

supporting informations

**SIMPLE BRØNSTED ACID CATALYZED
THREE-COMPONENT REACTIONS FOR EFFICIENT
ALKYLATION OF INDOLIZINES WITH AROMATIC
ALDEHYDES AND HANTZCH ESTERS**

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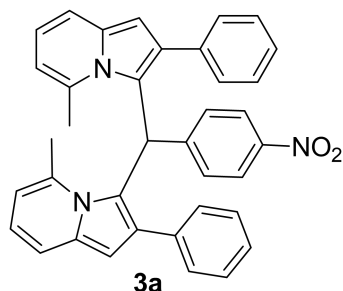
1. General Information

Unless otherwise noted, all commercially available compounds were used as provided without further purification. Solvents for chromatography were technical grade. Thin layer chromatography (TLC) was performed using glass-backed silica gel plates, and flash chromatography utilized 200-300 mesh silica gel. Products were visualized by UV light. ^1H NMR spectra were recorded on commercial instruments (400 MHz). Chemical shifts were reported in ppm from tetramethylsilane with the solvent resonance as the internal standard (CDCl_3 , $\delta = 7.26$). Spectra were reported as follows: chemical shift (δ ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz), integration and assignment. ^{13}C NMR spectra were collected on commercial instruments (100 MHz) with complete proton decoupling. Chemical shifts are reported in ppm from the tetramethylsilane with the solvent resonance as internal standard (CDCl_3 , $\delta = 77.0$). Mass spectra were recorded on Thermo Quest Finnigan LCQDECA system equipped with an ESI source.

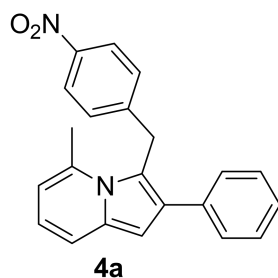
2. General procedure for the three component alkylation of indolizines

A reaction tube was charged with the iodolizine 1 (0.2 mmol, 1 eq.), aromatic aldehyde 2 (0.2 mmol, 1 eq.), Hantzsch ester (0.26 mmol, 1.3 eq.), anhydrous toluene (2 mL), TsOH (10 mol %). The system was stirred under a nitrogen atmosphere at 60 °C for 24 h. Then the products were obtained by purification with flash silica gel chromatography.

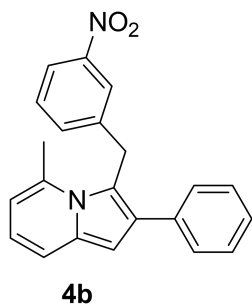
3. Experimental data for products



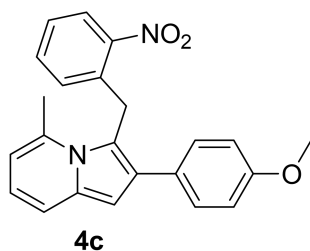
3,3'-((4-nitrophenyl)methylene)bis(5-methyl-2-phenylindolizine) (3a); brown solid (97.4 mg, 89%); m.p. 232-235 °C; ^1H NMR (400 MHz, CDCl_3) δ 8.08 (d, $J = 8.7$ Hz, 2H), 7.35 (d, $J = 8.5$ Hz, 2H), 7.30 (d, $J = 7.2$ Hz, 4H), 7.22 – 7.08 (m, 10H), 6.55 (d, $J = 9.1$ Hz, 2H), 6.46 (dd, $J = 9.1, 6.6$ Hz, 2H), 6.39 – 6.31 (m, 3H), 2.55 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 154.15, 146.03, 135.67, 132.71, 131.67, 130.54, 129.95, 129.24, 127.96, 126.40, 123.30, 117.45, 116.20, 112.12, 109.53, 108.29, 40.42, 18.89; HRMS (ESI): calcd. For $\text{C}_{37}\text{H}_{30}\text{N}_3\text{O}_2$ (M+H): 548.2335; found: 538.2340.



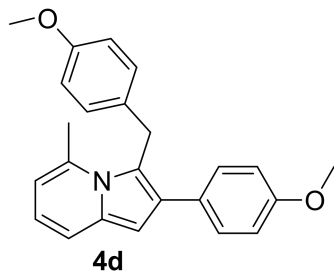
3-benzyl-5-methyl-2-phenylindolizine (4a); red solid (64.1 mg, 94%); m.p. 195-197 °C; ^1H NMR (400 MHz, CDCl_3) δ 8.09 (d, $J = 8.5$ Hz, 2H), 7.40 (dd, $J = 8.1, 5.5$ Hz, 4H), 7.36 (s, 1H), 7.29 (dd, $J = 9.7, 7.3$ Hz, 3H), 7.18 (d, $J = 9.0$ Hz, 1H), 6.73 (dd, $J = 8.8, 6.8$ Hz, 1H), 6.46 (d, $J = 6.5$ Hz, 1H), 4.39 (s, 2H), 2.56 (d, $J = 15.3$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 150.16, 146.24, 135.58, 132.85, 132.15, 129.90, 128.88, 128.84, 128.57, 126.76, 123.61, 117.65, 114.74, 110.01, 107.69, 107.21, 30.33, 18.68; HRMS (ESI): calcd. For $\text{C}_{22}\text{H}_{19}\text{N}_2\text{O}_2$ (M+H): 343.1442; found: 343.1449.



5-methyl-3-(3-nitrobenzyl)-2-phenylindolizine (4b); red solid (64.3 mg, 94%); m.p. 182-185 °C; ¹H NMR (400 MHz, CDCl₃) δ 8.07 (d, *J* = 8.1 Hz, 1H), 7.99 (s, 1H), 7.52 – 7.31 (m, 9H), 6.69 (dd, *J* = 8.9, 6.8 Hz, 1H), 6.44 (t, *J* = 6.8 Hz, 1H), 4.39 (s, 2H), 2.40 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 148.65, 140.84, 135.45, 133.81, 130.17, 130.12, 129.64, 129.51, 128.43, 126.78, 122.81, 121.64, 121.48, 117.73, 116.24, 115.41, 110.49, 106.41, 30.16, 9.32; HRMS (ESI): calcd. For C₂₂H₁₉N₂O₂ (M+H): 343.1442; found: 343.1447.

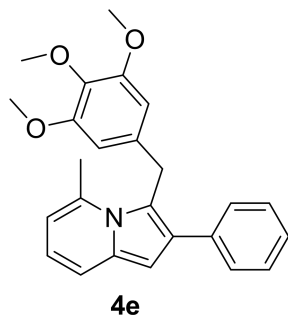


2-(4-methoxyphenyl)-5-methyl-3-(2-nitrobenzyl)indolizine (4c); red solid (68.4 mg, 92%); m.p. 208-209 °C; ¹H NMR (400 MHz, CDCl₃) δ 7.96 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.38 (td, *J* = 7.5, 1.5 Hz, 1H), 7.35 – 7.28 (m, 4H), 7.10 (dd, *J* = 7.8, 4.6 Hz, 2H), 6.94 – 6.86 (m, 2H), 6.69 (dd, *J* = 9.0, 6.6 Hz, 1H), 6.43 (d, *J* = 6.6 Hz, 1H), 4.58 (s, 2H), 3.83 (s, 3H), 2.58 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 158.57, 149.10, 137.10, 132.93, 132.70, 132.38, 130.93, 129.89, 129.63, 127.87, 126.70, 124.38, 117.46, 114.71, 114.10, 109.87, 107.34, 106.21, 55.31, 26.94, 18.73; HRMS (ESI): calcd. For C₂₃H₂₁N₂O₃ (M+H): 373.1550; found: 373.1555.

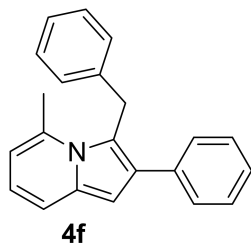


3-(4-methoxybenzyl)-2-(4-methoxyphenyl)-5-methylindolizine (4d); yellow solid (62.8 mg, 88%); m.p. 217-219 °C; ¹H NMR (400 MHz, CDCl₃) δ 7.45 – 7.37 (m, 2H), 7.29 (d, *J* = 3.4 Hz, 1H),

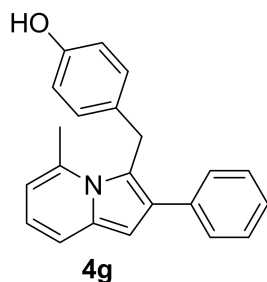
7.22 (d, $J = 9.0$ Hz, 1H), 7.10 (d, $J = 8.7$ Hz, 2H), 6.98 – 6.92 (m, 2H), 6.85 – 6.78 (m, 2H), 6.67 (dd, $J = 9.0, 6.6$ Hz, 1H), 6.40 (d, $J = 6.5$ Hz, 1H), 4.23 (s, 2H), 3.86 (s, 3H), 3.80 (s, 3H), 2.56 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 158.43, 157.59, 134.49, 132.44, 132.13, 129.99, 129.43, 128.98, 128.43, 116.80, 115.25, 113.94, 113.72, 109.59, 109.21, 106.91, 55.31, 55.25, 29.29, 18.72; HRMS (ESI): calcd. For $\text{C}_{24}\text{H}_{24}\text{NO}_2$ (M+H): 358.1807; found: 358.1813.



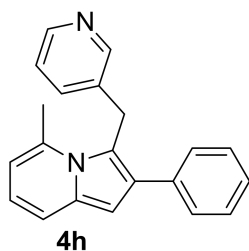
5-methyl-2-phenyl-3-(3,4,5-trimethoxybenzyl)indolizine (4e); brown solid (65.8 mg, 85%); m.p. 235–236 °C; ^1H NMR (400 MHz, CDCl_3) δ 7.56 (d, $J = 7.1$ Hz, 1H), 7.49 – 7.31 (m, 6H), 6.65 (dd, $J = 8.8, 6.5$ Hz, 1H), 6.43 (dd, $J = 9.8, 3.7$ Hz, 1H), 6.27 (s, 2H), 4.23 (s, 2H), 3.83 (s, 3H), 3.74 (s, 6H), 2.39 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 153.42, 135.85, 134.27, 130.19, 129.80, 128.94, 128.30, 126.50, 122.11, 117.78, 117.41, 115.01, 109.98, 105.88, 104.66, 60.85, 56.09, 30.64, 9.40; HRMS (ESI): calcd. For $\text{C}_{25}\text{H}_{26}\text{NO}_3$ (M+H): 388.1913; found: 388.1819.



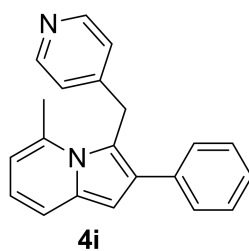
3-benzyl-5-methyl-2-phenylindolizine (4f); yellow solid (52.9 mg, 85%); m.p. 174–176 °C; ^1H NMR (400 MHz, CDCl_3) δ 7.54 (d, $J = 7.1$ Hz, 1H), 7.52 – 7.45 (m, 5H), 7.40 (td, $J = 6.0, 2.6$ Hz, 1H), 7.33 (t, $J = 7.3$ Hz, 2H), 7.30 – 7.24 (m, 1H), 7.13 (d, $J = 7.3$ Hz, 2H), 6.69 (dd, $J = 8.7, 6.6$ Hz, 1H), 6.43 (t, $J = 6.7$ Hz, 1H), 4.36 (s, 2H), 2.47 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 138.50, 135.87, 130.27, 129.82, 129.04, 128.77, 128.31, 127.82, 126.51, 126.35, 122.15, 117.92, 117.45, 115.02, 110.00, 105.89, 30.50, 9.48; HRMS (ESI): calcd. For $\text{C}_{22}\text{H}_{20}\text{N}$ (M+H): 298.1593; found: 298.1598.



4-((5-methyl-2-phenylindolizin-3-yl)methyl)phenol (4g); brown solid (53.8 mg, 86%); m.p. 188-190 °C; ¹H NMR (400 MHz, CDCl₃) δ 7.50 (d, *J* = 7.1 Hz, 1H), 7.47 – 7.39 (m, 5H), 7.35 (dd, *J* = 11.1, 4.2 Hz, 1H), 6.93 (d, *J* = 8.3 Hz, 2H), 6.75 (d, *J* = 8.4 Hz, 2H), 6.64 (dd, *J* = 8.7, 6.6 Hz, 1H), 6.40 (dd, *J* = 9.9, 3.6 Hz, 1H), 4.23 (s, 2H), 2.40 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 154.09, 135.81, 130.36, 130.21, 129.69, 128.86, 128.81, 128.23, 126.43, 122.14, 118.23, 117.37, 115.59, 114.93, 109.89, 105.78, 29.57, 9.40; HRMS (ESI): calcd. For C₂₂H₂₀NO (M+H): 314.1548; found: 314.1557.

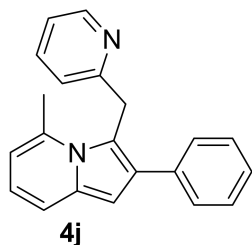


5-methyl-2-phenyl-3-(pyridin-3-ylmethyl)indolizine (4h); brown solid (55.4 mg, 93%); m.p. 159-162 °C; ¹H NMR (400 MHz, CDCl₃) δ 8.51 – 8.36 (m, 2H), 7.45 (dt, *J* = 15.8, 7.8 Hz, 4H), 7.39 – 7.33 (m, 3H), 7.25 (d, *J* = 7.8 Hz, 1H), 7.17 (dd, *J* = 7.7, 4.7 Hz, 1H), 6.66 (dd, *J* = 8.9, 6.6 Hz, 1H), 6.42 (t, *J* = 6.7 Hz, 1H), 4.30 (s, 2H), 2.38 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 149.49, 147.82, 135.52, 135.27, 134.08, 130.18, 129.98, 129.28, 128.38, 126.69, 123.66, 121.62, 117.60, 116.42, 115.26, 110.35, 106.20, 27.78, 9.31; HRMS (ESI): calcd. For C₂₁H₁₉N₂ (M+H): 299.1548; found: 299.1556.

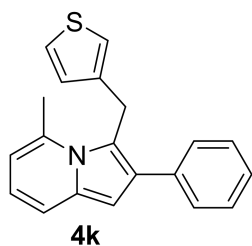


5-methyl-2-phenyl-3-(pyridin-4-ylmethyl)indolizine (4i); brown solid (56.8 mg, 95%); m.p. 168-171 °C; ¹H NMR (400 MHz, CDCl₃) δ 8.50 (d, *J* = 5.9 Hz, 2H), 7.51 – 7.34 (m, 7H), 6.99 (d,

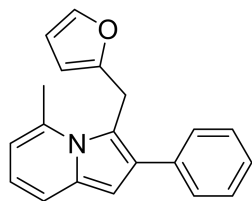
$J = 5.5$ Hz, 2H), 6.68 (dd, $J = 8.8, 6.5$ Hz, 1H), 6.43 (t, $J = 6.8$ Hz, 1H), 4.28 (s, 2H), 2.39 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 150.06, 147.89, 135.43, 130.12, 129.47, 128.40, 126.73, 123.19, 121.65, 117.63, 115.83, 115.38, 110.39, 106.22, 29.94, 9.34; HRMS (ESI): calcd. For $\text{C}_{21}\text{H}_{19}\text{N}_2$ (M+H): 358.1807; found: 358.1813.



