

## **Supporting Information**

### **Facile and Direct Synthesis of 1-Phenyl-Substituted $\beta$ -Benzofused Oxygen Heterocycles from Benzoxaboroles and Salicylaldehydes under Amine Catalysis**

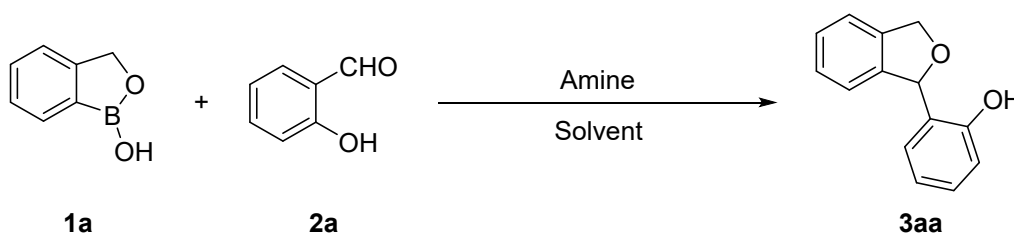
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# 1. General Information

Chemicals were purchased from Leyan (Shanghai, China) and used without further purification unless otherwise mentioned. All commercially available reagents and solvents were used without further purification unless otherwise stated. Nuclear Magnetic Resonance spectra were recorded on a Bruker 400 Ultra Shield spectrometer (400 MHz for  $^1\text{H}$ , 101 MHz for  $^{13}\text{C}$ , and 376 MHz for  $^{19}\text{F}$ ) in Chloroform- $d$  and DMSO- $d_6$ . Data are reported as follows: chemical shifts ( $\delta$ ) reported in parts per million (ppm), multiplicity, coupling constants ( $J$ ) reported in Hertz (Hz), and integration. Analytical thin-layer chromatography (TLC) was carried out on precoated plates (silica gel 60 F254), and spots were visualized under ultraviolet light. High-resolution mass spectra (HR-MS) were recorded under electron impact (EI-TOF) (70 eV) condition using a Micro Mass GCT CA 055 instrument.

## 2. Optimization of the Reaction Conditions<sup>[a]</sup>

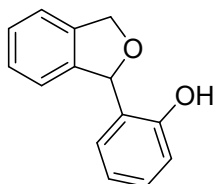


Entry	<b>1a:2a</b> (mmol:mmol)	Amine/mmol	Solvent	Temperature (°C)	Yield (%)
1	0.5:0.5	morpholine/0.5	Toluene	60	18
2	0.5:0.5	morpholine/0.5	MeOH	60	trace
3	0.5:0.5	morpholine/0.5	DCE	60	15
4	0.5:0.5	morpholine/0.5	Toluene	100	53
5	0.5:0.5	morpholine/0.5	1,4-dioxane	100	31
6	0.5:0.5	morpholine/0.5	Toluene	110	70
7	0.5:0.5	piperidine/0.5	Toluene	110	55
8	0.5:0.5	aniline/0.5	Toluene	110	n.d.
9	0.5:0.5	-	Toluene	110	n.d.
10	0.5:0.75	morpholine/0.5	Toluene	110	83
11	0.75:0.5	morpholine/0.5	Toluene	110	87
12	1.0:0.5	morpholine/0.5	Toluene	110	98
13	1.0:0.5	morpholine/0.25	Toluene	110	91
14	1.0:0.5	morpholine/0.1	Toluene	110	75
15 <sup>[b]</sup>	1.0:0.5	morpholine/0.375	Toluene	110	98
16 <sup>[b]</sup>	1.0:0.5	morpholine/0.25	Toluene	110	97
17 <sup>[b]</sup>	1.0:0.5	morpholine/0.1	Toluene	110	95 (90) <sup>[c]</sup>

<sup>[a]</sup> Reaction conditions: **1a** (0.5 mmol), **2a** (0.5 mmol), morpholine (0.5 mmol), Toluene (1.5 mL) at 60 °C for 12 h under Ar. <sup>[b]</sup> 200 mg 3 Å MS were added. <sup>[c]</sup> Isolated yield.

### 3. Experimental Procedures

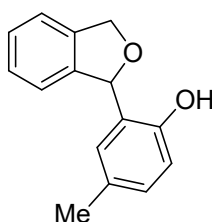
#### 2-(1,3-dihydroisobenzofuran-1-yl)phenol (**3aa**)



Benzoxaborole (**1a**, 1 mmol, 133.9 mg), salicylaldehyde (0.5 mmol, 61.1 mg), morpholine (0.2 equiv., 8.7 mg), and 3 Å MS (200 mg) were added in a reaction tube with toluene (1.5 mL), and the mixture was stirred under Ar at 110°C for 12 h. The reaction was quenched with saturated NaCl (aq) and extracted with ethyl acetate, dried over MgSO<sub>4</sub>, filtered, and concentrated under vacuum. The residue was chromatographed on silica gel with Petroleum ether/ ethyl acetate (8:1) to afford 2-(1,3-dihydroisobenzofuran-1-yl)phenol (**3aa**) as a white solid (95.5 mg, 90% yield). M.p.: 101.7-102.7°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.68 (s, 1H), 7.34 – 7.24 (m, 3H), 7.21 (td, *J* = 7.6, 1.7 Hz, 1H), 7.17 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.13 (d, *J* = 7.3 Hz, 1H), 6.90 (td, *J* = 7.3, 1.2 Hz, 1H), 6.86 (dd, *J* = 8.1, 1.2 Hz, 1H), 6.33 (t, *J* = 2.3 Hz, 1H), 5.29 (dd, *J* = 12.2, 2.1 Hz, 1H), 5.18 (dd, *J* = 12.2, 2.1 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.7, 140.3, 138.3, 129.6, 128.1, 127.8, 127.6, 124.3, 122.3, 121.1, 119.9, 117.3, 85.6, 72.6. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>12</sub>O<sub>2</sub> (M<sup>+</sup>) 212.0837; found, 212.0835.

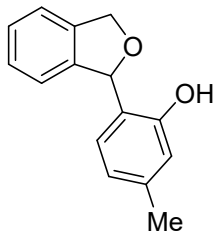
#### Analytical Data for Other Substrates:

#### 2-(1,3-dihydroisobenzofuran-1-yl)-4-methylphenol (**3ac**)



Pale yellow solid (90% yield). M.p.: 109.2-110.7°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.40 (s, 1H), 7.32 – 7.22 (m, 3H), 7.13 (d, *J* = 7.2 Hz, 1H), 6.99 (dd, *J* = 8.1, 2.2 Hz, 1H), 6.95 (d, *J* = 2.2 Hz, 1H), 6.75 (d, *J* = 8.1 Hz, 1H), 6.30 (t, *J* = 2.4 Hz, 1H), 5.27 (dd, *J* = 12.2, 2.2 Hz, 1H), 5.15 (dd, *J* = 12.2, 2.2 Hz, 1H), 2.27 (s, 3H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 153.2, 140.5, 138.4, 130.0, 129.1, 128.0, 127.8, 124.4, 122.4, 121.1, 117.0, 85.3, 72.6, 20.6. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0992.

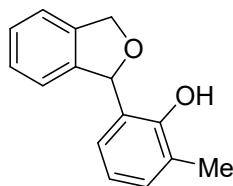
#### 2-(1,3-dihydroisobenzofuran-1-yl)-5-methylphenol (**3ad**)



Pale yellow oil (95% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.57 (s, 1H), 7.31 – 7.21 (m, 3H), 7.11 (d, *J* = 7.2 Hz, 1H), 7.03 (d, *J* = 7.7 Hz, 1H), 6.70 (dd, *J* = 7.7, 1.6 Hz, 1H), 6.67 (d, *J* = 1.6 Hz, 1H), 6.30 (t, *J* = 2.4 Hz, 1H), 5.26 (dd, *J* = 12.1, 2.1 Hz, 1H), 5.14 (dd, *J* = 12.3, 2.2 Hz, 1H), 2.27 (s, 3H). <sup>13</sup>C

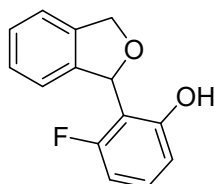
NMR (101 MHz, Chloroform-*d*)  $\delta$  155.4, 140.6, 139.8, 138.4, 128.0, 127.8, 127.5, 122.3, 121.6, 121.1, 120.8, 117.9, 85.4, 72.5, 21.2. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0991.

2-(1,3-dihydroisobenzofuran-1-yl)-6-methylphenol (**3ae**)



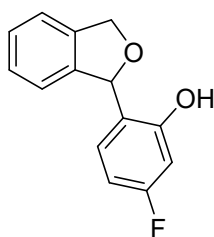
Pale yellow oil (77% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*)  $\delta$  7.88 (s, 1H), 7.32 – 7.21 (m, 3H), 7.09 (d, *J* = 7.5 Hz, 2H), 7.00 (d, *J* = 7.7 Hz, 1H), 6.81 (t, *J* = 7.5 Hz, 1H), 6.28 (t, *J* = 2.4 Hz, 1H), 5.27 (dd, *J* = 12.2, 2.0 Hz, 1H), 5.16 (dd, *J* = 12.2, 2.0 Hz, 1H), 2.20 (s, 3H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*)  $\delta$  154.0, 140.4, 138.2, 130.9, 128.1, 127.8, 126.2, 125.3, 123.4, 122.4, 121.1, 119.4, 86.3, 72.6, 15.8. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0989.

2-(1,3-dihydroisobenzofuran-1-yl)-3-fluorophenol (**3af**)



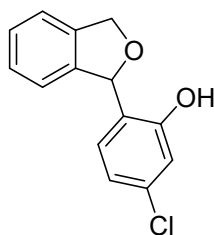
Yellow oil (45% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*)  $\delta$  8.64 (s, 1H), 7.33 – 7.28 (m, 2H), 7.27 – 7.24 (m, 1H), 7.20 – 7.10 (m, 2H), 6.71 – 6.65 (m, 2H), 6.62 (dt, *J* = 8.3, 1.1 Hz, 1H), 5.36 (dd, *J* = 12.3, 2.1 Hz, 1H), 5.21 (dd, *J* = 12.3, 2.6 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*)  $\delta$  160.3 (d, *J* = 244.1 Hz), 157.4 (d, *J* = 6.0 Hz), 139.9, 137.5, 129.7 (d, *J* = 10.9 Hz), 128.3, 128.2, 122.1, 120.9, 113.3 (d, *J* = 3.0 Hz), 106.6 (d, *J* = 22.1 Hz), 81.3 (d, *J* = 6.5 Hz), 72.7. <sup>19</sup>F NMR (376 MHz, Chloroform-*d*)  $\delta$  -118.78 – -118.88 (m). HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub>FO<sub>2</sub> (M<sup>+</sup>) 230.0738; found, 230.0739.

2-(1,3-dihydroisobenzofuran-1-yl)-5-fluorophenol (**3ag**)



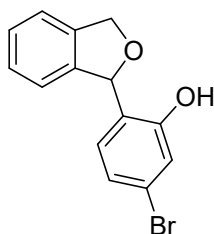
White solid (87% yield). M.p.: 122.8–123.7°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*)  $\delta$  7.96 (s, 1H), 7.34 – 7.24 (m, 3H), 7.12 – 7.07 (m, 2H), 6.63 – 6.55 (m, 2H), 6.28 (t, *J* = 2.4 Hz, 1H), 5.26 (dd, *J* = 12.3, 2.0 Hz, 1H), 5.15 (dd, *J* = 12.3, 2.2 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*)  $\delta$  163.5 (d, *J* = 245.7 Hz), 157.1 (d, *J* = 12.3 Hz), 139.9, 138.15, 128.5 (d, *J* = 10.3 Hz), 128.1, 127.8, 122.1, 121.1, 120.3 (d, *J* = 3.3 Hz), 106.7 (d, *J* = 21.6 Hz), 104.7 (d, *J* = 24.4 Hz), 85.1, 72.4. <sup>19</sup>F NMR (376 MHz, Chloroform-*d*)  $\delta$  -112.46 – -112.57 (m). HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub>FO<sub>2</sub> (M<sup>+</sup>) 230.0738; found, 230.0740.

5-chloro-2-(1,3-dihydroisobenzofuran-1-yl)phenol (**3ah**)



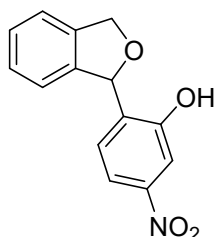
Pale yellow solid (85% yield). M.p.:90.3-91.5°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.93 (s, 1H), 7.34 – 7.23 (m, 3H), 7.10 (dd, *J* = 7.1, 1.2 Hz, 1H), 7.08 – 7.04 (m, 1H), 6.88 – 6.84 (m, 2H), 6.29 (t, *J* = 2.2 Hz, 1H), 5.26 (dd, *J* = 12.2, 2.1 Hz, 1H), 5.16 (dd, *J* = 12.2, 2.1 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.4, 139.8, 138.2, 134.8, 128.5, 128.3, 128.0, 123.2, 122.2, 121.2, 120.1, 117.6, 84.9, 72.7. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>35</sup>ClO<sub>2</sub> (M<sup>+</sup>) 246.0442; found, 246.0435. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>37</sup>ClO<sub>2</sub> (M<sup>+</sup>) 248.0413; found, 248.0415.

5-bromo-2-(1,3-dihydroisobenzofuran-1-yl)phenol (**3ai**)



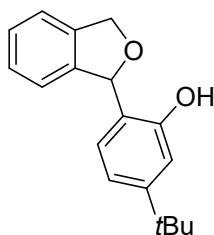
Pale yellow solid (90% yield). M.p.:105.7-106.6°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.91 (s, 1H), 7.34 – 7.24 (m, 3H), 7.10 (d, *J* = 7.2 Hz, 1H), 7.04 – 6.98 (m, 3H), 6.28 (t, *J* = 2.4 Hz, 1H), 5.27 (dd, *J* = 12.2, 2.1 Hz, 1H), 5.16 (dd, *J* = 12.2, 2.1 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.5, 139.7, 138.2, 128.7, 128.3, 128.0, 123.6, 123.1, 122.7, 122.2, 121.2, 120.5, 85.1, 72.7. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>79</sup>BrO<sub>2</sub> (M<sup>+</sup>) 289.9937; found, 289.9940. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>81</sup>BrO<sub>2</sub> (M<sup>+</sup>) 291.9916; found, 291.9924.

2-(1,3-dihydroisobenzofuran-1-yl)-5-nitrophenol (**3aj**)



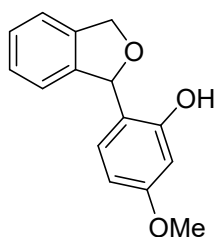
Yellow solid (92% yield). M.p.:118.7-119.7°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 8.38 (s, 1H), 7.76 (dd, *J* = 8.4, 2.2 Hz, 1H), 7.71 (d, *J* = 2.2 Hz, 1H), 7.38 – 7.28 (m, 4H), 7.14 (d, *J* = 7.4 Hz, 1H), 6.43 (t, *J* = 2.4 Hz, 1H), 5.34 (dd, *J* = 12.3, 2.2 Hz, 1H), 5.24 (dd, *J* = 12.3, 2.2 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.3, 148.7, 138.9, 138.0, 131.5, 128.6, 128.1, 127.8, 122.1, 121.4, 114.9, 112.5, 84.8, 73.1. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub>NO<sub>4</sub> (M<sup>+</sup>) 257.0683; found, 257.0676.

5-(tert-butyl)-2-(1,3-dihydroisobenzofuran-1-yl)phenol (**3ak**)



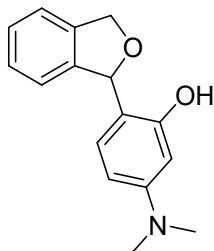
Pale yellow oil (88% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.63 (s, 1H), 7.31 – 7.21 (m, 3H), 7.17 – 7.13 (m, 1H), 7.09 – 7.06 (m, 1H), 6.92 – 6.89 (m, 2H), 6.32 (t, *J* = 2.4 Hz, 1H), 5.26 (dd, *J* = 12.2, 2.1 Hz, 1H), 5.14 (dd, *J* = 12.2, 2.1 Hz, 1H), 1.27 (s, 9H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.2, 153.2, 140.4, 138.4, 128.0, 127.8, 127.1, 122.5, 121.5, 121.1, 117.0, 114.5, 85.3, 72.5, 34.6, 31.3. HRMS (EI<sup>+</sup>) calcd for C<sub>18</sub>H<sub>20</sub>O<sub>2</sub> (M<sup>+</sup>) 268.1458; found, 268.1458.

2-(1,3-dihydroisobenzofuran-1-yl)-5-methoxyphenol (**3al**)



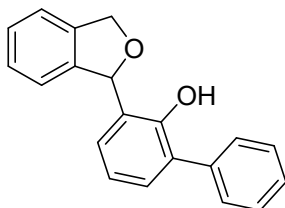
Pale yellow oil (90% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.72 (s, 1H), 7.33 – 7.24 (m, 3H), 7.10 (d, *J* = 7.0 Hz, 1H), 7.05 (d, *J* = 8.2 Hz, 1H), 6.48 – 6.43 (m, 2H), 6.26 (t, *J* = 2.4 Hz, 1H), 5.26 (dd, *J* = 12.2, 2.0 Hz, 1H), 5.15 (dd, *J* = 12.2, 2.0 Hz, 1H), 3.77 (s, 3H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 161.0, 157.0, 140.5, 138.3, 128.4, 128.0, 127.8, 122.3, 121.1, 116.7, 106.0, 102.7, 85.5, 72.3, 55.3. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>3</sub> (M<sup>+</sup>) 242.0937; found, 242.0930.

