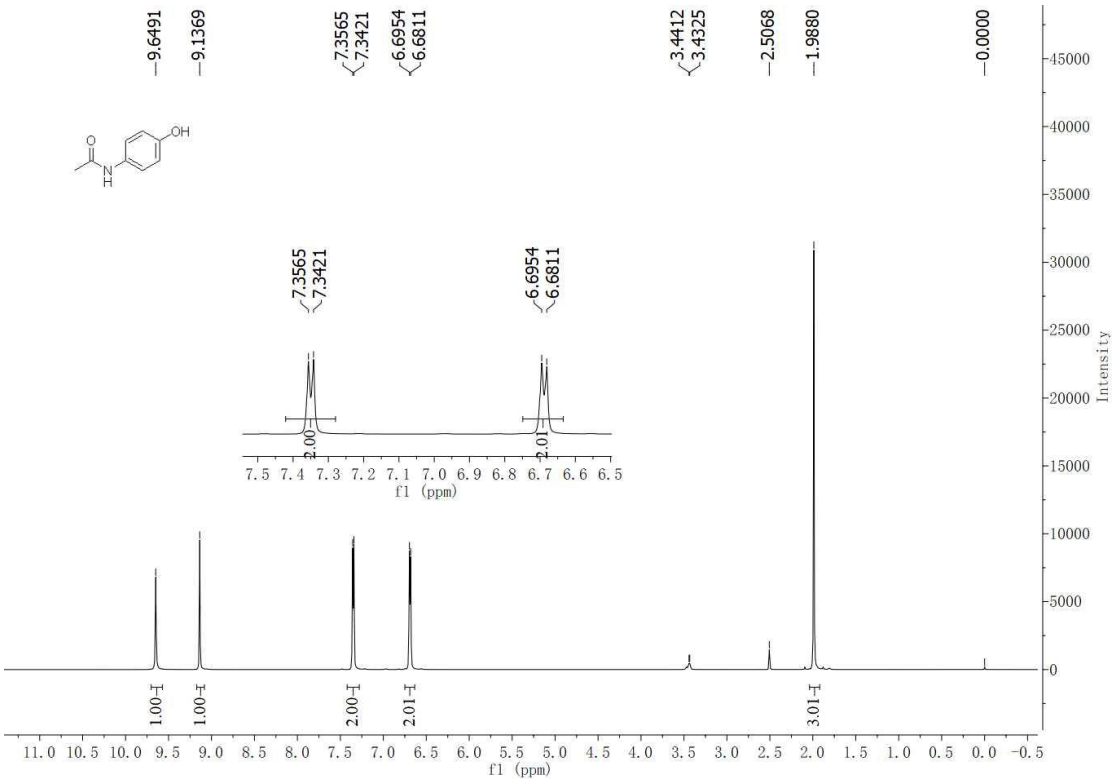
[1]H-NMR Spectrum (600 MHz, DMSO) of **2m**



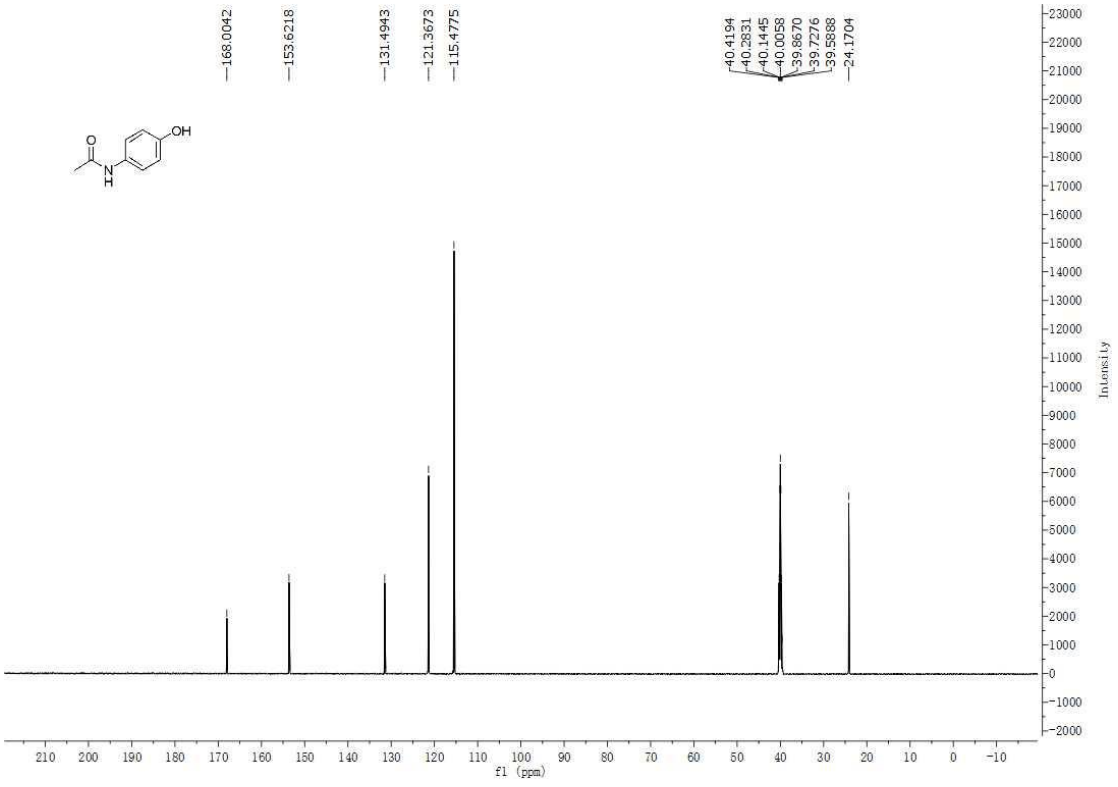
[13]C-NMR Spectrum (150 MHz, DMSO) of **2m**



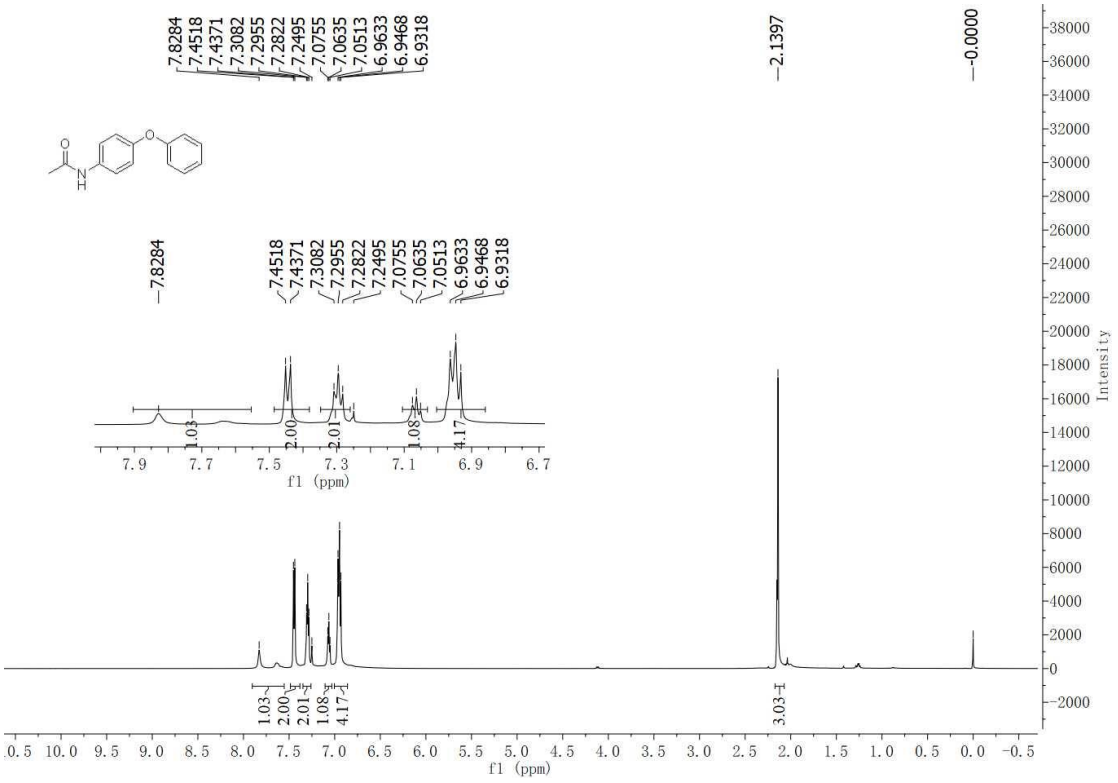
^{1}H-NMR Spectrum (600 MHz, DMSO) of **2n**



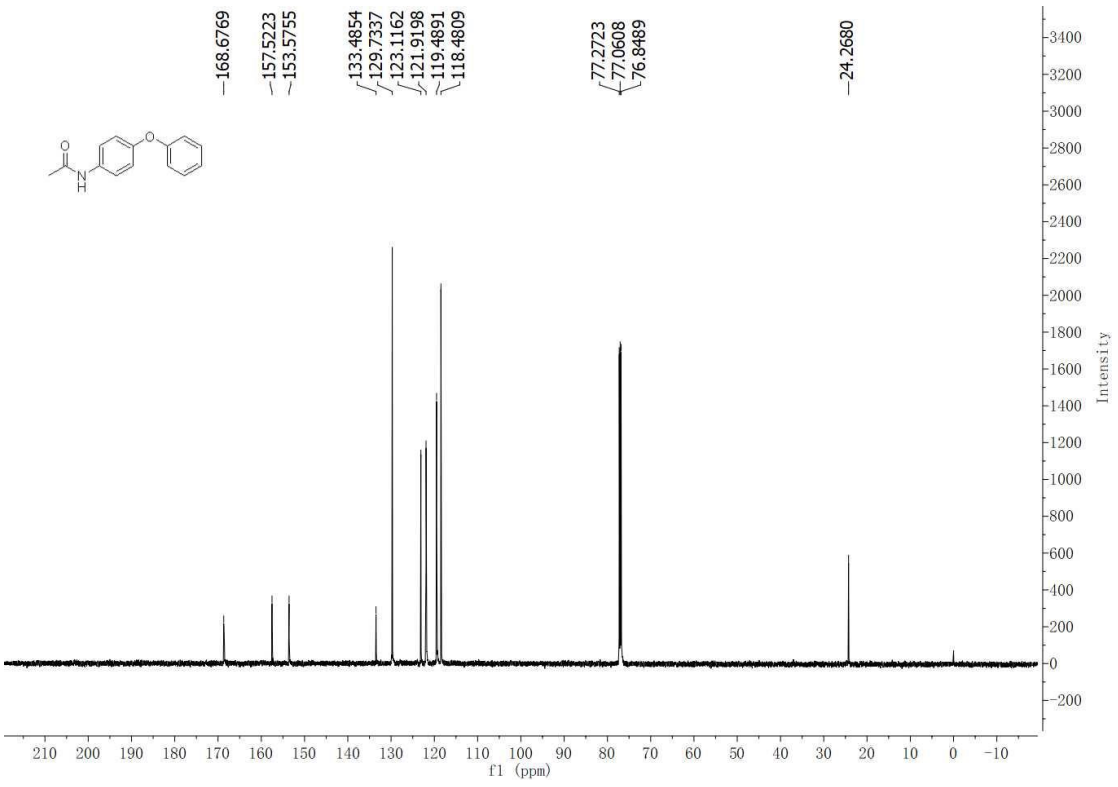
^{13}C-NMR Spectrum (150 MHz, DMSO) of **2n**



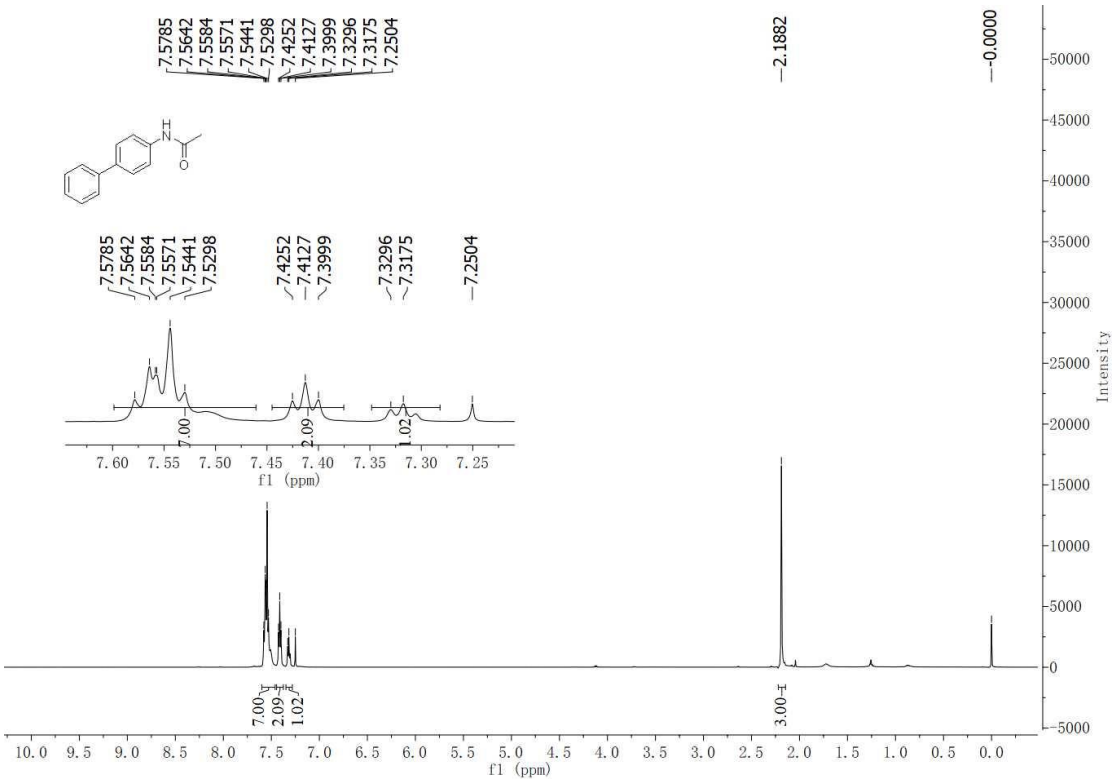
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2o**



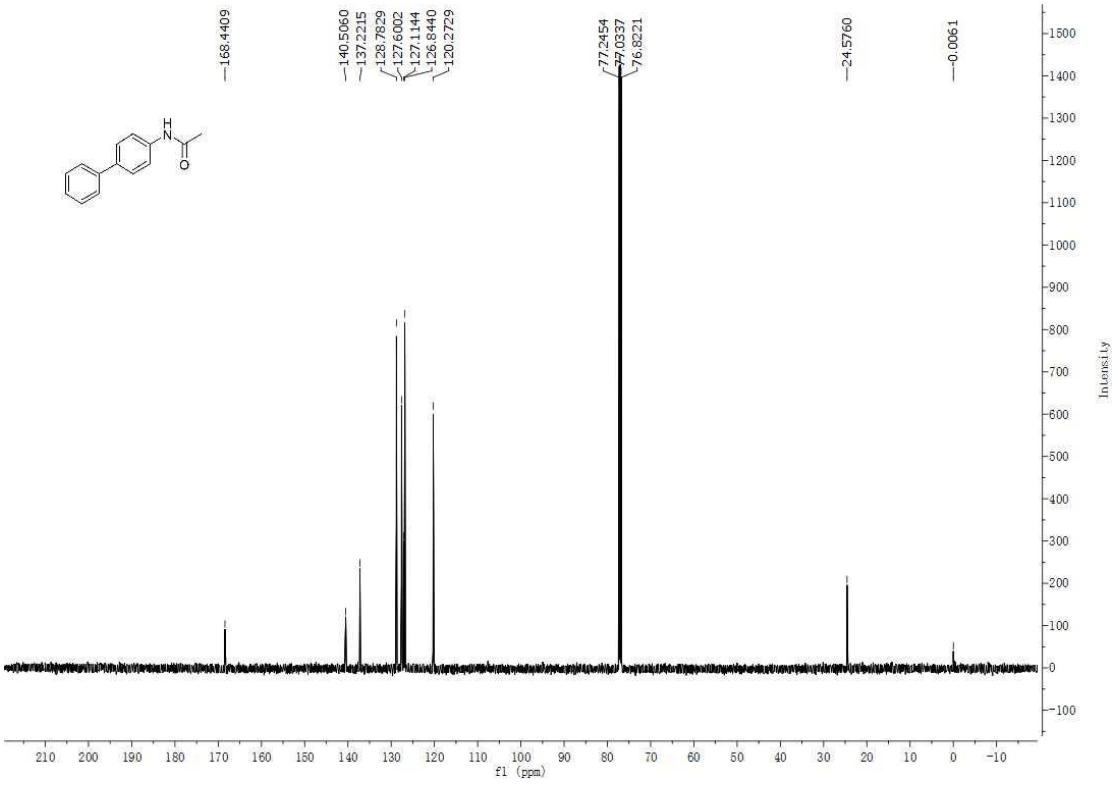
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2o**