5-methyl-2-phenyl-3-(pyridin-2-ylmethyl)indolizine (4j), brown solid (53.6 mg, 90%); m.p. 164–166 °C; ^1H NMR (400 MHz, CDCl_3) δ 8.59 (d, $J = 4.2$ Hz, 1H), 7.71 (d, $J = 7.0$ Hz, 1H), 7.60 – 7.35 (m, 7H), 7.19 – 7.02 (m, 1H), 6.82 (d, $J = 7.8$ Hz, 1H), 6.69 – 6.61 (m, 1H), 6.42 (t, $J = 6.7$ Hz, 1H), 4.49 (s, 2H), 2.40 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 158.94, 149.38, 136.80, 135.73, 130.30, 129.87, 128.91, 128.33, 126.57, 122.31, 122.02, 121.47, 117.38, 117.12, 115.21, 110.04, 106.06, 33.68, 9.39; HRMS (ESI): calcd. For $\text{C}_{24}\text{H}_{24}\text{NO}_2$ (M+H): 358.1807; found: 358.1800.

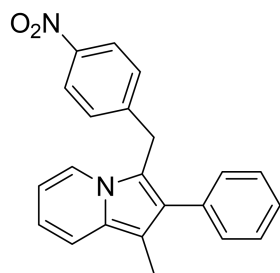


5-methyl-2-phenyl-3-(thiophen-3-ylmethyl)indolizine (4k); brown solid (53.9 mg, 89%); m.p. 149–151 °C; ^1H NMR (400 MHz, CDCl_3) δ 7.59 (d, $J = 7.1$ Hz, 1H), 7.50 – 7.41 (m, 5H), 7.37 (t, $J = 7.0$ Hz, 1H), 7.29 (t, $J = 3.9$ Hz, 1H), 6.88 (d, $J = 4.9$ Hz, 1H), 6.81 (d, $J = 1.6$ Hz, 1H), 6.67 (dd, $J = 8.9, 6.5$ Hz, 1H), 6.44 (t, $J = 6.7$ Hz, 1H), 4.27 (s, 2H), 2.41 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 139.06, 135.78, 130.24, 129.71, 128.27, 127.71, 126.47, 126.00, 122.06, 120.83, 118.16, 117.44, 114.95, 109.98, 105.83, 25.80, 9.41; HRMS (ESI): calcd. For $\text{C}_{20}\text{H}_{18}\text{NS}$ (M+H): 304.1162; found: 304.1169.



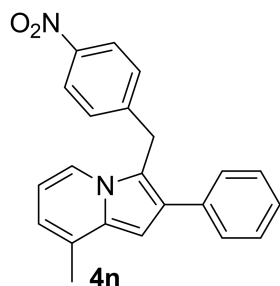
4l

3-(furan-2-ylmethyl)-5-methyl-2-phenylindolizine (4l); brown solid (52.2 mg, 91%); m.p. 178-180 °C; ¹H NMR (400 MHz, CDCl₃) δ 7.77 (d, *J* = 7.1 Hz, 1H), 7.55 – 7.47 (m, 4H), 7.46 – 7.39 (m, 3H), 6.71 (dd, *J* = 8.7, 6.7 Hz, 1H), 6.52 (t, *J* = 6.3 Hz, 1H), 6.41 – 6.27 (m, 1H), 5.98 (d, *J* = 2.4 Hz, 1H), 4.27 (s, 2H), 2.42 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 152.25, 141.55, 135.58, 130.38, 129.91, 128.59, 128.27, 126.56, 122.12, 117.45, 115.59, 115.15, 110.42, 110.06, 106.19, 105.94, 24.26, 9.39; HRMS (ESI): calcd. For C₂₀H₁₈NO (M+H): 288.1383; found: 238.1389.



4m

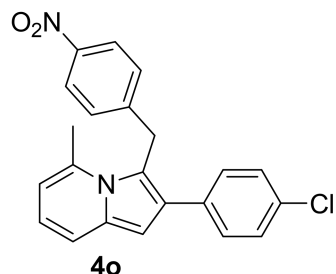
1-methyl-3-(4-nitrobenzyl)-2-phenylindolizine (4m); red solid (59.5 mg, 87%); m.p. 209-211 °C; ¹H NMR (400 MHz, CDCl₃) δ 8.13 (d, *J* = 8.7 Hz, 2H), 7.53 – 7.33 (m, 8H), 7.20 (d, *J* = 8.7 Hz, 2H), 6.68 (dd, *J* = 8.8, 6.6 Hz, 1H), 6.47 – 6.39 (m, 1H), 4.39 (s, 2H), 2.39 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 146.76, 146.45, 135.39, 130.10, 129.47, 128.55, 128.42, 126.78, 124.02, 121.50, 117.69, 116.10, 115.43, 110.49, 106.35, 30.43, 9.30; HRMS (ESI): calcd. For C₂₂H₁₉N₂O₂ (M+H): 343.1447; found: 343.1439.



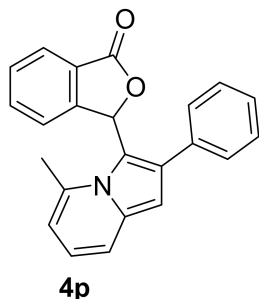
4n

8-methyl-3-(4-nitrobenzyl)-2-phenylindolizine (4n); brown solid (57.5 mg, 84%); m.p. 235-237 °C; ¹H NMR (400 MHz, CDCl₃) δ 8.16 (d, *J* = 8.6 Hz, 2H), 7.50 (d, *J* = 7.2 Hz, 2H), 7.44 (t, *J* = 7.5

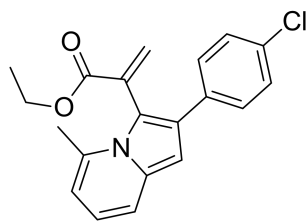
Hz, 2H), 7.40 – 7.33 (m, 2H), 7.26 (d, $J = 8.5$ Hz, 2H), 6.70 (s, 1H), 6.58 (d, $J = 6.6$ Hz, 1H), 6.45 (t, $J = 6.8$ Hz, 1H), 4.53 (s, 2H), 2.51 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 146.86, 146.36, 136.29, 133.71, 129.37, 128.75, 128.70, 128.60, 128.37, 126.72, 124.11, 119.85, 116.51, 111.06, 97.69, 30.66, 18.15; HRMS (ESI): calcd. For $\text{C}_{22}\text{H}_{19}\text{N}_2\text{O}_2$ ($\text{M}+\text{H}$): 358.1807; found: 358.1811.



2-(4-chlorophenyl)-5-methyl-3-(4-nitrobenzyl)indolizine (4o); brown solid (65.4 mg, 87%); m.p. 195-197 °C; ^1H NMR (400 MHz, CDCl_3) δ 8.09 (d, $J = 8.7$ Hz, 2H), 7.41 – 7.33 (m, 5H), 7.28 (d, $J = 8.4$ Hz, 2H), 7.20 (d, $J = 9.0$ Hz, 1H), 6.75 (dd, $J = 9.0, 6.7$ Hz, 1H), 6.48 (d, $J = 6.7$ Hz, 1H), 4.37 (s, 2H), 2.58 (s, 3H); HRMS (ESI): calcd. For $\text{C}_{22}\text{H}_{18}\text{ClN}_2\text{O}_2$ ($\text{M}+\text{H}$): 377.1056; found: 377.1063.

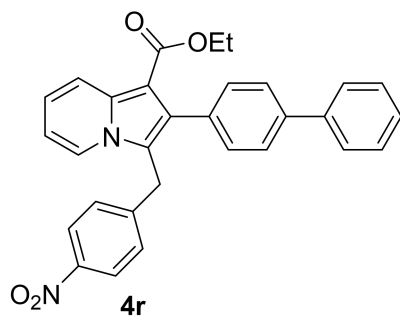


3-(5-methyl-2-phenylindolizin-3-yl)isobenzofuran-1(3H)-one (4p); off-white solid (56.3 mg, 83%); m.p. 211-213 °C; ^1H NMR (400 MHz, CDCl_3) δ 7.98 (dd, $J = 28.8, 17.9$ Hz, 1H), 7.64 (dd, $J = 9.1, 4.2$ Hz, 2H), 7.59 (dt, $J = 15.8, 4.1$ Hz, 2H), 7.47 (t, $J = 7.5$ Hz, 2H), 7.38 (t, $J = 7.4$ Hz, 1H), 7.34 (s, 1H), 7.28 (d, $J = 8.5$ Hz, 1H), 6.88 (s, 1H), 6.56 (dd, $J = 9.1, 6.7$ Hz, 1H), 6.43 (d, $J = 6.7$ Hz, 1H), 6.20 (d, $J = 9.1$ Hz, 1H), 2.55 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 170.84, 149.69, 134.46, 134.04, 133.35, 132.52, 132.06, 129.74, 129.11, 128.63, 127.24, 126.98, 125.42, 123.24, 119.29, 114.98, 110.70, 108.36, 103.76, 77.99, 18.81; HRMS (ESI): calcd. For $\text{C}_{23}\text{H}_{18}\text{NO}_2$ ($\text{M}+\text{H}$): 340.1332; found: 340.1339.



4q

ethyl 2-(2-(4-chlorophenyl)-5-methylindolizin-3-yl)acrylate (4q); brown solid (56.3 mg, 83%); m.p. 164-166 °C; ^1H NMR (400 MHz, CDCl_3) δ 7.49 – 7.32 (m, 6H), 6.81 (dd, $J = 9.1, 6.6$ Hz, 1H), 6.59 (d, $J = 1.9$ Hz, 1H), 6.46 (d, $J = 6.6$ Hz, 1H), 5.92 (d, $J = 1.9$ Hz, 1H), 3.95 (q, $J = 7.1$ Hz, 2H), 2.56 (s, 3H), 0.96 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 167.52, 135.27, 134.70, 132.87, 132.84, 132.38, 129.35, 128.65, 127.89, 127.35, 119.05, 115.48, 110.51, 108.18, 107.83, 60.91, 18.67, 13.75; HRMS (ESI): calcd. For $\text{C}_{20}\text{H}_{19}\text{ClNO}_2$ ($\text{M}+\text{H}$): 340.1103; found: 340.1096.



4r

ethyl 2-([1,1'-biphenyl]-4-yl)-3-(4-nitrobenzyl)indolizine-1-carboxylate (4r); brown solid (36.3 mg, 80%); m.p. 175-176 °C; ^1H NMR (400 MHz, CDCl_3) δ 8.38 – 8.35 (m, 1H), 8.17 – 8.08 (m, 2H), 7.69 – 7.60 (m, 4H), 7.57 (d, $J = 7.0$ Hz, 1H), 7.49 – 7.39 (m, 4H), 7.35 (ddd, $J = 7.3, 3.9, 1.2$ Hz, 1H), 7.21 (d, $J = 8.7$ Hz, 2H), 7.12 (ddd, $J = 9.1, 6.7, 0.9$ Hz, 1H), 6.71 (td, $J = 6.8, 1.2$ Hz, 1H), 4.32 (s, 2H), 4.24 (d, $J = 7.1$ Hz, 2H), 1.19 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.84, 146.89, 145.25, 140.80, 139.97, 137.72, 136.22, 133.79, 131.56, 130.59, 128.75, 128.46, 127.25, 127.00, 126.40, 124.10, 122.65, 122.40, 120.42, 119.63, 113.01, 104.40, 102.27, 59.36, 30.03, 14.17; HRMS (ESI): calcd. For $\text{C}_{30}\text{H}_{25}\text{N}_2\text{O}_4^+$ ($\text{M}+\text{H}$): 477.1809; found: 477.1801.

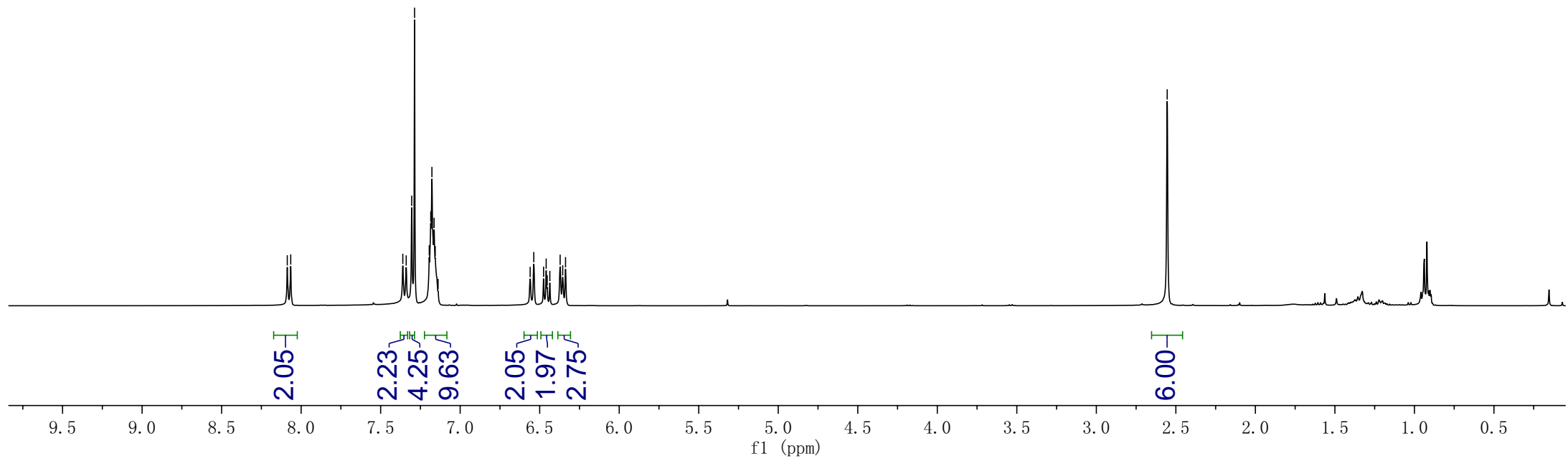
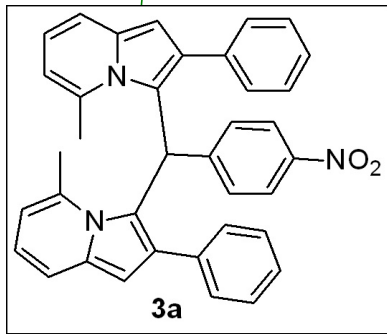
4. ^1H NMR and ^{13}C NMR

hj-6-28-1

CDC13

8.09
8.07
7.30
7.29
7.19
7.18
7.18
7.16
6.56
6.54
6.48
6.46
6.45
6.44
6.37
6.36
6.34