2-(1,3-dihydroisobenzofuran-1-yl)-5-(dimethylamino)phenol (**3am**)



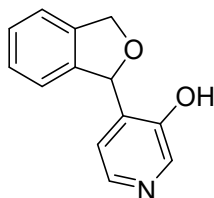
Yellow oil (84% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.47 (s, 1H), 7.30 – 7.24 (m, 3H), 7.14 – 7.08 (m, 1H), 7.00 (d, *J* = 8.3 Hz, 1H), 6.29 (dd, *J* = 8.3, 2.5 Hz, 1H), 6.26 (d, *J* = 2.5 Hz, 1H), 6.23 (t, *J* = 2.2 Hz, 1H), 5.25 (dd, *J* = 12.2, 2.1 Hz, 1H), 5.13 (dd, *J* = 12.2, 2.1 Hz, 1H), 2.92 (s, 6H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.6, 152.0, 141.0, 138.5, 128.4, 127.8, 127.7, 122.3, 121.0, 112.6, 104.4, 101.2, 85.6, 72.1, 40.5. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>17</sub>NO<sub>2</sub> (M<sup>+</sup>) 255.1254; found, 255.1255.

3-(1,3-dihydroisobenzofuran-1-yl)-[1,1'-biphenyl]-2-ol (**3an**)



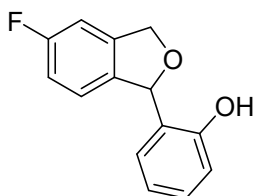
Yellow oil (84% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.52 – 7.48 (m, 2H), 7.43 – 7.39 (m, 2H), 7.34 – 7.23 (m, 6H), 7.21 – 7.16 (m, 2H), 6.95 (t, *J* = 7.6 Hz, 1H), 6.46 (t, *J* = 2.4 Hz, 1H), 5.29 (dd, *J* = 12.2, 2.0 Hz, 1H), 5.18 (dd, *J* = 12.2, 2.0 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 151.9, 140.7, 138.5, 137.7, 130.5, 129.7, 129.5, 128.6, 128.0, 127.8, 127.4, 127.2, 126.0, 122.5, 121.1, 120.1, 84.7, 72.8. HRMS (EI<sup>+</sup>) calcd for C<sub>20</sub>H<sub>16</sub>O<sub>2</sub> (M<sup>+</sup>) 288.1145; found, 288.1144.

4-(1,3-dihydroisobenzofuran-1-yl)pyridin-3-ol (**3ao**)



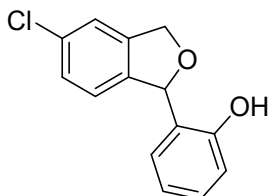
Yellow solid (65% yield). M.p.: 175.8-176.9°C. <sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>) δ 10.26 (s, 1H), 8.23 (s, 1H), 8.00 (d, *J* = 4.8 Hz, 1H), 7.37 – 7.27 (m, 3H), 7.23 (td, *J* = 7.3, 1.3 Hz, 1H), 7.16 (d, *J* = 4.8 Hz, 1H), 6.48 (t, *J* = 2.1 Hz, 1H), 5.36 (dd, *J* = 12.4, 2.8 Hz, 1H), 5.18 (dd, *J* = 12.4, 1.6 Hz, 1H). <sup>13</sup>C NMR (101 MHz, DMSO-*d*<sub>6</sub>) δ 150.9, 141.6, 141.2, 139.0, 138.1, 137.7, 128.3, 128.1, 122.4, 121.7, 121.2, 79.5, 73.5. HRMS (EI<sup>+</sup>) calcd for C<sub>13</sub>H<sub>11</sub>NO<sub>2</sub> (M<sup>+</sup>) 213.0784; found, 213.0788.

2-(5-fluoro-1,3-dihydroisobenzofuran-1-yl)phenol (**3ba**)



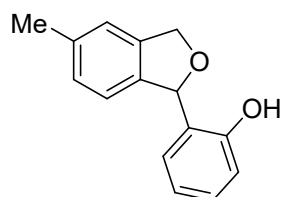
Yellow oil (95% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.46 (s, 1H), 7.20 (td, *J* = 7.7, 1.7 Hz, 1H), 7.13 (dd, *J* = 7.7, 1.7 Hz, 1H), 7.06 (dd, *J* = 8.0, 4.9 Hz, 1H), 6.99 – 6.92 (m, 2H), 6.89 (td, *J* = 7.6, 1.2 Hz, 1H), 6.85 (dd, *J* = 8.0, 1.2 Hz, 1H), 6.31 (s, 1H), 5.24 (dd, *J* = 12.5, 2.1 Hz, 1H), 5.13 (dd, *J* = 12.5, 2.1 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 163.0 (d, *J* = 245.9 Hz), 155.4, 140.6 (d, *J* = 8.7 Hz), 136.0 (d, *J* = 2.4 Hz), 129.7, 127.5, 124.5, 123.7 (d, *J* = 9.1 Hz), 120.1, 117.2, 115.0 (d, *J* = 23.1 Hz), 108.5 (d, *J* = 24.0 Hz), 84.8, 72.2 (d, *J* = 2.9 Hz). <sup>19</sup>F NMR (376 MHz, Chloroform-*d*) δ -114.66 – -114.78 (m). HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub>FO<sub>2</sub> (M<sup>+</sup>) 230.0738; found, 230.0738.

2-(5-chloro-1,3-dihydroisobenzofuran-1-yl)phenol (**3ca**)



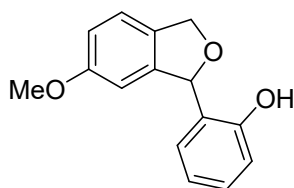
Orange oil (89% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.41 (s, 1H), 7.26 – 7.17 (m, 3H), 7.12 (dd, *J* = 7.7, 1.7 Hz, 1H), 7.04 (d, *J* = 8.0 Hz, 1H), 6.89 (td, *J* = 7.6, 1.2 Hz, 1H), 6.84 (d, *J* = 8.0 Hz, 1H), 6.30 (t, *J* = 2.4 Hz, 1H), 5.24 (dd, *J* = 12.5, 2.1 Hz, 1H), 5.12 (dd, *J* = 12.5, 2.1 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.3, 140.4, 139.1, 134.0, 129.8, 128.1, 127.5, 124.4, 123.5, 121.5, 120.2, 117.2, 84.7, 72.1. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>35</sup>ClO<sub>2</sub> (M<sup>+</sup>) 246.0442; found, 246.0439. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>11</sub><sup>37</sup>ClO<sub>2</sub> (M<sup>+</sup>) 248.0413; found, 248.0414.

2-(5-methyl-1,3-dihydroisobenzofuran-1-yl)phenol (**3da**)



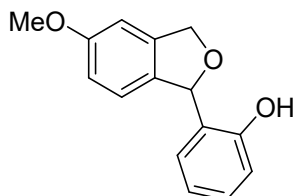
Pale yellow oil (94% yield).  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.73 (s, 1H), 7.25 – 7.16 (m, 3H), 7.11 (d,  $J$  = 7.7 Hz, 1H), 6.94 – 6.89 (m, 2H), 6.87 (dd,  $J$  = 8.1, 1.2 Hz, 1H), 6.26 (t,  $J$  = 2.4 Hz, 1H), 5.26 (dd,  $J$  = 12.0, 2.6 Hz, 1H), 5.14 (dd,  $J$  = 12.0, 2.6 Hz, 1H), 2.32 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  155.7, 140.5, 137.8, 135.4, 129.5, 129.0, 127.6, 124.3, 122.7, 120.8, 119.9, 117.3, 85.8, 72.4, 21.4. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0990.

2-(6-methoxy-1,3-dihydroisobenzofuran-1-yl)phenol (**3ea**)



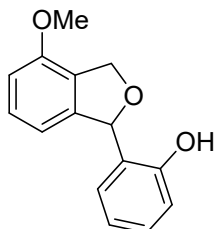
Pale yellow oil (90% yield).  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.69 (s, 1H), 7.25 – 7.15 (m, 3H), 6.93 – 6.83 (m, 3H), 6.62 (d,  $J$  = 2.4 Hz, 1H), 6.27 (t,  $J$  = 2.5 Hz, 1H), 5.23 (dd,  $J$  = 11.6, 2.3 Hz, 1H), 5.11 (dd,  $J$  = 11.6, 2.3 Hz, 1H), 3.74 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  159.9, 155.6, 142.1, 130.3, 129.6, 127.6, 124.3, 121.8, 120.0, 117.3, 114.2, 107.7, 85.6, 72.3, 55.6. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>3</sub> (M<sup>+</sup>) 242.0937; found, 242.0934.

2-(5-methoxy-1,3-dihydroisobenzofuran-1-yl)phenol (**3fa**)



White solid (96% yield). M.p.: 136.4–137.3°C.  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.69 (s, 1H), 7.23 – 7.12 (m, 2H), 7.03 – 6.99 (m, 1H), 6.90 – 6.77 (m, 4H), 6.28 (t,  $J$  = 2.4 Hz, 1H), 5.22 (dd,  $J$  = 12.3, 2.1 Hz, 1H), 5.11 (dd,  $J$  = 12.3, 2.1 Hz, 1H), 3.78 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  160.1, 155.5, 140.1, 132.4, 129.5, 127.5, 124.9, 123.2, 120.0, 117.2, 114.0, 106.4, 85.1, 72.5, 55.6. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>3</sub> (M<sup>+</sup>) 242.0937; found, 242.0939.

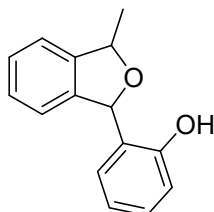
2-(4-methoxy-1,3-dihydroisobenzofuran-1-yl)phenol (**3ga**)



Orange oil (86% yield).  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.80 (s, 1H), 7.25 – 7.14 (m, 3H), 6.91 – 6.83 (m, 2H), 6.77 (d,  $J$  = 8.1 Hz, 1H), 6.71 (d,  $J$  = 7.5 Hz, 1H), 6.33 (t,  $J$  = 2.4 Hz, 1H), 5.30 (dd,  $J$  = 12.3, 2.3 Hz, 1H), 5.14 (dd,  $J$  = 12.3, 2.3 Hz, 1H), 3.84 (s, 3H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$

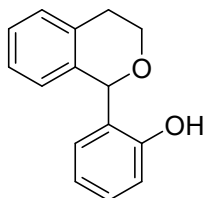
155.6, 154.2, 142.2, 129.7, 129.5, 127.5, 126.2, 124.5, 119.9, 117.2, 114.4, 109.6, 86.1, 71.2, 55.4.  
HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>3</sub> (M<sup>+</sup>) 242.0937; found, 242.0936.

2-(3-methyl-1,3-dihydroisobenzofuran-1-yl)phenol (**3ha**)



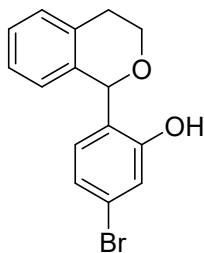
Yellow oil (94% yield). d.r.=1.7:1. major isomer: <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.97 (s, 1H), 7.22 – 7.18 (m, 5H), 7.02 (d, *J* = 7.5 Hz, 1H), 6.92 (td, *J* = 7.5, 1.2 Hz, 1H), 6.86 (d, *J* = 7.5 Hz, 1H), 6.19 (d, *J* = 2.3 Hz, 1H), 5.38 (qd, *J* = 6.4, 2.3 Hz, 1H), 1.69 (d, *J* = 6.4 Hz, 3H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.7, 142.5, 141.0, 129.6, 128.2, 128.0, 127.8, 124.0, 122.1, 120.8, 119.8, 117.3, 84.9, 79.6, 20.9. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0992.

2-(isochroman-1-yl)phenol (**3ia**)



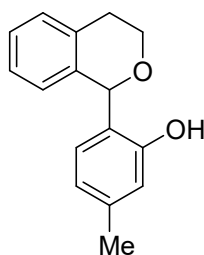
Pale yellow solid (85% yield). M.p.:132.8-134.0°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.43 (s, 1H), 7.26 – 7.16 (m, 3H), 7.11 (td, *J* = 7.3, 1.4 Hz, 1H), 7.03 (dd, *J* = 7.5, 1.3 Hz, 1H), 6.94 – 6.81 (m, 3H), 5.89 (s, 1H), 4.25 (dt, *J* = 11.5, 5.4 Hz, 1H), 4.00 (ddd, *J* = 11.5, 8.7, 4.7 Hz, 1H), 3.11 (ddd, *J* = 16.8, 8.7, 5.4 Hz, 1H), 2.92 (dt, *J* = 16.8, 4.7 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.6, 135.1, 132.8, 129.8, 129.6, 129.0, 127.3, 126.4, 126.2, 125.8, 119.6, 117.3, 79.0, 64.3, 28.5. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>14</sub>O<sub>2</sub> (M<sup>+</sup>) 226.0988; found, 226.0992.

5-bromo-2-(isochroman-1-yl)phenol (**3ja**)



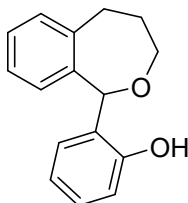
Pale yellow solid (88% yield). M.p.:117.3-118.4°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.61 (s, 1H), 7.24 – 7.09 (m, 3H), 7.06 (d, *J* = 2.0 Hz, 1H), 6.99 (dd, *J* = 8.1, 2.0 Hz, 1H), 6.87 (d, *J* = 8.1 Hz, 1H), 6.81 (d, *J* = 7.7 Hz, 1H), 5.84 (s, 1H), 4.21 (dt, *J* = 11.4, 5.2 Hz, 1H), 3.97 (ddd, *J* = 11.4, 8.6, 4.7 Hz, 1H), 3.07 (ddd, *J* = 16.7, 8.6, 5.8 Hz, 1H), 2.90 (dt, *J* = 16.7, 4.7 Hz, 1H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.5, 134.50, 132.8, 130.7, 129.1, 127.6, 126.3, 125.0, 123.0, 122.7, 120.6, 78.4, 64.3, 28.4. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>13</sub><sup>79</sup>BrO<sub>2</sub> (M<sup>+</sup>) 304.0093; found, 304.0097. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>13</sub><sup>81</sup>BrO<sub>2</sub> (M<sup>+</sup>) 306.0073; found, 306.0076.

2-(isochroman-1-yl)-5-methylphenol (**3ka**)



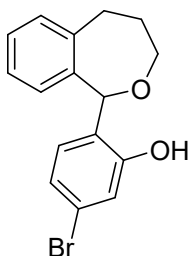
Pale yellow solid (86% yield). M.p.:92.9-94.4°C. <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.32 (s, 1H), 7.22 – 7.14 (m, 2H), 7.10 (td, *J* = 7.4, 1.7 Hz, 1H), 6.89 (d, *J* = 7.7 Hz, 1H), 6.85 (d, *J* = 7.7 Hz, 1H), 6.72 (d, *J* = 1.6 Hz, 1H), 6.67 (dd, *J* = 7.7, 1.7 Hz, 1H), 5.85 (s, 1H), 4.23 (dt, *J* = 11.5, 5.2 Hz, 1H), 3.97 (ddd, *J* = 11.5, 8.6, 4.7 Hz, 1H), 3.08 (ddd, *J* = 16.7, 8.6, 5.7 Hz, 1H), 2.90 (dt, *J* = 16.7, 4.7 Hz, 1H), 2.29 (s, 3H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 155.4, 140.0, 135.4, 132.9, 129.4, 129.0, 127.3, 126.5, 126.2, 123.05, 120.4, 117.8, 78.7, 64.2, 28.5, 21.2. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>16</sub>O<sub>2</sub> (M<sup>+</sup>) 240.1145; found, 240.1145.

2-(1,3,4,5-tetrahydrobenzo[*c*]oxepin-1-yl)phenol (**3la**)



Yellow oil (79% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 7.78 (s, 1H), 7.21 – 7.09 (m, 3H), 6.99 (td, *J* = 7.3, 1.7 Hz, 1H), 6.92 (d, *J* = 8.1 Hz, 1H), 6.82 – 6.75 (m, 2H), 6.62 (d, *J* = 7.7 Hz, 1H), 5.84 (s, 1H), 4.30 (dt, *J* = 12.3, 3.7 Hz, 1H), 4.00 (ddd, *J* = 13.0, 9.5, 4.0 Hz, 1H), 3.13 (ddd, *J* = 14.3, 9.8, 3.4 Hz, 1H), 2.93 (ddd, *J* = 14.7, 7.0, 2.9 Hz, 1H), 1.89 – 1.78 (m, 2H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 156.3, 142.0, 140.2, 129.6, 129.3, 128.4, 128.2, 127.7, 126.4, 123.9, 119.7, 117.3, 85.1, 74.3, 35.1, 29.7. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>16</sub>O<sub>2</sub> (M<sup>+</sup>) 240.1145; found, 240.1146.

5-bromo-2-(1,3,4,5-tetrahydrobenzo[*c*]oxepin-1-yl)phenol (**3ma**)



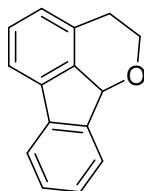
Yellow oil (83% yield). <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) δ 8.03 (s, 1H), 7.24 – 7.18 (m, 2H), 7.15 (d, *J* = 2.0 Hz, 1H), 7.11 – 7.05 (m, 1H), 6.98 (dd, *J* = 8.1, 2.0 Hz, 1H), 6.71 (d, *J* = 8.1 Hz, 1H), 6.67 (d, *J* = 7.7 Hz, 1H), 5.87 (s, 1H), 4.36 (dt, *J* = 12.1, 3.5 Hz, 1H), 4.10 – 4.01 (m, 1H), 3.23 – 3.14 (m, 1H), 2.98 (ddd, *J* = 14.6, 6.5, 2.8 Hz, 1H), 1.98 – 1.84 (m, 2H). <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) δ 157.2, 142.0, 139.7, 129.8, 129.5, 128.4, 127.5, 126.5, 123.1, 122.8, 122.4, 120.6, 84.7, 74.4, 35.0, 29.6. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>15</sub><sup>79</sup>BrO<sub>2</sub> (M<sup>+</sup>) 318.0250; found, 318.0255. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>15</sub><sup>81</sup>BrO<sub>2</sub> (M<sup>+</sup>) 320.0229; found, 320.0235.



