

## Supporting Information

### Visible-light-mediated Aerobic Ritter-type C-H Amination of Diarylmethane using DDQ/*tert*-Butyl Nitrite

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# 1 General Information

Unless stated otherwise, all reagents were purchased from commercial sources and used without further purification. Thin layer chromatography (TLC) was carried out using Merck TLC silica gel 60 sheet and visualized with ultraviolet light (254/365 nm). Flash column chromatography (FCC) was performed on silica gel (200-300 mesh) as the stationary phase and the solvents employed were of analytical grade. The air, oxygen, nitrogen and helium cylinder were supplied by Hangzhou Jingong Special Gases.

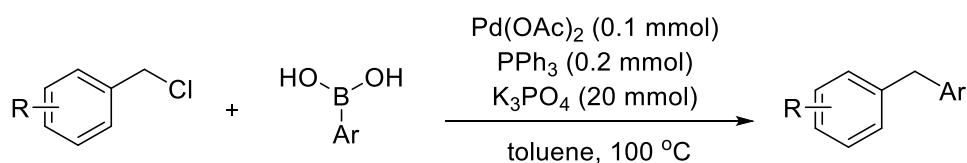
$^1\text{H}$  NMR spectra and  $^{13}\text{C}$  NMR spectra were recorded on a Bruker AVANCE<sup>III</sup> 500 (500 MHz) spectrometer and Bruker AVANCE<sup>III</sup> 500 (126 MHz) spectrometer at 25 °C, respectively.

Gas chromatography analysis was carried out using Agilent 7890A with AT•SE-54 GC capillary column (30 m × 250  $\mu\text{m}$  × 0.33  $\mu\text{m}$ ) was employed for all the separations using the following conditions: initial column temperature 100 °C; initial hold time 2 min; final temperature 280 °C; hold time 5 min; temperature ramp 15 °C/min; detector temperature: 300 °C, injection temperature 280 °C; injection volume 1  $\mu\text{L}$ ; split ratio 30:1; column flow rate 1 mL/min. The effluent was combusted in a  $\text{H}_2$ /Air flame and detected using an FID (flame ionization detector).

Gas chromatography-mass spectrometry (GC-MS) was carried out using Thermo Fisher Trace ISQ with TG-5MS GC capillary column (60 m × 250  $\mu\text{m}$  × 0.25  $\mu\text{m}$ ) was employed for all the separations using the following conditions: the initial column temperature 100 °C, initial held time 2 min; final temperature was increased to 280 °C at 15 °C/min and held for 20 min. Injection temperature 250 °C, ion source temperature 200 °C, EI ionization method with electron energy 70 eV and mass-to-charge ratio: 40-500.

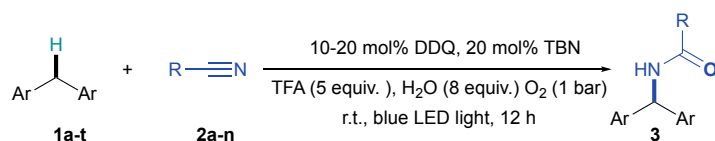
## 2 Experimental Details

### 2.1 General procedure for the synthesis of various diarylmethanes



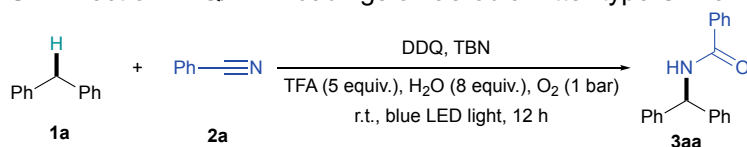
Substituted diarylmethanes (**1b-t**) were synthesised using the method derived from the literature<sup>1</sup>: To a 100 mL dry Schlenk flask, 4.2 g of tripotassium phosphate (20 mmol), substituted phenylboronic acid (15 mmol), 52.5 mg of Triphenylphosphine (0.2 mmol), 22.5 mg palladium acetate (0.1 mmol), substituted benzyl chloride (10 mmol) and 35 mL toluene solvent were charged. After nitrogen gas was introduced into the Schlenk bottle as protective gas, the apparatus was placed in a 100 °C oil bath. The reaction was monitored by TLC thin layer chromatography and gas chromatography. After the reaction was completed, reaction was cooled to room temperature. Methyl tert-butyl ether (20 mL), 1 M NaOH aqueous solution (10 mL) and saturated brine (20 mL) were added to the reaction mixture. Then the reaction mixture was transferred to a separating funnel. The aqueous layer was separated and back extracted with methyl tert-butyl ether (20 mL) twice. Then the combined organic layers were then dried over Na<sub>2</sub>SO<sub>4</sub>, filtered and concentrated under reduced pressure. The crude material was then purified by silica gel flash chromatography using the noted solvent systems.

## 2.1 General procedure for visible-light-mediated Ritter-type C-H amination using DDQ/tert-butyl nitrite



To a reaction tube DDQ (10-20 mol%, 11-22 mg), diarylmethane (0.5 mmol), trifluoroacetic acid (5.0 equiv., 180  $\mu$ L), H<sub>2</sub>O (8 equiv. 72  $\mu$ L) and nitrile (2 mL, ~20 equiv.) were added. After the reaction tube was flushed with oxygen, tert-butyl nitrite (20 mol%, 12  $\mu$ L) was quickly injected via a micro syringe. Then reaction tube was sealed with a tetrafluoroethylene stopper and placed in a blue LED light-emitting device (18 W). After reaction was stirred at room temperature for 12 hours, the reaction mixture was quenched and neutralized with potassium carbonate solution. The reaction mixture was then transferred to a separating funnel, the aqueous layer was separated and back extracted with ethyl acetate (30 mL) twice. The combined organic layers were dried over NaSO<sub>4</sub>, filtered and concentrated under reduced pressure. The crude material was then purified by silica gel flash chromatography using the noted solvent systems.

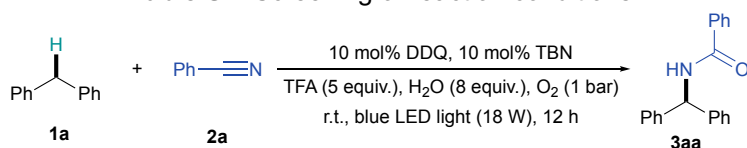
**Note:** For nitriles (e.g., 4-chlorobenzonitrile, 4-bromobenzonitrile) that are solid at room temperature, reaction was carried out with 15 equiv. of corresponding nitrile in DCE (2 mL).

**Table S1.** Effect of DDQ/TBN loadings on aerobic Ritter-type C-H amination

Entry	DDQ [mol%]	TBN [mol%]	Yield [%] <sup>[a]</sup>
1	10	10	61
2	10	5	52
3	5	10	46
4	5	5	41

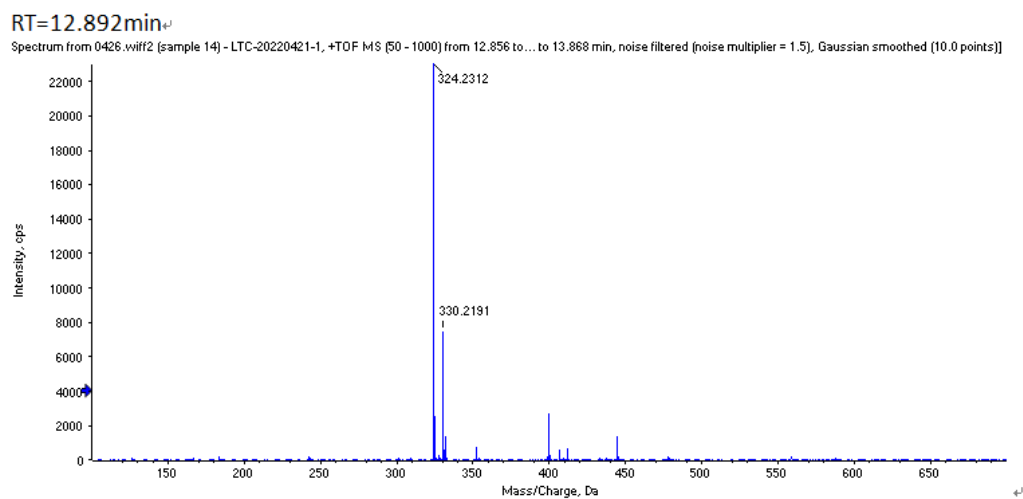
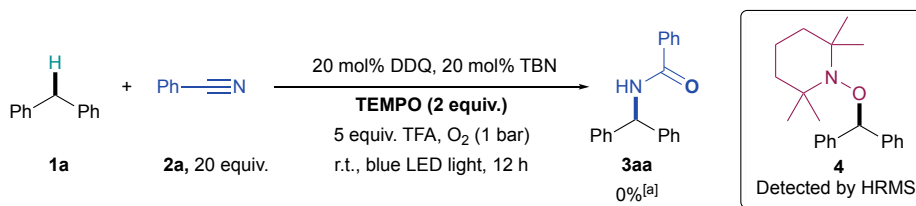
Reaction conditions: reaction was performed with **1a** (0.5 mmol), **2a** (2 mL, as reagent/solvent), DDQ (amount as specified), TBN (amount as specified), TFA (5 equiv., 2.5 mmol), and H<sub>2</sub>O (4 mmol, 8 equiv.) with blue LED light and oxygen balloon at room temperature for 12 h.

[a] Yields were determined by GC using biphenyl as internal standard.

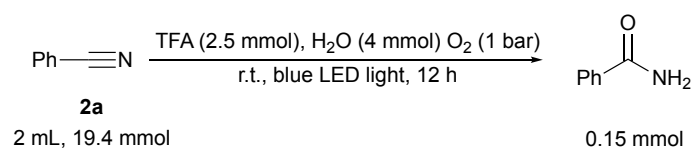
**Table S2.** Screening of reaction conditions

Entry	Variation from the standard conditions	Yield [%] <sup>[a]</sup>
1	<b>none</b>	<b>61</b>
2	40 °C	39
3	60 °C	40
4	air (1 bar)	31
5	50% O <sub>2</sub> in N <sub>2</sub> (1 bar)	35
6	10 mol% isobutyl nitrite	44
7	10 mol% butyl nitrite	31
8	LED plain light (15 W)	51
9	red LED light (15 W)	21
10	blue LED light (10W)	35
11	bule LED light (30 W)	59

Standard conditions: reaction was performed with **1a** (0.5 mmol), **2a** (2 mL, as reagent/solvent), DDQ (10 mol%, 0.10 mmol), TBN (10 mol%, 0.10 mmol), TFA (5 equiv., 2.5 mmol), and H<sub>2</sub>O (4 mmol, 8 equiv.) with blue LED light (18 W) and oxygen balloon at room temperature for 12 h.

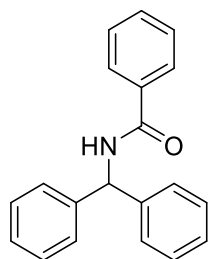


**Figure S1.** Confirmation of compound **4** by HPLC-MS (ESI). Calcd. for  $[M+H]^+$   $C_{22}H_{30}NO$ : 324.2322, found: 324.2312, error (ppm): -3.1.

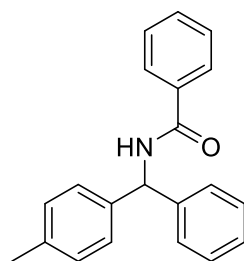


**Figure S2.** Study of hydrolysis of benzonitrile.

### 3 Products Characterization data

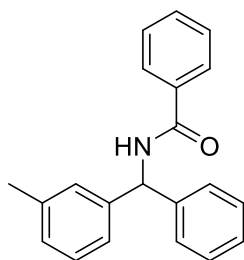


**N-benzhydrylbenzamide (3aa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3aa** as white solid. Yield: 76%, 109 mg. m.p.: 168-169 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.78 (d, *J* = 7.1 Hz, 2H), 7.47 (t, *J* = 8.6 Hz, 1H), 7.39 (t, *J* = 10.0 Hz, 2H), 7.33-7.30 (m, 4H), 7.28-7.22 (m, 6H), 6.72 (d, *J* = 7.5 Hz, 1H), 6.42 (d, *J* = 7.9 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 141.5, 134.3, 131.7, 128.8, 128.6, 127.6, 127.5, 127.0, 57.5. NMR data is consistent with literature values.<sup>2</sup> MS (EI), *m/z* 287.13 [M<sup>+</sup>, 70%], 105.16 [100%].

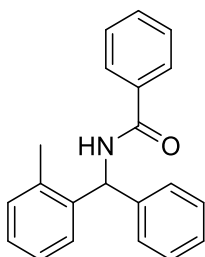


**N-(phenyl(p-tolyl)methyl)benzamide (3ba):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ba** as white solid. Yield: 85%, 128 mg. m.p.: 165-166 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.80 (d, *J* = 7.5 Hz, 2H), 7.48 (t, *J* = 7.3 Hz, 1H), 7.40 (t, *J* = 7.6 Hz, 2H), 7.34-7.26 (m, 5H), 7.18-7.13 (m, 4H), 6.74 (d, *J* = 7.1 Hz, 1H), 6.40 (d, *J* = 7.7 Hz, 1H), 2.33 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 141.7, 138.6, 137.3, 134.4, 131.6, 129.4, 128.7, 128.6, 127.5, 127.5, 127.4, 127.1, 57.2, 21.1. NMR data is consistent with literature values.<sup>3</sup> MS (EI), *m/z* 301.19 [M<sup>+</sup>, 40%], 105.16 [100%].

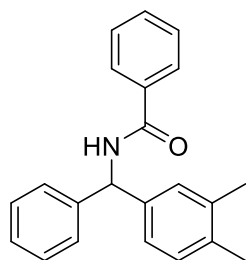




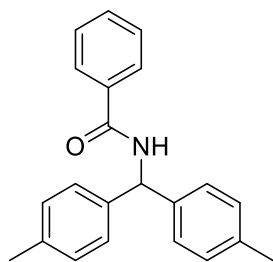
**N-(phenyl(m-tolyl)methyl)benzamide (3ca):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ca** as white solid. Yield: 82%, 123 mg. m.p.: 163-164 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.84 (d, *J* = 7.4 Hz, 2H), 7.53 (t, *J* = 7.4 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 2H), 7.35 (t, *J* = 7.0 Hz, 2H), 7.31-7.28 (m, 3H), 7.22 (d, *J* = 7.0 Hz, 4H), 6.71 (d, *J* = 7.4 Hz, 1H), 6.64 (d, *J* = 7.7 Hz, 1H), 2.38 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 141.6, 141.5, 138.4, 134.3, 131.6, 128.7, 128.6, 128.5, 128.4, 128.3, 127.5, 127.1, 124.6, 57.5, 21.5. MS (EI), *m/z* 301.18 [M<sup>+</sup>, 30%], 105.01 [100%]. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>21</sub>H<sub>18</sub>NO]<sup>-</sup> 300.1394, found 300.1395.



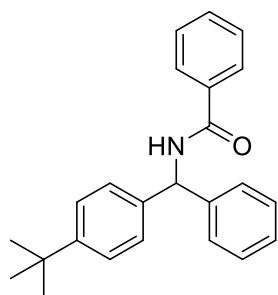
**N-(phenyl(o-tolyl)methyl)benzamide (3da):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3da** as white solid. Yield: 80%, 120 mg. m.p.: 163-164 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.78 (d, *J* = 7.4 Hz, 2H), 7.47 (t, *J* = 7.4 Hz, 1H), 7.39 (t, *J* = 7.7 Hz, 2H), 7.30 (t, *J* = 7.0 Hz, 2H), 7.26-7.22 (m, 3H), 7.17 (d, *J* = 7.0 Hz, 4H), 6.65 (d, *J* = 7.4 Hz, 1H), 6.59 (d, *J* = 7.7 Hz, 1H), 2.32 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.3, 141.0, 139.5, 136.5, 134.3, 131.7, 130.9, 128.7, 128.6, 127.6, 127.5, 127.4, 127.1, 126.8, 126.2, 54.5, 19.5. NMR data is consistent with literature values.<sup>3</sup> MS (EI), *m/z* 301.16 [M<sup>+</sup>, 30%], 105.01 [100%].



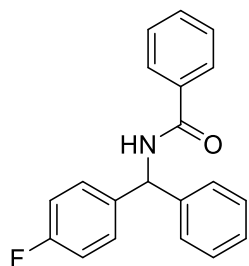
**N-((3,4-dimethylphenyl)(phenyl)methyl)benzamide (3ea):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ea** as white solid. Yield: 64%, 101 mg. m.p.: 150-151 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.81 (d, *J* = 7.1 Hz, 2H), 7.50-7.48 (m, 1H), 7.41 (t, *J* = 7.8 Hz, 2H), 7.34-7.25 (m, 5H), 7.10-7.01 (m, 3H), 6.71 (d, *J* = 7.6 Hz, 1H), 6.37 (d, *J* = 7.8 Hz, 1H), 2.23 (s, 6H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 141.7, 139.0, 137.0, 136.0, 134.4, 131.6, 130.0, 128.9, 128.7, 128.6, 127.4, 127.3, 127.1, 124.9, 57.3, 19.9, 19.5. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>22</sub>H<sub>20</sub>NO]<sup>-</sup> 314.1550, found 314.1549.



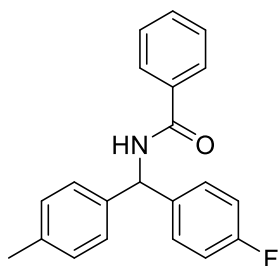
**N-(di-p-tolylmethyl)benzamide (3fa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3fa** as white solid. Yield: 78%, 123 mg. m.p.: 182-183 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.79 (d, *J* = 8.6 Hz, 2H), 7.48 (t, *J* = 6.3 Hz, 1H), 7.40 (t, *J* = 7.8 Hz, 2H), 7.18-7.12 (m, 8H), 6.71 (d, *J* = 7.6 Hz, 1H), 6.36 (d, *J* = 7.8 Hz, 1H), 2.32 (s, 6H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.4, 138.8, 137.1, 134.4, 131.6, 129.4, 128.6, 127.4, 127.1, 57.0, 21.0. NMR data is consistent with literature values.<sup>4</sup> MS (EI), *m/z* 315.19 [M<sup>+</sup>, 60%], 105.06 [100%].



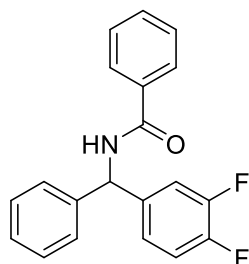
**N-((4-(tert-butyl)phenyl)(phenyl)methyl)benzamide (3ga):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ga** as white solid. Yield: 81%, 138 mg. m.p.: 166-168 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.80 (d, *J* = 7.1 Hz, 2H), 7.48 (t, *J* = 6.2 Hz, 1H), 7.40 (t, *J* = 7.9 Hz, 2H), 7.35-7.32 (m, 6H), 7.26-7.20 (m, 3H), 6.77 (d, *J* = 7.7 Hz, 1H), 6.42 (d, *J* = 7.8 Hz, 1H), 1.30 (s, 9H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 150.5, 141.6, 138.5, 134.4, 131.6, 128.7, 128.6, 127.4, 127.3, 127.1, 125.7, 57.2, 34.5, 31.3. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>24</sub>H<sub>24</sub>NO]<sup>-</sup> 342.1863, found 342.1866.



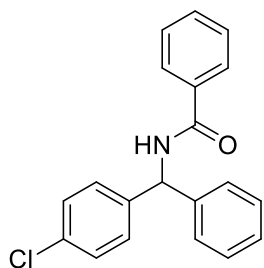
**N-((4-fluorophenyl)(phenyl)methyl)benzamide (3ia):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ia** as white solid. Yield: 72%, 109 mg. m.p.: 167-168 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.81 (d, *J* = 7.2 Hz, 2H), 7.50 (t, *J* = 7.5 Hz, 1H), 7.41-7.24 (m, 9H), 7.11 (d, *J* = 7.8 Hz, 1H), 7.01 (t, *J* = 8.7 Hz, 2H), 6.42 (d, *J* = 7.9 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.7, 162.1 (d, *J* = 244.6 Hz), 141.3, 137.4 (d, *J* = 3.2 Hz), 134.1, 131.7, 129.2 (d, *J* = 8.1 Hz), 128.8, 128.6, 127.7, 127.5, 127.2, 115.5 (d, *J* = 21.4 Hz), 56.8. NMR data is consistent with literature values.<sup>3</sup> MS (EI), *m/z* 305.15 [M<sup>+</sup>, 30%], 105.02 [100%].



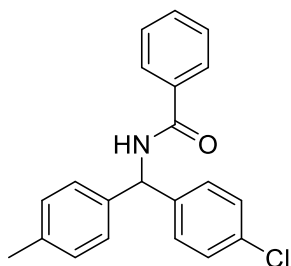
**N-((4-fluorophenyl)(p-tolyl)methyl)benzamide (3ja):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ja** as white solid. Yield: 68%, 108 mg. m.p.: 182-183 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.81 (d, *J* = 7.2 Hz, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.43 (t, *J* = 7.9 Hz, 1H), 7.28-7.26 (m, 2H), 7.17 (s, 4H), 7.02 (t, *J* = 8.7 Hz, 2H), 6.75 (d, *J* = 7.5 Hz, 1H), 6.39 (d, *J* = 7.7 Hz, 1H), 2.35 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 162.1 (d, *J* = 244.6 Hz), 138.4, 137.5, 134.2, 131.7, 129.5, 129.0 (d, *J* = 8.1 Hz), 128.6, 127.4, 127.1, 115.5 (d, *J* = 21.3 Hz), 56.6, 21.1. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>21</sub>H<sub>17</sub>FNO]<sup>-</sup> 318.1300, found 318.1304.



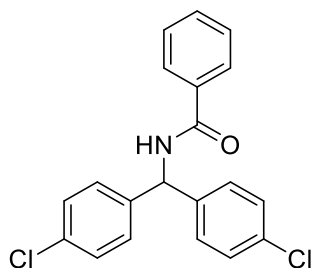
**N-((3,4-difluorophenyl)(phenyl)methyl)benzamide (3ka):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ka** as white solid. Yield: 58%, 94 mg. m.p.: 176-178 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.80 (d, *J* = 7.2 Hz, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.43 (t, *J* = 7.9 Hz, 2H), 7.38-7.30 (m, 3H), 7.25 (t, *J* = 4.0 Hz, 2H), 7.14-7.03 (m, 3H), 6.76 (d, *J* = 7.3 Hz, 1H), 6.36 (d, *J* = 7.6 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.6, 151.0 (dd, *J* = 93.2, 12.7 Hz), 149.0 (dd, *J* = 92.6, 12.5 Hz), 140.6, 138.5 (dd, *J* = 8.3, 4.2 Hz), 133.8, 131.9, 129.0, 128.7, 128.1, 127.5, 127.1, 123.4 (dd, *J* = 6.3, 3.6 Hz), 117.4 (d, *J* = 17.2 Hz), 116.4 (d, *J* = 17.9 Hz), 56.7. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>20</sub>H<sub>14</sub>F<sub>2</sub>NO]<sup>-</sup> 322.1049, found 322.1049.



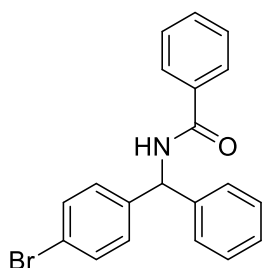
**N-((4-chlorophenyl)(phenyl)methyl)benzamide (3la):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3la** as white solid. Yield: 76%, 122 mg. m.p.: 169-170 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.75 (d, *J* = 7.9 Hz, 2H), 7.46 (t, *J* = 7.2 Hz, 1H), 7.38-7.22 (m, 9H), 7.18 (d, *J* = 8.4 Hz, 2H), 6.89 (d, *J* = 6.4 Hz, 1H), 6.35 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.7, 141.1, 140.0, 134.0, 133.3, 131.8, 128.9, 128.8, 128.7, 128.6, 127.8, 127.6, 127.1, 56.9. NMR data is consistent with literature values.<sup>5</sup> MS (EI), *m/z* 321.11 [*M*<sup>+</sup>, 30%], 105.02 [100%].



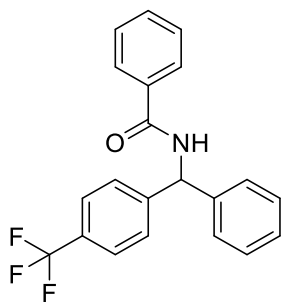
**N-((4-chlorophenyl)(p-tolyl)methyl)benzamide (3ma):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ma** as white solid. Yield: 73%, 122 mg. m.p.: 178-180 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.80 (d, *J* = 7.3 Hz, 2H), 7.51 (t, *J* = 7.4 Hz, 1H), 7.42 (t, *J* = 7.8 Hz, 2H), 7.30-7.22 (m, 4H), 7.21 (s, 4H), 6.71 (d, *J* = 7.4 Hz, 1H), 6.36 (d, *J* = 7.7 Hz, 1H), 2.34 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 140.2, 138.1, 137.6, 134.1, 133.2, 131.8, 129.6, 128.8, 128.7, 128.6, 127.5, 127.1, 56.7, 21.1. MS (EI), *m/z* 335.17 [*M*<sup>+</sup>, 30%], 105.14 [100%]. HRMS (ESI): *m/z* [*M*-H]<sup>-</sup> calc. for [C<sub>21</sub>H<sub>17</sub>ClNO]<sup>-</sup> 334.1004, found 334.1008.



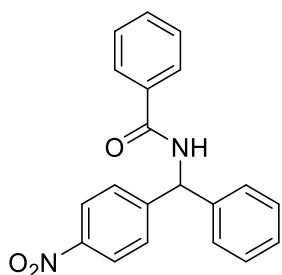
**N-(bis(4-chlorophenyl)methyl)benzamide (3na):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3na** as white solid. Yield: 62%, 110 mg. m.p.: 199-200 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.78 (d, *J* = 7.2 Hz, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.43 (t, *J* = 7.9 Hz, 2H), 7.31 (d, *J* = 8.5 Hz, 4H), 7.19 (d, *J* = 8.4 Hz, 4H), 6.73 (d, *J* = 7.5 Hz, 1H), 6.36 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.6, 139.5, 133.8, 133.7, 131.9, 129.2, 128.8, 128.7, 127.1, 56.4. NMR data is consistent with literature values.<sup>6</sup> MS (EI), *m/z* 355.09 [M<sup>+</sup>, 20%], 105.14 [100%].



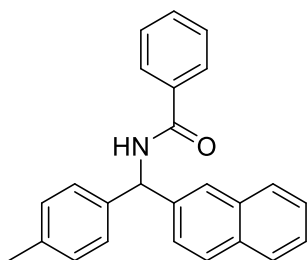
**N-((4-bromophenyl)(phenyl)methyl)benzamide (3oa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3oa** as white solid. Yield: 71%, 129 mg. m.p.: 183-184 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.79 (d, *J* = 8.2 Hz, 2H), 7.50 (t, *J* = 7.7 Hz, 1H), 7.45-7.39 (m, 4H), 7.35-7.25 (m, 5H), 7.16 (d, *J* = 8.4 Hz, 2H), 6.76 (d, *J* = 7.1 Hz, 1H), 6.37 (d, *J* = 7.7 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.6, 140.9, 140.5, 134.0, 131.8, 129.2, 128.9, 128.7, 127.9, 127.6, 127.1, 121.5, 57.0. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>20</sub>H<sub>15</sub>BrNO]<sup>-</sup> 364.0343, found 364.0346.



