

# Synthesis of *N*-vinylindoles through Copper Catalyzed Cyclization Reaction of *N*-(2-alkynylphenyl)imine

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## Supporting Information

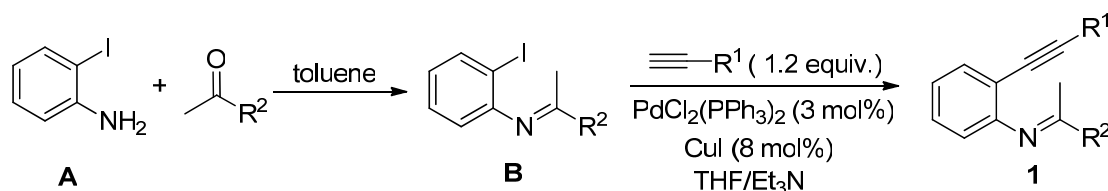
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## (A) Typical Experimental Procedure

### (a) Materials:

Substrates **1** were prepared according to the known procedures.<sup>1</sup>



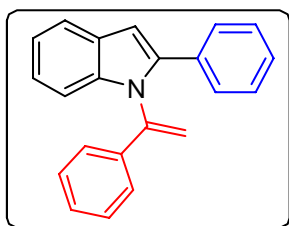
Substrates **1** were conveniently prepared by condensation of *o*-iodoanilines with ketones to give *N*-(*o*-iodophenyl)imines **B** followed by Sonogashira coupling of **B** with acetylenes to give *N*-(2-alkynylphenyl)imines.

### (b) Typical Experimental Procedure for the Copper Catalyzed Cyclization

#### Reaction of *N*-(2-alkynylphenyl)imine:

To a Schlenk tube were added *N*-(2-alkynylphenyl)imines **1** (0.2 mmol), Cu(OAc)<sub>2</sub> (10 mol%) and DCE (2 mL). Then the tube was charged with N<sub>2</sub> (1 atm), and was stirred at 100 °C for the indicated time until complete consumption of starting material as monitored by TLC. After the reaction was finished, the reaction mixture was diluted in diethyl ether and the solid was removed by filtration. The solvent was evaporated under reduced pressure, and the resulting residue was purified by silica gel column chromatography (hexane/ethyl acetate) to afford the desired product **2**.

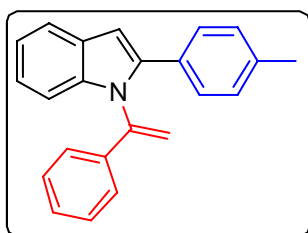
**(B) Analytical data for 2.**



**2-Phenyl-1-(1-phenylvinyl)-1H-indole (2a)<sup>2</sup>**

Yellow oil; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ: 7.68 - 7.65 (m, 1H), 7.49 - 7.47 (m, 2H), 7.27 - 7.09 (m, 11H), 6.77 (s, 1H),

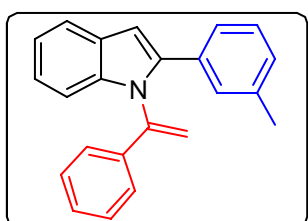
5.89 (s, 1H), 5.25 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ: 143.5, 141.3, 139.0, 137.2, 132.7, 128.8, 128.5, 128.4, 128.3, 128.1, 127.4, 125.9, 122.2, 120.6, 120.4, 113.8, 111.5, 103.7; LRMS (EI 70 ev) *m/z* (%): 295 (M<sup>+</sup>, 100), 193 (37), 165 (24), 103 (26), 51 (7).



**1-(1-Phenylvinyl)-2-(p-tolyl)-1H-indole (2b)**

Yellow solid, mp 85.3 - 87.0 °C (uncorrected); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ: 7.66 - 7.63 (m, 1H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.24 - 7.08 (m, 8H), 7.05 (d, *J* = 8.0 Hz, 2H), 6.73

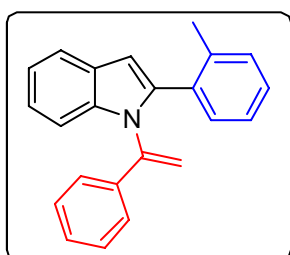
(s, 1H), 5.88 (s, 1H), 5.22 (s, 1H), 2.29 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ: 143.5, 141.4, 138.9, 137.2 (2C), 129.8, 128.8, 128.7, 128.5, 128.4, 128.2, 125.9, 122.0, 120.5, 120.3, 113.8, 111.4, 103.2, 21.2; LRMS (EI 70 ev) *m/z* (%): 309 (M<sup>+</sup>, 100), 294 (32), 232 (22), 207 (26), 103 (20), 77 (19); HRMS (EI) calcd for C<sub>23</sub>H<sub>20</sub>N [M + H]<sup>+</sup>: 310.1596, found 310.1596.



**1-(1-Phenylvinyl)-2-(m-tolyl)-1H-indole (2c)**

Yellow oil; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ: 7.66 - 7.64 (m, 1H), 7.31 (s, 1H), 7.26 (d, *J* = 8.0 Hz, 1H), 7.22 - 7.07 (m, 9H), 7.00 (d, *J* = 8.0 Hz, 1H), 6.75 (s, 1H), 5.86 (s, 1H),

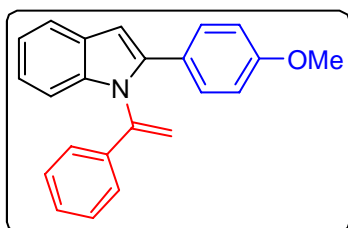
5.24 (s, 1H), 2.26 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 143.6, 141.4, 139.0, 137.6, 137.3, 132.6, 129.1, 128.7, 128.5, 128.3, 128.2, 127.9, 125.9, 125.4, 122.1, 120.5, 120.4, 113.7, 111.4, 103.5, 21.4; LRMS (EI 70 ev)  $m/z$  (%): 309 ( $\text{M}^+$ , 100), 294 (35), 232 (25), 207 (29), 103 (26), 77 (27); HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{20}\text{N}$  [ $\text{M} + \text{H}$ ] $^+$ : 310.1596, found 310.1596.



**1-(1-Phenylvinyl)-2-(o-tolyl)-1H-indole (2d)**

Yellow solid, mp 91.3 - 92.8 °C (uncorrected);  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.68 - 7.66 (m, 1H), 7.26 - 7.24 (m, 1H), 7.15 - 7.06 (m, 8H), 7.00 - 6.97 (m, 3H), 6.60 (s, 1H), 5.68 (s,

1H), 5.24 (s, 1H), 2.20 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 143.4, 140.0, 137.9, 137.7, 137.3, 132.4, 130.9, 129.8, 128.5, 128.2, 128.1, 127.9, 126.0, 124.9, 121.9, 120.4, 120.3, 112.8, 111.3, 104.6, 20.5; LRMS (EI 70 ev)  $m/z$  (%): 309 ( $\text{M}^+$ , 3), 265 (100), 237 (49), 195 (77), 109 (20), 95 (20); HRMS (EI) calcd for  $\text{C}_{23}\text{H}_{20}\text{N}$  [ $\text{M} + \text{H}$ ] $^+$ : 310.1596, found 310.1596.

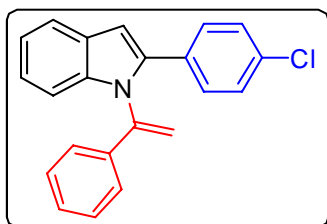


**2-(4-Methoxyphenyl)-1-(1-phenylvinyl)-1H-indole (2e)**

Yellow solid, mp 97.5 - 99.3 °C (uncorrected);  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.64 (d,  $J = 8.0$  Hz, 1H), 7.40 (d,  $J = 8.0$  Hz, 2H), 7.25 - 7.06 (m, 9H), 6.78 (d,  $J = 8.0$  Hz,

2H), 6.69 (s, 1H), 5.89 (s, 1H), 5.25 (s, 1H), 3.75 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 159.0, 143.6, 141.1, 138.8, 137.2, 129.6, 128.7, 128.5, 128.4, 125.8, 125.3, 121.9, 120.5, 120.2, 113.9, 113.6, 113.3, 102.8, 55.2; LRMS (EI 70 ev)  $m/z$  (%): 325 ( $\text{M}^+$ , 100), 310 (16), 282 (10), 248 (15), 208 (24), 180 (15), 103 (19), 77 (17); HRMS (EI)

calcd for C<sub>23</sub>H<sub>20</sub>NO [M + H]<sup>+</sup>: 326.1545, found 326.1545.



**2-(4-Chlorophenyl)-1-(1-phenylvinyl)-1H-indole (2f)**

Yellow solid, mp 123.6 - 124.9 °C (uncorrected); <sup>1</sup>H

NMR (400 MHz, CDCl<sub>3</sub>) δ: 7.67 - 7.64 (m, 1H), 7.40 (d,

*J* = 8.8 Hz, 2H), 7.26 - 7.11 (m, 10H), 6.75 (s, 1H), 5.91

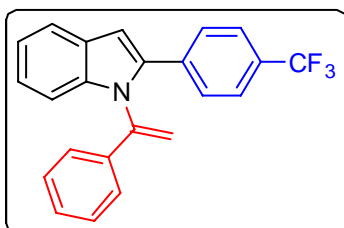
(s, 1H), 5.26 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ: 143.4, 139.9, 139.1, 137.0,

133.4, 131.2, 129.5, 128.9, 128.6, 128.3, 128.2, 125.8, 122.5, 120.8, 120.5, 113.9,

111.4, 103.9; LRMS (EI 70 ev) *m/z* (%): 329 (M<sup>+</sup>, 100), 293 (39), 252 (14), 227 (44),

103 (49), 77 (32), 51 (5); HRMS (EI) calcd for C<sub>22</sub>H<sub>17</sub>ClN [M + H]<sup>+</sup>: 330.1050, found

330.1053.



**1-(1-Phenylvinyl)-2-(4-(trifluoromethyl)phenyl)-1H-indole (2g)**

Yellow solid, mp 120.1 - 121.8 °C (uncorrected); <sup>1</sup>H

NMR (400 MHz, CDCl<sub>3</sub>) δ: 7.69 - 7.67 (m, 1H), 7.59 (d,

*J* = 8.0 Hz, 2H), 7.49 (d, *J* = 8.0 Hz, 2H), 7.25 - 7.13 (m, 8H), 6.84 (s, 1H), 5.92 (s,

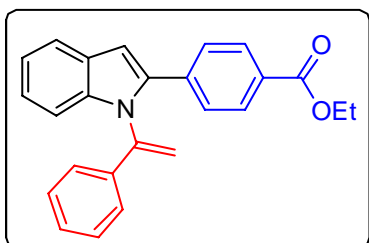
1H), 5.27 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ: 143.4, 139.5, 139.4, 136.9, 136.2,

129.2 (d, *J* = 33 Hz, 1C), 129.1, 128.7, 128.3, 128.1, 125.8, 124.1 (d, *J* = 270 Hz, 1C),

125.1 - 125.0 (m, 1C), 122.9, 120.9, 120.8, 114.0, 111.6, 104.9; LRMS (EI 70 ev) *m/z*

(%): 363 (M<sup>+</sup>, 100), 286 (16), 261 (42), 103 (55), 77 (29); HRMS (EI) calcd for

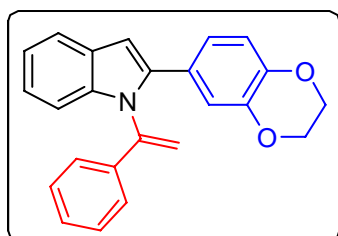
C<sub>23</sub>H<sub>17</sub>F<sub>3</sub>N [M + H]<sup>+</sup>: 364.1313, found 364.1319.



**Ethyl 4-(1-(1-phenylvinyl)-1H-indol-2-yl)benzoate (2h)**

Yellow solid, mp 75.5 - 76.8 °C (uncorrected); <sup>1</sup>H

NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.93 (d,  $J$  = 8.0 Hz, 2H), 7.57 (d,  $J$  = 8.0 Hz, 2H), 7.25 - 7.13 (m, 9H), 6.86 (s, 1H), 5.93 (s, 1H), 5.30 (s, 1H), 4.37 - 4.32 (m, 2H), 1.37 (t,  $J$  = 8.0 Hz, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 166.3, 143.5, 139.9, 139.5, 137.0, 136.9, 129.4, 129.0, 128.6, 128.1, 127.9 (2C), 125.8, 122.9, 120.9, 120.8, 113.8, 111.5, 104.9, 60.9, 14.3; LRMS (EI 70 ev)  $m/z$  (%): 367 (M<sup>+</sup>, 100), 338 (21), 294 (60), 237 (39), 191 (30), 103 (51), 77 (38); HRMS (EI) calcd for C<sub>25</sub>H<sub>22</sub>NO<sub>2</sub> [M + H]<sup>+</sup>: 368.1651, found 368.1652.

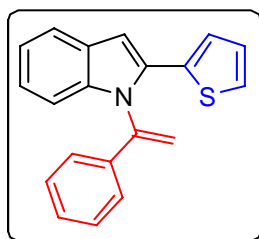


**2-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-1-(1-phenylvinyl)-1H-indole (2i)**

Yellow solid, mp 105.4 - 106.9 °C (uncorrected); <sup>1</sup>H

NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.64 - 7.62 (m, 1H), 7.23 -

7.06 (m, 8H), 7.02 (s, 1H), 6.96 (d,  $J$  = 8.0 Hz, 1H), 6.73 (d,  $J$  = 8.0 Hz, 1H), 6.68 (s, 1H), 5.90 (s, 1H), 5.27 (s, 1H), 4.24 - 4.12 (m, 4H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 143.6, 143.3, 143.1, 140.9, 139.0, 137.3, 128.8, 128.6, 128.4, 126.3, 125.9, 122.1, 121.8, 120.6, 120.3, 117.3, 117.0, 113.9, 111.4, 103.1, 64.4, 64.3; LRMS (EI 70 ev)  $m/z$  (%): 353 (M<sup>+</sup>, 100), 325 (12), 281 (13), 276 (18), 103 (22), 77 (20); HRMS (EI) calcd for C<sub>24</sub>H<sub>20</sub>NO<sub>2</sub> [M + H]<sup>+</sup>: 354.1494, found 354.1498.



**1-(1-Phenylvinyl)-2-(thiophen-2-yl)-1H-indole (2j)**

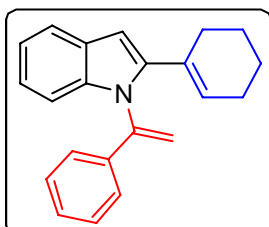
Yellow solid, mp 69.6 - 70.5 °C (uncorrected); <sup>1</sup>H NMR (400

MHz, CDCl<sub>3</sub>)  $\delta$ : 7.65 - 7.61 (m, 1H), 7.23 - 7.11 (m, 10H), 6.89

- 6.87 (m, 1H), 6.84 (s, 1H), 6.08 (s, 1H), 5.47 (s, 1H); <sup>13</sup>C

NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 143.2, 139.1, 136.7, 134.2, 134.1, 128.8, 128.6, 128.0,

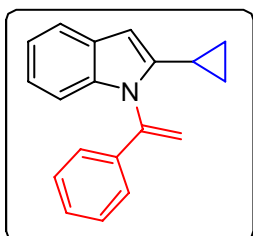
127.2, 125.9, 125.6, 125.4, 122.5, 120.7, 120.4, 115.1, 111.0, 103.4; LRMS (EI 70 ev)  $m/z$  (%): 301 ( $M^+$ , 10), 224 (19), 199 (40), 103 (49), 77 (26); HRMS (EI) calcd for  $C_{20}H_{16}NS$  [ $M + H$ ] $^+$ : 302.1003, found 302.1004.



**2-(Cyclohex-1-en-1-yl)-1-(1-phenylvinyl)-1H-indole (2k)<sup>2</sup>**

Yellow oil;  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$ : 7.60 - 7.58 (m, 1H), 7.29 - 7.24 (m, 4H), 7.13 - 7.04 (m, 4H), 6.49 (s, 1H), 5.98 - 5.96 (m, 1H), 5.87 (s, 1H), 5.42 (s, 1H), 2.16 - 2.11 (m, 2H),

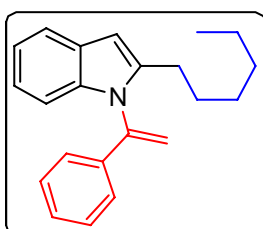
1.99 - 1.97 (m, 2H), 1.52 - 1.47 (m, 2H), 1.40 - 1.35 (m, 2H);  $^{13}C$  NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 144.5, 143.2, 138.5, 138.1, 129.6, 129.1, 128.5, 128.3, 125.9, 121.7, 120.3, 120.1, 111.9, 110.9, 101.5, 99.5, 28.3, 25.6, 22.7, 21.7; LRMS (EI 70 ev)  $m/z$  (%): 299 ( $M^+$ , 100), 271 (11), 256 (40), 222 (28), 194 (10), 167 (12), 103 (12), 77 (20).



**2-Cyclopropyl-1-(1-phenylvinyl)-1H-indole (2l)**

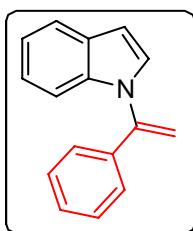
Yellow oil;  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$ : 7.54 - 7.52 (m, 1H), 7.27 - 7.23 (m, 3H), 7.19 - 7.12 (m, 3H), 7.08 - 7.03 (m, 2H), 6.18 (s, 1H), 6.03 (s, 1H), 5.47 (s, 1H), 1.65 - 1.59 (m, 1H),

0.76 - 0.72 (m, 2H), 0.67 - 0.64 (m, 2H);  $^{13}C$  NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 143.9, 143.1, 138.0, 137.3, 128.8, 128.6, 128.0, 125.8, 121.0, 120.0, 119.7, 113.6, 110.4, 97.7, 8.2, 7.8 (2C); LRMS (EI 70 ev)  $m/z$  (%): 259 ( $M^+$ , 100), 244 (80), 231 (48), 168 (27), 130 (31), 103 (30), 77 (44); HRMS (EI) calcd for  $C_{20}H_{15}NS$  ( $M^+$ ): 321.1729, found 321.1725; HRMS (EI) calcd for:  $C_{19}H_{18}N$  [ $M + H$ ] $^+$ : 260.1439, found 260.1438.



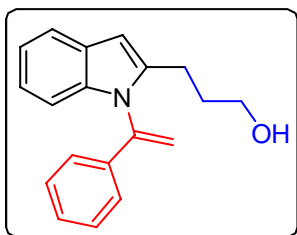
**2-Hexyl-1-(1-phenylvinyl)-1H-indole (2m)**

Yellow oil;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.57 - 7.55 (m, 1H), 7.30 - 7.23 (m, 3H), 7.15 - 7.03 (m, 5H), 6.39 (s, 1H), 6.04 (s, 1H), 5.41 (s, 1H), 2.50 (t,  $J = 8.0$  Hz, 2H), 1.65 - 1.57 (m, 2H), 1.31 - 1.19 (m, 6H), 0.84 (t,  $J = 8.0$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 143.0, 141.9, 138.0, 137.0, 128.9, 128.7, 128.2, 125.6, 121.0, 119.9, 119.6, 113.7, 110.4, 100.3, 31.5, 28.9, 28.5, 27.0, 22.5, 14.0; LRMS (EI 70 ev)  $m/z$  (%): 303 ( $\text{M}^+$ , 40), 246 (19), 232 (100), 217 (16), 198 (11), 130 (43), 117 (12), 103 (39), 77 (34); HRMS (EI) calcd for:  $\text{C}_{22}\text{H}_{26}\text{N}$  [ $\text{M} + \text{H}$ ] $^+$ : 304.2065, found 304.2066.



**1-(1-Phenylvinyl)-1H-indole (2n)<sup>3</sup>**

Yellow solid, mp 90.5 - 92.3 °C (uncorrected);  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 7.66 - 7.63 (m, 1H), 7.38 - 7.28 (m, 5H), 7.17 (d,  $J = 3.2$  Hz, 1H), 7.14 - 7.07 (m, 3H), 6.61 (d,  $J = 3.3$  Hz, 1H), 5.57 (s, 1H), 5.36 (s, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 145.0, 137.0, 136.4, 129.3, 129.1, 128.7, 128.6, 126.9, 122.0, 121.0, 120.2, 111.9, 108.1, 103.1; LRMS (EI 70 ev)  $m/z$  (%): 219 ( $\text{M}^+$ , 91), 117 (100), 103 (41), 77 (32), 51 (10).

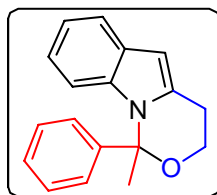


**3-(1-(1-Phenylvinyl)-1H-indol-2-yl)propan-1-ol (2o)**

Yellow oil;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$ : 8.62 (s, 1H), 7.40 - 7.37 (m, 2H), 7.30 - 7.24 (m, 5H), 7.11 (t,  $J = 8.0$  Hz, 1H), 6.99 (t,  $J = 8.0$  Hz, 1H), 5.73 (d,  $J = 1.6$  Hz, 1H), 5.33 (d,  $J = 2.0$  Hz, 1H), 3.59 (t,  $J = 6.0$  Hz, 2H), 2.73 (t,  $J = 7.2$  Hz, 2H), 1.83 - 1.77 (m, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$ : 142.5, 141.9, 136.7, 135.2, 128.3, 128.1, 127.5, 127.2, 121.2, 119.6, 119.5, 115.0, 113.9, 110.3, 61.9, 31.8, 23.1; LRMS (EI 70 ev)  $m/z$  (%): 277 ( $\text{M}^+$ , 55), 246 (42), 232 (100), 174 (26), 103 (35), 77 (30); HRMS (EI) calcd



for:  $C_{19}H_{20}NO$   $[M + H]^+$ : 278.1545, found 278.1545.



**1-Methyl-1-phenyl-3,4-dihydro-1H-[1,3]oxazino[3,4-a]indole (2p)**

Yellow solid, mp 50.9 - 52.3 °C (uncorrected);  $^1H$  NMR (400 MHz,

$CDCl_3$ )  $\delta$ : 7.56 (d,  $J = 7.6$  Hz, 1H), 7.32 - 7.22 (m, 3H), 7.11 -

7.03 (m, 3H), 6.98 - 6.94 (m, 1H), 6.90 - 6.88 (m, 1H), 6.34 (s, 1H), 3.97 - 3.91 (m,

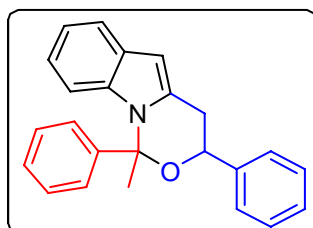
1H), 3.76 - 3.70 (m, 1H), 3.28 - 3.20 (m, 1H), 3.06 - 3.00 (m, 1H), 2.26 (s, 3H);  $^{13}C$

NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 141.6, 134.7, 134.5, 128.5, 128.4, 126.6 (2C), 120.5,

119.9, 119.6, 112.7, 98.8, 90.3, 58.5, 26.9, 24.8; LRMS (EI 70 ev)  $m/z$  (%): 263 ( $M^+$ ,

23), 143 (100), 115 (18), 77 (8); HRMS (EI) calcd for:  $C_{18}H_{18}NO$   $[M + H]^+$ : 264.1388,

found 264.1389.