7.6, 2.0 Hz, 1H), 7.00 (d,  $J = 7.5$  Hz, 1H), 6.44 (t,  $J = 2.5$  Hz, 1H), 5.26 (dd,  $J = 12.2, 2.5$  Hz, 1H), 5.12 (dd,  $J = 12.2, 2.0$  Hz, 1H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  146.1, 139.5, 138.2, 134.1, 129.0, 128.8, 127.7, 127.1, 126.8, 121.2, 120.2, 120.0, 117.6 (q,  $J = 321.3$  Hz), 78.9, 72.4. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>11</sub>F<sub>3</sub>O<sub>4</sub>S (M<sup>+</sup>) 344.0325; found, 344.0327.

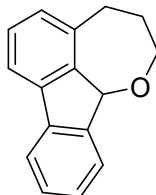
**4aa** (0.3 mmol), Pd(OAc)<sub>2</sub> (0.1 equiv.), dcype (0.2 equiv.), Rb<sub>2</sub>CO<sub>3</sub> (1.5 equiv.), and CsOPiv (1.0 equiv.) were added in a reaction tube with toluene (1.5 mL), and the mixture was stirred at 120 °C for 16 h. The reaction was quenched with saturated NaCl (aq) and extracted with ethyl acetate, dried over MgSO<sub>4</sub>, filtered, and concentrated under vacuum. The residue was chromatographed on silica gel with Petroleum ether/ ethyl acetate (50:1) to afford **5aa** a pale yellow oil (73% yield).  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.63 (d,  $J = 7.5$  Hz, 1H), 7.59 (d,  $J = 7.5$  Hz, 1H), 7.38 – 7.33 (m, 2H), 7.27 – 7.18 (m, 2H), 7.07 (d,  $J = 7.2$  Hz, 1H), 6.04 (d,  $J = 2.5$  Hz, 1H), 5.63 (dd,  $J = 11.6, 2.5$  Hz, 1H), 4.99 (d,  $J = 11.6$  Hz, 1H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  158.1, 148.6, 145.7, 141.6, 139.3, 130.5, 129.3, 126.8, 126.7, 122.1, 121.4, 120.4, 86.3, 78.8. HRMS (EI<sup>+</sup>) calcd for C<sub>14</sub>H<sub>10</sub>O (M<sup>+</sup>) 194.0727; found, 194.0726.

3,10b-dihydro-2*H*-indeno[1,2,3-*ij*]isochromene (**5ia**)



White solid (91% yield). M.p.: 122.3-123.8°C.  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.63 (d,  $J = 7.5$  Hz, 2H), 7.43 (d,  $J = 7.5$  Hz, 1H), 7.35 (t,  $J = 7.5$  Hz, 1H), 7.30 – 7.22 (m, 2H), 7.00 (d,  $J = 7.5$  Hz, 1H), 5.25 (s, 1H), 4.32 – 4.24 (m, 2H), 2.90 (t,  $J = 6.4$  Hz, 2H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  145.3, 143.8, 141.3, 138.6, 132.2, 129.5, 129.1, 127.4, 125.9, 125.3, 121.2, 118.3, 79.2, 67.0, 26.7. HRMS (EI<sup>+</sup>) calcd for C<sub>15</sub>H<sub>12</sub>O (M<sup>+</sup>) 208.0883; found, 208.0885.

2,3,4,11b-tetrahydrofluoreno[9,1-*bc*]oxepine (**5la**)



White solid (88% yield). M.p.: 103.4-104.8°C.  $^1\text{H}$  NMR (400 MHz, Chloroform-*d*)  $\delta$  7.67 – 7.57 (m, 2H), 7.50 (d,  $J = 7.4$  Hz, 1H), 7.37 (t,  $J = 7.4$  Hz, 1H), 7.30 (t,  $J = 7.4$  Hz, 1H), 7.25 (t,  $J = 7.4$  Hz, 1H), 7.06 (d,  $J = 7.4$  Hz, 1H), 5.34 (s, 1H), 4.53 (dt,  $J = 12.3, 3.0$  Hz, 1H), 4.09 (t,  $J = 11.2$  Hz, 1H), 3.22 – 3.10 (m, 1H), 2.94 (dd,  $J = 14.8, 4.4$  Hz, 1H), 2.01 – 1.85 (m, 2H).  $^{13}\text{C}$  NMR (101 MHz, Chloroform-*d*)  $\delta$  145.2, 143.4, 140.6, 140.6, 140.1, 129.1, 128.8, 127.6, 127.3, 125.5, 120.1, 117.9, 83.9, 75.7, 35.4, 30.9. HRMS (EI<sup>+</sup>) calcd for C<sub>16</sub>H<sub>14</sub>O (M<sup>+</sup>) 222.1039; found, 222.1041.

## 4. X-ray Crystallographic Data

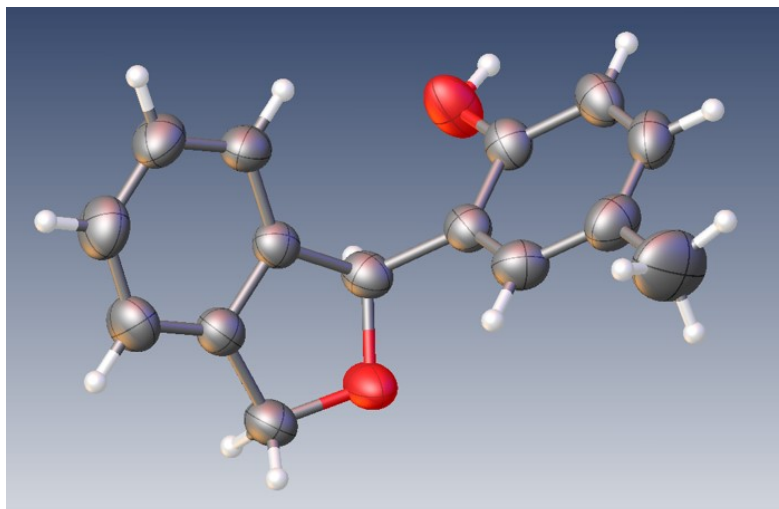


Figure S1: XRAY structure of 2-(1,3-dihydroisobenzofuran-1-yl)-4-methylphenol (**3ac**) (CCDC 2484228)

**Preparation for Crystal Growth.** The compound **3ac** was dissolved in minimum amount of chloroform/ethyl acetate (1:1) and kept at room temperature for slow evaporation (7 days). Crystal was formed which was subjected to X-ray diffraction analysis.

Table S1: Crystal data and structure refinement for <b>3ac</b> .	
Identification code	YXN3_0m_a
Empirical formula	C <sub>15</sub> H <sub>14</sub> O <sub>2</sub>
Formula weight	226.26
Temperature/K	273.15
Crystal system	monoclinic
Space group	P2 <sub>1</sub> /n
a/Å	8.3110(2)
b/Å	16.9374(4)
c/Å	8.9160(2)
α/°	90
β/°	103.7360(10)
γ/°	90
Volume/Å <sup>3</sup>	1219.18(5)
Z	4
ρ <sub>calc</sub> /cm <sup>3</sup>	1.233
μ/mm <sup>-1</sup>	0.645
F(000)	480.0
Crystal size/mm <sup>3</sup>	0.25 × 0.24 × 0.24
Radiation	CuKα (λ = 1.54178)
2θ range for data collection/°	10.446 to 136.95
Index ranges	-10 ≤ h ≤ 9, -19 ≤ k ≤ 19, -10 ≤ l ≤ 10

Reflections collected	17180
Independent reflections	2202 [ $R_{\text{int}} = 0.0469$ , $R_{\text{sigma}} = 0.0342$ ]
Data/restraints/parameters	2202/0/157
Goodness-of-fit on $F^2$	1.074
Final R indexes [ $I \geq 2\sigma(I)$ ]	$R_1 = 0.0458$ , $wR_2 = 0.1169$
Final R indexes [all data]	$R_1 = 0.0482$ , $wR_2 = 0.1190$
Largest diff. peak/hole / $e \text{ \AA}^{-3}$	0.22/-0.17

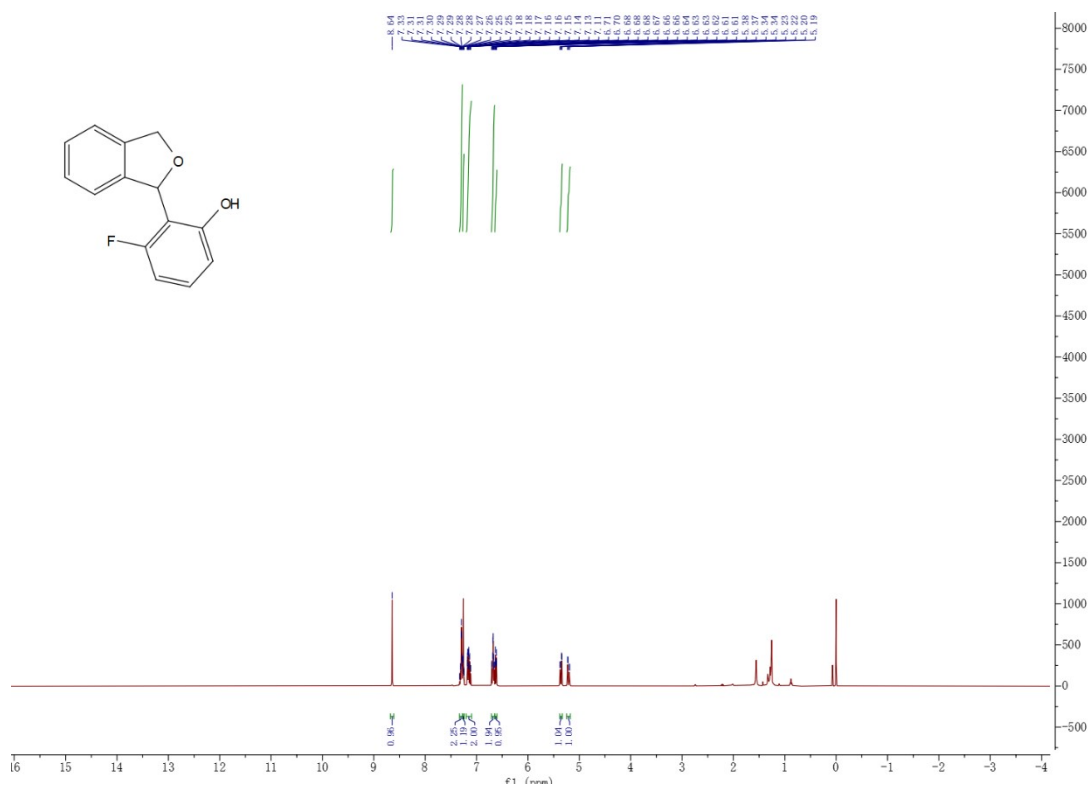




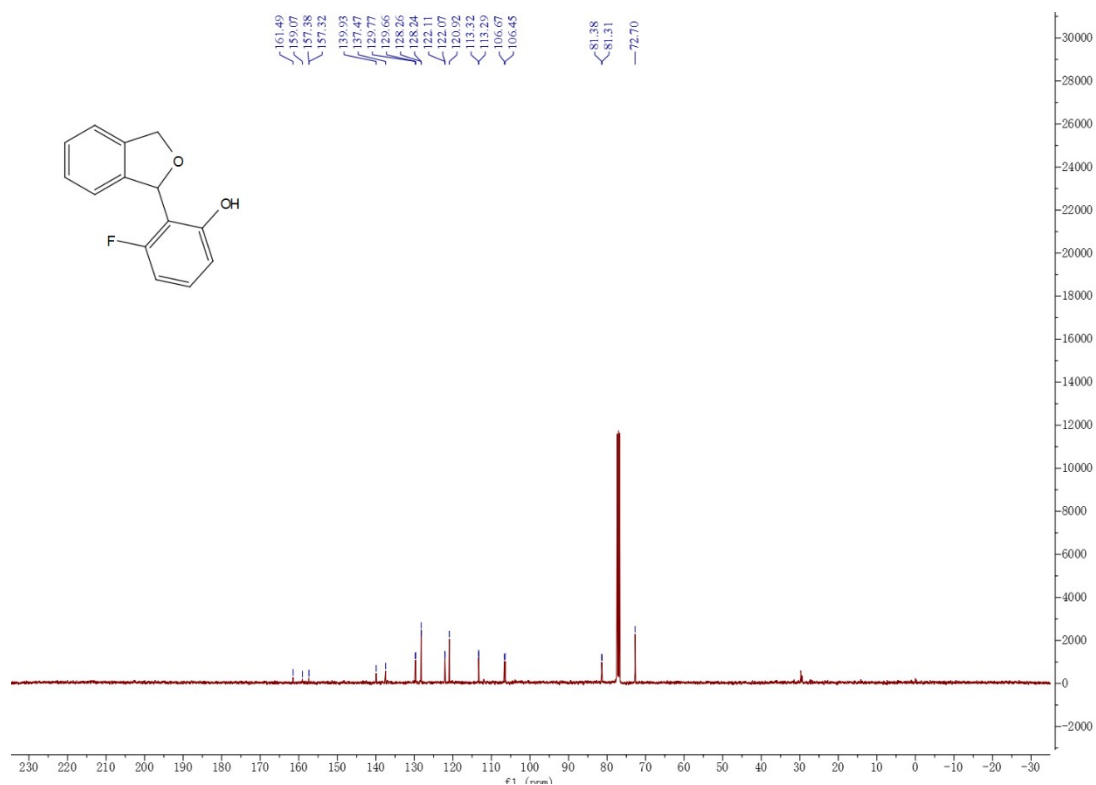




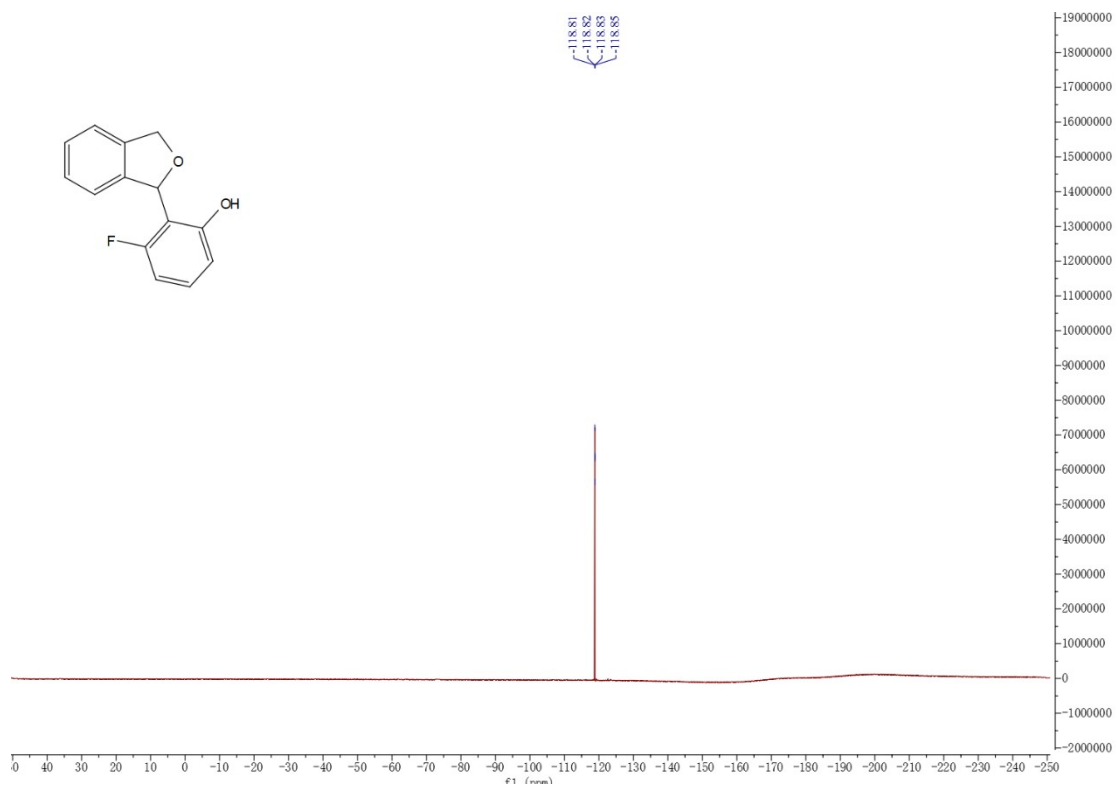
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3af



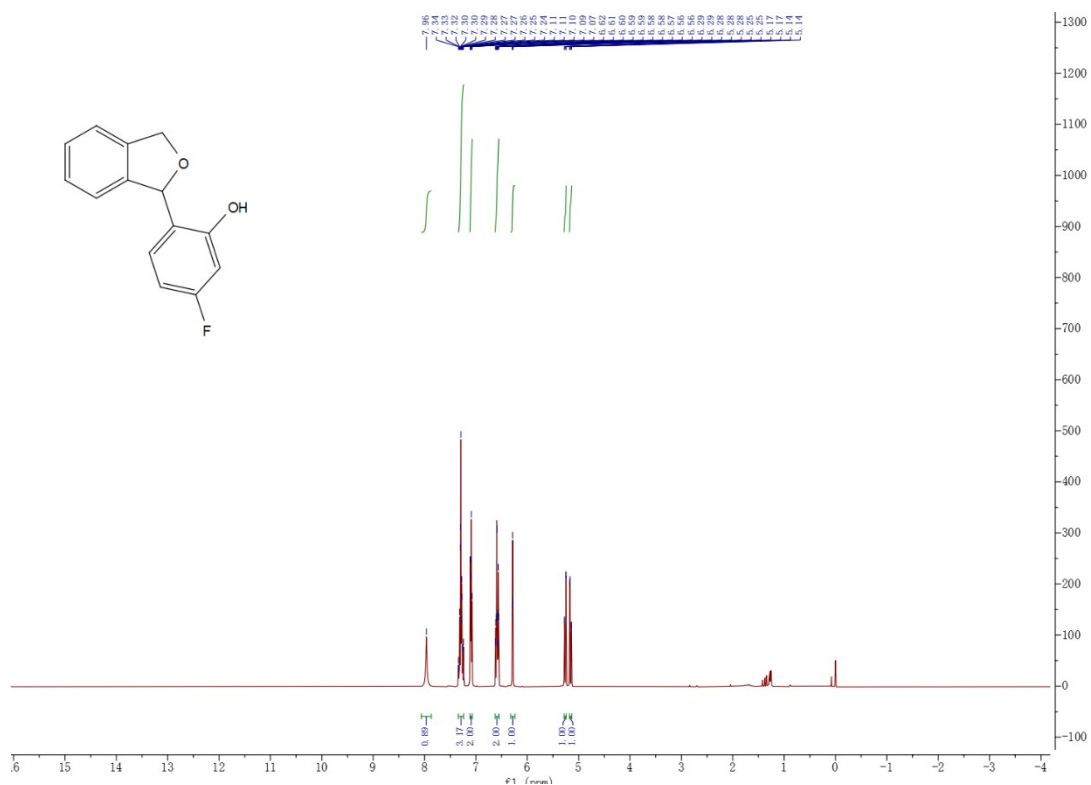
### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3af