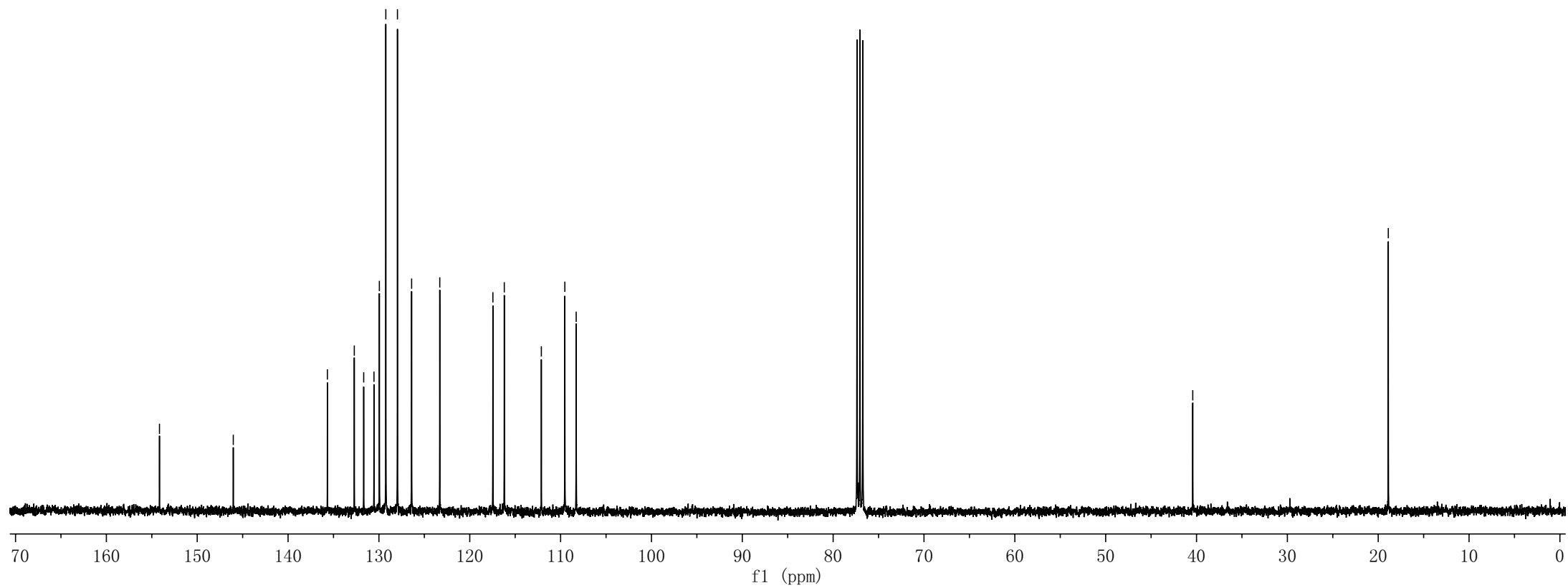
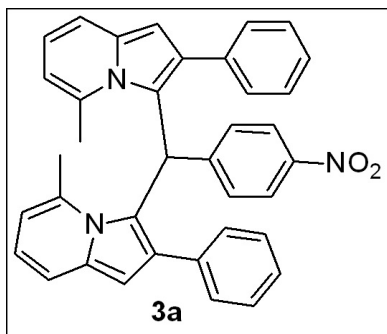
2.55

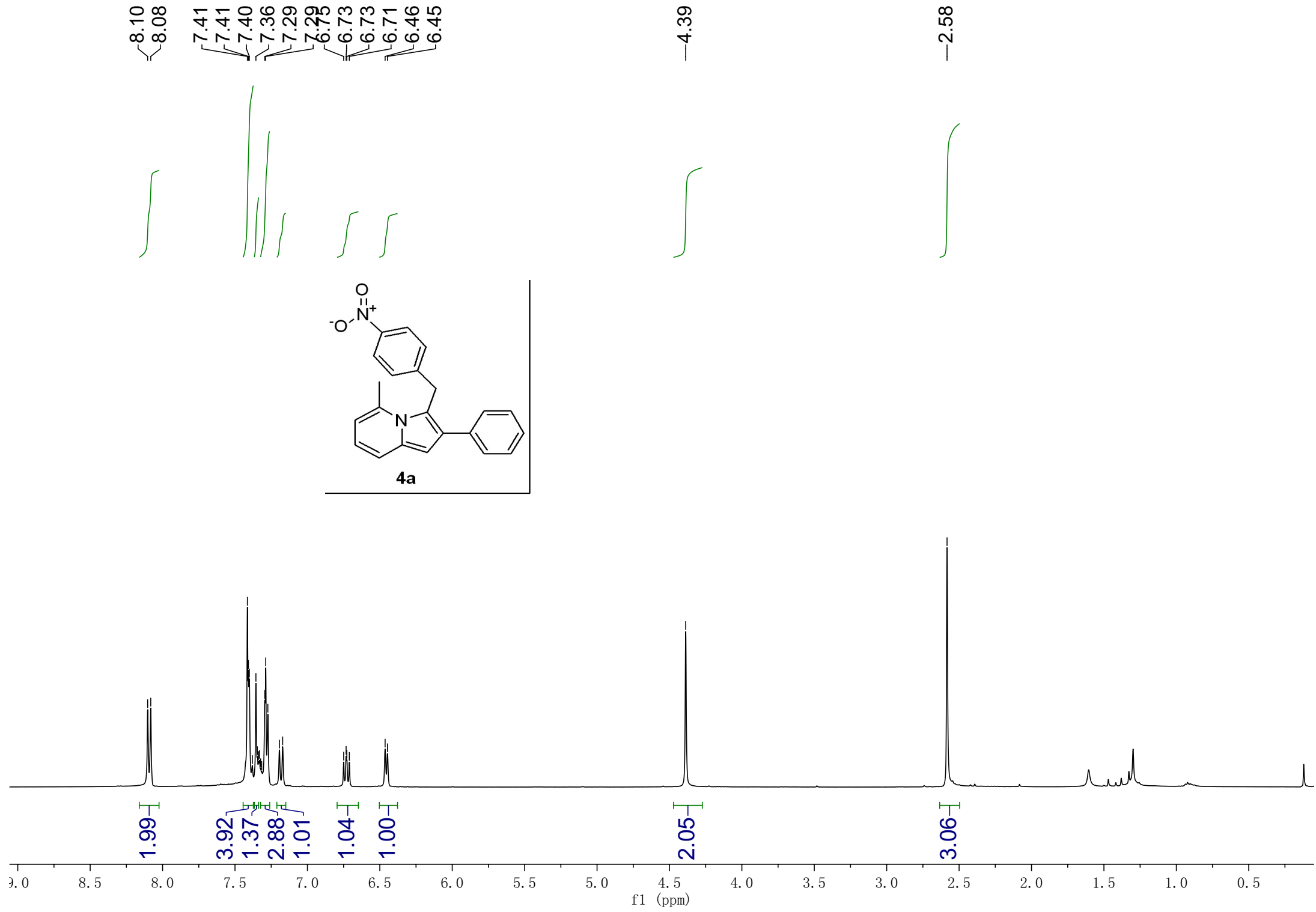


—154.15
 —146.03
 135.67
 132.71
 130.54
 129.95
 129.24
 127.96
 126.40
 123.30
 117.45
 116.20
 112.12
 109.53
 108.29

—40.42

—18.89



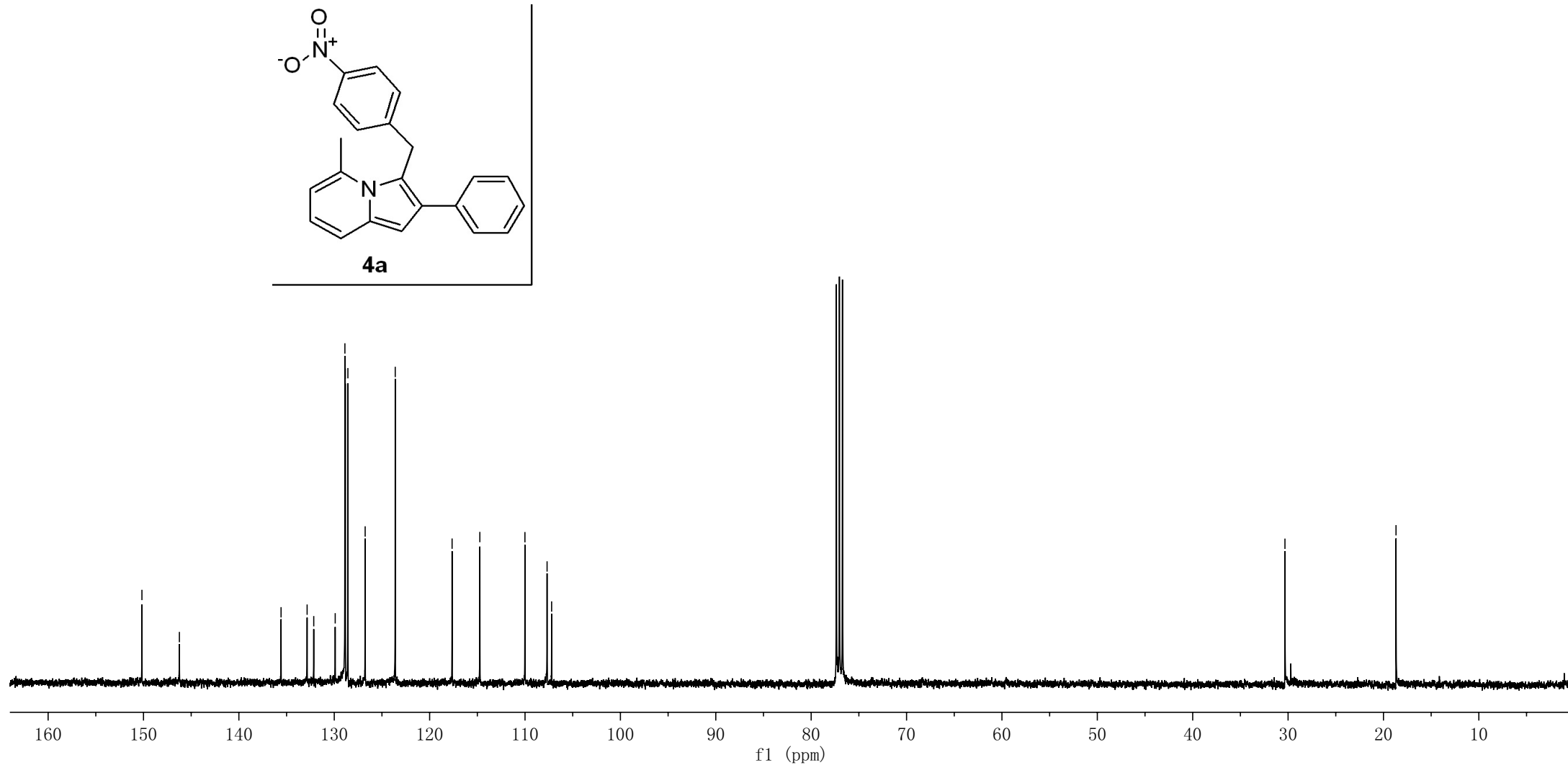
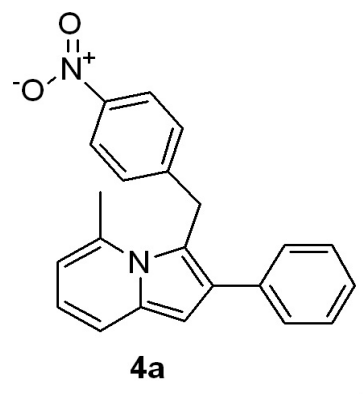


CDC13

—150.11
—146.21
135.51
132.81
132.11
129.91
128.81
128.81
128.51
126.71
123.61
—117.61
—114.71
110.01
107.61
107.21