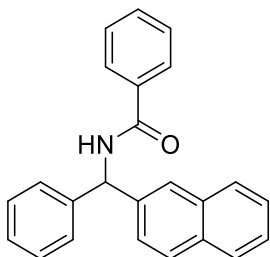
**N-(phenyl(4-(trifluoromethyl)phenyl)methyl)benzamide (3pa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3pa** as white solid. Yield: 66%, 117 mg. m.p.: 190-191 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.80 (d, *J* = 7.4 Hz, 2H), 7.57 (d, *J* = 8.2 Hz, 2H), 7.51 (t, *J* = 7.4 Hz, 1H), 7.43-7.29 (m, 7H), 7.25 (d, *J* = 6.9 Hz, 2H), 6.84 (d, *J* = 7.4 Hz, 1H), 6.45 (d, *J* = 7.6 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.7, 145.4, 140.6, 133.9, 131.9, 129.7 (q, *J* = 32.2 Hz), 129.0, 128.7, 128.1, 127.7, 127.6, 127.1, 125.7 (q, *J* = 7.4 Hz), 124.1, (q, *J* = 270.3 Hz), 57.3. NMR data is consistent with literature values.<sup>7</sup> HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>21</sub>H<sub>15</sub>F<sub>3</sub>NO]<sup>-</sup> 354.1111, found 354.1109.



**N-((4-nitrophenyl)(phenyl)methyl)benzamide (3qa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3qa** as white solid. Yield: 62%, 103 mg. m.p.: 172-173 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 8.14 (d, *J* = 8.8 Hz, 2H), 7.81 (d, *J* = 7.2 Hz, 2H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.47-7.41 (m, 4H), 7.39-7.34 (m, 3H), 7.27-7.25 (m, 2H), 7.01 (d, *J* = 7.3 Hz, 1H), 6.45 (d, *J* = 7.3 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.8, 148.8, 147.2, 140.0, 133.6, 132.0, 129.2, 128.7, 128.4, 128.1, 127.8, 127.1, 123.8, 57.4. NMR data is consistent with literature values.<sup>8</sup> MS (EI), *m/z* 332.14 [M<sup>+</sup>, 20%], 105.14 [100%].

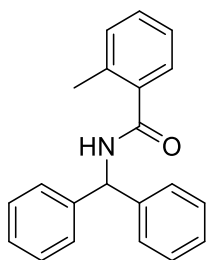


**N-(naphthalen-2-yl(p-tolyl)methyl)benzamide (3sa):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3sa** as white solid. Yield: 67%, 118 mg. m.p.: 187-188 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.87-7.78 (m, 6H), 7.53-7.43 (m, 6H), 7.26 (t, *J* = 10.0 Hz, 3H), 7.18 (d, *J* = 8.0 Hz, 2H), 6.84 (d, *J* = 7.7 Hz, 1H), 6.60 (d, *J* = 7.9 Hz, 1H), 2.37 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.5, 139.0, 138.4, 137.4, 134.3, 133.3, 132.8, 131.7, 129.5, 128.6, 128.5, 128.0, 127.7, 127.6, 127.1, 126.3, 126.0, 125.9, 125.7, 57.4, 21.1. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>25</sub>H<sub>20</sub>NO]<sup>-</sup> 350.1550, found 350.1546.

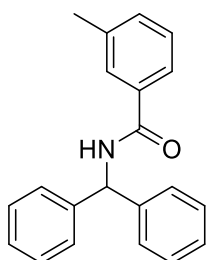


**N-(naphthalen-2-yl(phenyl)methyl)benzamide (3ta):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ta** as white solid. Yield: 64%, 108 mg. m.p.: 183-184 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.83-7.74 (m, 6H), 7.51-7.38 (m, 6H), 7.34-7.29 (m, 5H), 6.85 (d, *J* = 7.5 Hz, 1H), 6.61 (d, *J* = 7.9 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.6, 141.4, 138.8, 134.3, 133.3, 132.8, 131.7, 128.8, 128.6, 128.0, 127.7, 127.1, 126.3, 126.1, 126.0, 125.7, 57.6. HRMS (ESI): *m/z* [M-H]<sup>-</sup> calc. for [C<sub>24</sub>H<sub>18</sub>NO]<sup>-</sup> 336.1393, found 336.1397.

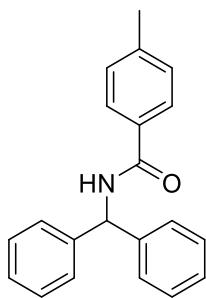




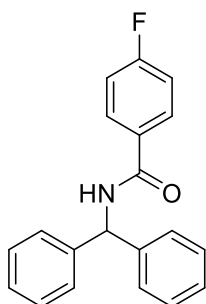
**N-benzhydryl-2-methylbenzamide (3ab):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ab** as white solid. Yield: 79%, 108 mg. m.p.: 176-178 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.83 (d, *J* = 7.5 Hz, 2H), 7.53 (t, *J* = 7.3 Hz, 1H), 7.44 (t, *J* = 7.6 Hz, 2H), 7.38-7.30 (m, 5H), 7.22-7.17 (m, 4H), 6.78 (d, *J* = 7.1 Hz, 2H), 6.44 (d, *J* = 7.7 Hz, 1H), 2.36 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 169.1, 141.5, 136.4, 136.1, 131.1, 130.1, 128.7, 127.6, 127.4, 126.7, 125.8, 57.3, 19.8. NMR data is consistent with literature values.<sup>9</sup> MS (EI), *m/z* 301.14 [M<sup>+</sup>, 30%], 105.16 [100%].



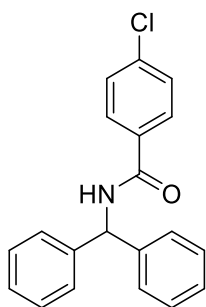
**N-benzhydryl-3-methylbenzamide (3ac):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ac** as white solid. Yield: 80%, 120 mg. m.p.: 157-158 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.60 (d, *J* = 18.2 Hz, 2H), 7.34-7.25 (m, 12H), 6.74 (d, *J* = 7.4 Hz, 1H), 6.44 (d, *J* = 7.9 Hz, 1H), 2.37 (s, 3H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 166.7, 141.5, 138.5, 134.3, 132.4, 128.7, 128.5, 127.8, 127.5, 127.4, 124.0, 57.4, 21.3. NMR data is consistent with literature values.<sup>9</sup> MS (EI), *m/z* 301.17 [M<sup>+</sup>, 40%], 105.12 [100%].



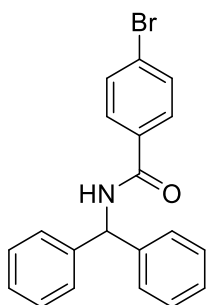
**N-benzhydryl-4-methylbenzamide (3ad):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 15) afforded the title product **3ad** as white solid. Yield: 84%, 126 mg. m.p.: 178-179 °C.  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  7.70 (d,  $J = 8.1$  Hz, 2H), 7.34-7.24 (m, 10H), 7.20 (d,  $J = 8.0$  Hz, 2H), 6.75 (d,  $J = 7.6$  Hz, 2H), 6.43 (d,  $J = 7.9$  Hz, 1H), 2.38 (s, 3H);  $^{13}\text{C}$  NMR (125 MHz,  $\text{CDCl}_3$ )  $\delta$  166.5, 142.1, 141.6, 131.4, 129.3, 128.7, 127.6, 127.1, 57.4, 21.4. NMR data is consistent with literature values.<sup>9</sup> MS (EI),  $m/z$  301.16 [ $\text{M}^+$ , 40%], 105.16 [100%].



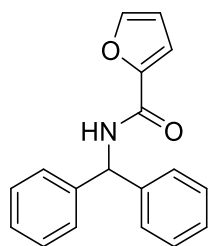
**N-benzhydryl-4-fluorobenzamide (3ae):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ae** as white solid. Yield: 72%, 110 mg. m.p.: 215-217 °C.  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  7.83-7.80 (m, 2H), 7.34 (d,  $J = 7.7$  Hz, 4H), 7.30-7.28 (m, 6H), 7.09 (t,  $J = 8.6$  Hz, 2H), 6.67 (d,  $J = 7.3$  Hz, 1H), 6.42 (d,  $J = 7.8$  Hz, 1H);  $^{13}\text{C}$  NMR (125 MHz,  $\text{CDCl}_3$ )  $\delta$  165.9, 164.6 (d,  $J = 199.0$  Hz), 141.4, 130.4 (d,  $J = 3.2$  Hz), 129.4 (d,  $J = 8.9$  Hz), 128.8, 127.6, 127.5, 115.7 (d,  $J = 21.8$  Hz), 57.6. NMR data is consistent with literature values.<sup>9</sup> MS (EI),  $m/z$  305.15 [ $\text{M}^+$ , 30%], 123.12 [100%].



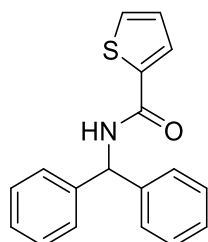
**N-benzhydryl-4-chlorobenzamide (3af):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3af** as white solid. Yield: 69%, 111 mg. m.p.: 169-170 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.74 (d, *J* = 8.6 Hz, 2H), 7.40-7.33 (m, 6H), 7.29 (t, *J* = 5.1 Hz, 6H), 6.69 (d, *J* = 7.4 Hz, 1H), 6.42 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 165.5, 141.3, 138.0, 132.6, 128.9, 128.8, 128.5, 127.7, 127.5, 57.6. NMR data is consistent with literature values.<sup>6</sup> MS (EI), *m/z* 139.10 [*M*<sup>+</sup>, 40%], 321.14 [100%].



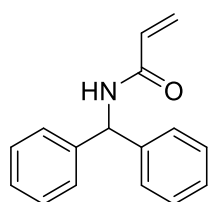
**N-benzhydryl-4-bromobenzamide (3ag):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ag** as white solid. Yield: 65%, 119 mg. m.p.: 195-196 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.85-7.82 (m, 2H), 7.37 (d, *J* = 7.7 Hz, 4H), 7.32-7.30 (m, 6H), 7.28 (s, 1H), 7.12 (t, *J* = 8.6 Hz, 2H), 6.69 (d, *J* = 7.3 Hz, 1H), 6.45 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 165.6, 141.3, 137.9, 132.5, 128.8, 128.7, 128.5, 127.6, 127.4, 57.5. NMR data is consistent with literature values.<sup>6</sup> MS (EI), *m/z* 365.08 [*M*<sup>+</sup>, 50%], 104.13 [100%].



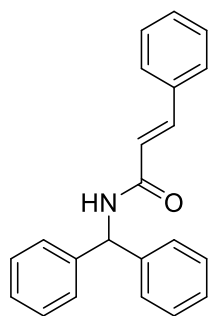
**N-benzhydrylfuran-2-carboxamide (3ah):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ah** as white solid. Yield: 51%, 71 mg. m.p.: 163-164 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.41 (d, *J* = 1.0 Hz, 1H), 7.34-7.32 (m, 4H), 7.29-7.25 (m, 6H), 7.13 (d, *J* = 4.0 Hz, 1H), 6.98 (d, *J* = 7.9 Hz, 1H), 6.48-6.47 (m, 1H), 6.42 (d, *J* = 8.3 Hz, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 157.5, 147.8, 144.0, 141.3, 128.7, 127.6, 127.5, 114.8, 112.3, 56.6. NMR data is consistent with literature values.<sup>10</sup> MS (EI), *m/z* 277.17 [M<sup>+</sup>, 60%], 95.01 [100%].



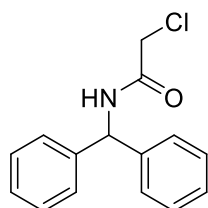
**N-benzhydrylthiophene-2-carboxamide (3ai):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ai** as white solid. Yield: 58%, 85 mg. m.p.: 170-171 °C. <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ 7.50 (d, *J* = 3.2 Hz, 1H), 7.43 (d, *J* = 4.8 Hz, 1H), 7.30 (t, *J* = 7.7 Hz, 4H), 7.25 (t, *J* = 7.4 Hz, 6H), 7.01 (t, *J* = 4.0 Hz, 1H), 6.56 (d, *J* = 6.3 Hz, 1H), 6.37 (d, *J* = 7.8 Hz, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 161.0, 141.3, 138.6, 130.3, 128.8, 128.4, 127.7, 127.6, 127.5, 57.4. NMR data is consistent with literature values.<sup>9</sup> MS (EI), *m/z* 293.13 [M<sup>+</sup>, 40%], 111.03 [100%].



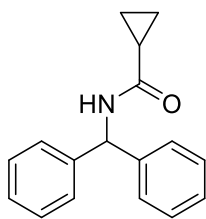
**N-benzhydrylacrylamide (3aj):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3aj** as white solid. Yield: 86%, 102 mg. m.p.: 180-181 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.36-7.33 (m, 4H), 7.30-7.25 (m, 6H), 6.35-6.31 (m, 3H), 6.21-6.15 (m, 1H), 5.69-5.66 (m, 1H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 164.6, 141.3, 130.6, 128.7, 127.5, 127.4, 127.1, 57.1. NMR data is consistent with literature values.<sup>11</sup> MS (EI), *m/z* 237.12 [M<sup>+</sup>, 50%], 104.17 [100%].



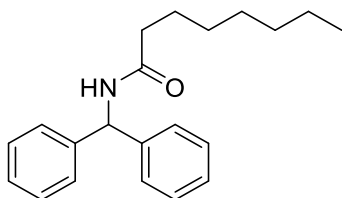
**N-benzhydrylcinnamamide (3ak):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3ak** as white solid. Yield: 82%, 128 mg. m.p.: 221-222 °C. <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ 7.67 (d, *J* = 15.5 Hz, 1H), 7.49 (s, 2H), 7.33 (t, *J* = 7.8 Hz, 7H), 7.26 (t, *J* = 7.4 Hz, 7H), 6.48 (d, *J* = 15.6 Hz, 1H), 6.39 (d, *J* = 7.6 Hz, 1H), 6.27 (d, *J* = 6.3 Hz, 1H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 165.0, 141.9, 141.4, 134.7, 129.8, 128.8, 128.7, 127.8, 127.6, 127.5, 120.2, 57.2. NMR data is consistent with literature values.<sup>11</sup> MS (EI), *m/z* 313.17 [M<sup>+</sup>, 40%], 182.16 [100%].



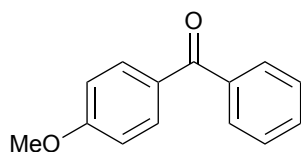
**N-benzhydryl-2-chloroacetamide (3al):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3al** as white solid. Yield: 78%, 101 mg. m.p.: 131-133 °C. <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ 7.35 (t, *J* = 7.1 Hz, 4H), 7.29 (t, *J* = 7.2 Hz, 2H), 7.24 (d, *J* = 7.4 Hz, 5H), 6.25 (d, *J* = 8.3 Hz, 1H), 4.10 (s, 2H); <sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>) δ 165.1, 140.7, 128.8, 127.8, 127.3, 57.2, 42.7. NMR data is consistent with literature values.<sup>7</sup> MS (EI), *m/z* 259.12 [M<sup>+</sup>, 20%], 224.17 [100%].



**N-benzhydrylcyclopropanecarboxamide (3am):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product **3am** as white solid. Yield: 76%, 95 mg. m.p.: 169-170 °C.  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  7.34 (t,  $J$  = 7.1 Hz, 5H), 7.28 (t,  $J$  = 7.2 Hz, 3H), 7.25 (s, 2H), 6.41 (d,  $J$  = 7.3 Hz, 1H), 6.28 (d,  $J$  = 8.0 Hz, 1H), 1.46-1.41 (m, 1H), 1.02-0.99 (m, 2H), 0.77-0.73 (m, 2H);  $^{13}\text{C}$  NMR (125 MHz,  $\text{CDCl}_3$ )  $\delta$  172.7, 141.8, 128.6, 127.5, 127.4, 57.1, 14.8, 7.3. NMR data is consistent with literature values.<sup>11</sup> MS (EI),  $m/z$  251.16 [ $\text{M}^+$ , 80%], 182.13 [100%].

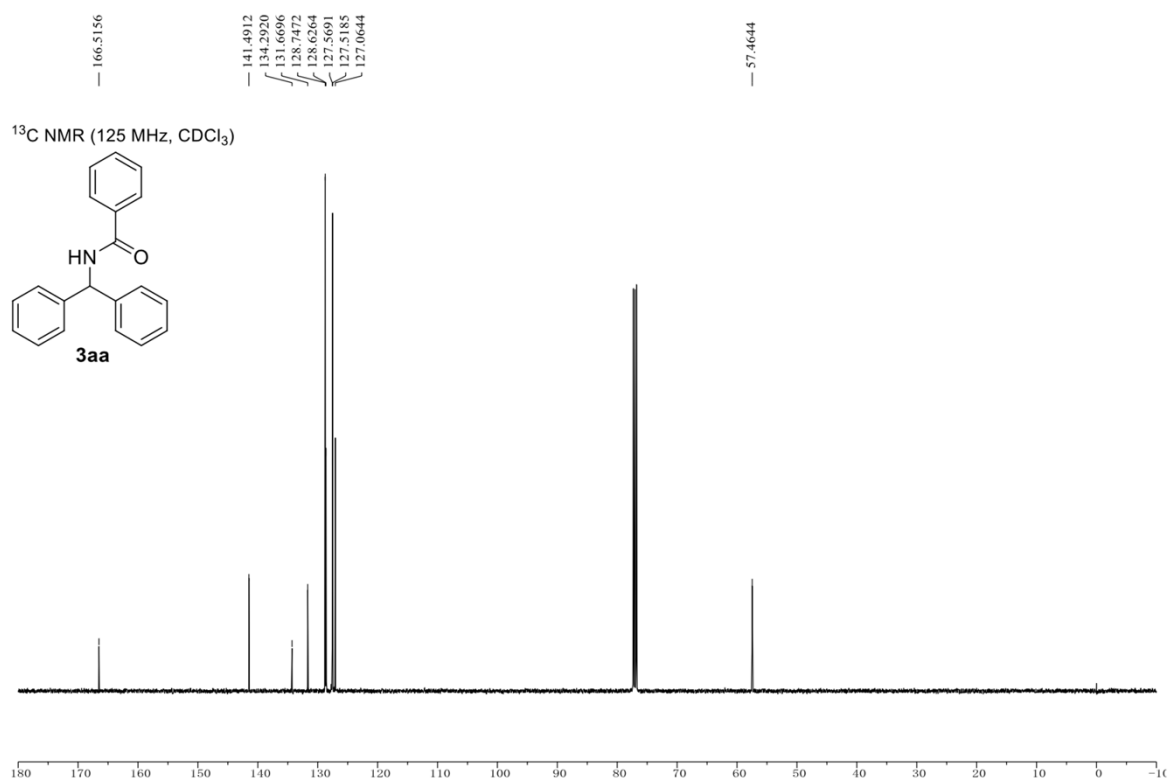
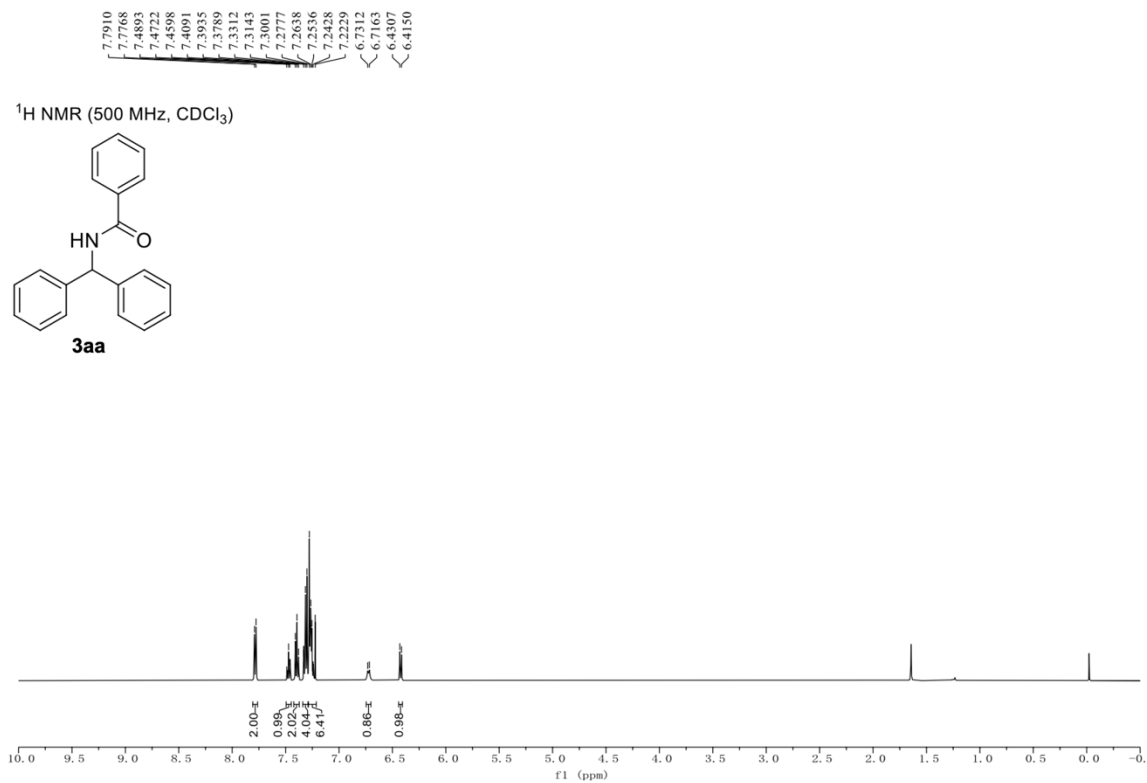


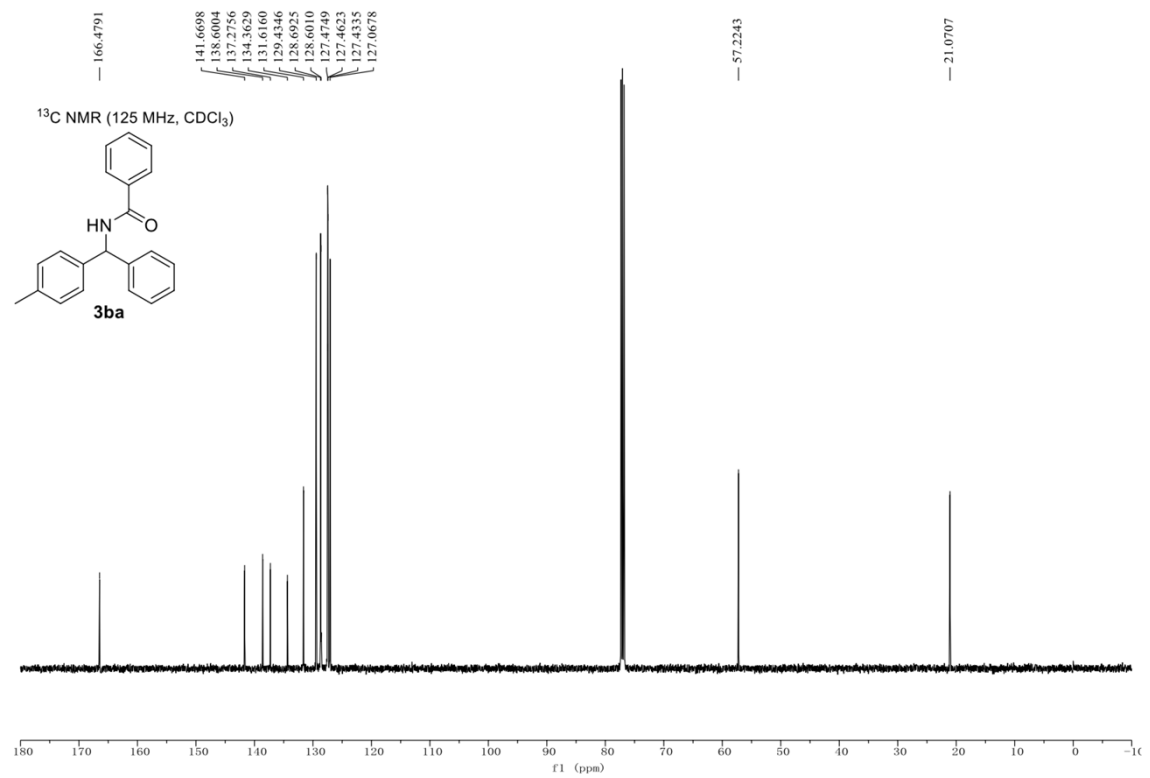
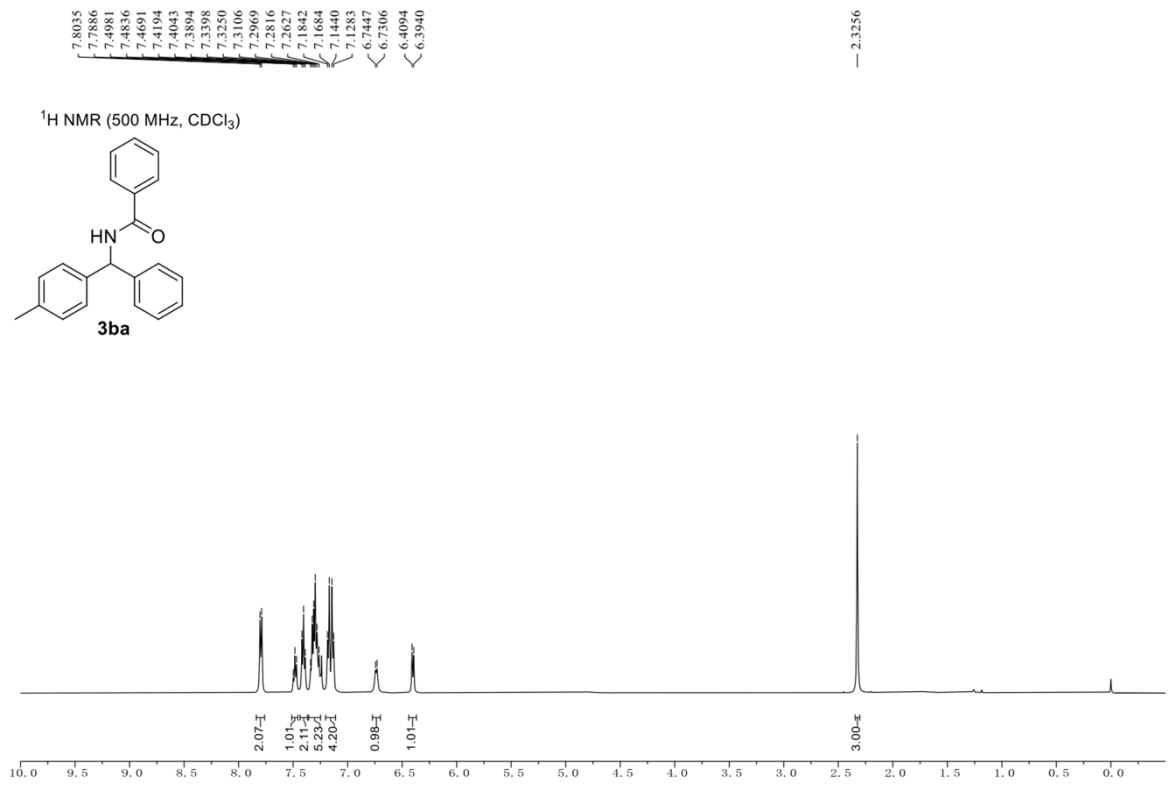
**N-benzhydryloctanamide (3an):** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 5) afforded the title product **3an** as white solid. Yield: 71%, 94 mg. m.p.: 106-107 °C.  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  7.32-7.20 (m, 10H), 6.25 (d,  $J$  = 7.6 Hz, 2H), 7.22 (t,  $J$  = 7.5 Hz, 2H), 1.64 (t,  $J$  = 6.5 Hz, 2H), 1.28-1.25 (m, 8H), 0.87 (t,  $J$  = 6.7 Hz, 3H);  $^{13}\text{C}$  NMR (125 MHz,  $\text{CDCl}_3$ )  $\delta$  172.3, 141.7, 128.6, 127.5, 127.4, 56.8, 36.8, 31.7, 29.3, 29.0, 25.8, 22.6, 14.1. NMR data is consistent with literature values.<sup>12</sup> MS (EI),  $m/z$  309.17 [ $\text{M}^+$ , 30%], 167.17 [100%].