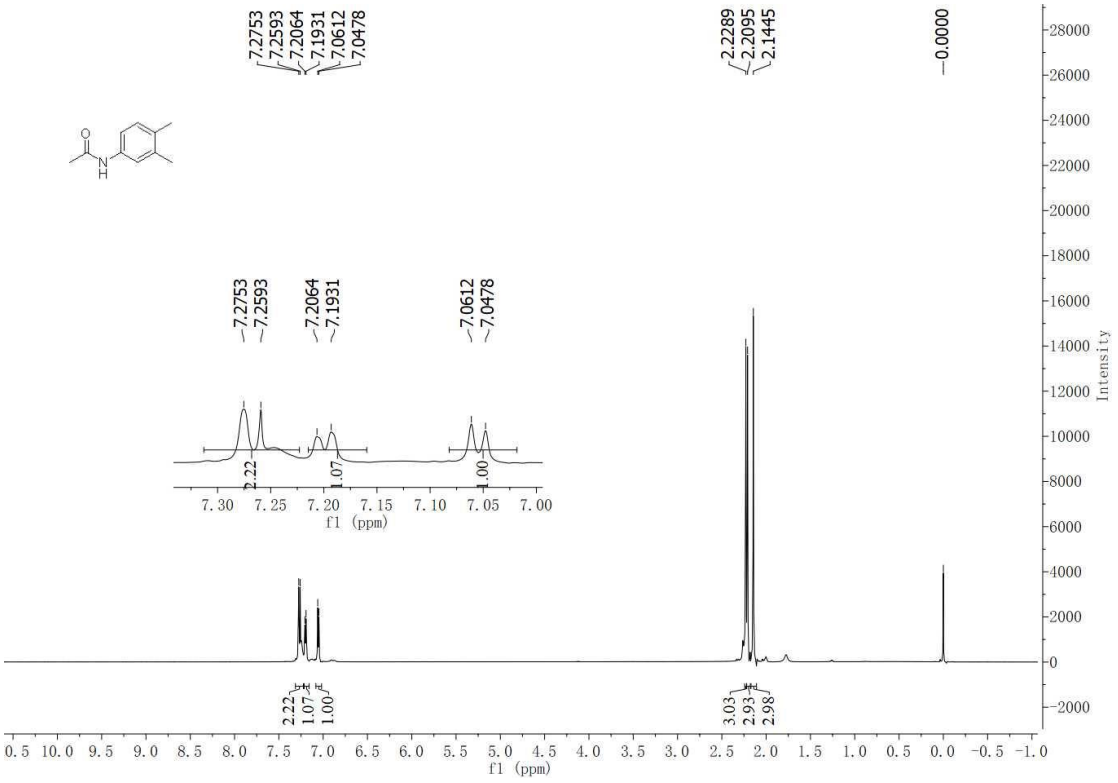
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2p**



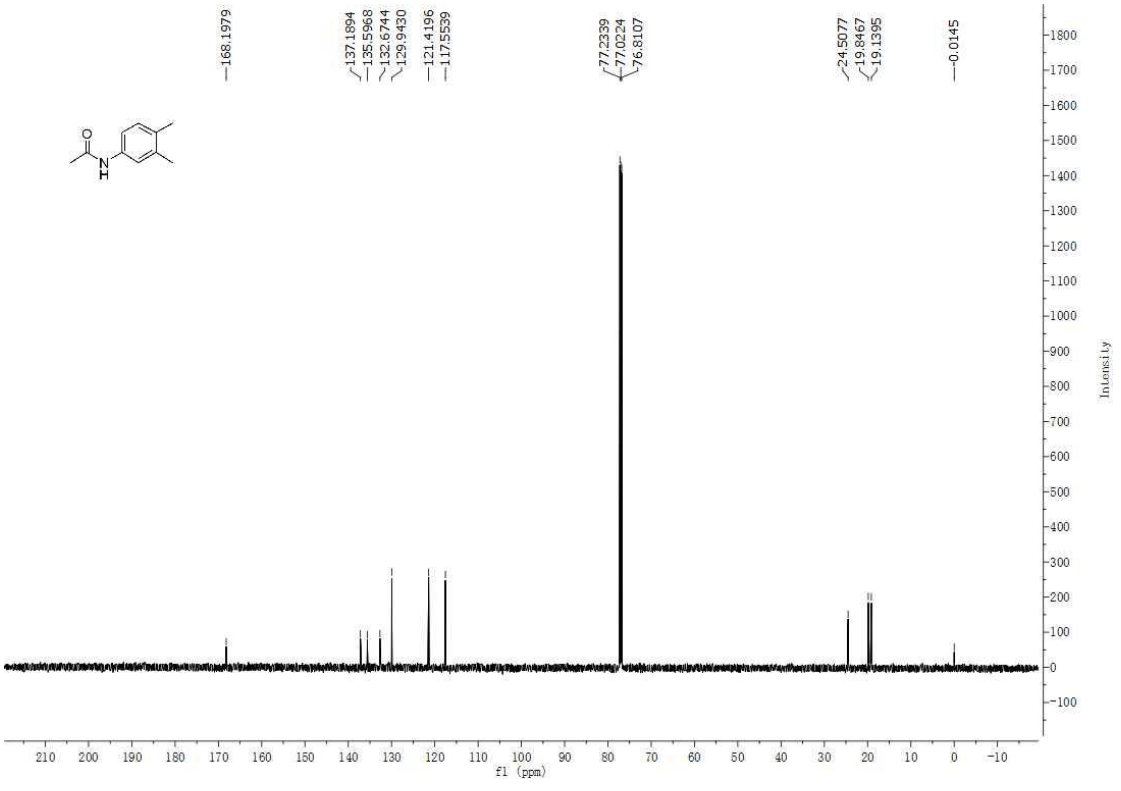
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2p**



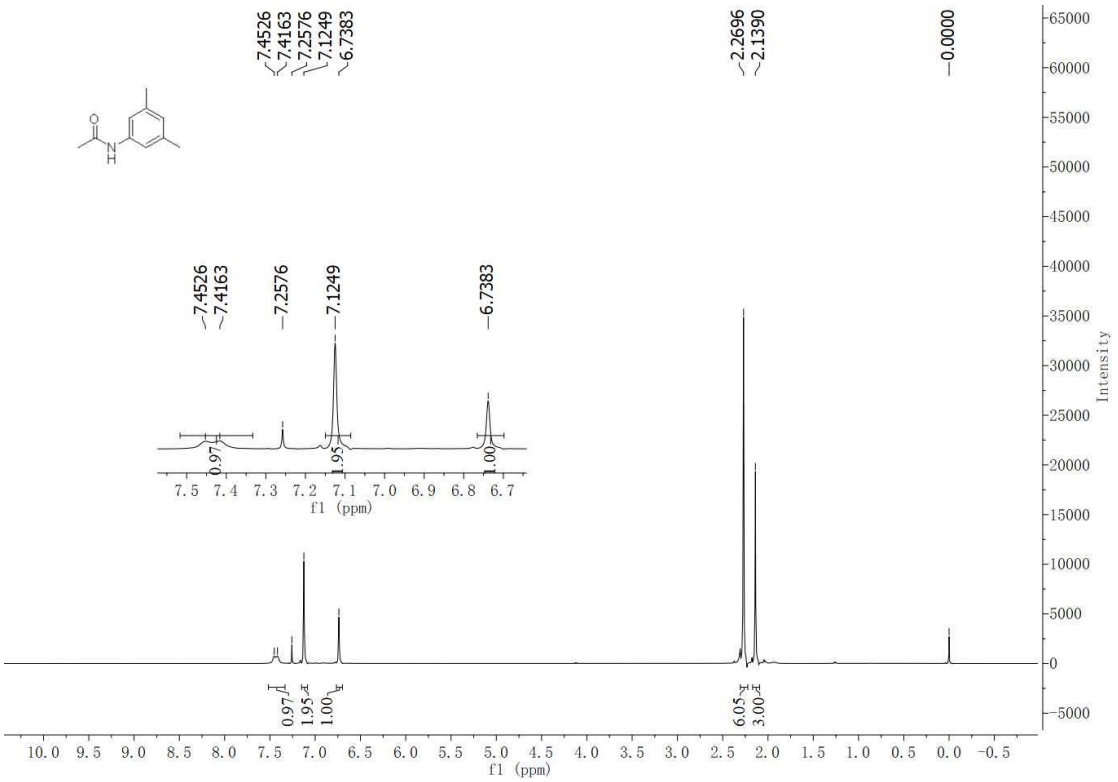
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2q**



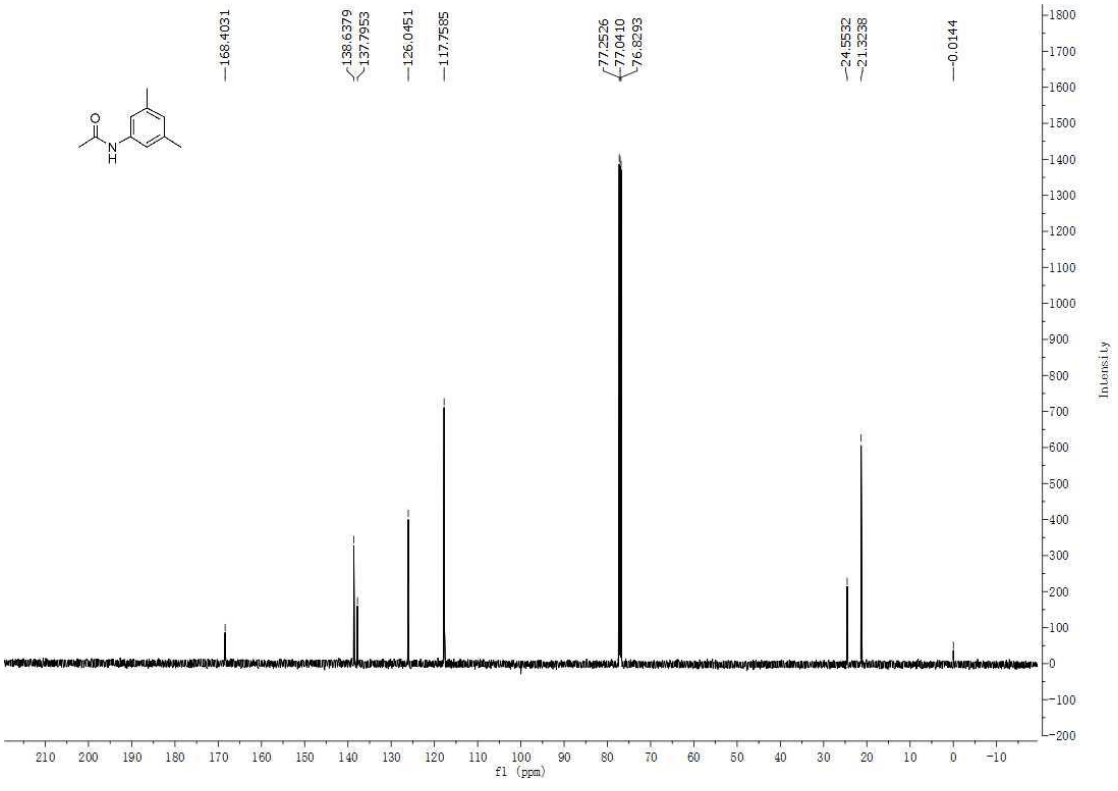
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2q**



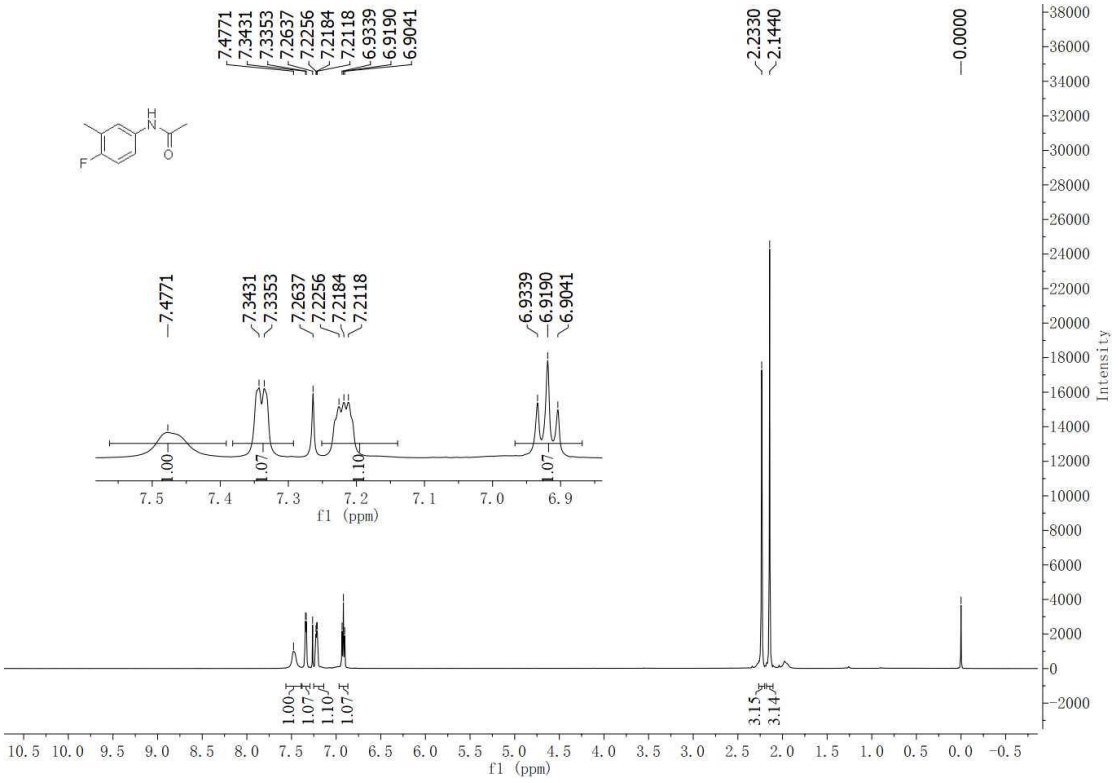
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2r**



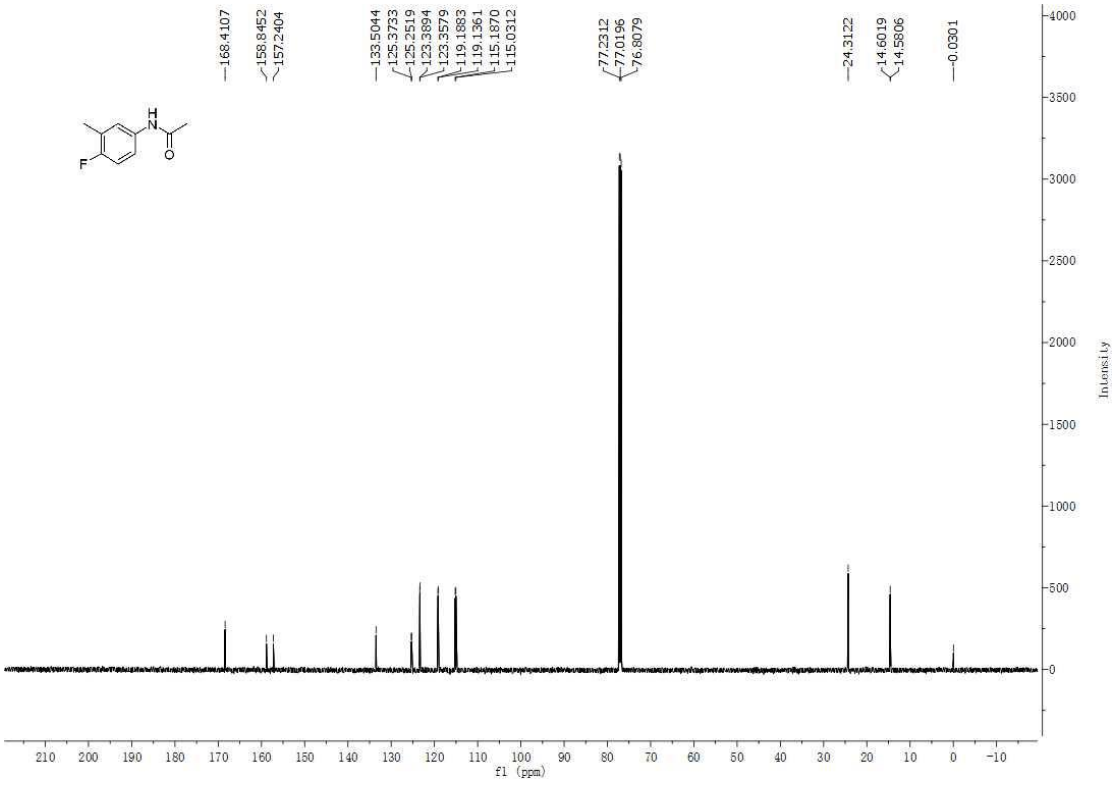
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2r**



