

# Supporting Information

## **Copper(II)-Catalyzed Selective Reductive Methylation of Amines with Formic Acid: An Option for Indirect Utilization of CO<sub>2</sub>**

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## 1. General information.

The starting materials were commercially available and were used without further purification. Solvents were dried and degassed by standard methods before use. The products were isolated by column chromatography on silica gel (200-300 mesh) using petroleum ether and ethyl acetate mixtures.  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra were recorded on a Bruker Avance 400 spectrometer at ambient temperature. All chemical shifts are reported relative to tetramethylsilane (0.0 ppm for  $^1\text{H}$  NMR in  $\text{CDCl}_3$ ) and d-solvent peaks (77.00 ppm for  $^{13}\text{C}$  NMR,  $\text{CDCl}_3$ ), respectively.  $^1\text{H}$  NMR peaks are labeled as singlet (s), doublet (d), triplet (t), and multiplet (m). The coupling constants  $J$  are reported in Hertz (Hz). GC-MS data were performed on Finnigan HP G1800 A. GC analyses were performed on a Shimadzu GC-2014 equipped with a capillary column (RTX-Wax 30 m  $\times$  0.25  $\mu\text{m}$ ) using a flame ionization detector.

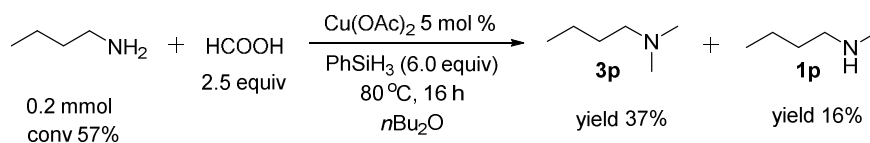
## 2. Experimental Section

### General Procedure for reductive methylation of amines (taking secondary amine as an example)

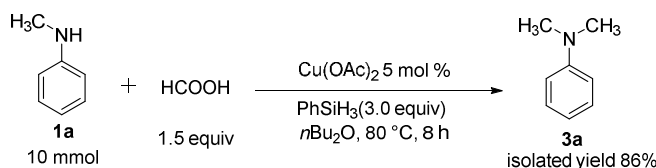
In a 10 mL Schlenk tube,  $\text{Cu}(\text{OAc})_2$  (0.025 mmol, 4.6 mg) were dissolved in dry  $n\text{Bu}_2\text{O}$  (1.0 mL). After the mixture had been stirred for 5 min,  $\text{PhSiH}_3$  (1.5 mmol, 185  $\mu\text{L}$ ) was added via a microsyringe, following with amines (0.5 mmol) and  $\text{HCOOH}$  (0.75 mmol, 28  $\mu\text{L}$ ). A bubble gas generation was observed when  $\text{HCOOH}$  was added. The reaction mixture was stirred for 8 h at 80  $^\circ\text{C}$ . After completion, the mixture was diluted with ethyl acetate (5 mL), then quenched with aqueous  $\text{NaOH}$  (3 M solution; 3 mL) carefully, and stirred for 3 h at room temperature. The mixture was extracted with ethyl acetate (three times) and the combined organic layers were dried over  $\text{Na}_2\text{SO}_4$  anhydrous. Finally, the organic phase was filtered, concentrated, and purified by silica gel column chromatography (petroleum ether/ethyl acetate mixtures) to give the corresponding methylated amines. All catalytic reactions were performed at least twice to ensure reproducibility.

### General Procedure for reductive methylation of *n*-butylamine

In a 10 mL tube with a screw cap, Cu(OAc)<sub>2</sub> (0.001 mmol, 1.9 mg) were dissolved in dry *n*Bu<sub>2</sub>O (1.0 mL). After the mixture was stirred for 5 min, PhSiH<sub>3</sub> (1.2 mmol, 123  $\mu$ L) was added via a microsyringe, following with *n*-butylamine (0.2 mmol, 20  $\mu$ L) and HCOOH (0.5 mmol, 18  $\mu$ L). A bubble gas generation was observed when HCOOH was added. The reaction mixture was stirred for 16 h at 80 °C. After completion, the conversion and yield was determined by <sup>1</sup>H NMR using 1,3,5-trimethoxybenzene as internal standard. This reaction was conducted on 10 mmol scale to isolate the product **3p** by distillation, and **3p** was isolated as a colorless liquid. The byproduct *N*-methylbutylamine (**1p**) could be isolated by similar distillation as a colorless liquid.



### Procedure for reductive methylation of **1a** on a gram-scale



In a 100 mL one-neck flask, Cu(OAc)<sub>2</sub> (0.5 mmol, 91 mg) were dissolved in dry *n*Bu<sub>2</sub>O (20.0 mL). After the mixture had been stirred for 5 min, PhSiH<sub>3</sub> (30.0 mmol) was added, following with **1a** (10.0 mmol) and HCOOH (15.0 mmol). A bubble gas generation was observed when HCOOH was added. After the work-up process (mentioned above), the organic phase was filtered, concentrated, and purified by silica gel column chromatography (petroleum ether/ethyl acetate mixtures) to give the corresponding **3a** in 86% isolated yield (1.0423 g).

### 3. Investigation of the Key Reaction Parameters

**Table S1** Variation of the catalyst loading<sup>a</sup>

Reaction scheme showing the reaction of **1a** (N-methyl-N-phenylmethanamine) with HCOOH, catalyzed by Cu(OAc)<sub>2</sub> and PhSiH<sub>3</sub>, to yield **2a** (N-methyl-N-phenylmethanamine-2-ylidene) and **3a** (N-methyl-N-phenylmethanamine).

entry	catalyst loading	conv (%)	yield of <b>2a</b> (%) <sup>b</sup>	yield of <b>3a</b> (%) <sup>b</sup>
1	5%	>99	0	99
2	3%	99	42	52
3	1%	92	52	39

<sup>a</sup>Reaction conditions: **1a** (0.5 mmol), HCOOH (1.5 equiv), PhSiH<sub>3</sub> (3.0 equiv), *n*Bu<sub>2</sub>O (1.0 mL), 80 °C, 12 h.

<sup>b</sup>Determined by GC using 1,3,5-trimethoxybenzene as an internal standard.

**Table S2** Variation of the amount of formic acid and phenylsilane<sup>a</sup>

Reaction scheme showing the reaction of **1a** (N-methyl-N-phenylmethanamine) with HCOOH, catalyzed by Cu(OAc)<sub>2</sub> and PhSiH<sub>3</sub>, to yield **2a** (N-methyl-N-phenylmethanamine-2-ylidene) and **3a** (N-methyl-N-phenylmethanamine).

entry	HCOOH [equiv]	PhSiH <sub>3</sub> [equiv]	conv (%)	yield of <b>2a</b> (%) <sup>b</sup>	yield of <b>3a</b> (%) <sup>b</sup>
1	1.1	3.0	85	0	83
2	1.3	3.0	96	0	96
3	1.5	3.0	>99	0	99
4	1.5	2.0	>99	13	82

<sup>a</sup>Reaction conditions: **1a** (0.5 mmol), Cu(OAc)<sub>2</sub> (5 mol %, 4.6 mg), *n*Bu<sub>2</sub>O (1.0 mL), 80 °C, 12 h. <sup>b</sup>Determined by GC using 1,3,5-trimethoxybenzene as an internal standard.

**Table S3** Influence of reaction time and reaction temperature<sup>a</sup>

Reaction scheme showing the reaction of **1a** (N-methyl-N-phenylmethanamine) with HCOOH, catalyzed by cat. and PhSiH<sub>3</sub>, to yield **2a** (N-methyl-N-phenylmethanamine-2-ylidene) and **3a** (N-methyl-N-phenylmethanamine).

entry	catalyst	T/°C	t/h	conv (%)	yield of <b>2a</b> (%) <sup>b</sup>	yield of <b>3a</b> (%) <sup>b</sup>
1	Cu(OAc) <sub>2</sub>	60	12	99	10	84
2	Cu(OTf) <sub>2</sub>	60	12	98	86	12
3	CuF <sub>2</sub>	60	12	95	66	27

<sup>a</sup>Reaction conditions: **1a** (0.5 mmol), catalyst (5 mol %), HCOOH (1.5equiv), PhSiH<sub>3</sub> (3.0 equiv), *n*Bu<sub>2</sub>O (1 mL). <sup>b</sup>Determined by GC using 1,3,5-trimethoxybenzene as an internal standard.

**Table S4** Influence of the solvent in the catalytic methylation of **1a**<sup>a</sup>

CN(C1=CC=CC=C1) + HCOOH >>[Cu(OAc)2, PhSiH3, solvent] C=NC1=CC=CC=C1 + CN(C1=CC=CC=C1)

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

entry	solvent	conv (%)	yield of <b>2a</b> (%) <sup>b</sup>	yield of <b>3a</b> (%) <sup>b</sup>
1	toluene	>99	0	99
2	Et <sub>2</sub> O	>99	25	74
3	1,4-dioxane	>99	42	54
4	THF	87	34	52
5	DMF	70	27	27
6	CH <sub>3</sub> CN	>99	92	trace

<sup>a</sup>Reaction Conditions: **1a** (0.5 mmol), HCOOH (1.5 equiv), PhSiH<sub>3</sub> (3.0 equiv), Cu(OAc)<sub>2</sub> (5 mol %, 4.6 mg), solvent (1.0 mL), 80 °C, 12 h. <sup>b</sup>Determined by GC using 1,3,5-trimethoxybenzene as an internal standard.