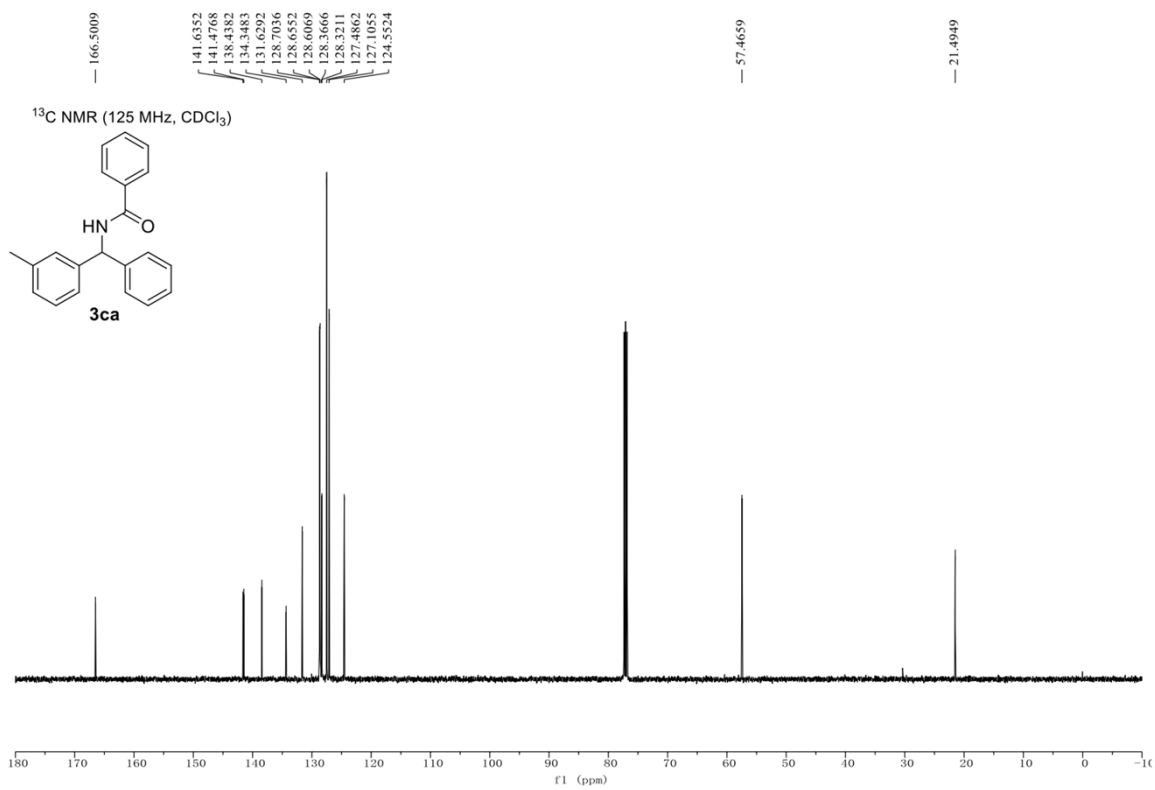
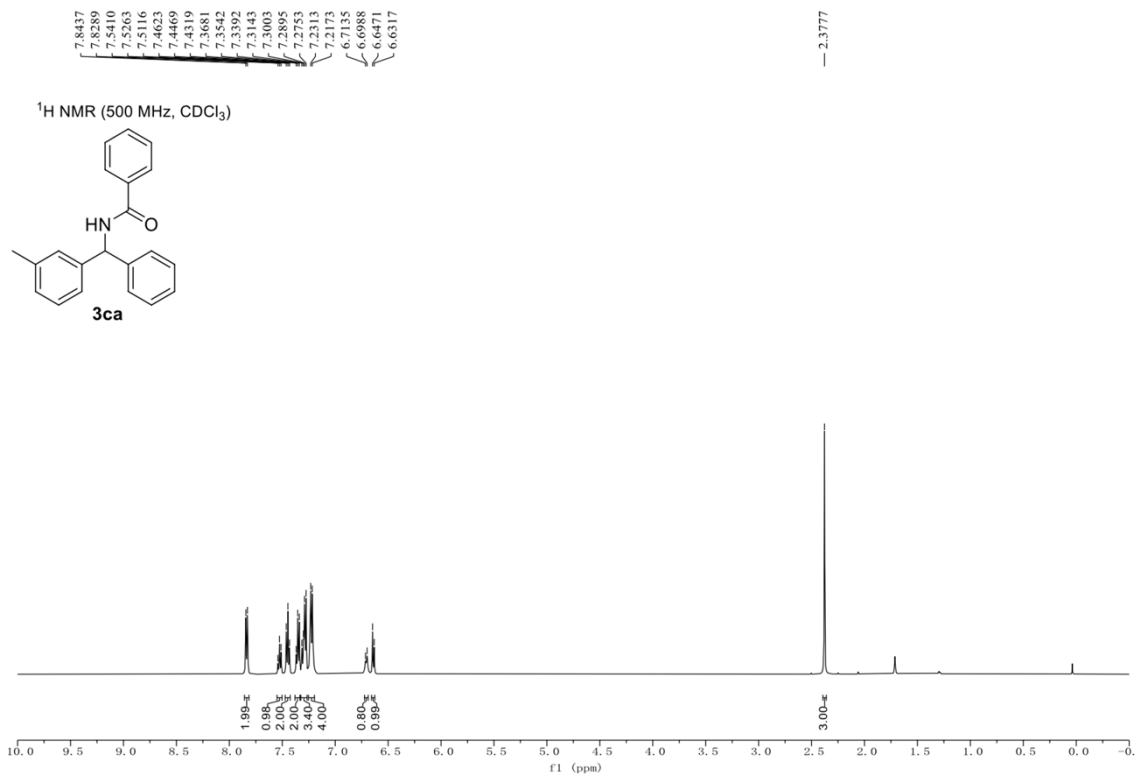
**(4-methoxyphenyl)(phenyl)methanone:** Column chromatography on silica gel (ethyl acetate : petroleum ether = 1 : 10) afforded the title product as white solid. Yield: 89%, 95 mg. m.p.: 58-63 °C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.83 (d,  $J$  = 8.8 Hz, 2H), 7.75 (d,  $J$  = 6.9 Hz, 2H), 7.56 (t,  $J$  = 7.4 Hz, 2H), 7.47 (t,  $J$  = 7.5 Hz, 2H), 6.96 (d,  $J$  = 8.8 Hz, 2H), 3.88 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  195.7, 163.3, 138.4, 132.7, 132.0, 130.3, 129.8, 128.3, 113.7, 55.6. NMR data is consistent with literature values.<sup>13</sup> MS (EI),  $m/z$  212.03 [ $\text{M}^+$ , 30%], 135.09 [100%].

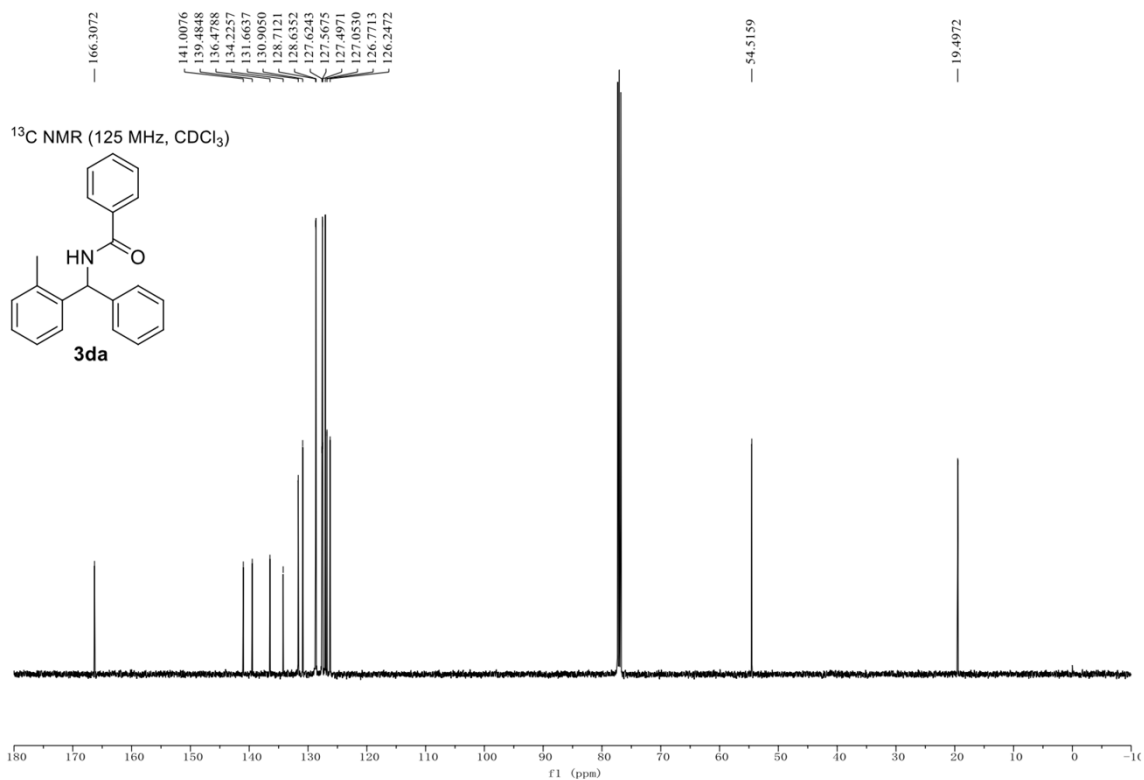
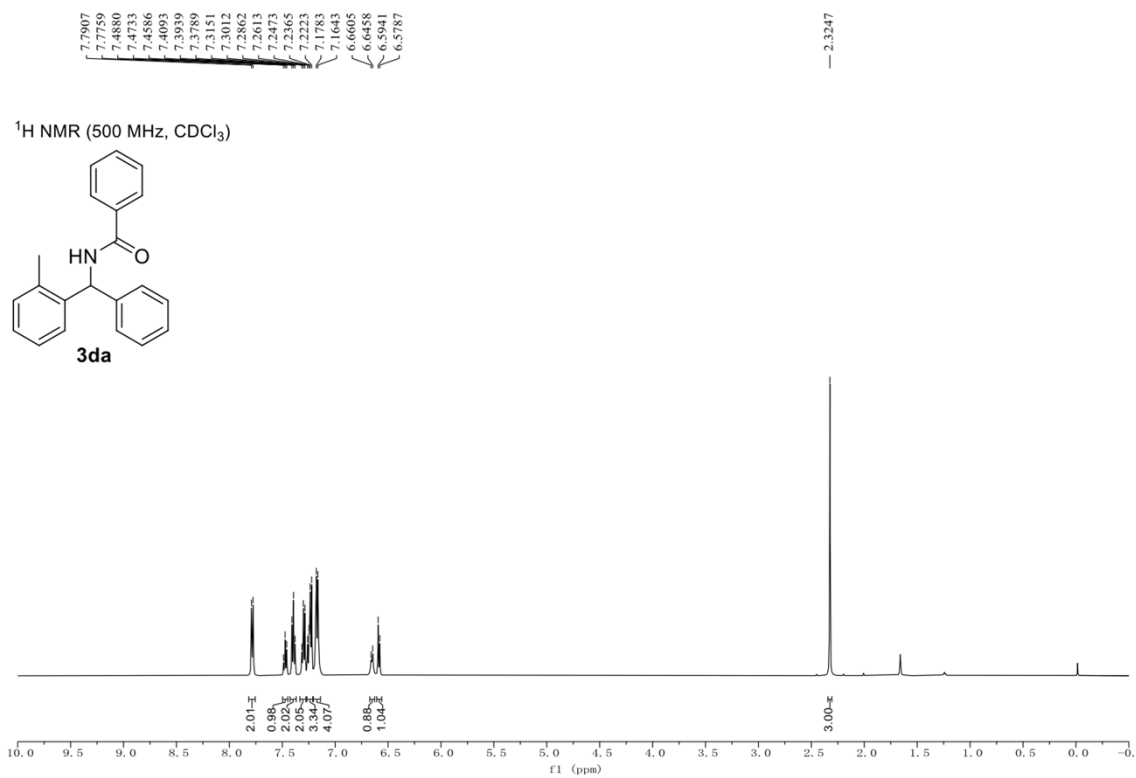
## 4 NMR data

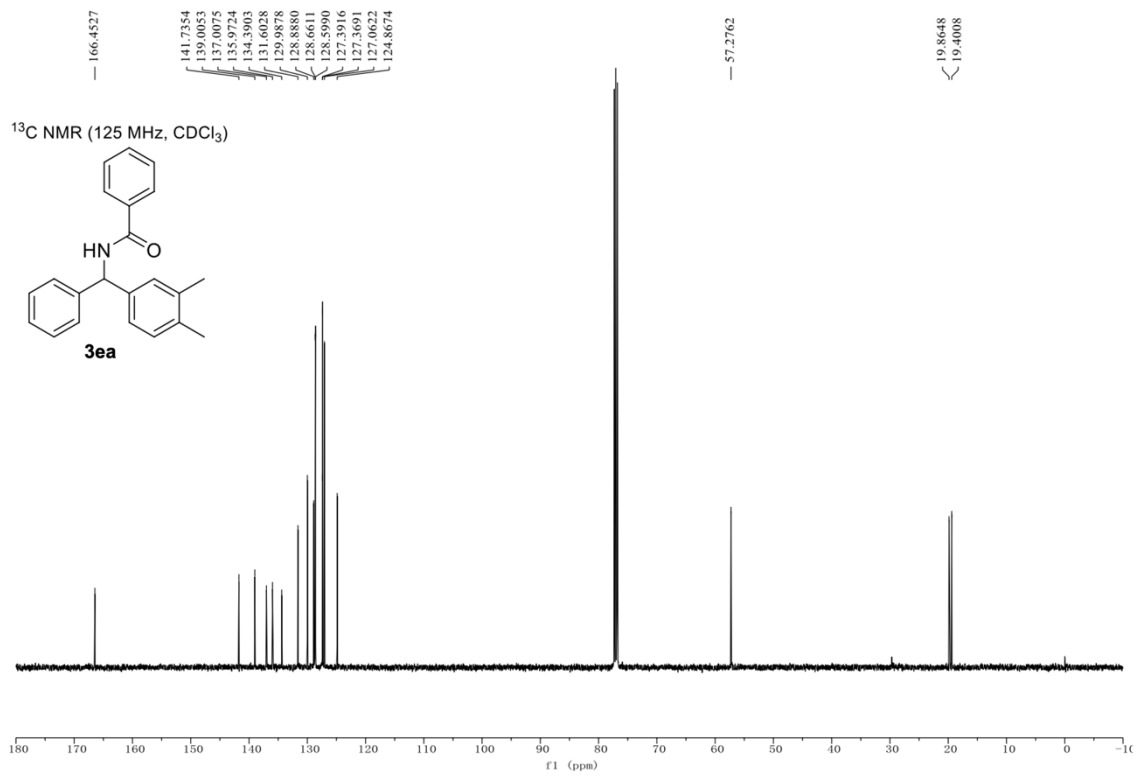
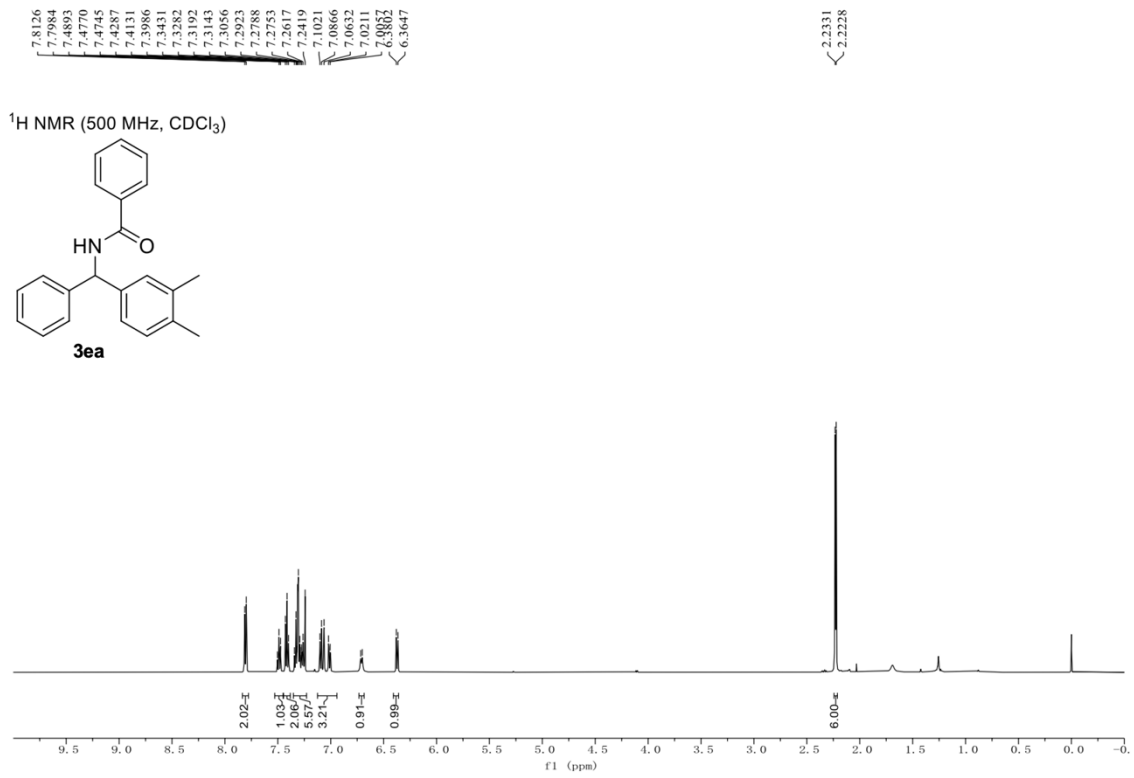


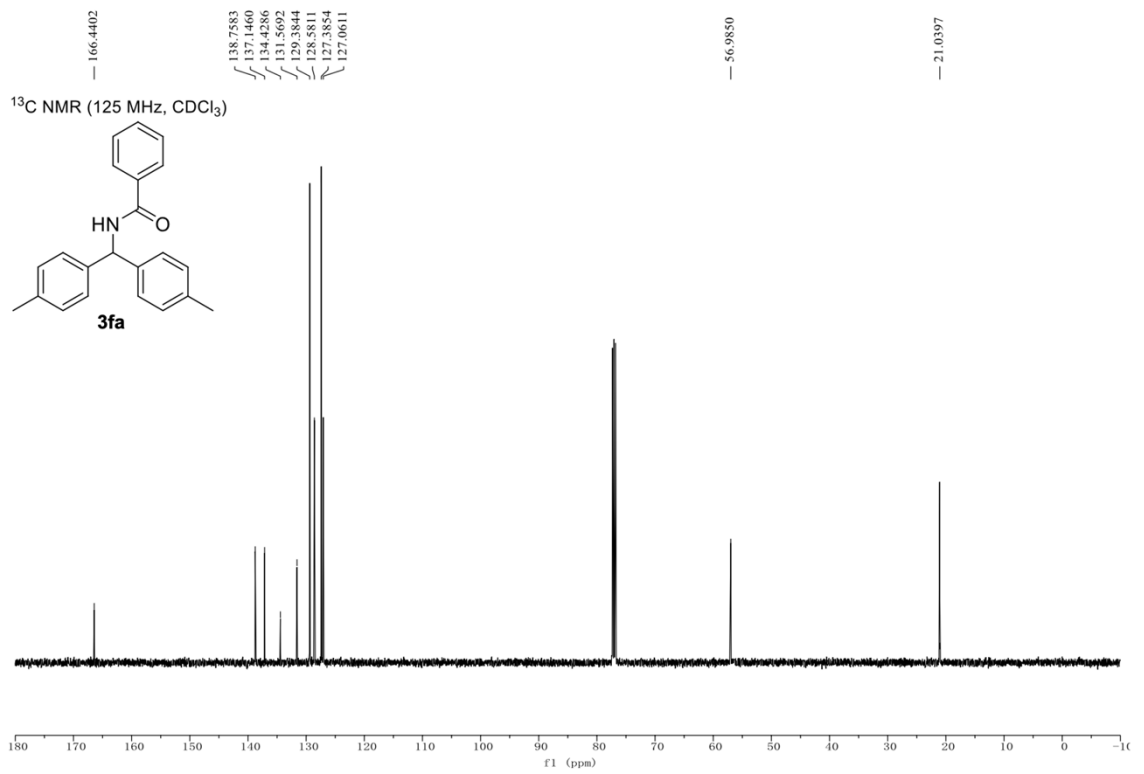
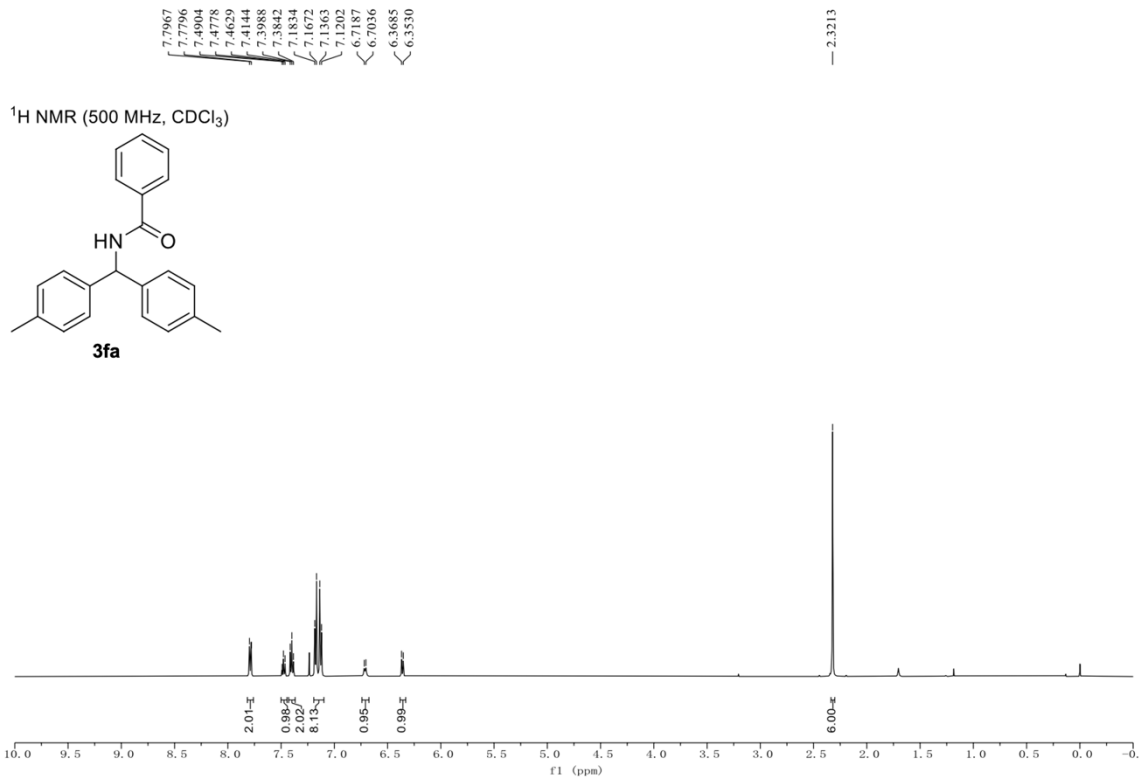


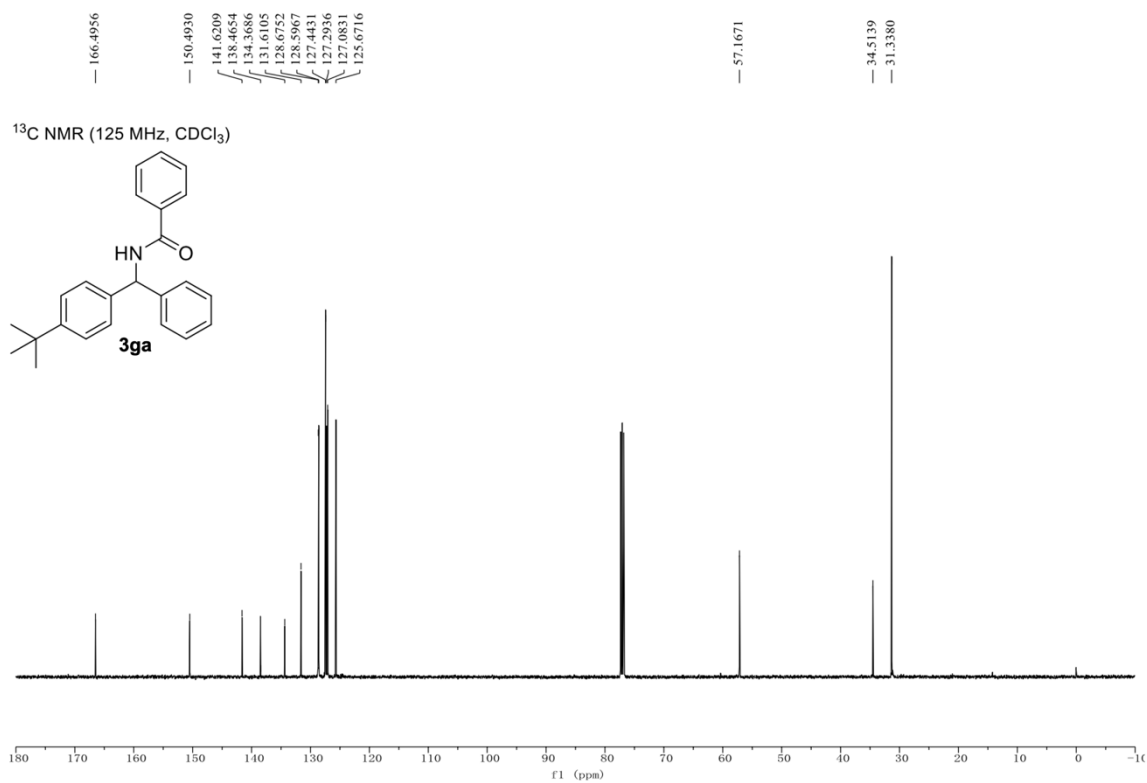
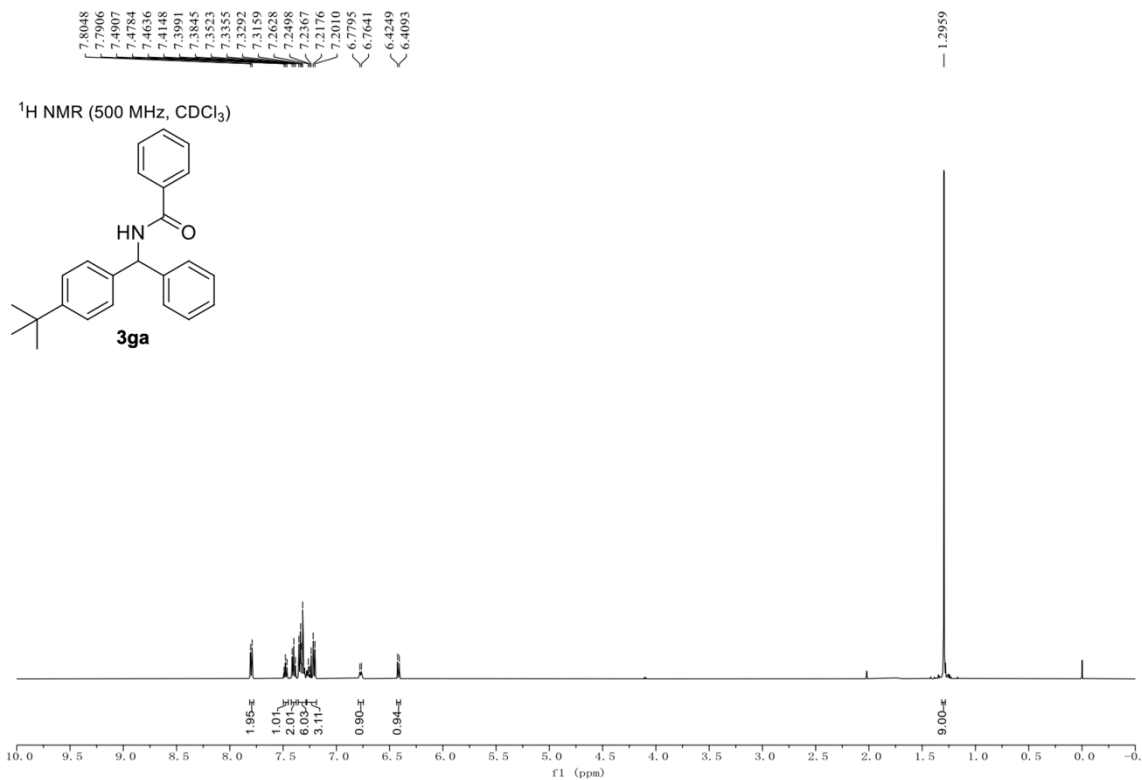