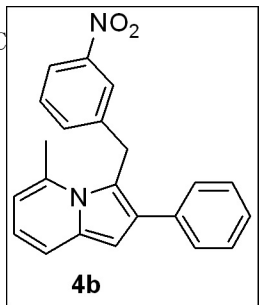
—30.33

—18.68



gx-B1

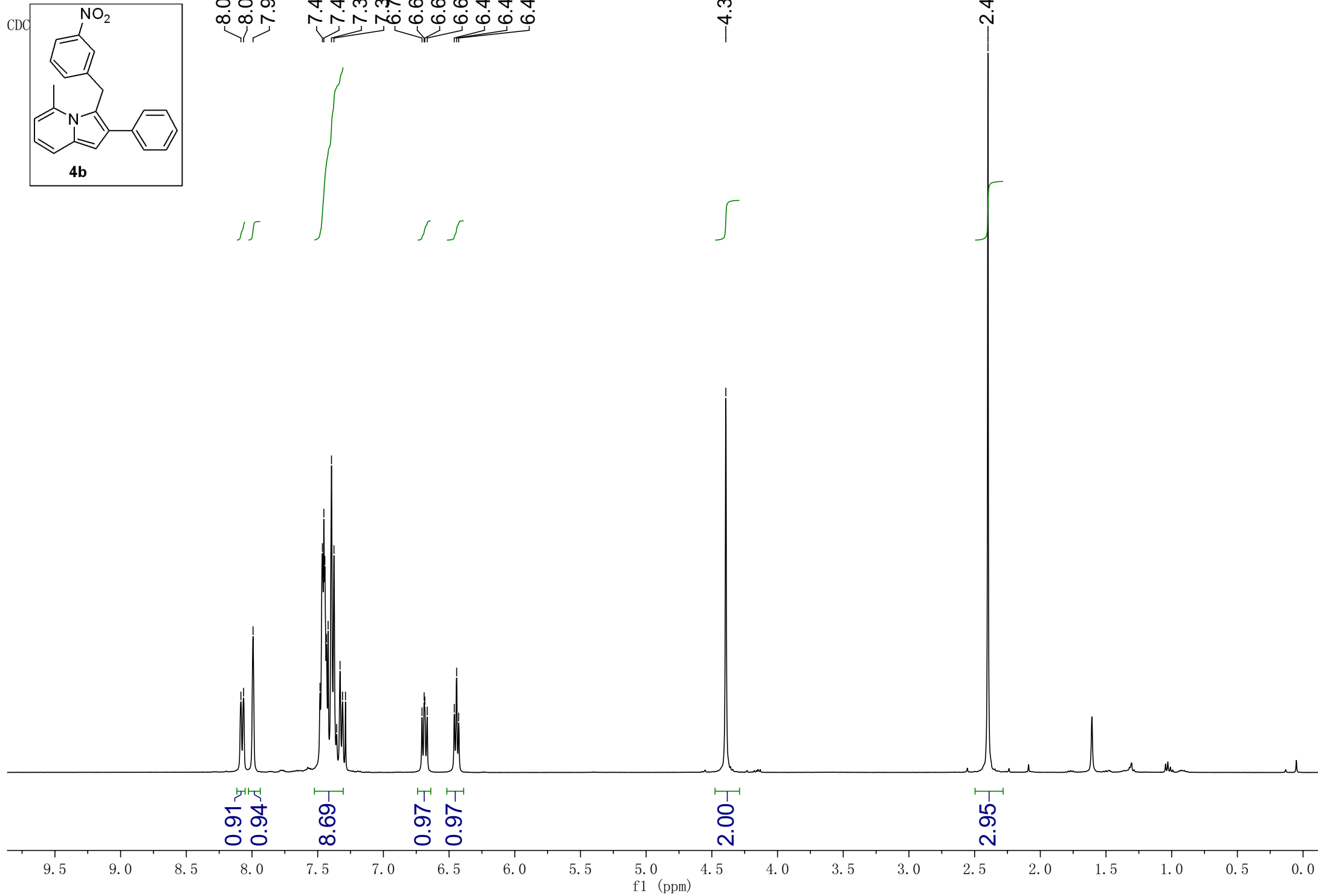
CDC



8.08
8.06
7.99
7.46
7.45
7.39
7.38
6.79
6.68
6.67
6.46
6.44
6.43

4.39

2.40



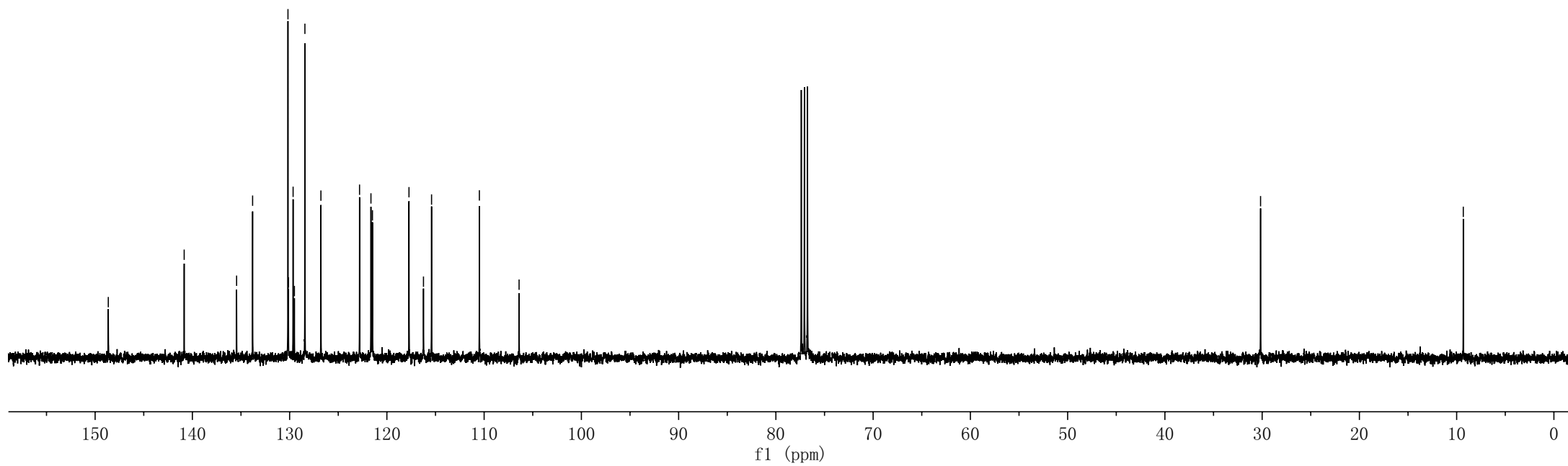
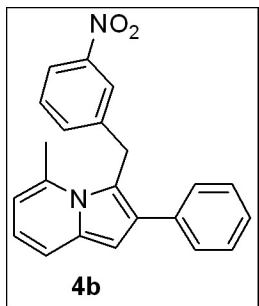
gx-B1

CDC13

148.65
140.84
135.45
133.81
130.17
130.12
129.64
129.51
128.43
126.78
122.81
121.64
121.48
117.73
116.24
115.41
110.49
106.41

—30.16

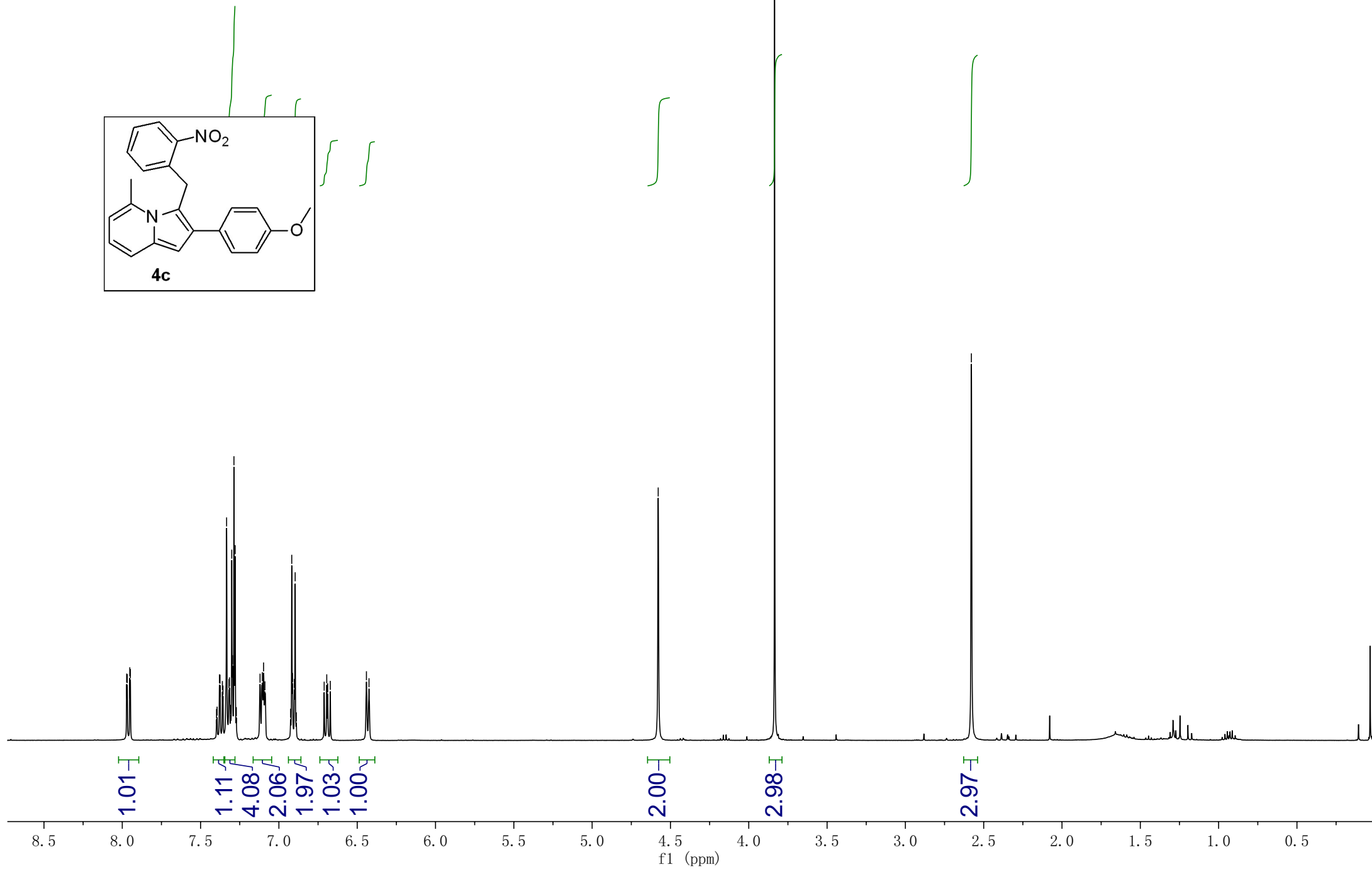
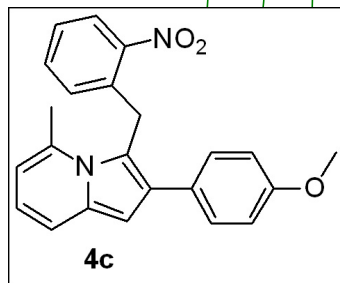
—9.32



gx-3124-4

CDC13

7.97 7.97 7.95 7.95 7.38 7.38 7.33 7.32 7.32 7.30 7.30 7.29 7.28 7.12 7.11 7.10 6.92 6.91 6.90 6.90 6.69 6.67 6.44 4.42



gx-3124-4

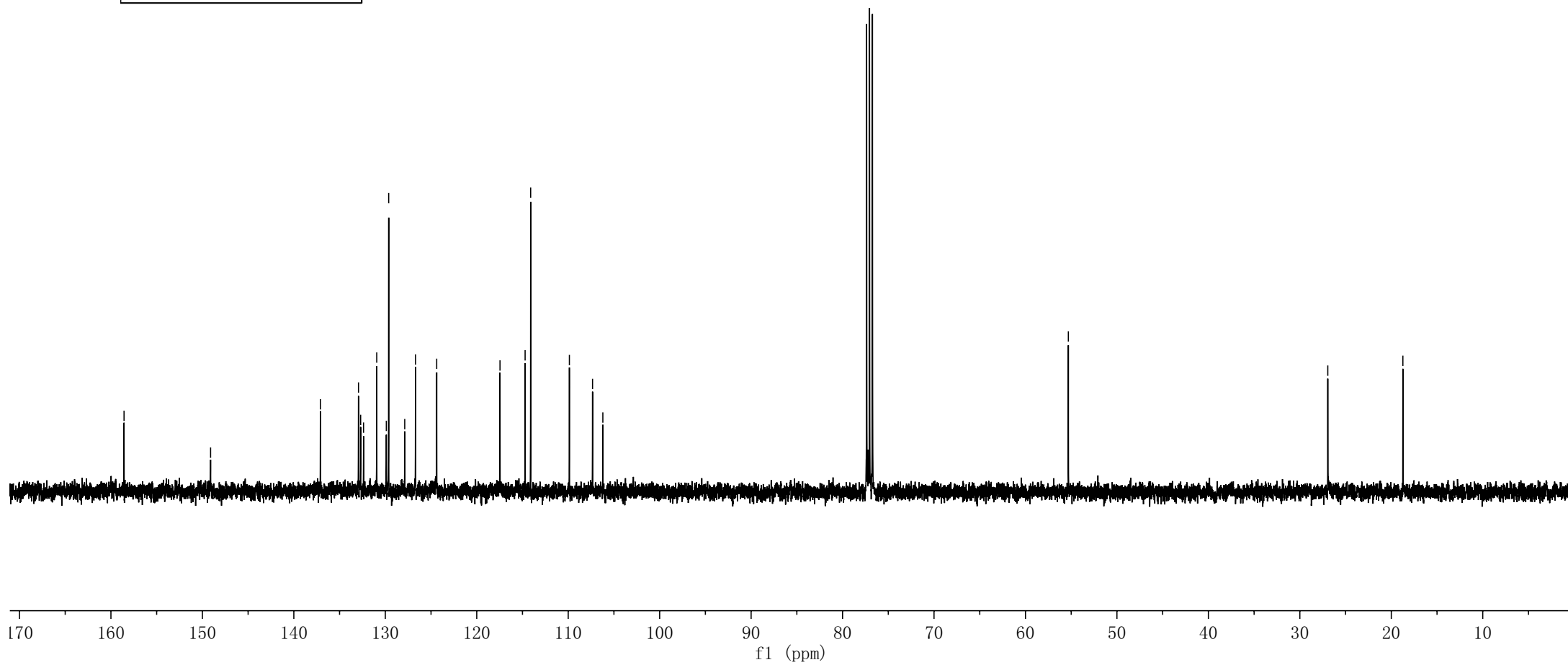
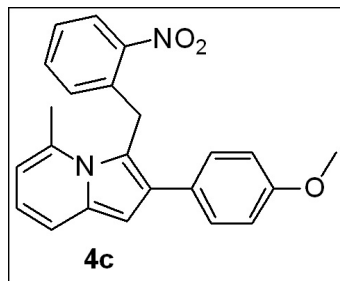
CDC13

—158.57
—149.10
137.10
132.93
132.70
130.93
129.89
129.63
127.87
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117.46
114.71
114.10
109.87
107.34
106.21