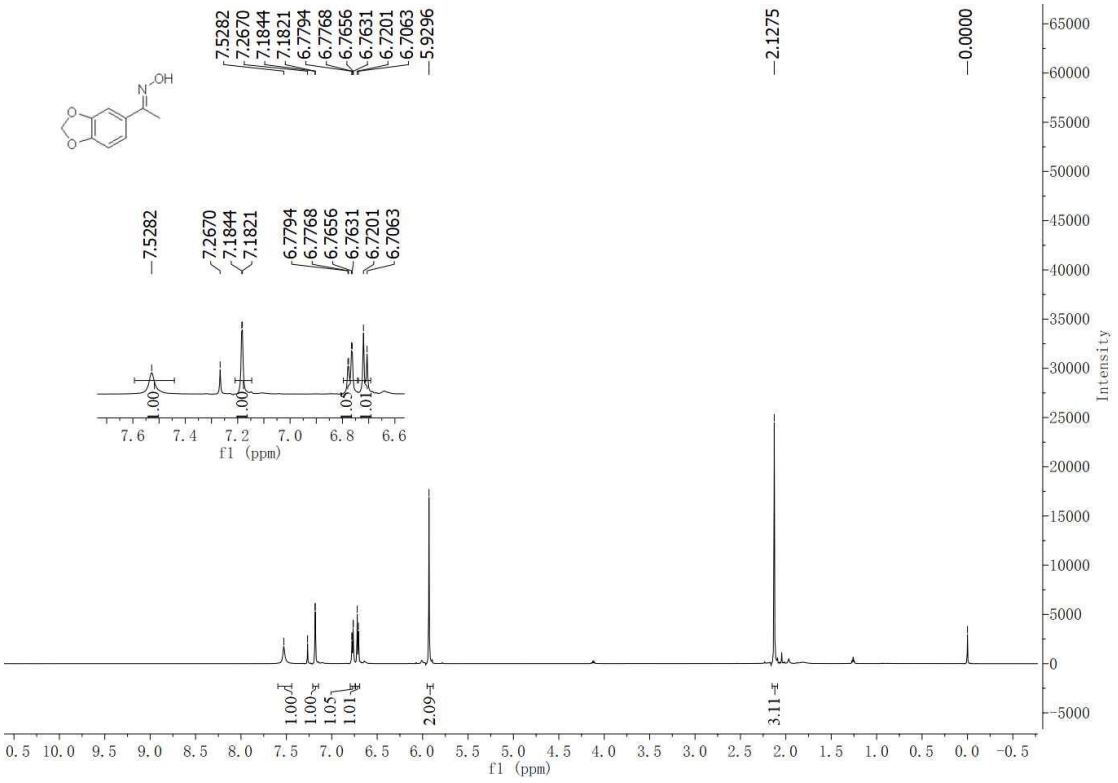
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2s**



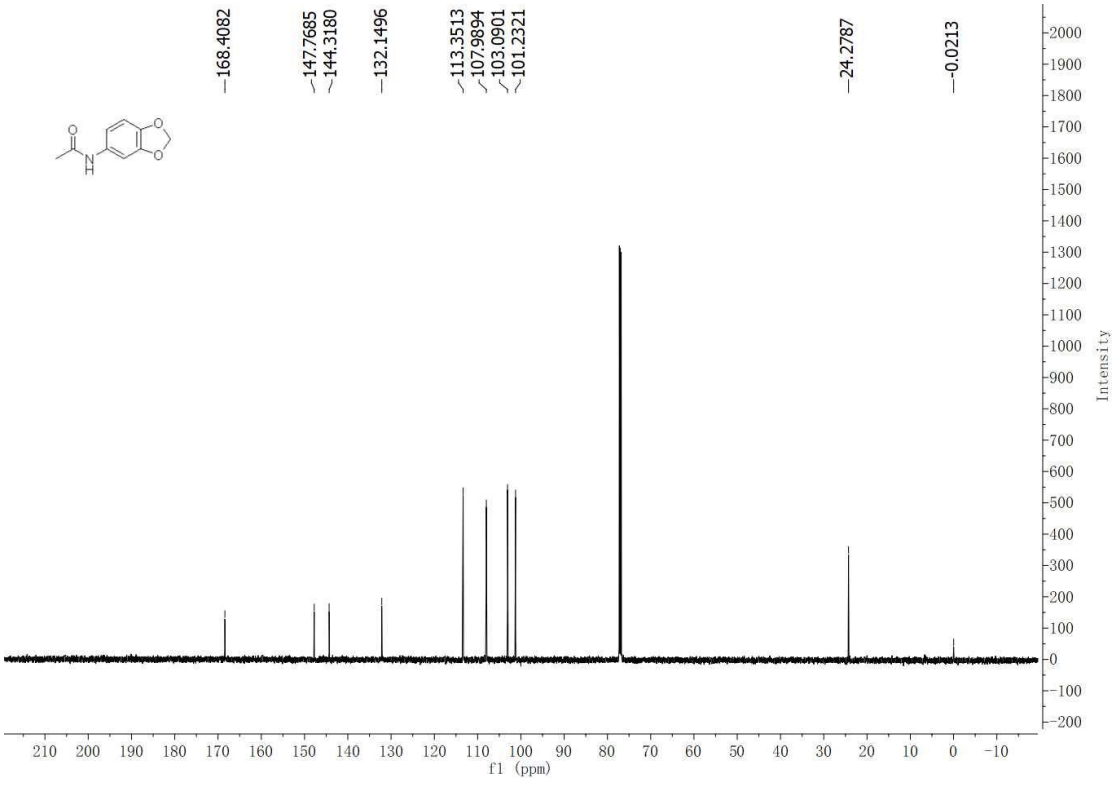
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2s**



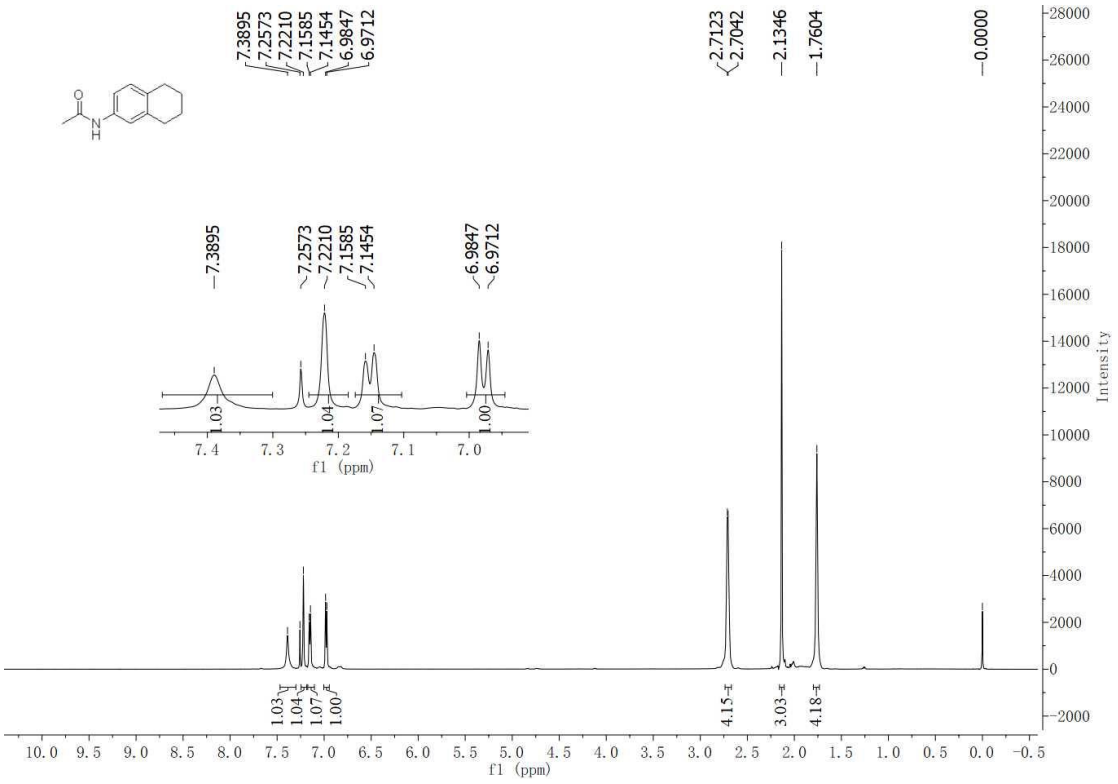
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2t**



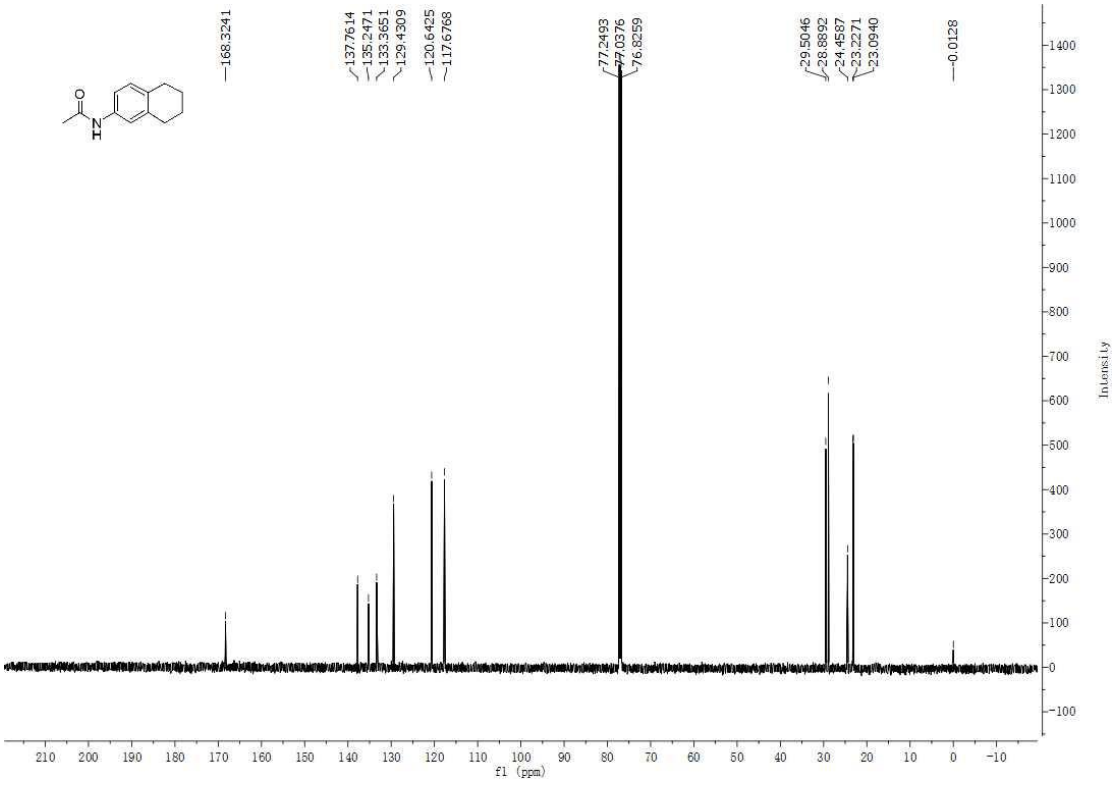
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2t**



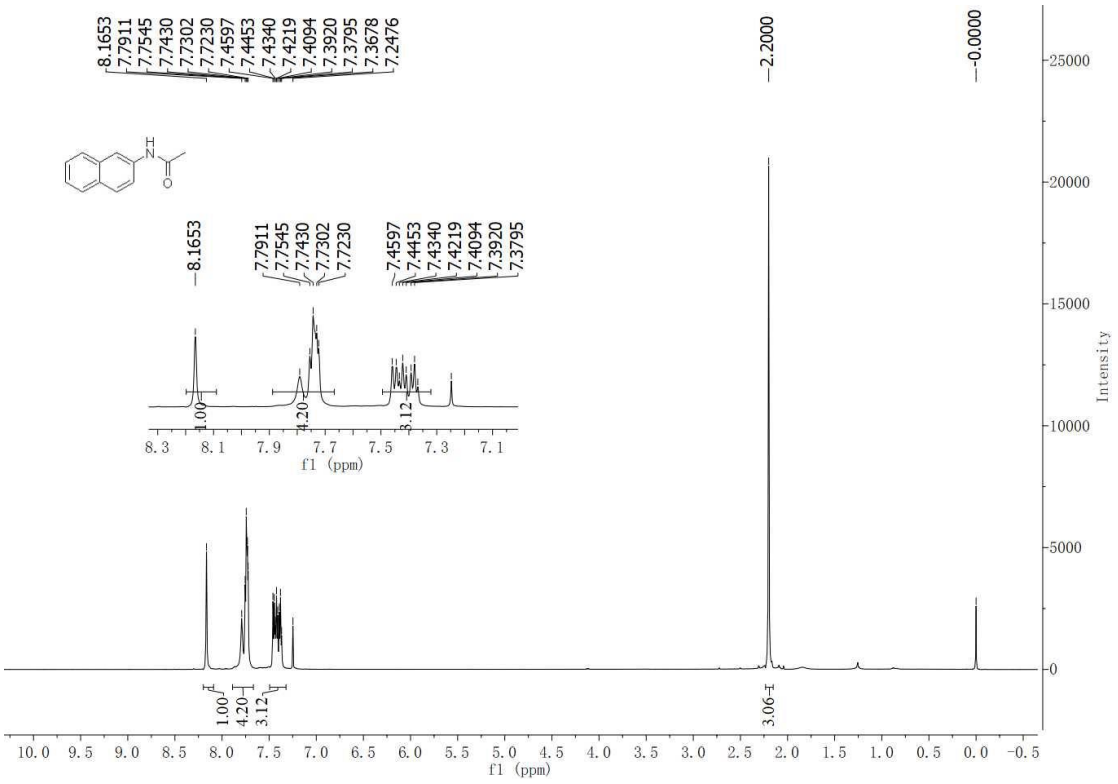
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2u**



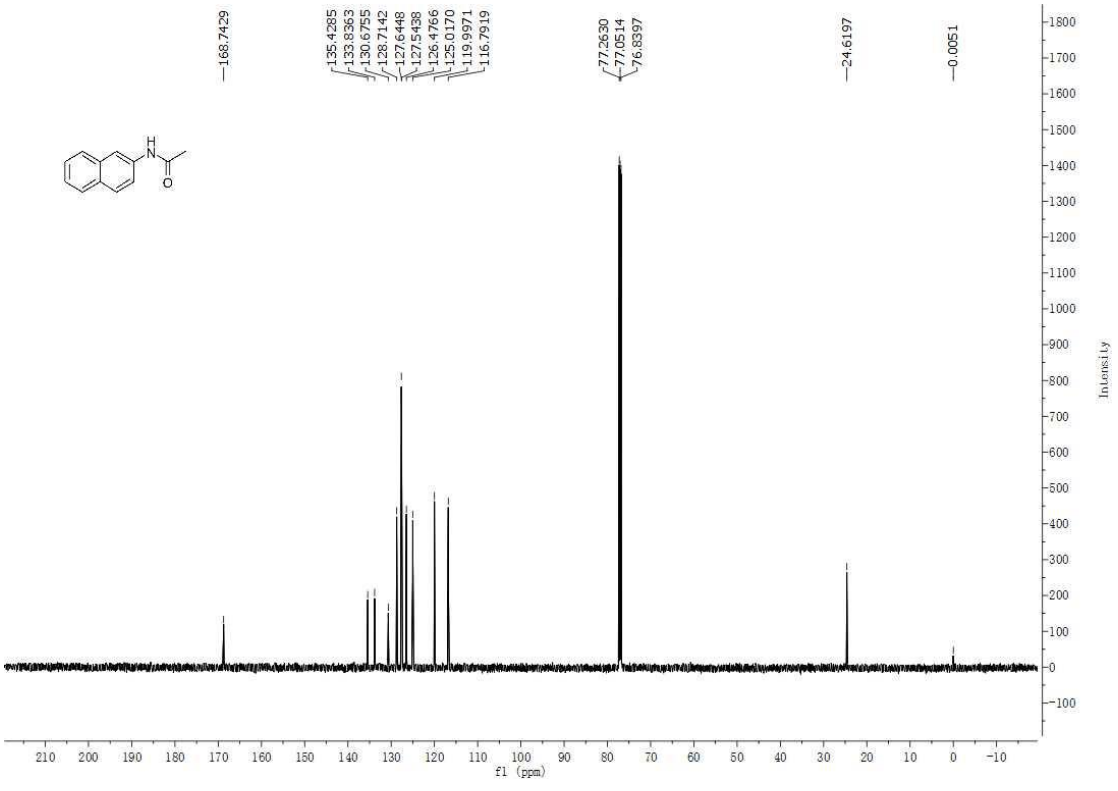
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2u**