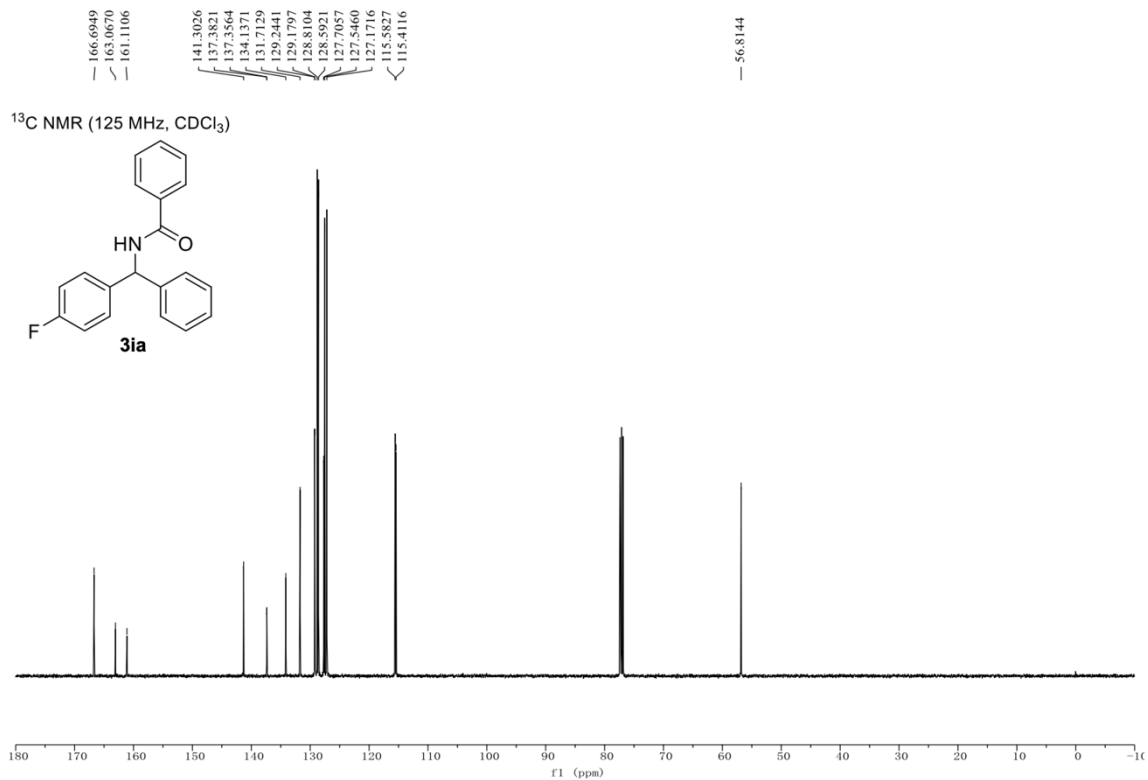
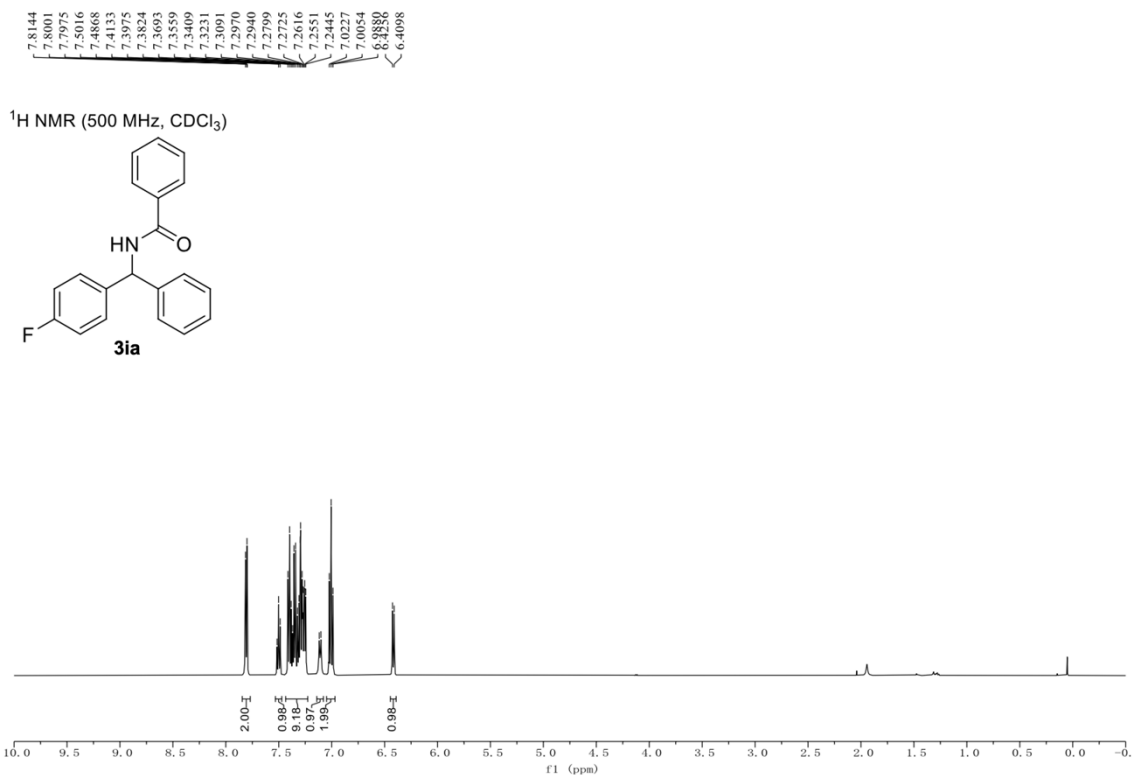


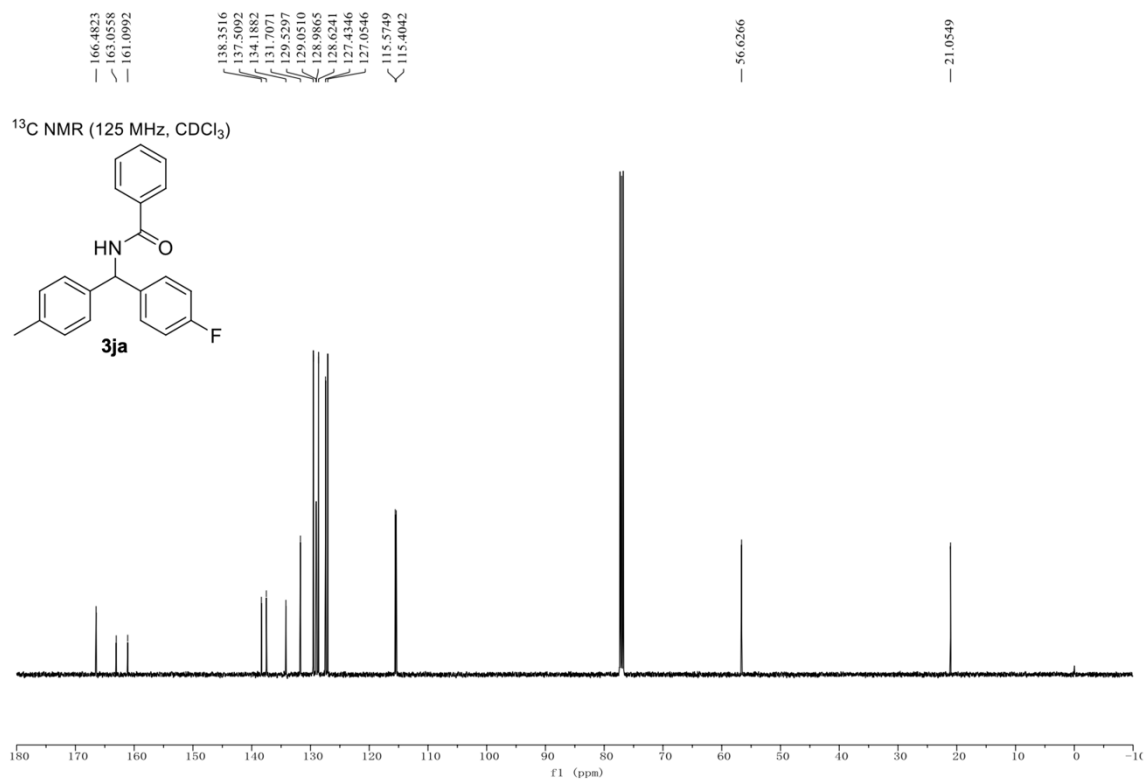
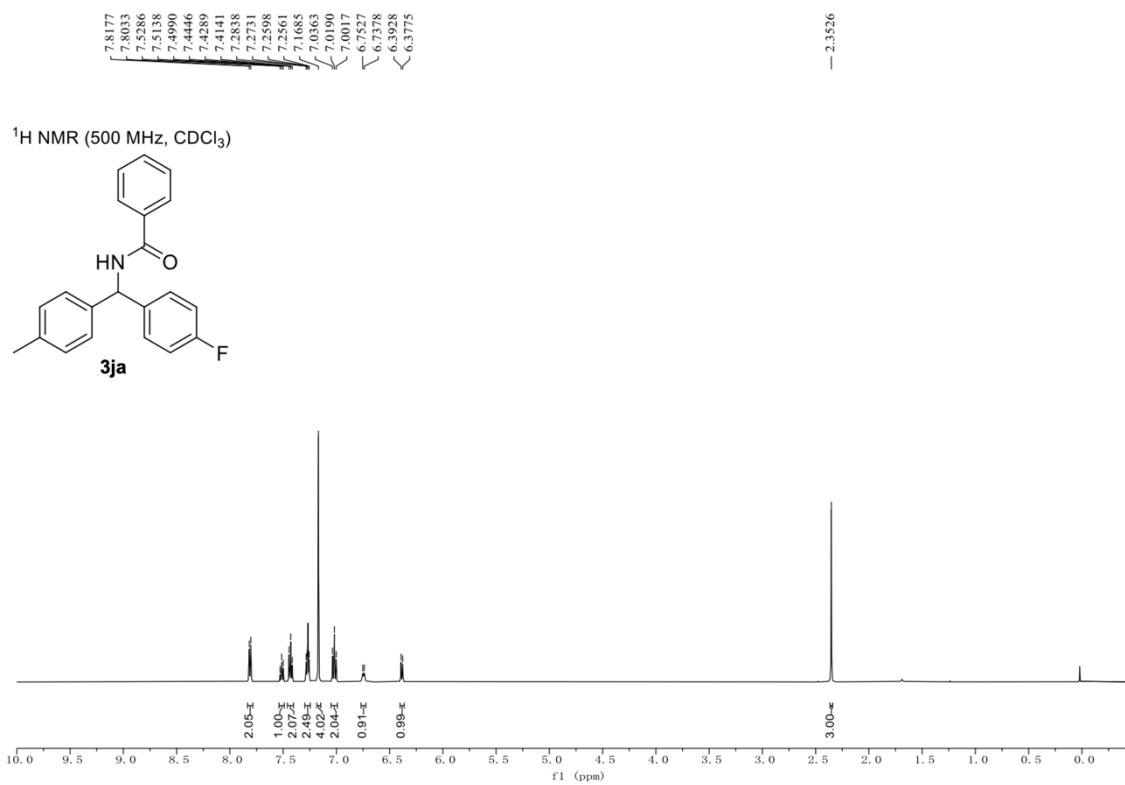


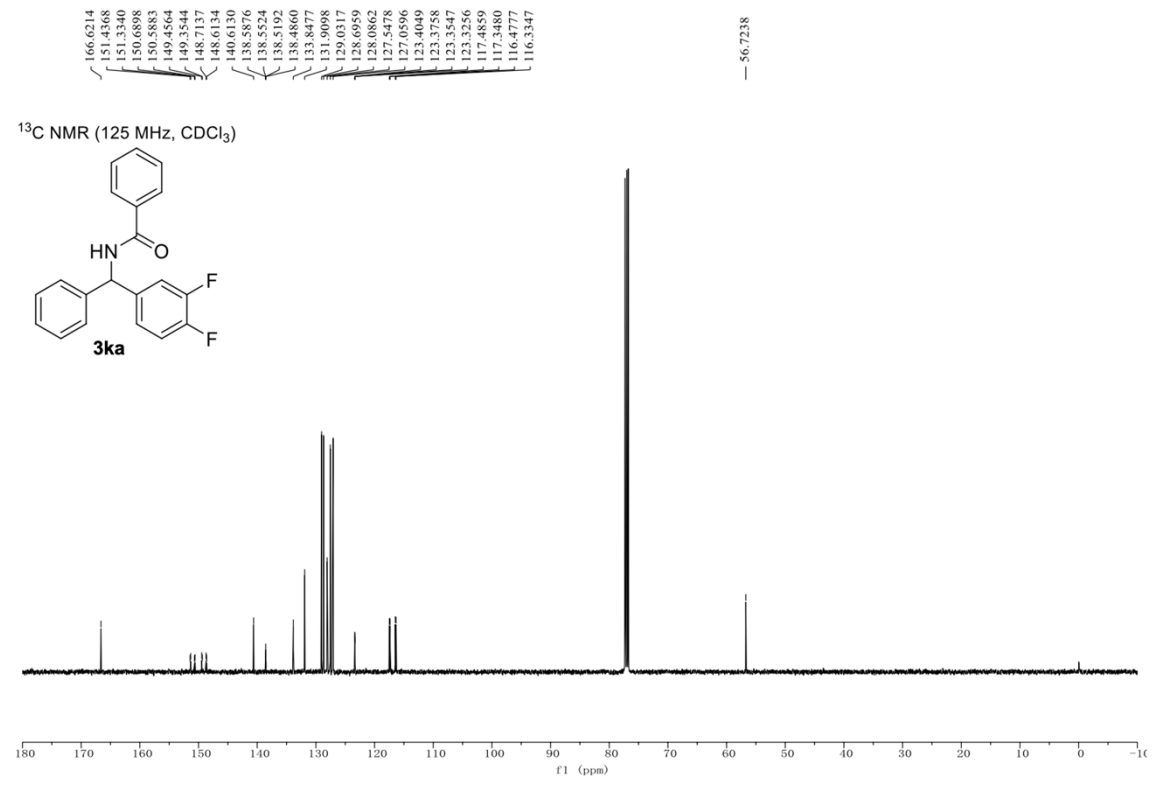
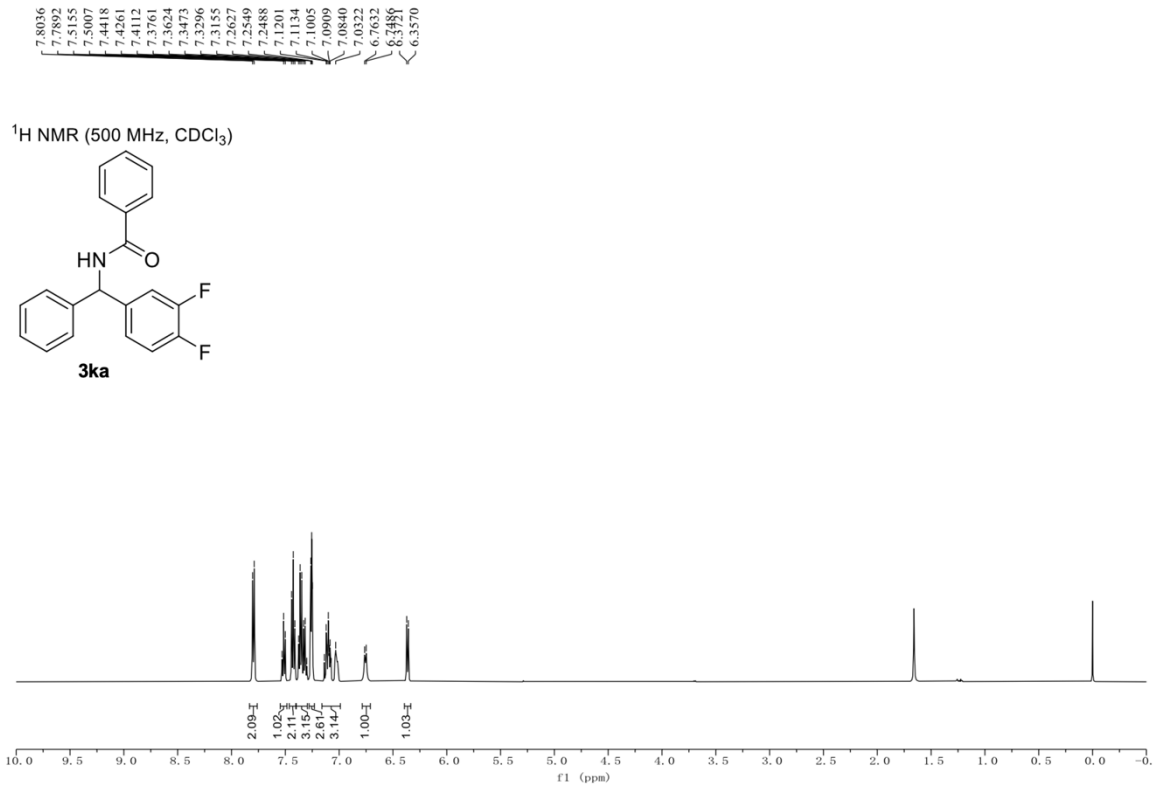




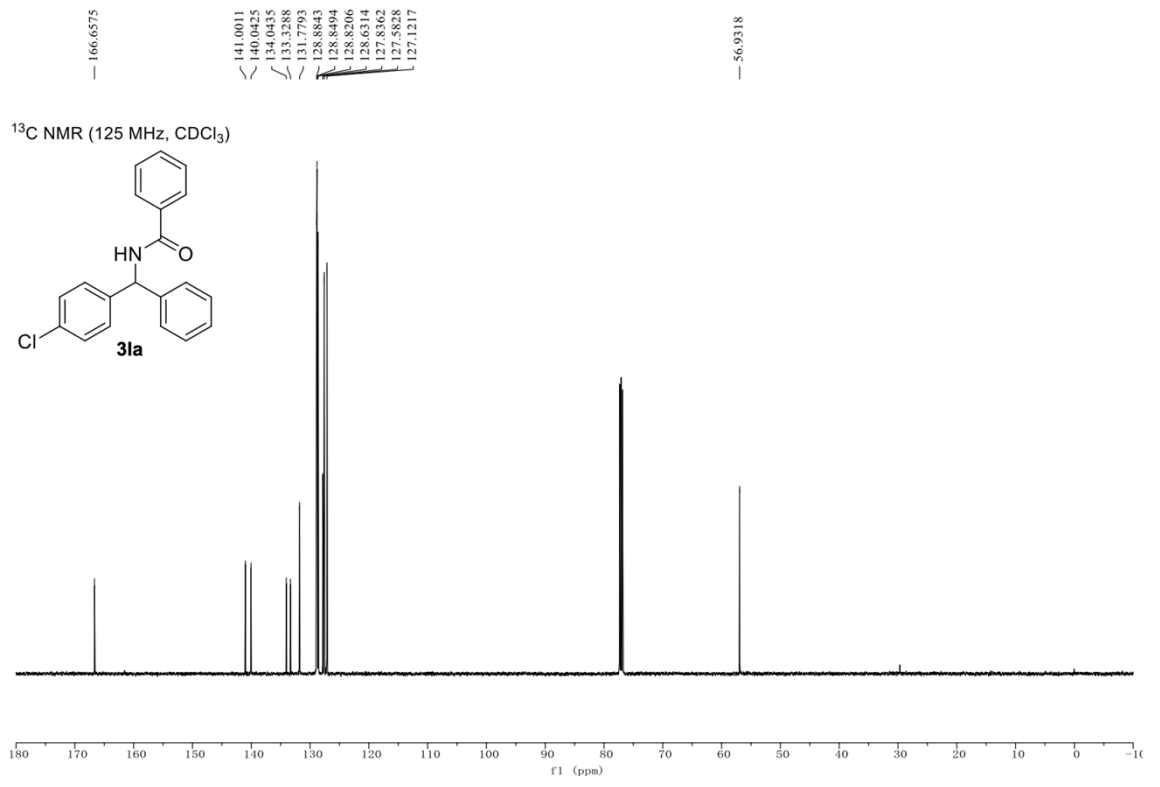
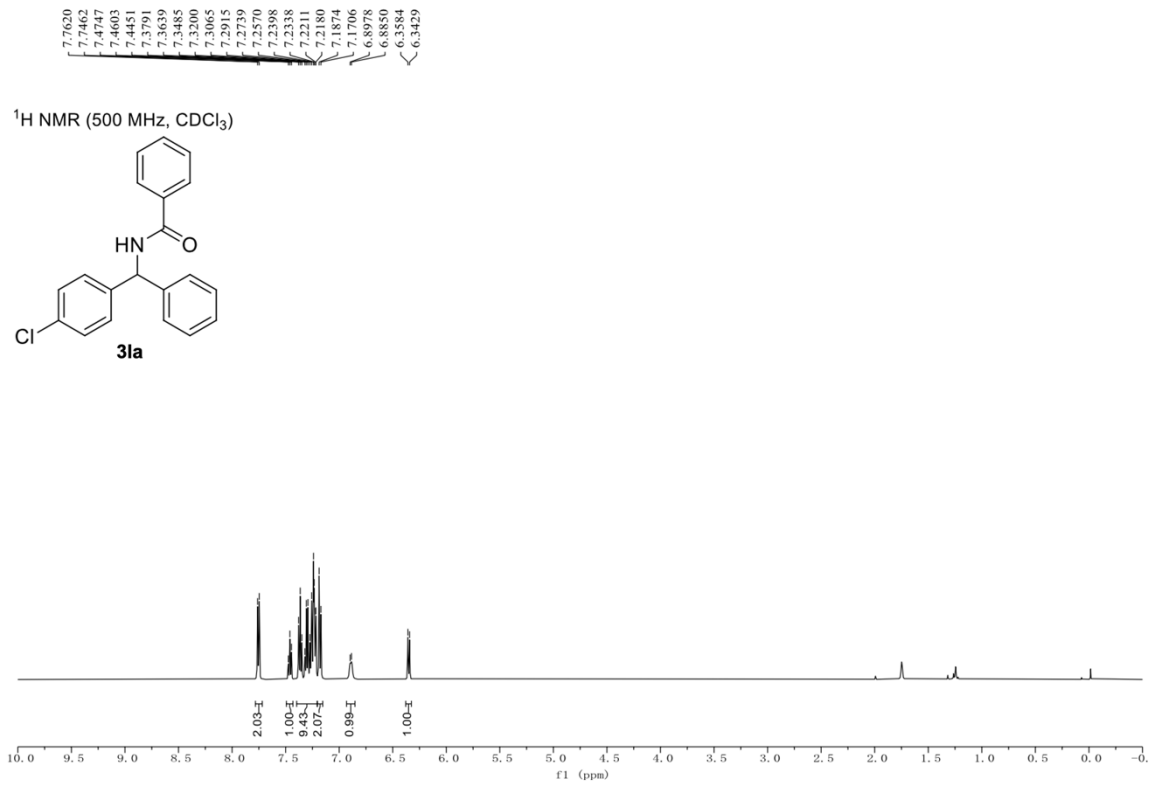


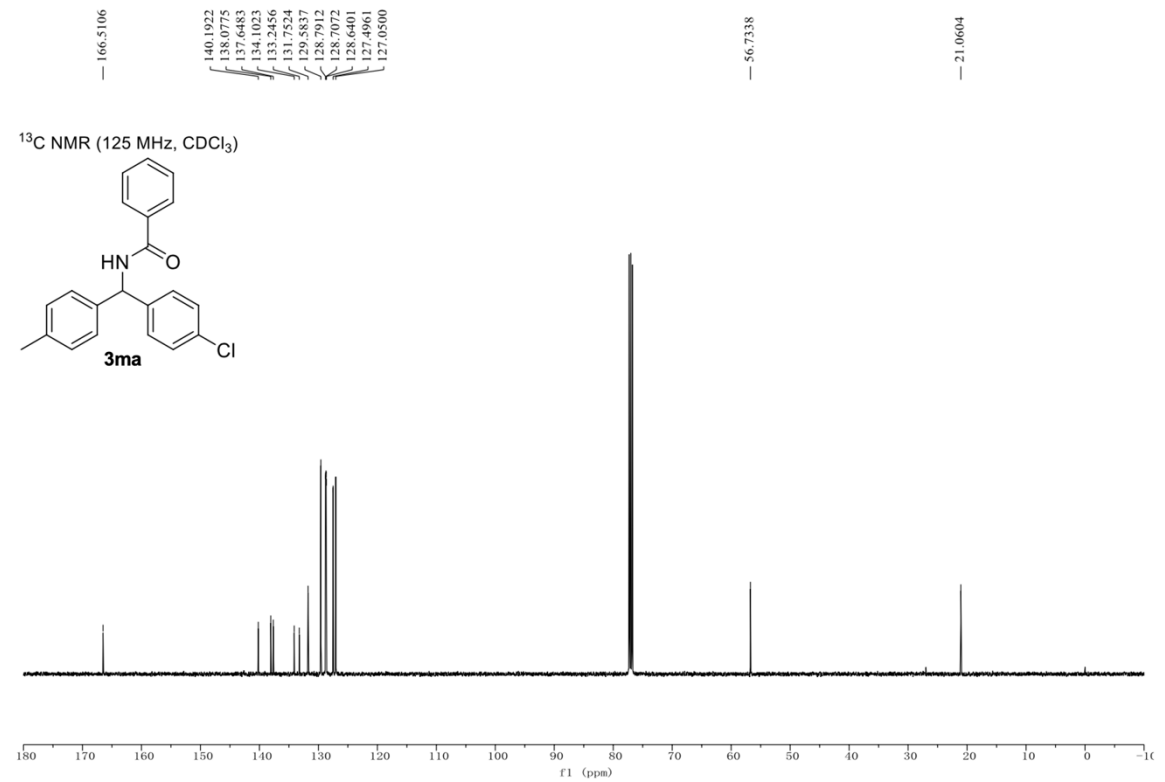
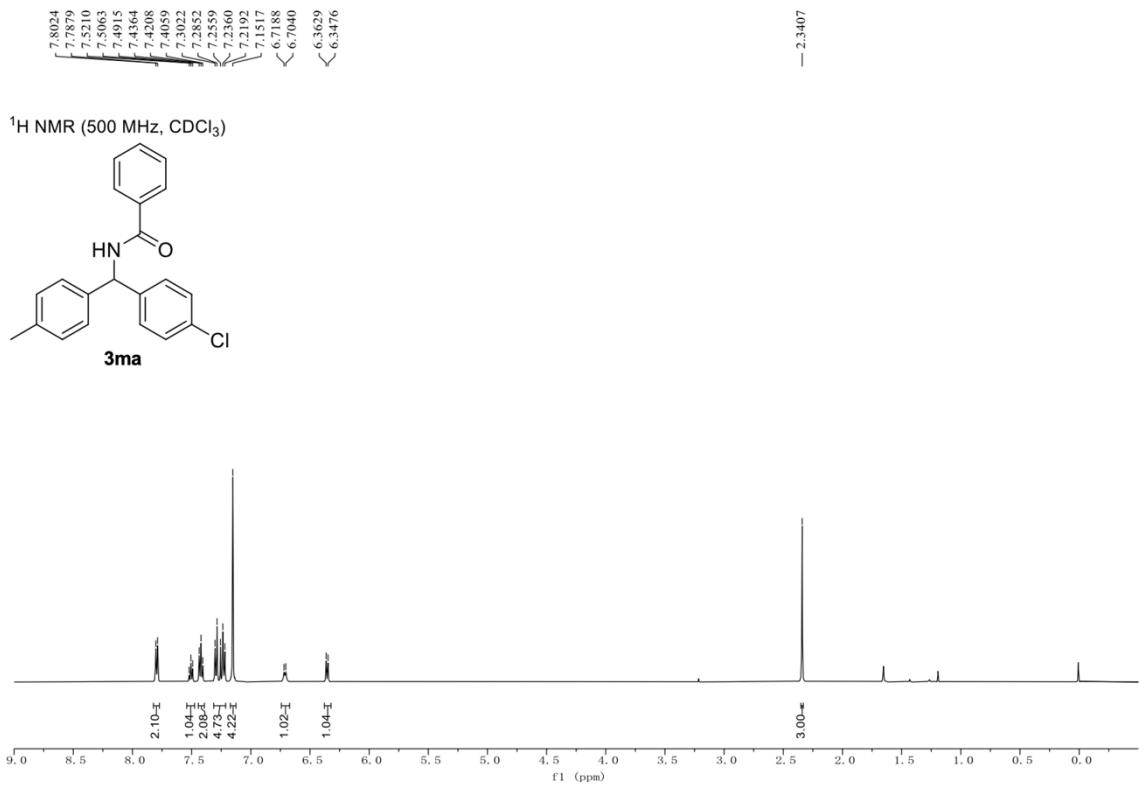