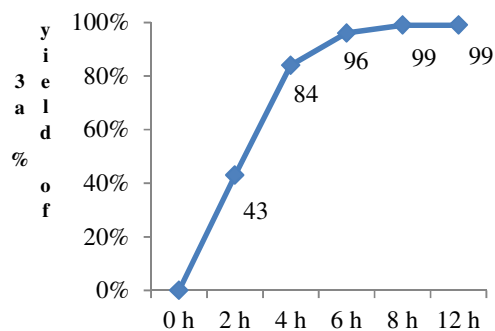
**Table S5** Screening of silanes<sup>a</sup>

CN(C1=CC=CC=C1) + HCOOH >>[Cu(OAc)2, hydrosilane, nBu2O] C=NC1=CC=CC=C1 + CN(C1=CC=CC=C1)

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

entry	hydrosilane	conv (%)	yield of <b>2a</b> (%) <sup>b</sup>	yield of <b>3a</b> (%) <sup>b</sup>
1	-	51	49	0
2	PhSiH <sub>3</sub>	>99	0	>99
3	Ph <sub>2</sub> SiH <sub>2</sub>	31	31	0
4	(EtO) <sub>2</sub> CH <sub>3</sub> SiH	63	60	0
5	(EtO) <sub>3</sub> SiH	79	79	0
6	PMHS	31	29	0
7	Et <sub>3</sub> SiH	27	27	0

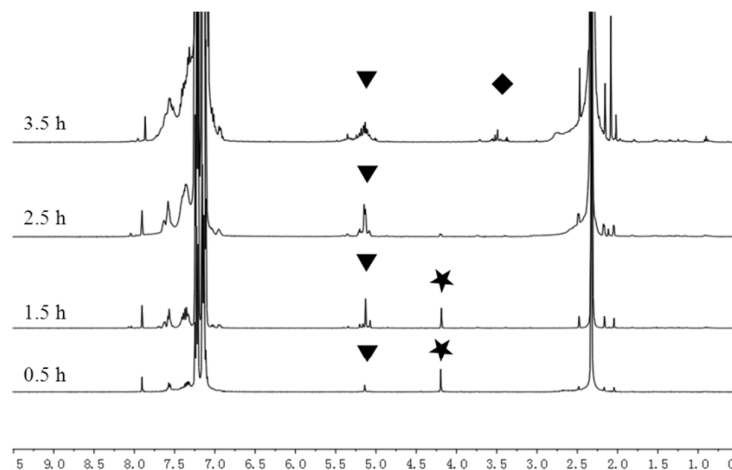
<sup>a</sup>Conditions: **1a** (0.5 mmol), HCOOH (1.5 equiv), hydrosilane (3.0 equiv), Cu(OAc)<sub>2</sub> (5 mol %, 4.6 mg), *n*Bu<sub>2</sub>O (1.0 mL), 80 °C, 12 h. <sup>b</sup>Determined by GC using 1,3,5-trimethoxybenzene as an internal standard.



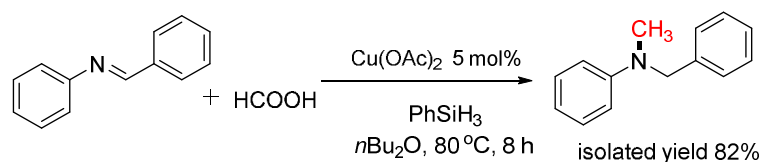
**Figure S1.** Influence of reaction time.

#### 4. Experimental procedures for control experiment.

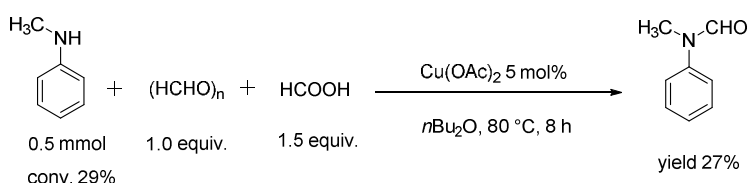
In a 10 mL Schlenk tube, Cu(OAc) (5.0 mol%, 4.6 mg) were dissolved in dry *n*Bu<sub>2</sub>O (1.0 mL). After the mixture had been stirred for 5 min, PhSiH<sub>3</sub> (1.5 mmol, 185  $\mu$ L) was added via a microsyringe, following with (1) *N*-methylformanilide (0.5 mmol, 62  $\mu$ L). (2) *N*-methylaniline (0.5 mmol, 54  $\mu$ L) and methanol (0.75 mmol). (3) *N*-methylaniline (0.5 mmol, 54  $\mu$ L), paraformaldehyde (0.75 mmol, 0.0225 g) was added with catalyst. The reaction mixture was stirred at 80 °C, respectively. For control experiment (4), in a 10 mL Schlenk tube, Cu(OAc) (5.0 mol%, 4.6 mg) were dissolved in dry *n*Bu<sub>2</sub>O (1.0 mL). After the mixture had been stirred for 5 min, HCOOH (0.75 mmol) and PhSiH<sub>3</sub> (0.5 mmol) were added via microsyringes, and the reaction mixture was stirred at 80 °C.



**Figure S2.** <sup>1</sup>H NMR spectra from the reaction of formic acid (FA), PhSiH<sub>3</sub> (2 equivalent of Si-H) and Cu(OAc)<sub>2</sub> catalyst in toluene. methoxide products ◆, PhSiH<sub>3</sub> ★, bis(silyl)acetal ▼.



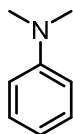
**Scheme S1.** The  $\text{Cu}(\text{OAc})_2$ -catalyzed *N*-methylation of benzylidene phenylamine with formic acid



**Scheme S2** Control experiment to exclude the Eschweiler-Clarke mechanism in the reduction of F to G

## 5. Characterization Data for the Products.

### *N,N*-dimethylaniline (**3a**, **3m**)<sup>1</sup>

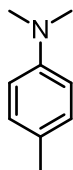


Light yellow liquid, 58.7 mg, 97% yield of **3a**

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.24 (dd,  $J = 8.8, 7.3$  Hz, 2H), 6.85 – 6.62 (m, 3H), 2.94 (s, 6H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  150.6, 129.0, 116.6, 112.6, 40.6. GC-MS (EI, 70 eV)  $m/z$  (%) 121.15 (81.29), 120.15 (100.00), 77.05 (29.56).

eluent: petroleum ether/ ethyl acetate = 50/1

### 4-Methyl-*N,N*-dimethylaniline (**3b**)<sup>1</sup>



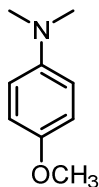
Light yellow liquid, 66.1 mg, 98% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.05 (d,  $J = 8.1$  Hz, 2H), 6.69 (d,  $J = 8.2$  Hz, 2H), 2.89 (s, 6H), 2.25 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  148.8, 129.5, 126.1, 113.2, 41.1, 20.2. GC-MS (EI, 70 eV)  $m/z$  (%) 35.20 (77.14), 134.15 (100.00), 91.10 (22.96).

eluent: petroleum ether/ ethyl acetate = 50/1

### 4-Methoxy-*N,N*-dimethylaniline (**3c**, **3o**)<sup>2</sup>



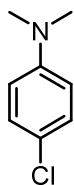


White solid, mp=46–48 °C, 69.5 mg, 92% yield of **3c**

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  6.88 – 6.81 (m, 2H), 6.79 – 6.72 (m, 2H), 3.76 (s, 3H), 2.86 (s, 6H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  152.1, 145.5, 115.0, 114.6, 55.7, 41.9. GC-MS (EI, 70 eV)  $m/z$  (%) 151.25 (59.49), 136.20 (100.00).

eluent: petroleum ether/ ethyl acetate = 50/1

**4-Chloro-*N,N*-dimethylaniline (3d)<sup>1</sup>**

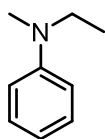


Yellow liquid, 67.4 mg, 87% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.17 (d,  $J$  = 8.9 Hz, 2H), 6.64 (d,  $J$  = 8.7 Hz, 2H), 2.92 (s, 6H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  149.1, 128.8, 121.4, 113.6, 40.6. GC-MS (EI, 70 eV)  $m/z$  (%) 157.10 (25.27), 156.10 (39.00), 155.10 (82.99), 154.10 (100.00).

eluent: petroleum ether/ ethyl acetate = 50/1

***N*-ethyl-*N*-methylaniline (3f)<sup>2</sup>**

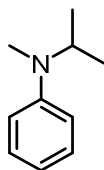


Yellow liquid, 62.1 mg, 92% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.22 (t,  $J$  = 7.7 Hz, 2H), 6.84 – 6.52 (m, 3H), 3.39 (q,  $J$  = 7.0 Hz, 2H), 2.89 (s, 3H), 1.10 (t,  $J$  = 7.1 Hz, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  149.1, 129.1, 116.0, 112.3, 46.8, 37.4, 11.1. GC-MS (EI, 70 eV)  $m/z$  (%) 135.15 (31.98), 120.15 (100.00), 77.05 (33.12).

eluent: petroleum ether/ ethyl acetate = 50/1

***N*-Isopropyl-*N*-methylaniline (3g)<sup>2</sup>**

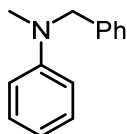


Yellow liquid, 34.3 mg, 46% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.22 (t,  $J = 7.9$  Hz, 2H), 6.79 (d,  $J = 8.2$  Hz, 2H), 6.69 (t,  $J = 7.2$  Hz, 1H), 4.18 – 3.96 (m, 1H), 2.72 (s, 3H), 1.15 (d,  $J = 6.6$  Hz, 6H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  150.1, 129.1, 116.4, 113.3, 48.9, 29.8, 19.3. GC-MS (EI, 70 eV)  $m/z$  (%) 149.20 (19.30), 134.15 (100.00), 77.05 (20.49).