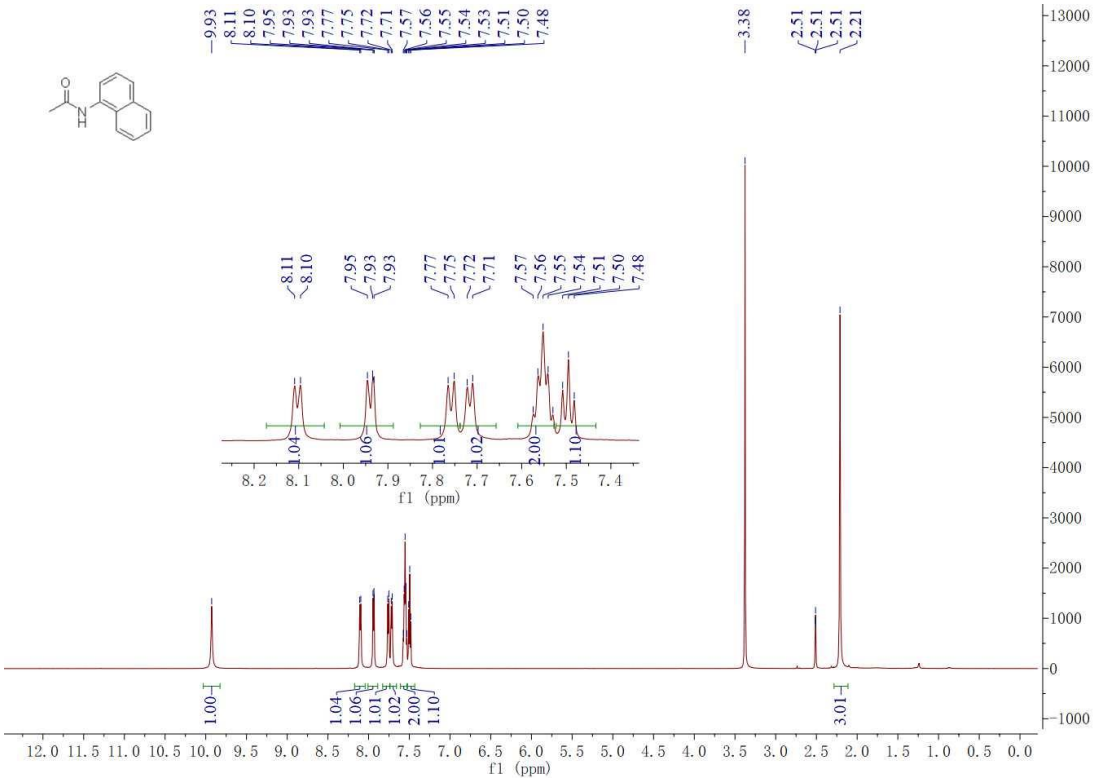
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2v**



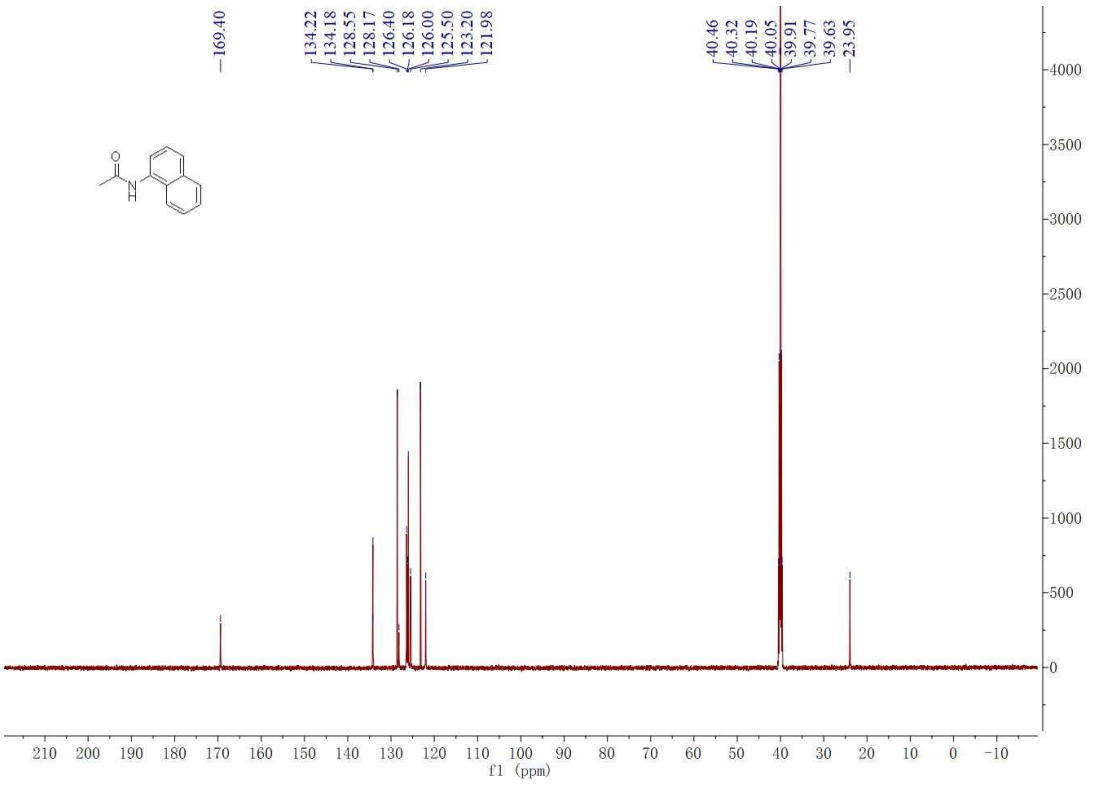
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2v**



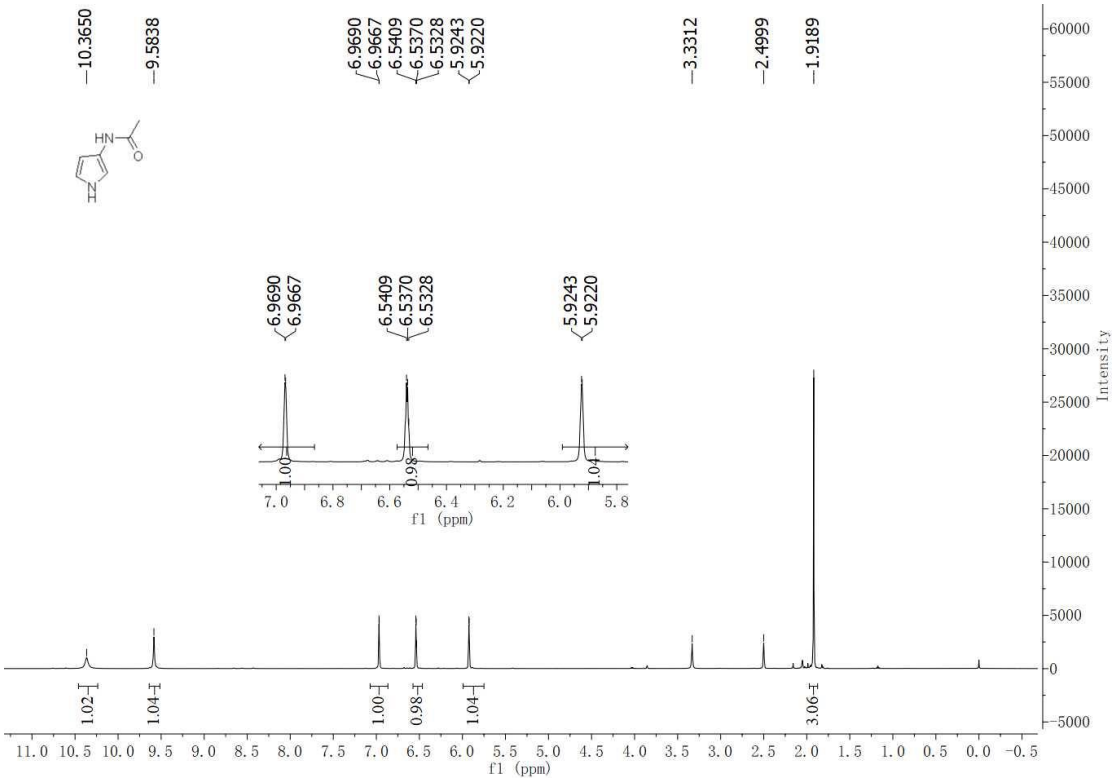
[1]H-NMR Spectrum (600 MHz, DMSO) of **2w**



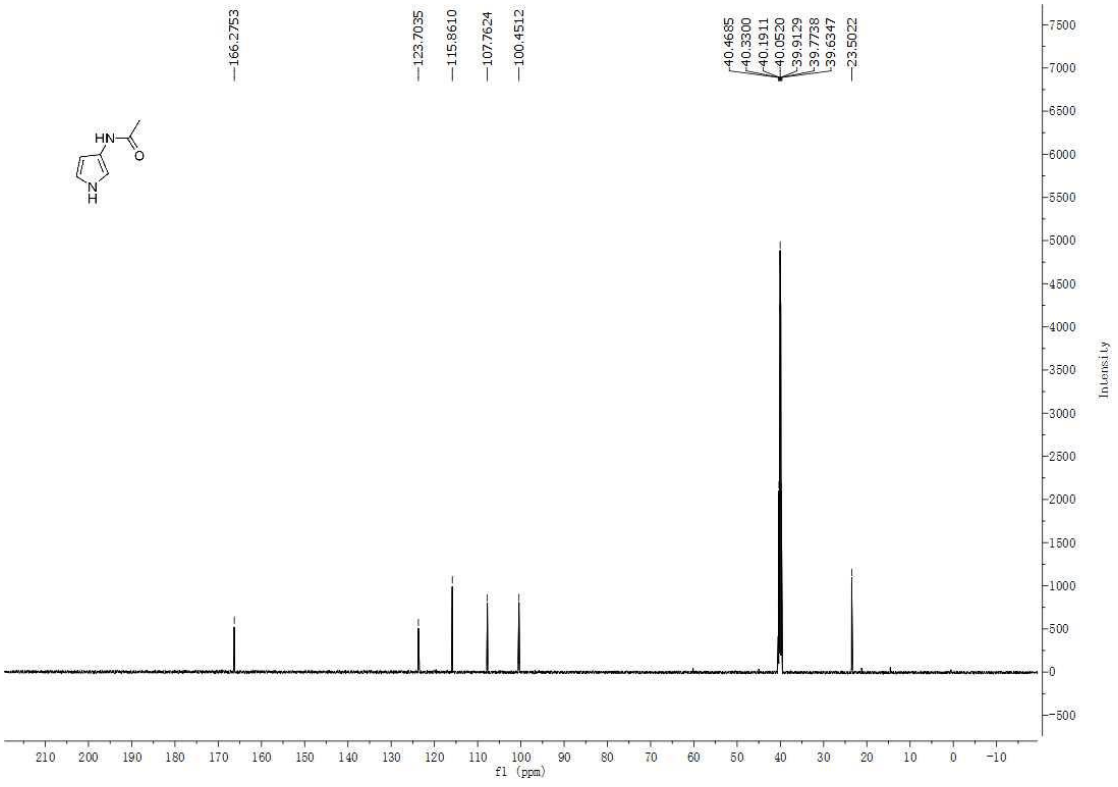
[13]C-NMR Spectrum (150 MHz, DMSO) of **2w**



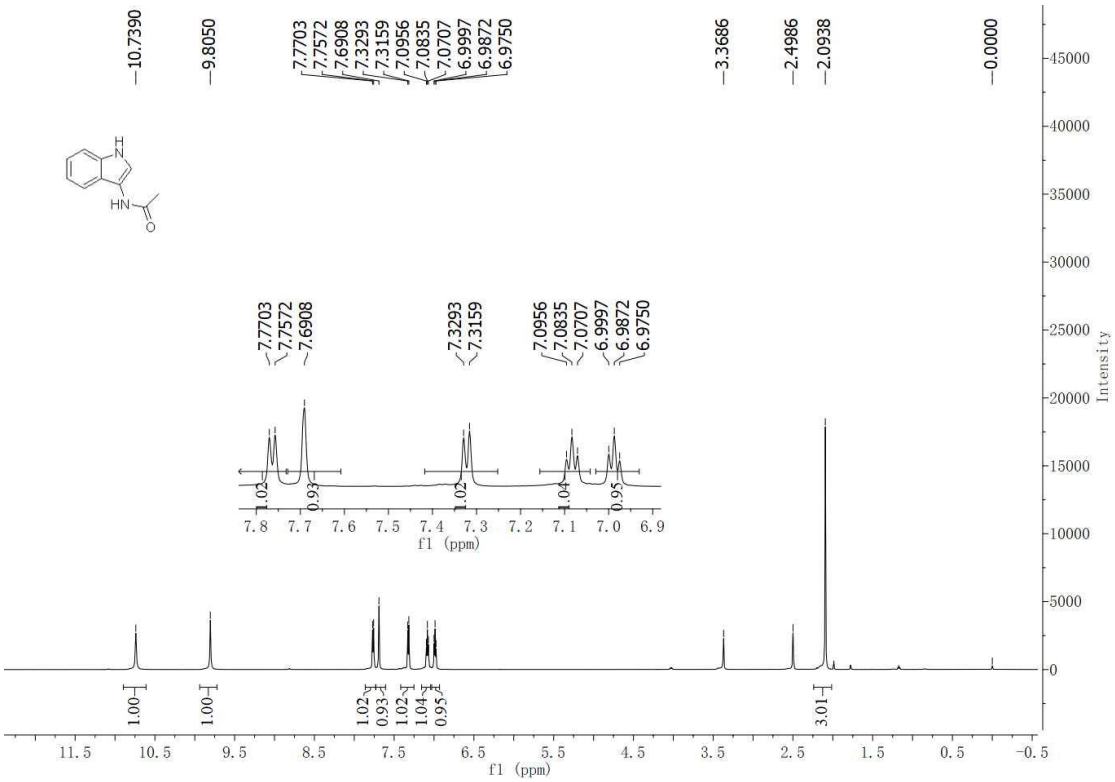
[1]H-NMR Spectrum (600 MHz, DMSO) of **2x**



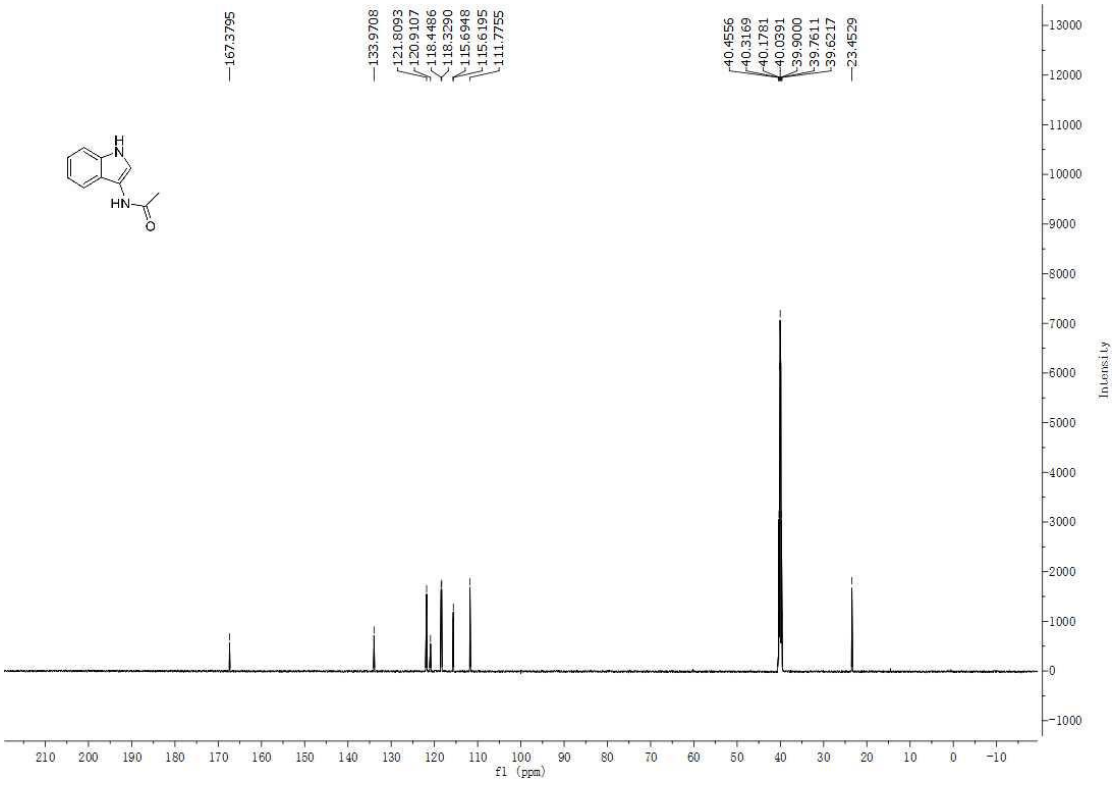
[13]C-NMR Spectrum (150 MHz, DMSO) of **2x**