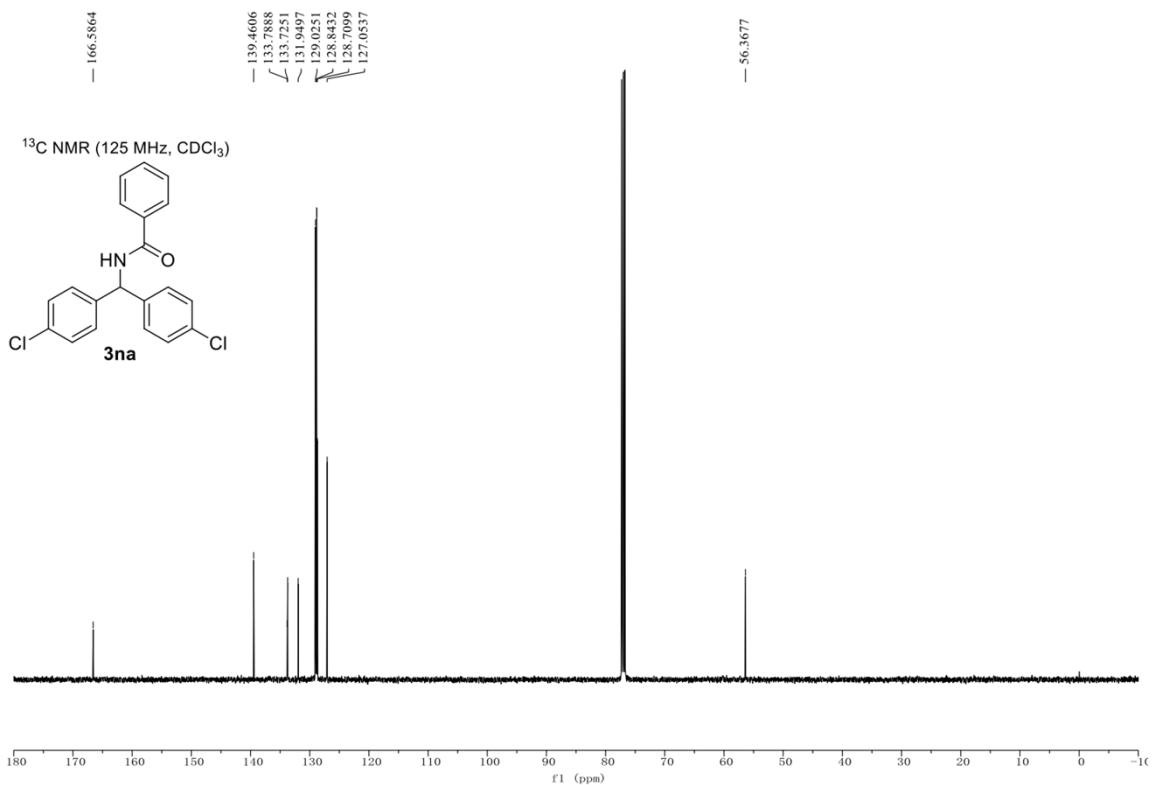
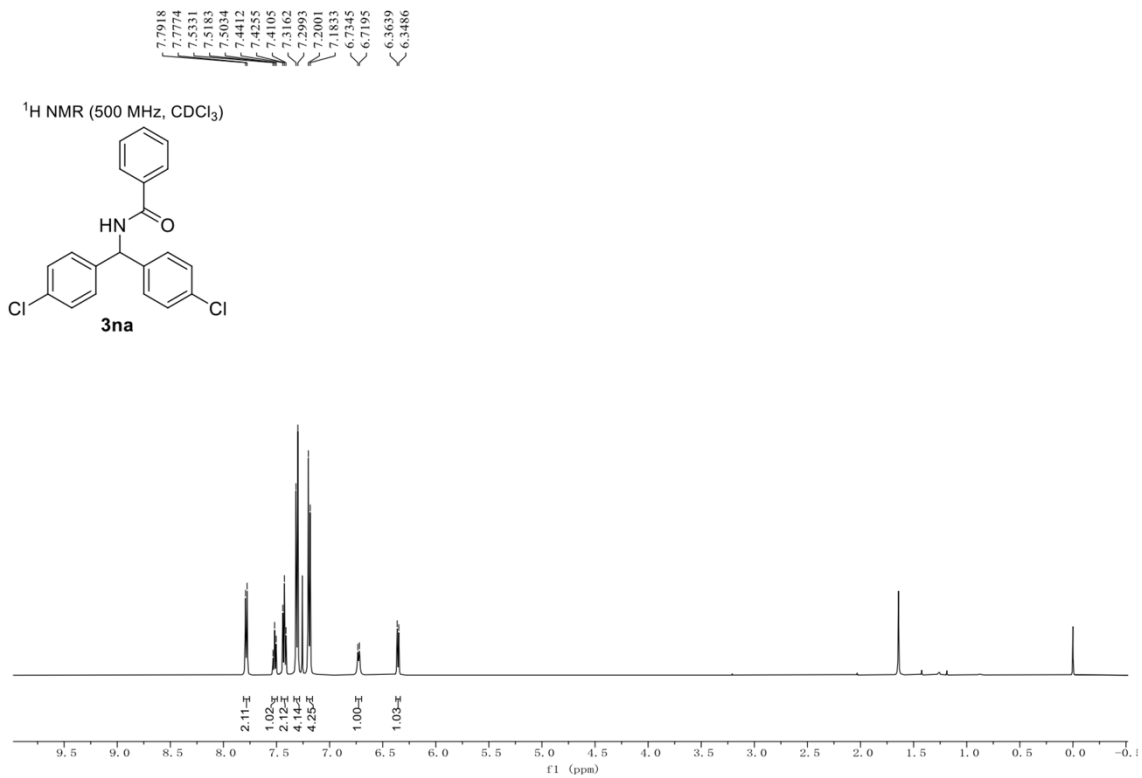


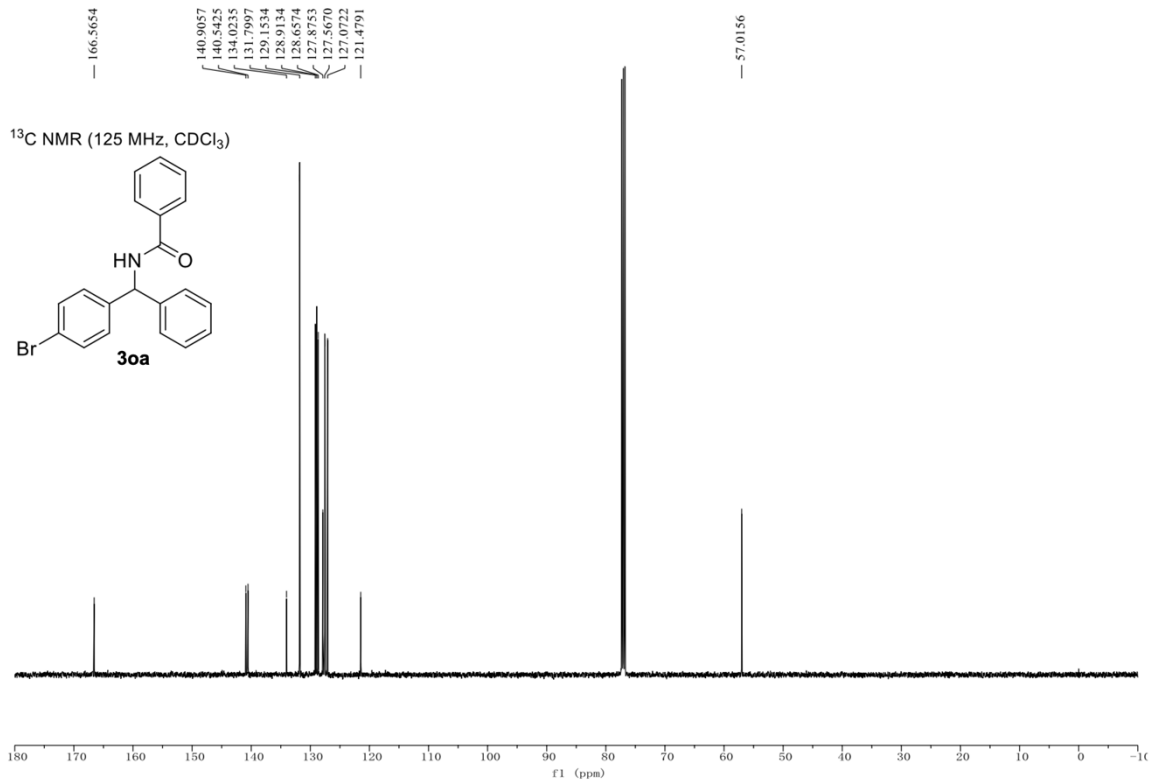
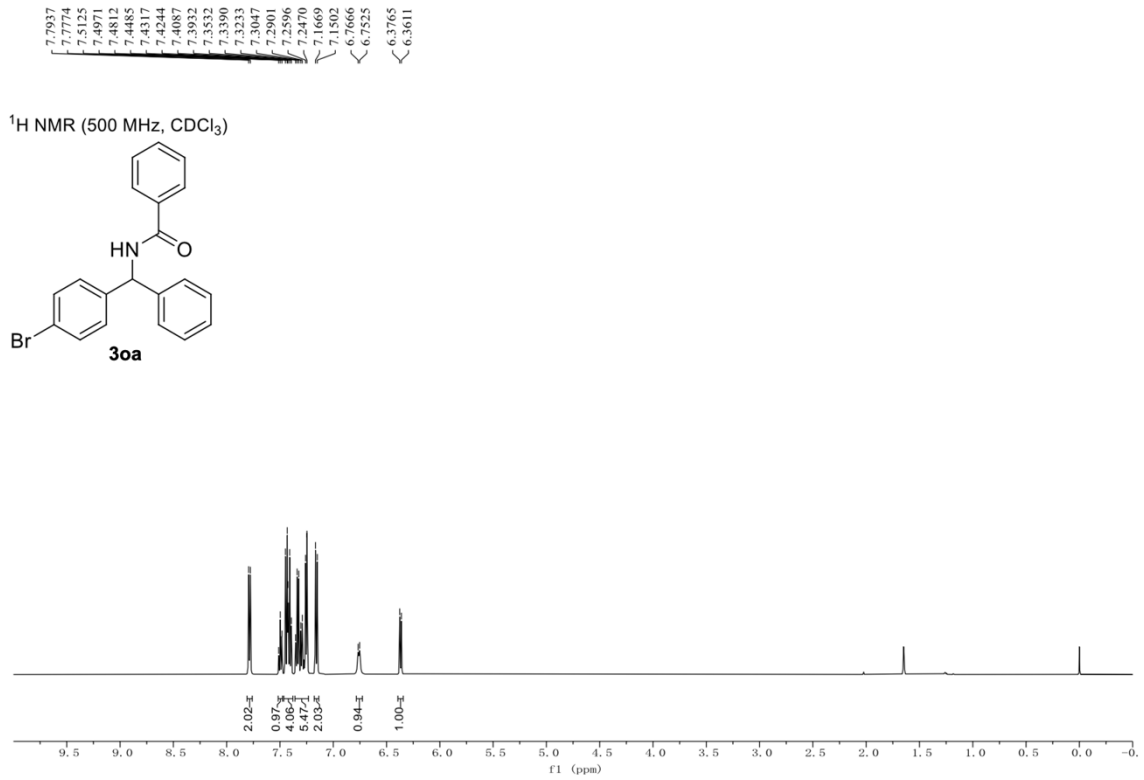


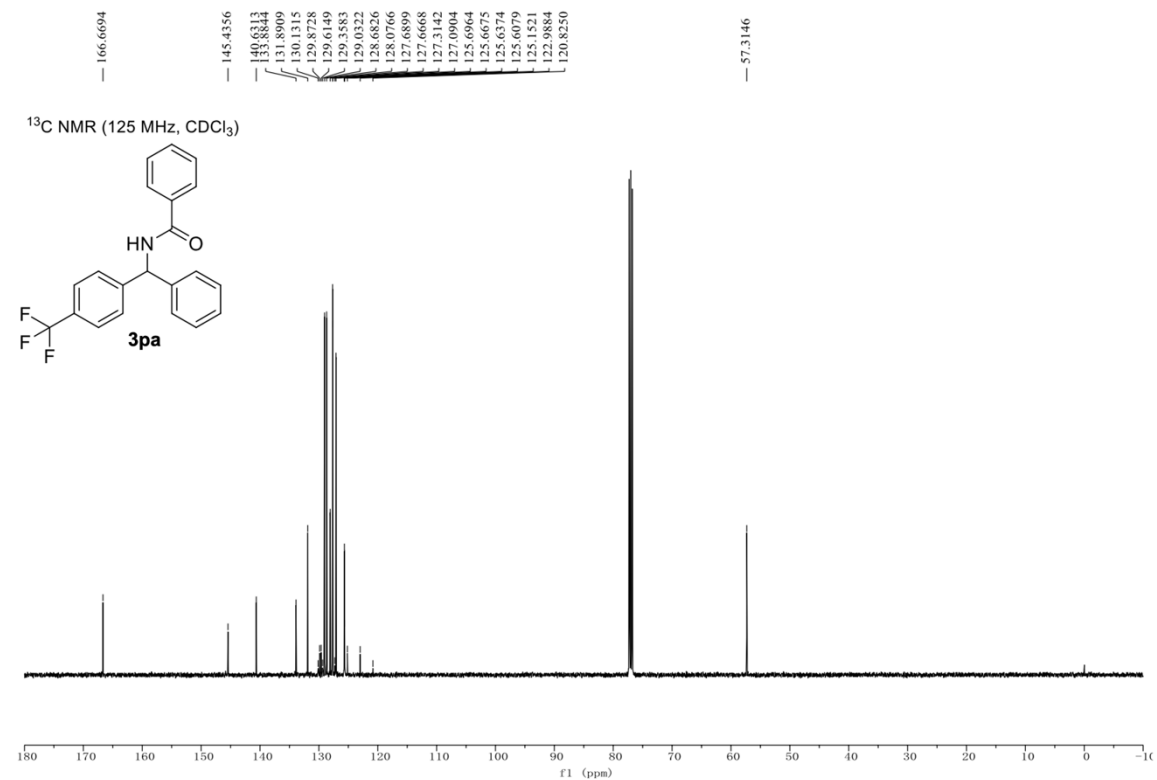
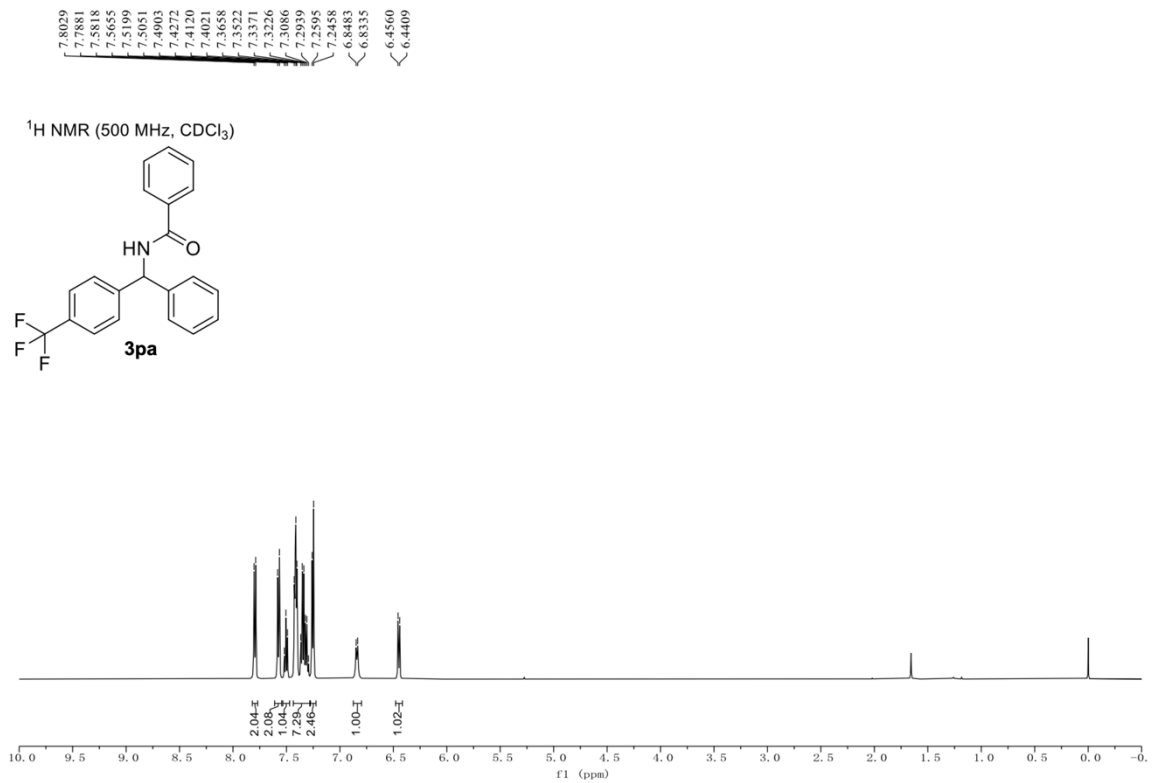


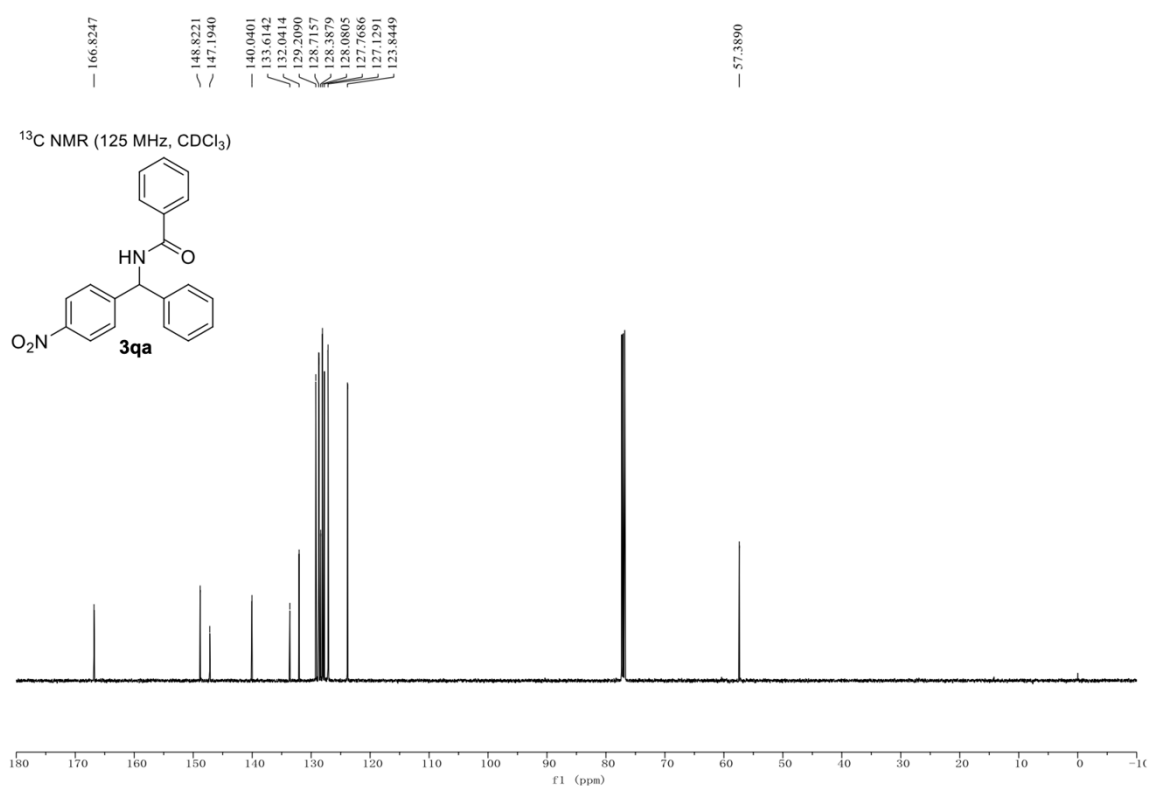
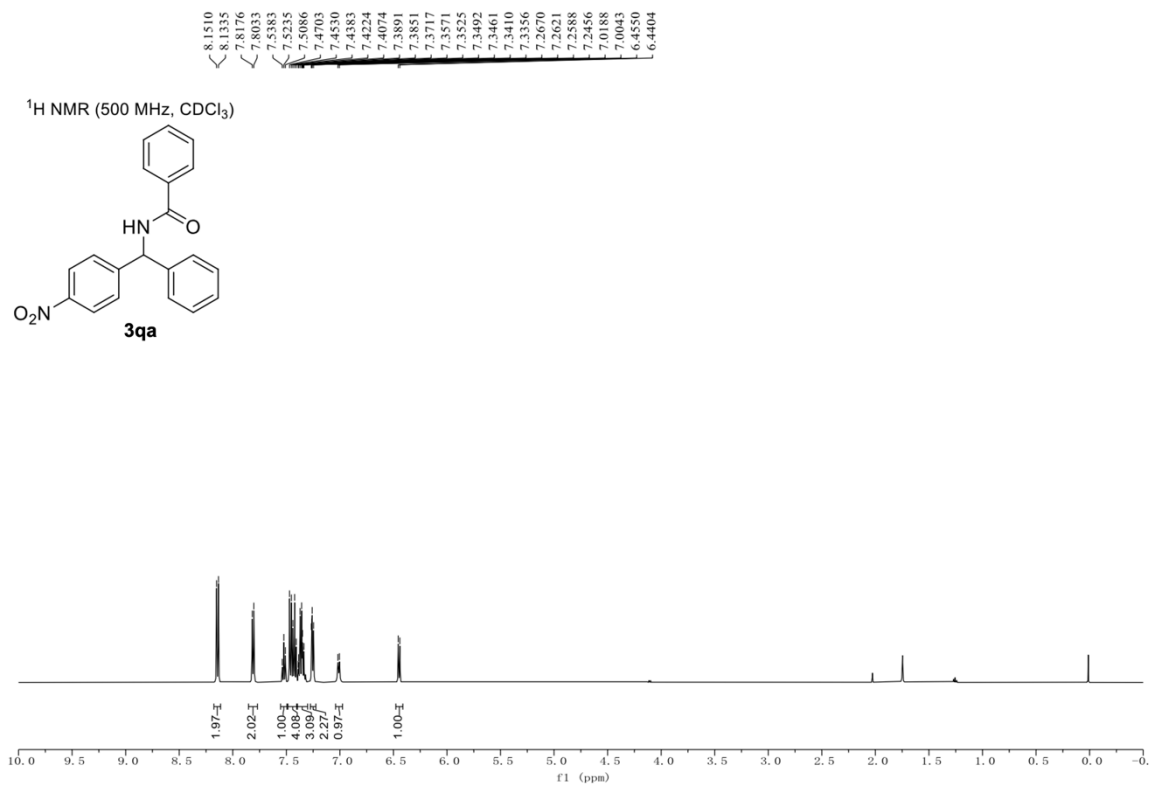


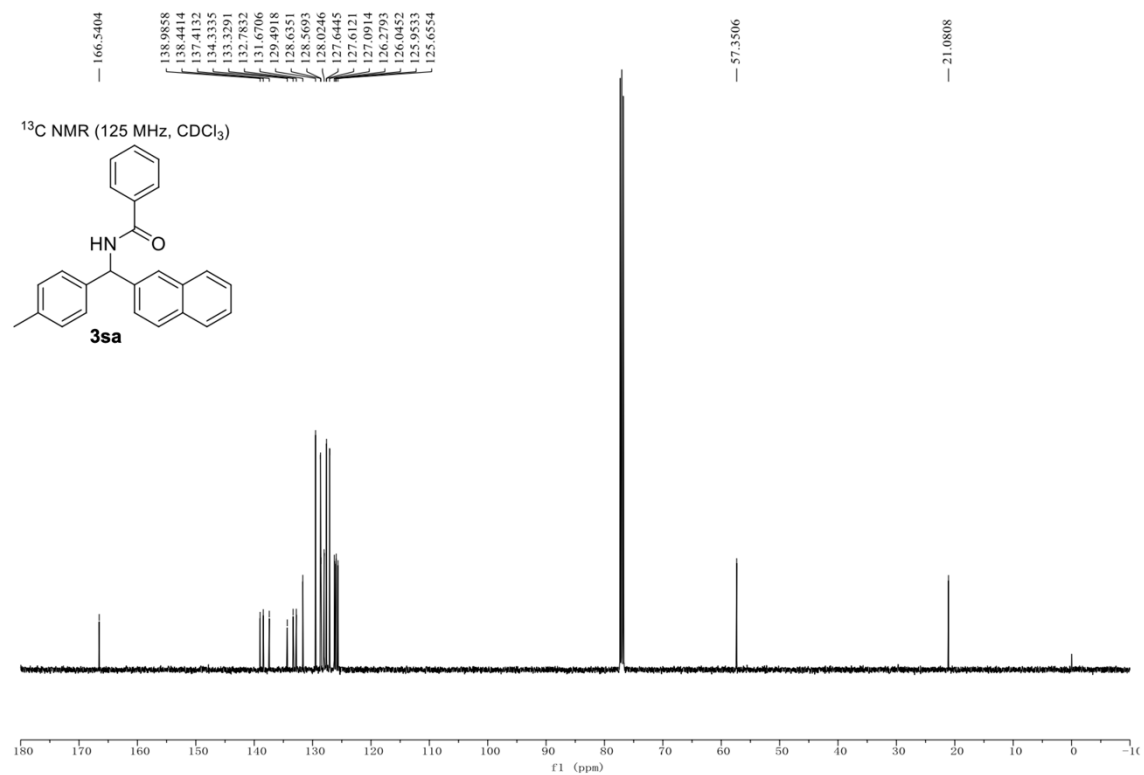
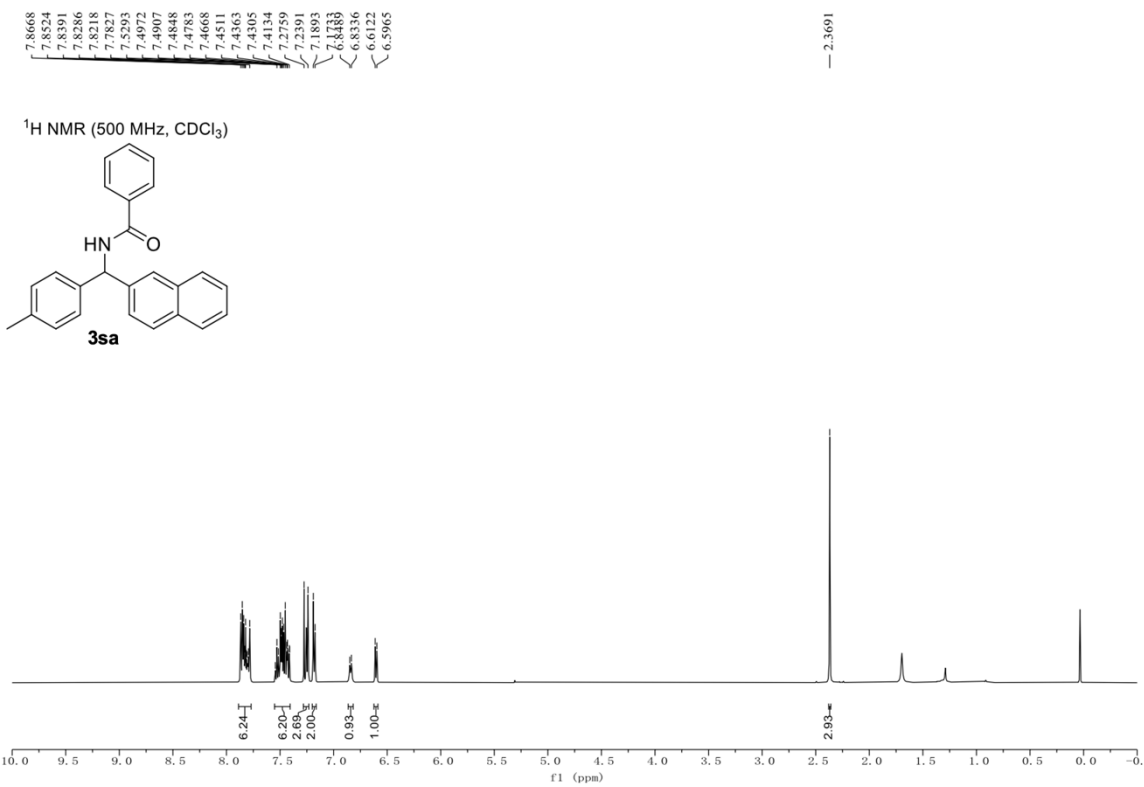