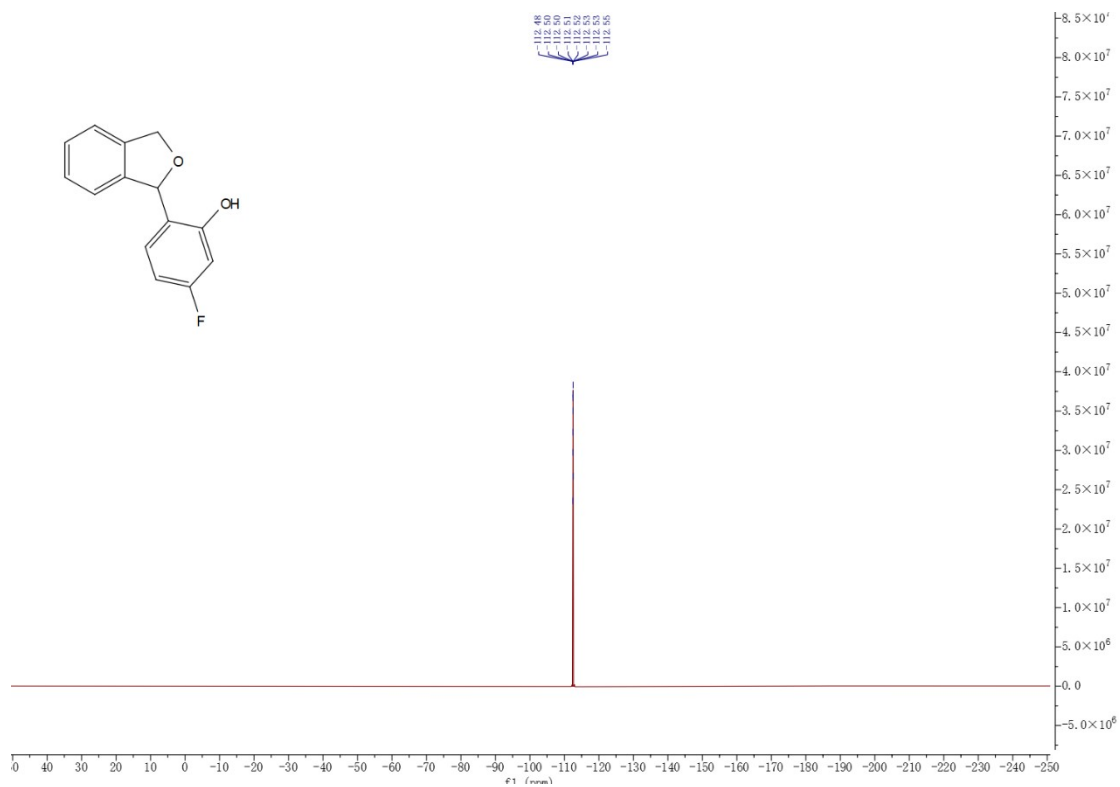
**<sup>19</sup>F NMR (376 MHz, Chloroform-*d*) of 3af**



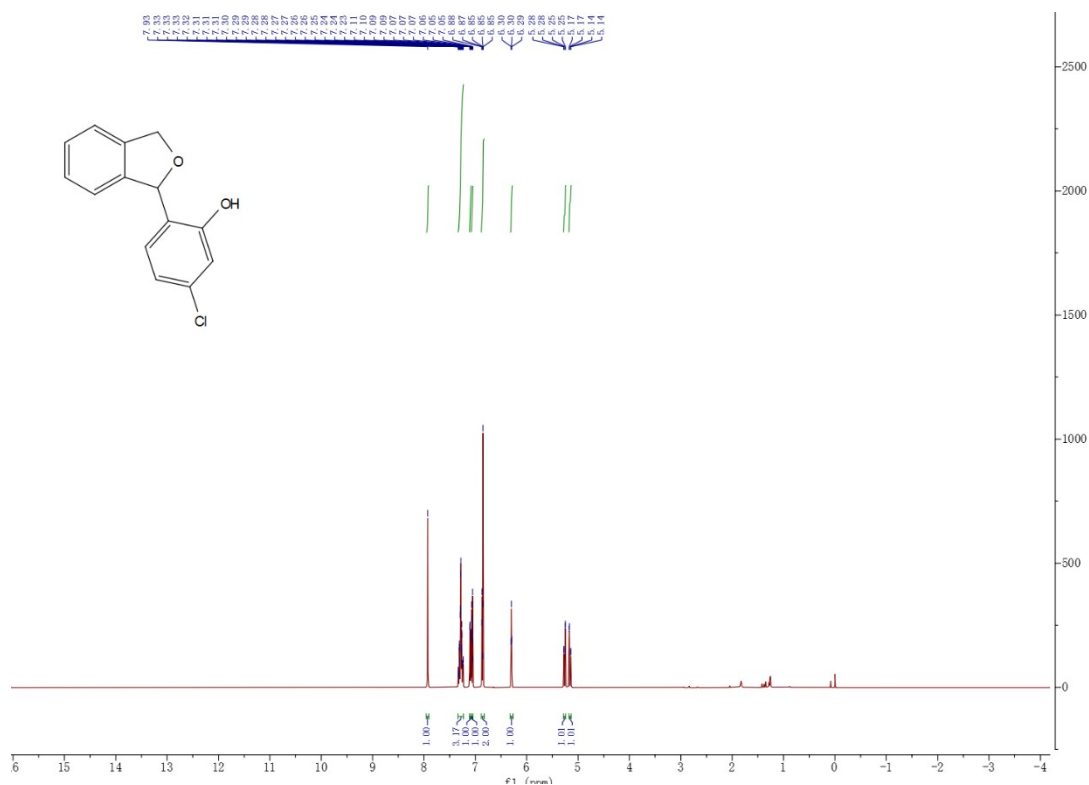
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ag



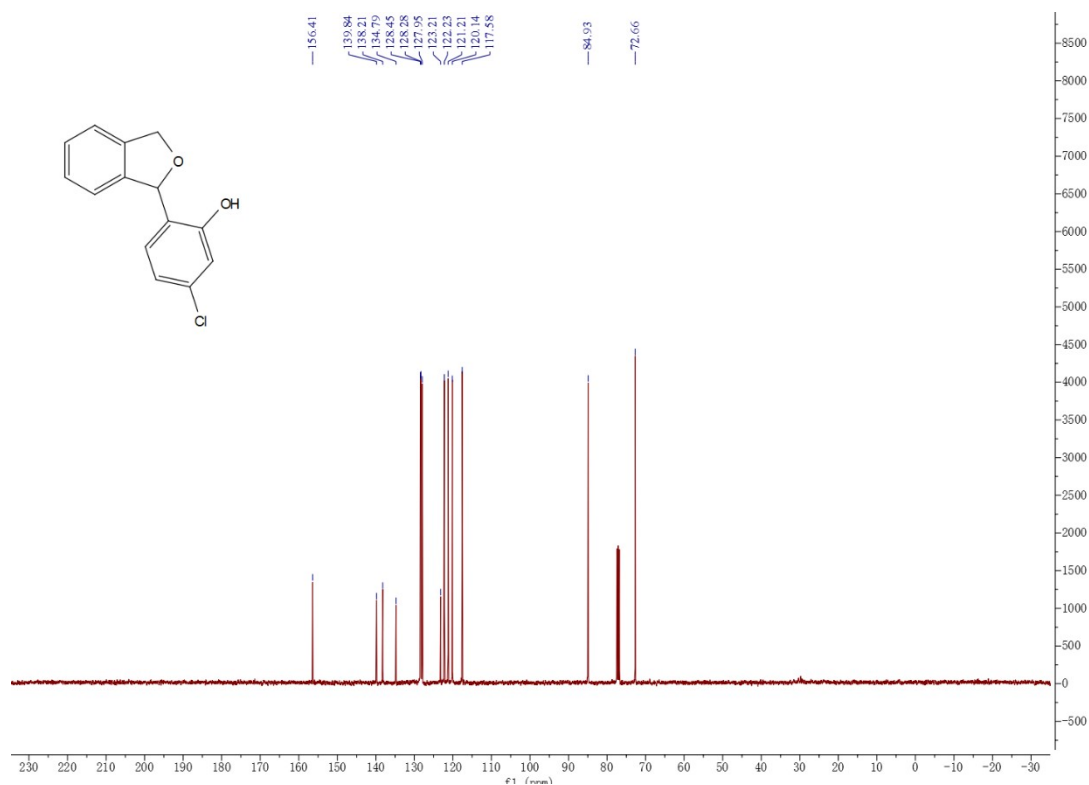
**<sup>19</sup>F NMR (376 MHz, Chloroform-*d*) of 3ag**



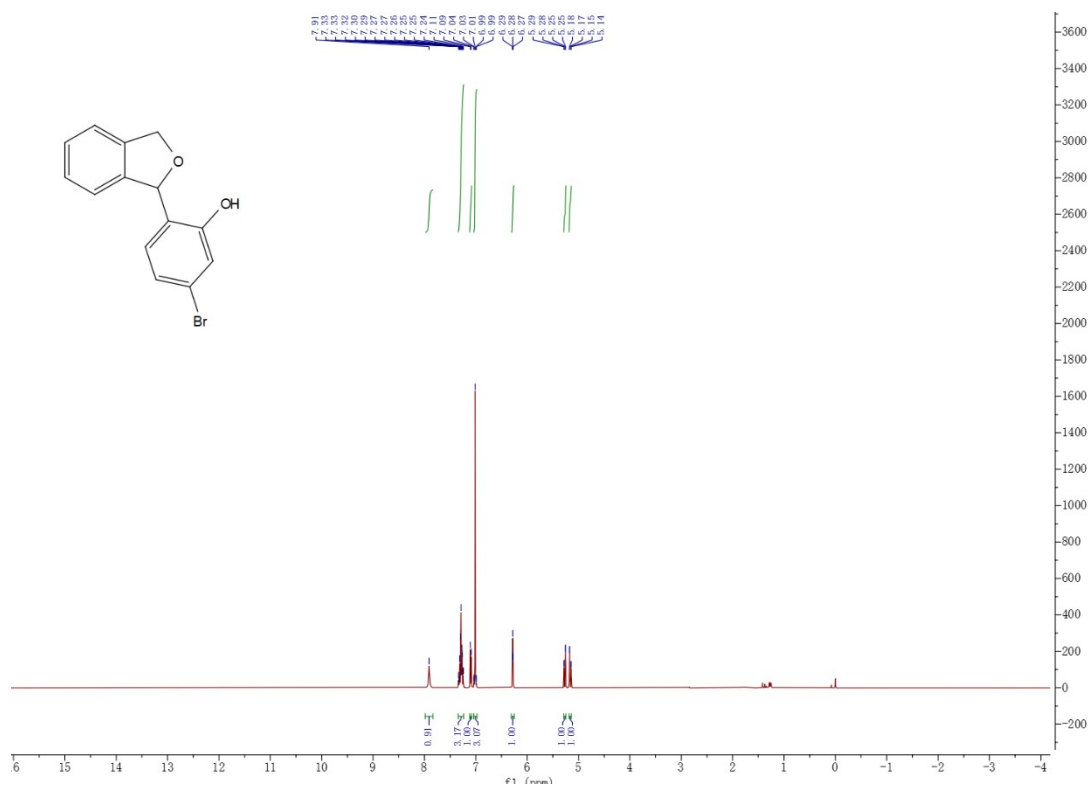
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ah**



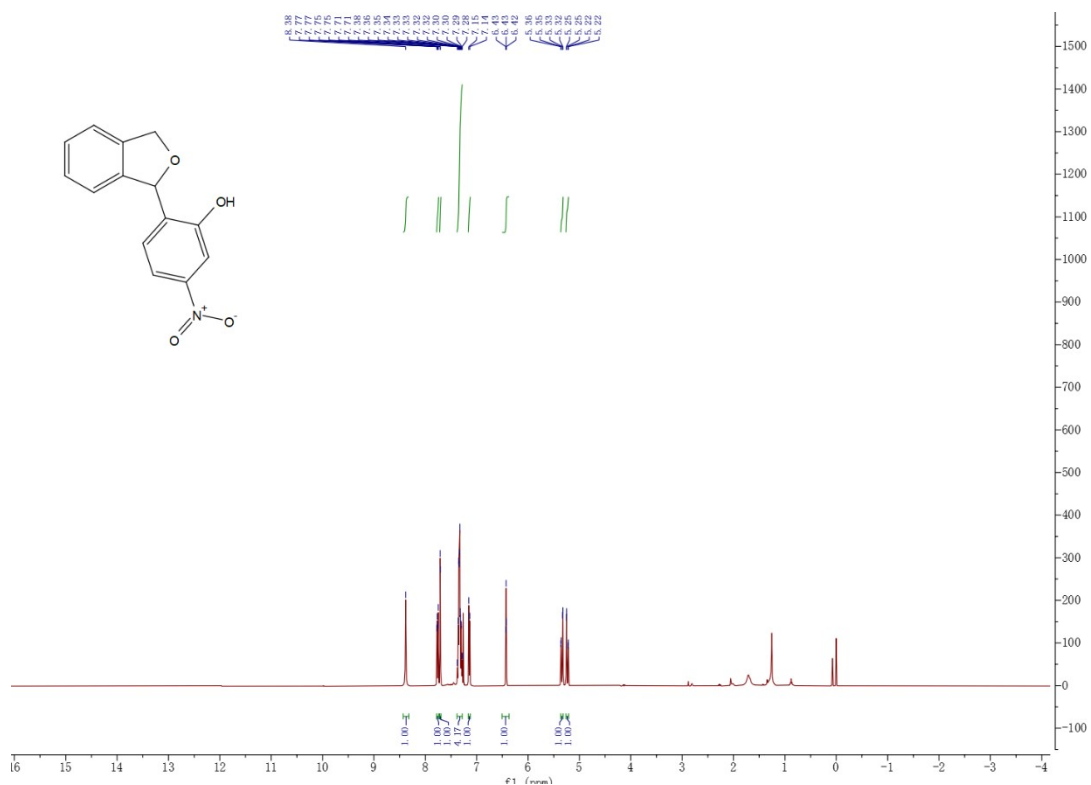
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ah**