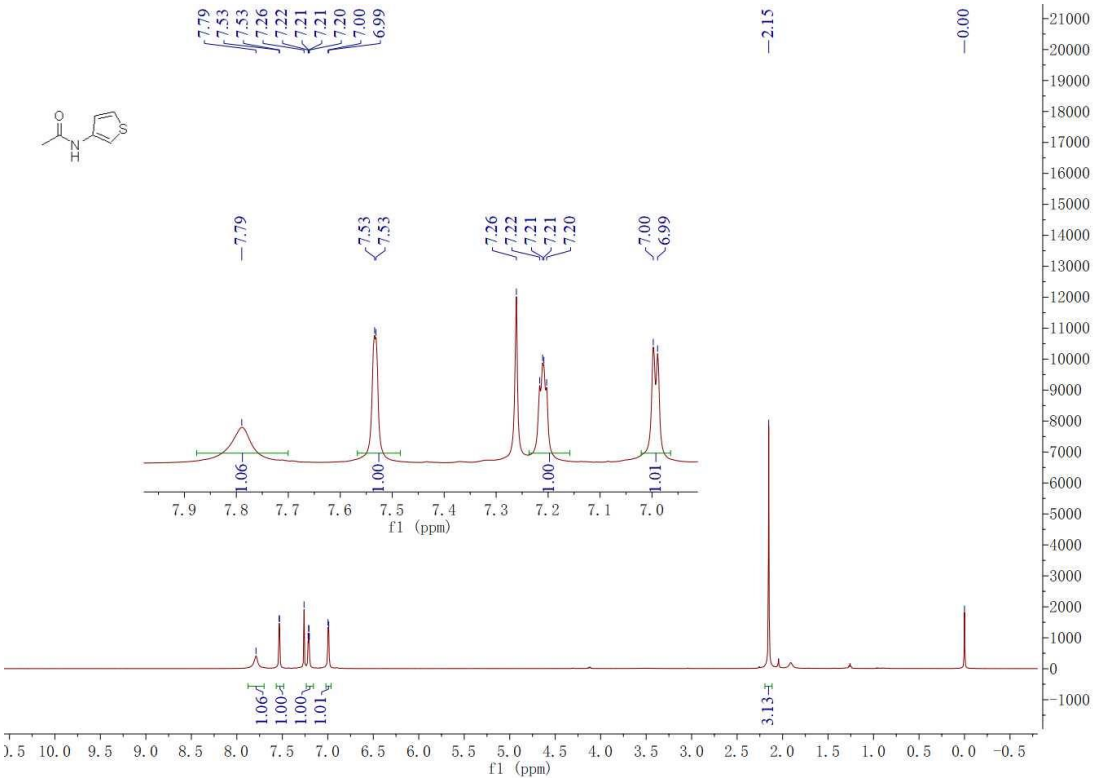
^{1}H-NMR Spectrum (600 MHz, DMSO) of **2y**



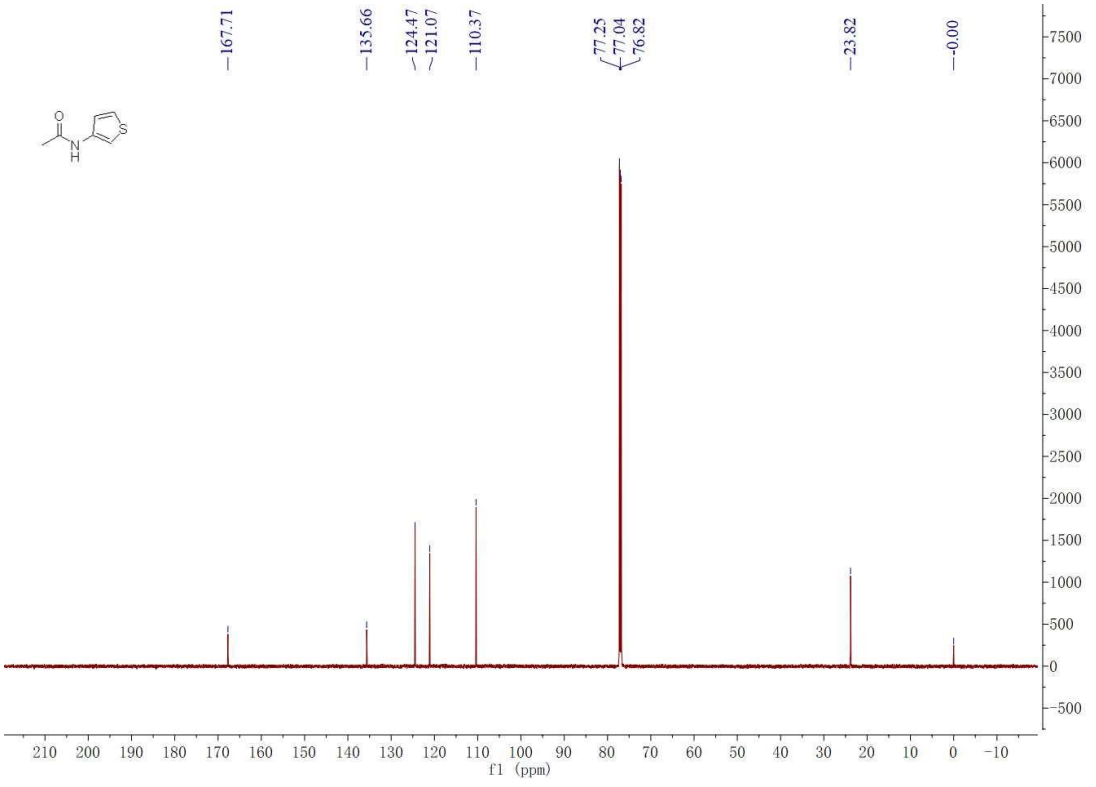
^{13}C-NMR Spectrum (150 MHz, DMSO) of **2y**



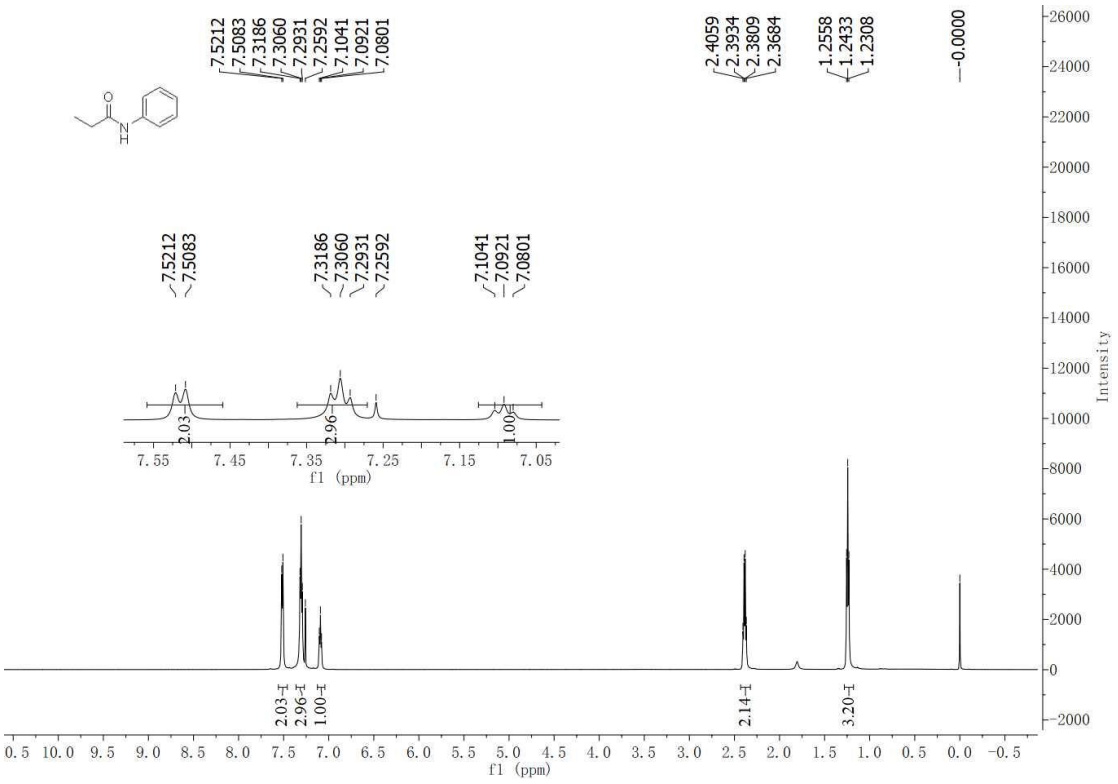
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2z**



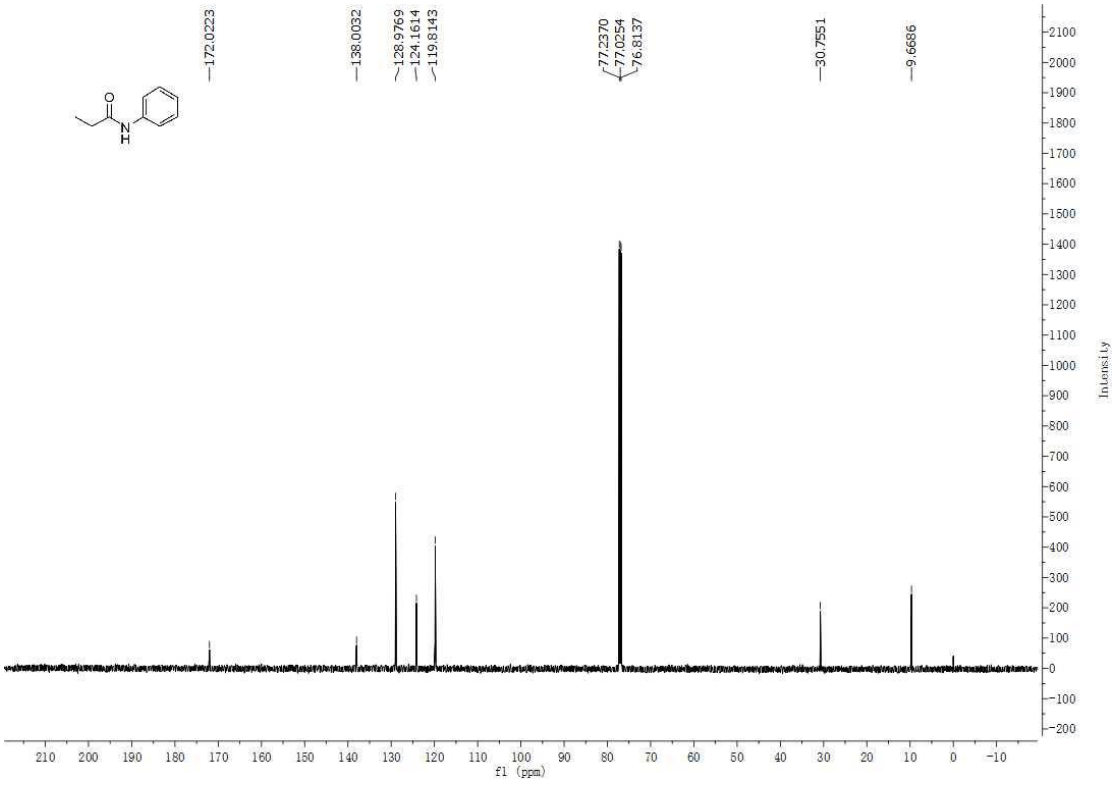
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2z**



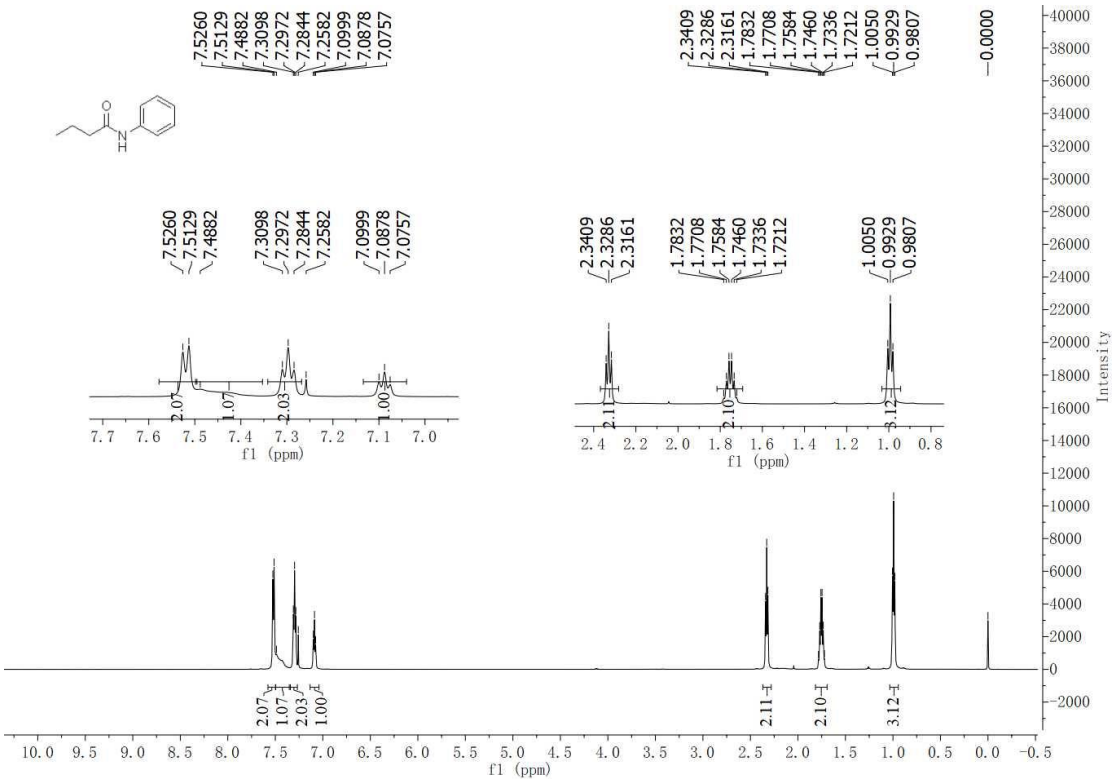
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2aa**