**1-Methyl-1,3-diphenyl-3,4-dihydro-1H-[1,3]oxazino[3,4-a]indole (2q)**

Yellow solid, mp 131.1 - 132.7 °C (uncorrected);  $^1H$  NMR

(400 MHz,  $CDCl_3$ )  $\delta$ : 7.56 - 7.52 (m, 3H), 7.46 - 7.44 (m,

2H), 7.40 - 7.34 (m, 5H), 7.32 - 7.28 (m, 1H), 7.01 (t,  $J = 8.0$  Hz, 1H), 6.87 (t,  $J = 8.0$

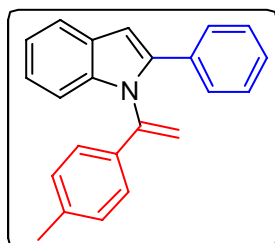
Hz, 1H), 6.61 - 6.59 (m, 1H), 6.36 (s, 1H), 5.27 - 5.24 (m, 1H), 3.36 - 3.34 (m, 2H),

2.25 (s, 3H);  $^{13}C$  NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 142.6, 140.8, 134.9, 134.0, 128.9, 128.8,

128.5 (2C), 128.0, 126.8, 126.0, 120.5, 119.9, 119.7, 112.1, 98.8, 90.4, 71.2, 32.8,

21.7; LRMS (EI 70 ev)  $m/z$  (%): 339 ( $M^+$ , 16), 218 (100), 130 (4), 105 (6), 77 (11);

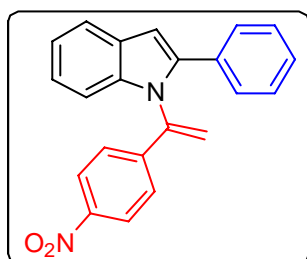
HRMS (EI) calcd for:  $C_{24}H_{22}NO$   $[M + H]^+$ : 340.1701, found 340.1703.



**2-phenyl-1-(1-(p-tolyl)vinyl)-1H-indole (2r)<sup>2</sup>**

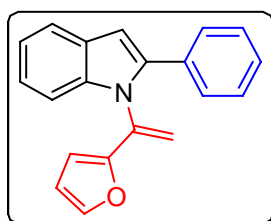
Yellow solid, mp 63.3 - 64.2 °C (uncorrected);  $^1H$  NMR (400

MHz, CDCl<sub>3</sub>)  $\delta$ : 7.67 - 7.64 (m, 1H), 7.50 - 7.48 (m, 2H), 7.27 - 7.18 (m, 3H), 7.15 - 7.08 (m, 5H), 7.02 (d,  $J$  = 8.0 Hz, 2H), 6.76 (s, 1H), 5.83 (s, 1H), 5.15 (s, 1H), 2.28 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 143.4, 141.3, 139.0, 138.8, 134.3, 132.8, 129.3, 128.3 (2C), 128.1, 127.4, 125.8, 122.1, 120.5, 120.4, 113.0, 111.5, 103.5, 21.2; LRMS (EI 70 ev)  $m/z$  (%): 309 (M<sup>+</sup>, 100), 218 (18), 193 (64), 65 (16), 115 (29), 91 (16).



**1-(1-(4-nitrophenyl)vinyl)-2-phenyl-1H-indole (2s)**

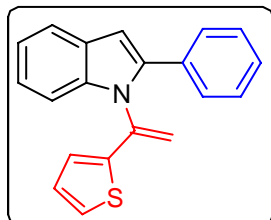
Yellow solid, mp 116.6 - 117.5 °C (uncorrected); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 8.01 - 7.97 (m, 2H), 7.69 - 7.67 (m, 1H), 7.41 - 7.39 (m, 2H), 7.25 - 7.15 (m, 8H), 6.78 (s, 1H), 6.06 (s, 1H), 5.59 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 147.6, 143.5, 142.0, 140.9, 138.8, 132.3, 128.4, 128.3, 128.2, 127.7, 126.6, 123.7, 122.6, 121.1, 120.8, 117.2, 110.8, 104.3; LRMS (EI 70 ev)  $m/z$  (%): 340 (M<sup>+</sup>, 100), 293 (31), 218 (37), 193 (27), 165 (25), 145 (12), 102 (13); HRMS (EI) calcd for: C<sub>22</sub>H<sub>17</sub>N<sub>2</sub>O<sub>2</sub> [M + H]<sup>+</sup>: 341.1290, found 341.1292.



**1-(1-(furan-2-yl)vinyl)-2-phenyl-1H-indole (2t)**

Yellow solid, mp 53.8 - 55.4 °C (uncorrected); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.65 (t,  $J$  = 4.0 Hz, 1H), 7.52 (d,  $J$  = 8.0 Hz, 2H), 7.34 - 7.22 (m, 5H), 7.18 - 7.13 (m, 2H), 6.75 (s, 1H), 6.24 - 6.23 (m, 1H), 5.98 (s, 1H), 5.87 (d,  $J$  = 4.0 Hz, 1H), 5.22 (s, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 151.0, 143.0, 141.0, 139.2, 134.5, 132.6, 128.3, 128.2, 128.1, 127.6, 122.3, 120.7, 120.4, 112.3, 111.5, 111.0, 109.4, 103.5; LRMS (EI 70 ev)  $m/z$  (%): 285 (M<sup>+</sup>, 100), 256 (32), 193 (49), 127 (10), 93 (22), 65 (30); HRMS (EI) calcd

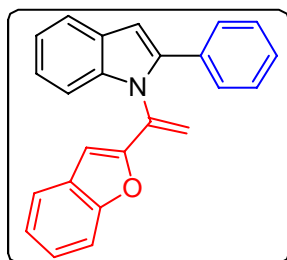
for:  $C_{20}H_{16}NO$   $[M + H]^+$ : 286.1232, found 286.1233.



**2-phenyl-1-(1-(thiophen-2-yl)vinyl)-1H-indole (2u)**

Yellow oil;  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$ : 7.66 - 7.64 (m, 1H), 7.55 - 7.53 (m, 2H), 7.31 - 7.21 (m, 4H), 7.17 - 7.12 (m, 3H), 6.82 (t,  $J = 4.0$  Hz, 1H), 6.76 (s, 1H), 6.69 (d,  $J = 4.0$  Hz, 1H),

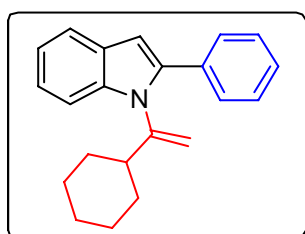
5.82 (s, 1H), 5.11 (s, 1H);  $^{13}C$  NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 141.4, 141.0, 139.1, 138.2, 132.6, 128.3, 128.2 (2C), 127.6, 127.5, 126.1 (2C), 122.3, 120.7, 120.5, 113.0, 111.3, 103.7; LRMS (EI 70 ev)  $m/z$  (%): 301 ( $M^+$ , 100), 193 (89), 165 (18), 109 (67), 65 (24); HRMS (EI) calcd for  $C_{20}H_{16}NS$   $[M + H]^+$ : 302.1003, found 302.1004.



**1-(1-(benzofuran-2-yl)vinyl)-2-phenyl-1H-indole (2v)**

Yellow solid, mp 142.8 - 143.9 °C (uncorrected);  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$ : 7.68 - 7.66 (m, 1H), 7.55 (d,  $J = 8.0$  Hz, 2H), 7.45 (d,  $J = 8.0$  Hz, 1H), 7.36 (d,  $J = 8.0$  Hz, 1H), 7.30 -

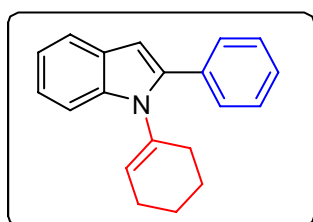
7.12 (m, 8H), 6.80 (s, 1H), 6.29 (s, 1H), 6.22 (s, 1H), 5.40 (s, 1H);  $^{13}C$  NMR (100 MHz,  $CDCl_3$ )  $\delta$ : 155.2, 152.6, 141.1, 139.3, 134.7, 132.4, 128.4, 128.3 (2C), 128.2, 127.7, 125.3, 123.1, 122.4, 121.6, 120.8, 120.5, 115.8, 111.2, 111.1, 105.8, 103.7; LRMS (EI 70 ev)  $m/z$  (%): 335 ( $M^+$ , 100), 193 (44), 143 (34), 115 (57), 89 (15), 63 (8); HRMS (EI) calcd for:  $C_{24}H_{18}NO$   $[M + H]^+$ : 336.1388, found 336.1392.



**1-(1-(cyclohexylideneethyl)-2-phenyl-1H-indole (2w)**

Yellow solid, mp 76.8 - 78.5 °C (uncorrected);  $^1H$  NMR

(400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.66 - 7.62 (m, 3H), 7.44 - 7.33 (m, 4H), 7.21 - 7.12 (m, 2H), 6.70 (s, 1H), 5.49 (s, 2H), 1.69 - 1.48 (m, 5H), 1.28 - 0.85 (m, 6H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 150.5, 139.4, 139.2, 133.6, 132.5, 128.4, 127.9, 127.5, 121.9, 120.2 (2C), 111.7, 111.0, 103.1, 44.0, 26.1(2C); LRMS (EI 70 eV)  $m/z$  (%): 301 (M<sup>+</sup>, 100), 218 (73), 193 (39), 165 (16); HRMS (EI) calcd for: C<sub>22</sub>H<sub>24</sub>N [M + H]<sup>+</sup>: 302.1909, found 302.1910.



**1-(cyclohex-1-en-1-yl)-2-phenyl-1H-indole (2x)**

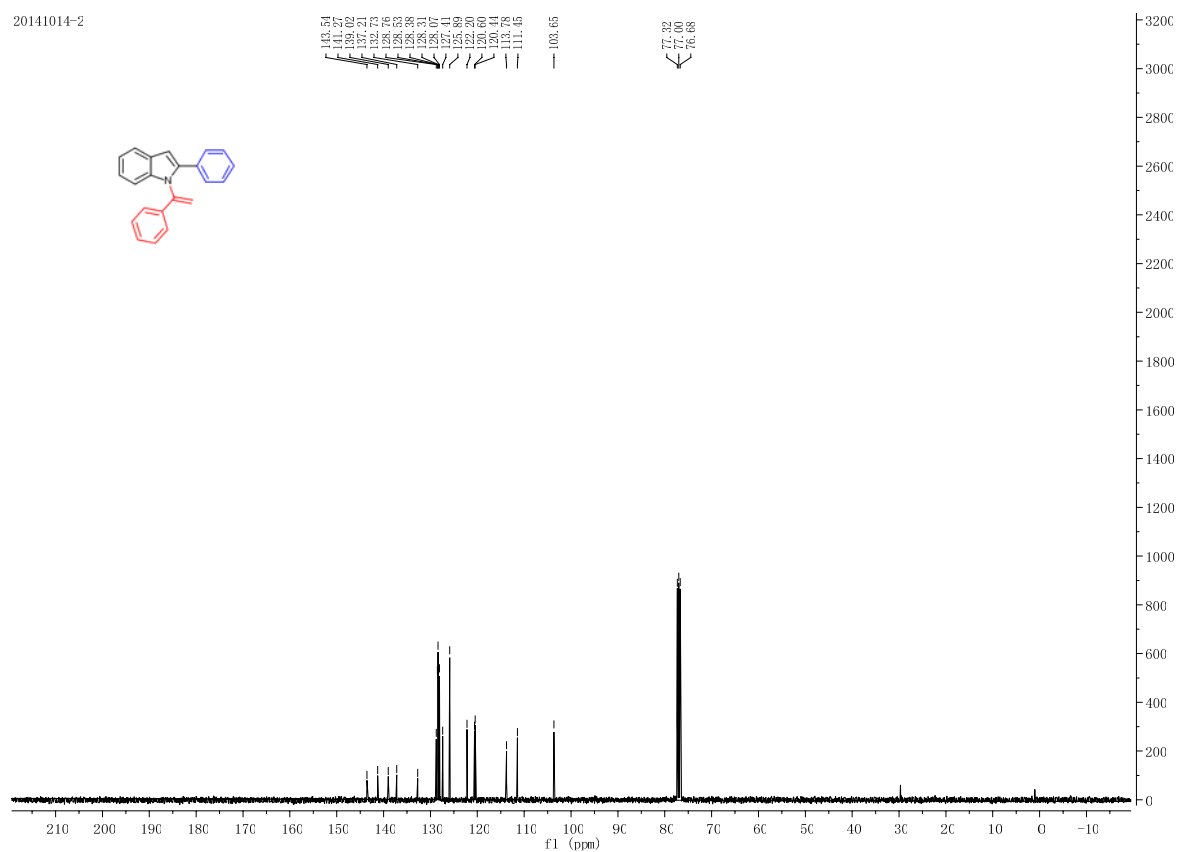
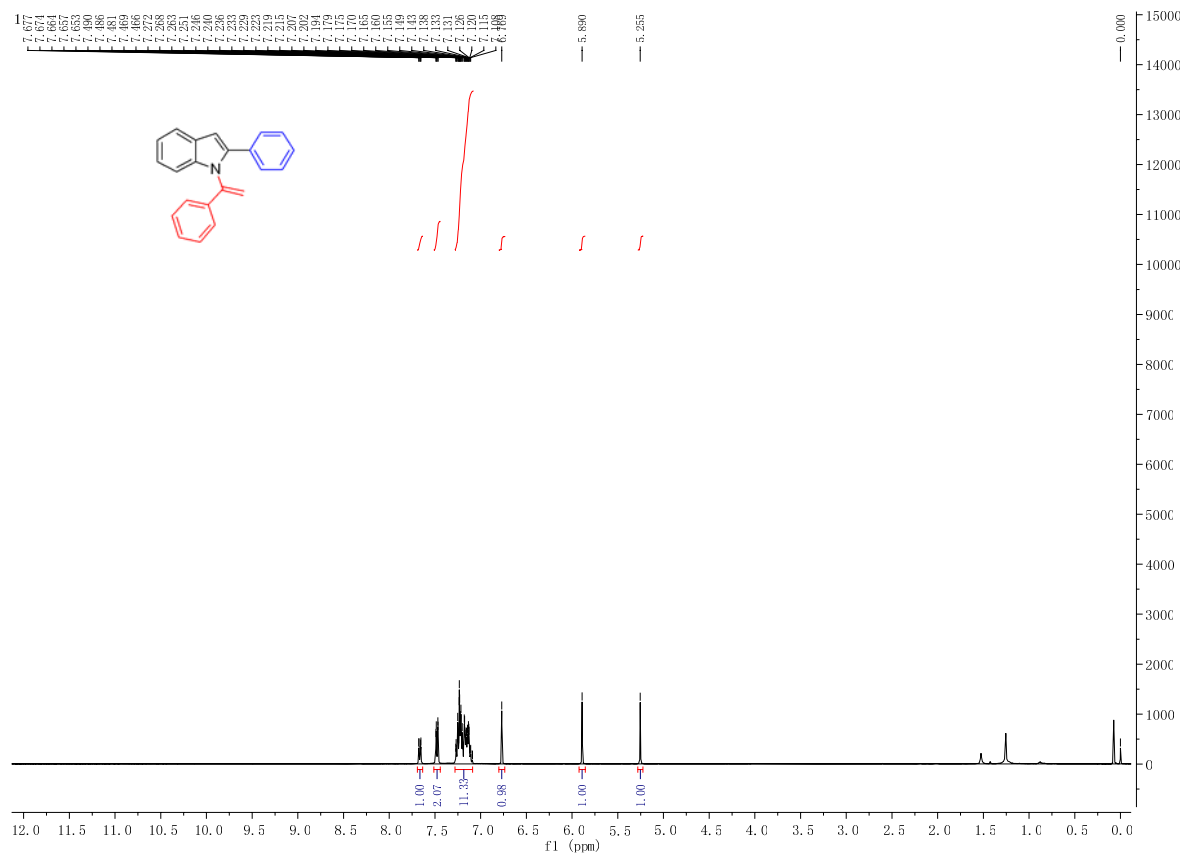
Yellow solid, mp 104.2 - 105.9 °C (uncorrected); <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$ : 7.65 - 7.61 (m, 3H), 7.41 - 7.38 (m, 3H), 7.34 - 7.30 (m, 1H), 7.19 (t,  $J$  = 7.2 Hz, 1H), 7.12 (t,  $J$  = 7.2 Hz, 1H), 6.67 (s, 1H), 6.05 (br, 1H), 2.31 (br, 2H), 1.95 (br, 2H), 1.66 (br, 4H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$ : 139.7, 138.3, 135.8, 133.5, 128.3, 128.1, 127.9, 127.7, 127.5, 121.8, 120.3, 120.1, 110.6, 102.5, 29.3, 24.9, 22.8, 21.8; LRMS (EI 70 eV)  $m/z$  (%): 273 (M<sup>+</sup>, 100), 244 (27), 230 (22), 193 (18), 165 (13), 115 (15); HRMS (EI) calcd for: C<sub>20</sub>H<sub>20</sub>N [M + H]<sup>+</sup>: 274.1596, found 274.1597.

**(C) References**

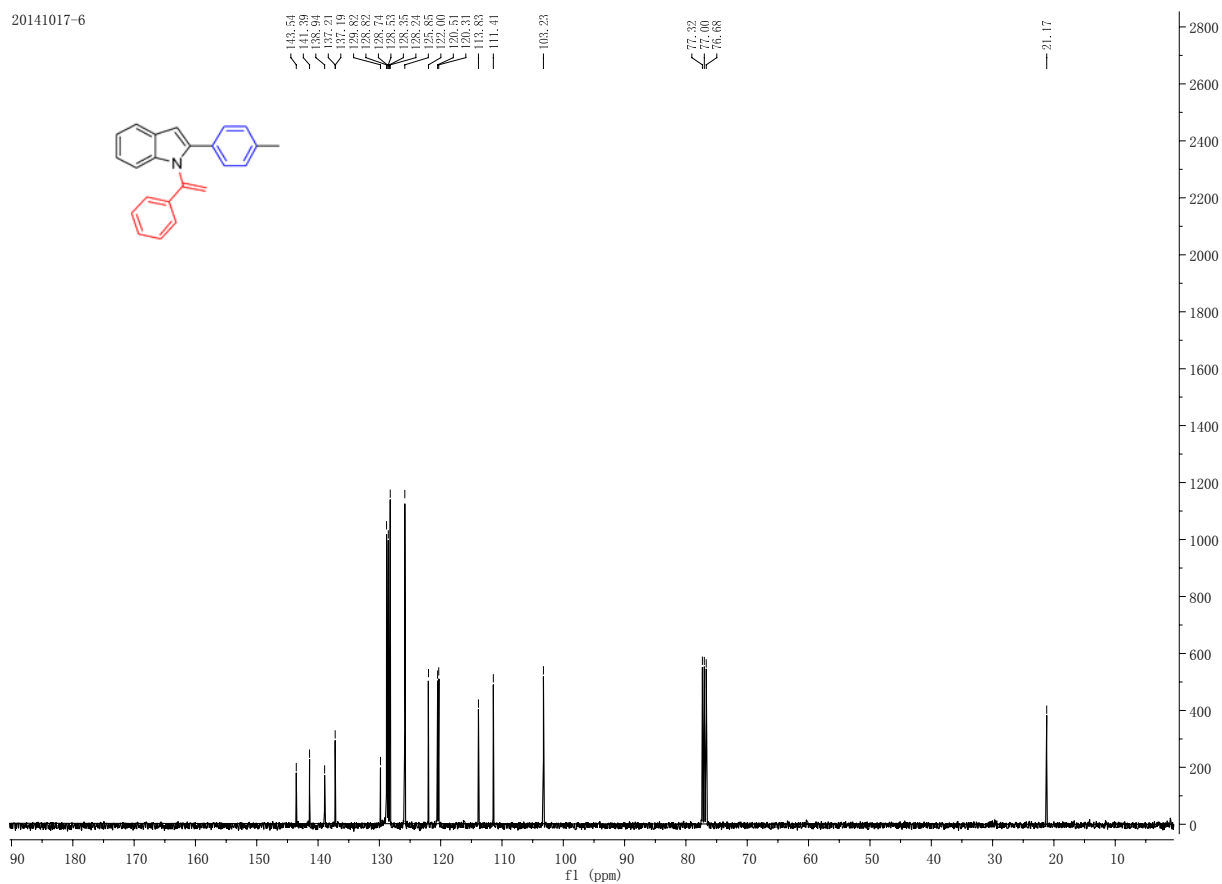
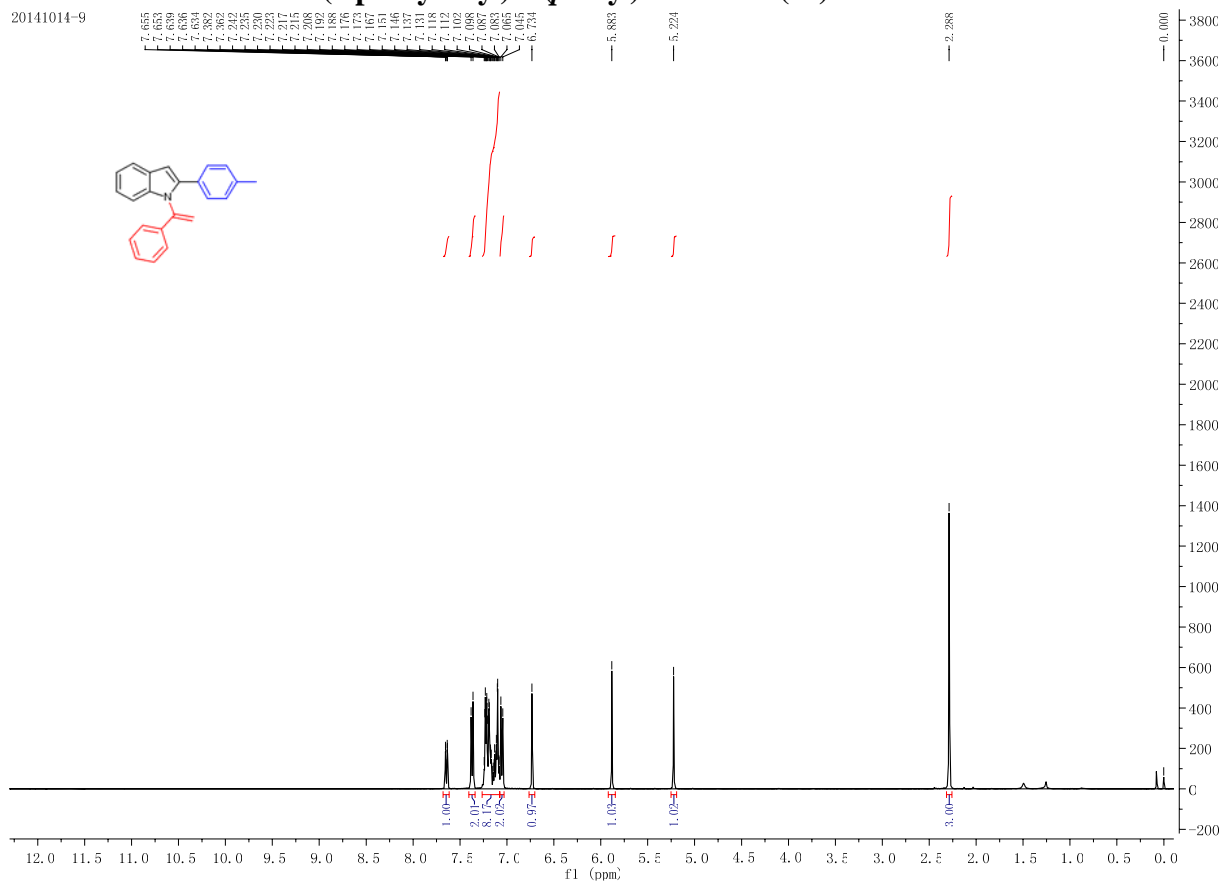
1. (a) R. Halim, P. J. Scammells and B. L. Flynn, *Org. Lett.*, 2008, **10**, 1967; (b) K. Hiroya, S. Itoh and T. Sakamoto, *J. Org. Chem.*, 2004, **69**, 1126.
2. Y. H. Zhang, J. P. Donahue, C.-J. Li, *Org. Lett.* 2007, **9**, 627.
3. (a) X. Zeng, G. Cheng, J. Shen, Xiuling Cui, *Org. Lett.* 2013, **15**, 3022; (b) M. Roche, G. Frison, J. Brion, O. Provot, A. Hamze, M. Alami, *J. Org. Chem.*, 2013, **78**, 8485; (c) G. Fridkin, N. Boutard and W. D. Lubell, *J. Org. Chem.* 2009, **74**, 5603.