**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ai**

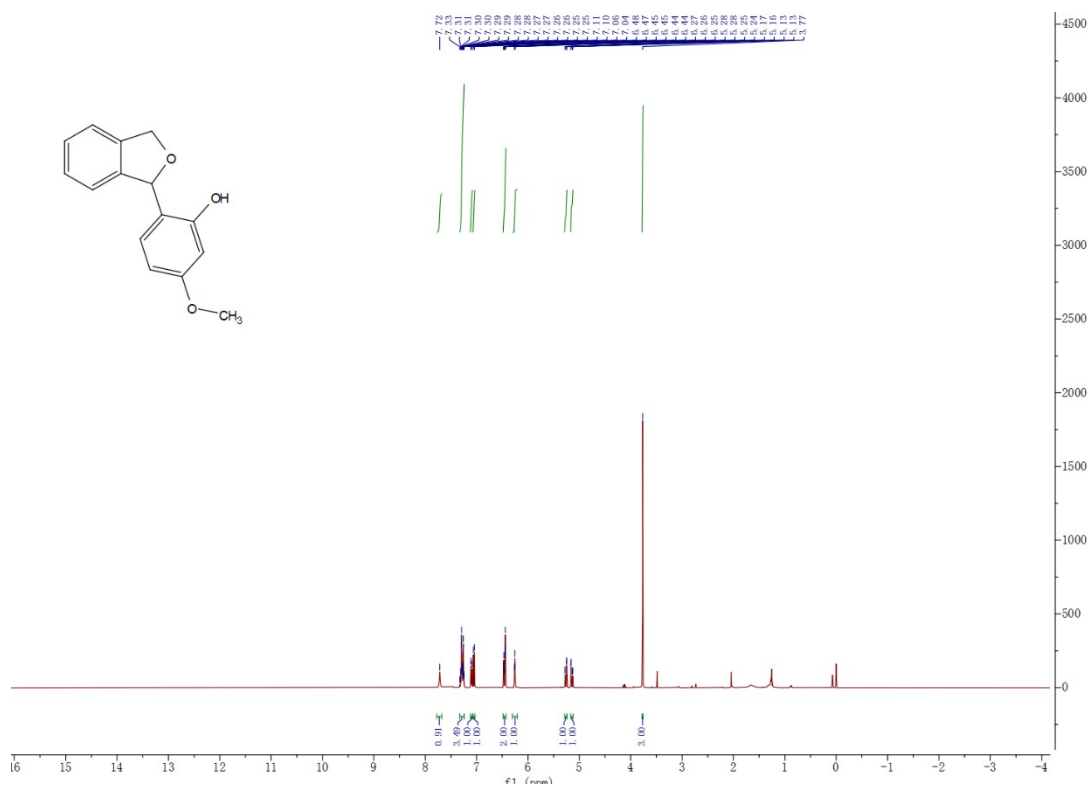


### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3aj

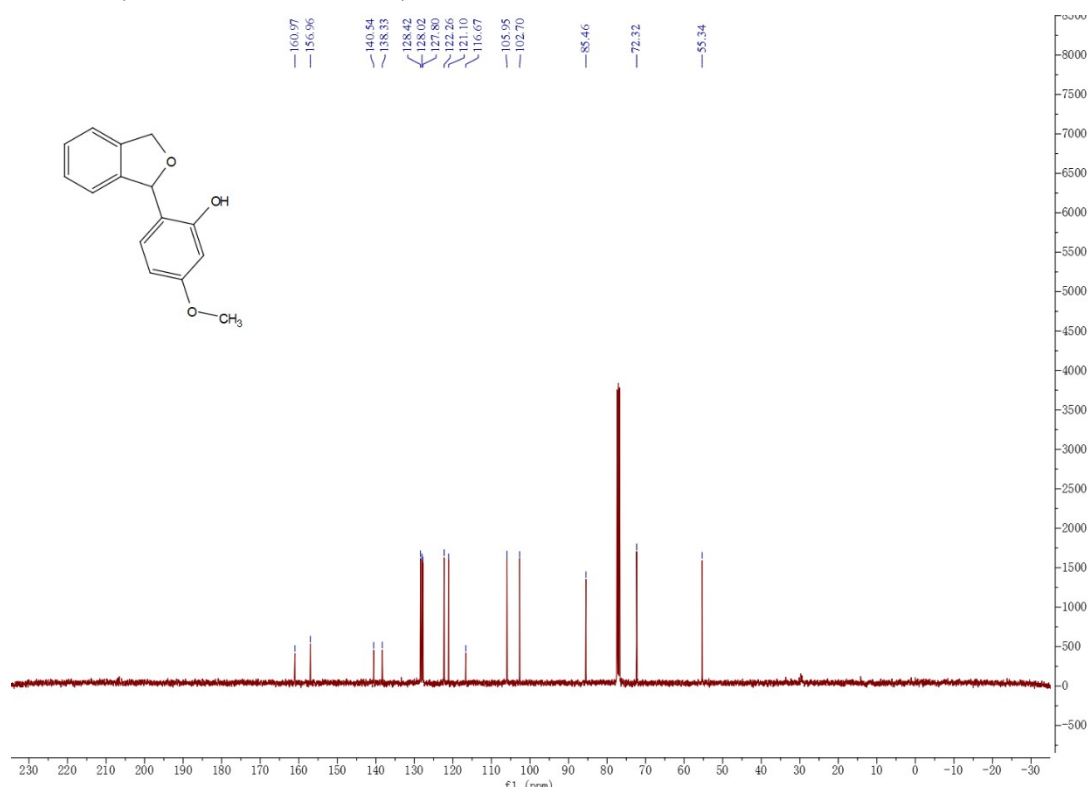




### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3a



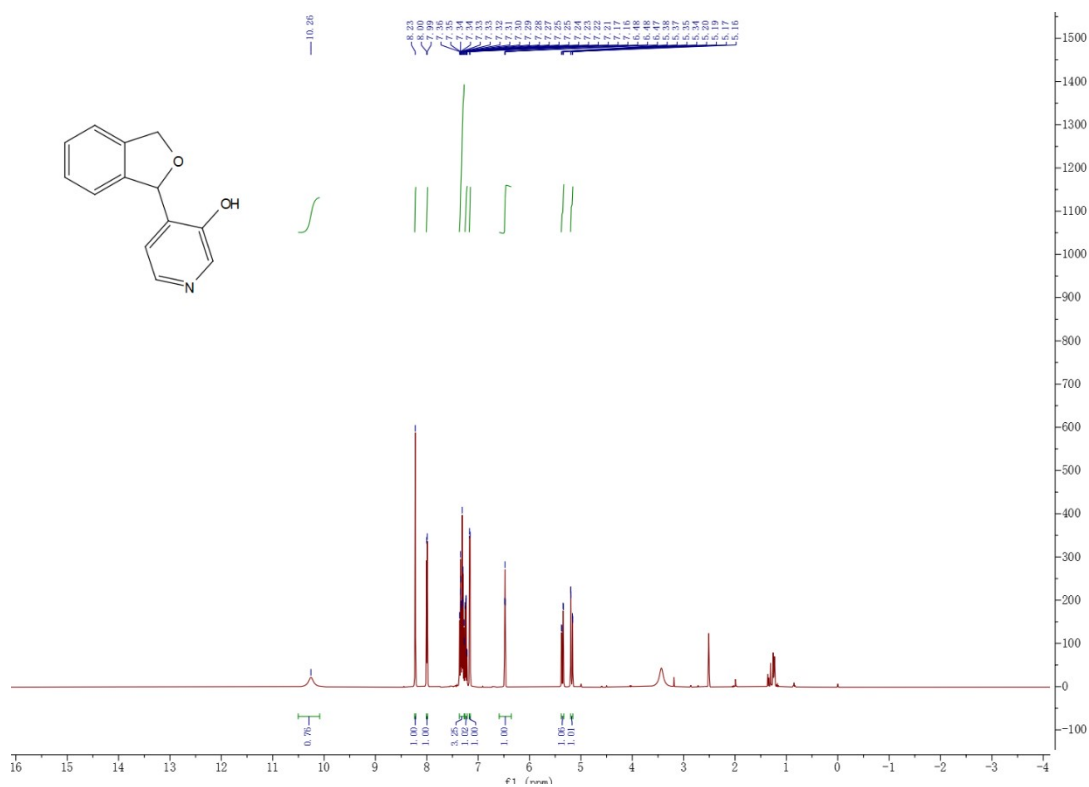
### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3a



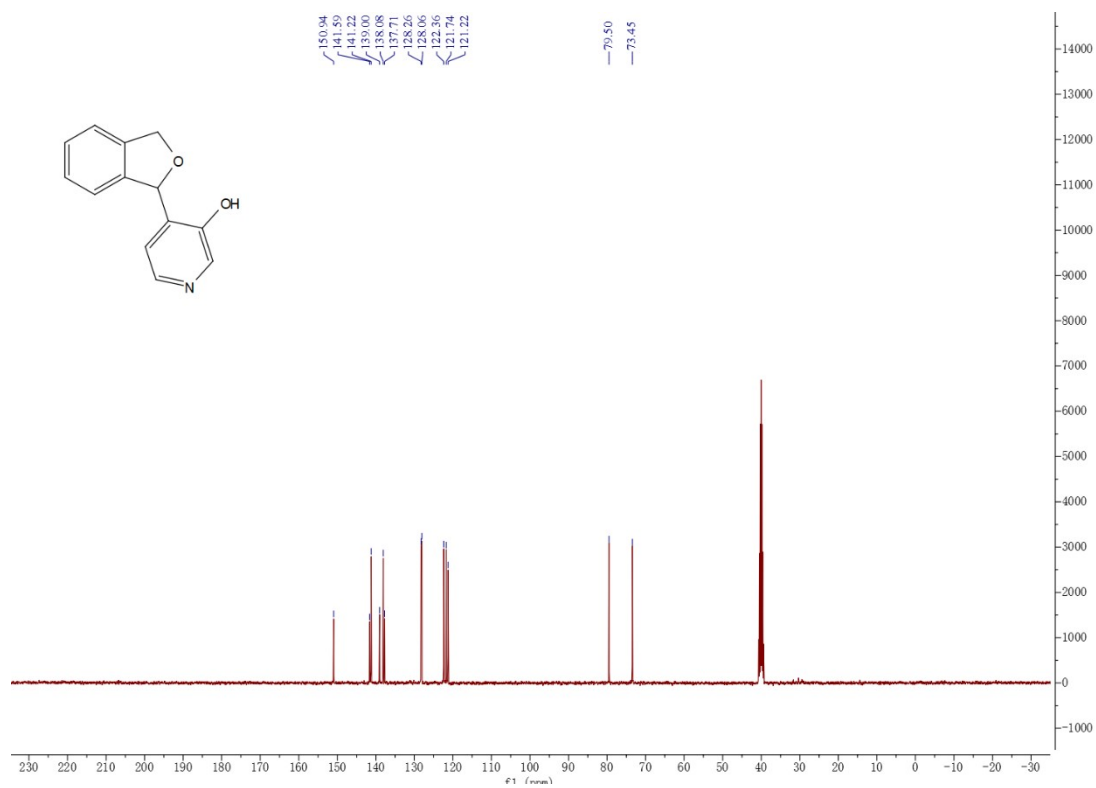




**<sup>1</sup>H NMR (400 MHz, DMSO-d<sub>6</sub>) of 3ao**

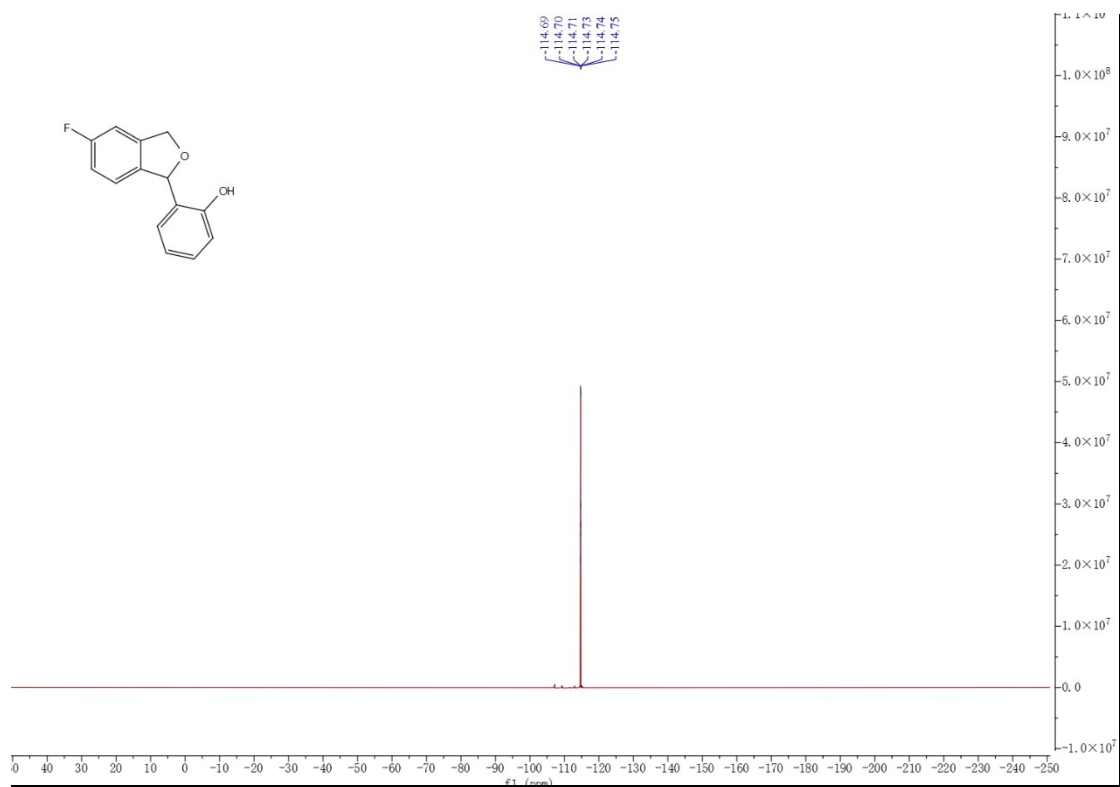


**<sup>13</sup>C NMR (101 MHz, DMSO-d<sub>6</sub>) of 3ao**

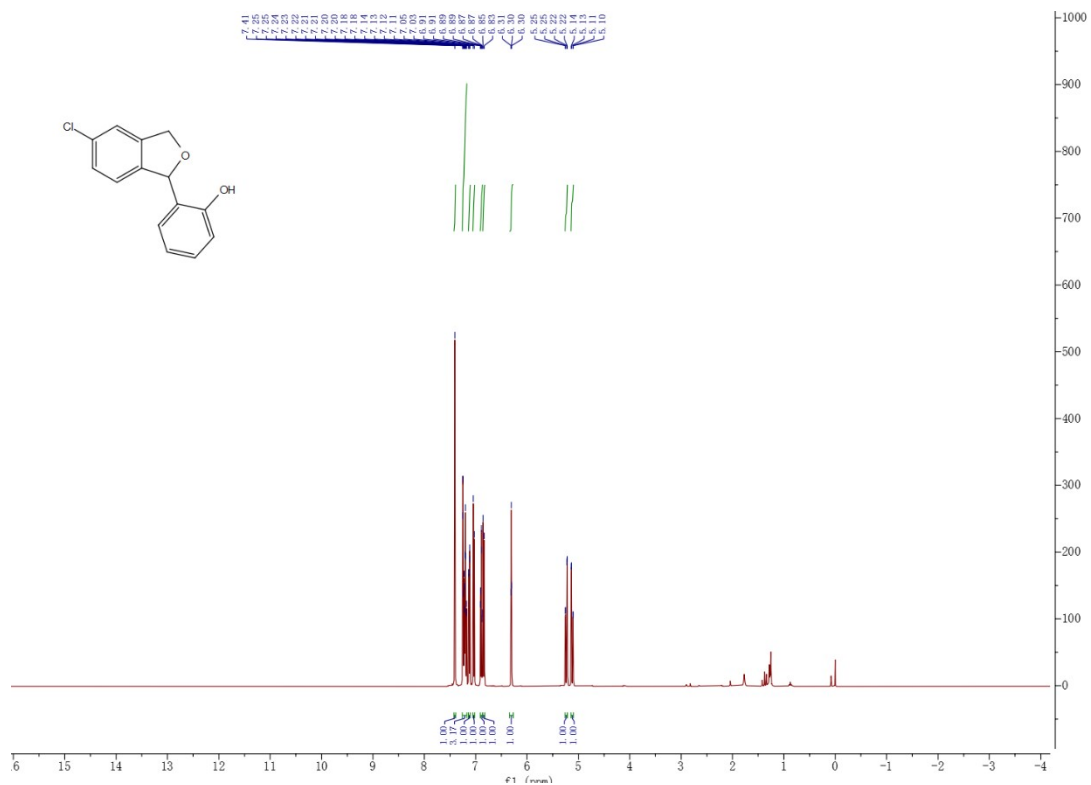




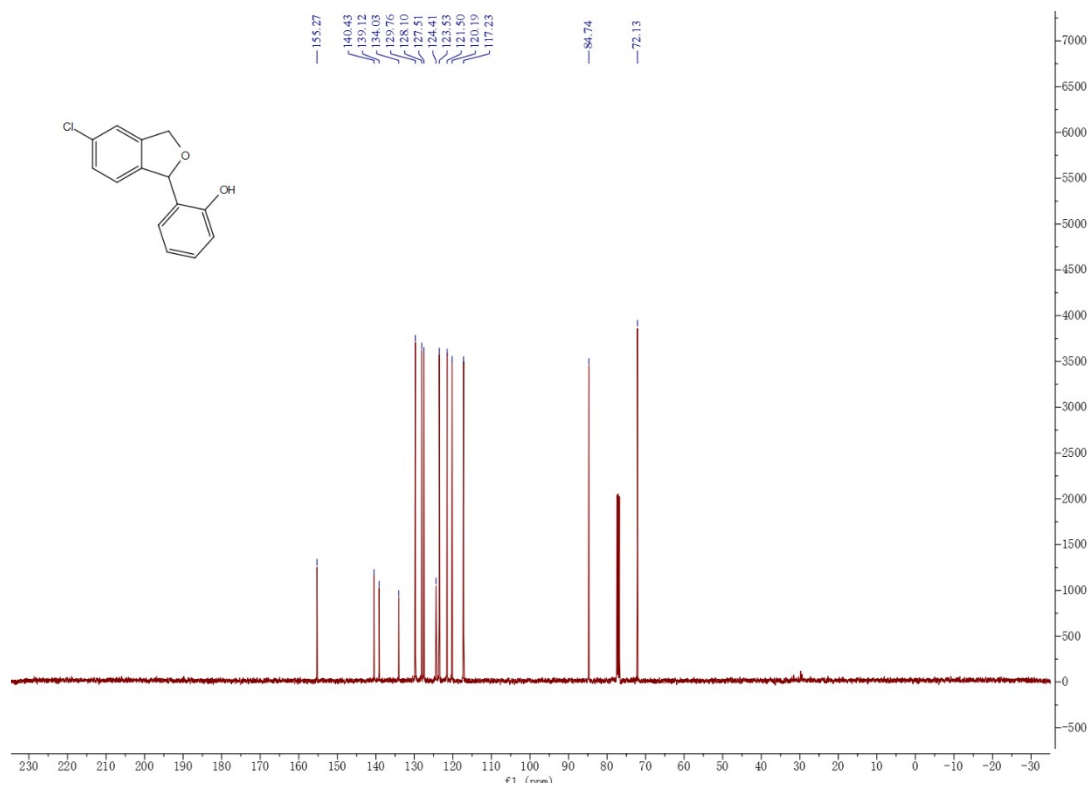
**<sup>19</sup>F NMR (376 MHz, Chloroform-*d*) of 3ba**



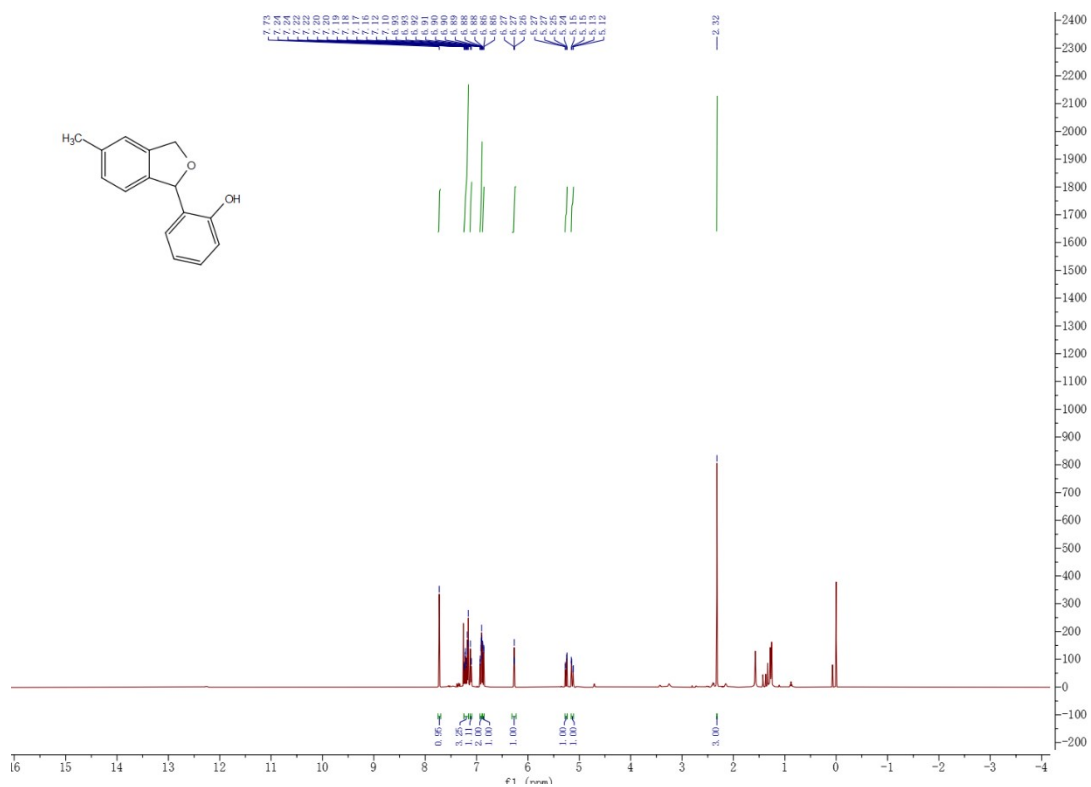
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ca