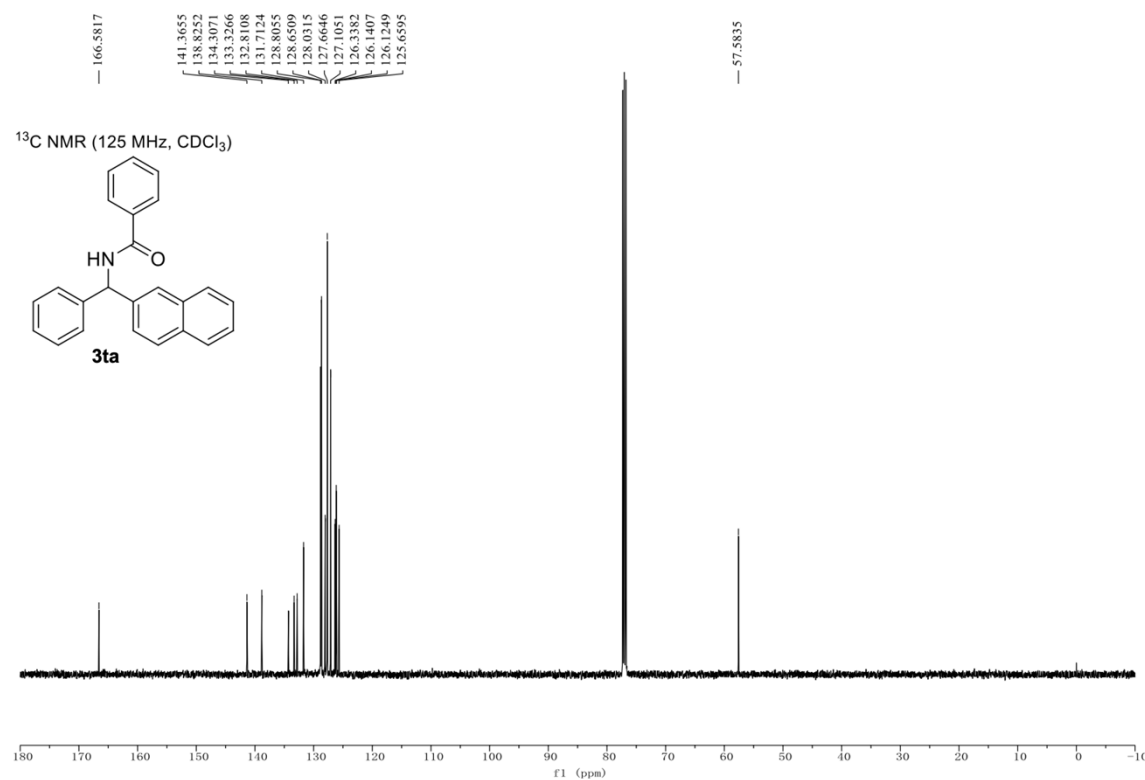
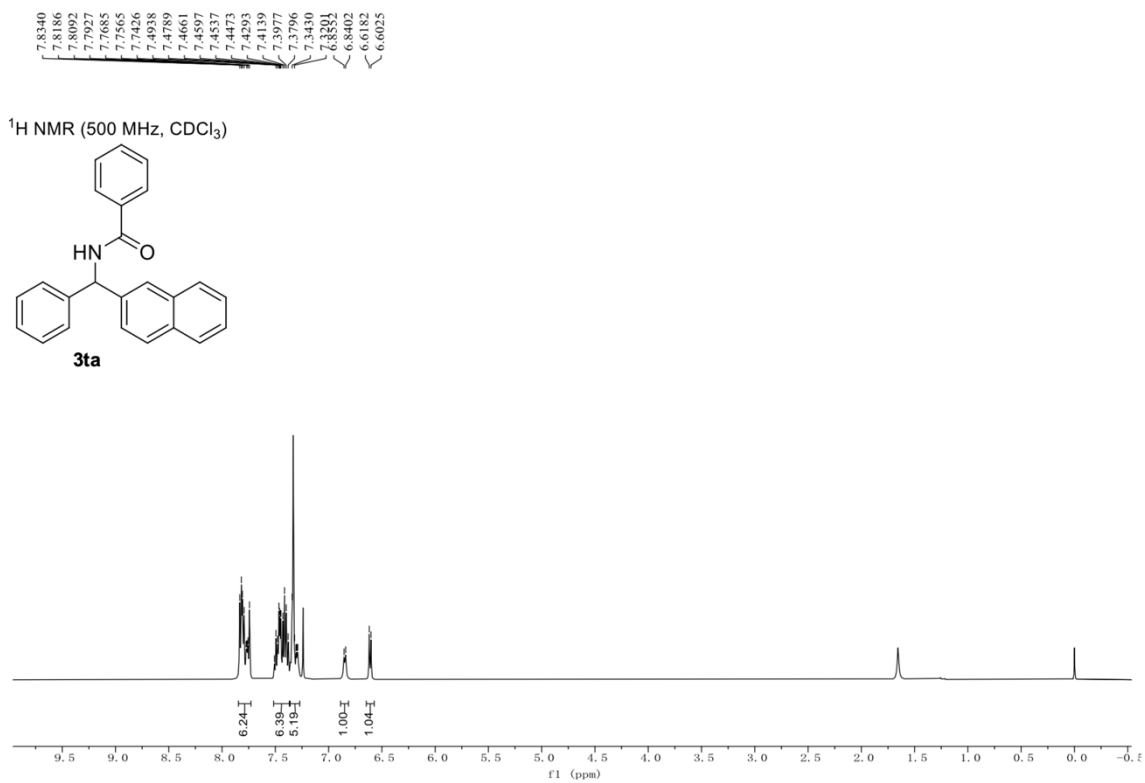




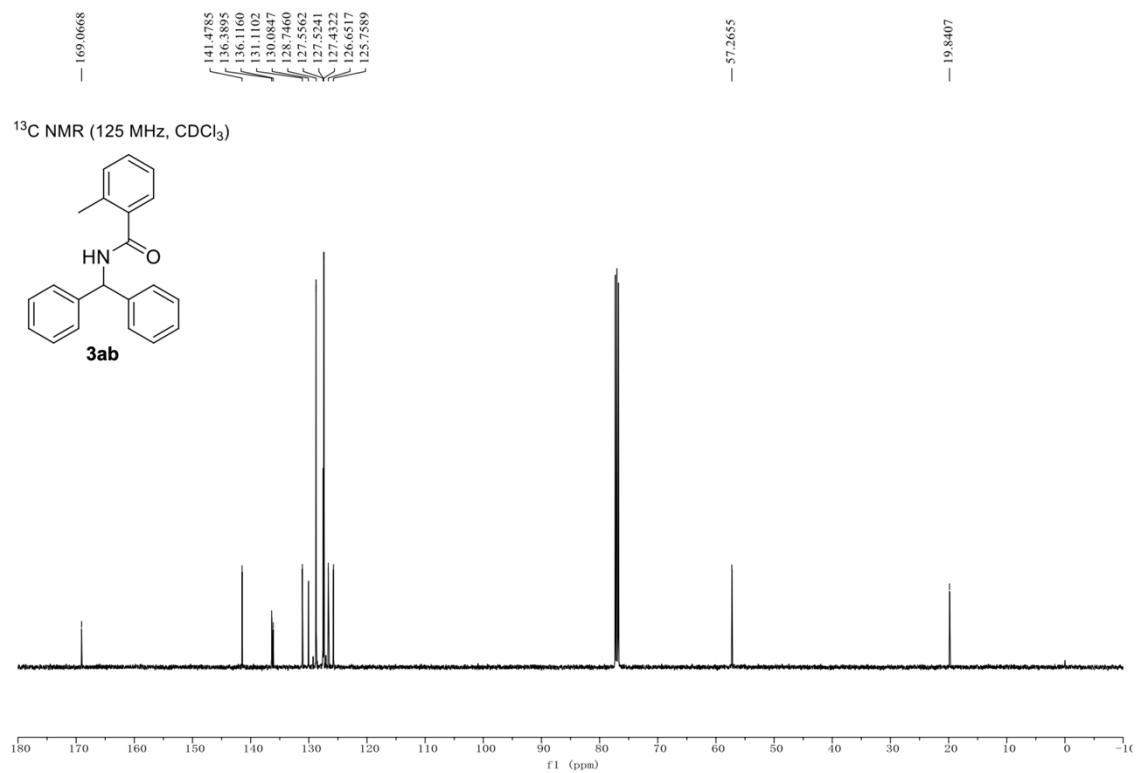
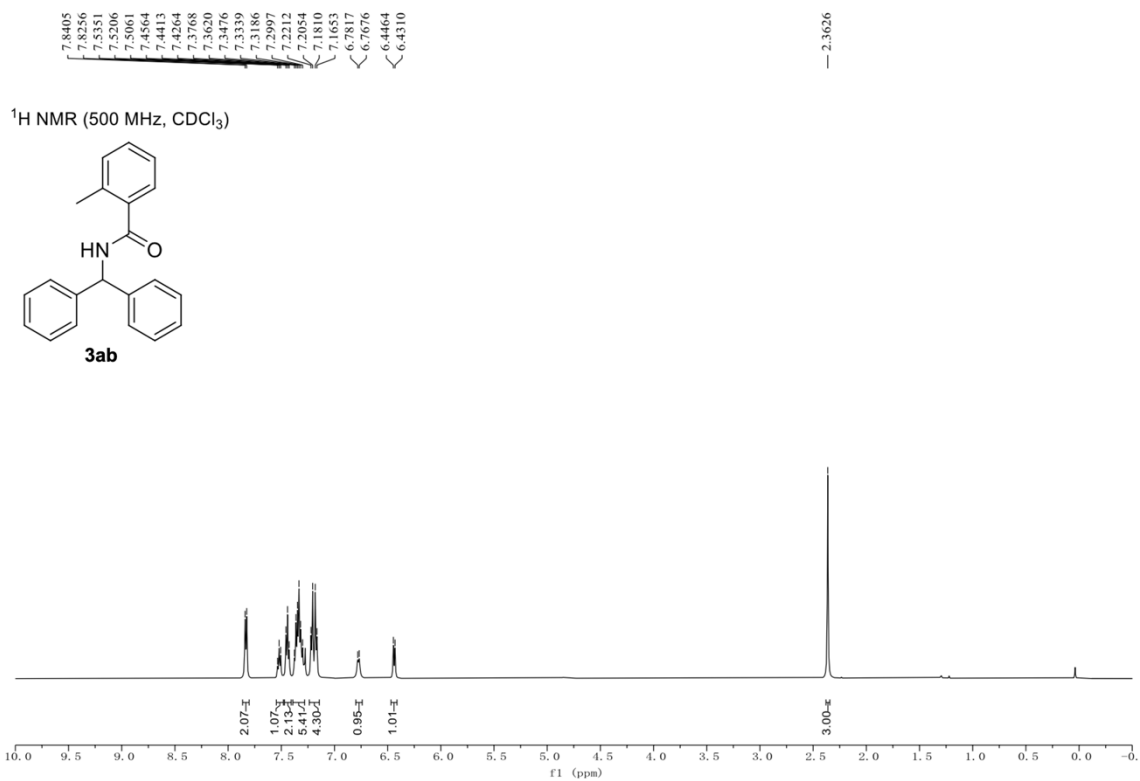


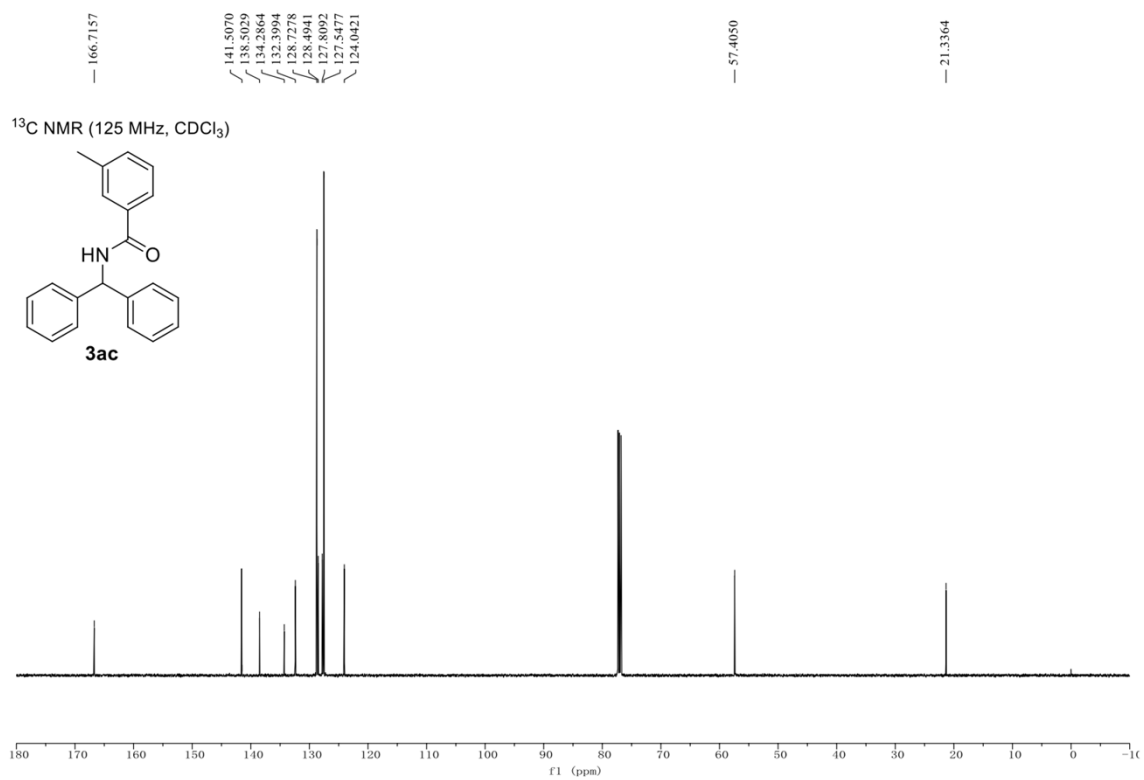
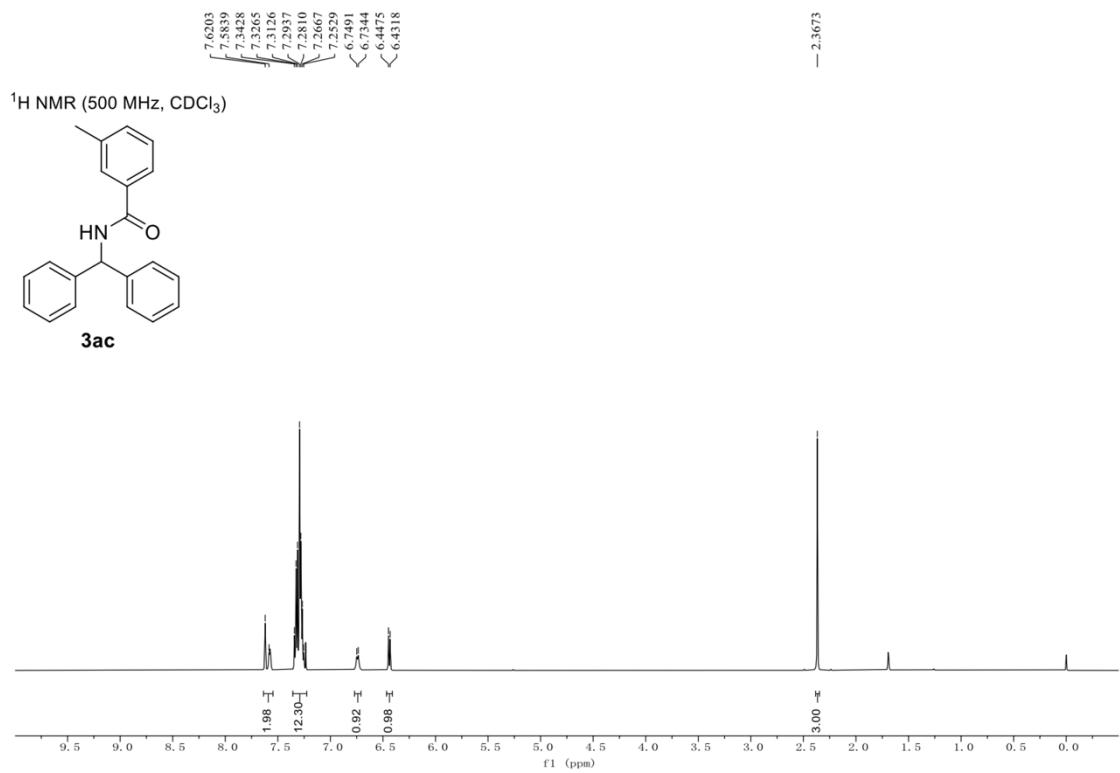


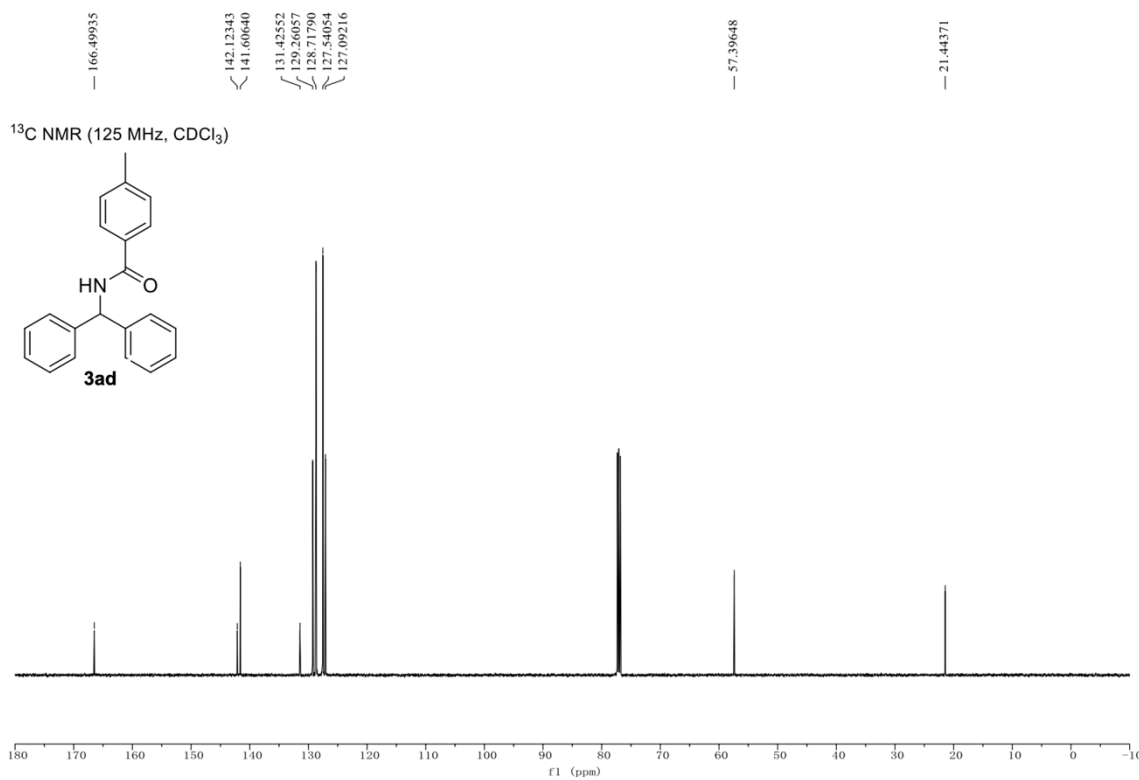
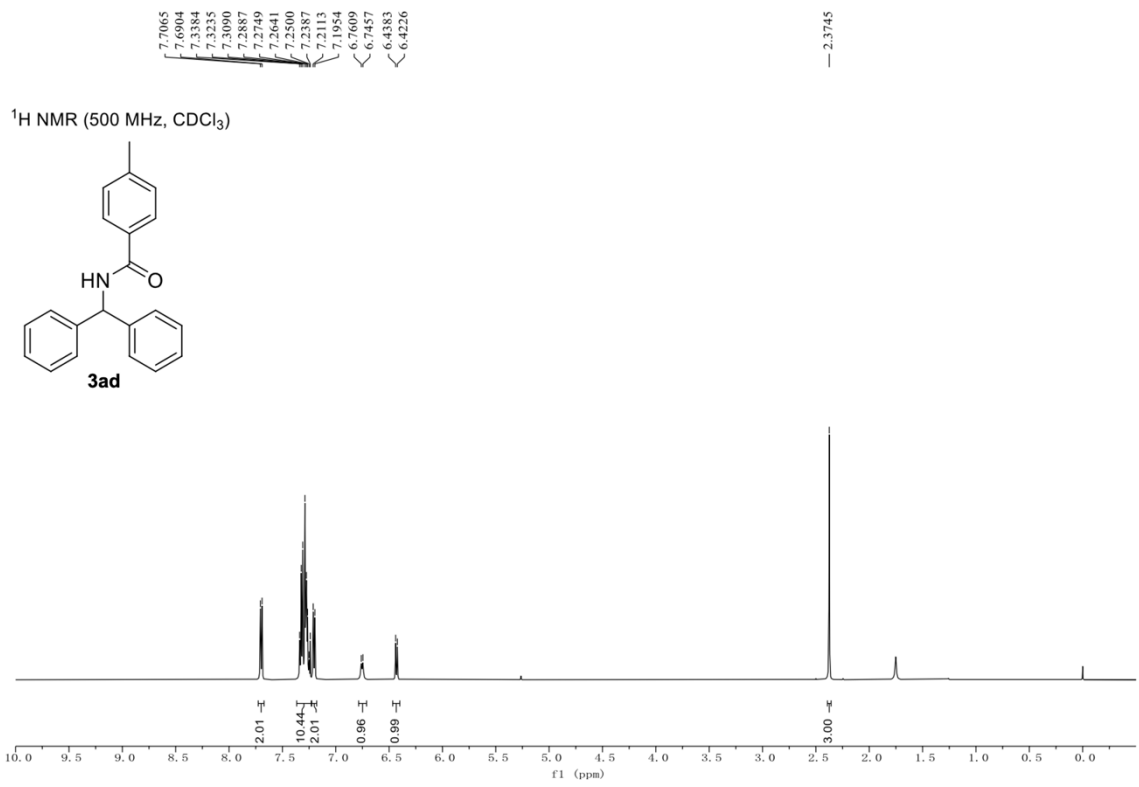






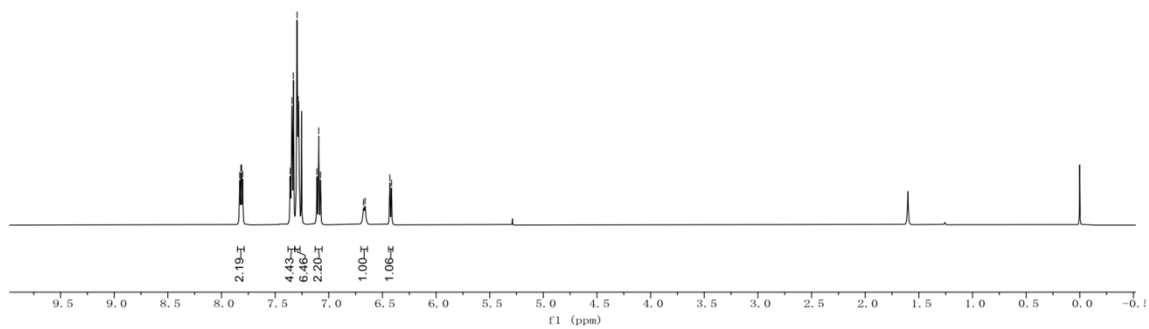
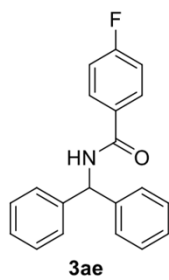