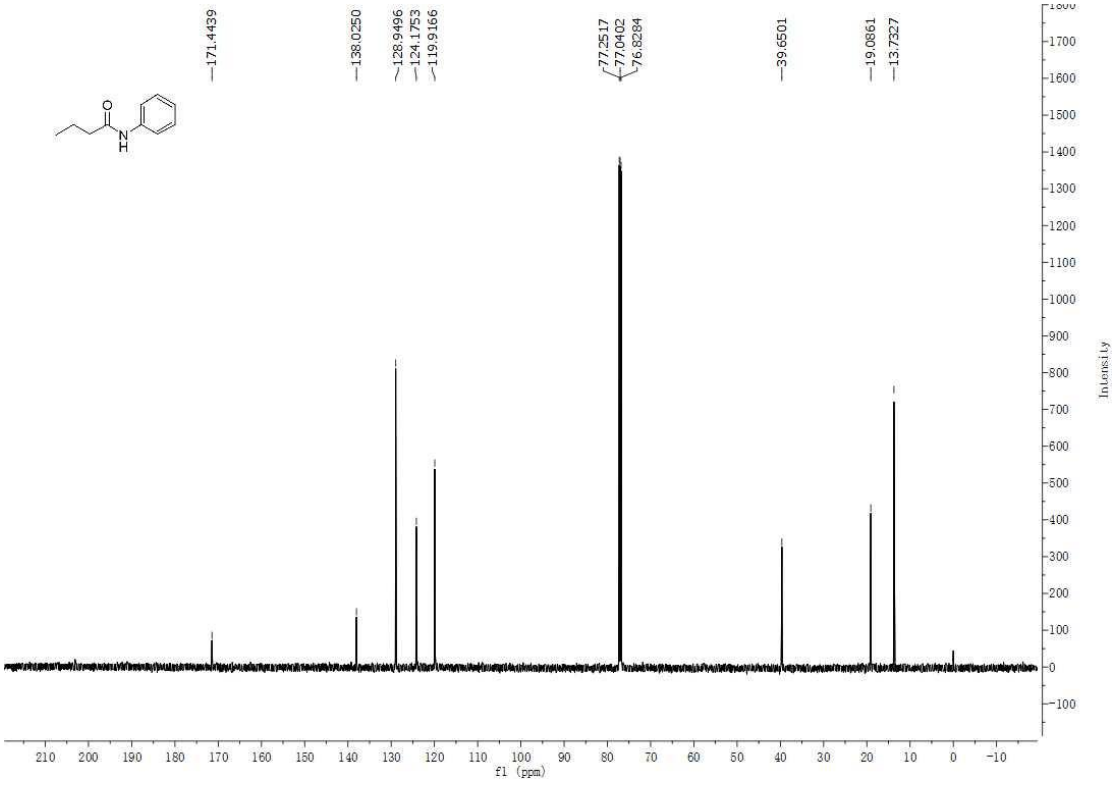
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2aa**



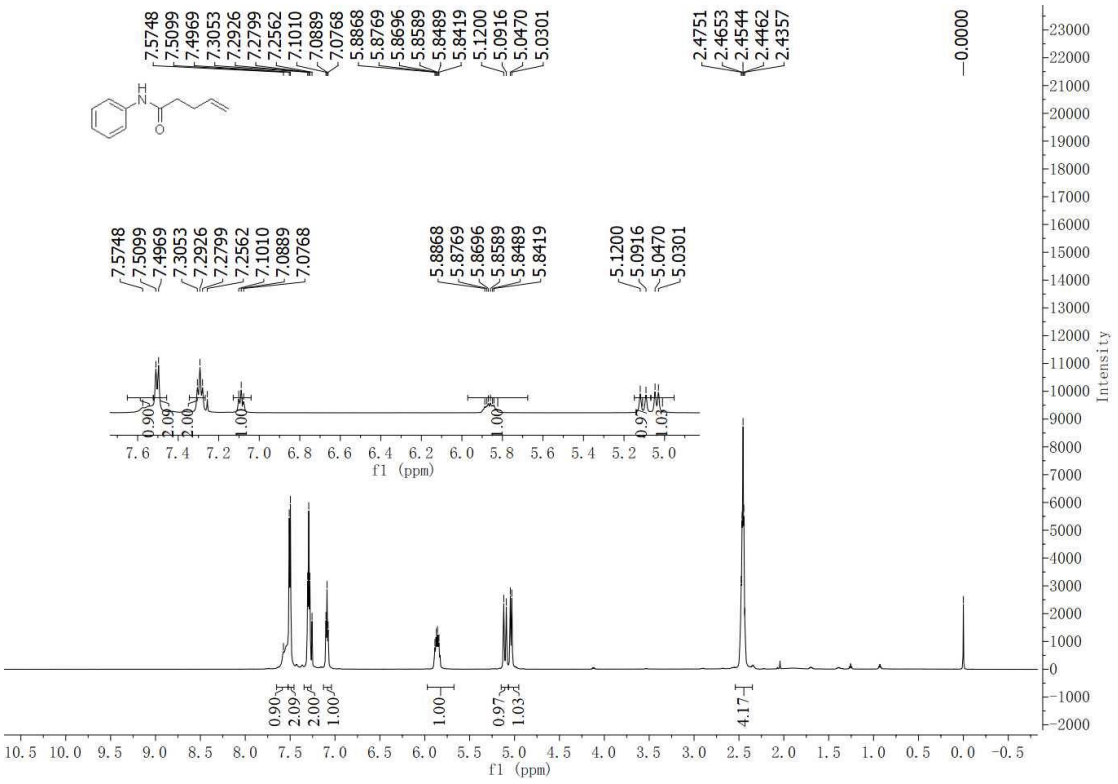
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ab**



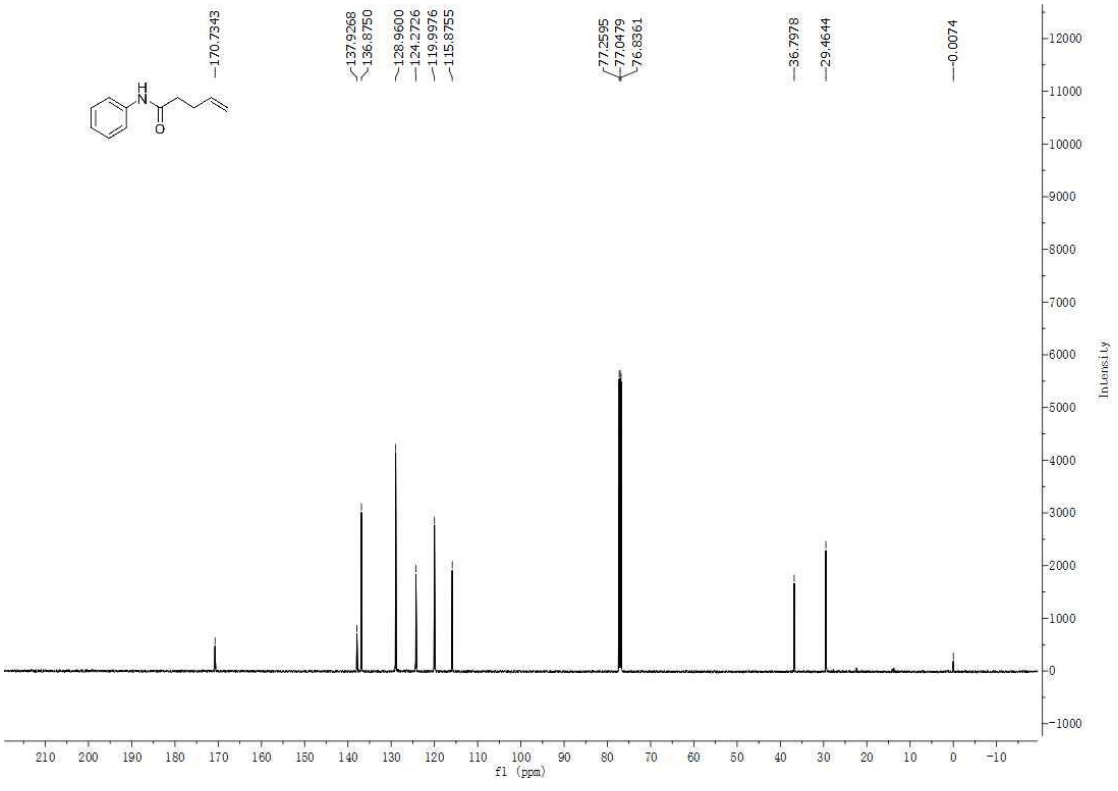
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ab**



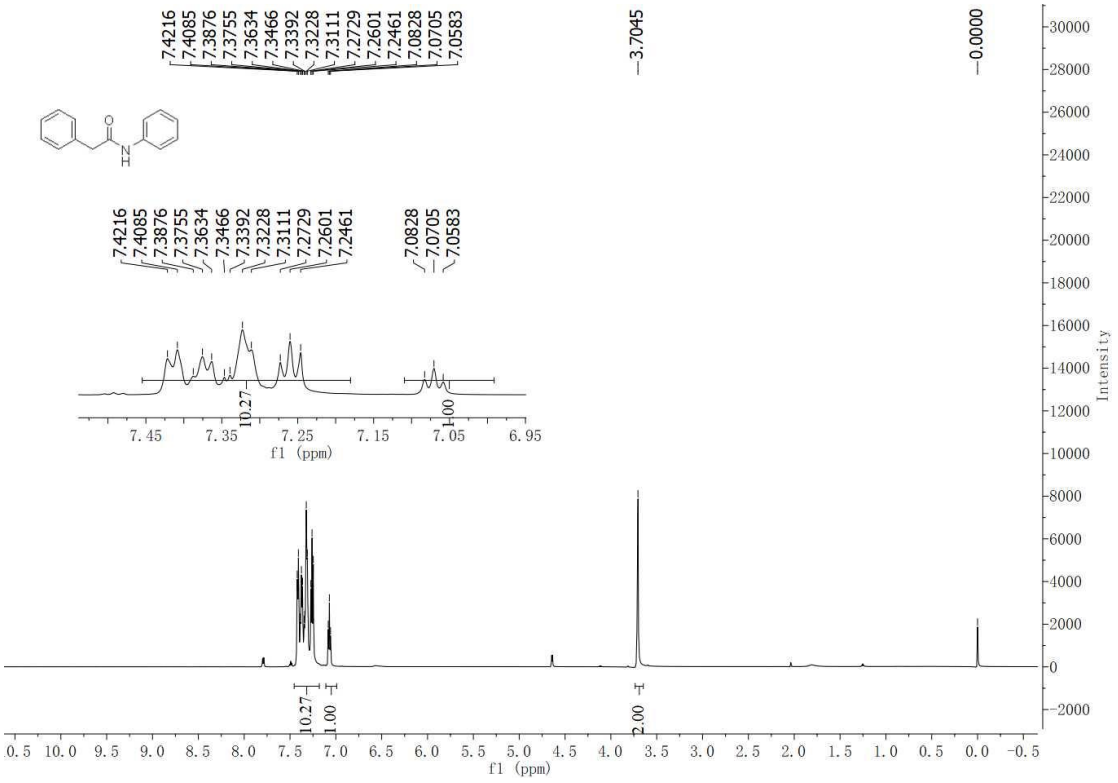
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ac**



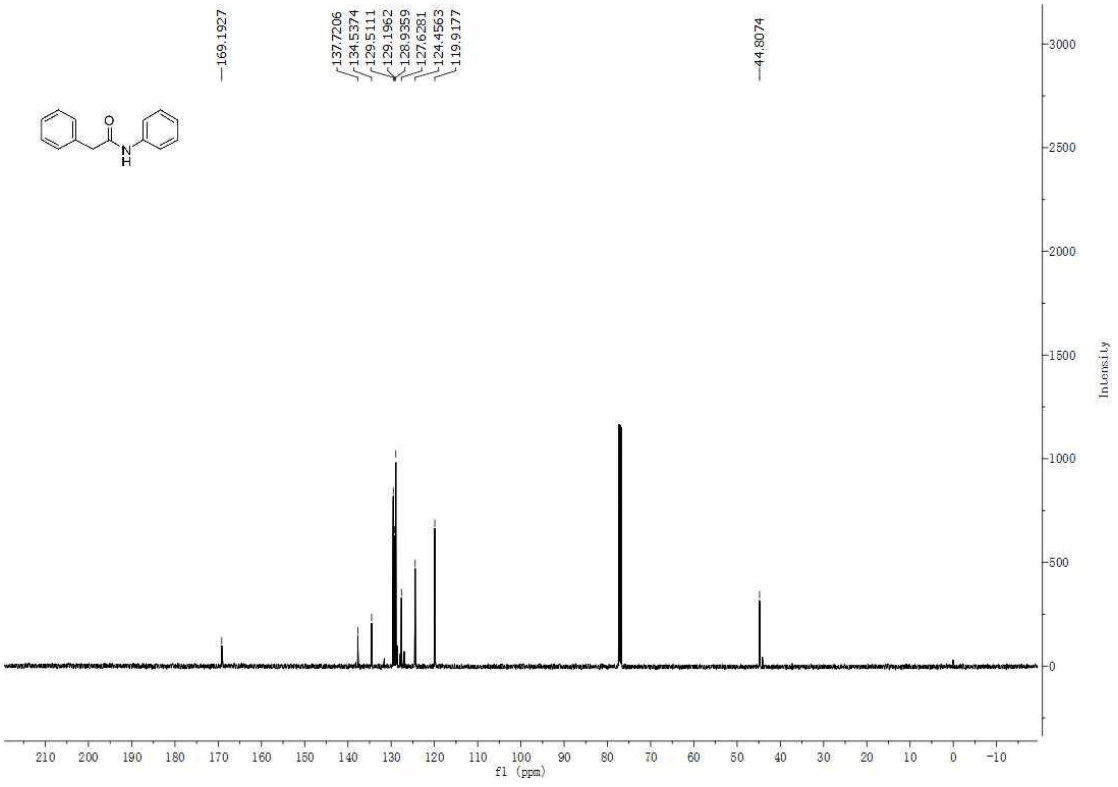
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ac**



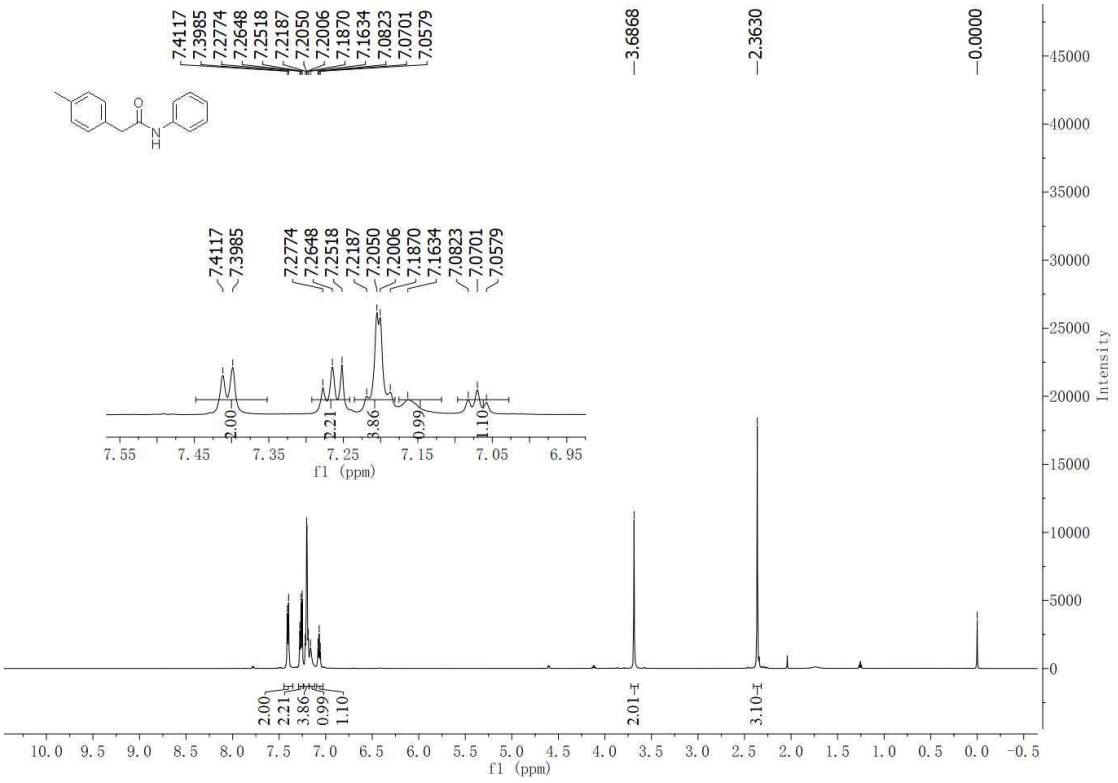
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ad**