# Spectra of 2a-2x

## 2-phenyl-1-(1-phenylvinyl)-1H-indole (2a)

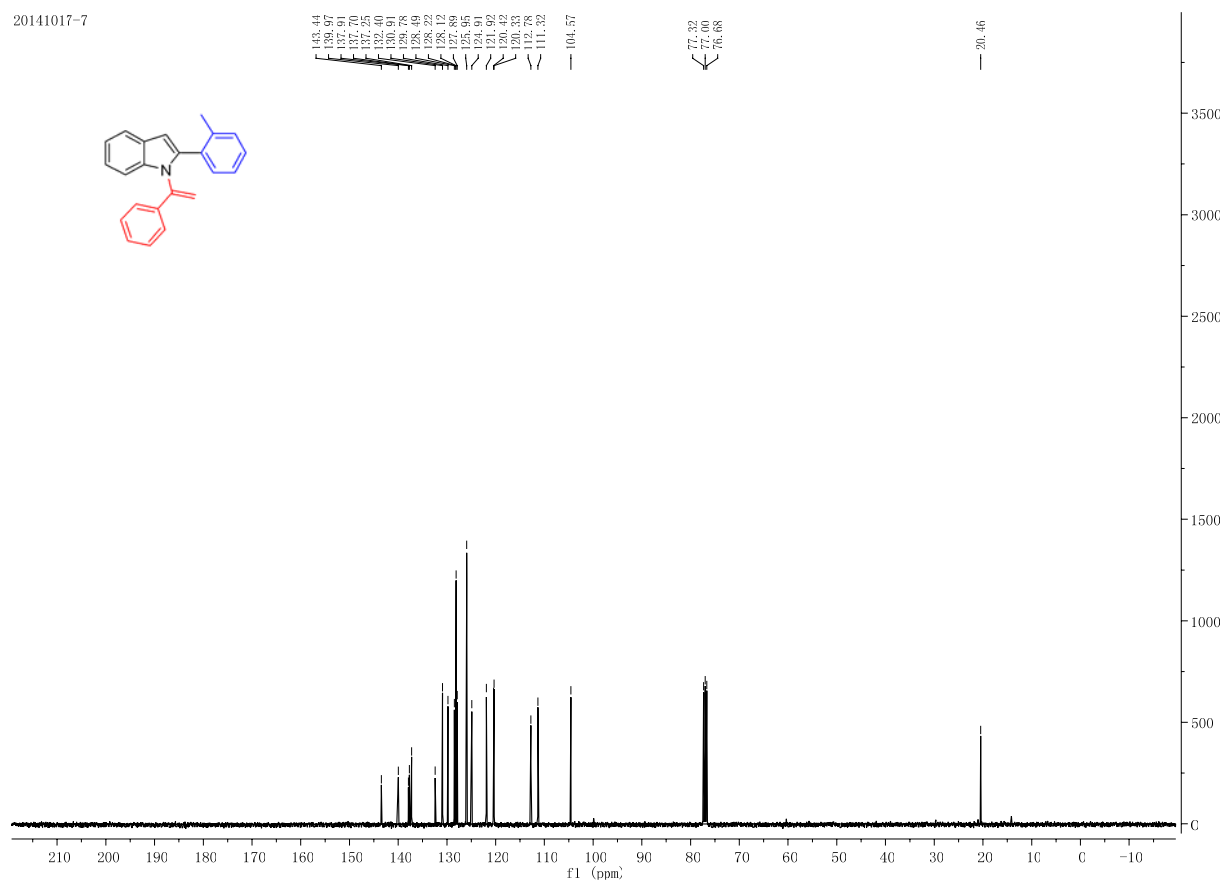
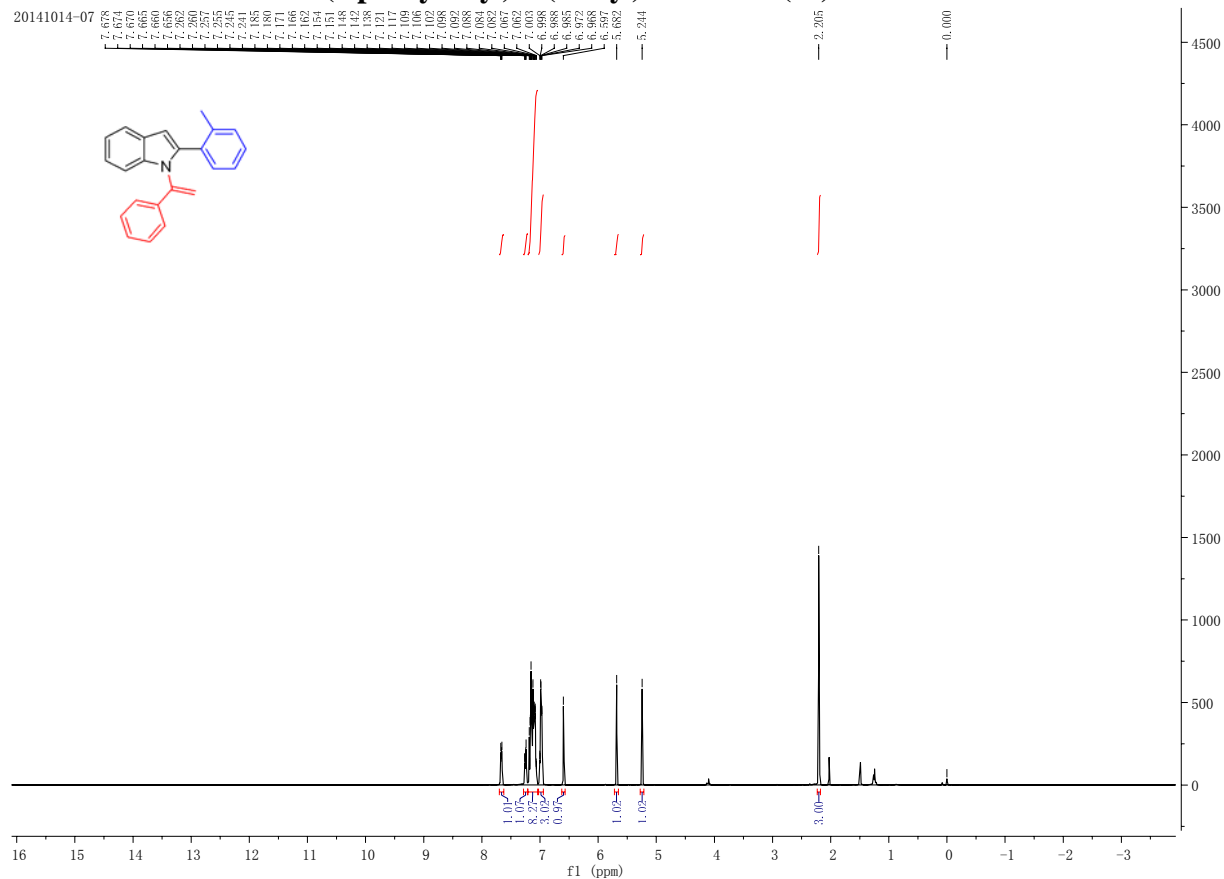


**1-(1-phenylvinyl)-2-(*p*-tolyl)-1*H*-indole (2b)**





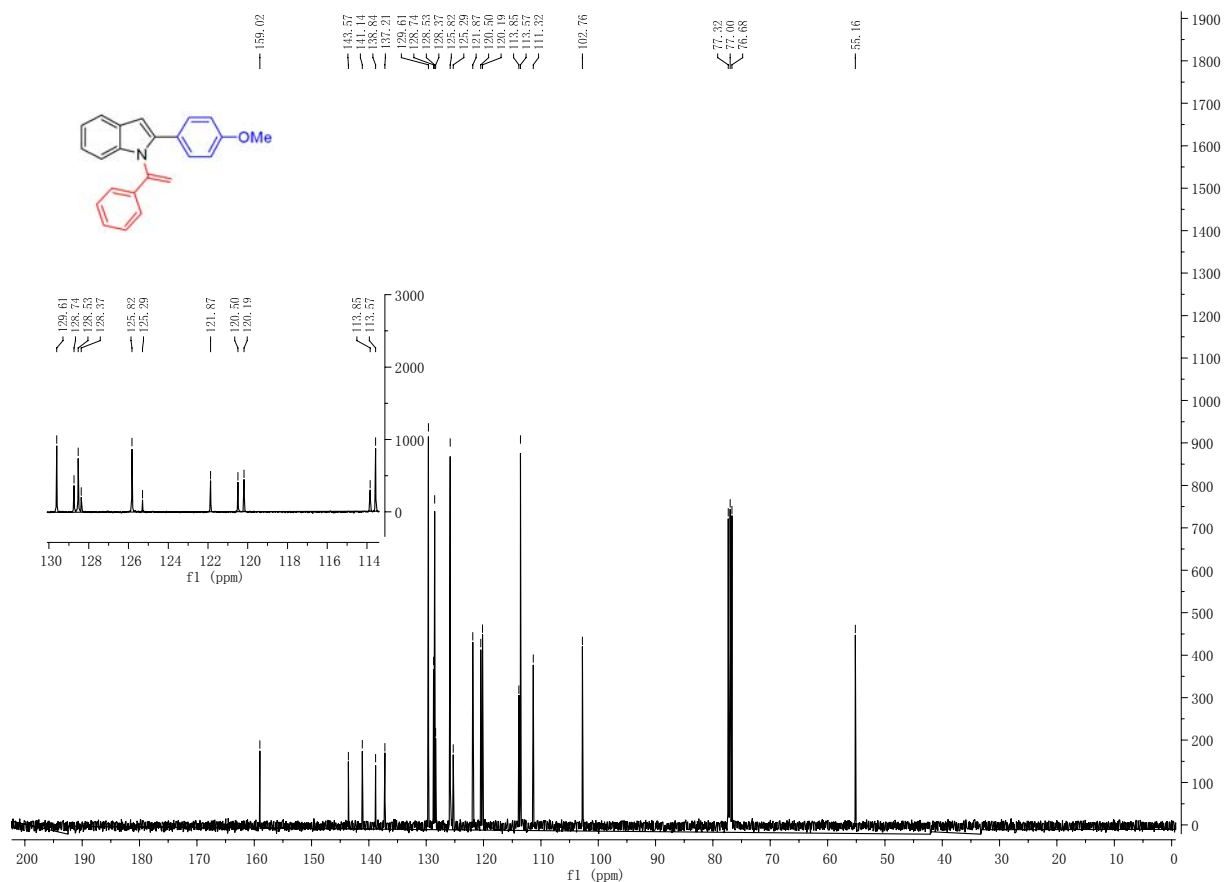
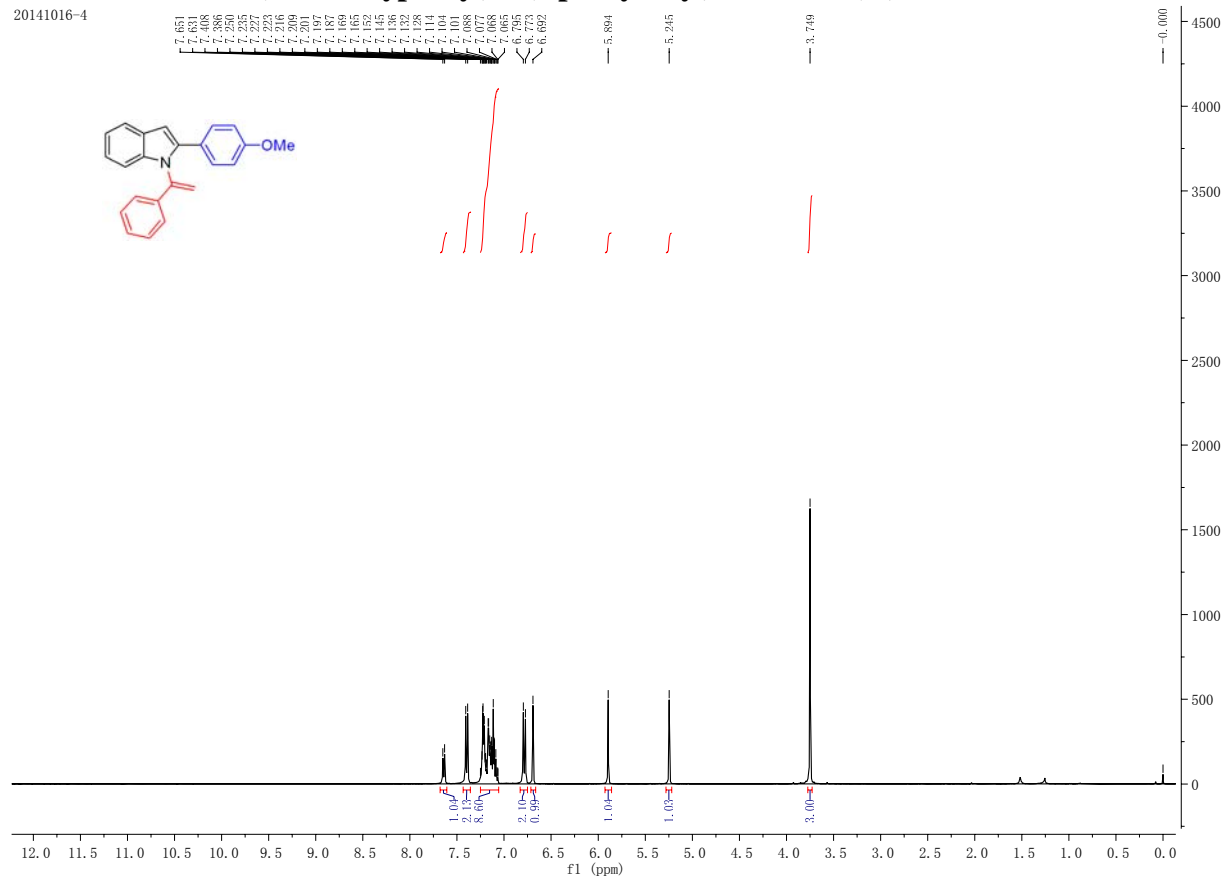
### 1-(1-phenylvinyl)-2-(*o*-tolyl)-1*H*-indole (2d)





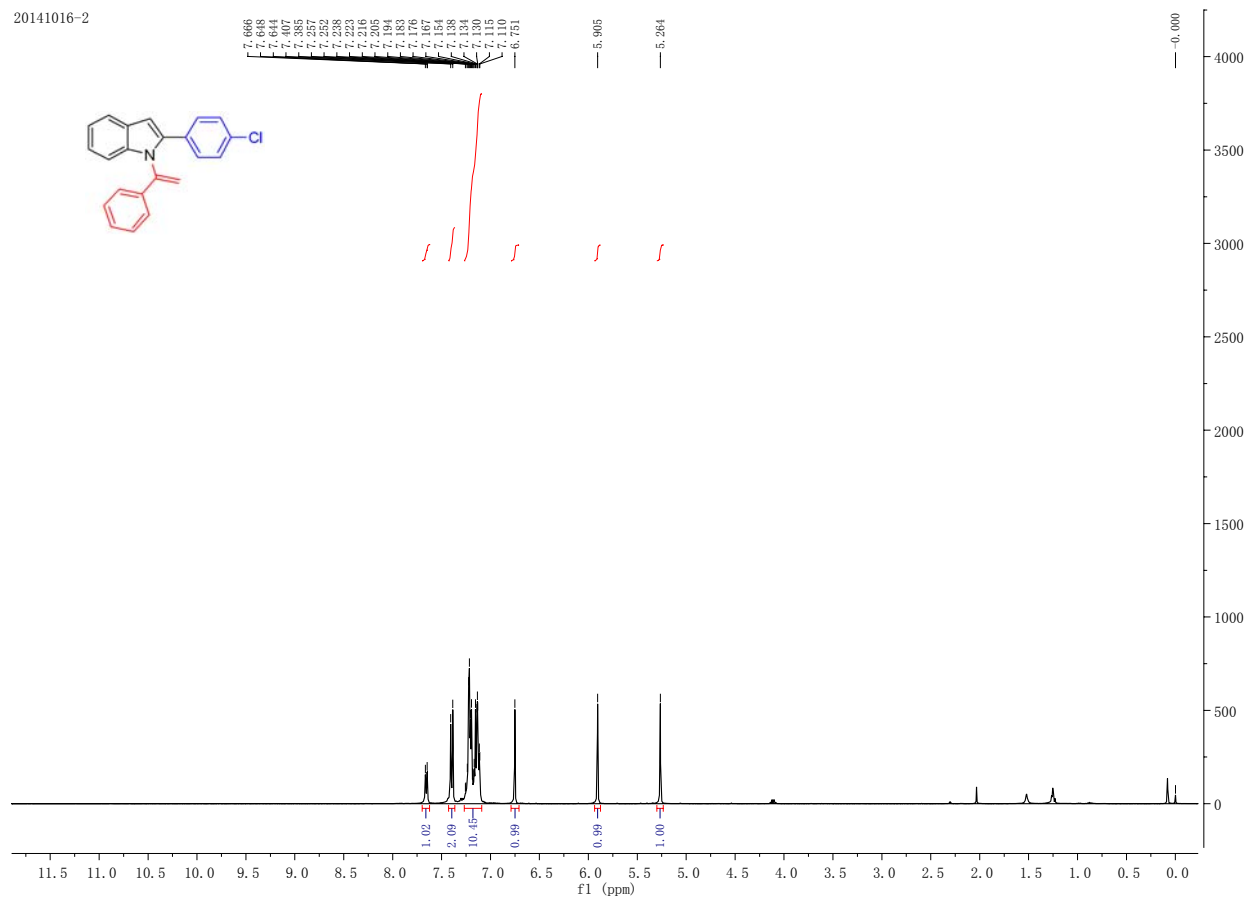
## 2-(4-methoxyphenyl)-1-(1-phenylvinyl)-1H-indole (2e)