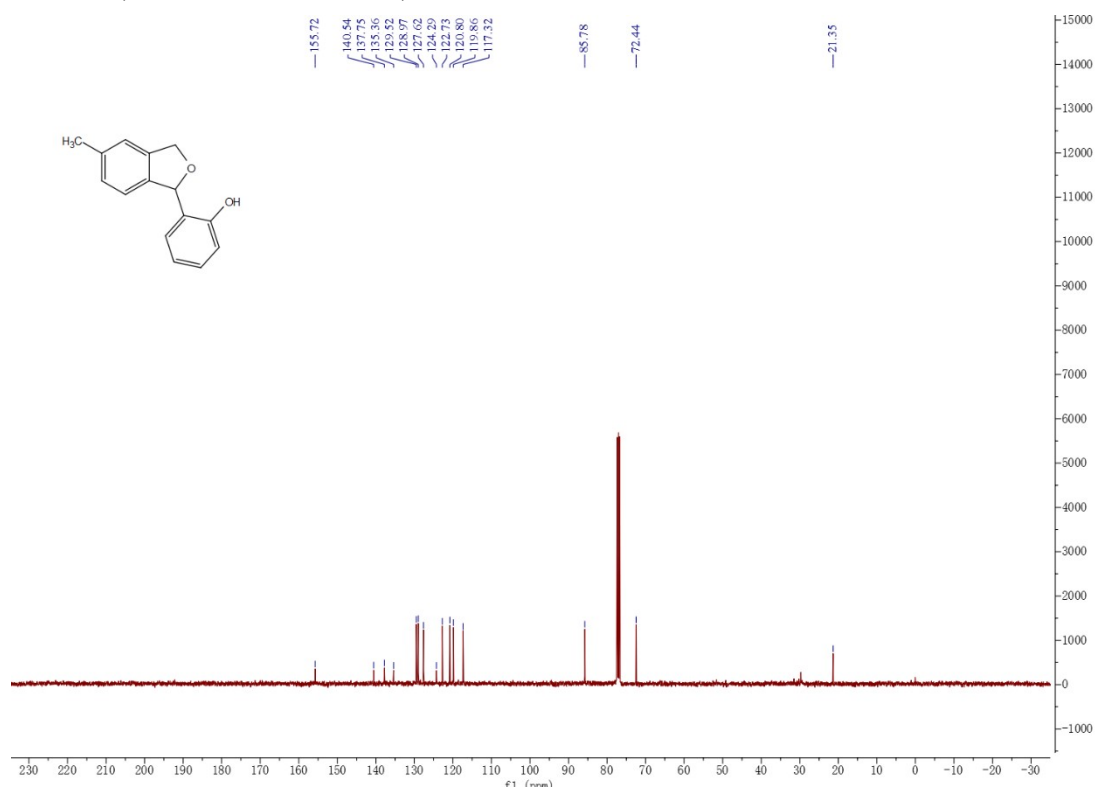
### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ca



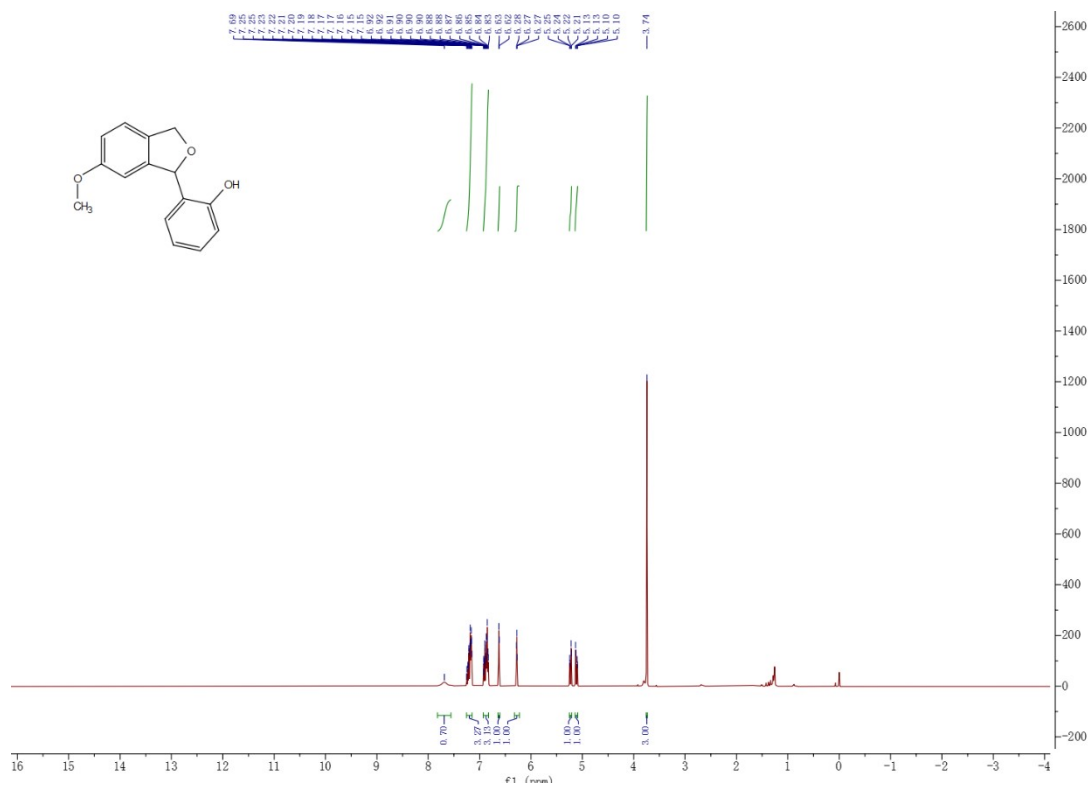
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3da**



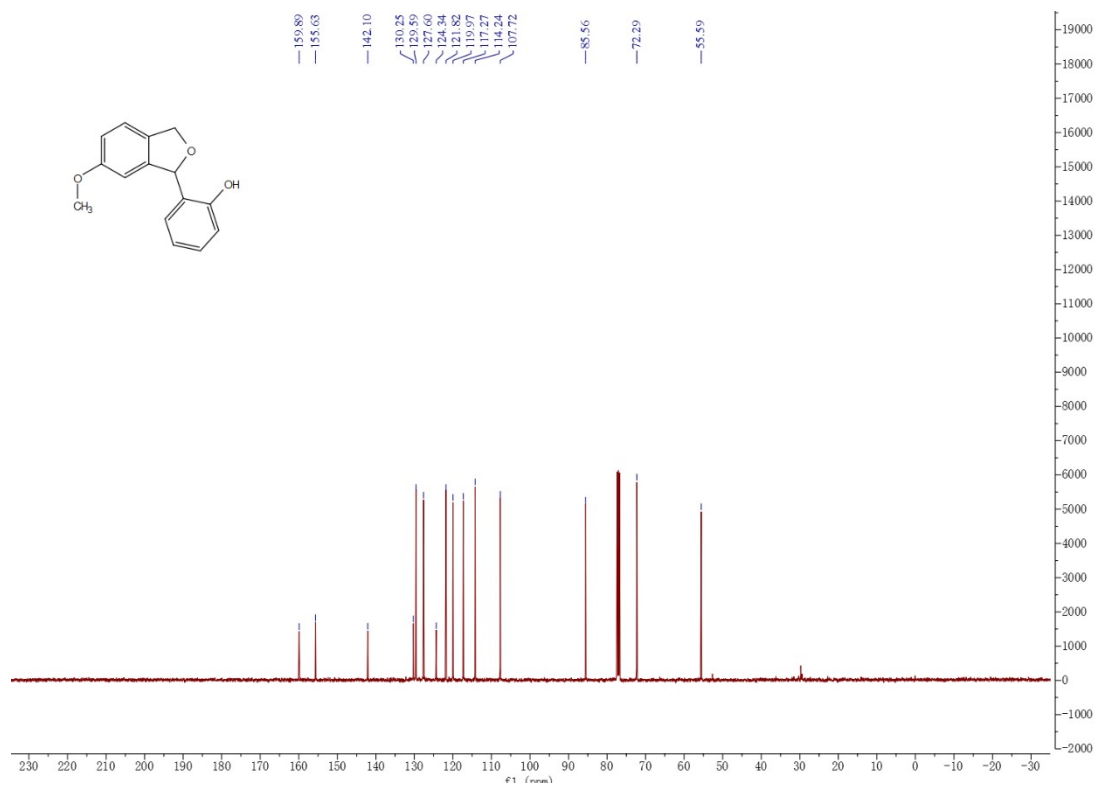
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3da**



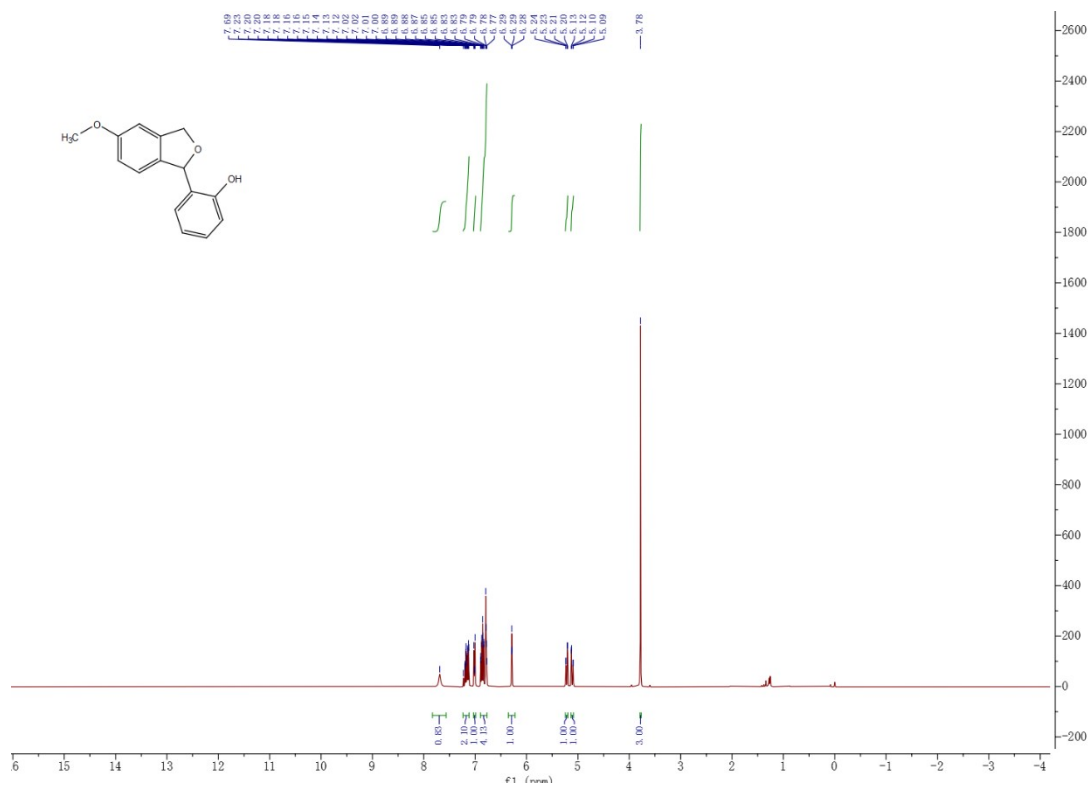
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ea**



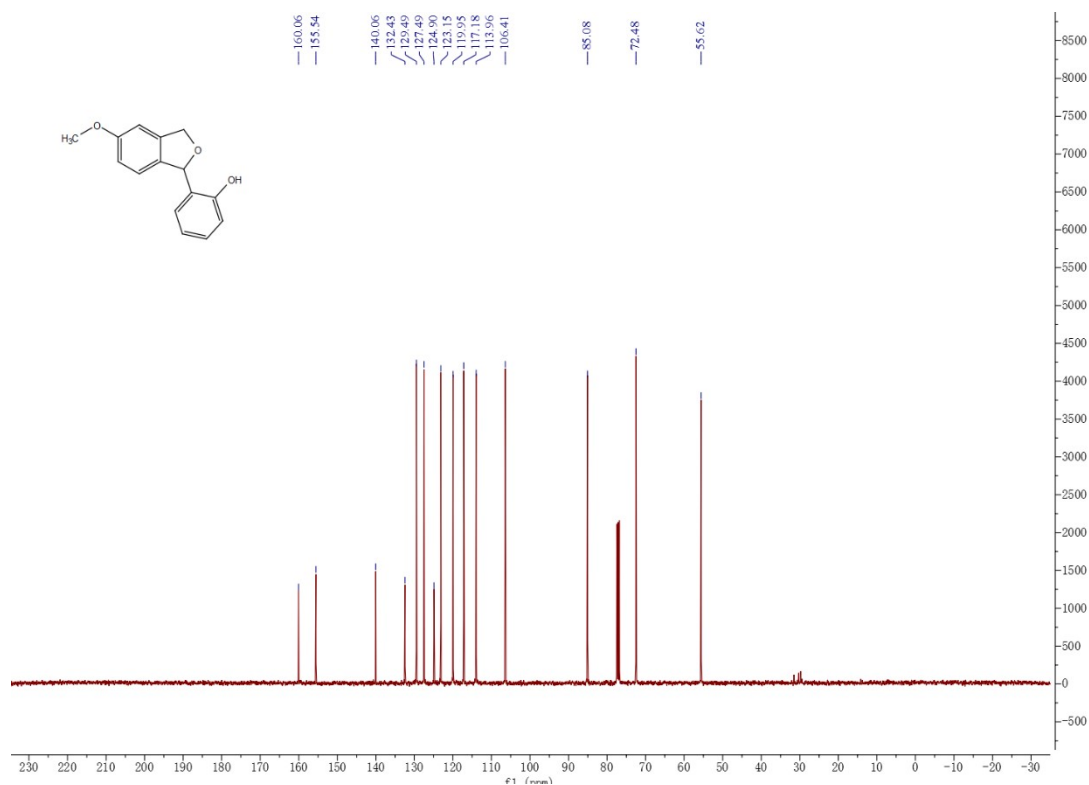
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ea**



### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3fa



### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3fa

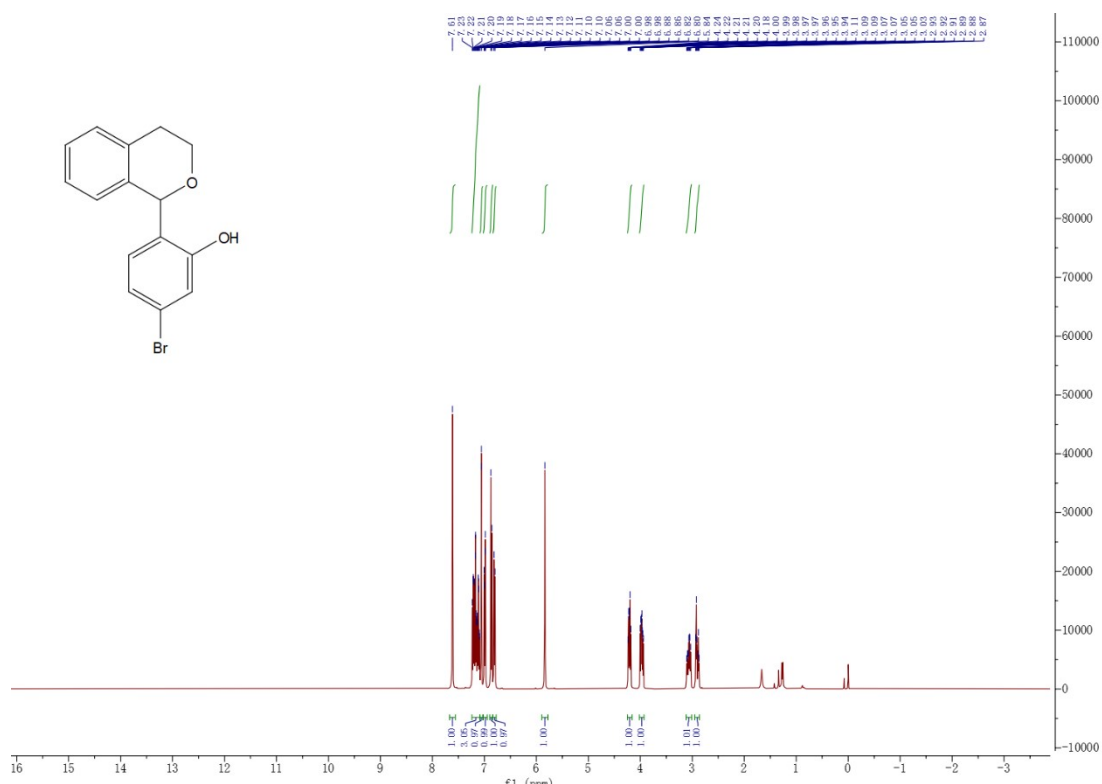




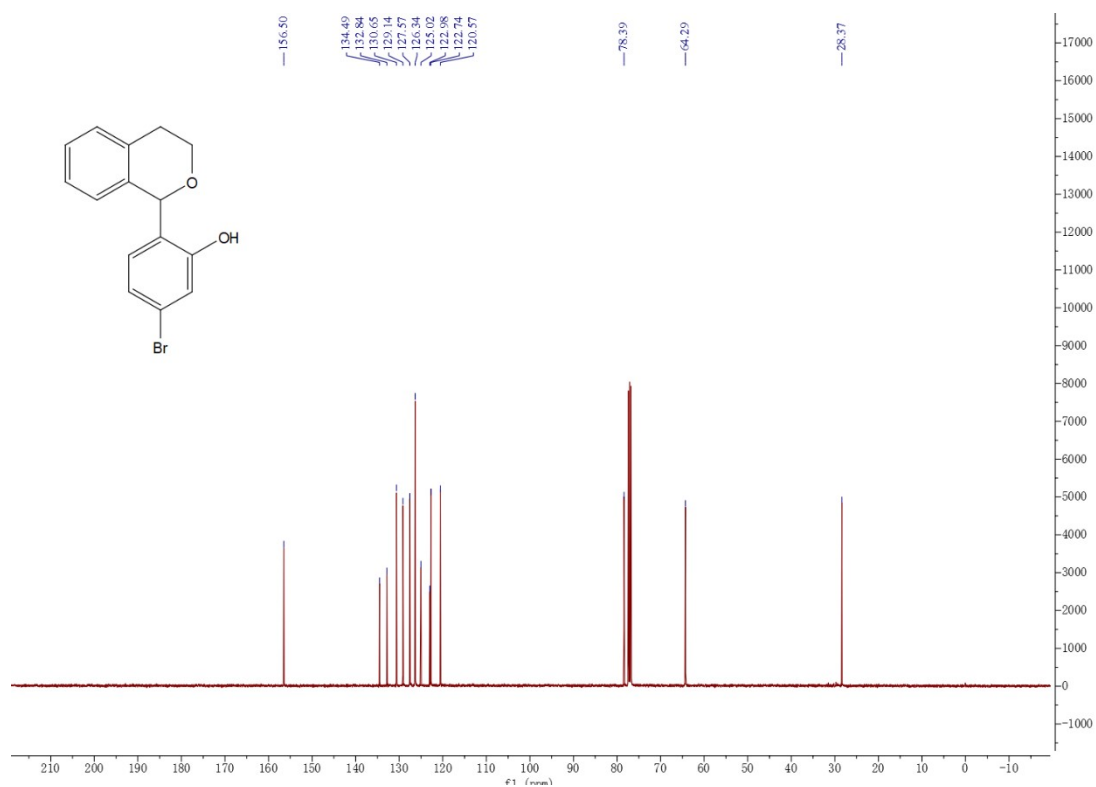




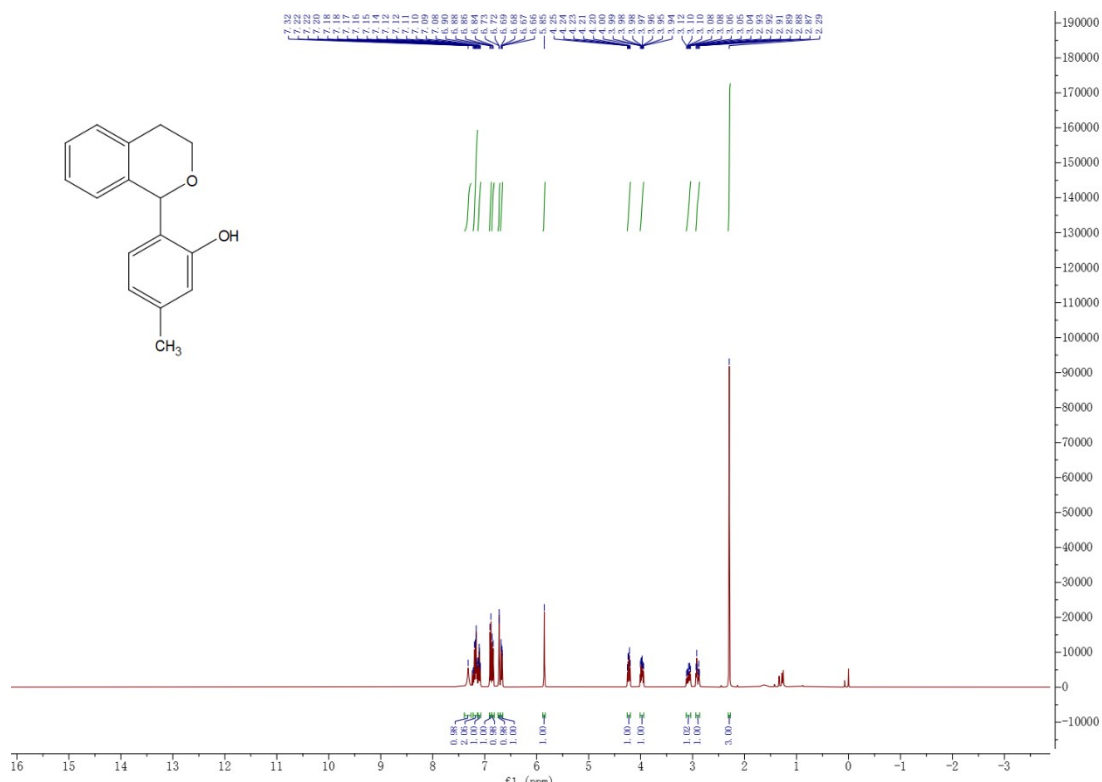
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ja**



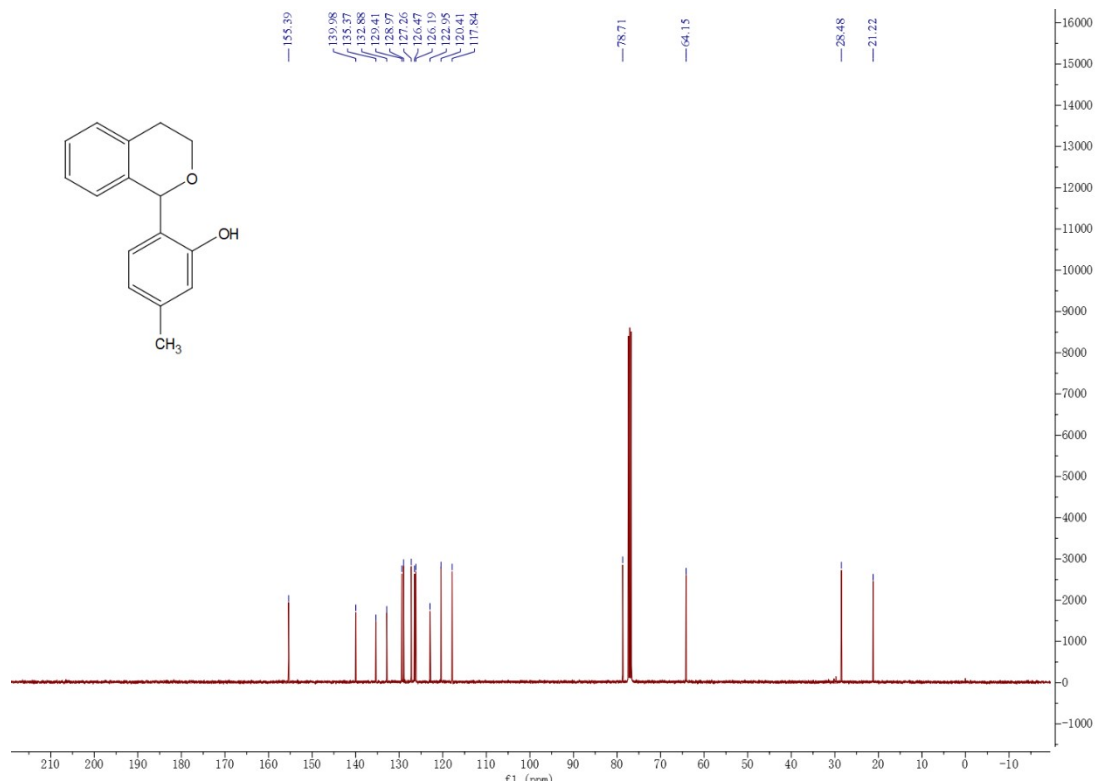
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ja**



### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ka

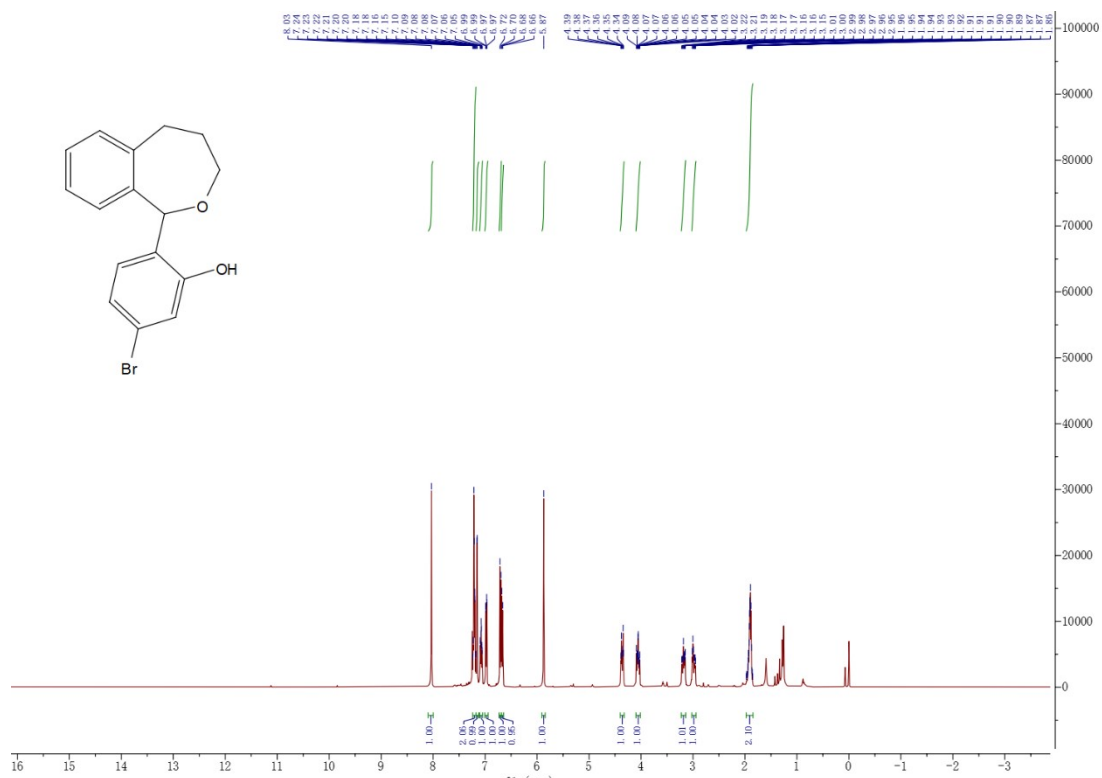


### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ka

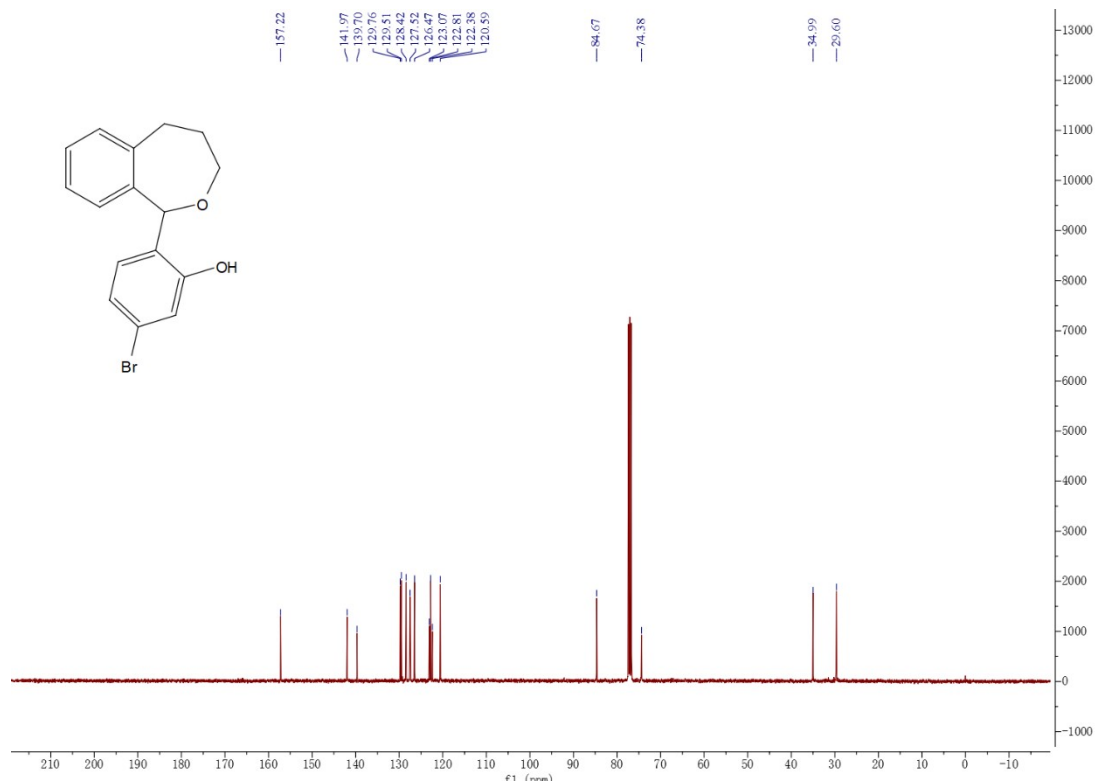




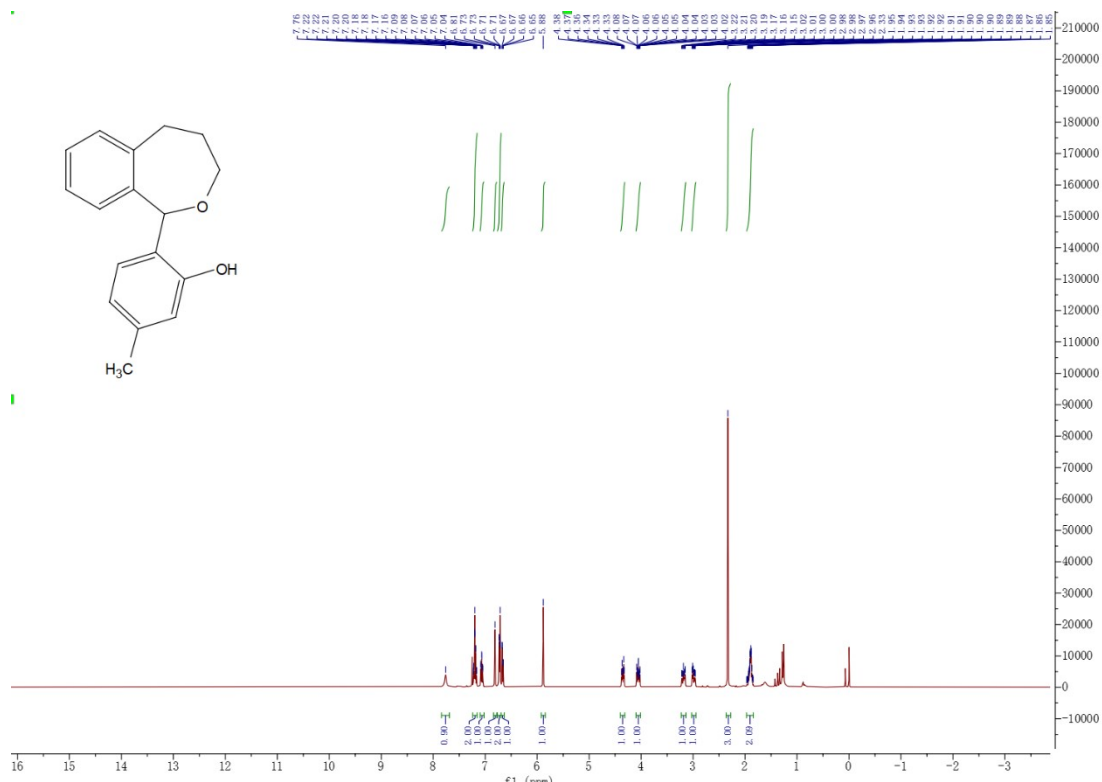
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3ma**



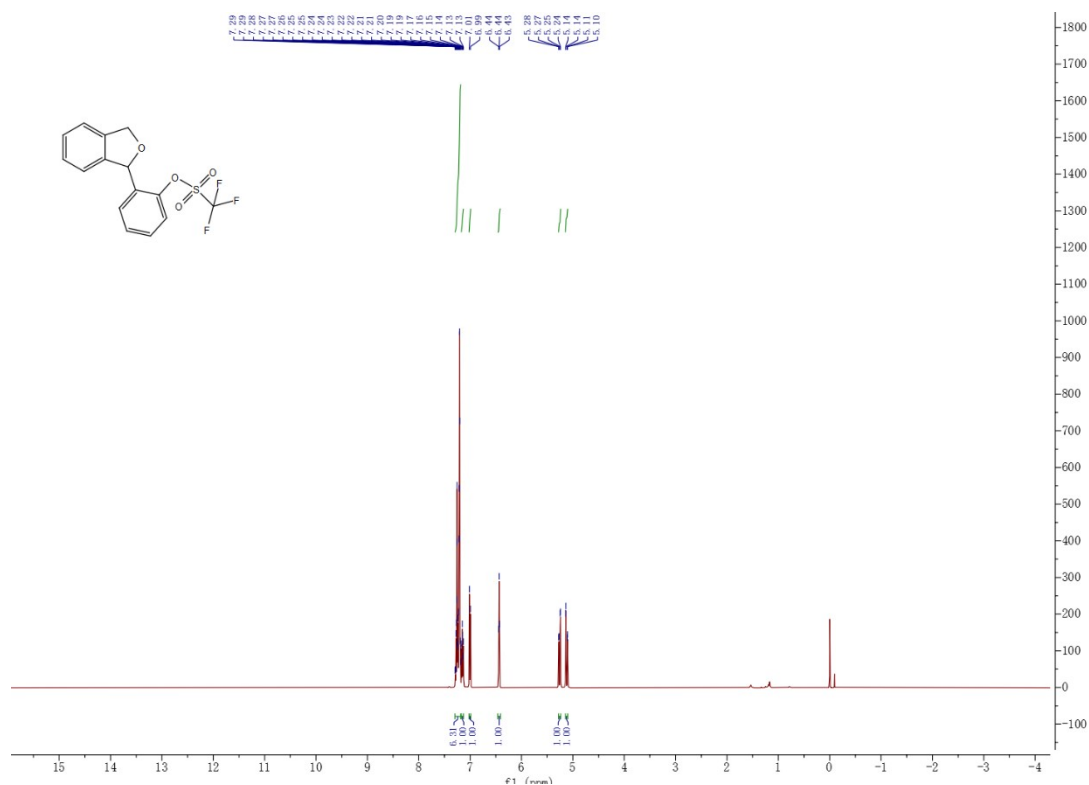
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 3ma**