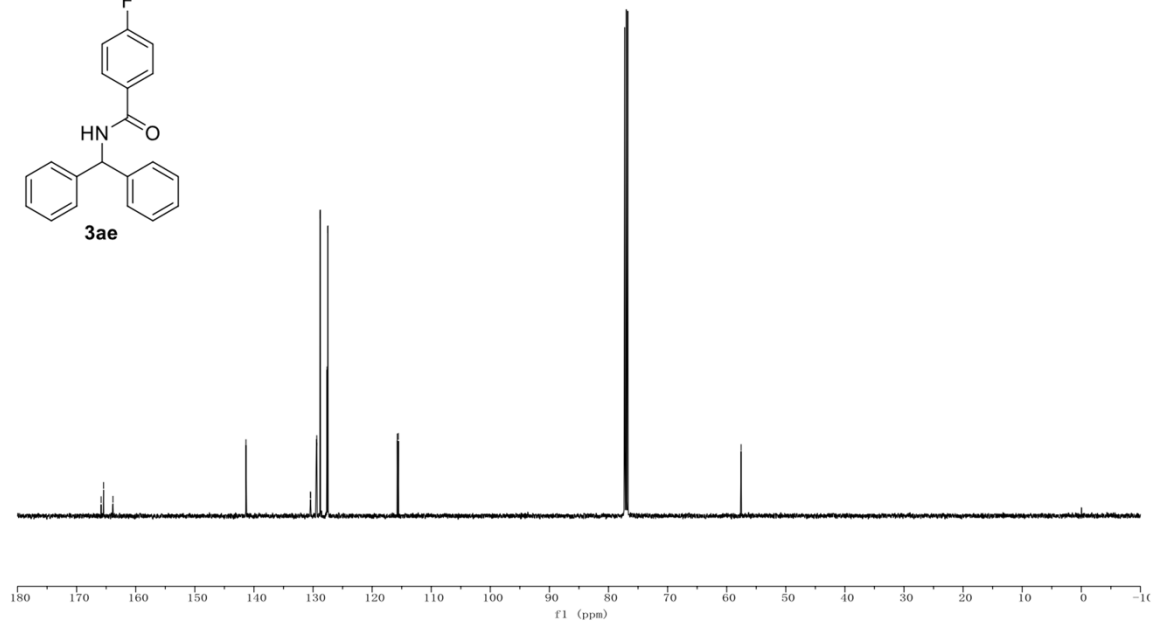
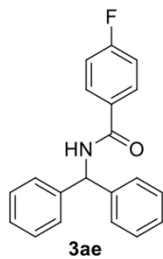
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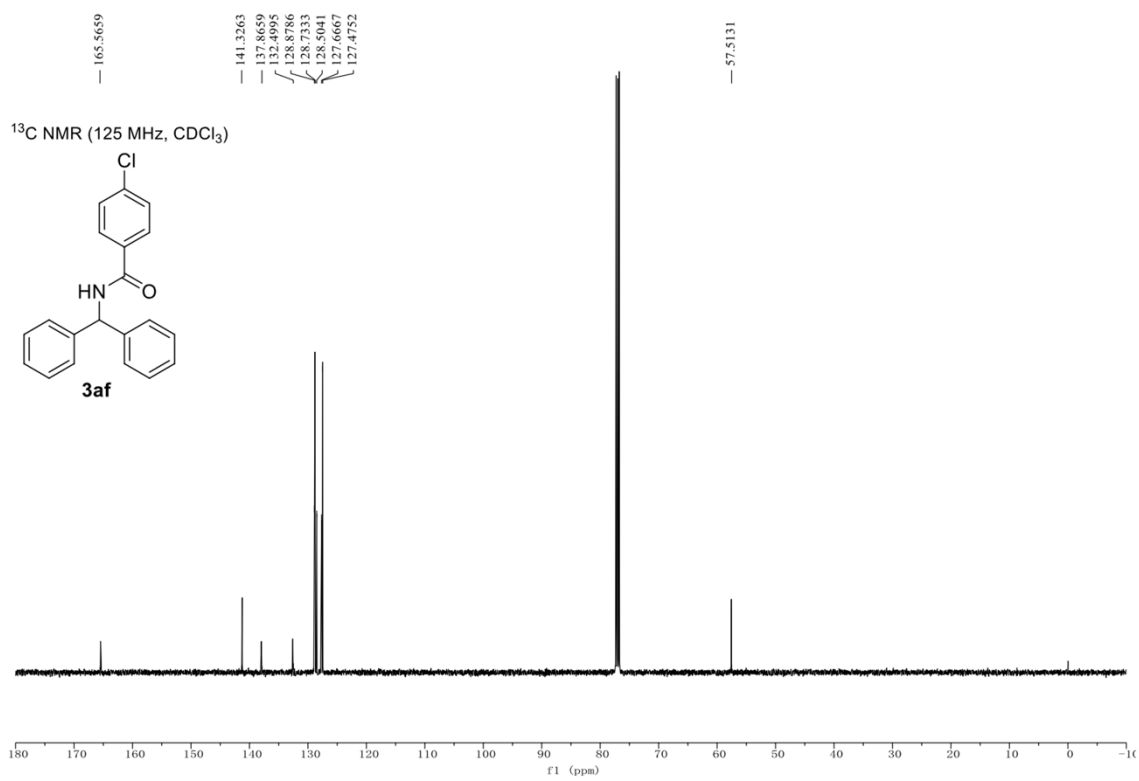
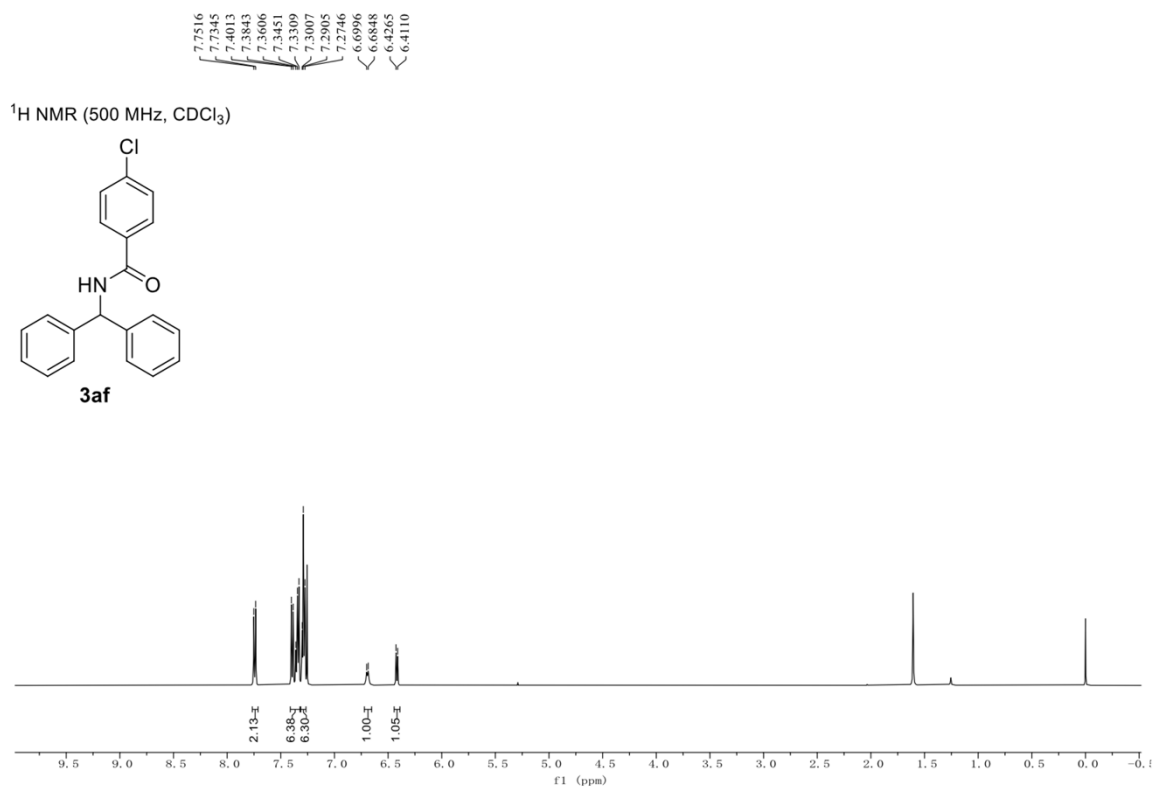
<sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)



165.8554  
165.4428  
163.8508  
141.3527  
130.4373  
130.4115  
129.4392  
129.3679  
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127.6311  
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57.5633

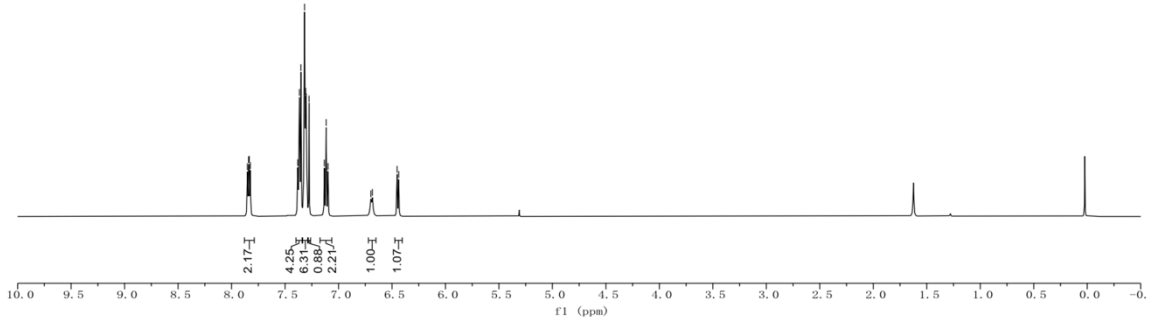
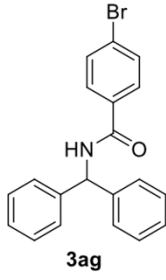
<sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>)





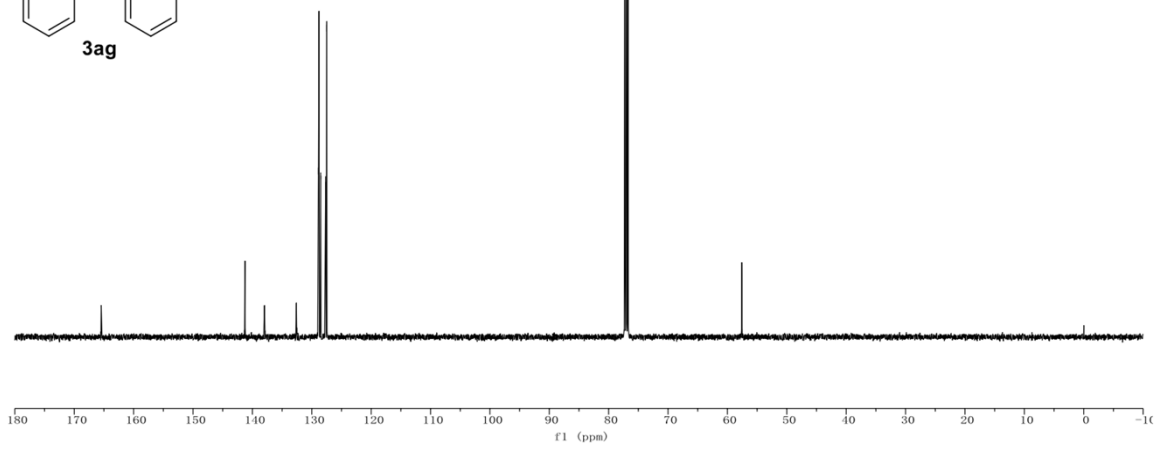
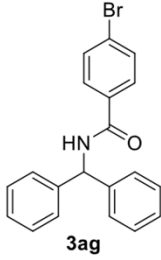
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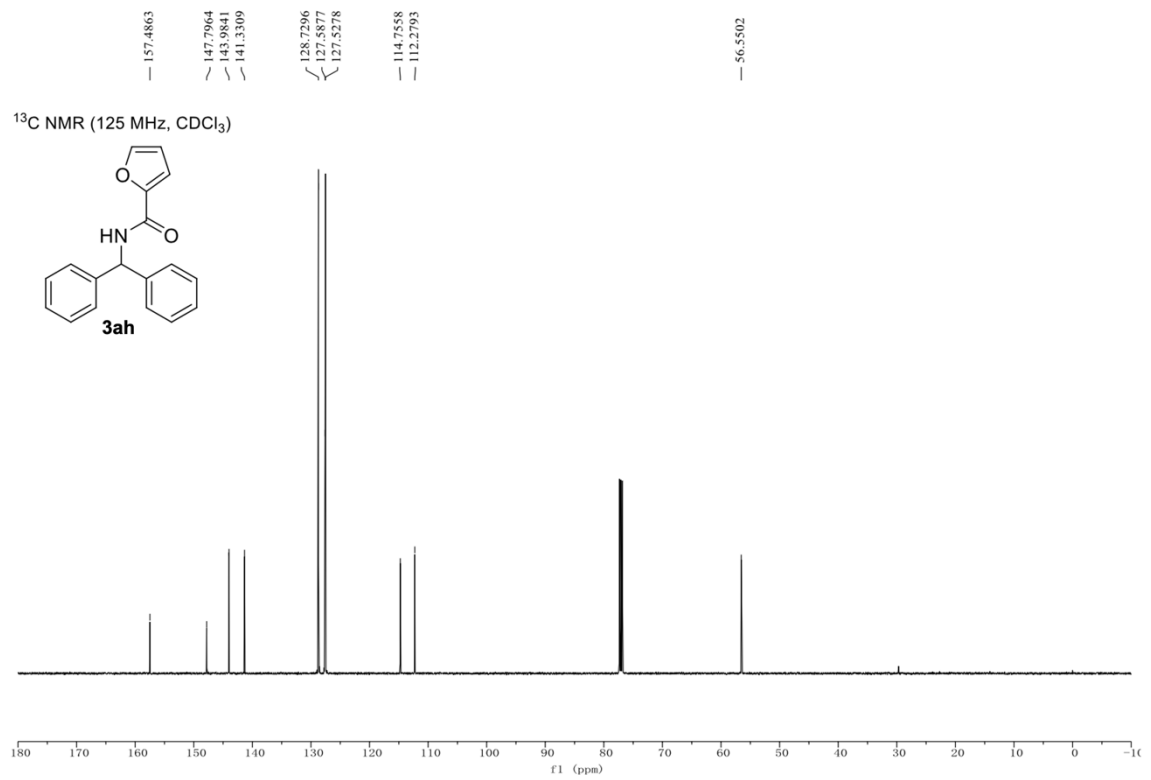
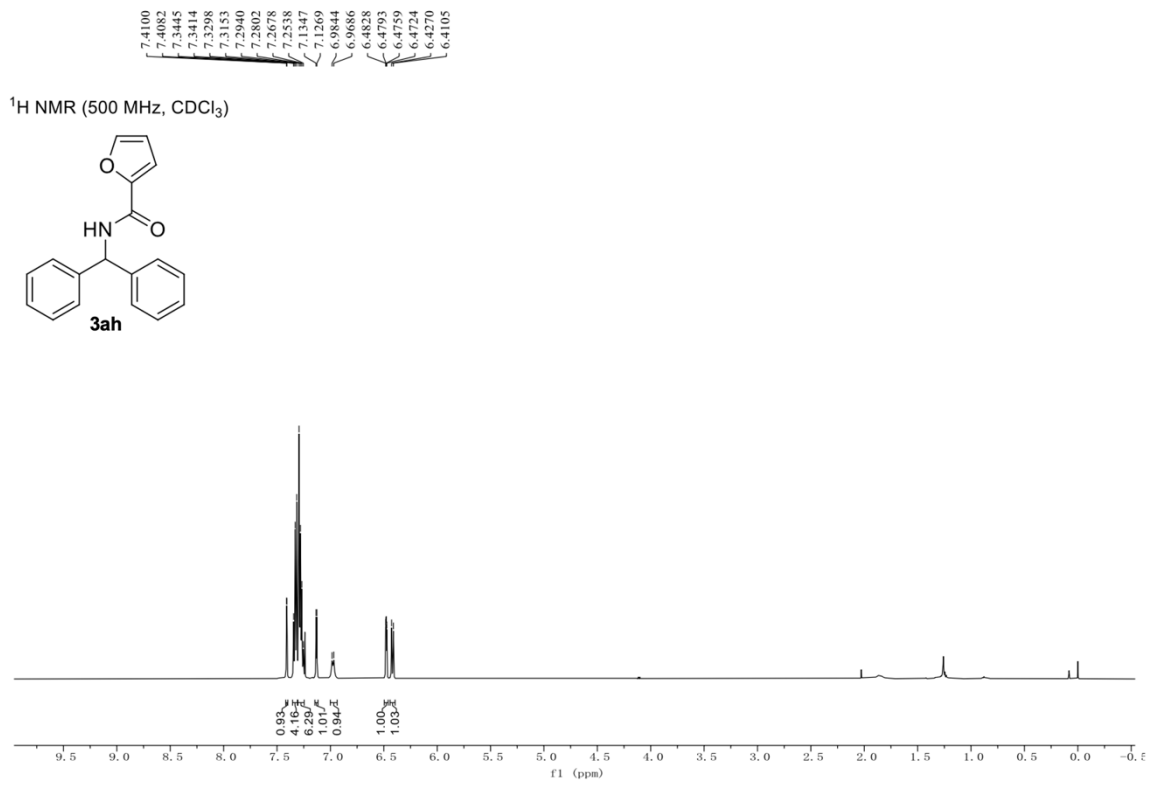
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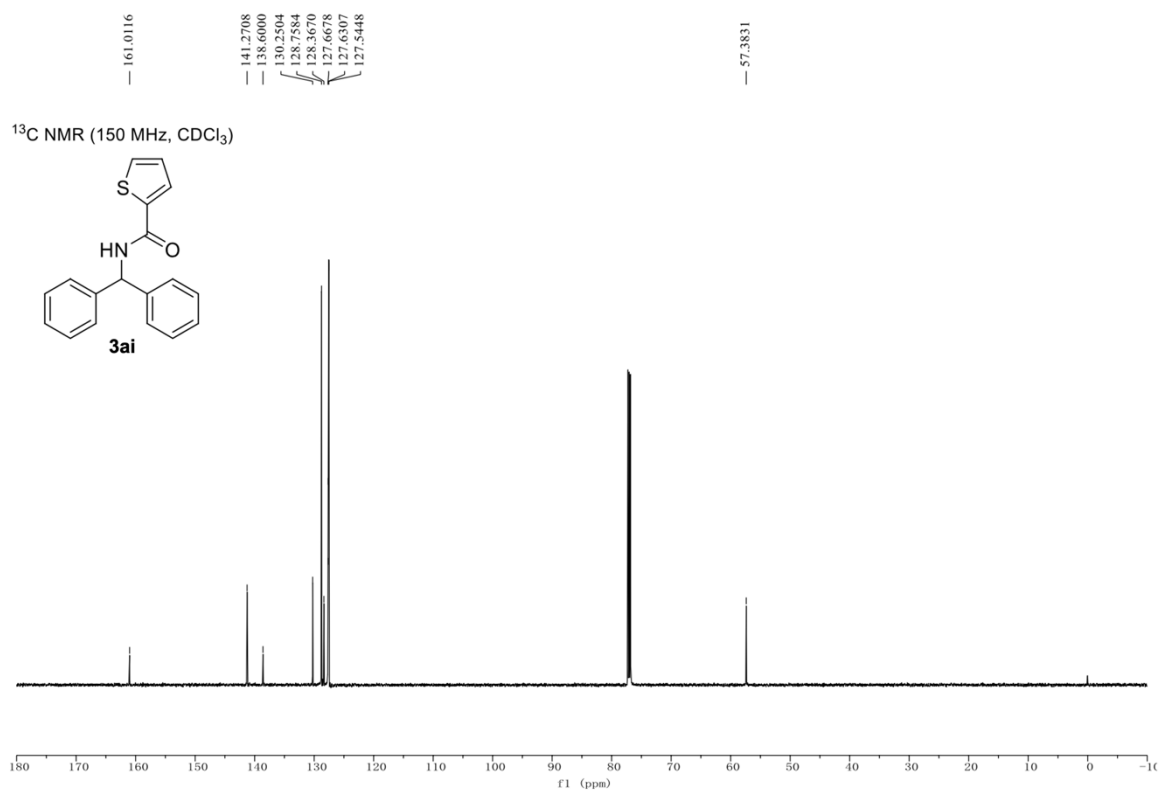
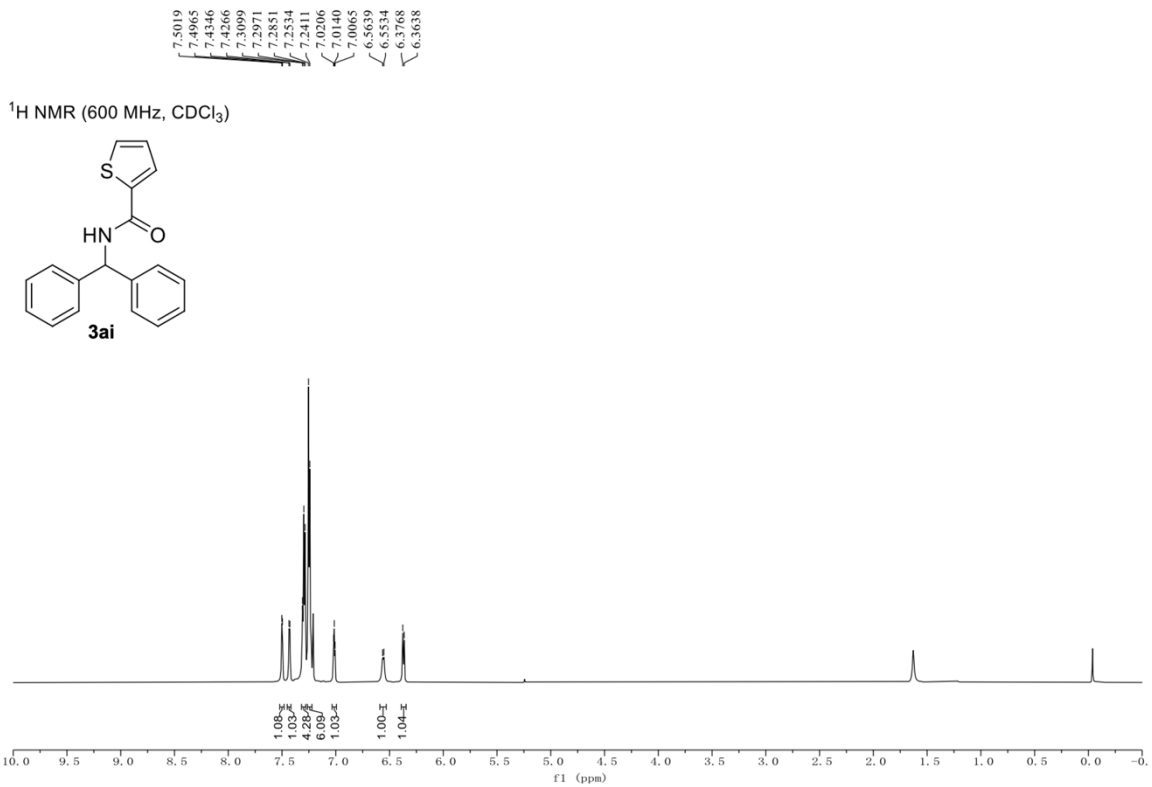


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137.8659  
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128.8786  
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127.4752  
57.5131

<sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>)



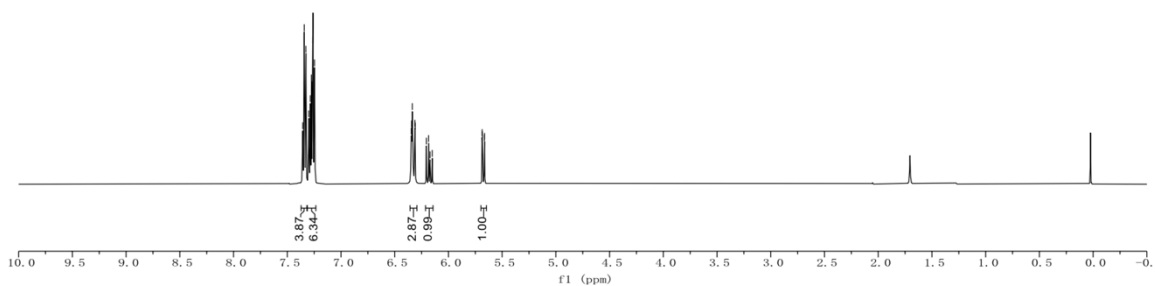
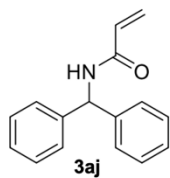






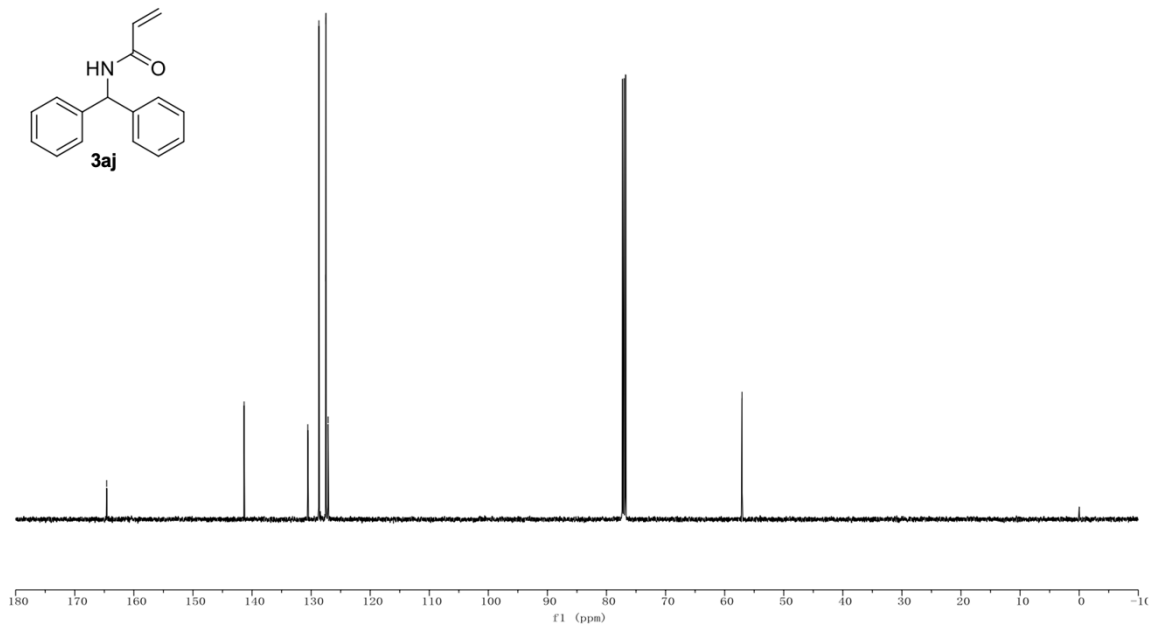
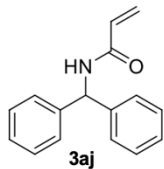
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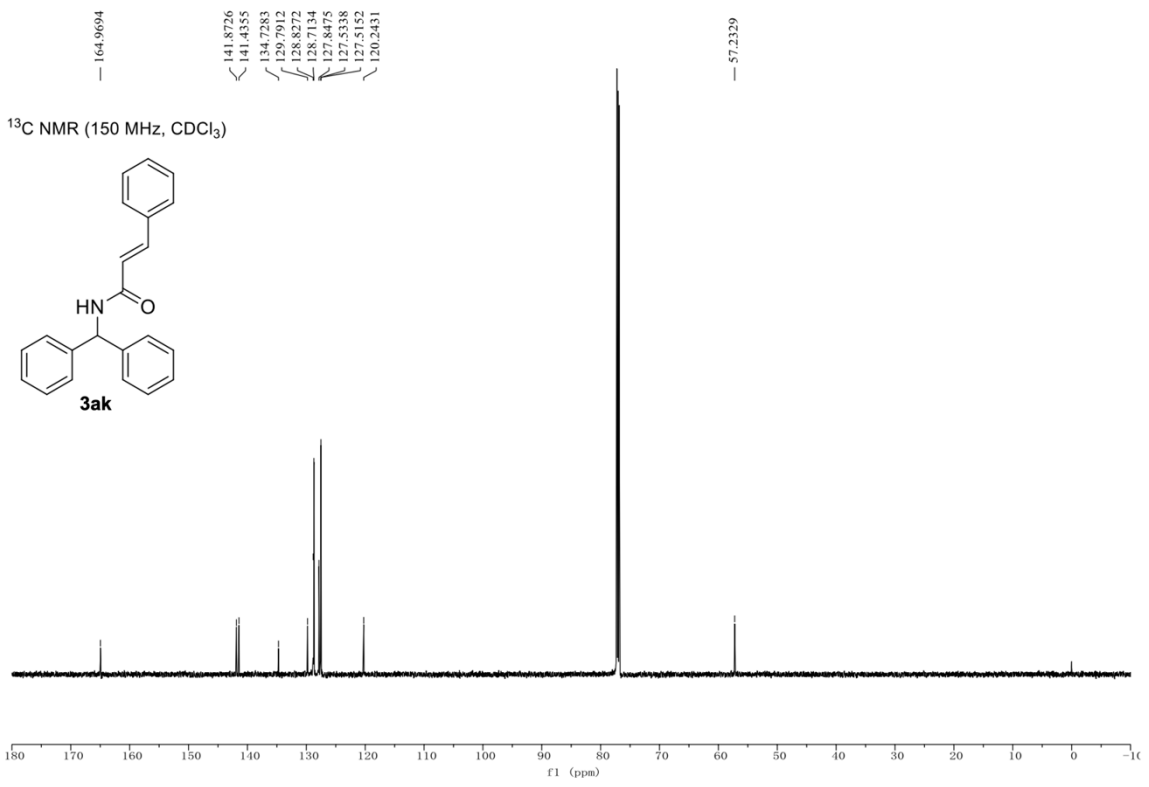
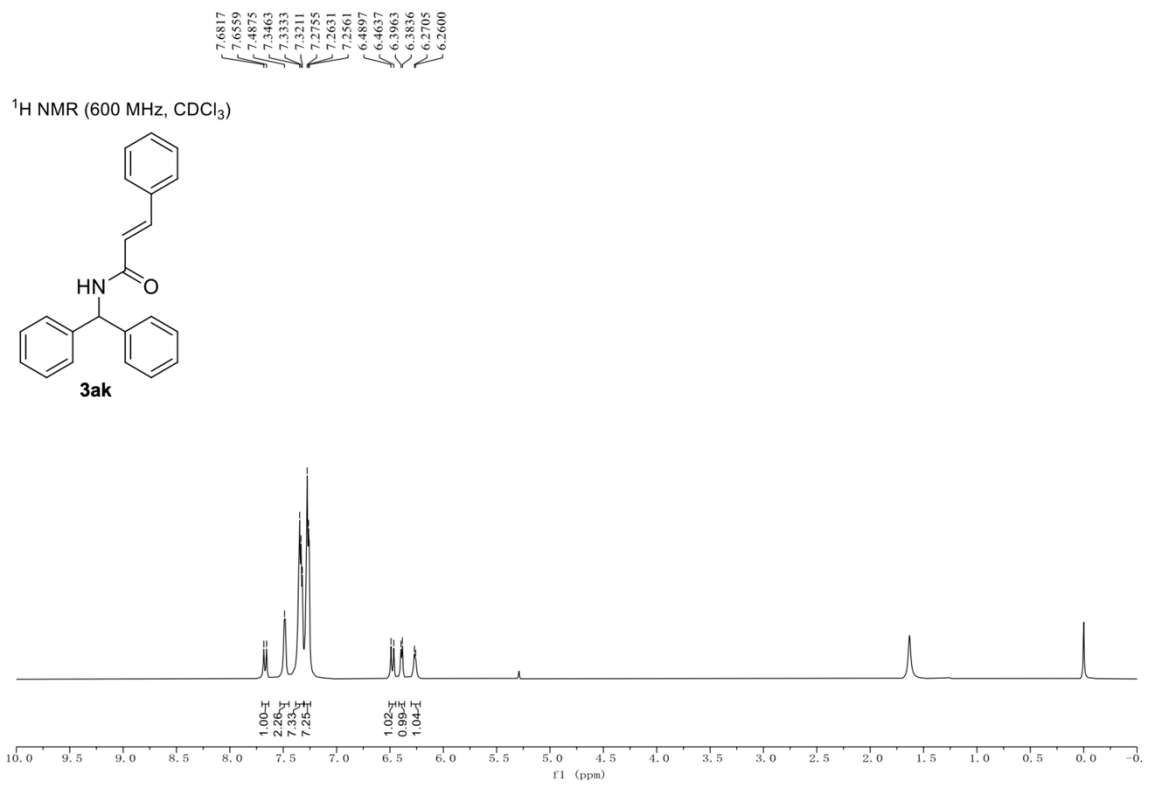
<sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)