—55.31

—26.94

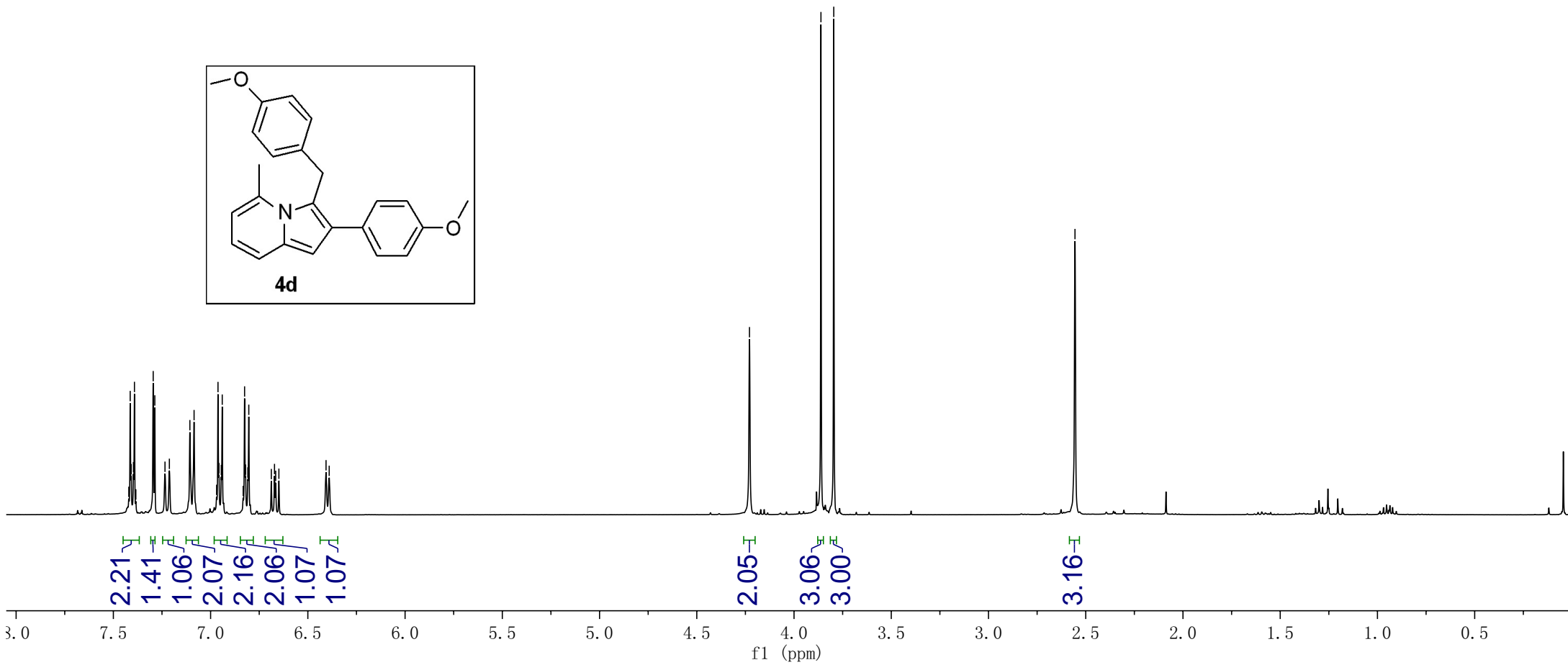
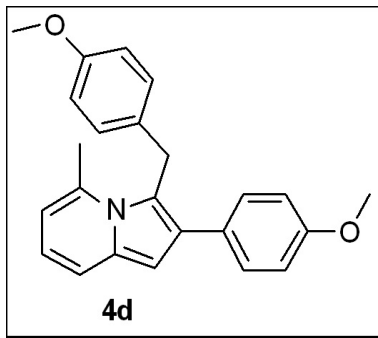
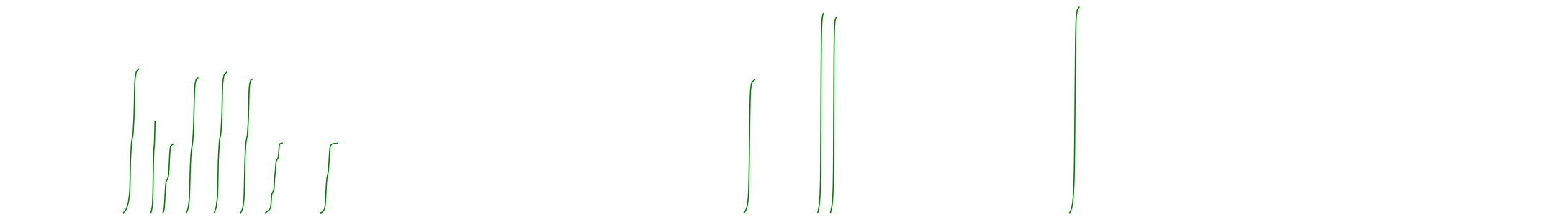
—18.73



gx-2314
CDC15
7.42
7.41
7.41
7.40
7.39
7.30
7.29
7.23
7.21
7.11
7.08
6.97
6.96
6.96
6.95
6.94
6.83
6.83
6.82
6.81
6.80
6.69
6.67
6.67
6.65
6.41
4.23

3.86
3.80

2.56



gx-3214-s

CDC13

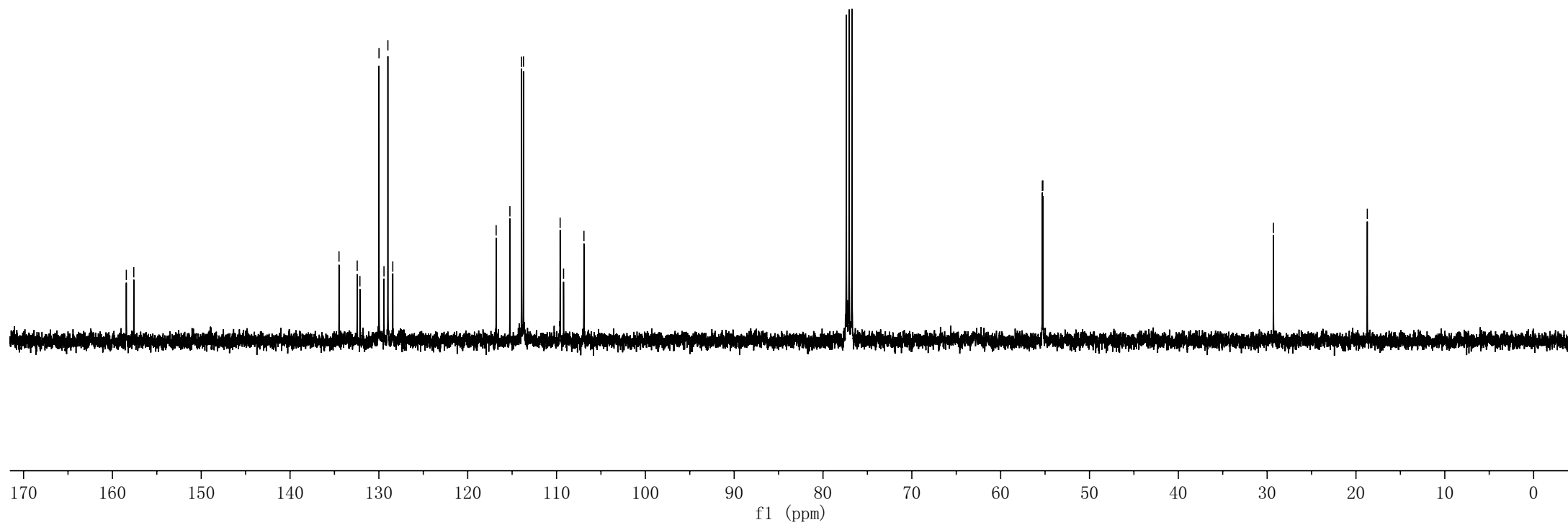
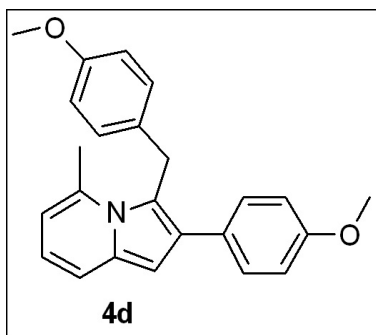
158.43
157.59

134.49
132.44
132.13
129.99
129.43
128.98
128.43
116.80
115.25
113.94
113.72
109.59
109.21
106.91

55.31
55.25

29.29

18.72



RXW0410507

CDCl₃

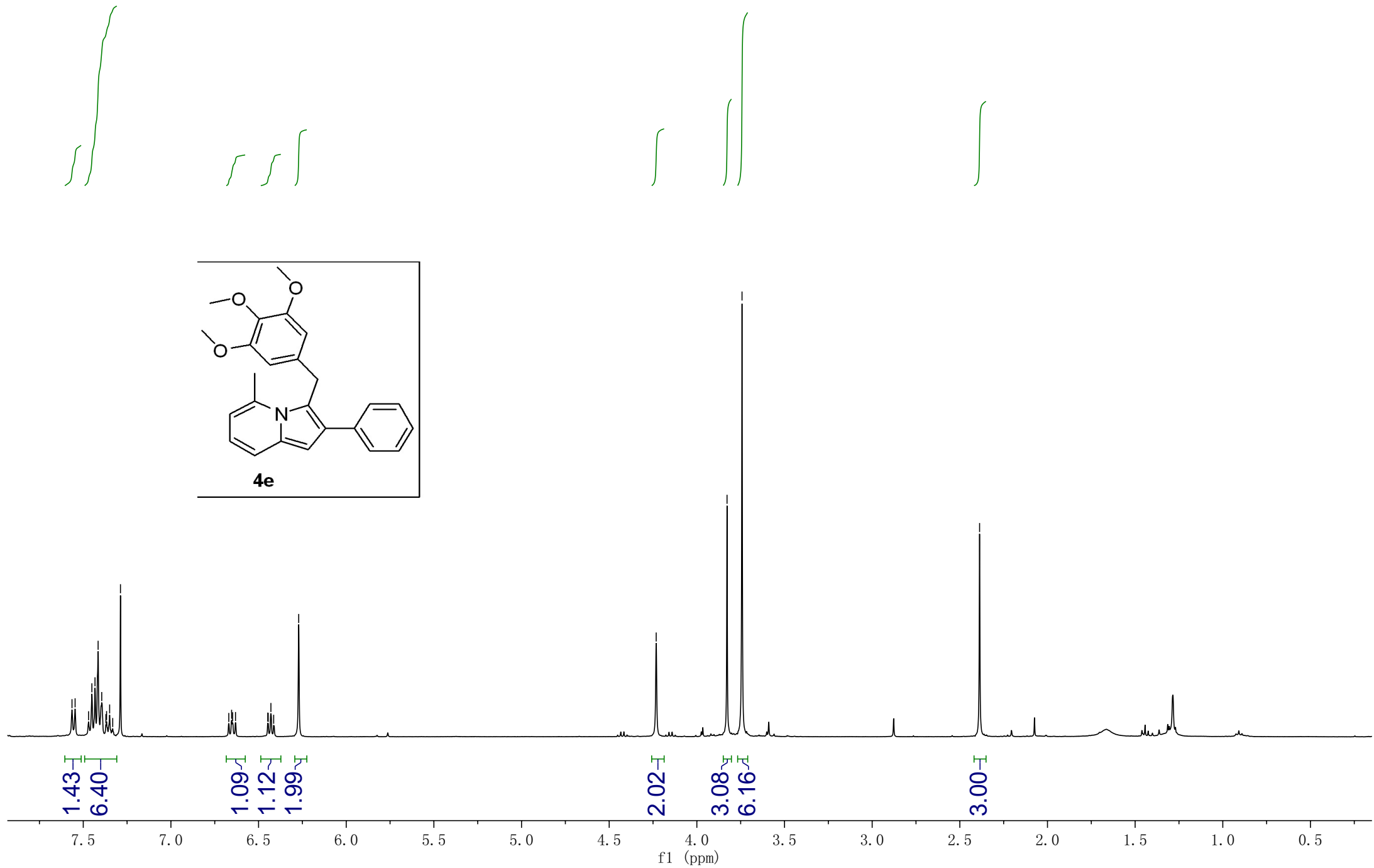
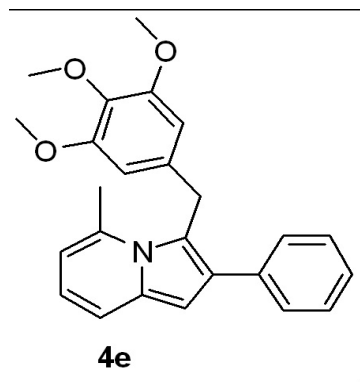
7.56
7.55
7.45
7.43
7.42
7.39
7.29
6.67
6.65
6.65
6.63
6.45
6.44
6.43
6.41
6.27

4.23

3.83

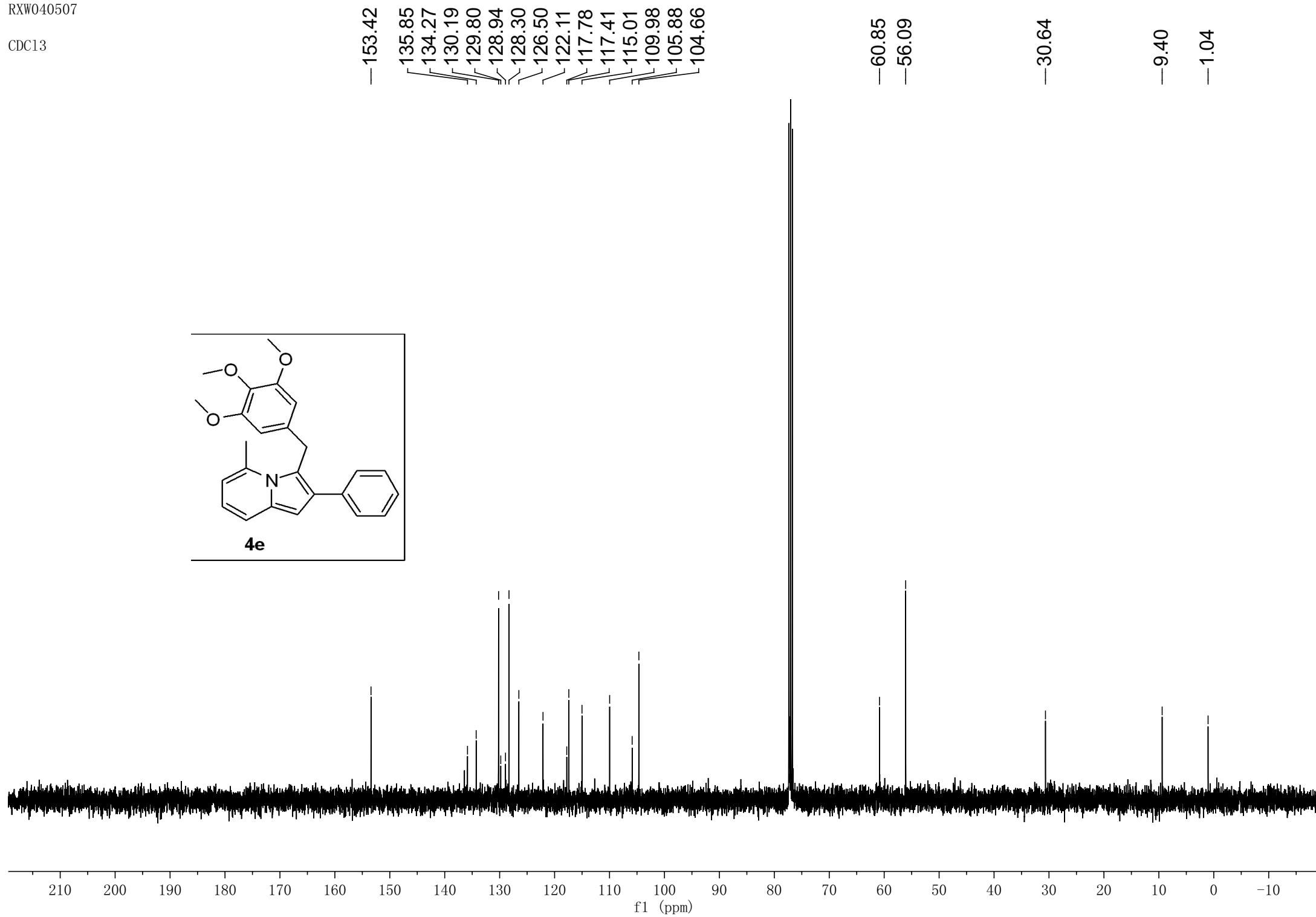
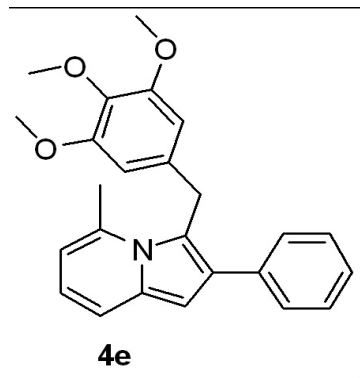
3.74