eluent: petroleum ether/ ethyl acetate = 100/1 to 50/1

***N*-benzyl-*N*-methylaniline (3h)<sup>2</sup>**

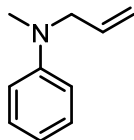


Yellow liquid, 84.7 mg, 86% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.38 – 7.27 (m, 2H), 7.27 – 7.15 (m, 5H), 6.79 – 6.64 (m, 3H), 4.53 (s, 2H), 3.01 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  149.7, 139.0, 129.1, 128.52, 126.8, 126.7, 116.5, 112.3, 56.6, 38.5. GC-MS (EI, 70 eV)  $m/z$  (%) 197.15 (79.61), 196.10 (25.26), 120.10 (71.12), 91.10 (100.00), 77.05 (27.50).

eluent: petroleum ether/ ethyl acetate = 100/1 to 50/1

***N*-allyl-*N*-methylaniline (3i)<sup>2</sup>**

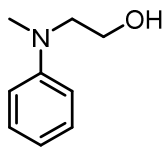


Yellow liquid, 56.6 mg, 77% yield

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.22 (t,  $J = 7.8$  Hz, 2H), 6.87 – 6.54 (m, 1H), 6.84 – 6.59 (m, 3H), 5.84 (ddd,  $J = 22.1, 10.2, 5.1$  Hz, 1H), 5.24 – 5.05 (m, 2H), 3.91 (d,  $J = 5.0$  Hz, 2H), 2.93 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  149.4, 133.8, 129.1, 116.4, 116.1, 112.4, 55.2, 38.0. GC-MS (EI, 70 eV)  $m/z$  (%) 148.08 (70.11), 147.15 (100.00), 146.26 (25.67), 120.28 (34.38).

eluent: petroleum ether/ ethyl acetate = 100/1

***N*-(2-hydroxyethyl)-*N*-methylaminobenzene (3j)<sup>2</sup>**

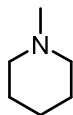


Brown liquid, 61.2 mg, 81% yield

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.23 (t, *J* = 7.6 Hz, 2H), 6.81 – 6.70 (m, 3H), 3.77 (t, *J* = 5.6 Hz, 2H), 3.44 (t, *J* = 5.6 Hz, 2H), 2.93 (s, 3H), 2.15 (br, 1H). <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 149.9, 129.1, 117.1, 112.9, 59.9, 55.3, 38.7. GC-MS (EI, 70 eV) *m/z* (%) 151.20 (16.32), 120.10 (100.00), 77.05 (25.60).

eluent: petroleum ether/ ethyl acetate = 5/1

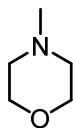
***N*-methylpiperidine (3k)<sup>3</sup>**



Less colour liquid

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 2.33 (s, 4H), 2.24 (s, 3H), 1.68 – 1.51 (m, 4H), 1.41 (s, 2H). <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 56.5, 46.9, 26.0, 23.7. GC-MS (EI, 70 eV) *m/z* (%) 99.15 (42.36), 98.15 (100.00), 71.10 (22.54).

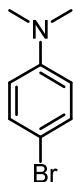
***N*-methylmorpholine (3l)<sup>4</sup>**



Less colour liquid

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 3.71 (t, *J* = 4.6 Hz, 4H), 2.41 (s, 4H), 2.29 (s, 3H). <sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 66.7, 55.2, 46.2. GC-MS (EI, 70 eV) *m/z* (%) 101.15 (100.00), 100.15 (36.36), 71.10 (60.10).

**4-Chloro-*N,N*-dimethylaniline (3n)<sup>1</sup>**

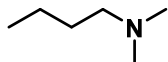


White solid, mp=55–57 °C

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.30 (d,  $J = 9.1$  Hz, 2H), 6.59 (d,  $J = 8.8$  Hz, 2H), 2.92 (s, 6H).  
 $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  149.5, 131.6, 114.1, 108.5, 40.5. GC-MS (EI, 70 eV)  $m/z$  (%) 201.00 (93.41), 200.00 (100.00), 199.00 (99.32), 198.00 (97.76), 118.15 (45.22), 77.10 (20.98).

eluent: petroleum ether/ ethyl acetate = 50/1

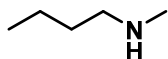
***N,N*-dimethylbutylamine (3p)<sup>4</sup>**



Colourless liquid.

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  2.30 – 2.16 (m, 8H), 1.48 – 1.41 (m, 2H), 1.37-1.28 (m, 2H), 0.92 (t,  $J = 7.3$  Hz, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  59.6, 45.5, 29.9, 20.6, 14.0. GC-MS (EI, 70 eV) 101.15 (100.00), 71.10 (12.15).

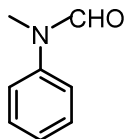
***N*-methylbutylamine (4p)<sup>5</sup>**



Colourless liquid

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  2.57 (t,  $J = 7.0$  Hz, 2H), 2.43 (s, 3H), 1.47 (m, 2H), 1.35 (m, 2H), 1.03 (s, 1H), 0.92 (t,  $J = 7.3$  Hz, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  51.78, 36.42, 31.98, 20.30, 13.84. GC-MS (EI, 70 eV) 87.12 (100.00), 84.07 (25.46), 70.06 (21.72), 57.09 (64.71), 56.08 (49.95), 55.10 (22.88).

***N*-methylformanilide (2a)<sup>4</sup>**



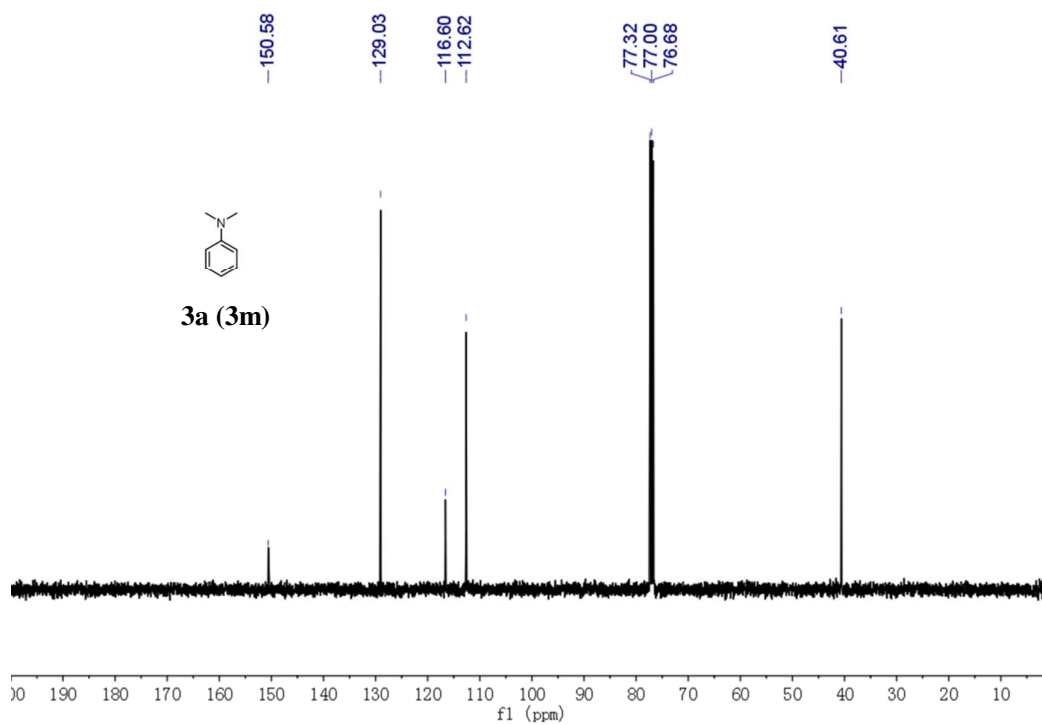
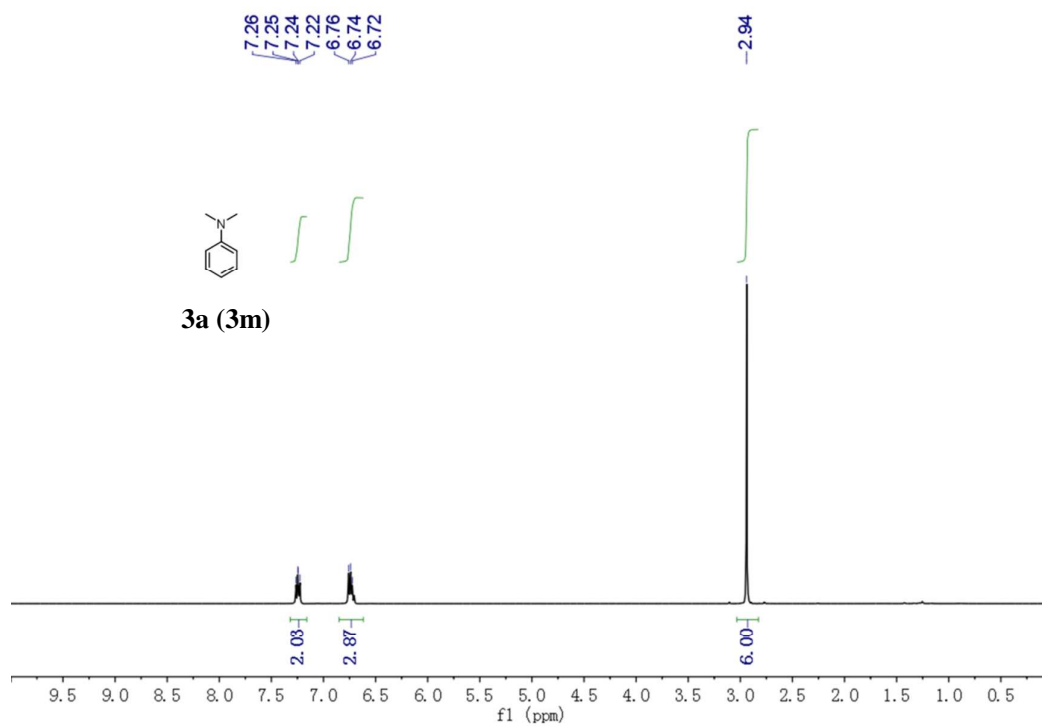
Yellow liquid