20141016-4

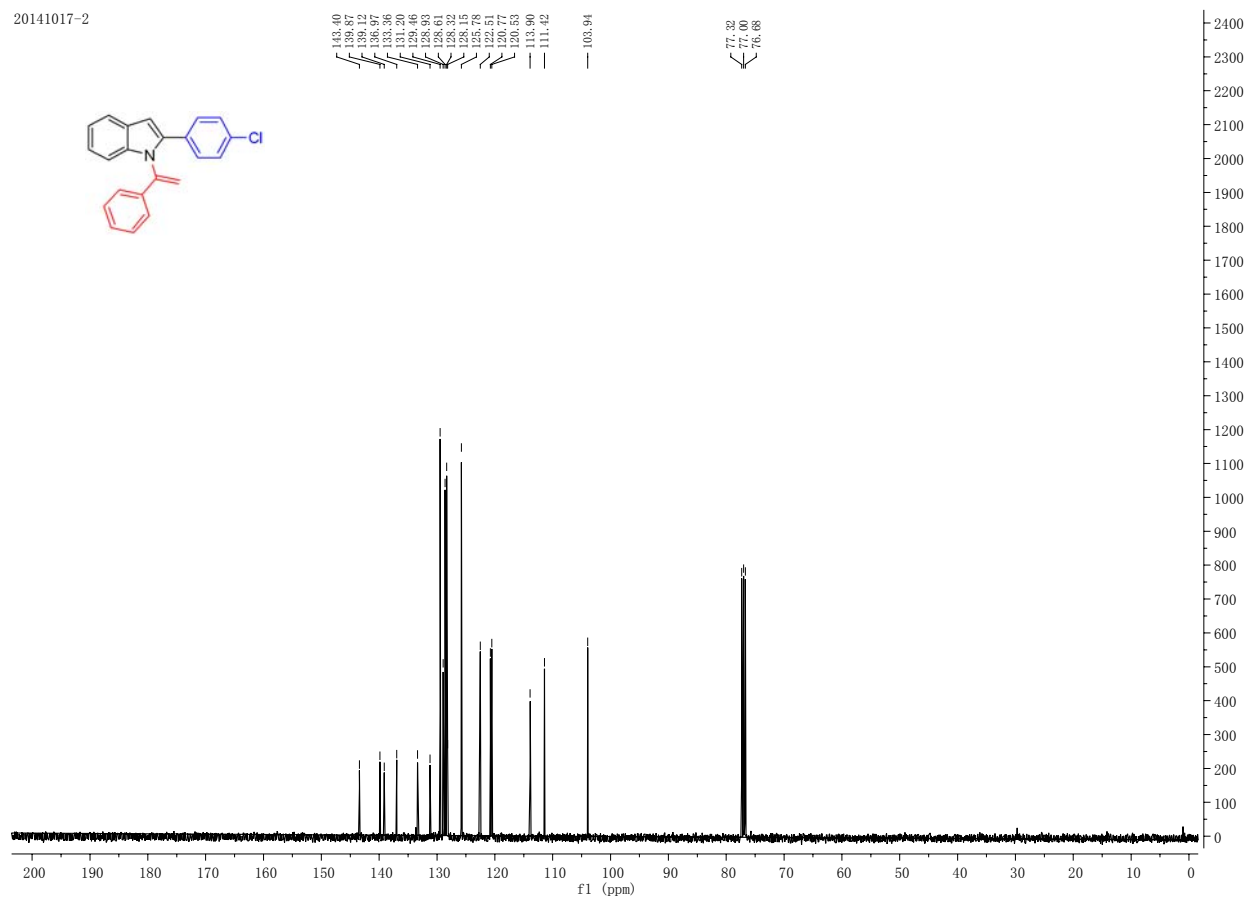


## 2-(4-chlorophenyl)-1-(1-phenylvinyl)-1H-indole (2f)

20141016-2

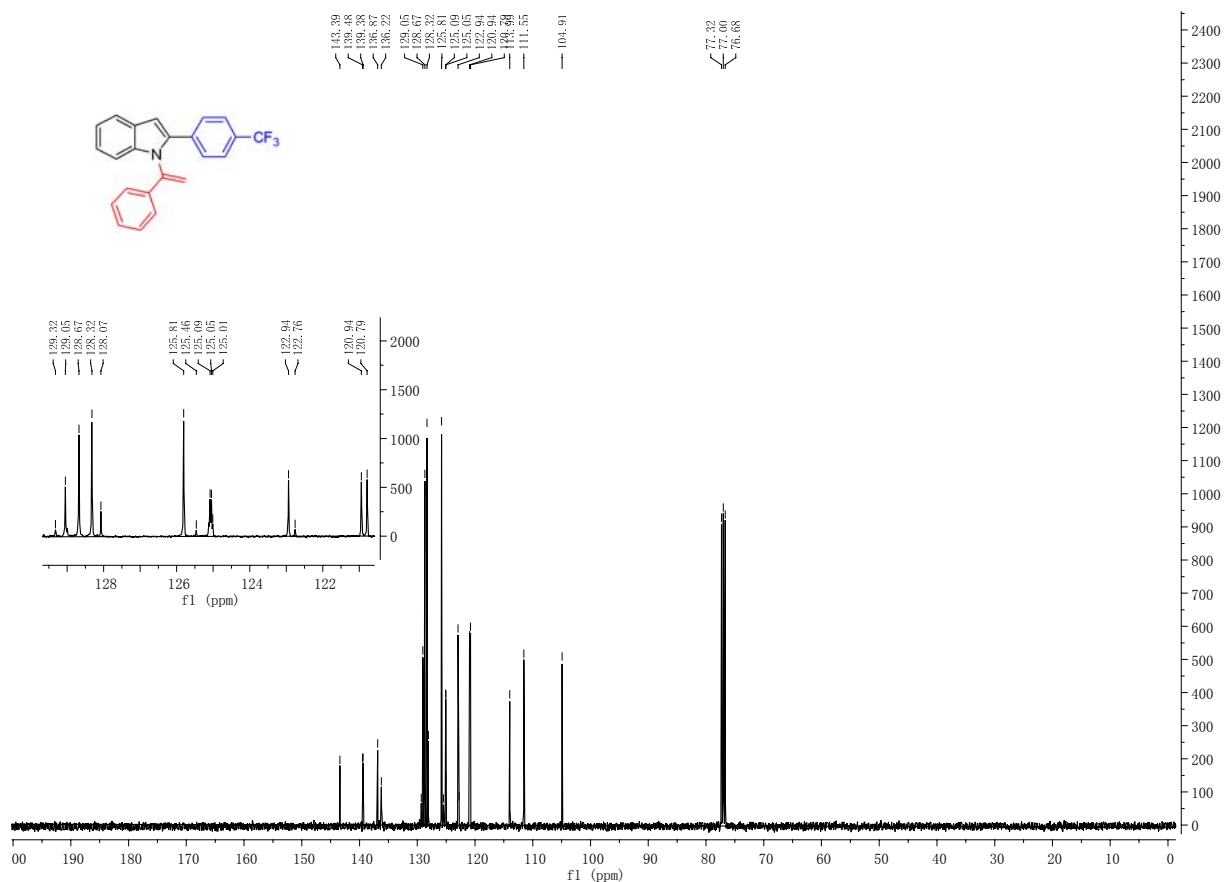
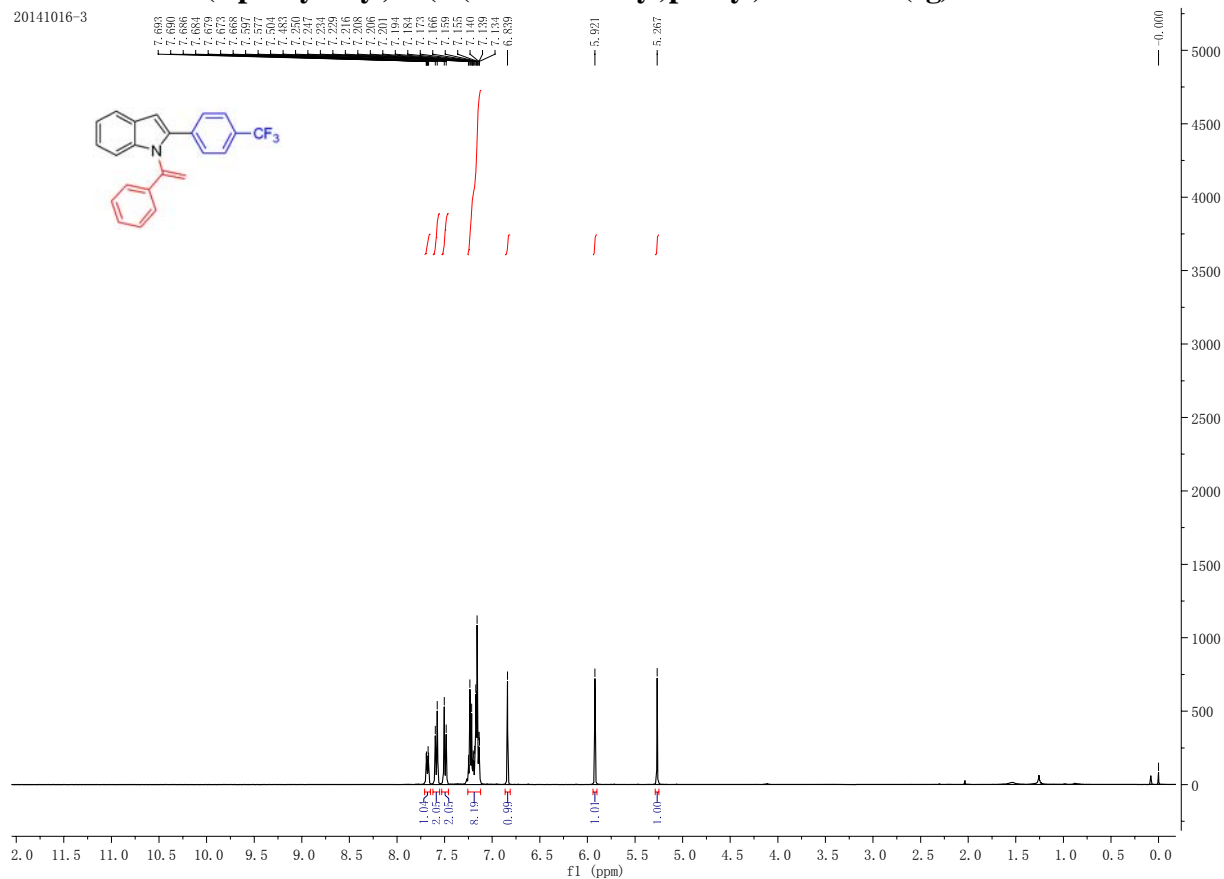


20141017-2



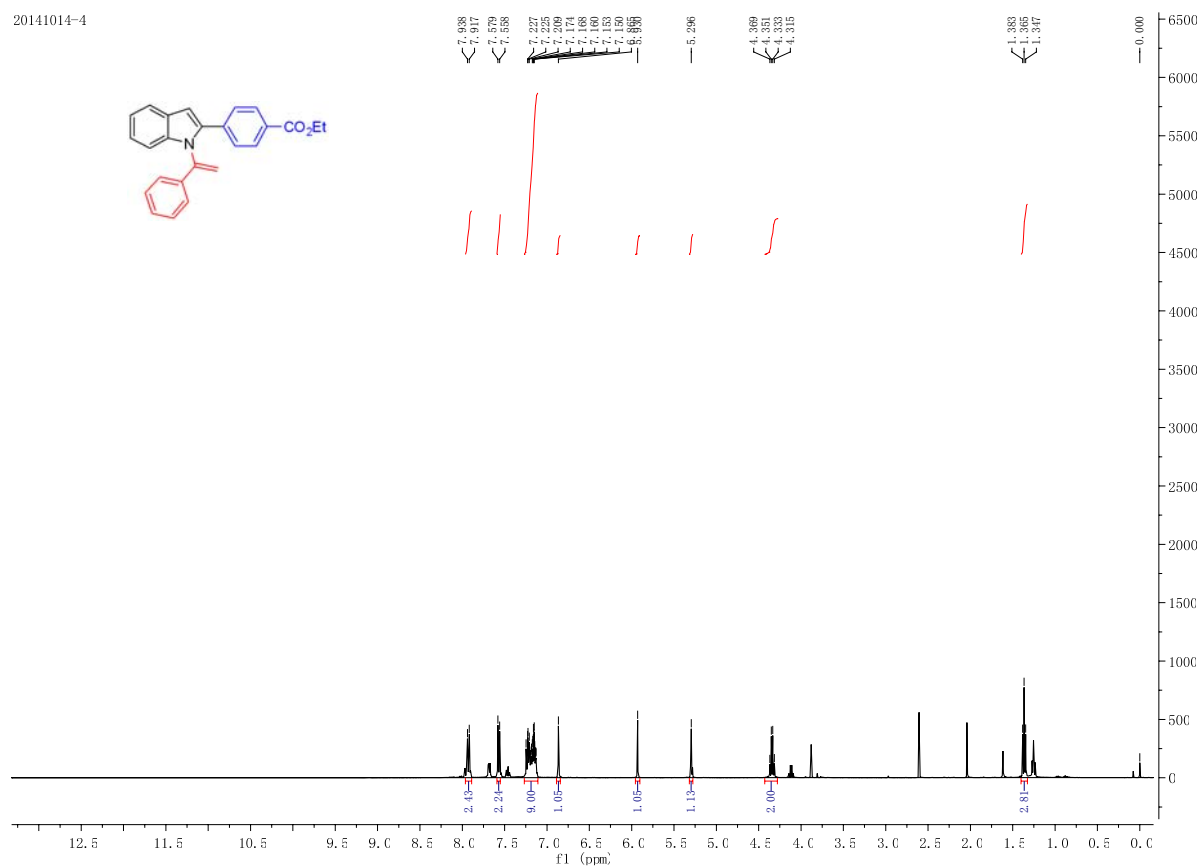
# 1-(1-phenylvinyl)-2-(4-(trifluoromethyl)phenyl)-1H-indole (2g)

20141016-3

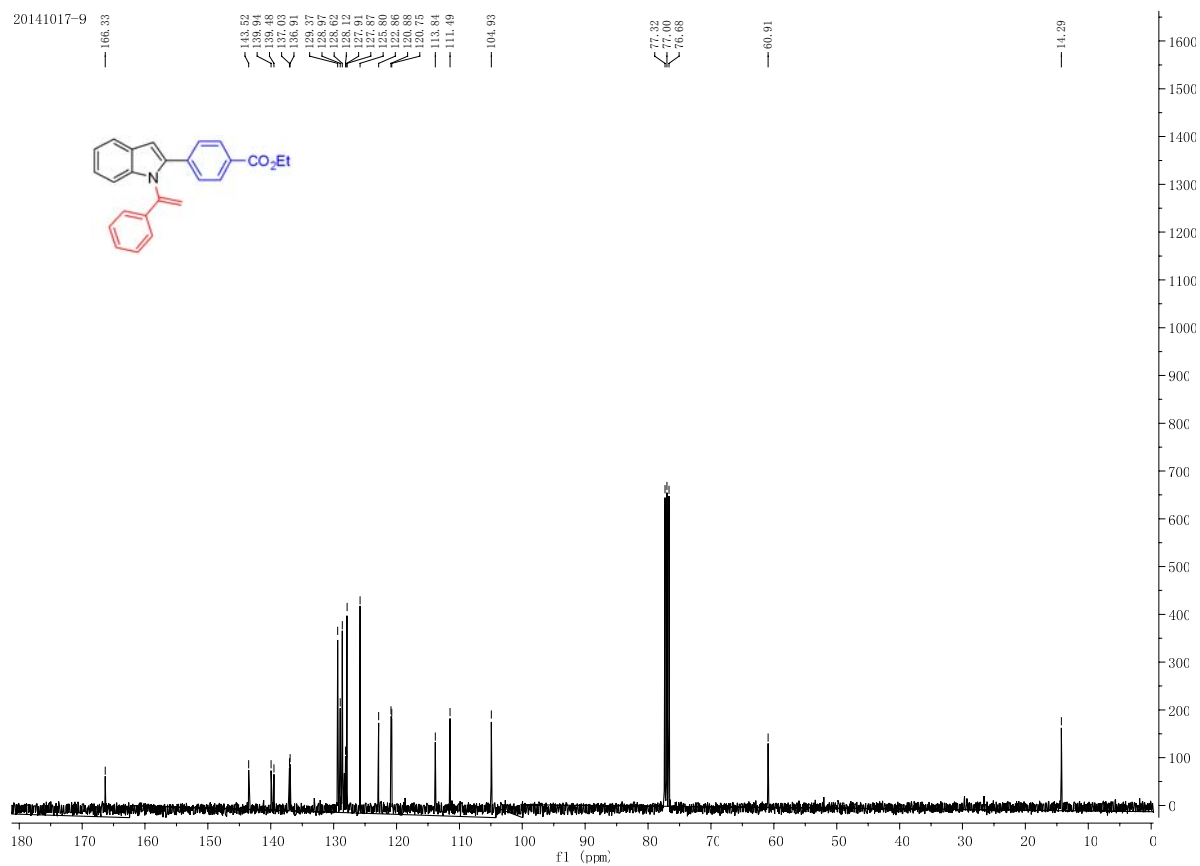


ethyl 4-(1-(1-phenylvinyl)-1H-indol-2-yl)benzoate (2h)

20141014-4

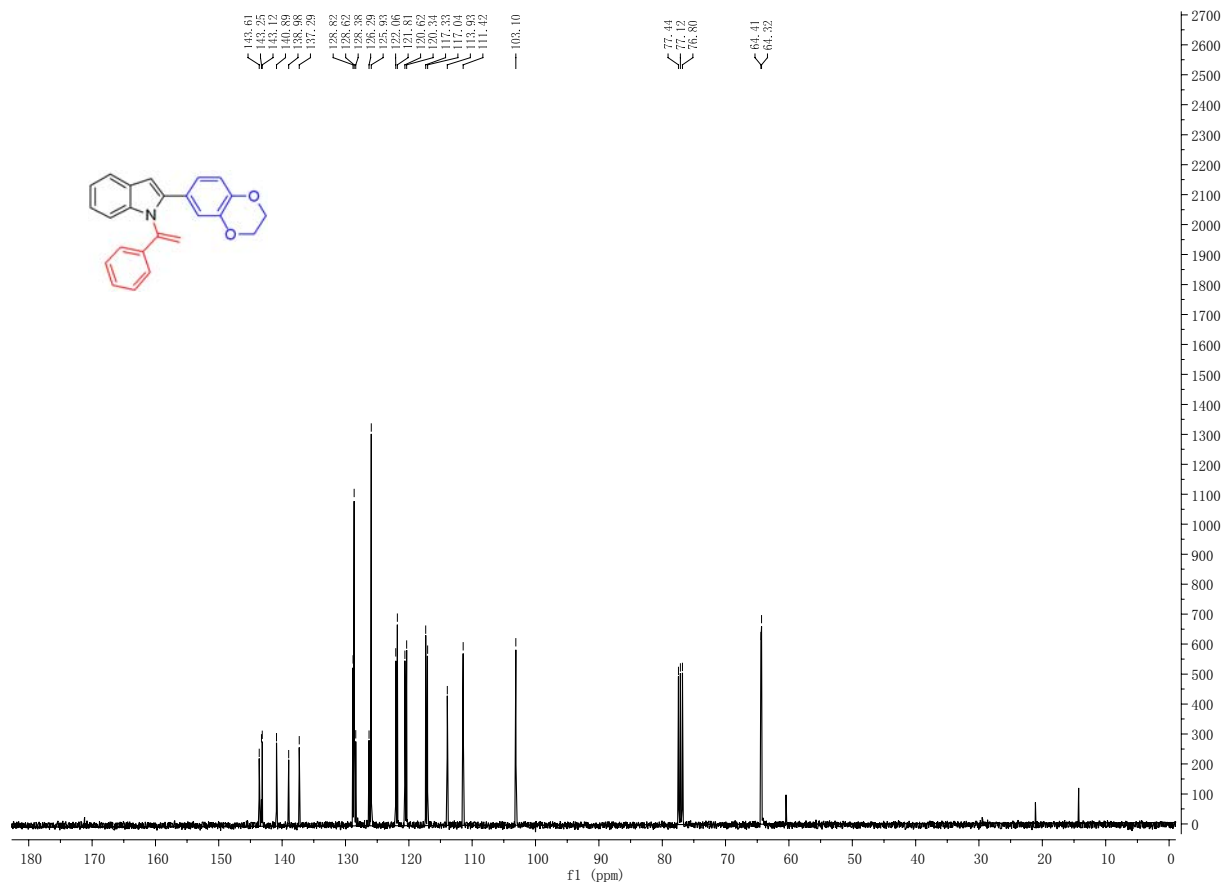
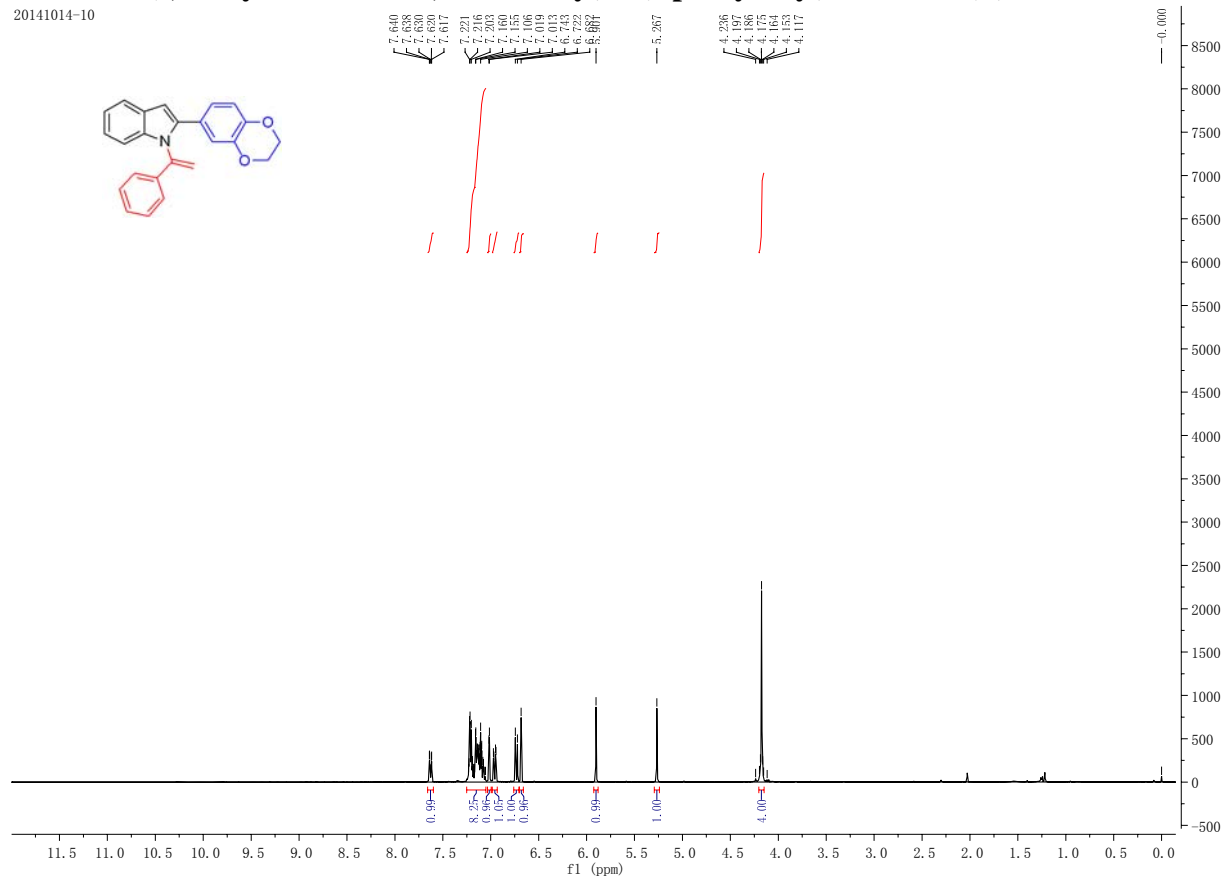