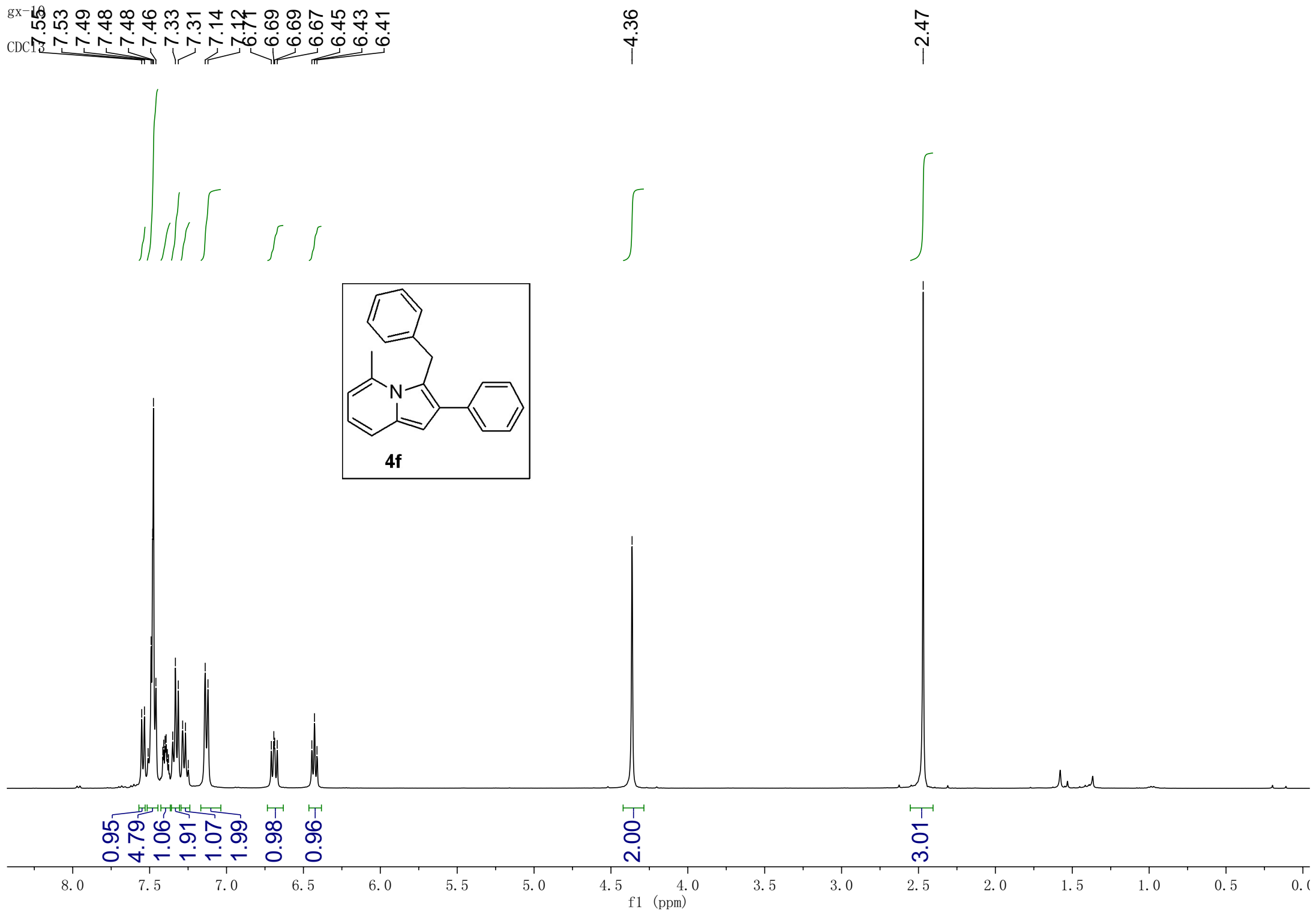
2.39



RXW040507

CDC13





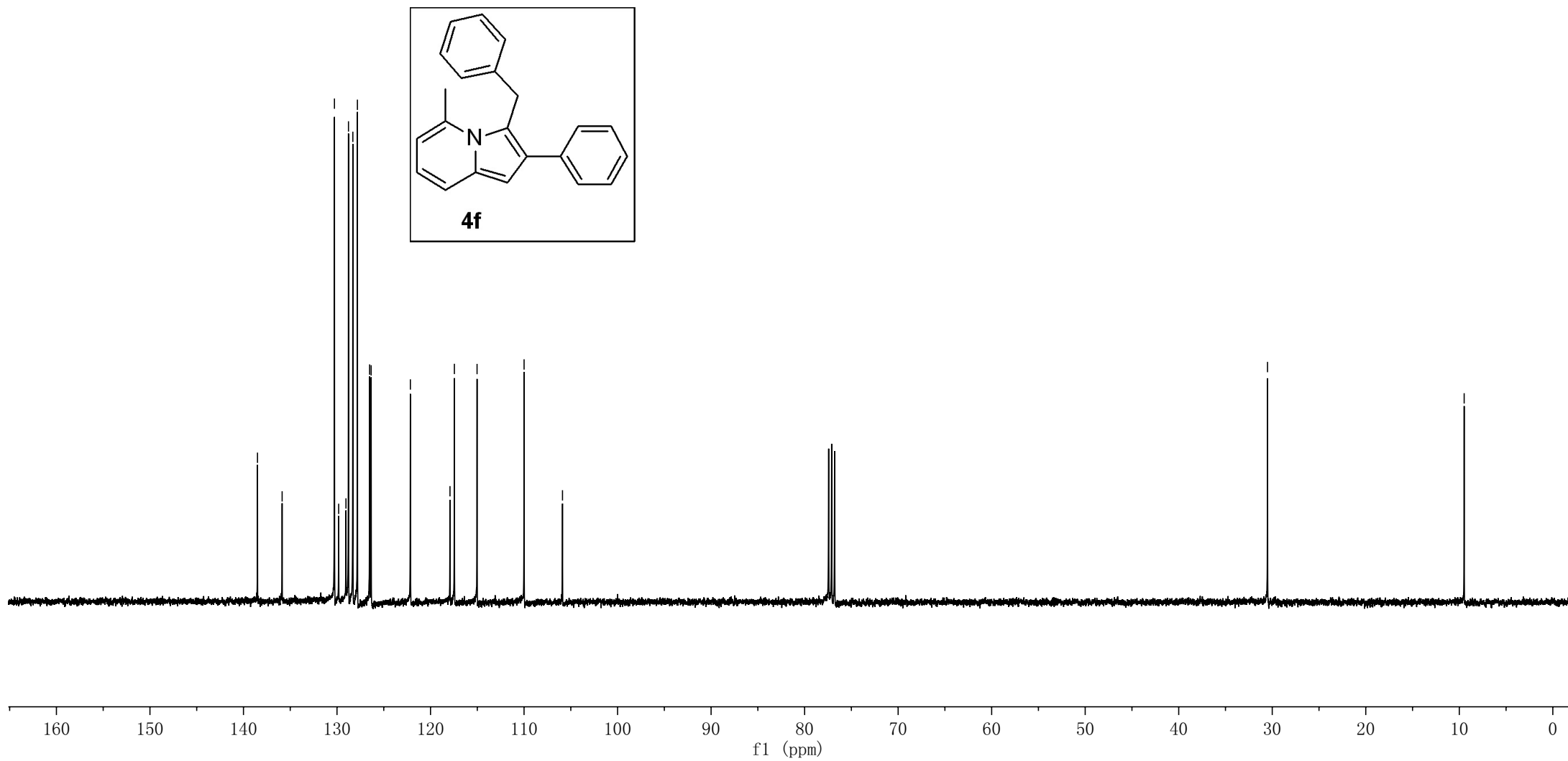
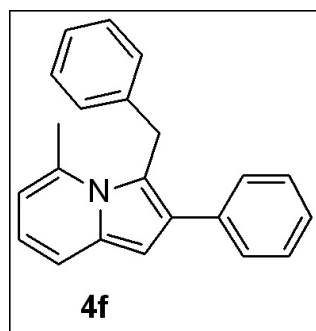
gx-10

CDC13

138.50
135.87
130.27
129.82
129.04
128.77
128.31
127.82
126.51
126.35
122.15
117.92
117.45
115.02
110.00
105.89

—30.50

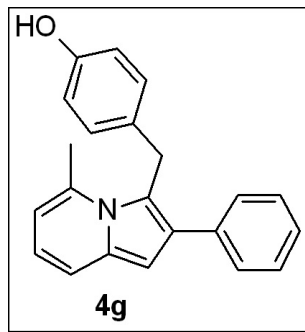
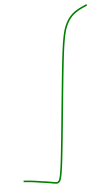
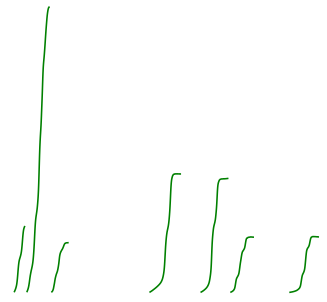
—9.48



CDCl₃
7.51, 7.49, 7.46, 7.44, 7.43, 7.42, 7.41, 7.40, 7.35, 7.29, 6.94, 6.92, 6.76, 6.73, 6.66, 6.65, 6.64, 6.62, 6.41, 6.41, 6.39, 6.37

—4.23

—2.40

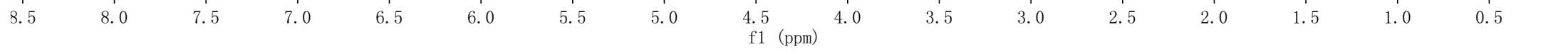


1.20
5.15
0.90

2.13
2.06
1.00
1.00

2.15

3.18



gx-31

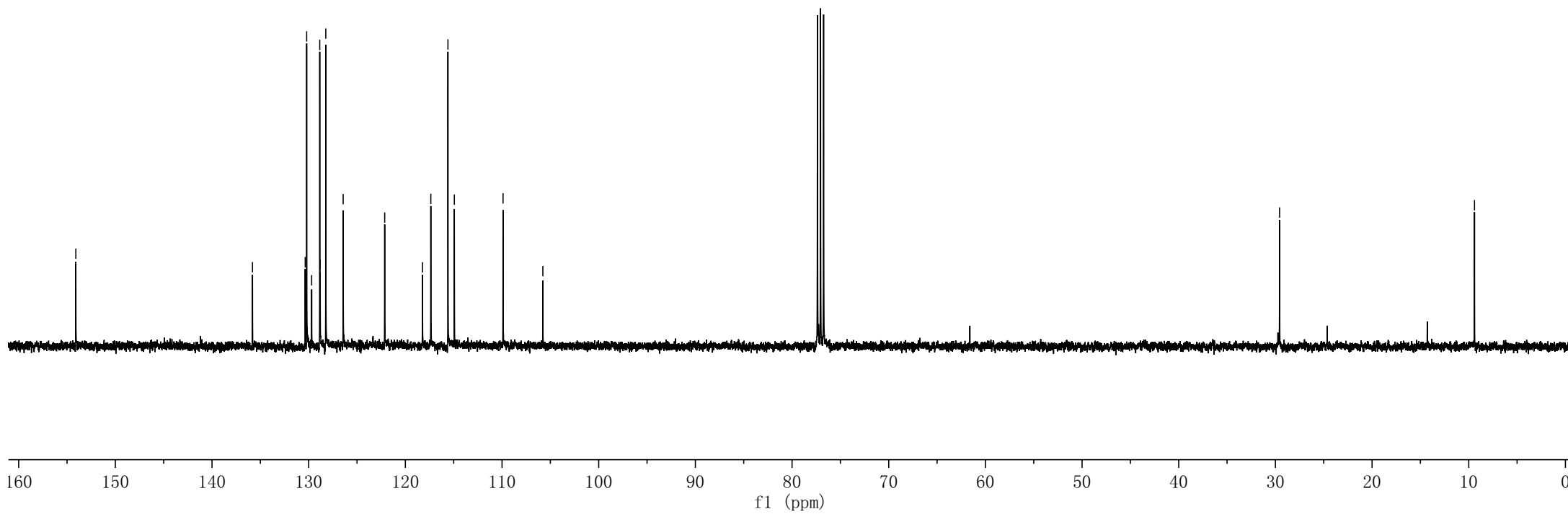
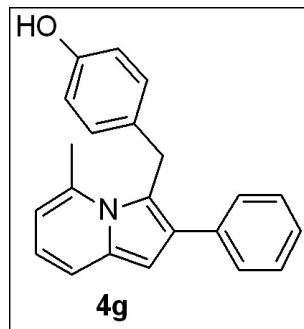
CDCl₃

—154.09

135.81
130.36
130.21
129.69
128.86
128.81
128.23
126.43
122.14
118.23
117.37
115.59
114.93
109.89
105.78

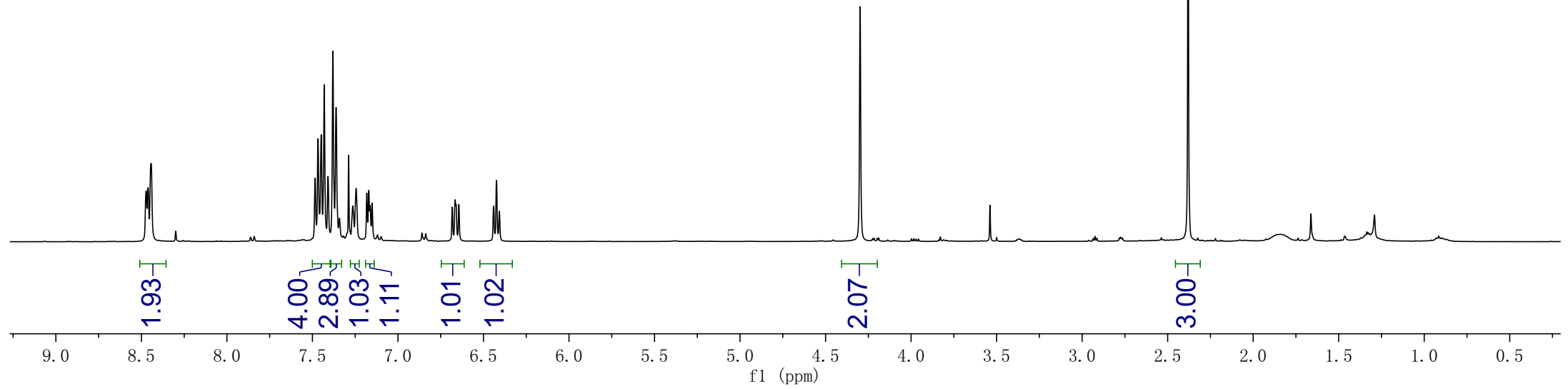
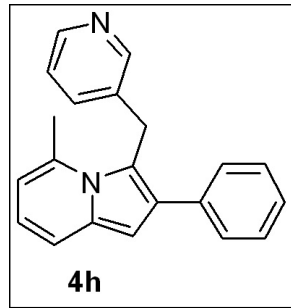
—29.57