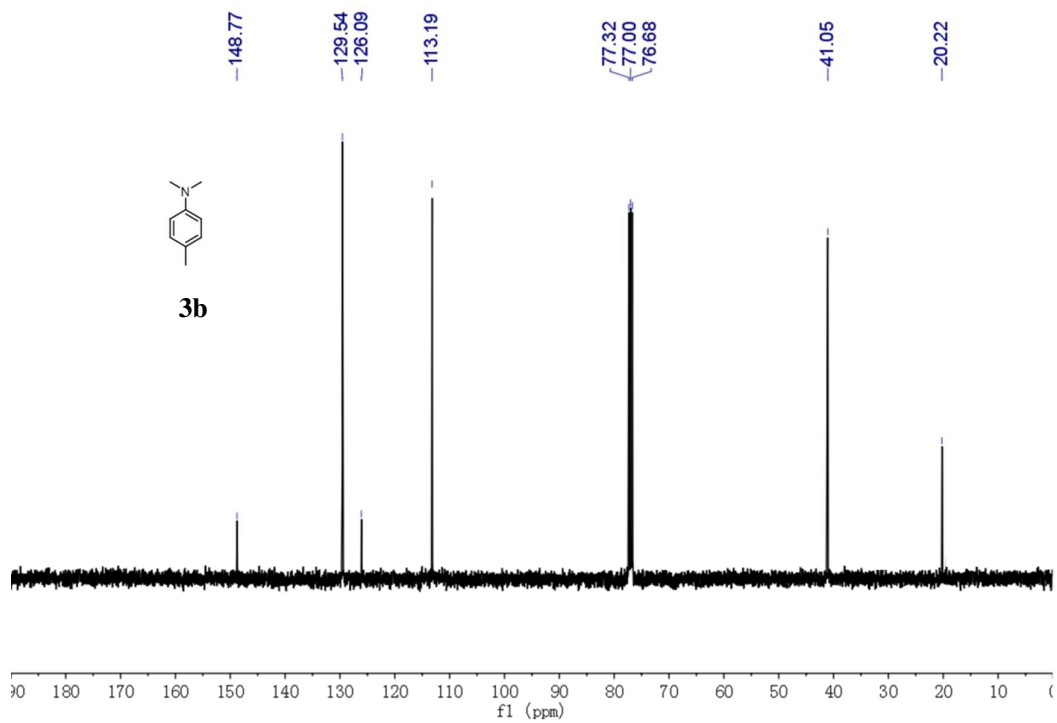
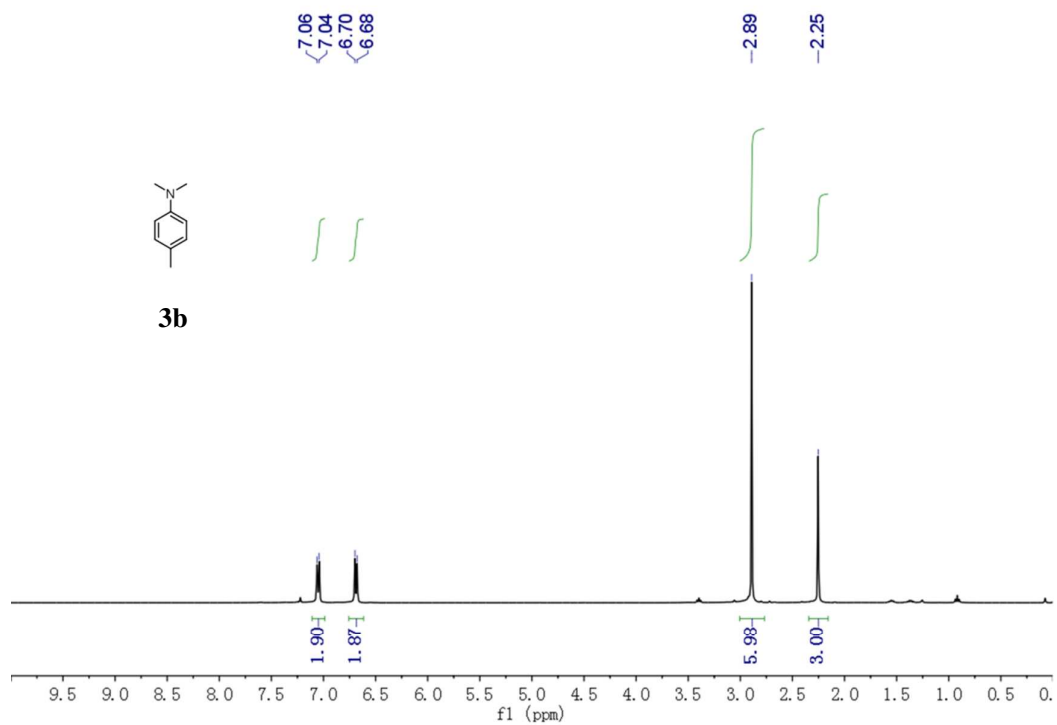
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.46 (s, 1H), 7.40 (t,  $J = 7.8$  Hz, 2H), 7.26 (dd,  $J = 10.0, 4.8$  Hz, 1H), 7.16 (d,  $J = 7.5$  Hz, 2H), 3.31 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz,  $\text{CDCl}_3$ )  $\delta$  162.3, 142.1, 129.6, 126.4, 122.3, 32.0. GC-MS (EI, 70 eV)  $m/z$  (%) 135.15 (70.68), 106.10 (100.00), 94.10 (30.45), 79.10 (20.54), 77.10 (42.48), 66.05 (21.05).