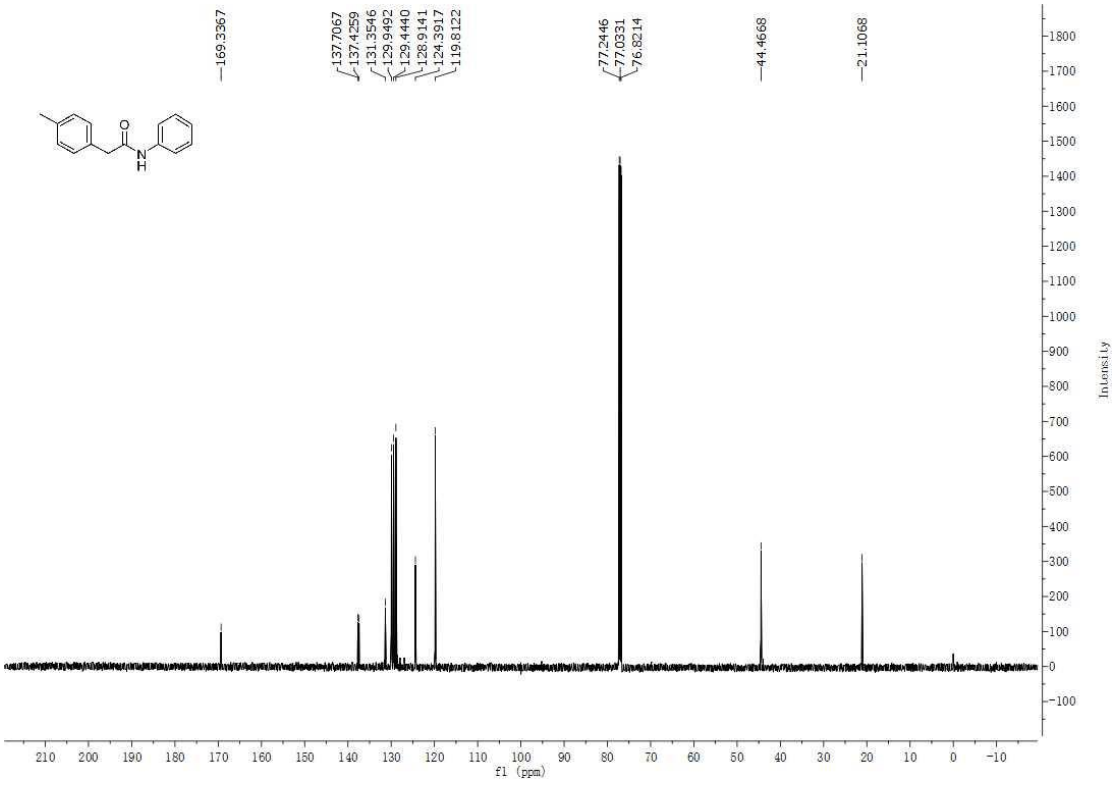
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ad**



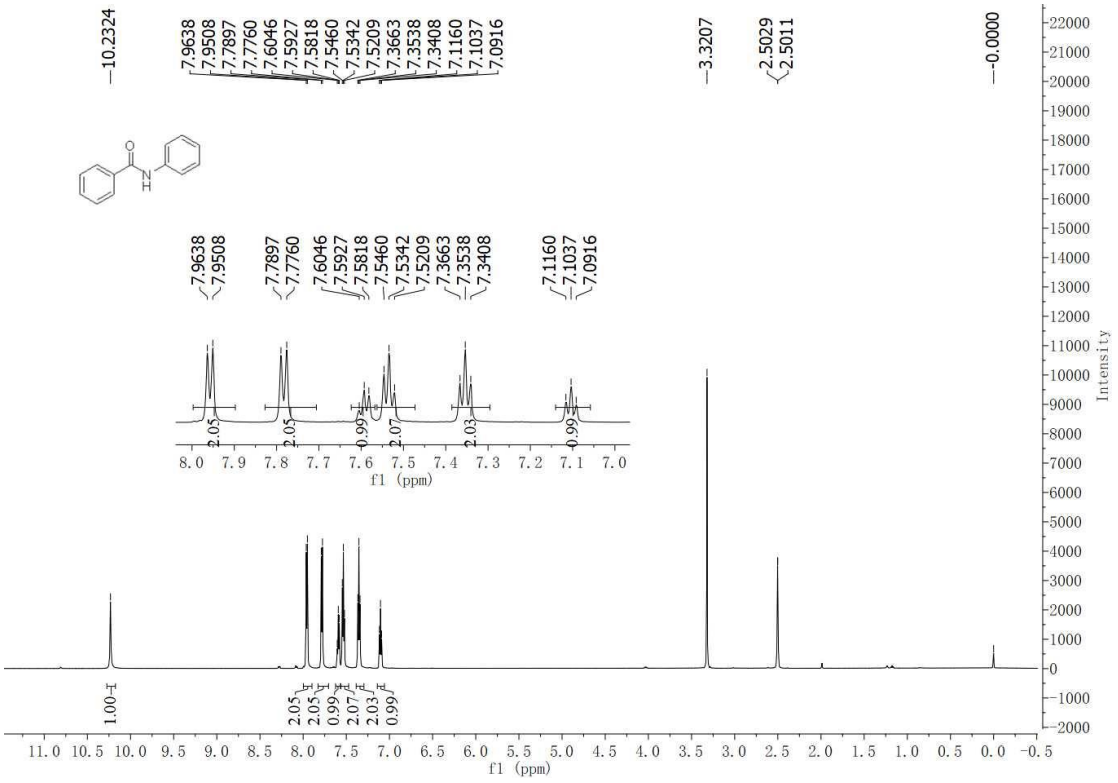
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ae**



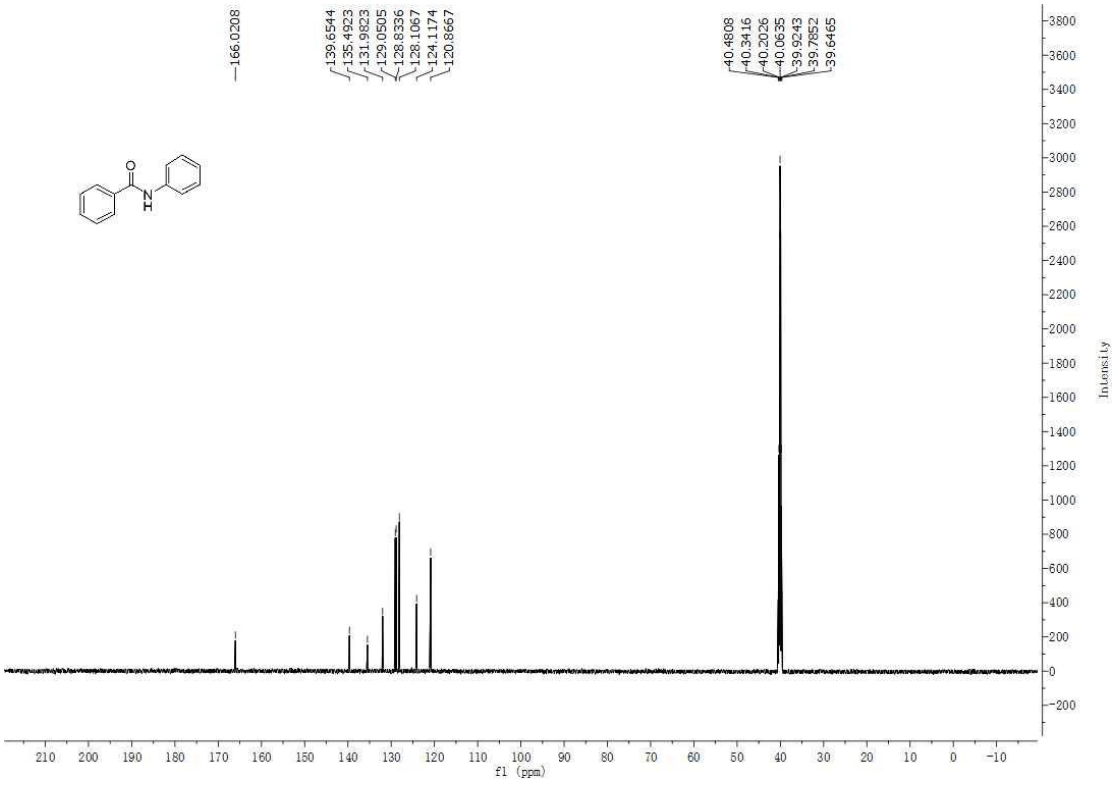
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ae**



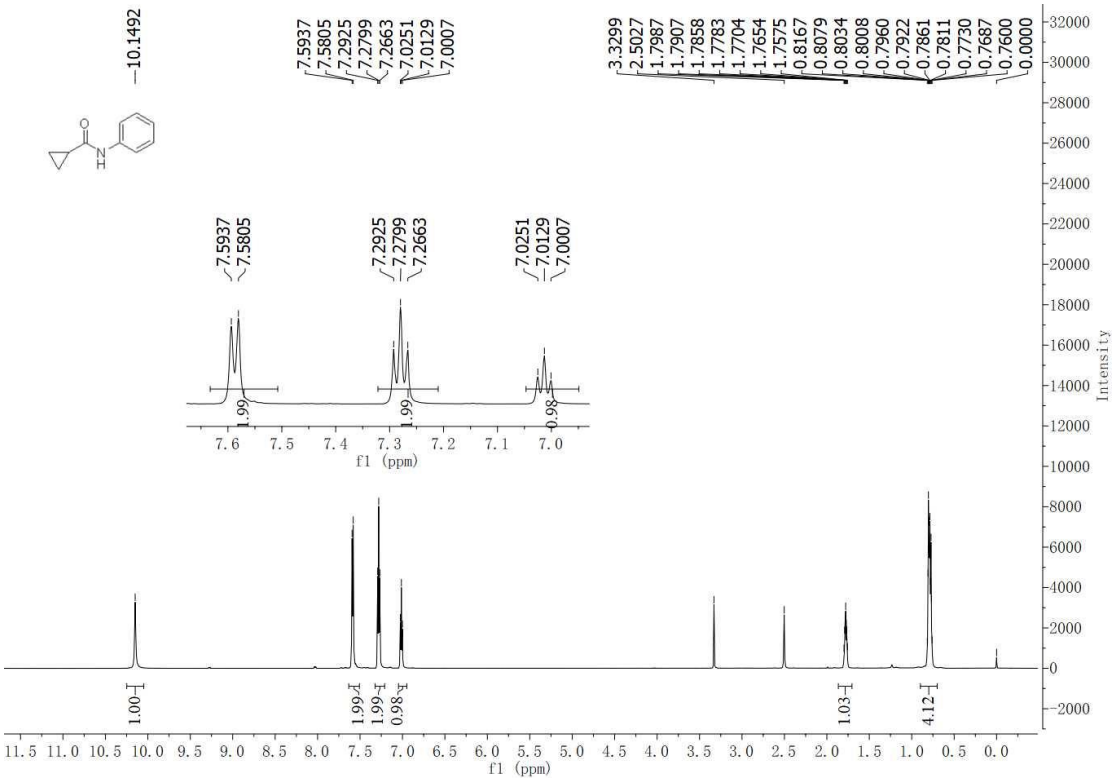
[1]H-NMR Spectrum (600 MHz, DMSO) of **2af**



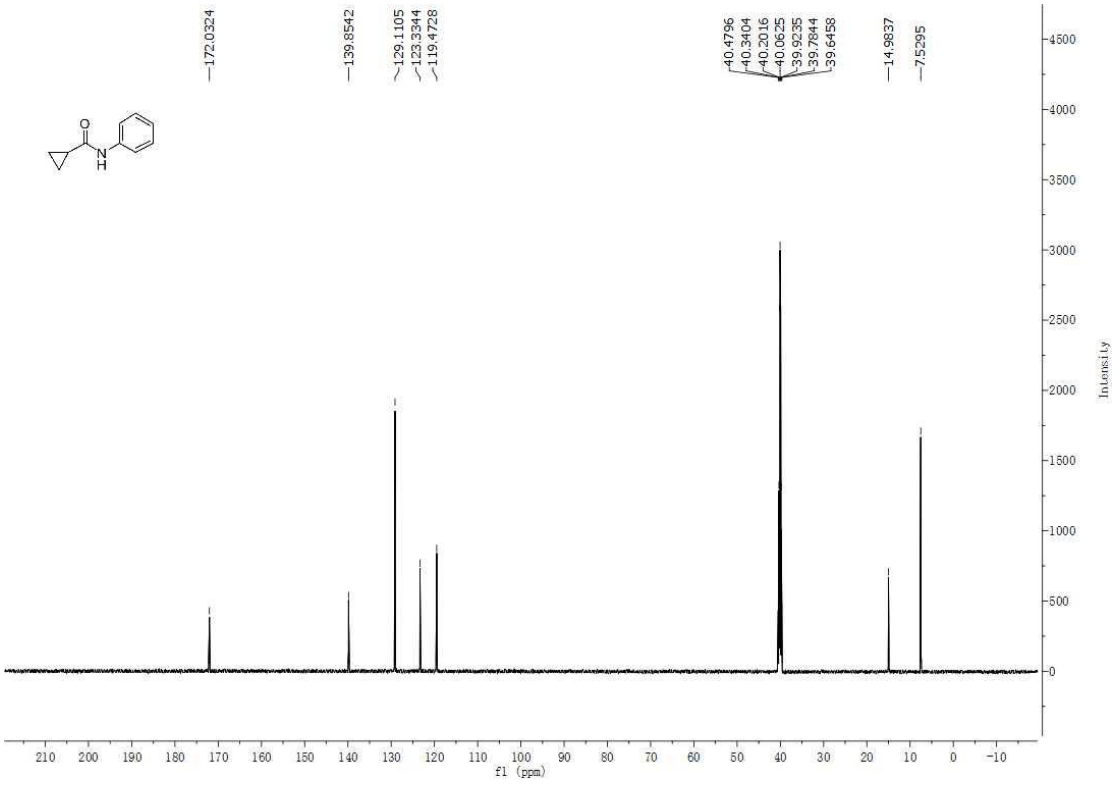
[13]C-NMR Spectrum (150 MHz, DMSO) of **2af**



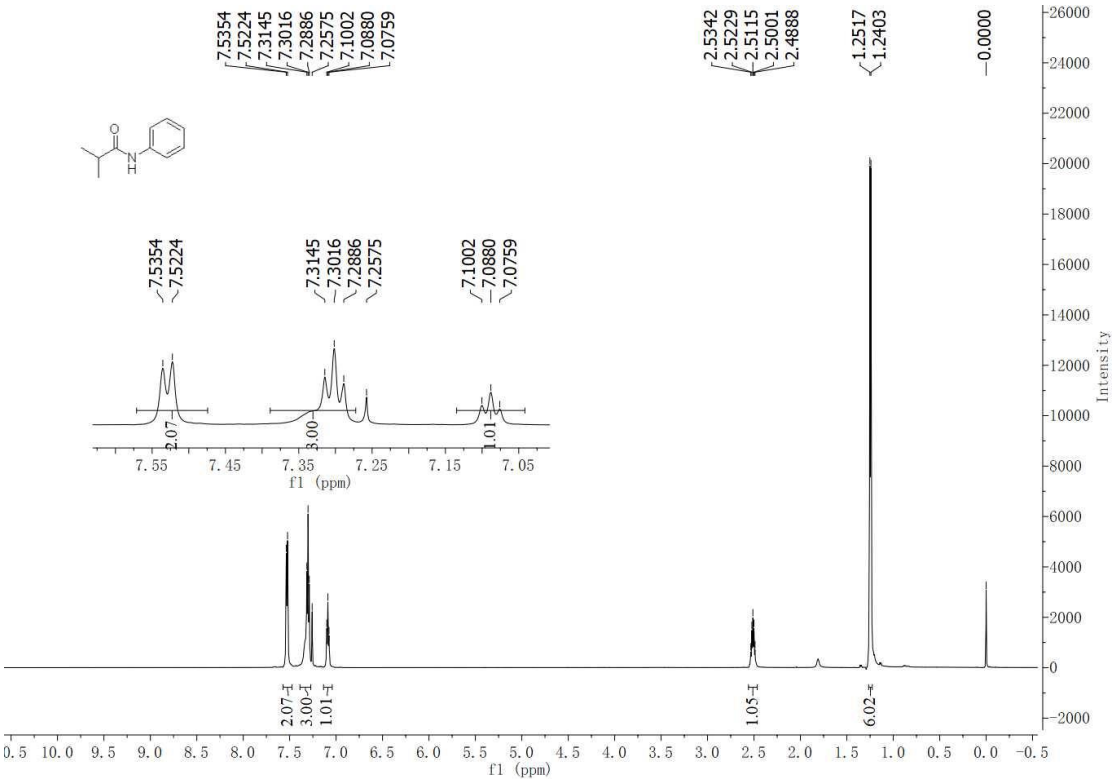
^{1}H-NMR Spectrum (600 MHz, DMSO) of **2ag**