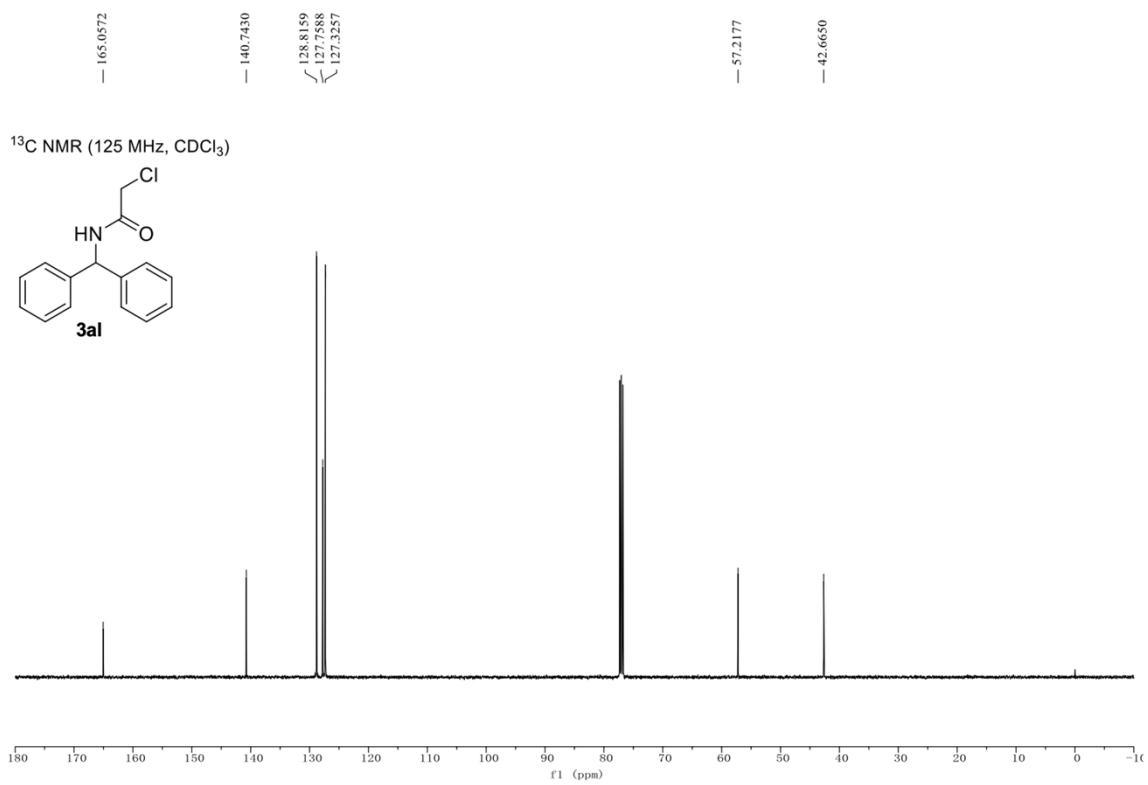
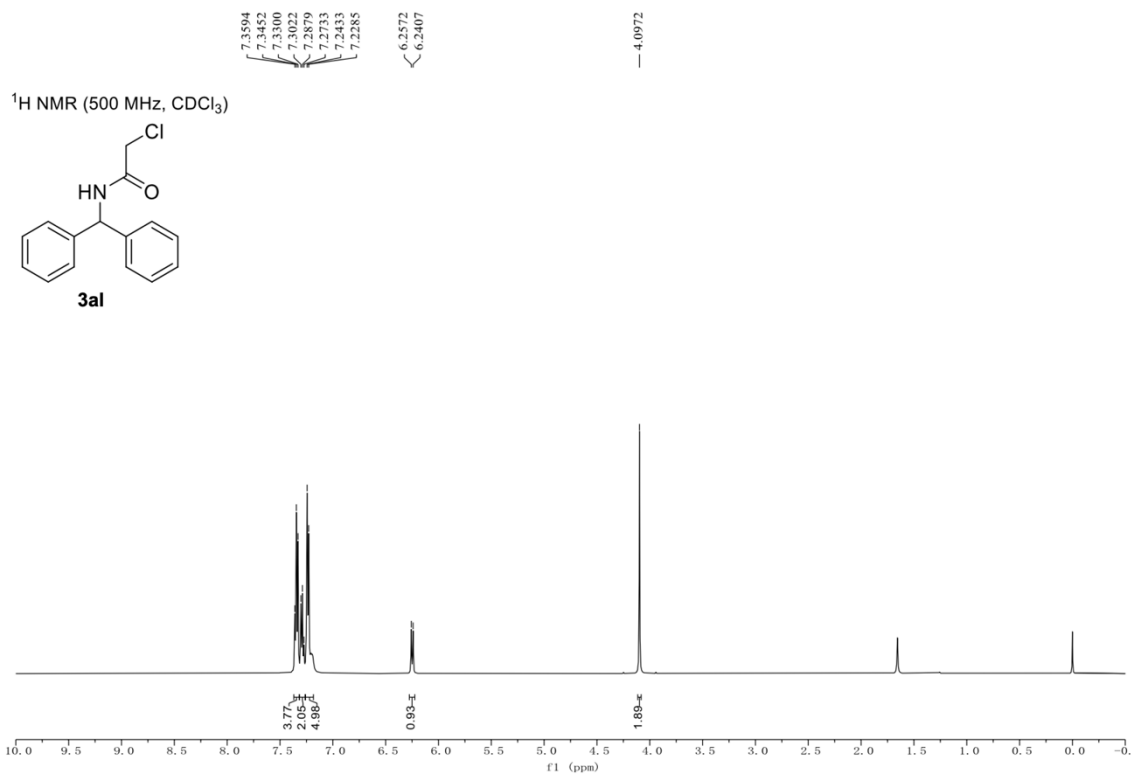


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141.3437  
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127.1290  
57.0576

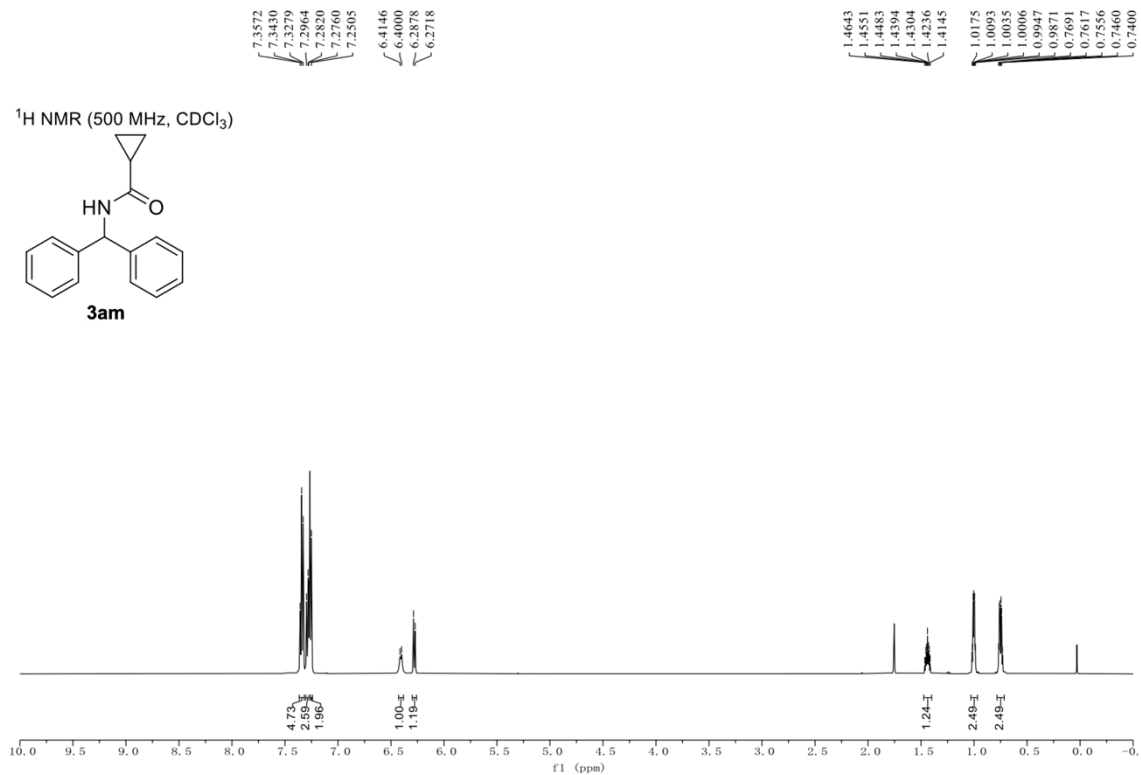
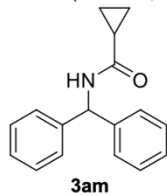
<sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>)



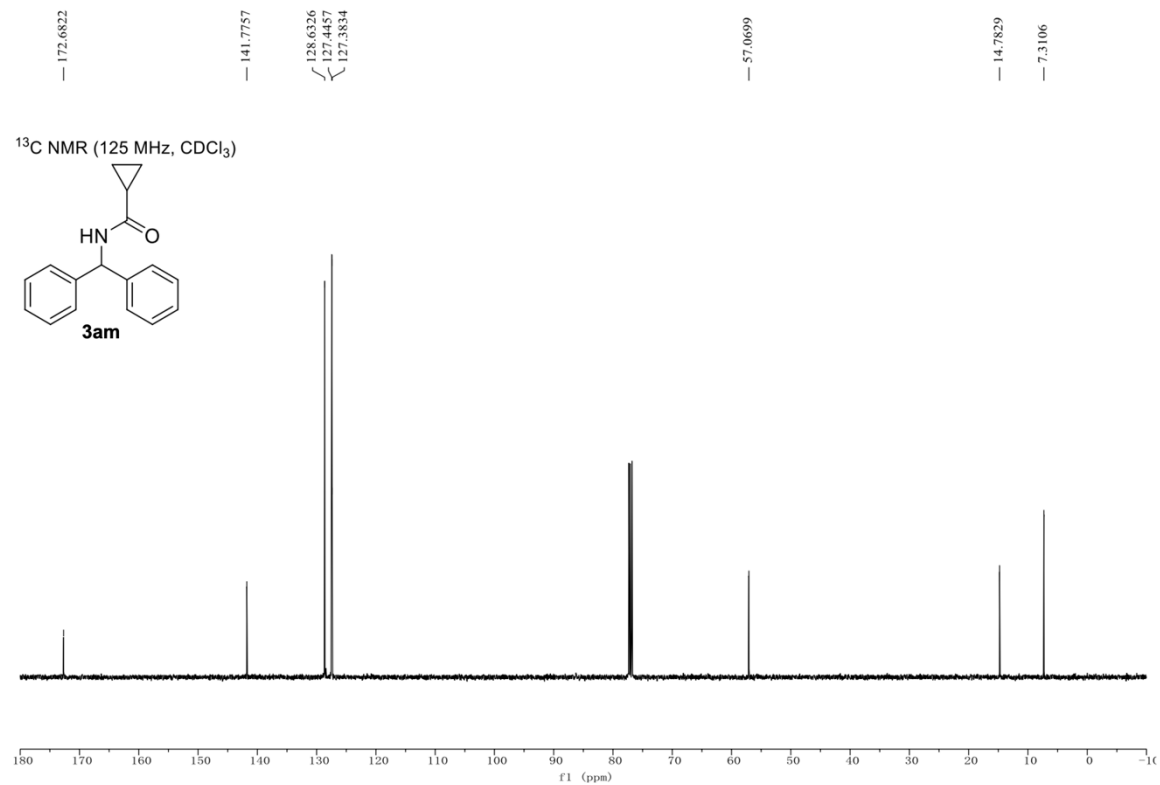
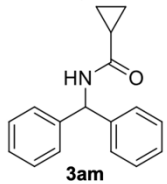


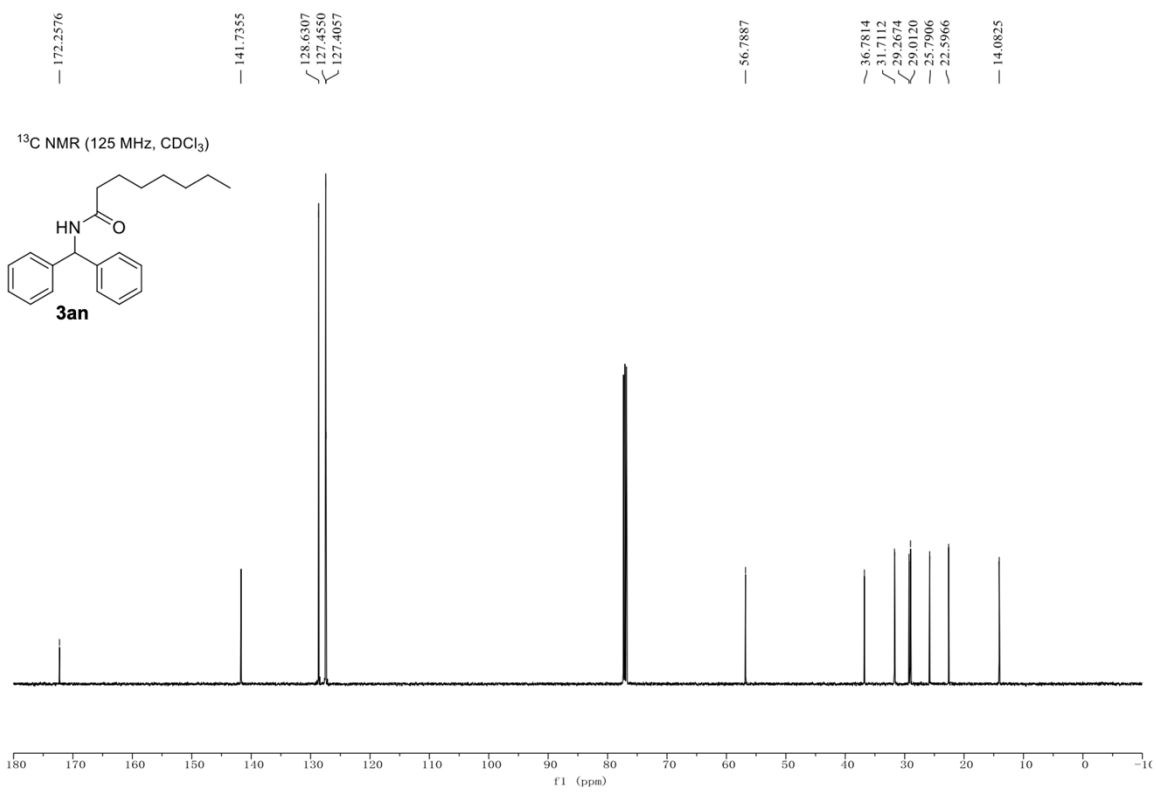
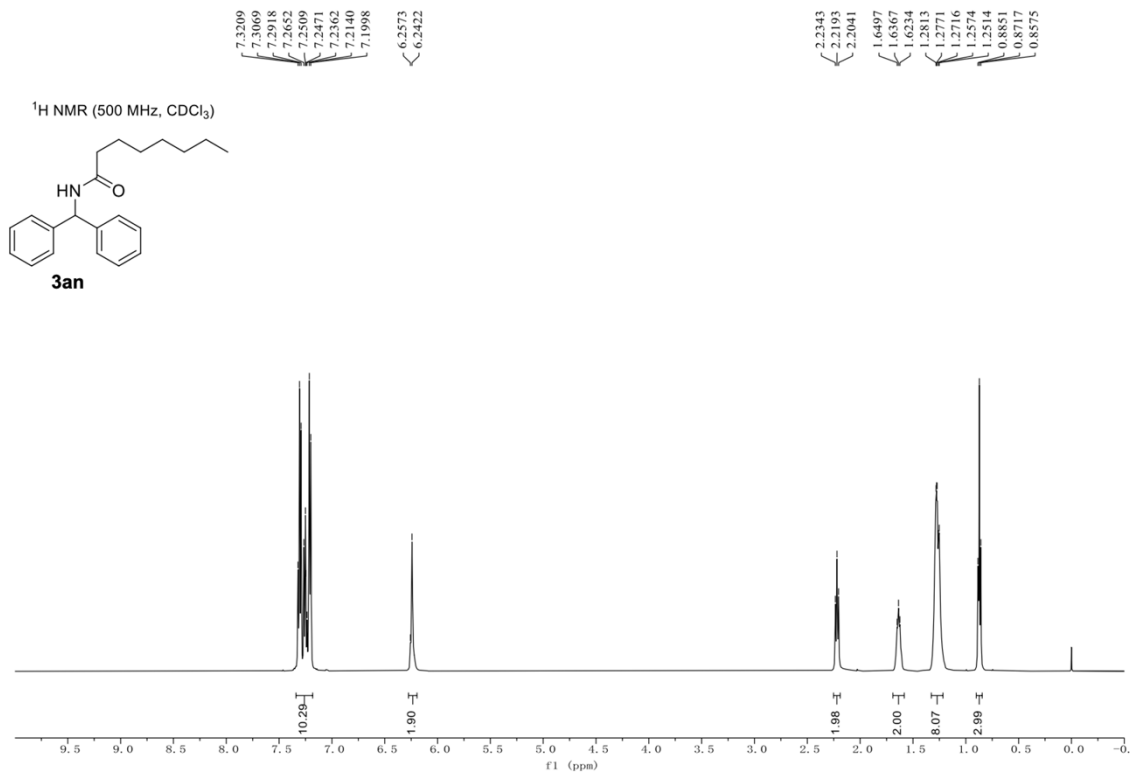


<sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)

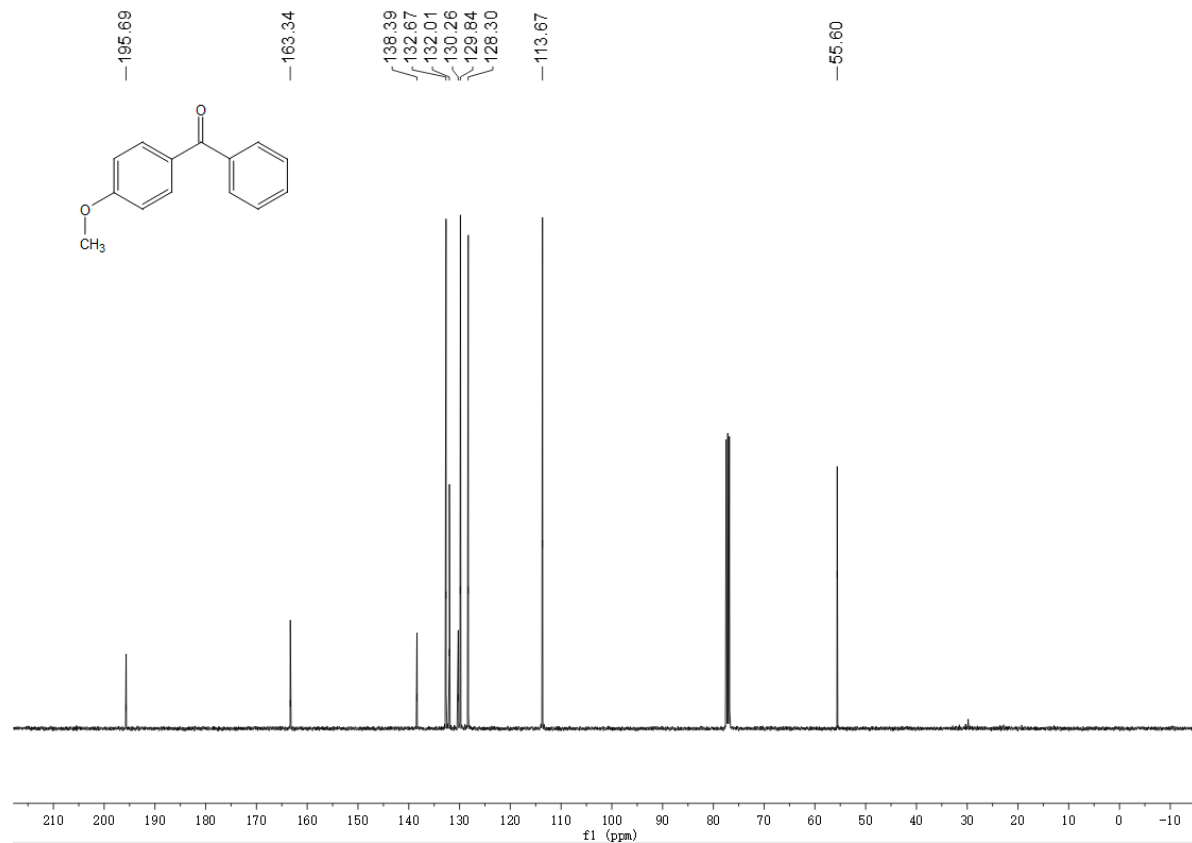
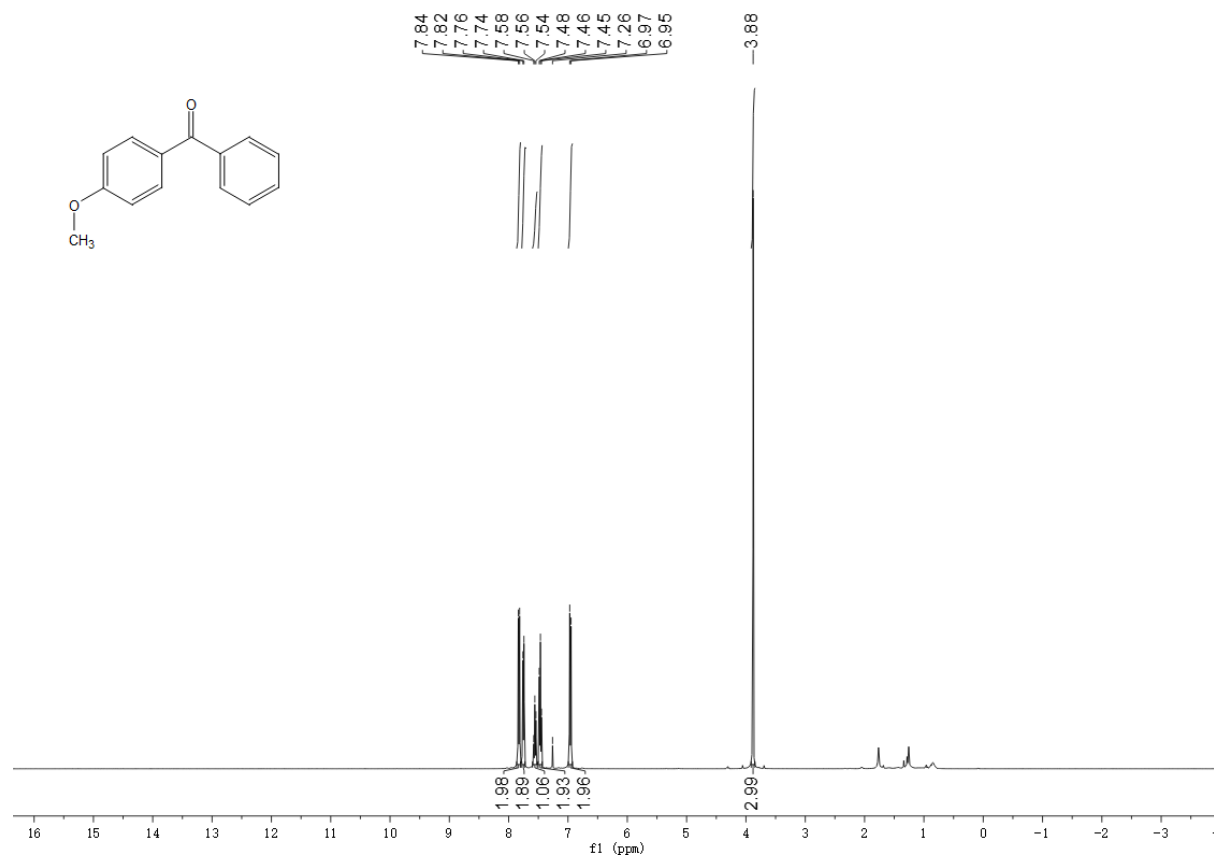


<sup>13</sup>C NMR (125 MHz, CDCl<sub>3</sub>)





# (4-methoxyphenyl)(phenyl)methanone



## 5 References

1. J. Liu, H. Zhang, H. Yi, C. Liu and A. Lei, *Sci. China. Chem.*, 2015, **58**, 1323-1328.
2. T. Ju, Q. Fu, J.-H. Ye, Z. Zhang, L.-L. Liao, S.-S. Yan, X.-Y. Tian, S.-P. Luo, J. Li and D.-G. Yu, *Angew. Chem. Int. Ed.*, 2018, **57**, 13897-13901.
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