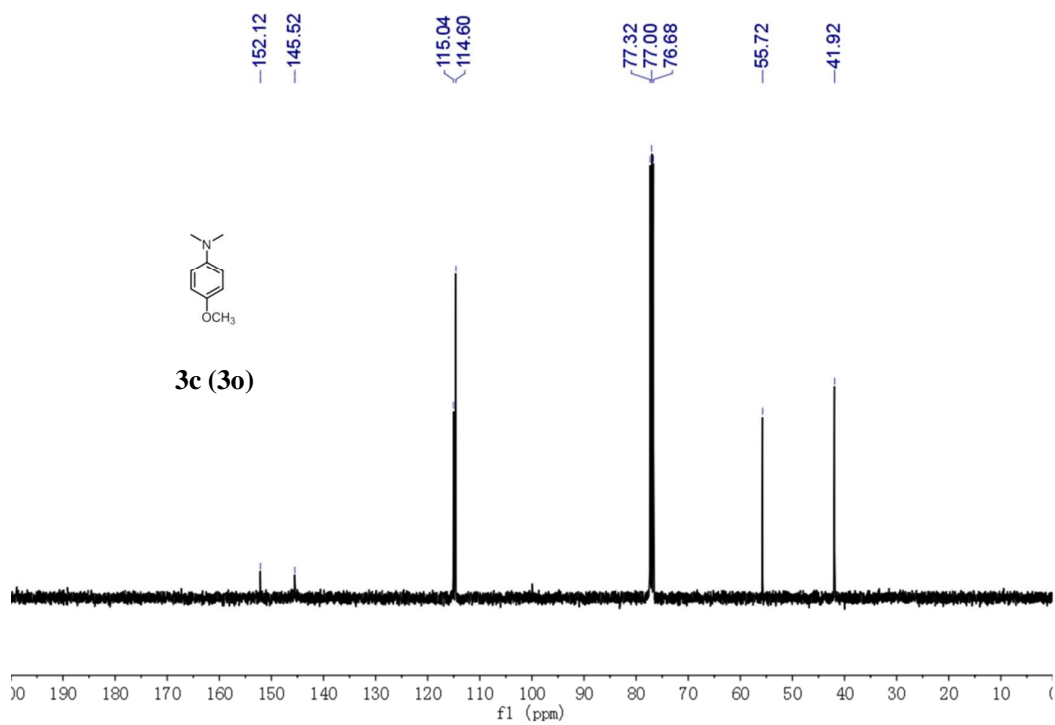
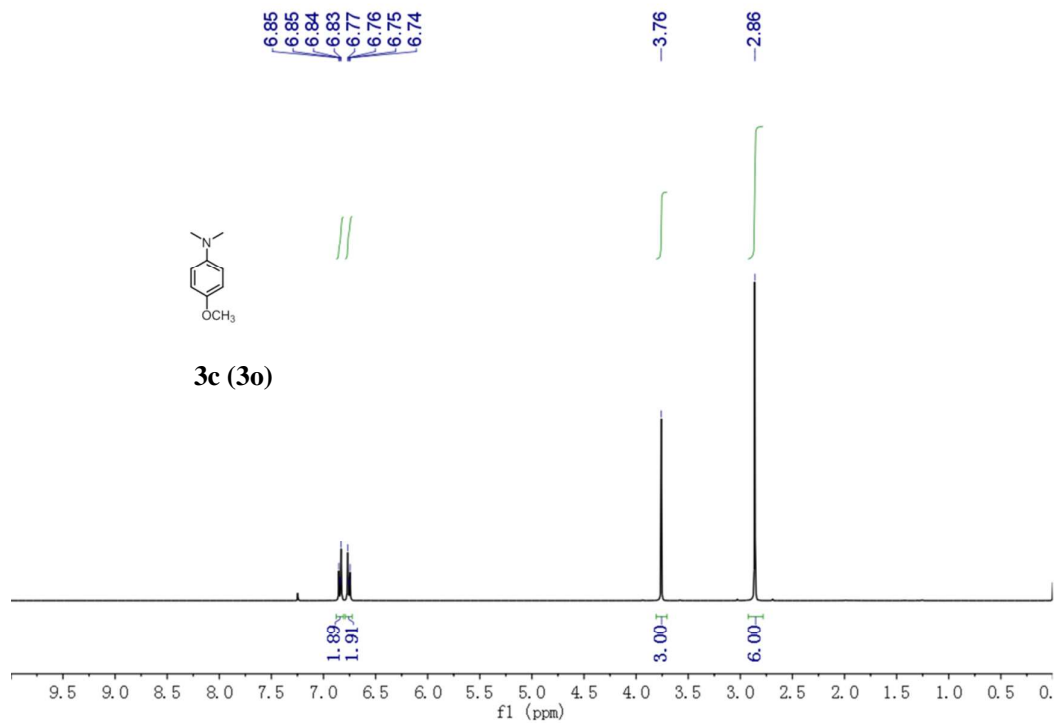
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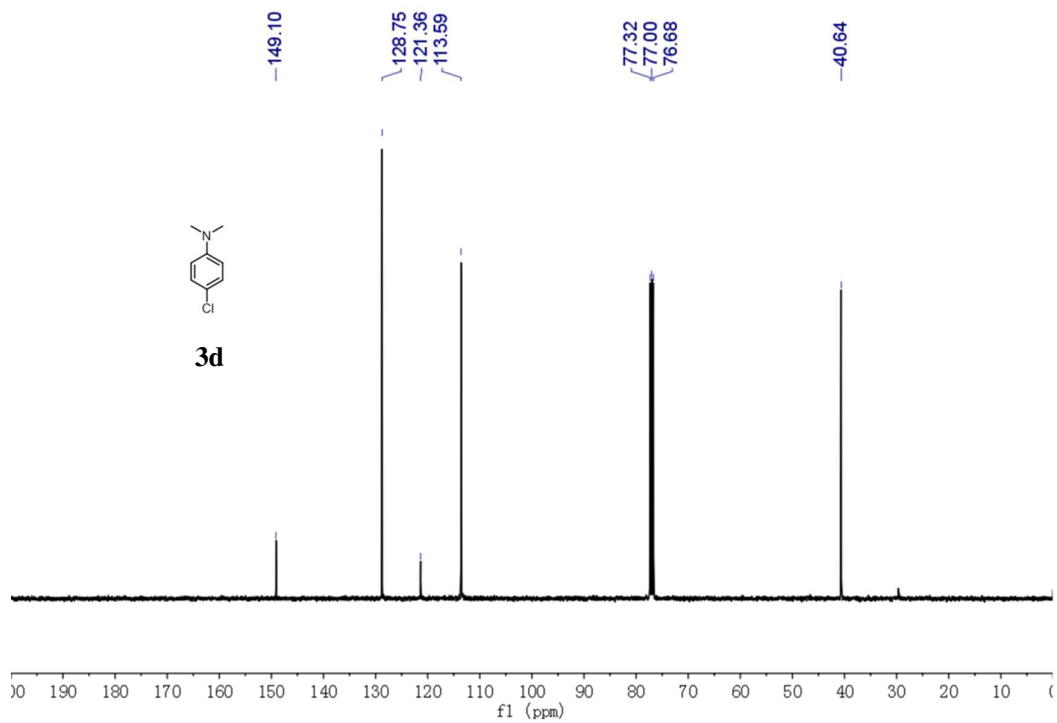
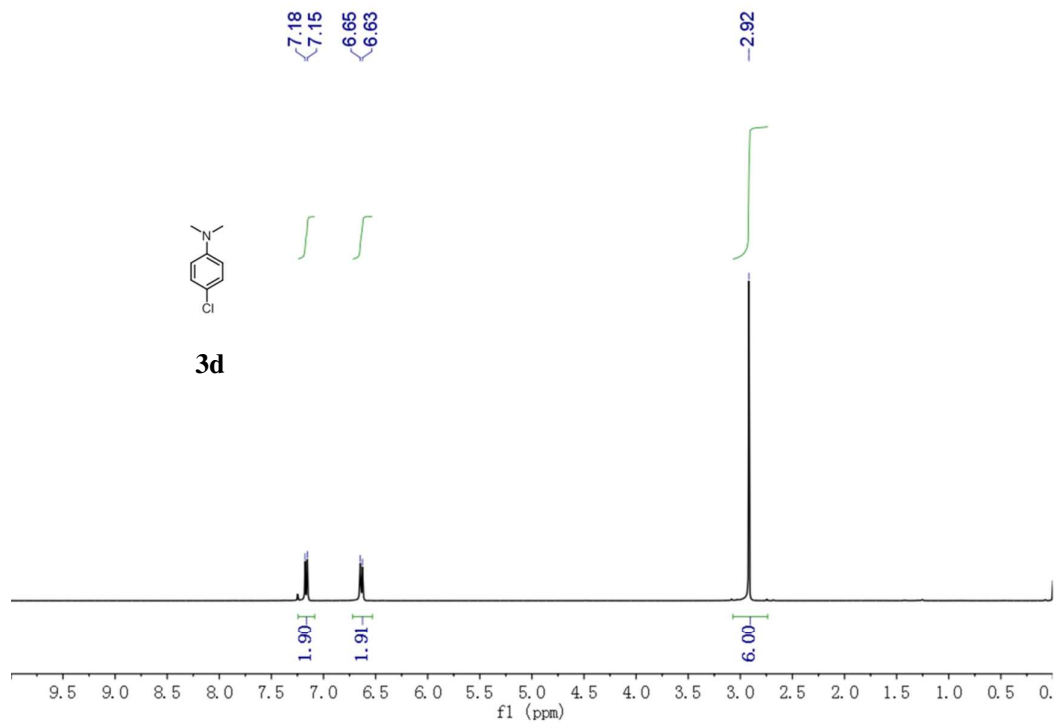
6. Copies of  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra of the isolated amines.

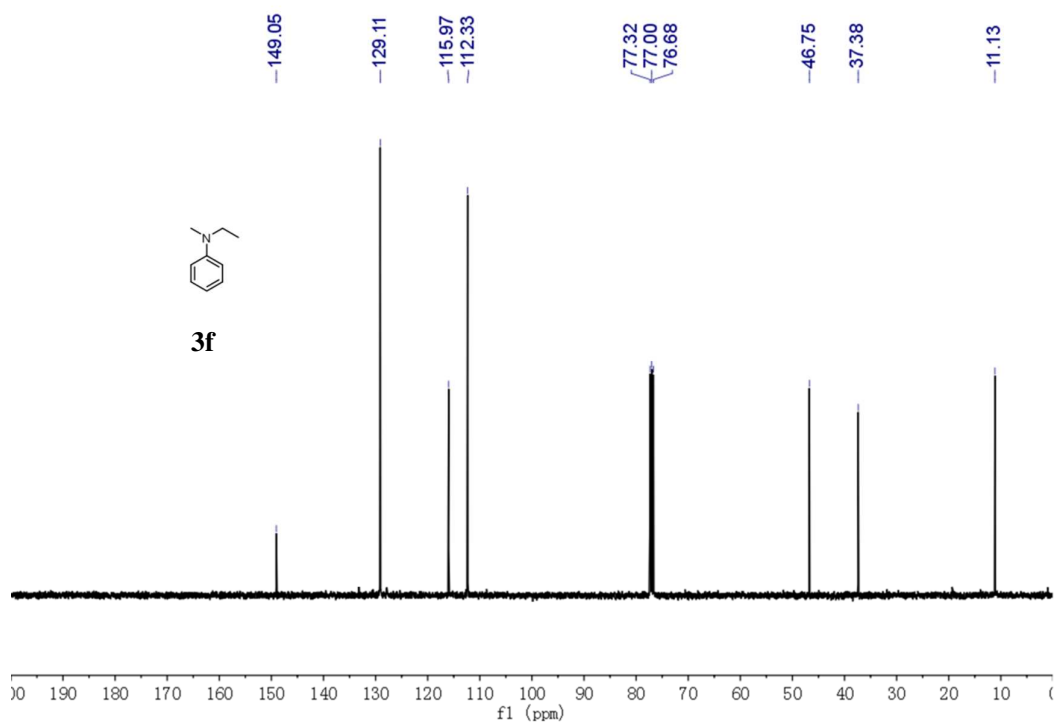
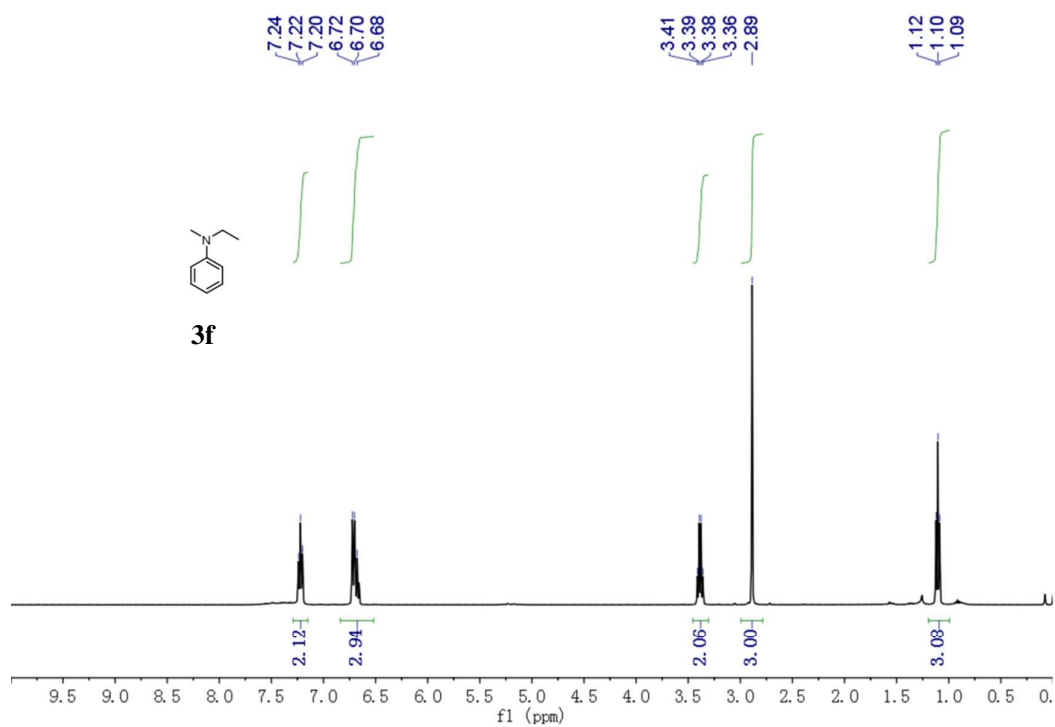