20141017-9

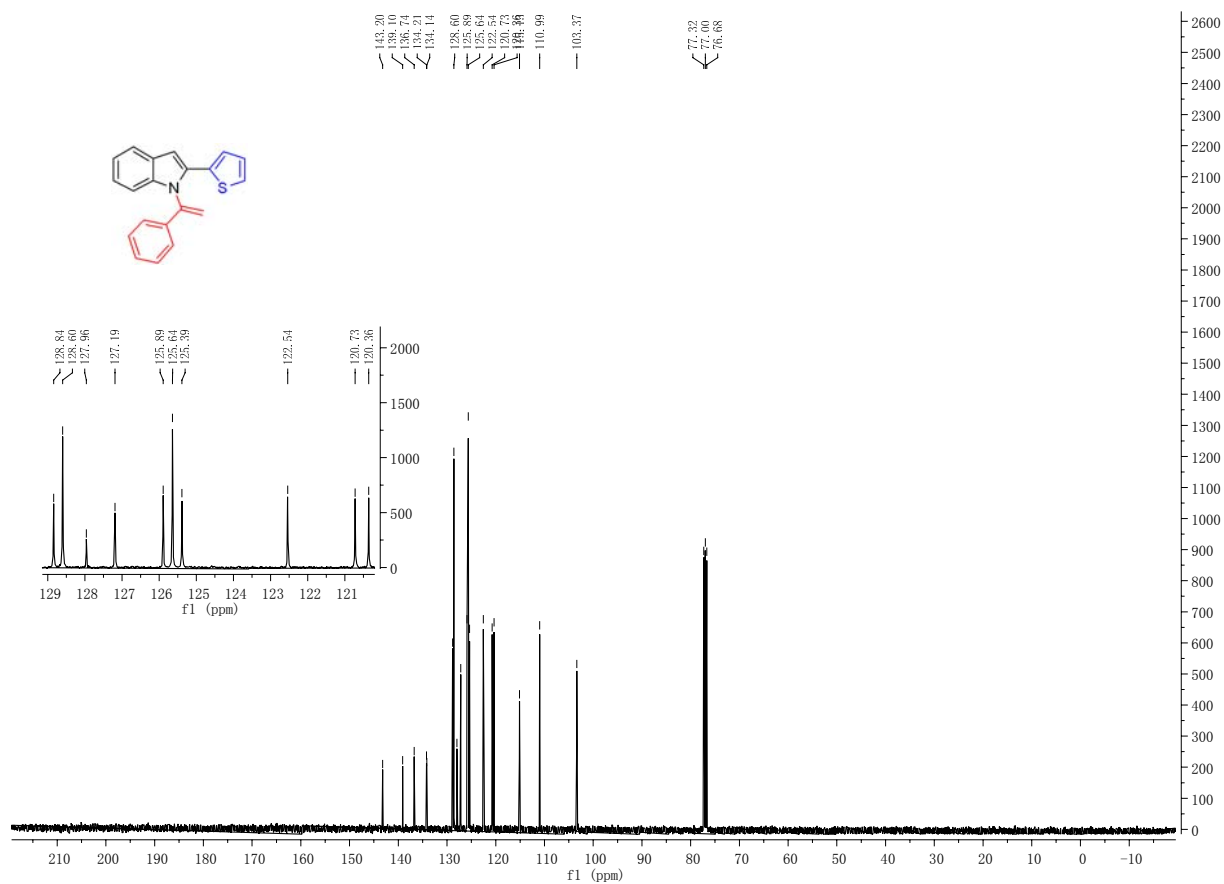
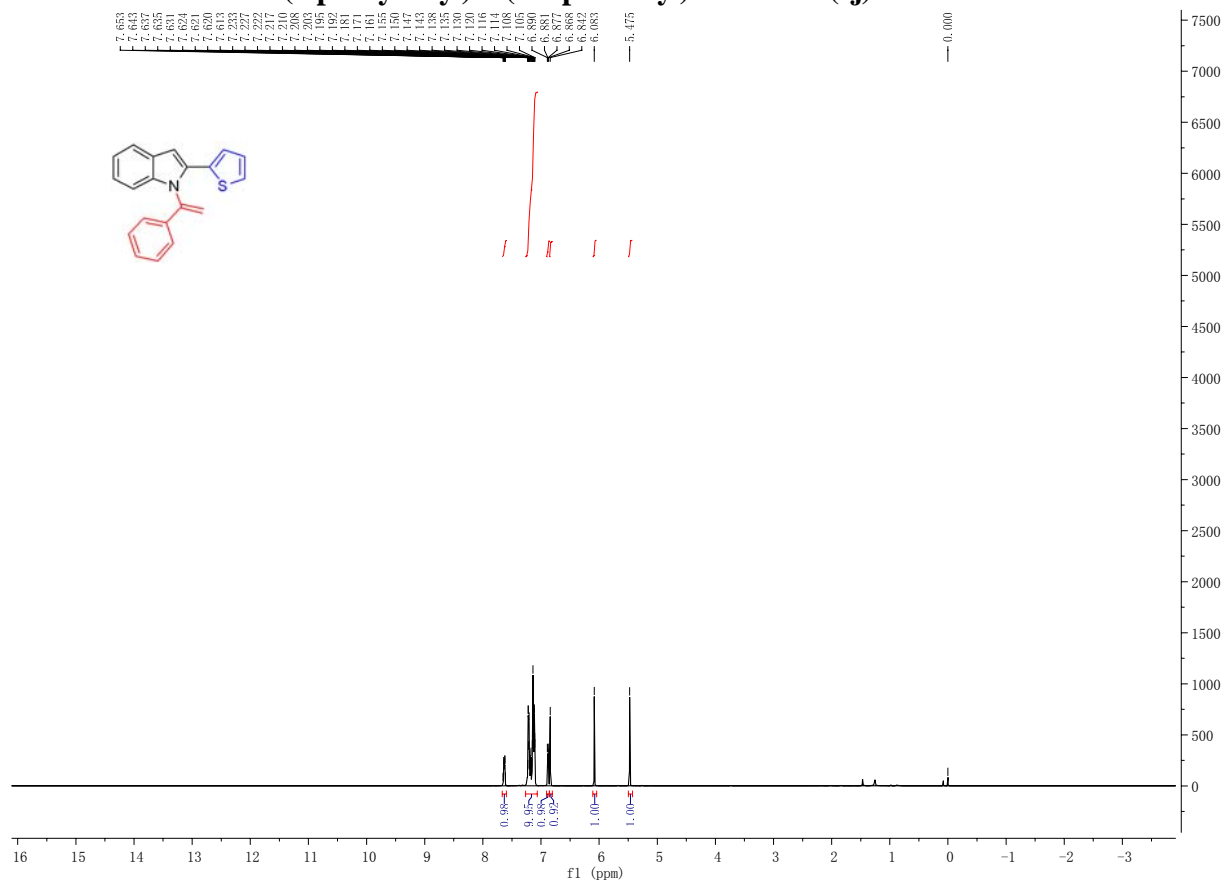


## 2-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-1-(1-phenylvinyl)-1H-indole (2i)

20141014-10

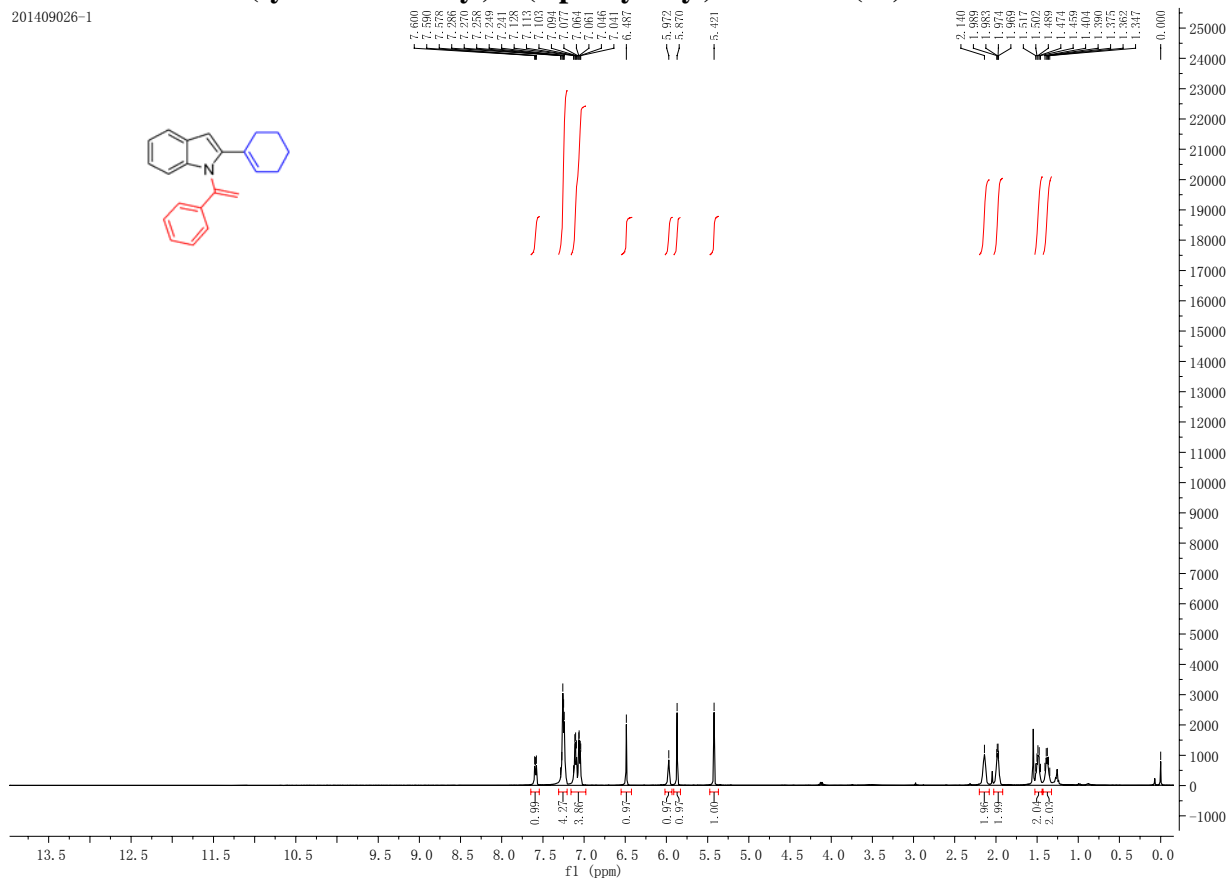


# 1-(1-phenylvinyl)-2-(thiophen-2-yl)-1H-indole (2j)

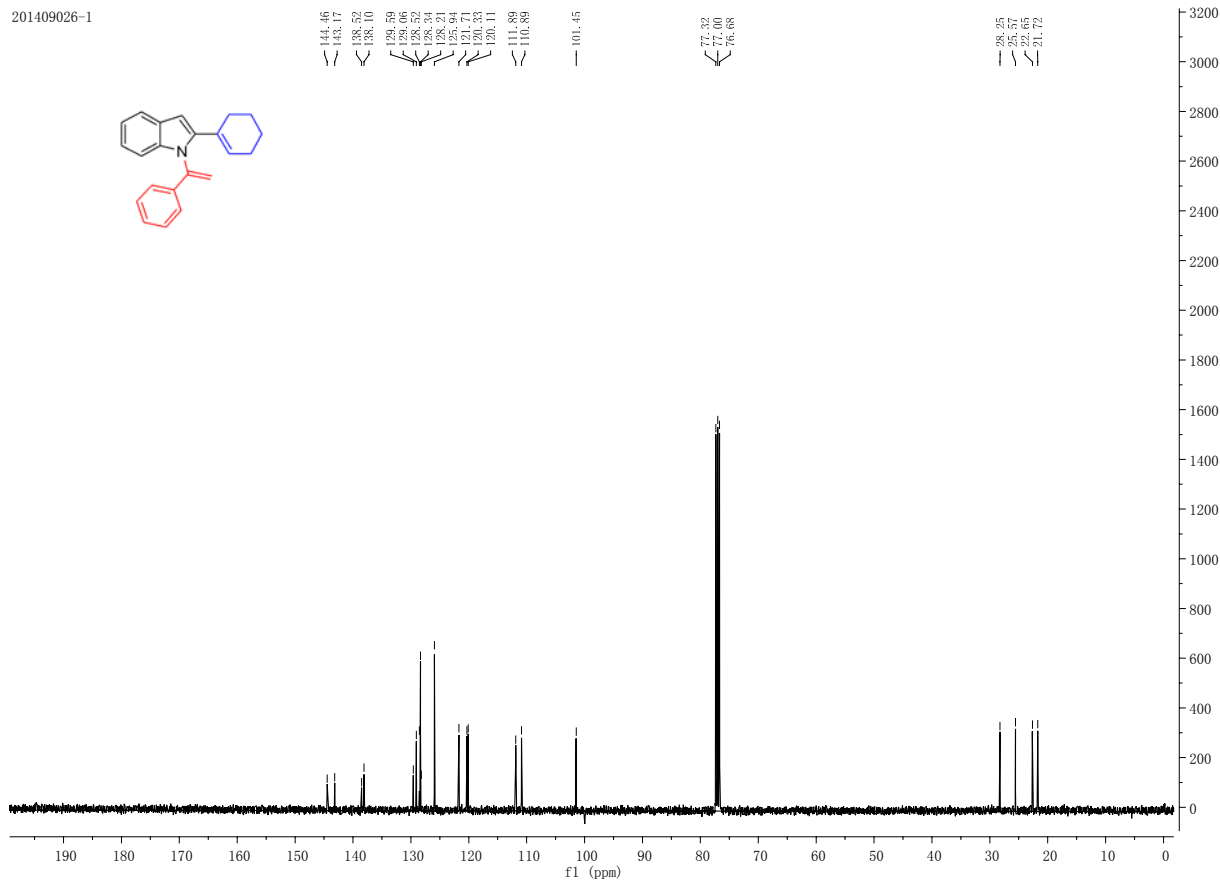


2-(cyclohex-1-en-1-yl)-1-(1-phenylvinyl)-1H-indole (2k)

201409026-1

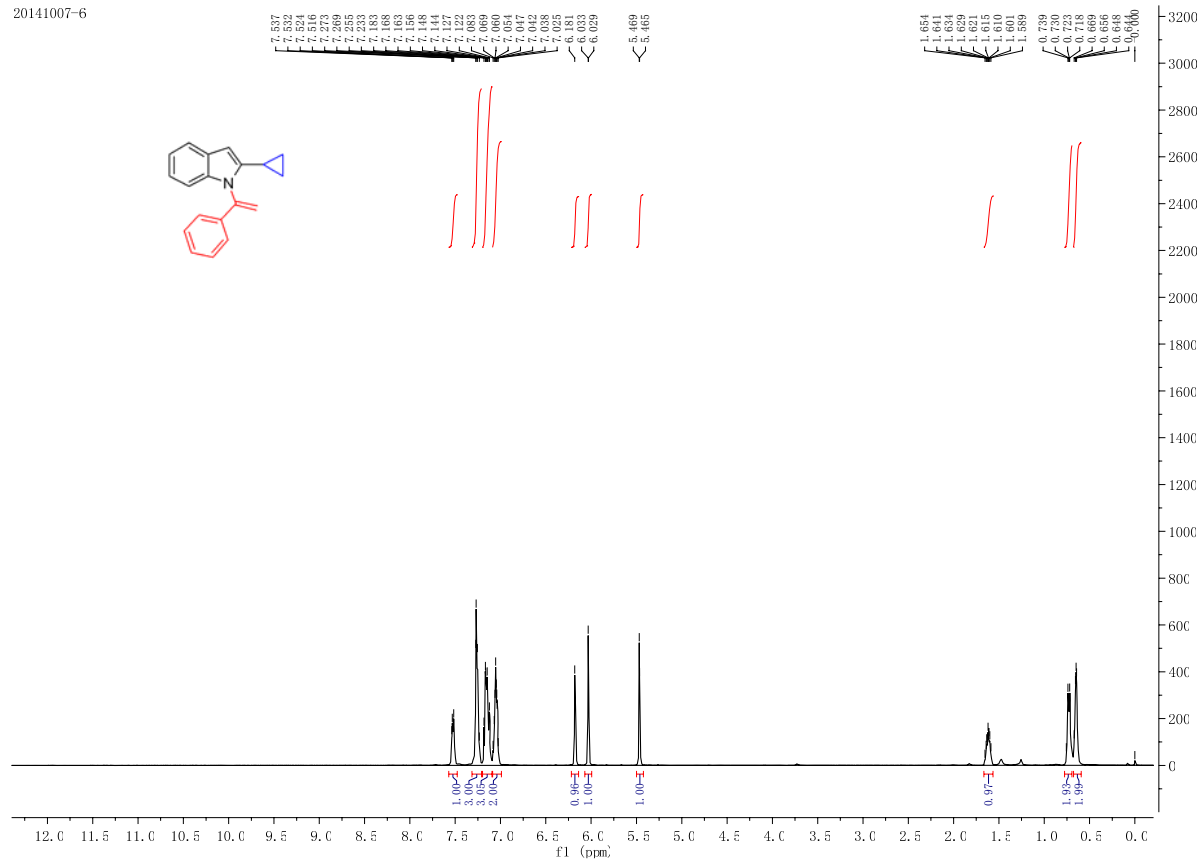


201409026-1

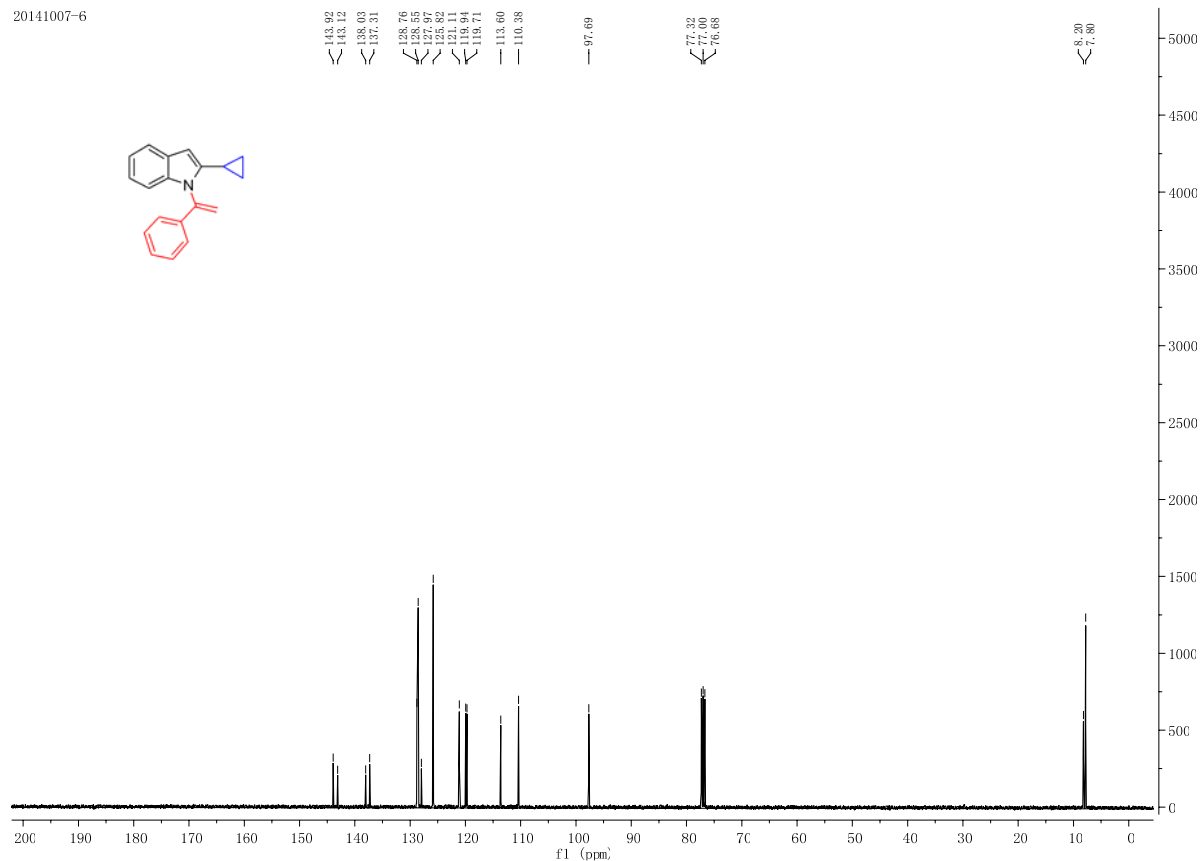


## 2-cyclopropyl-1-(1-phenylvinyl)-1H-indole (2l)

20141007-6

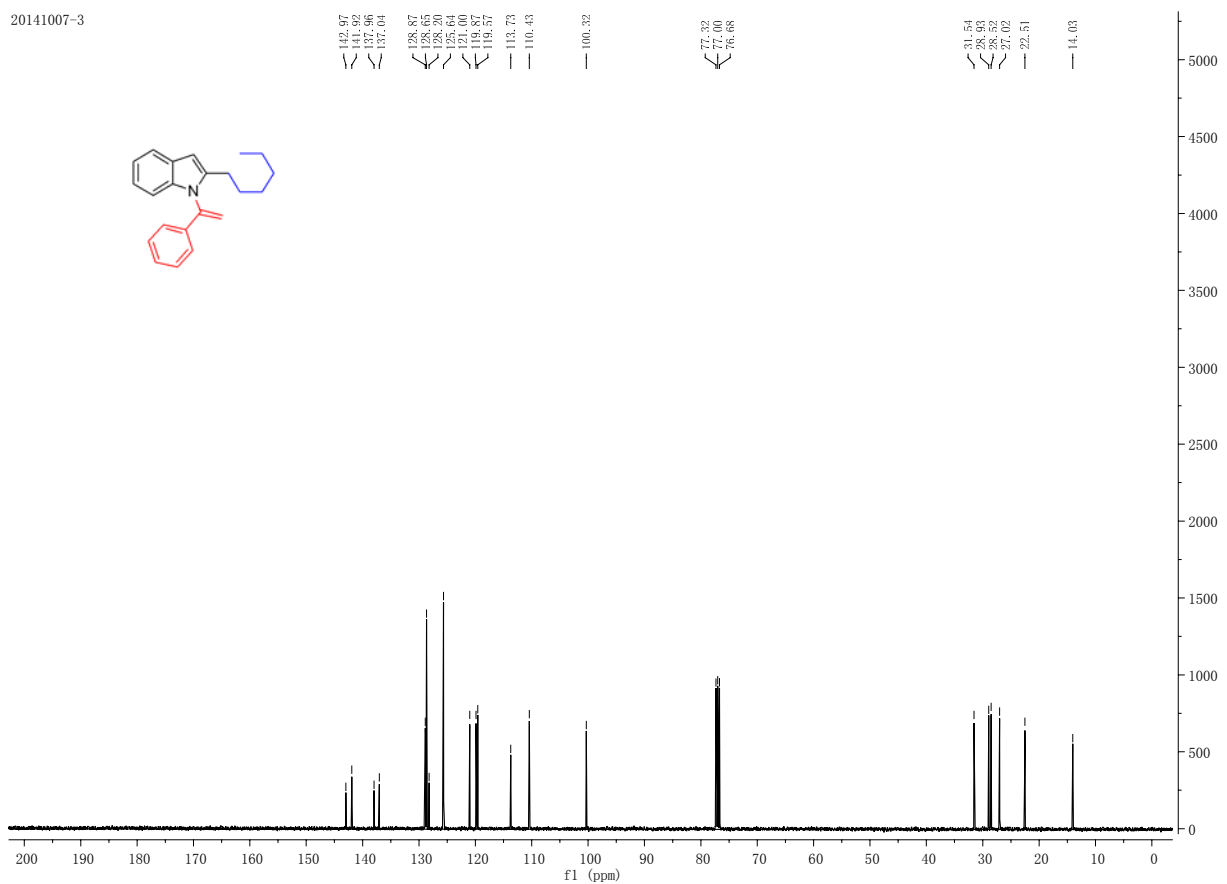
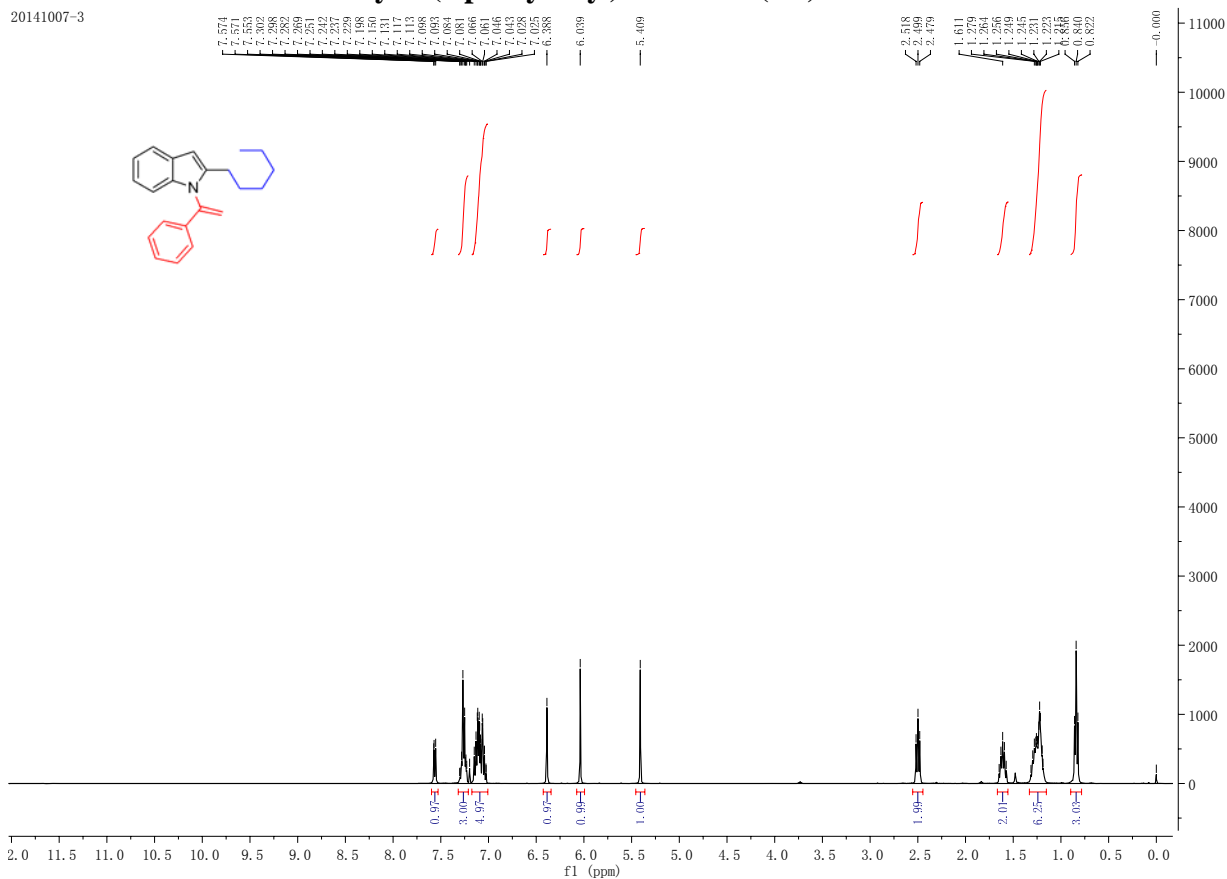