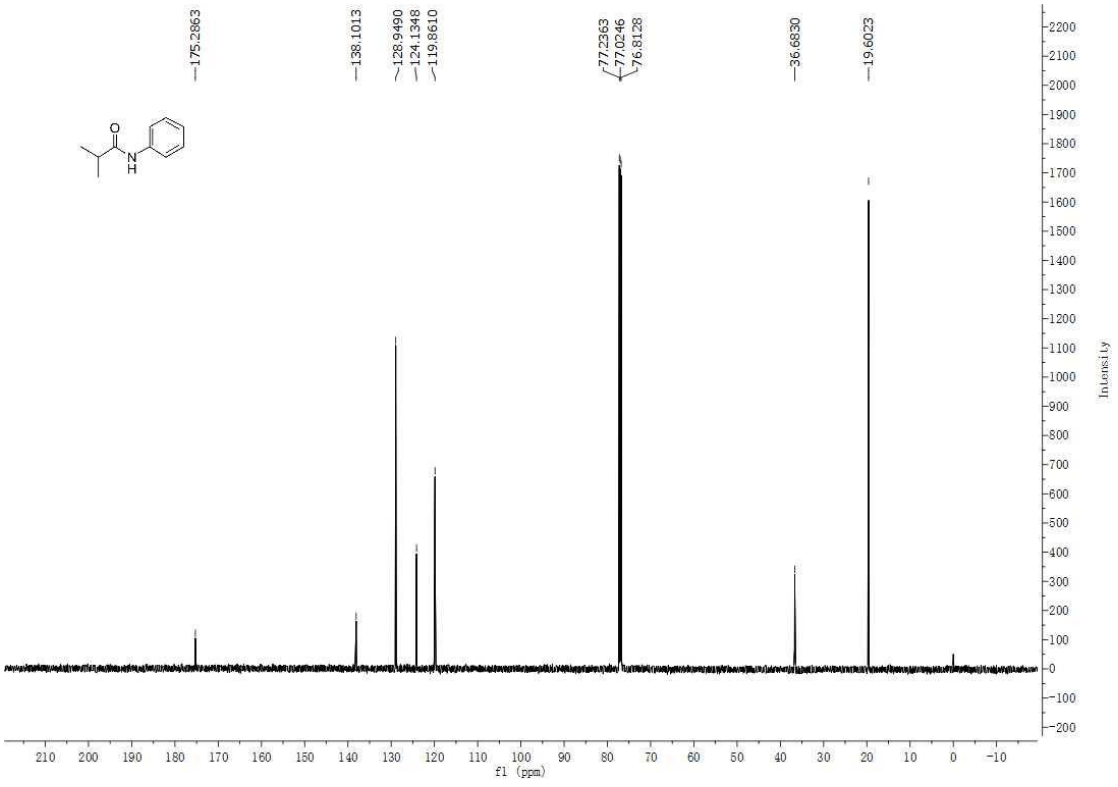
^{13}C-NMR Spectrum (150 MHz, DMSO) of **2ag**



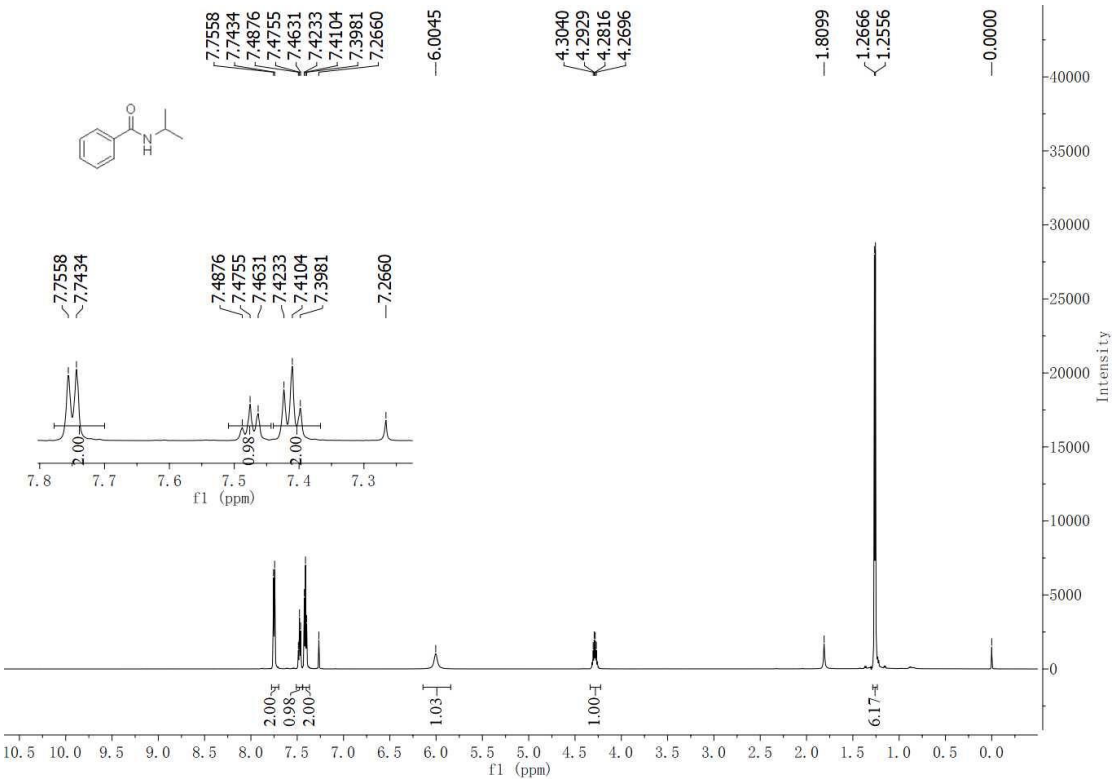
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ah-1**



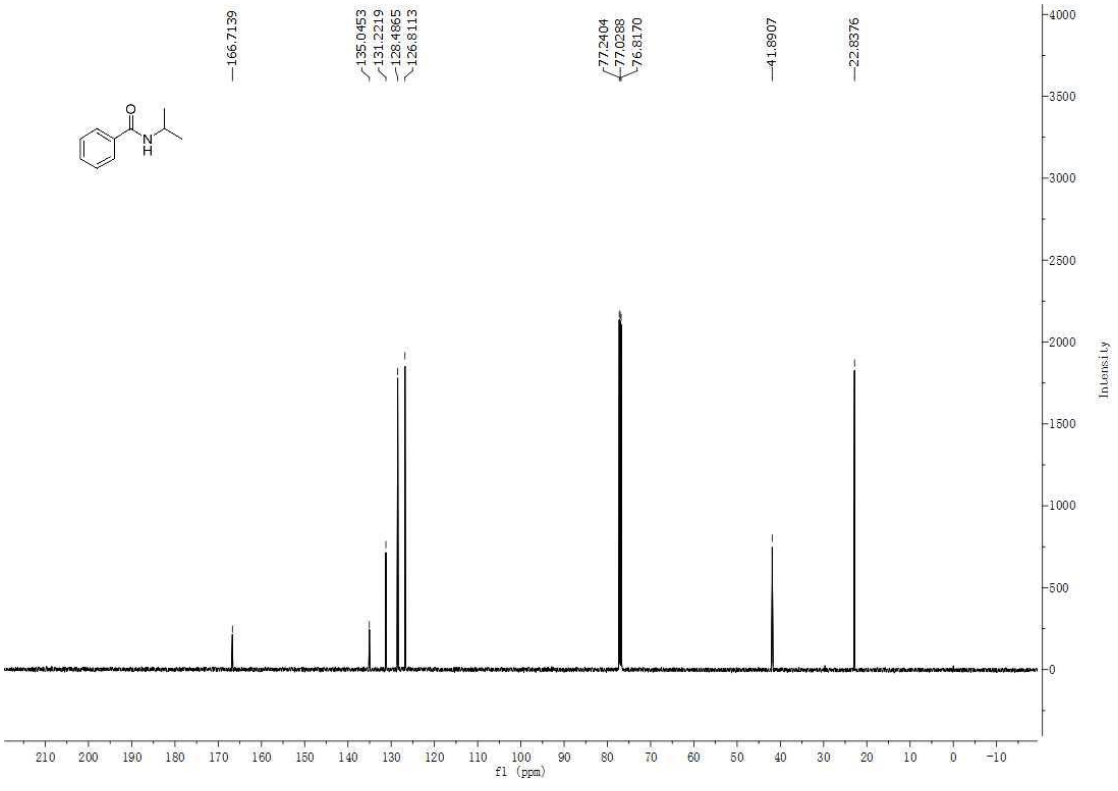
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ah-1**



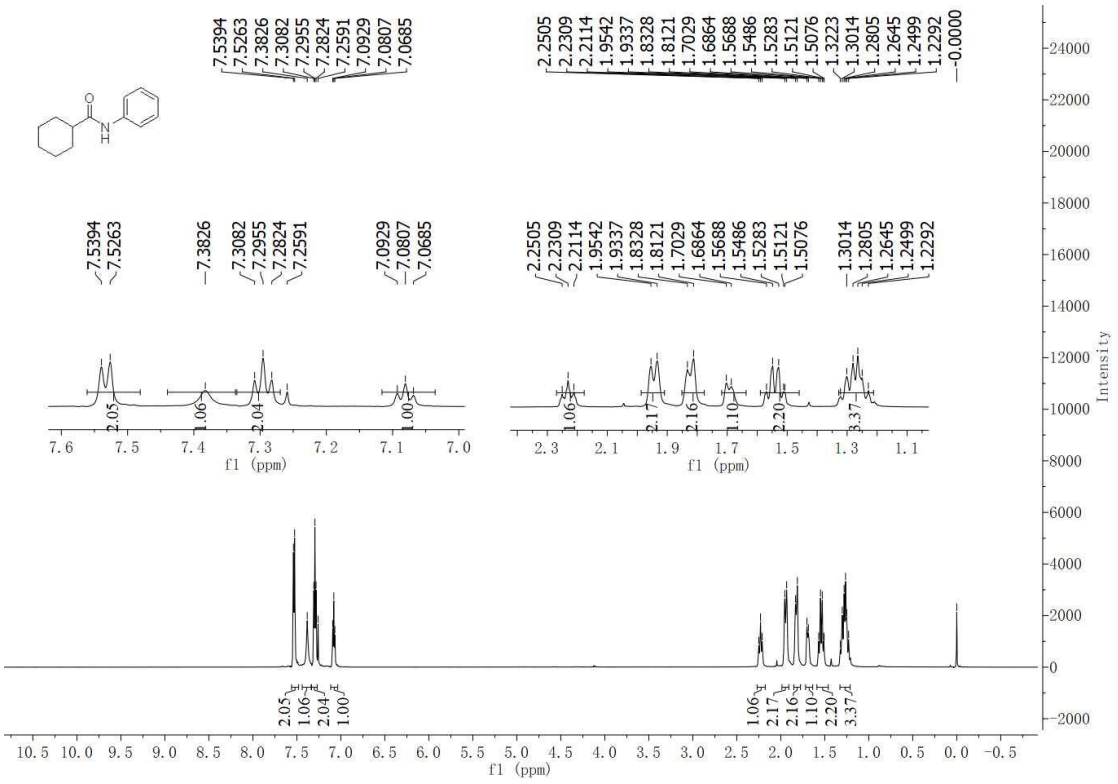
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ah-2**



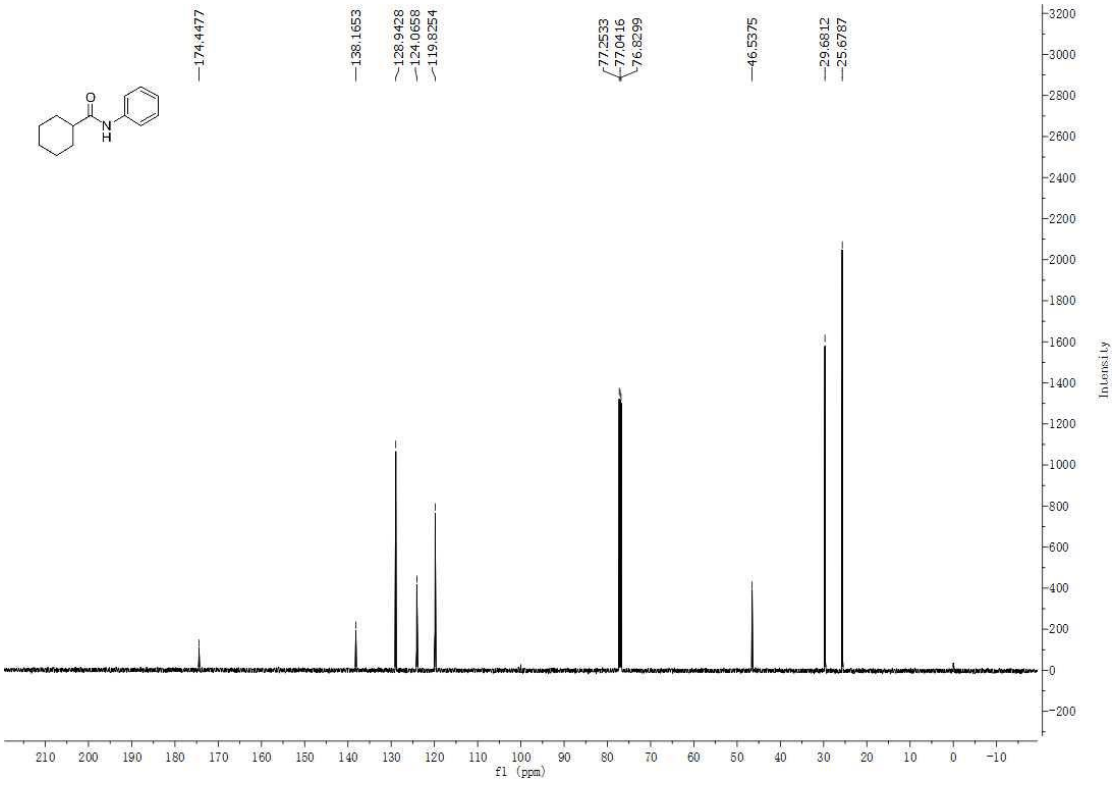
^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ah-2**



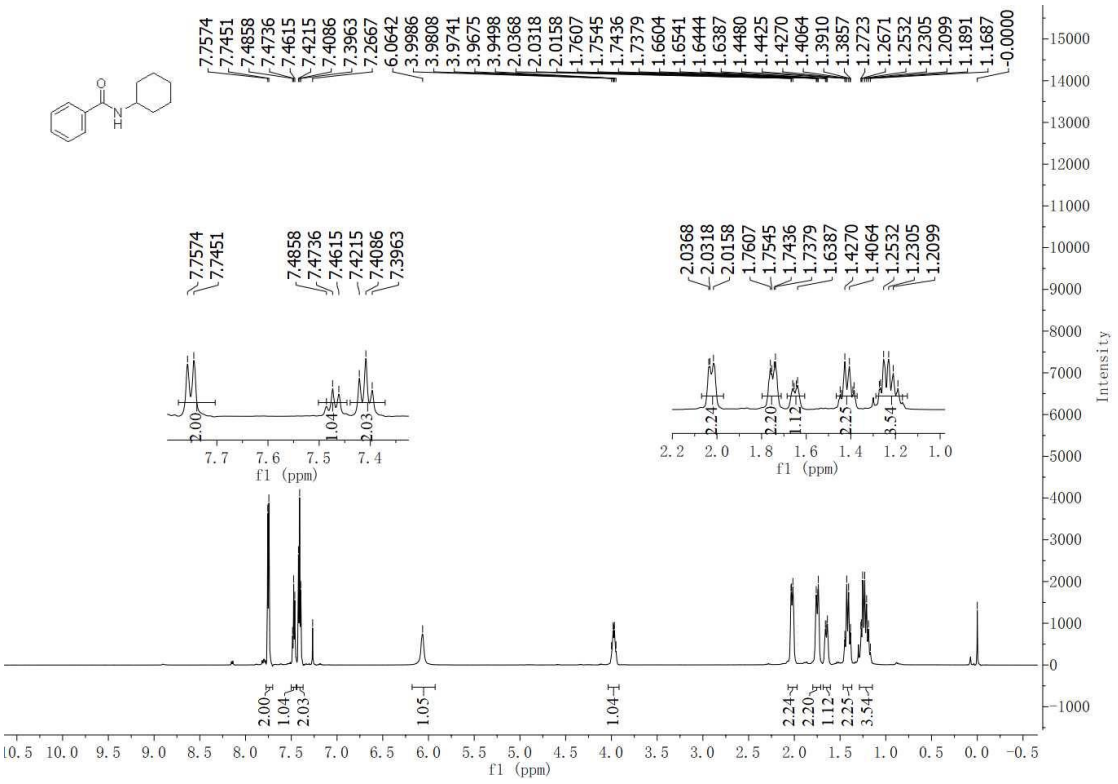
^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ai-1**



^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ai-1**



^{1}H-NMR Spectrum (600 MHz, $CDCl_3$) of **2ai-2**



^{13}C-NMR Spectrum (150 MHz, $CDCl_3$) of **2ai-2**