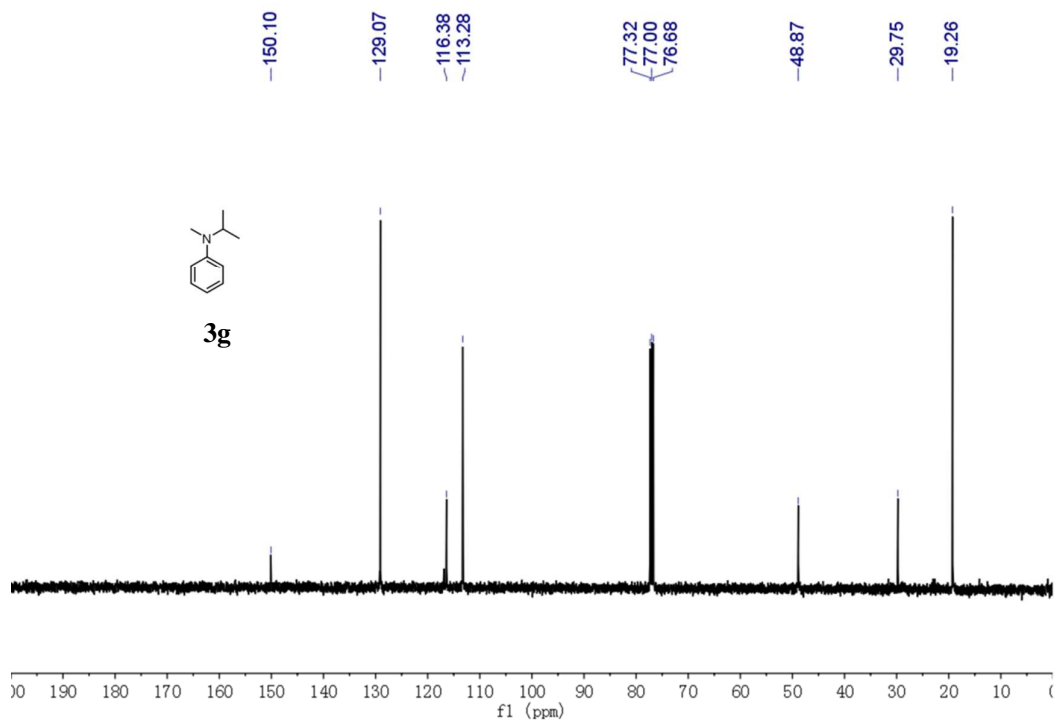
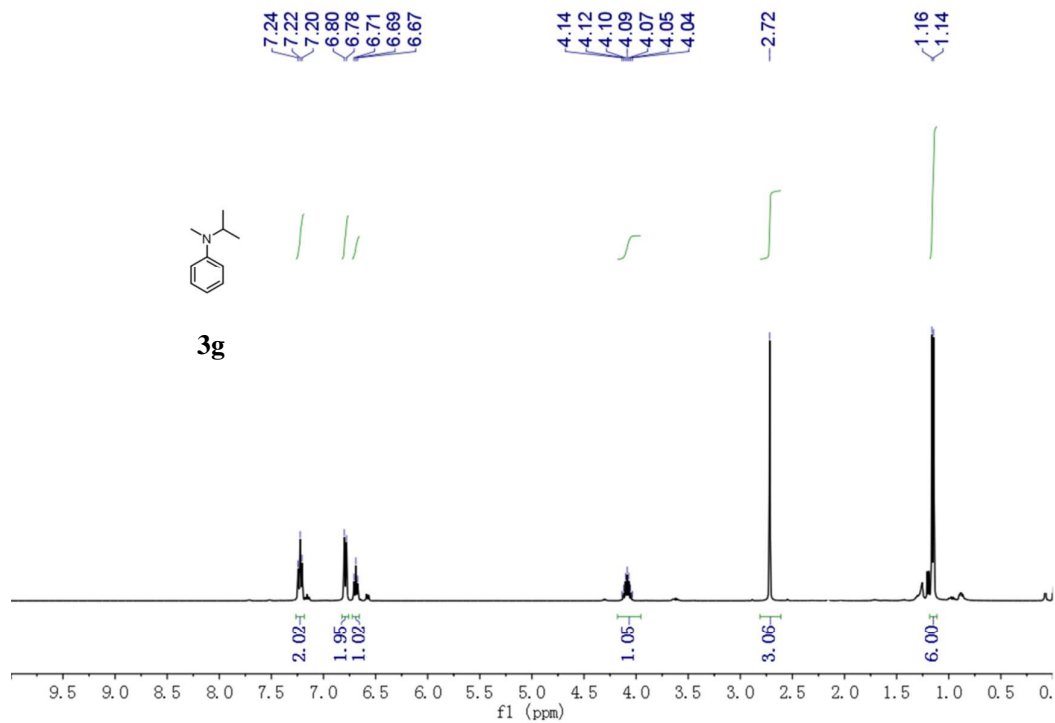


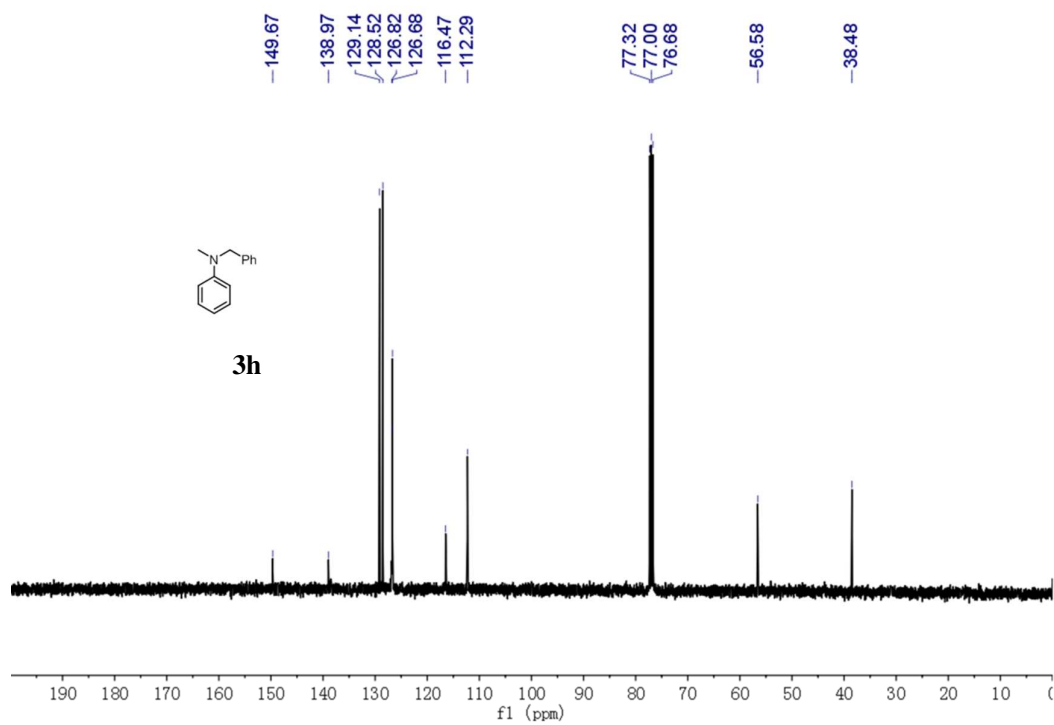
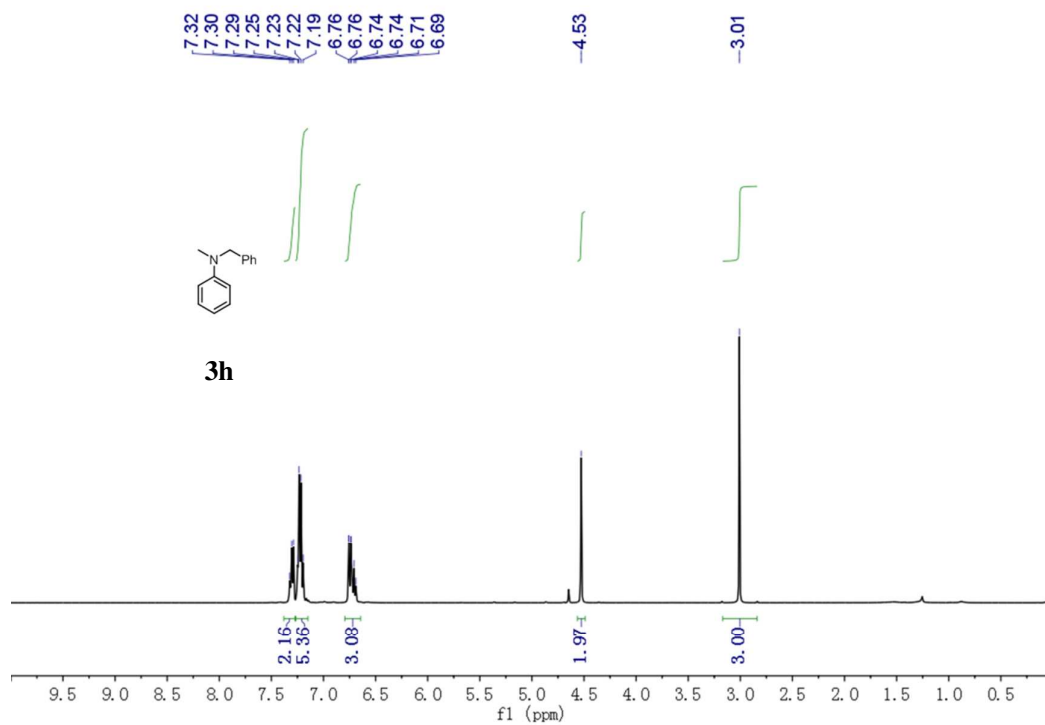