20141007-6

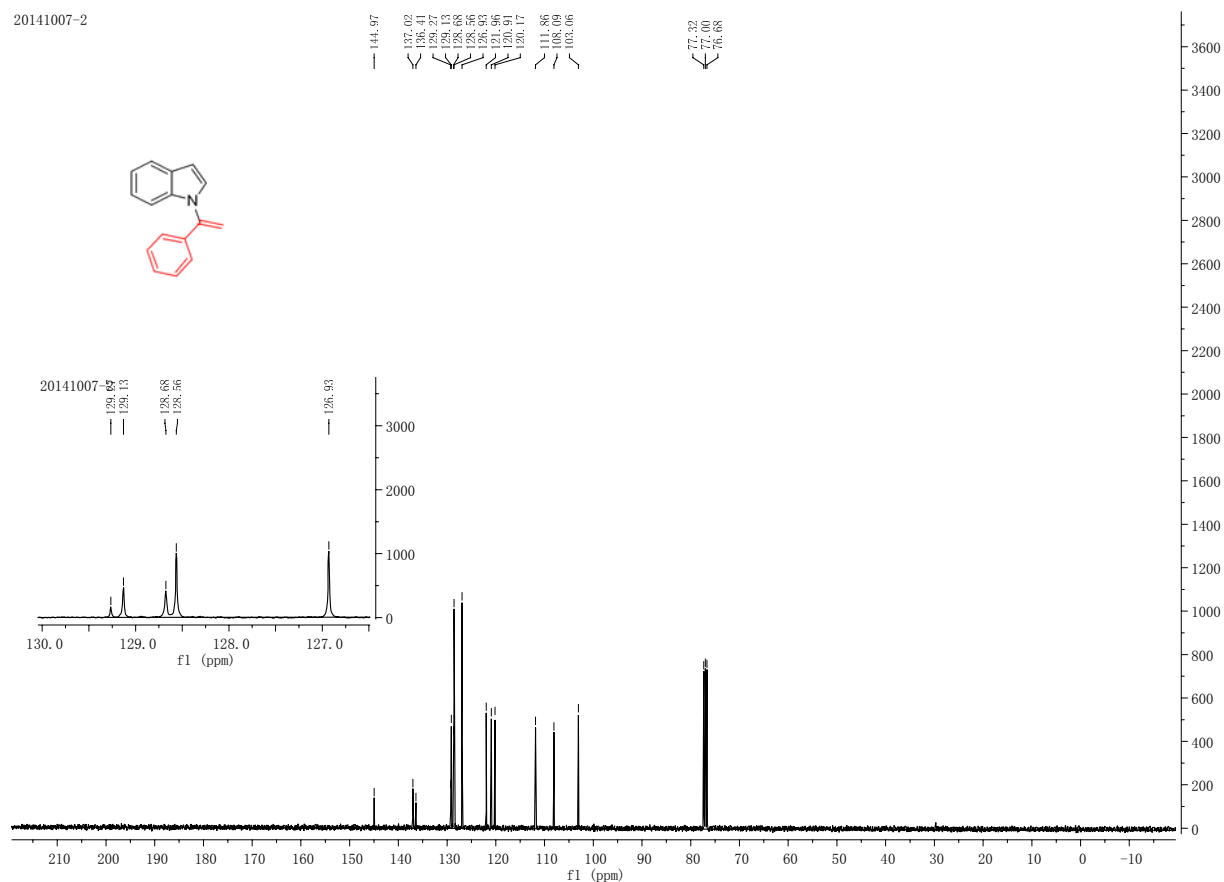
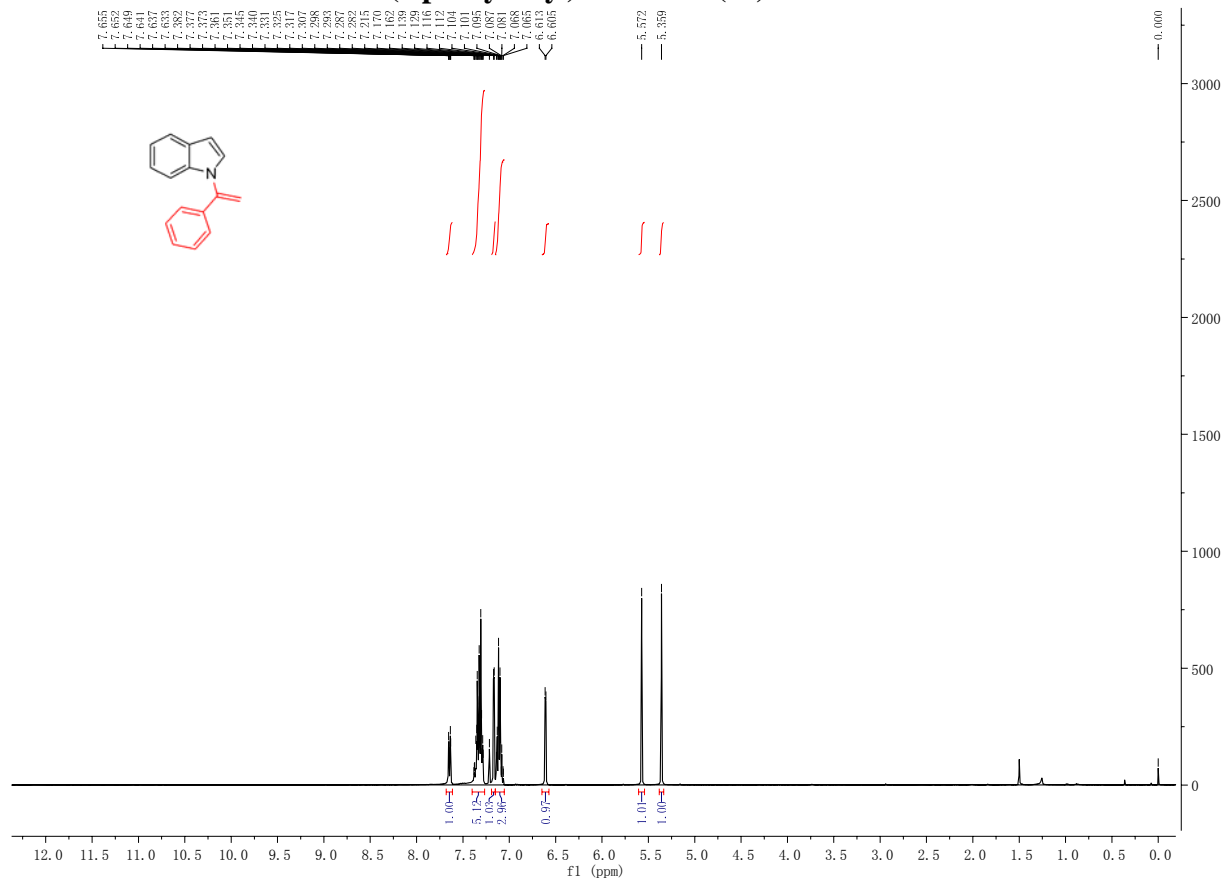




## 2-hexyl-1-(1-phenylvinyl)-1H-indole (2m)

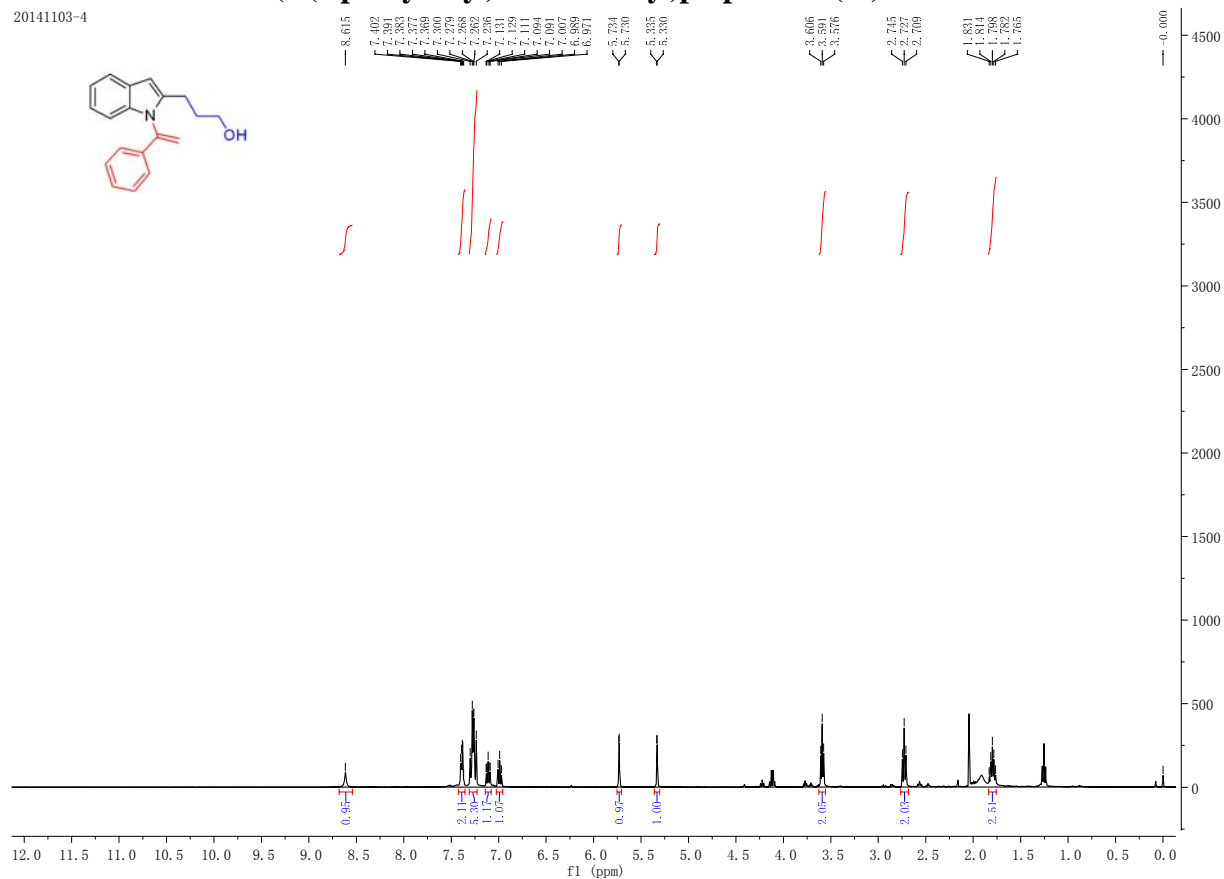
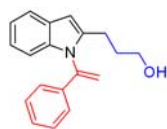


# 1-(1-phenylvinyl)-1H-indole (2n)

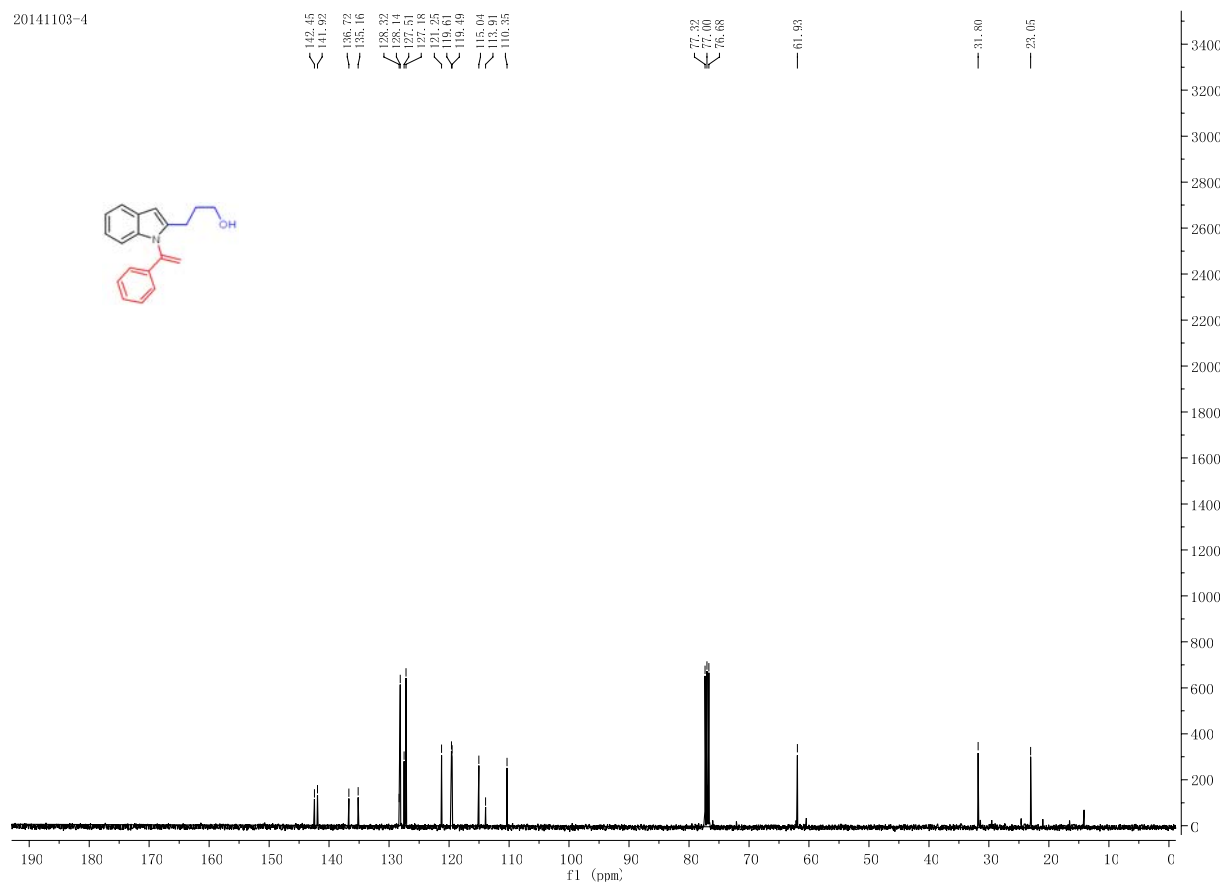
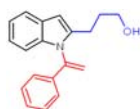