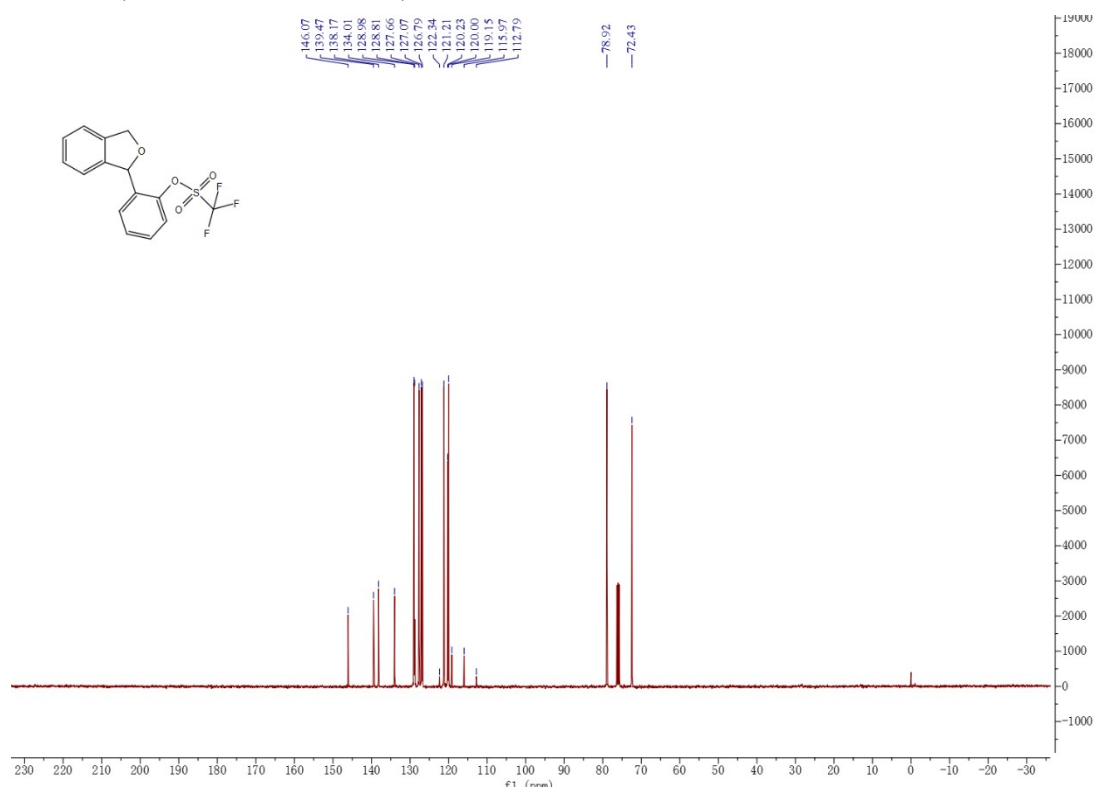
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 3na



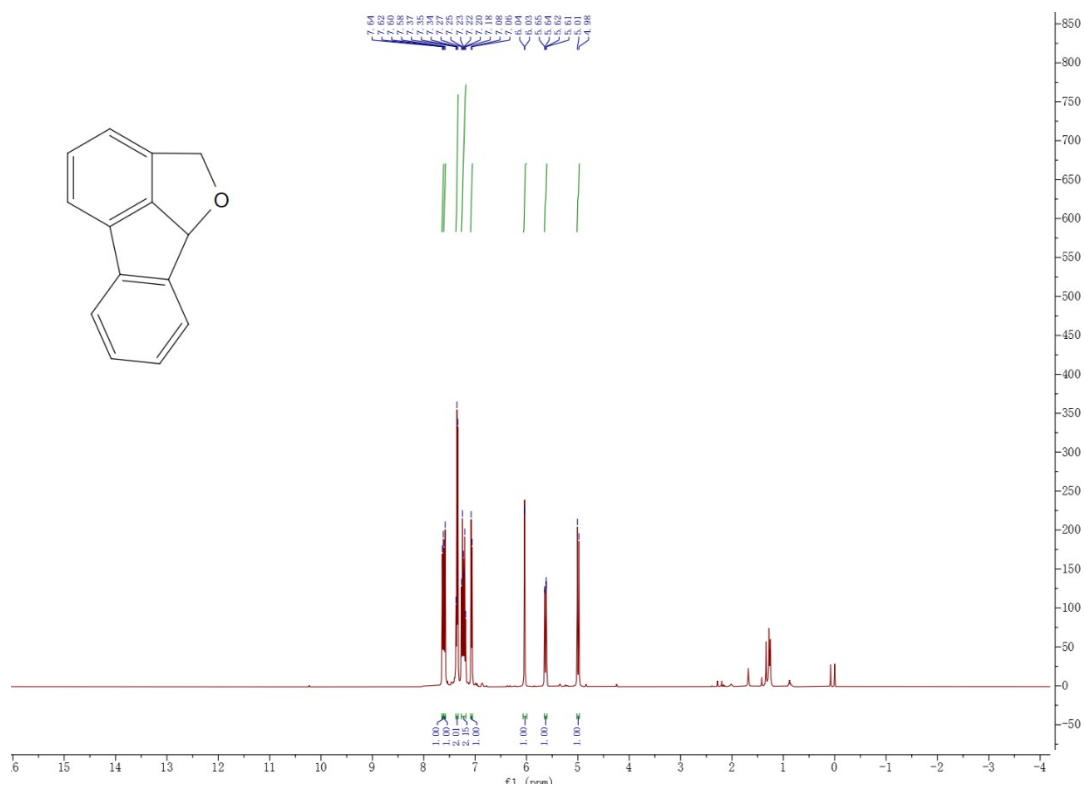
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 4aa



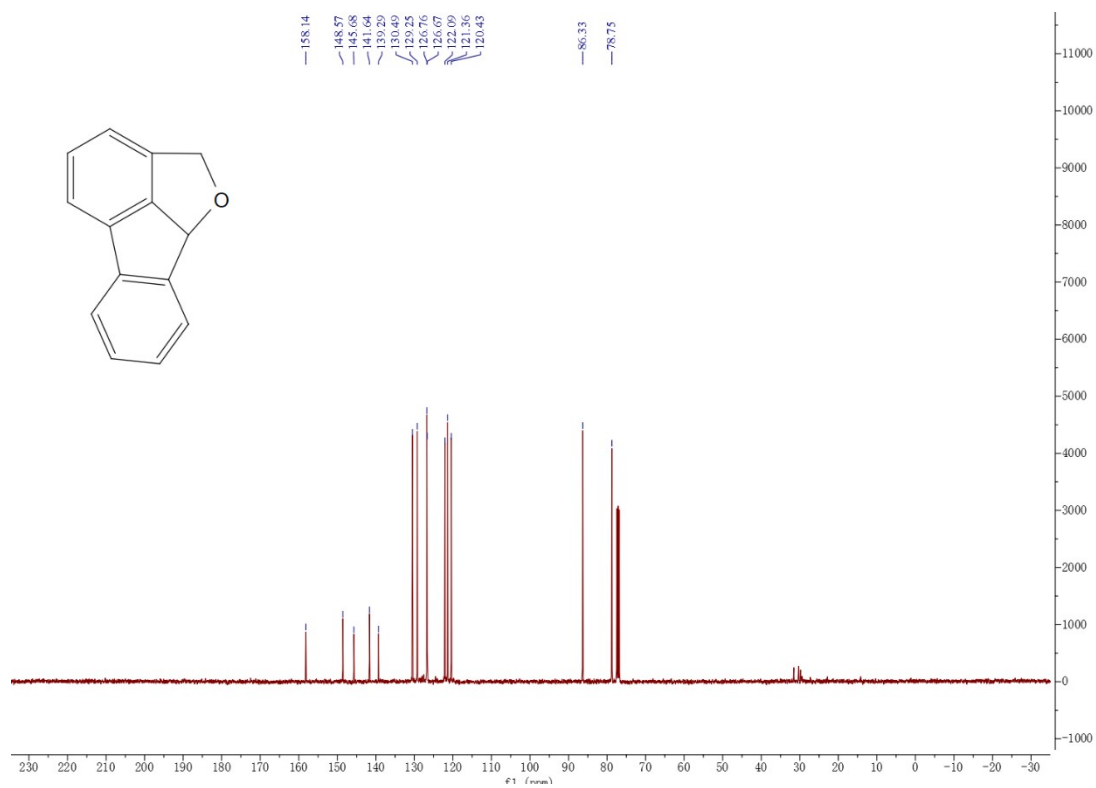
### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 4aa



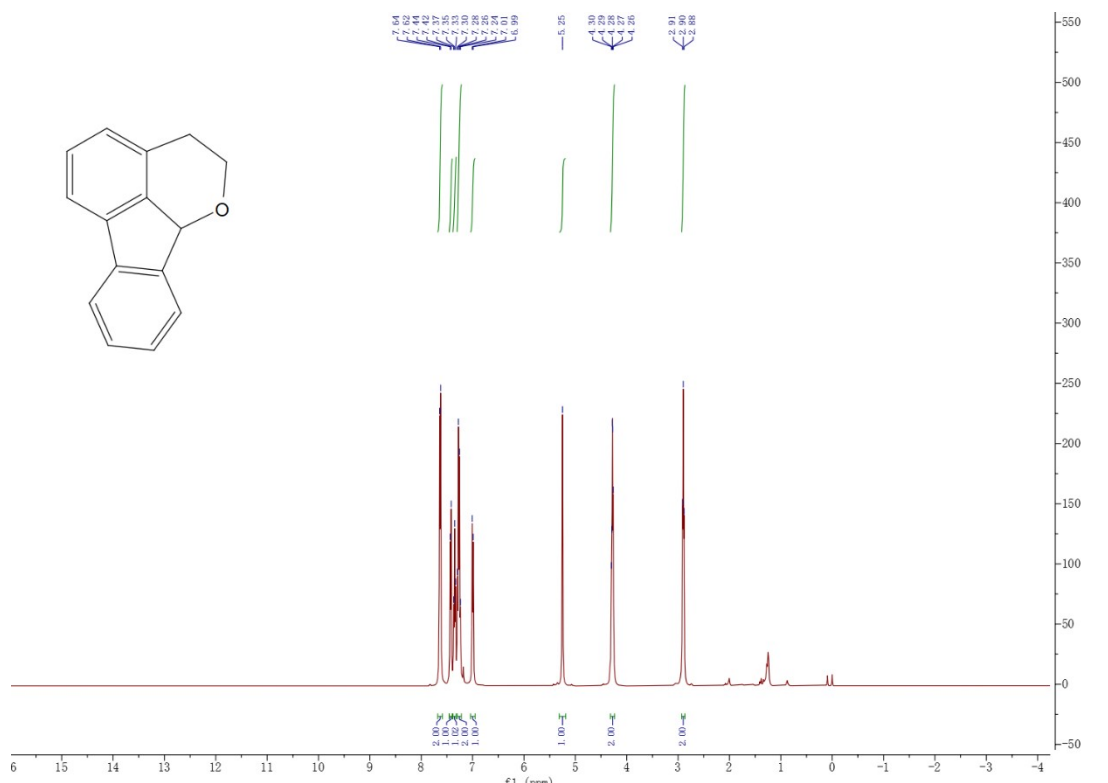
**<sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 5aa**



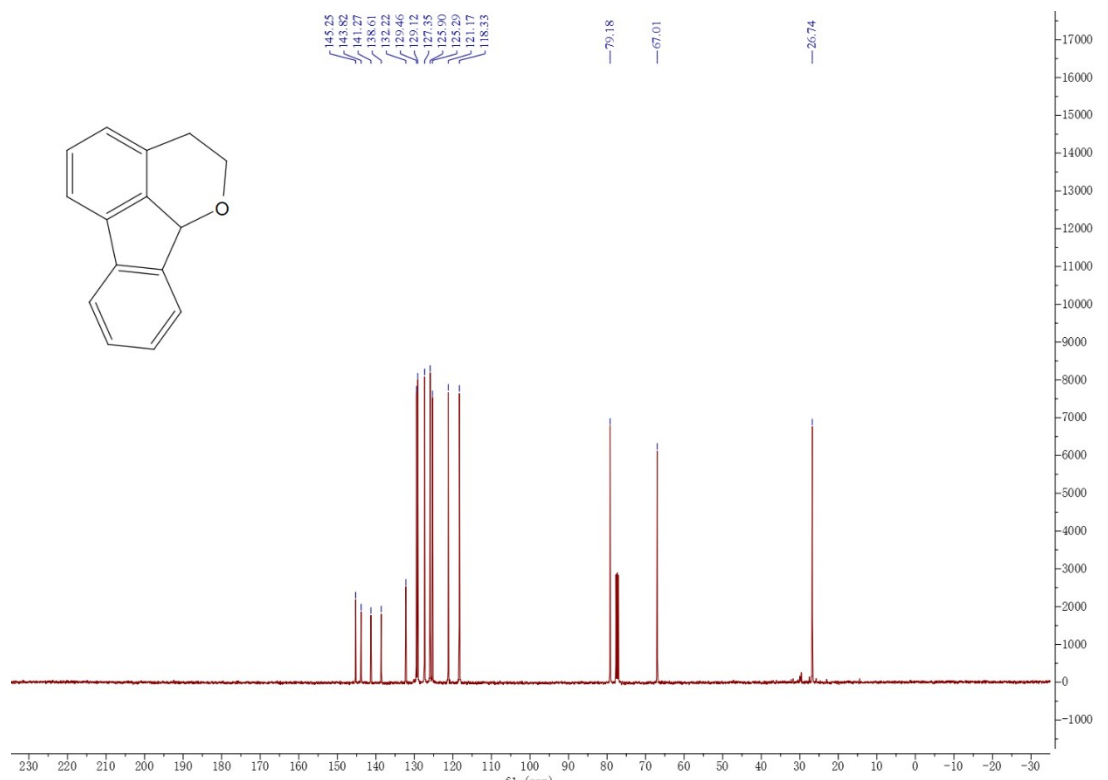
**<sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 5aa**



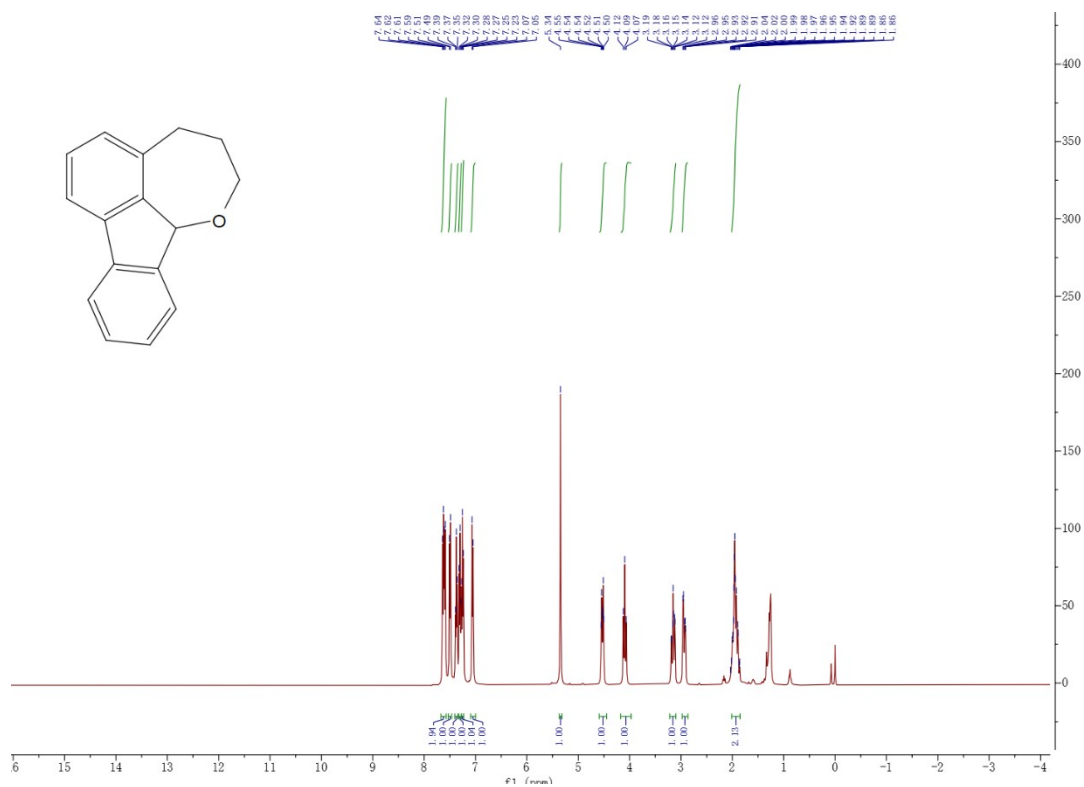
### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 5ia



### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 5ia



### <sup>1</sup>H NMR (400 MHz, Chloroform-*d*) of 5la



### <sup>13</sup>C NMR (101 MHz, Chloroform-*d*) of 5la