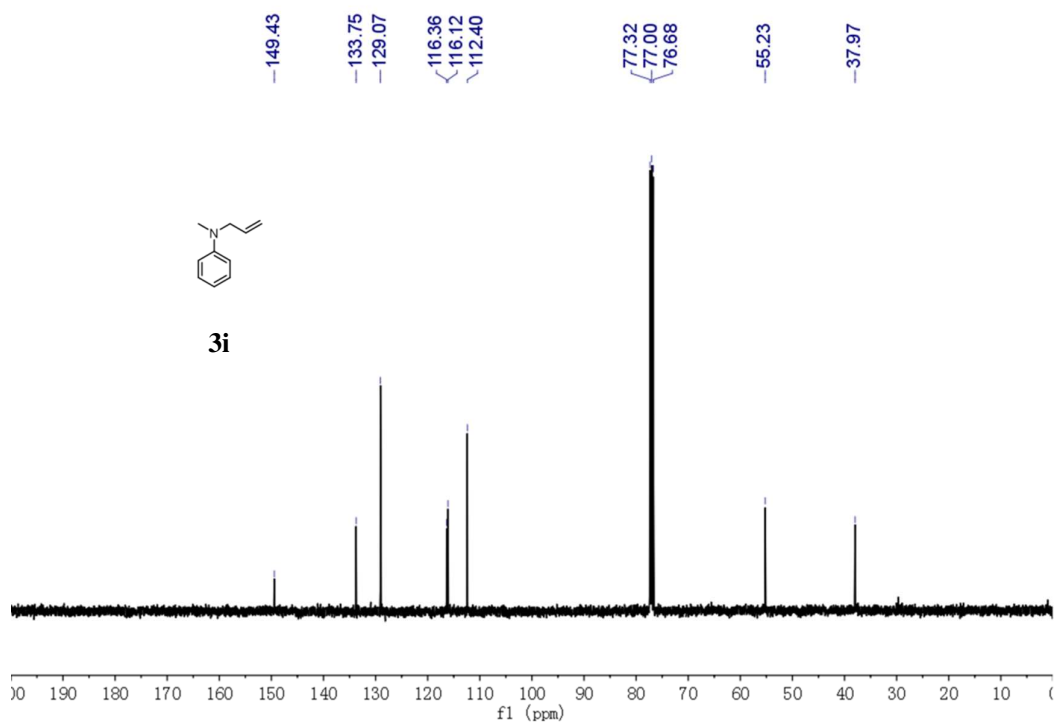
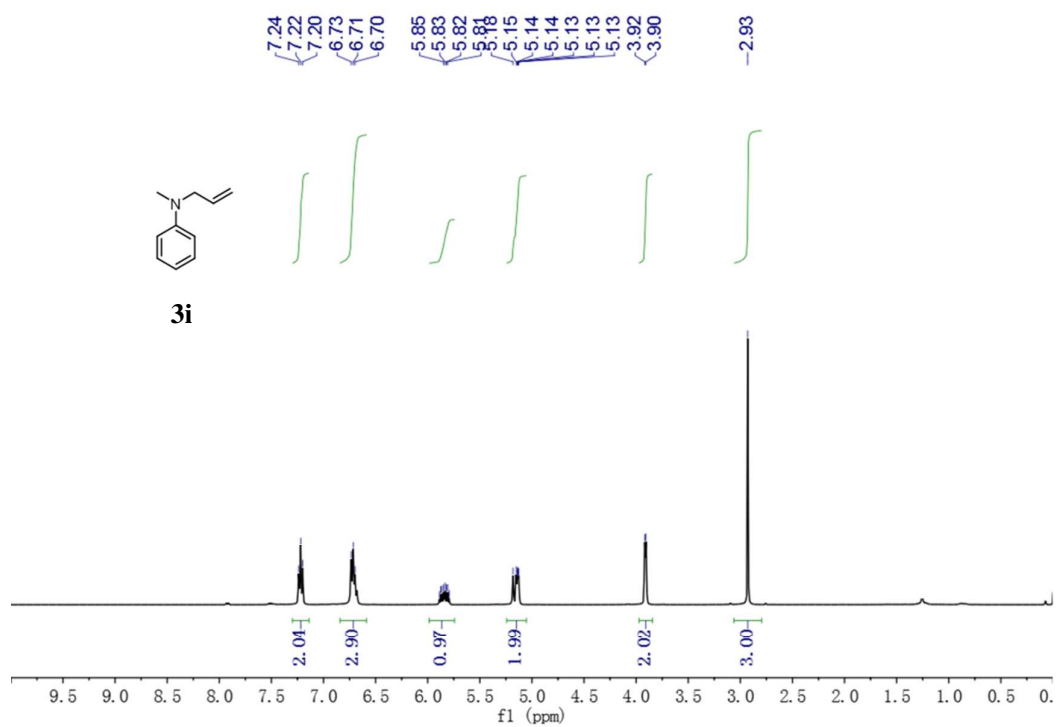


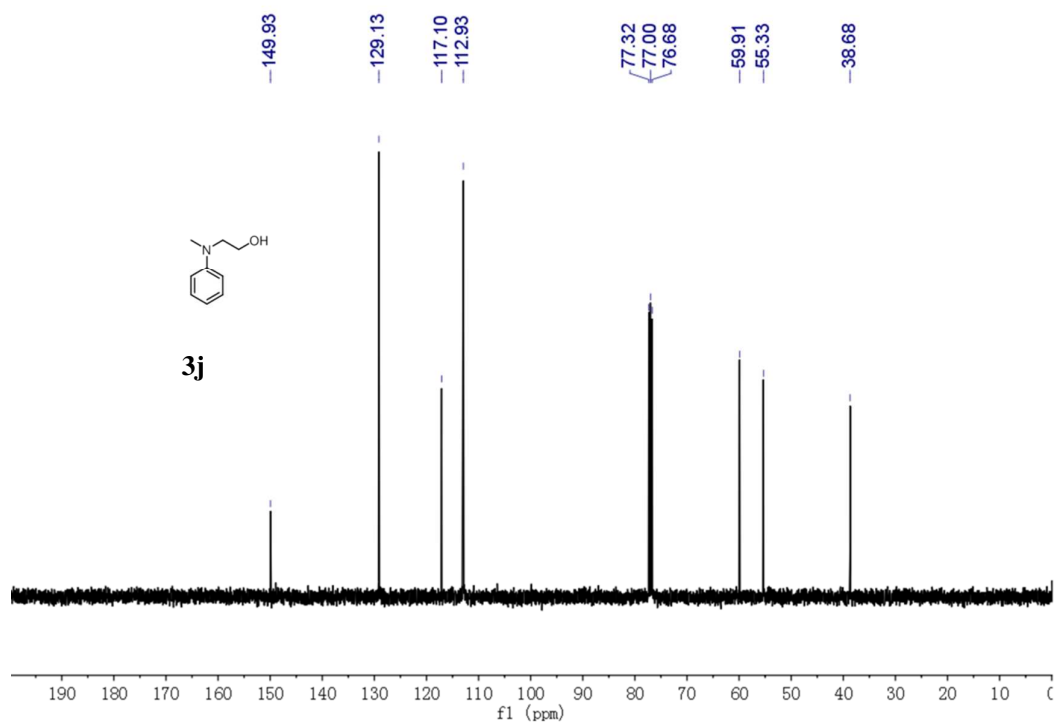
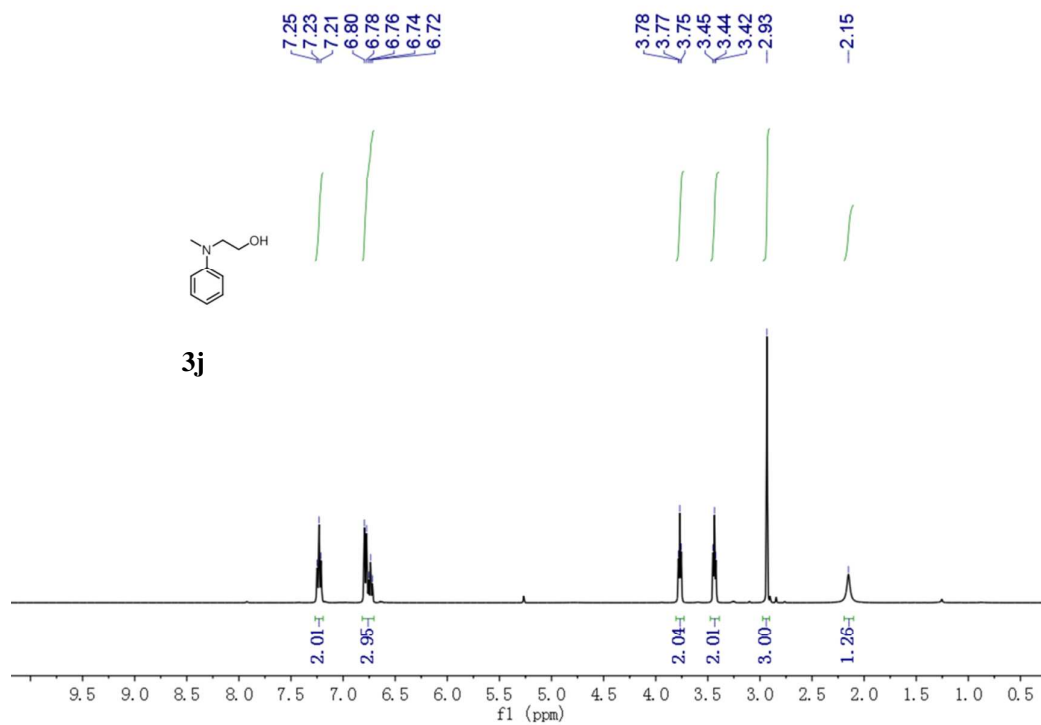