—9.40



RXW040503

CDC13



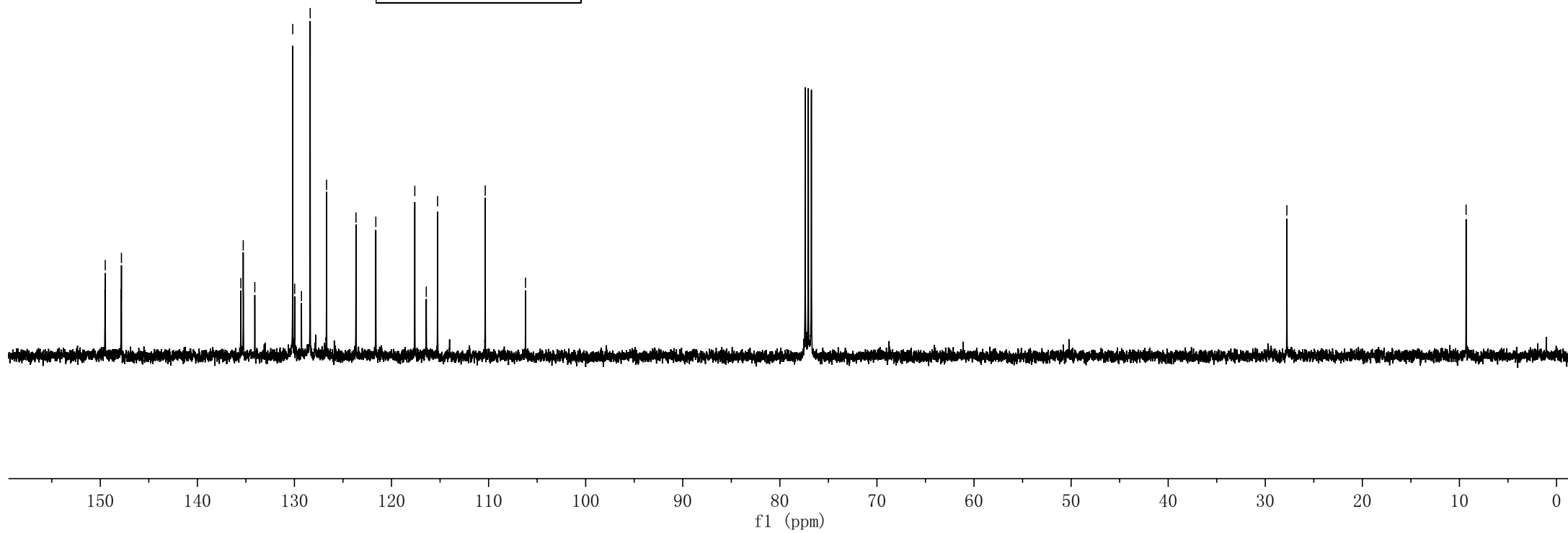
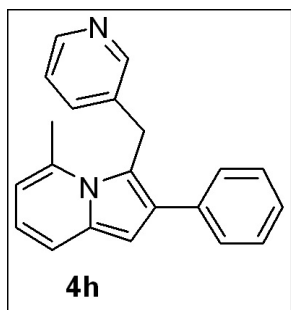
rxw040503

CDCl3

~149.49
~147.82
135.52
135.27
134.08
130.18
129.98
129.28
128.38
126.69
123.66
121.62
117.60
116.42
115.26
110.35
106.20

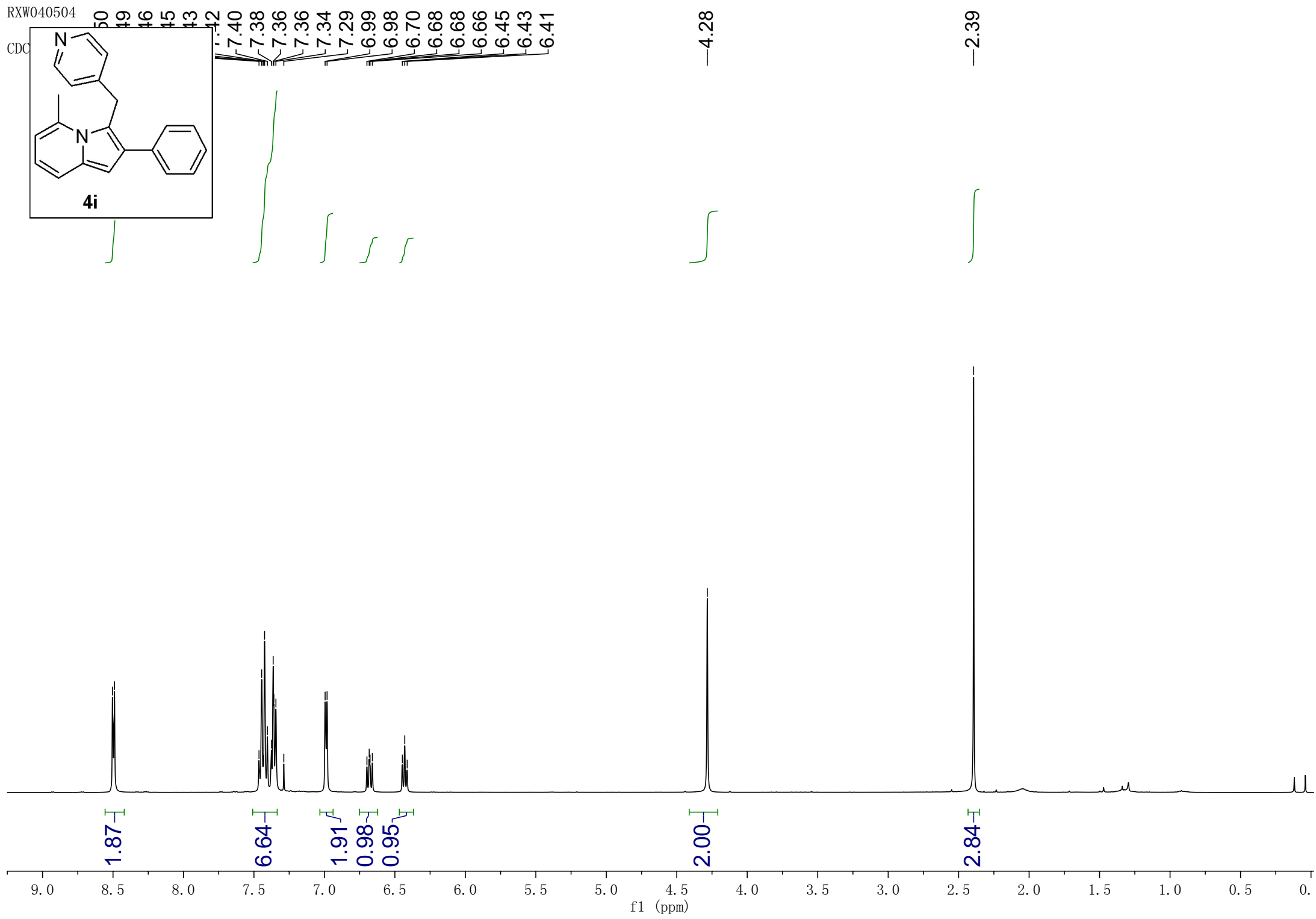
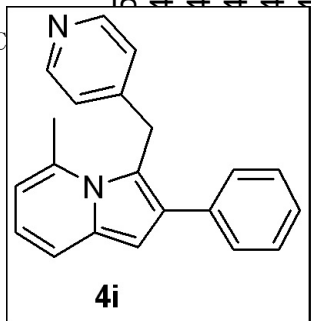
—27.78

—9.31



RXW040504

CDC



RXW040504

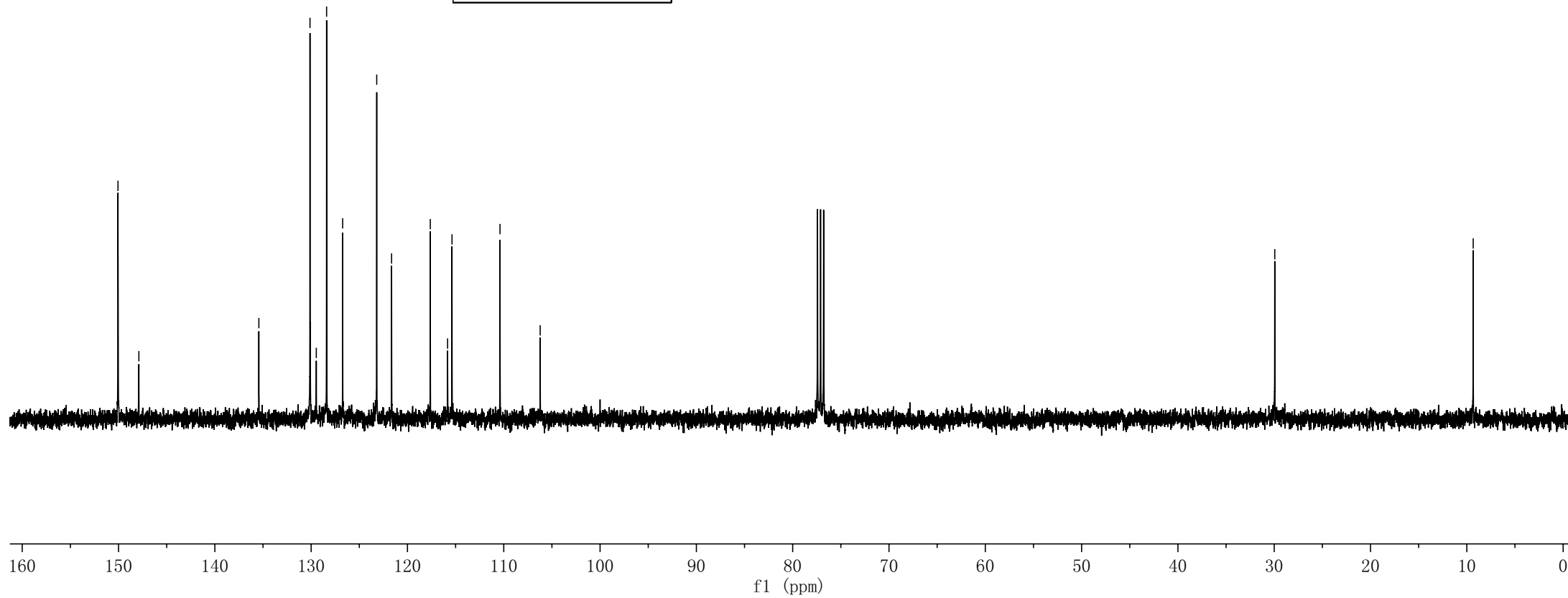
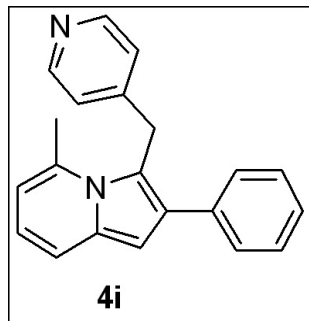
CDC13

~150.06
~147.89

~135.43
~130.12
~129.47
~128.40
~126.73
~123.19
~121.65
~117.63
~115.83
~115.38
~110.39
~106.22

—29.94

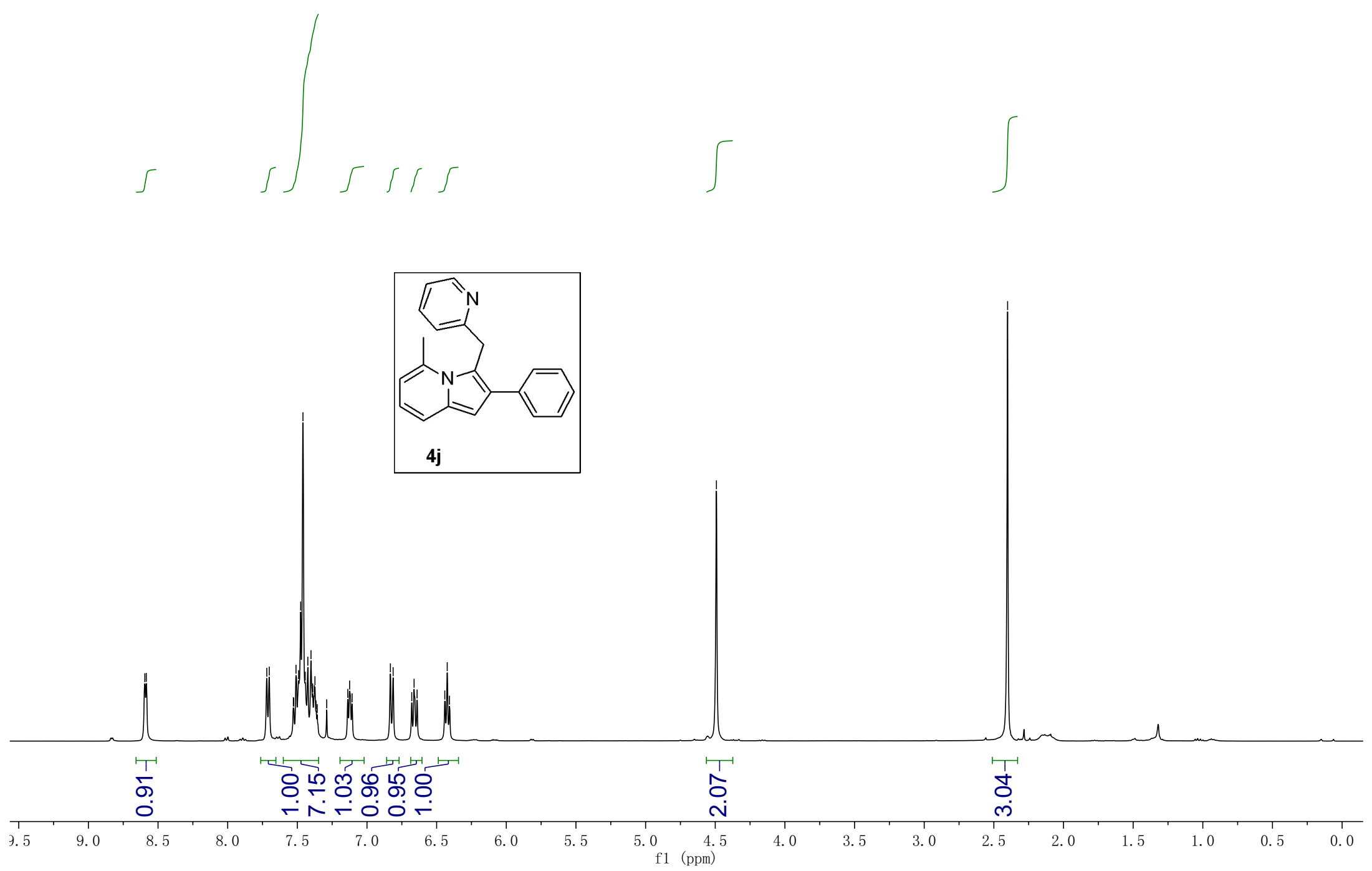
—9.34



gx-B21

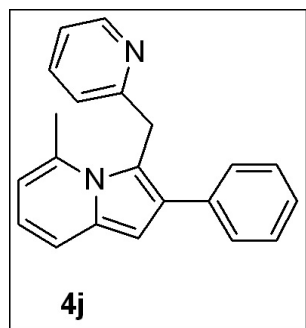
CDC13

8.59
8.58
7.72
7.70
7.51
7.49
7.48
7.46
7.44
7.42
7.40
7.39
7.38
7.37
7.14
7.12
7.11
6.83
6.81
6.68
6.66
6.64
6.44
6.42
6.41
6.40
2.40