### 3-(1-(1-phenylvinyl)-1H-indol-2-yl)propan-1-ol (2o)

20141103-4

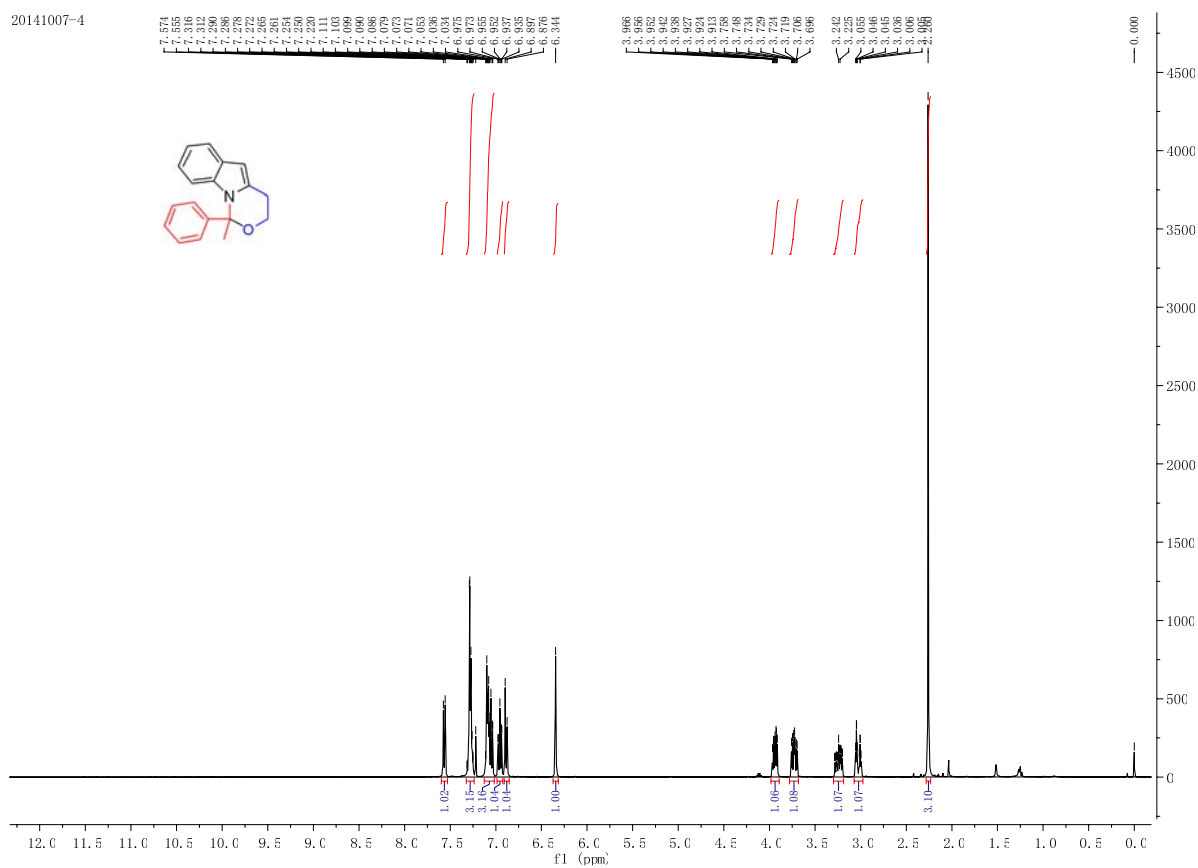


20141103-4

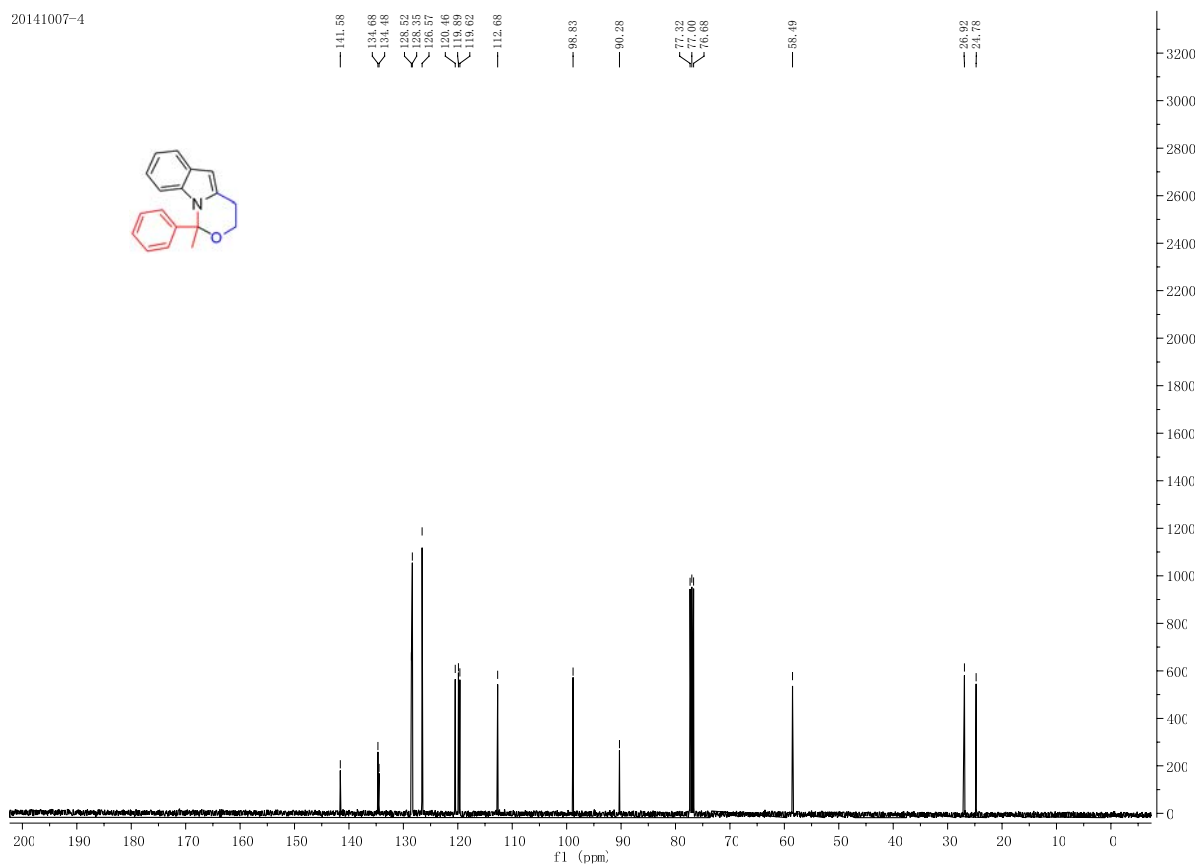


# 1-methyl-1-phenyl-3,4-dihydro-1H-[1,3]oxazino[3,4-a]indole (2p)

20141007-4

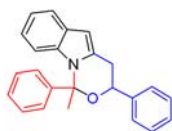
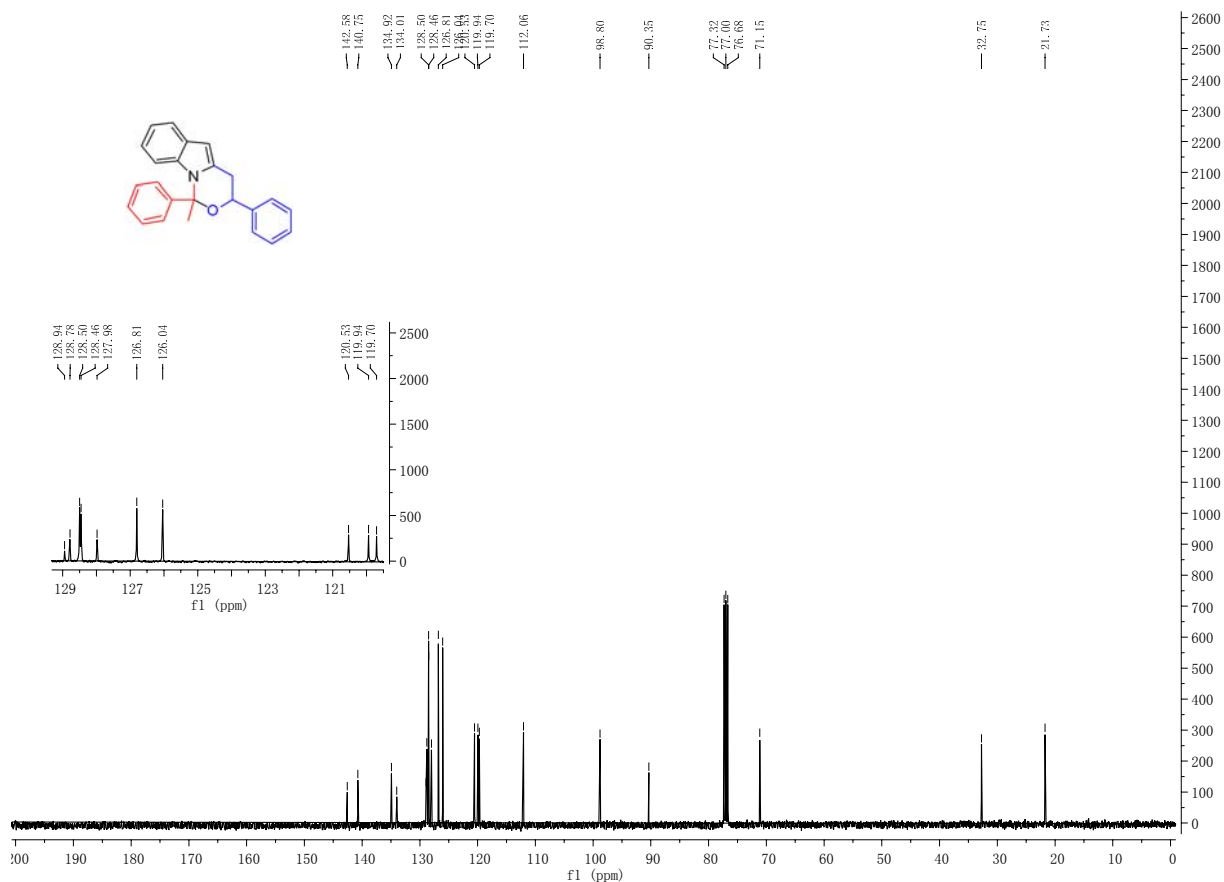
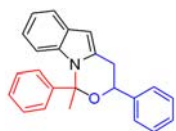
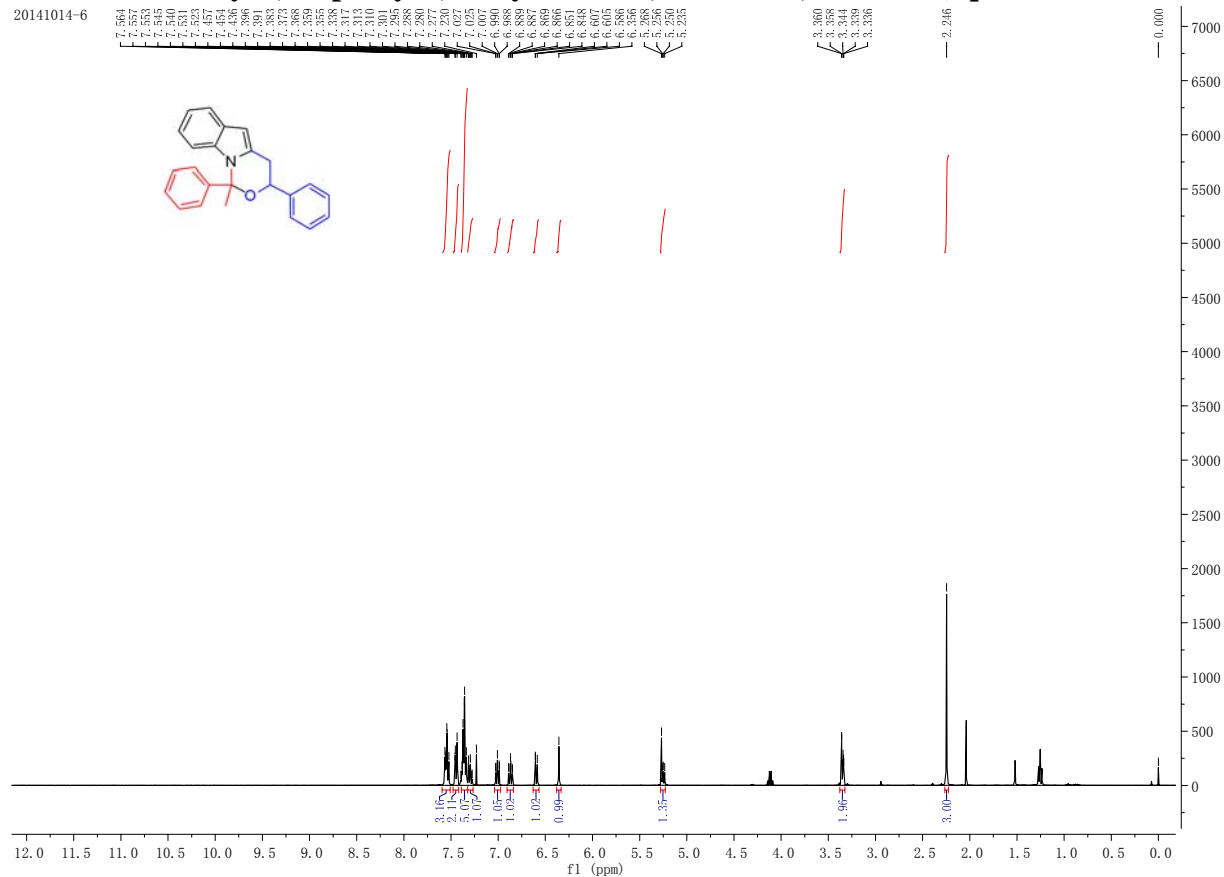


20141007-4



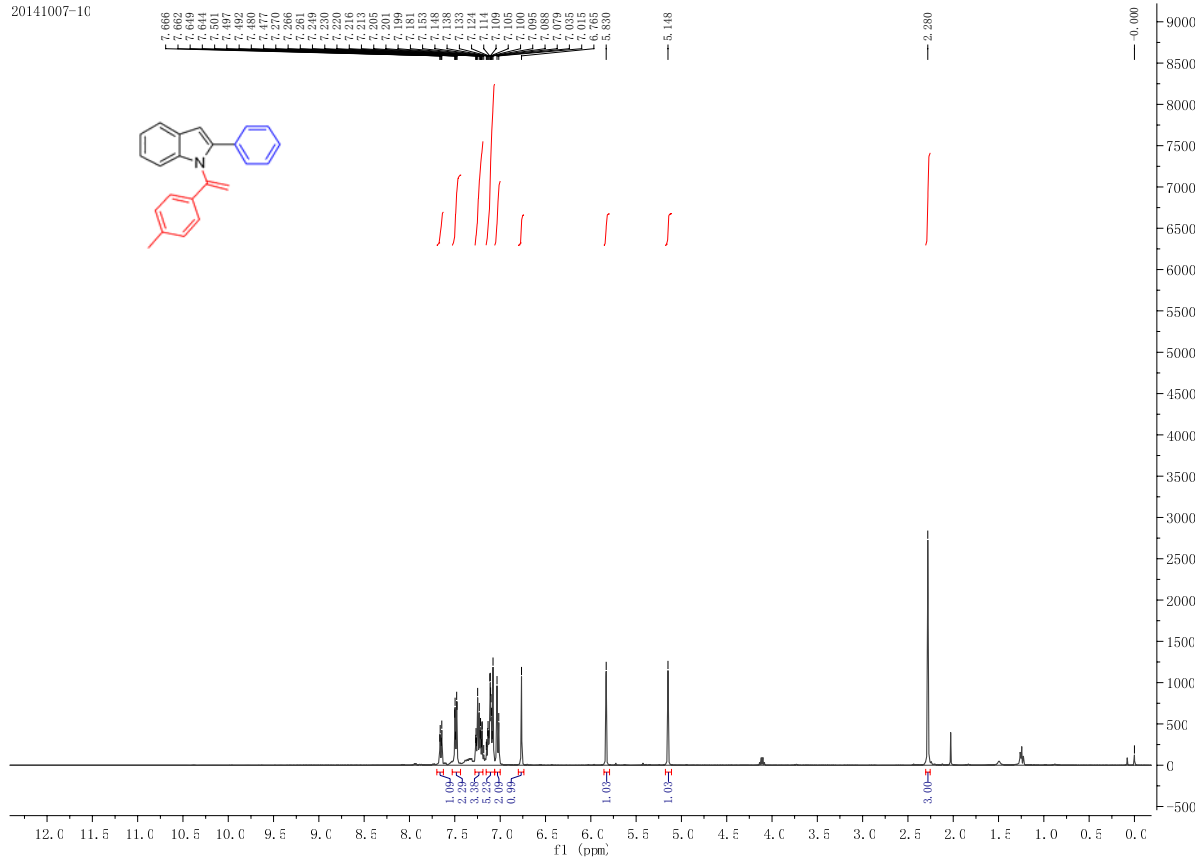
# 1-methyl-1,3-diphenyl-3,4-dihydro-1H-[1,3]oxazino[3,4-a]indole (2q)