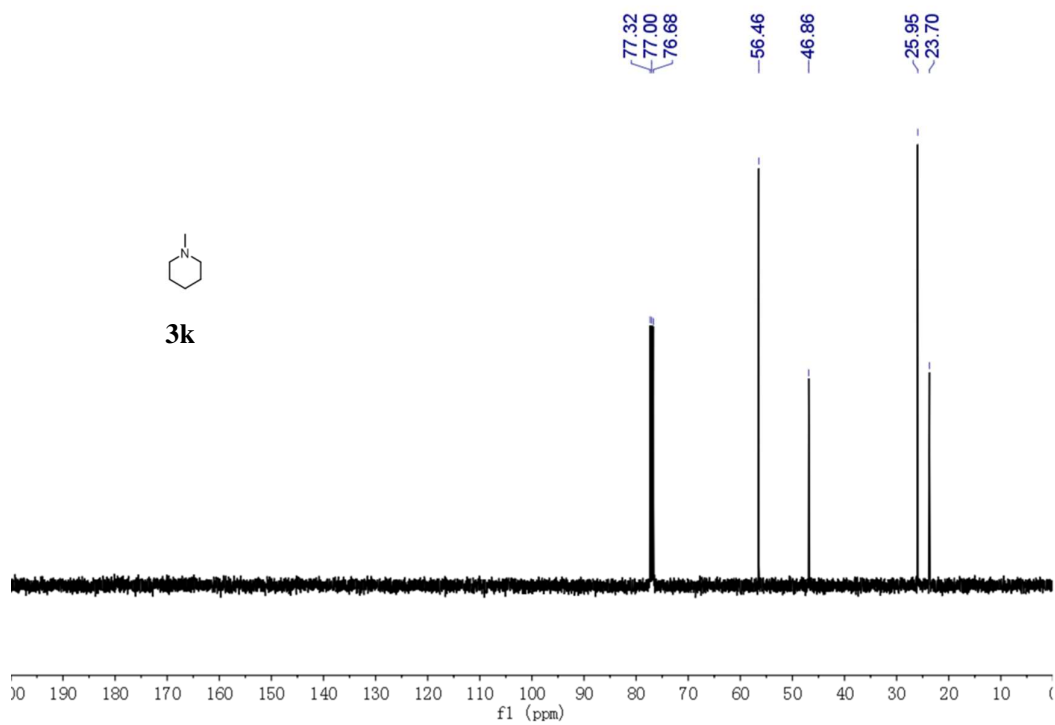
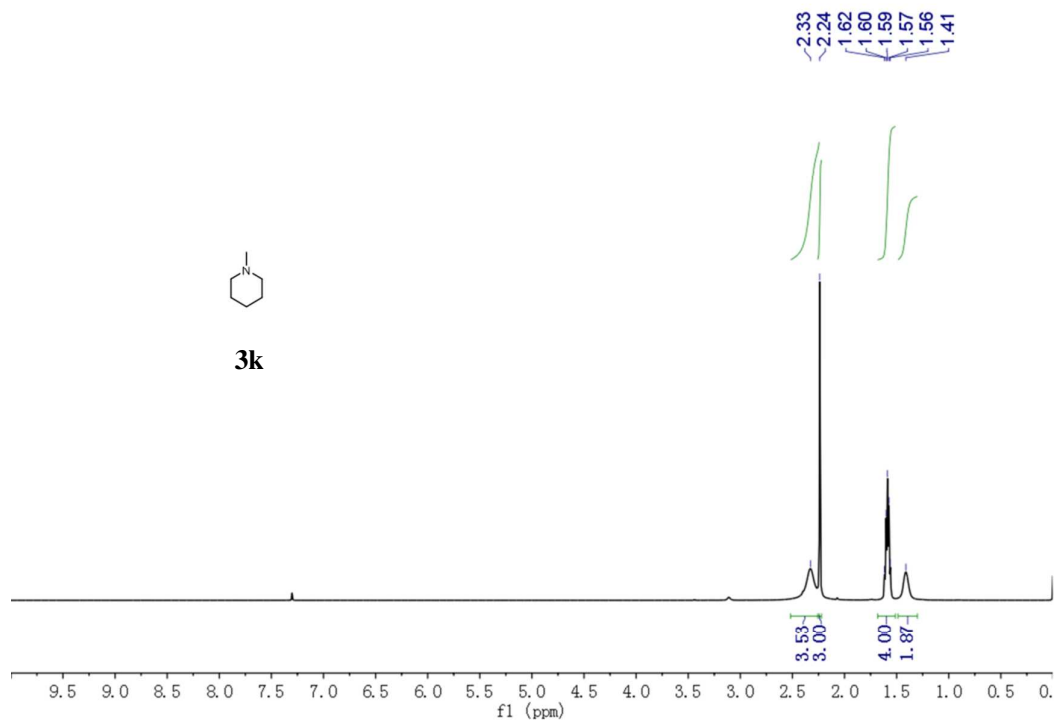






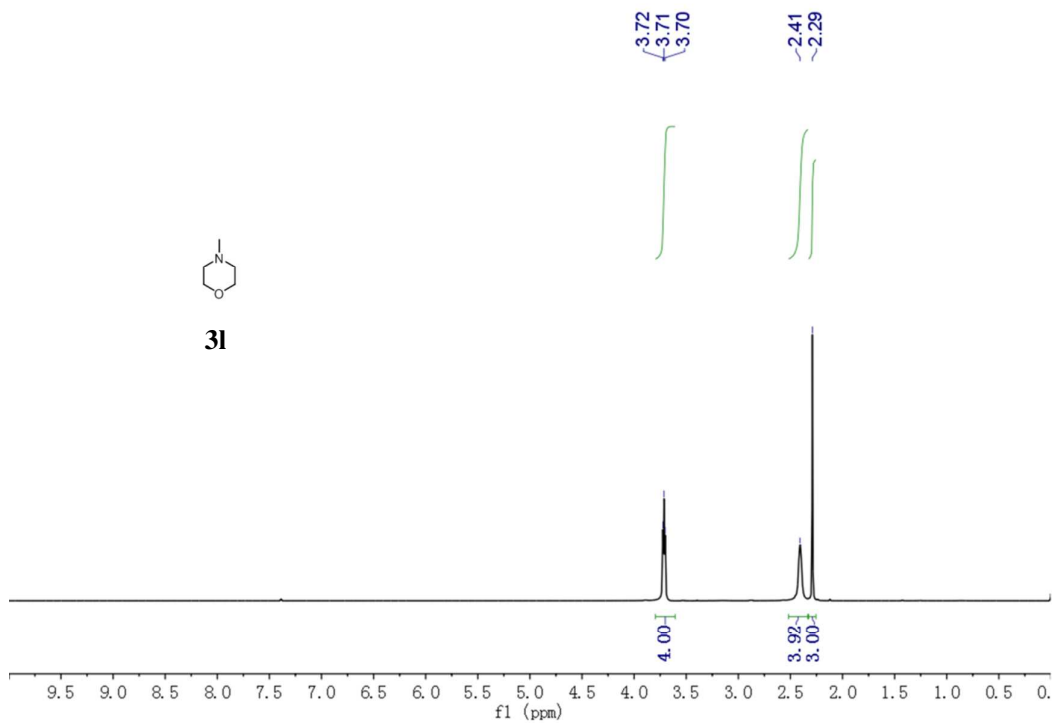








**3l**



**3l**