20141014-6

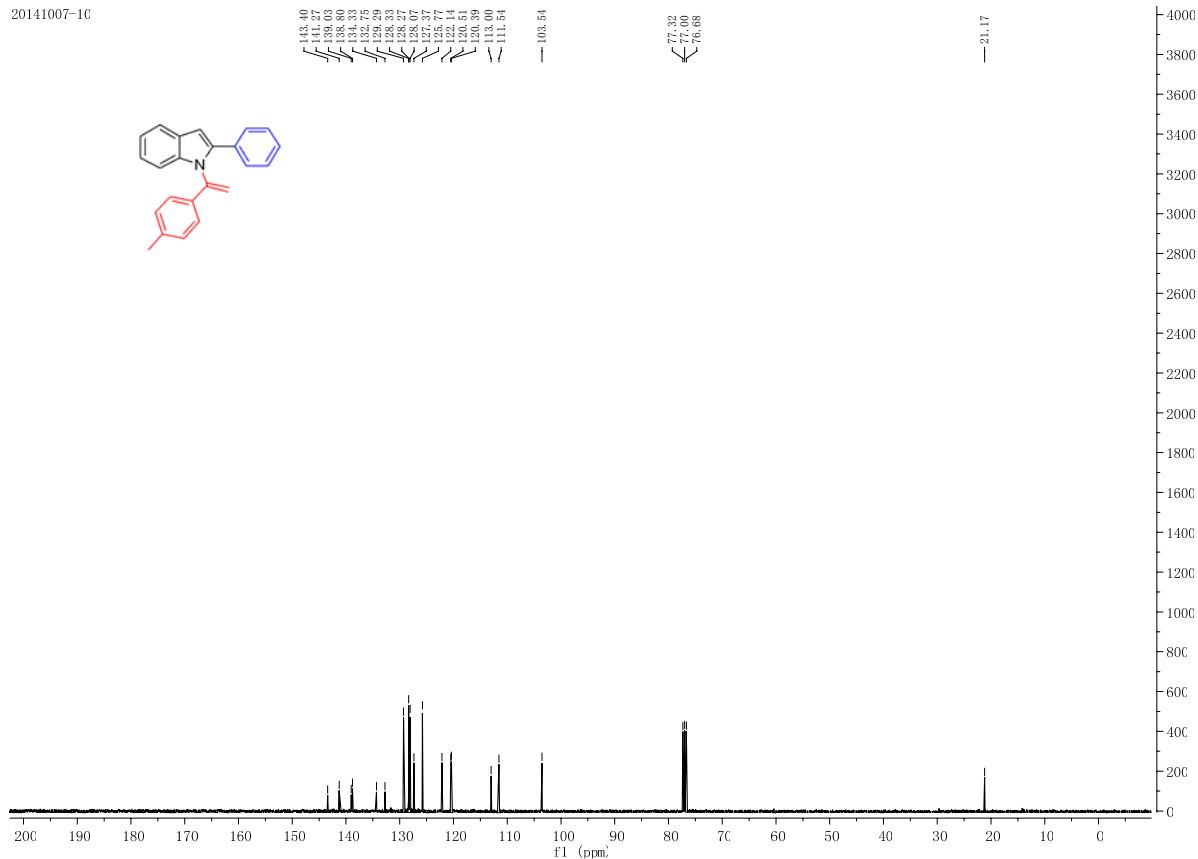


### 2-phenyl-1-(1-(p-tolyl)vinyl)-1H-indole (2r)

20141007-10



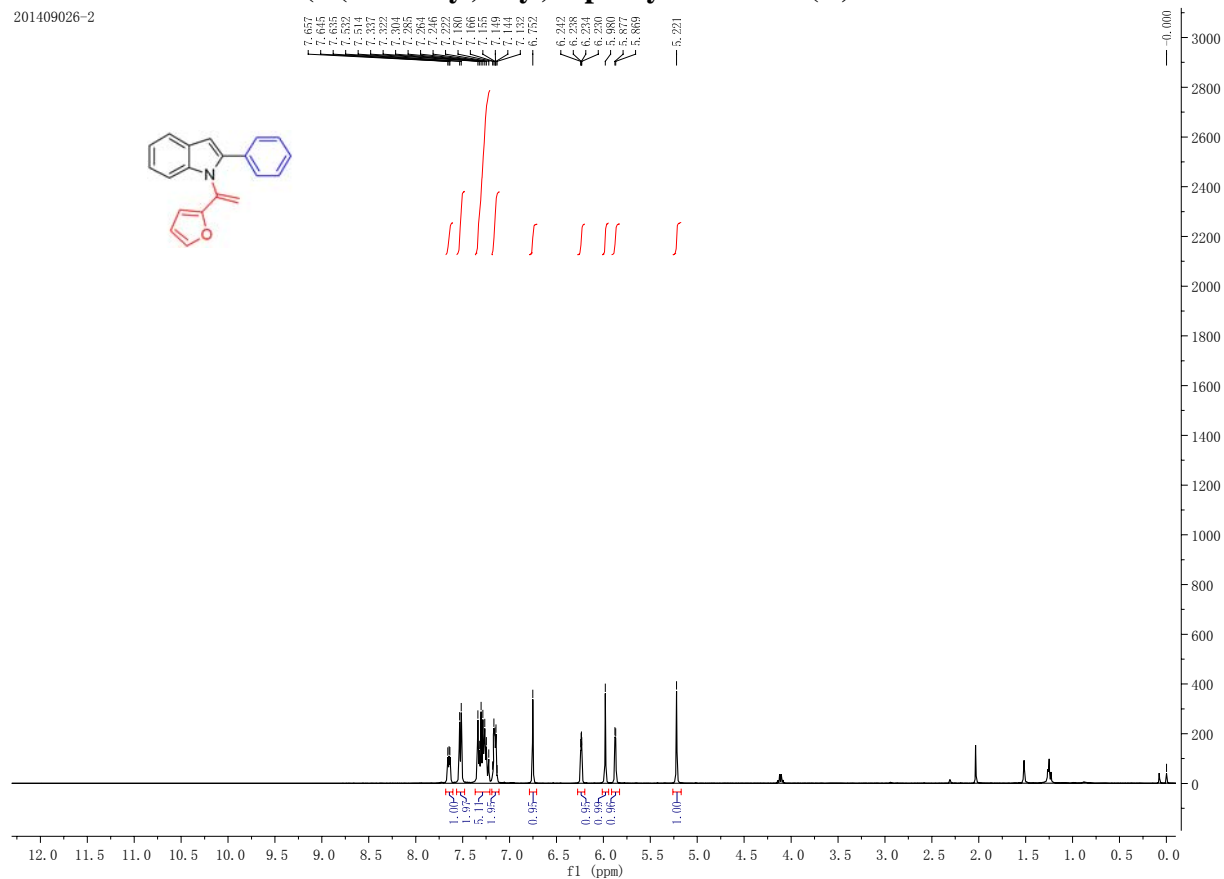
20141007-10



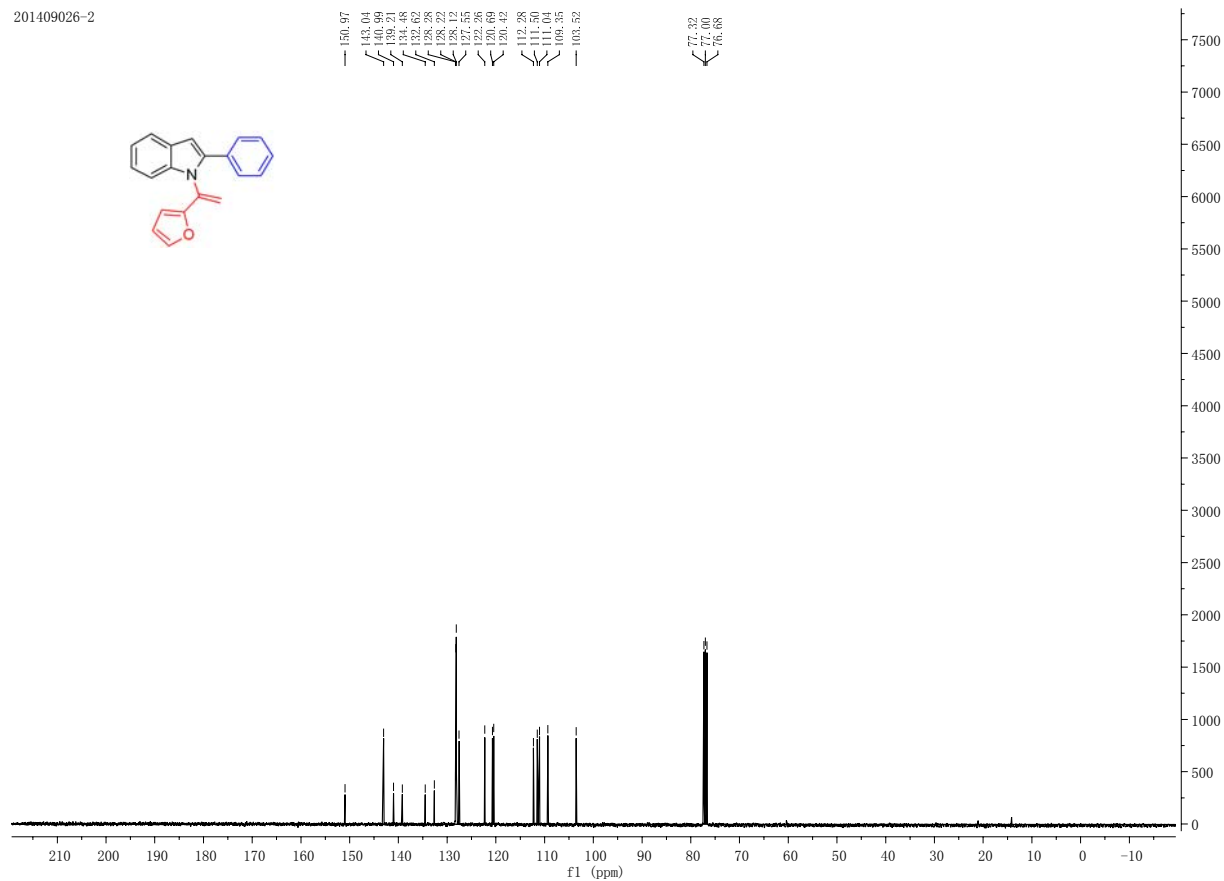


# 1-(1-(furan-2-yl)vinyl)-2-phenyl-1H-indole (2t)

201409026-2

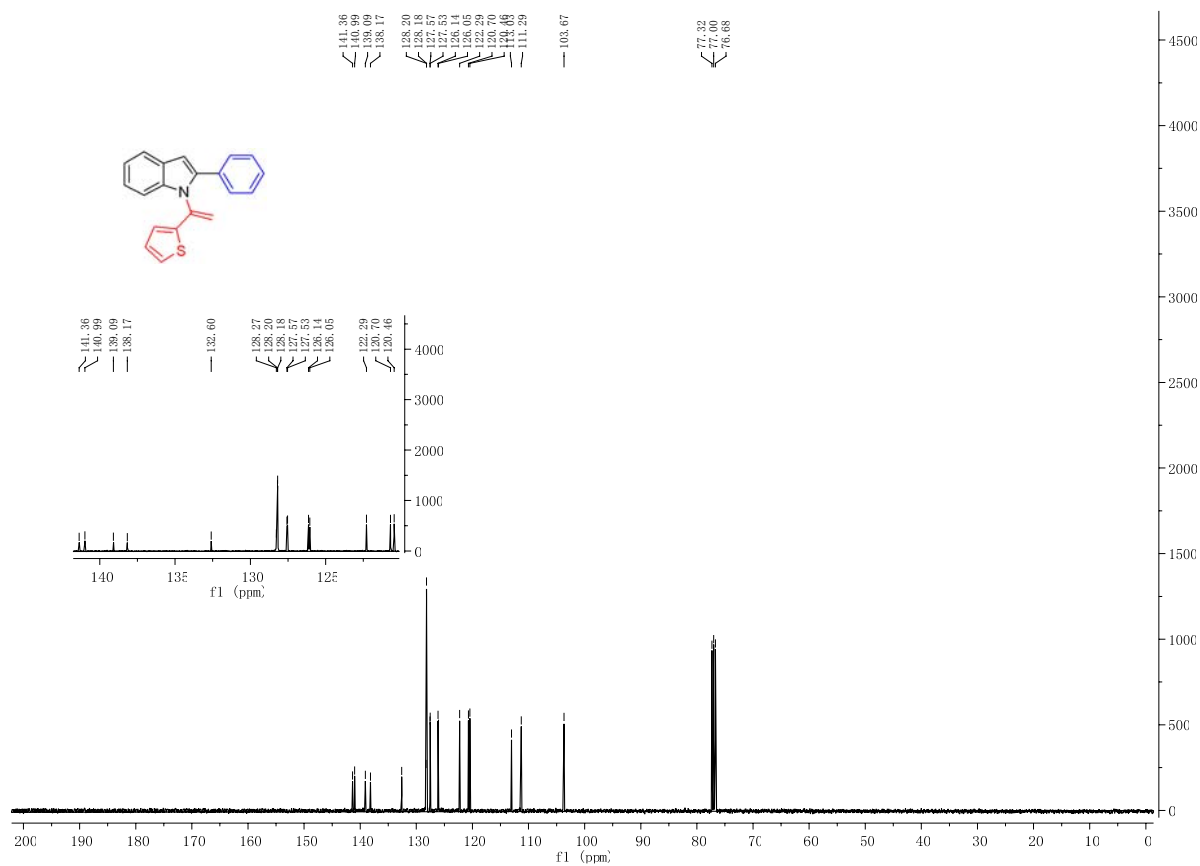
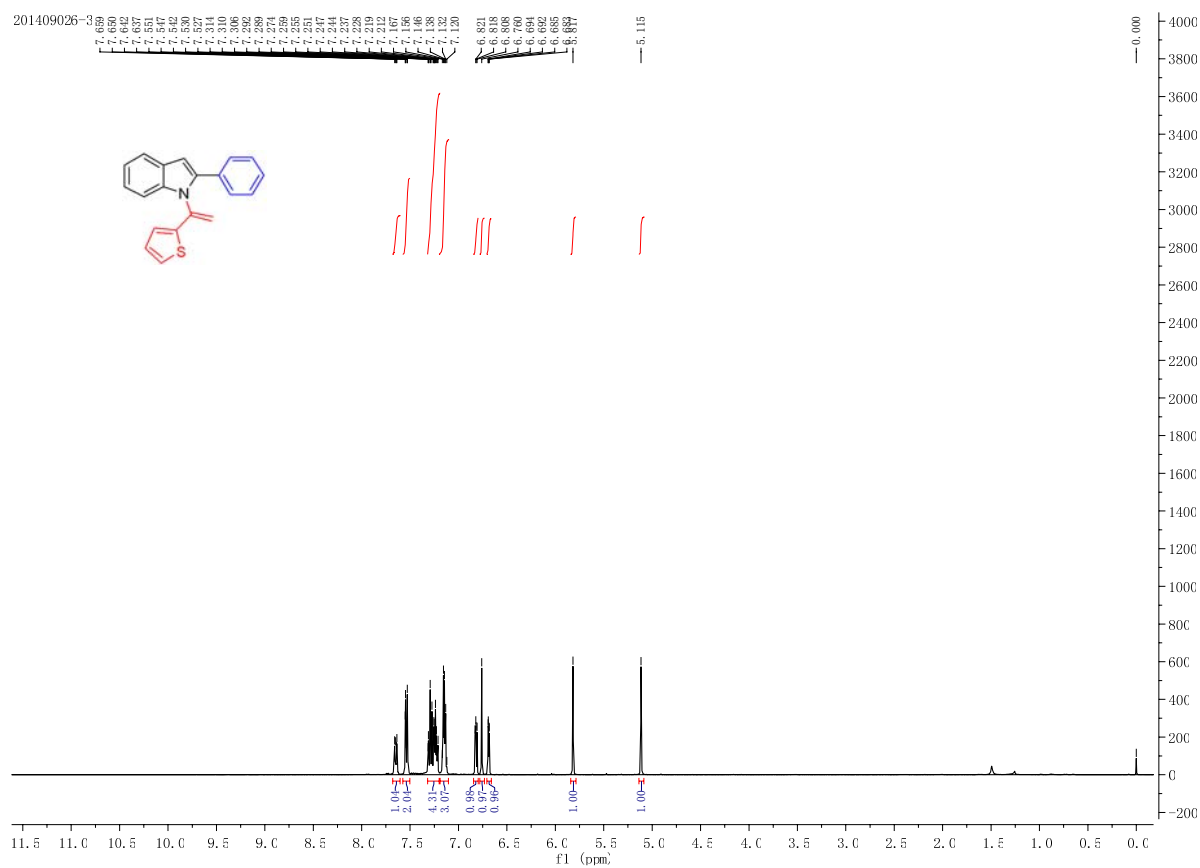


201409026-2

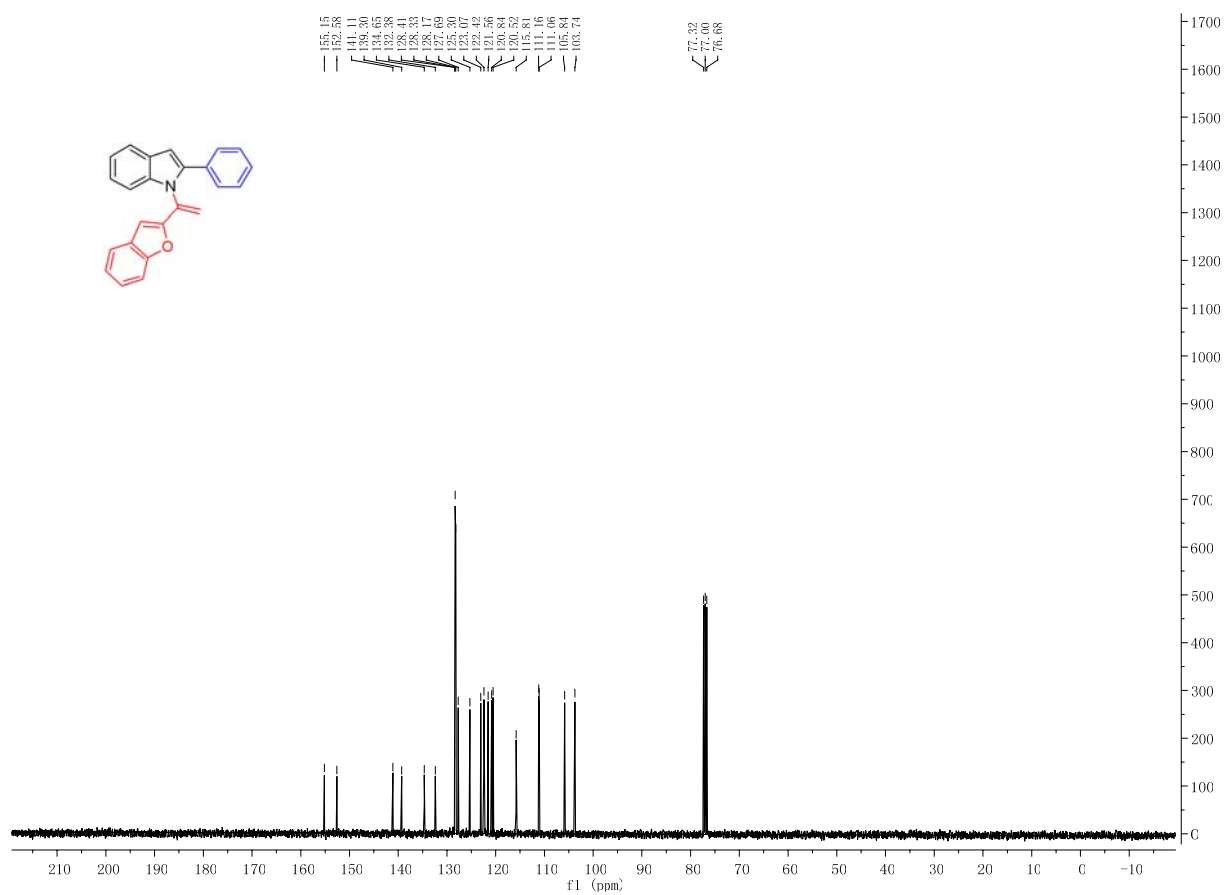
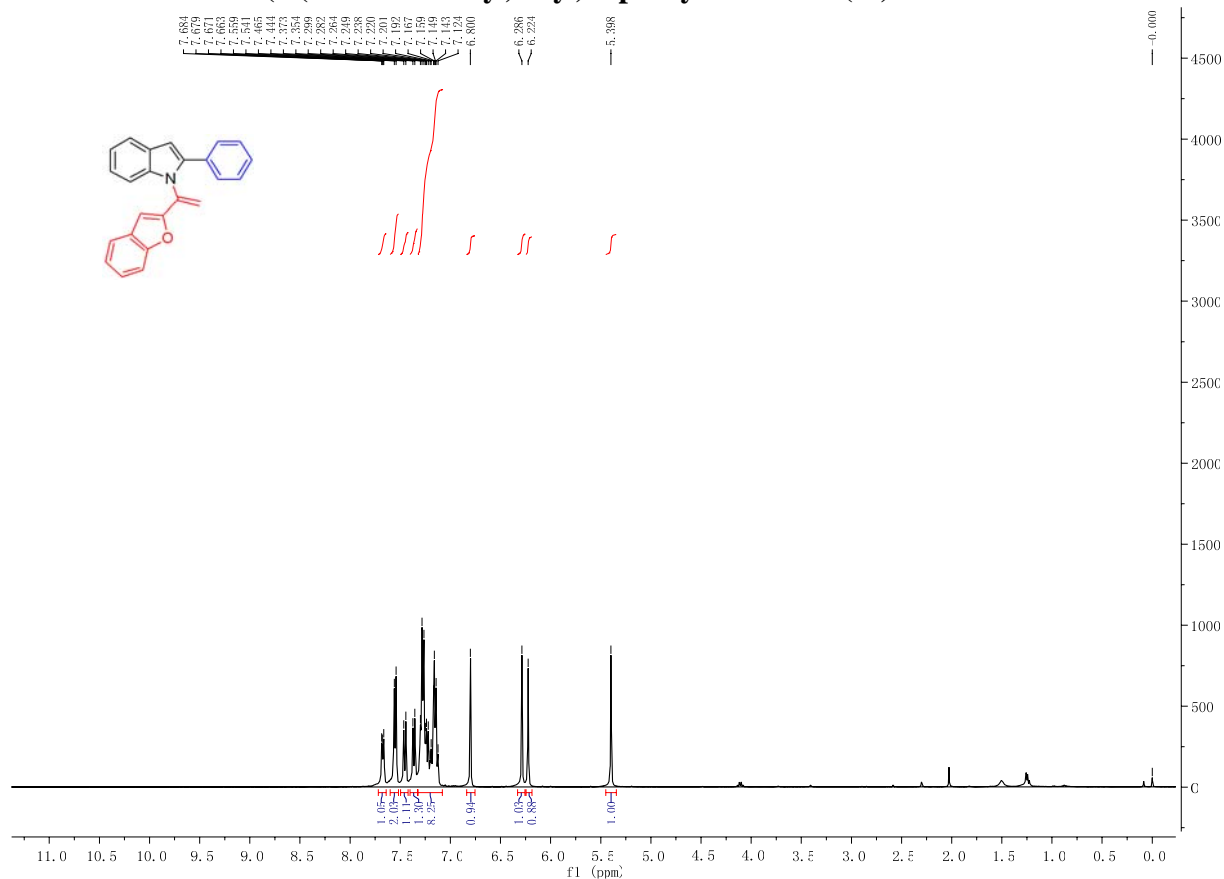




## 2-phenyl-1-(1-(thiophen-2-yl)vinyl)-1H-indole (2u)

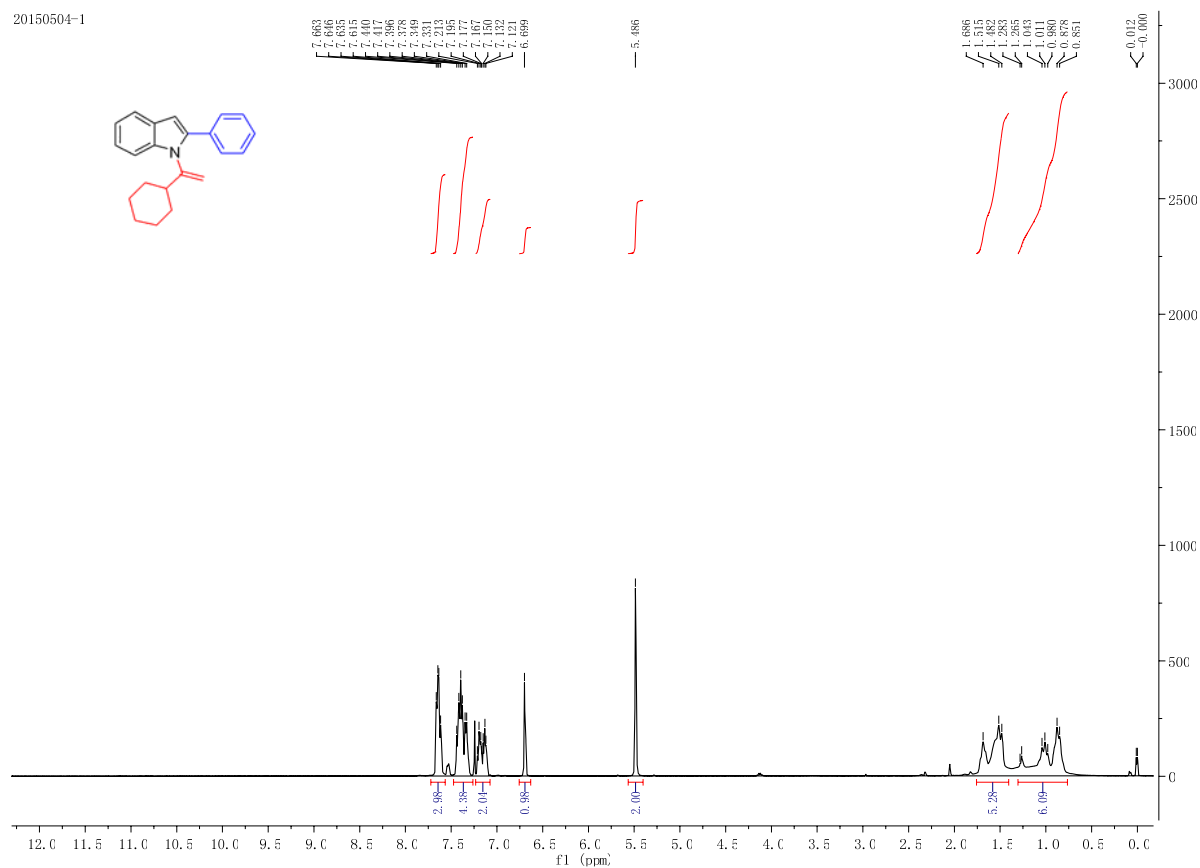


**1-(1-(benzofuran-2-yl)vinyl)-2-phenyl-1H-indole (2v)**

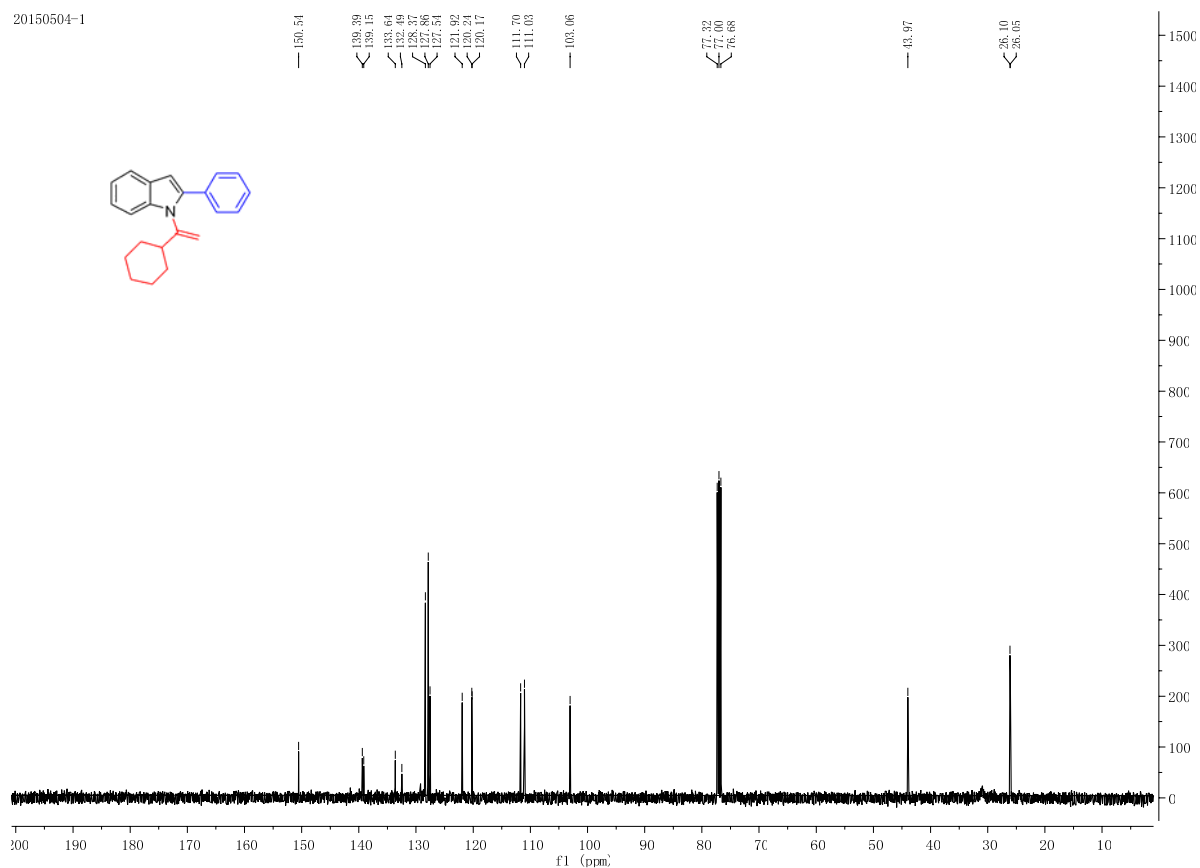


# 1-(1-cyclohexylideneethyl)-2-phenyl-1H-indole (2w)

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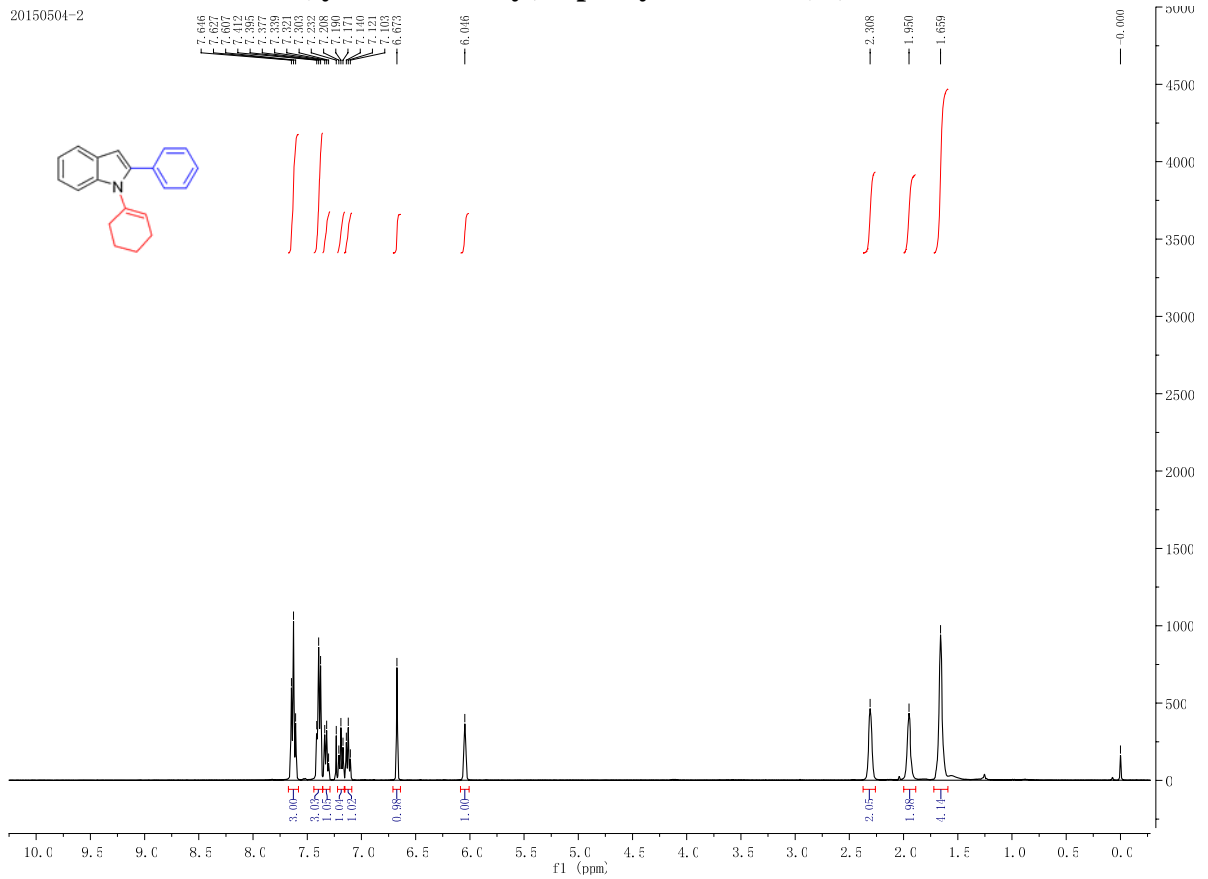


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**1-(cyclohex-1-en-1-yl)-2-phenyl-1H-indole (2x)**

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