gx-B21

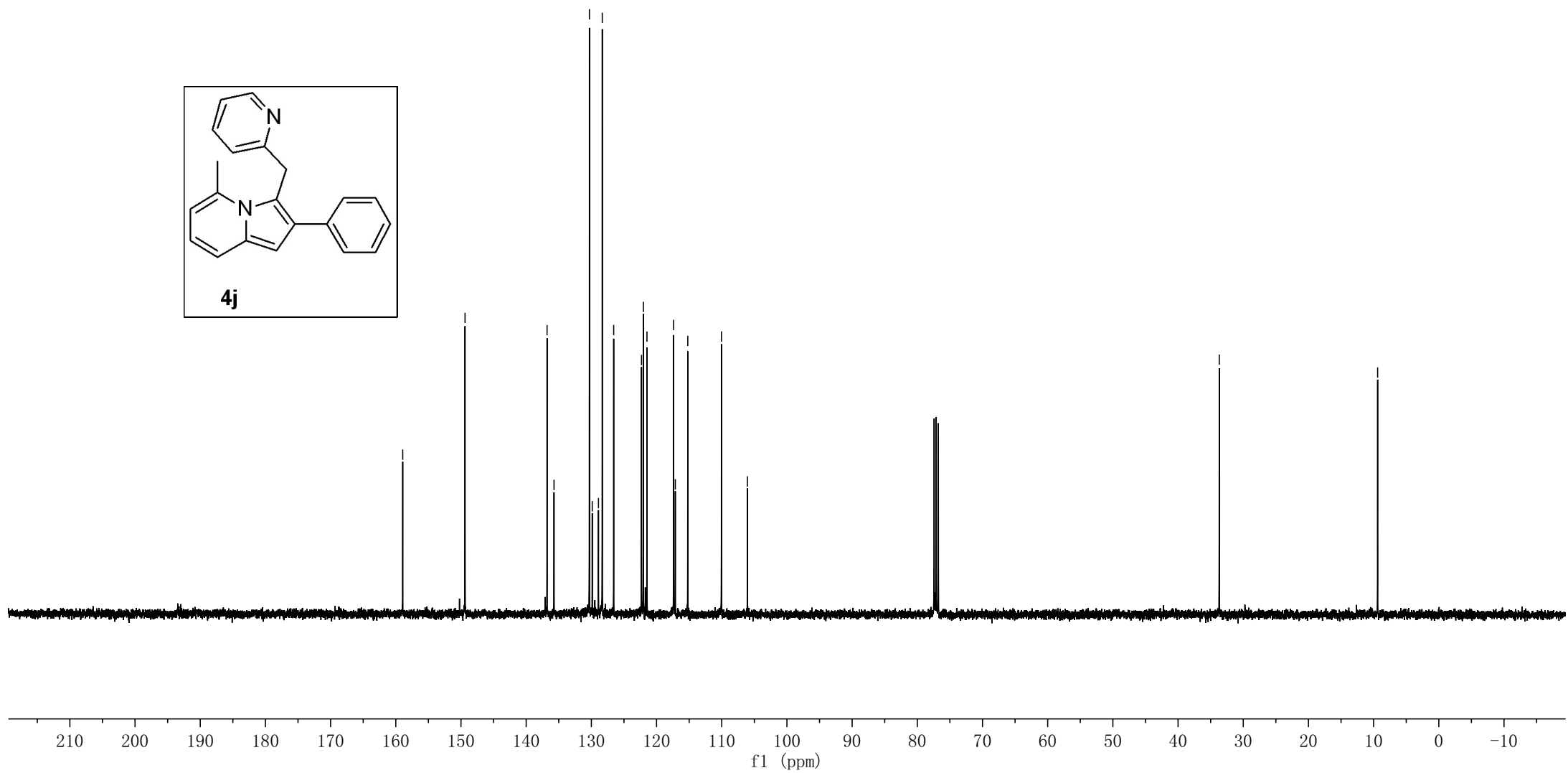
CDC13



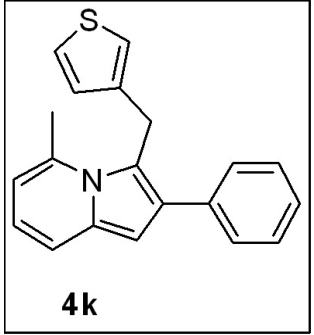
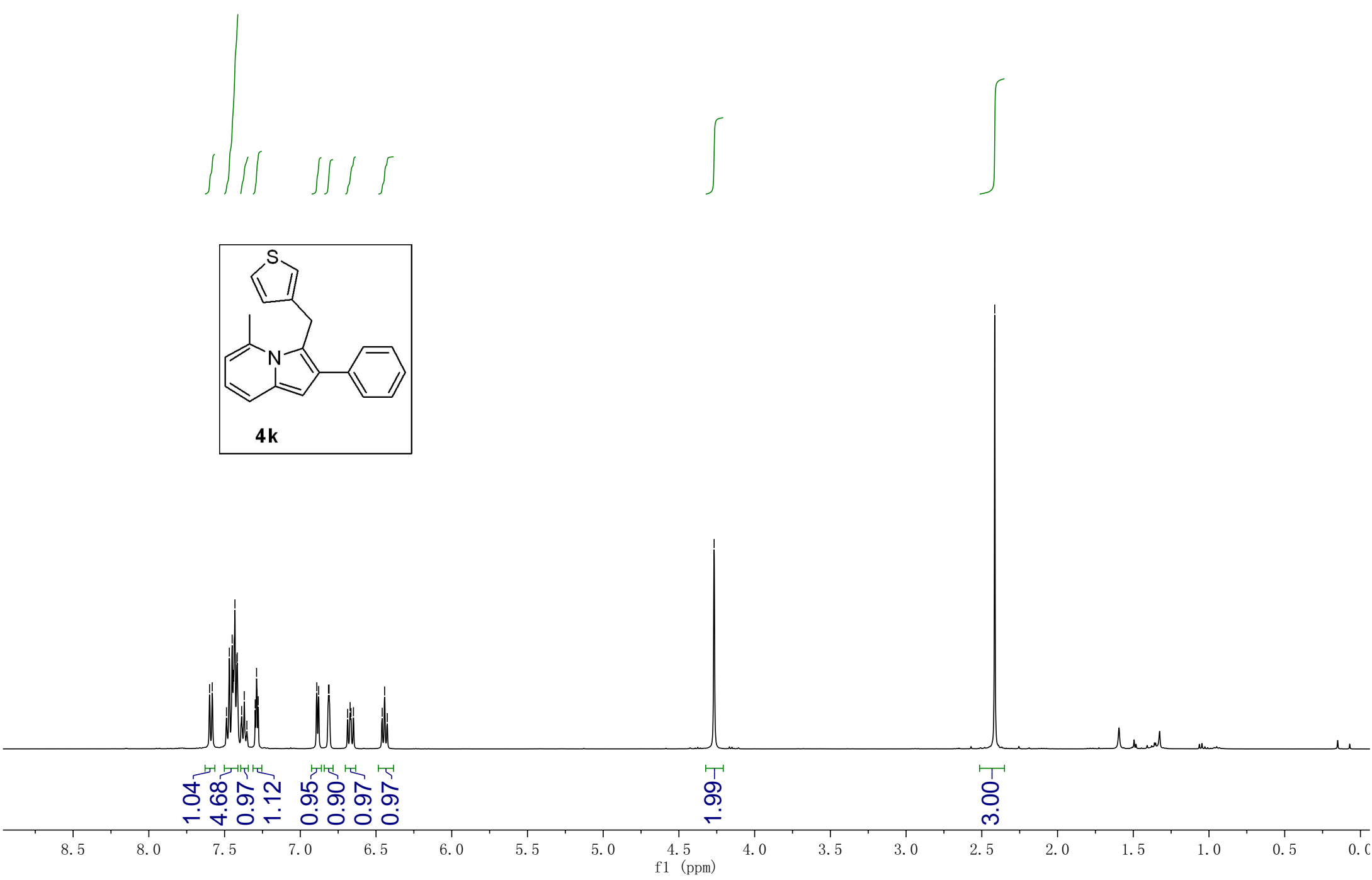
158.94
149.38
136.80
135.73
130.30
129.87
128.91
128.33
126.57
122.31
122.02
121.47
117.38
117.12
115.21
110.04
106.06

33.68

9.39



gx-B4
CDCl₃
7.60
7.58
7.47
7.45
7.44
7.43
7.42
7.42
7.37
7.30
7.29
7.28
6.88
6.81
6.81
6.69
6.67
6.67
6.65
6.46
6.44
6.43



—4.27

—2.41

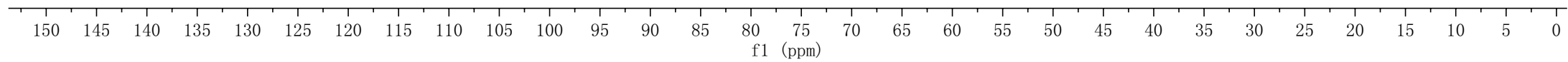
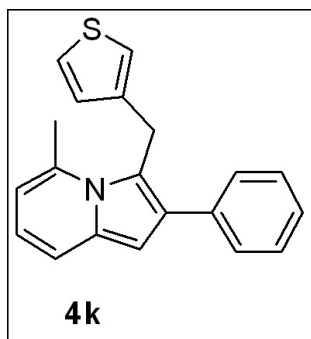
gx-B4

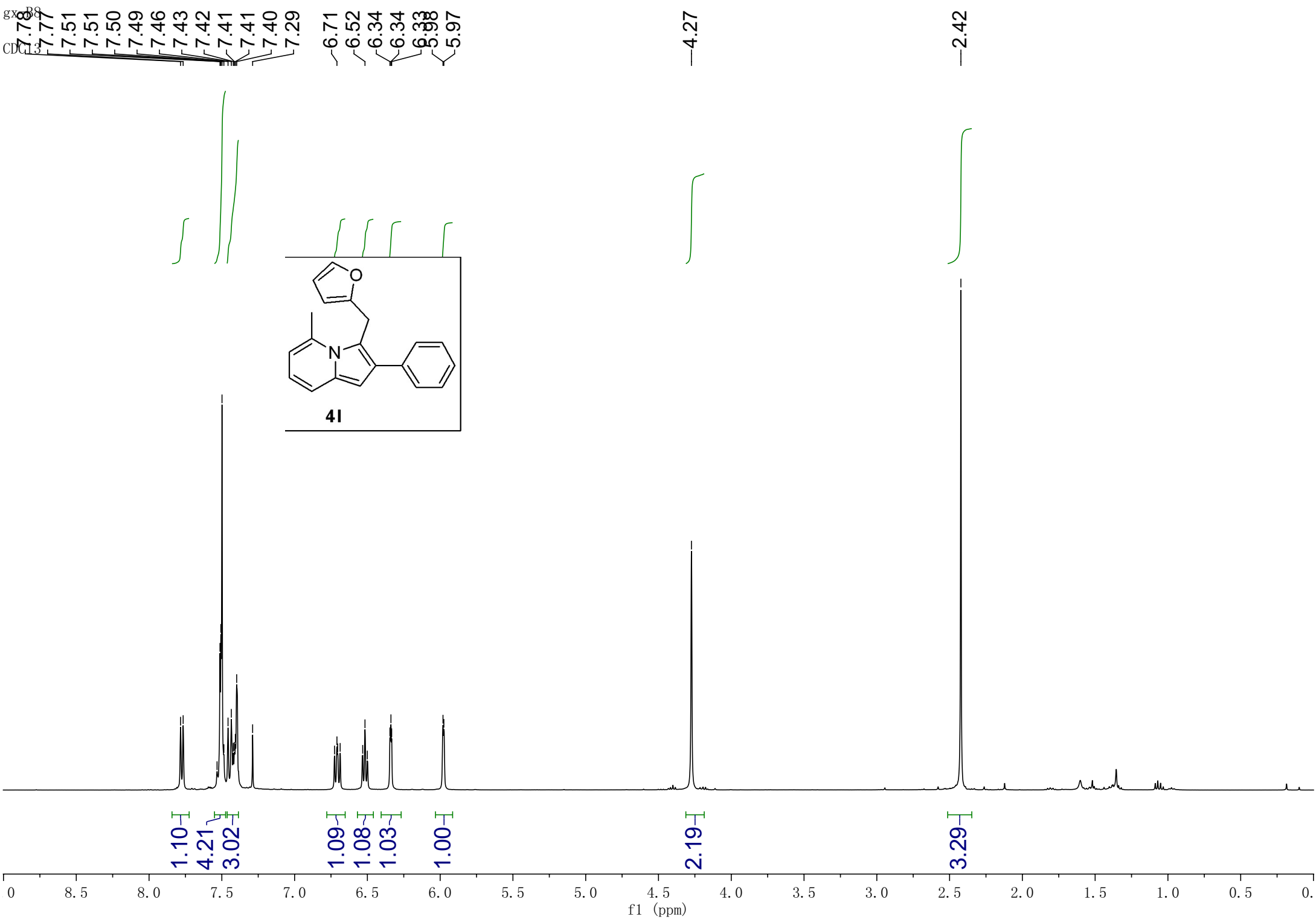
CDC13

139.06
135.78
130.24
129.71
128.27
127.71
126.47
126.00
122.06
120.83
118.16
117.44
114.95
109.98
105.83

25.80

9.41





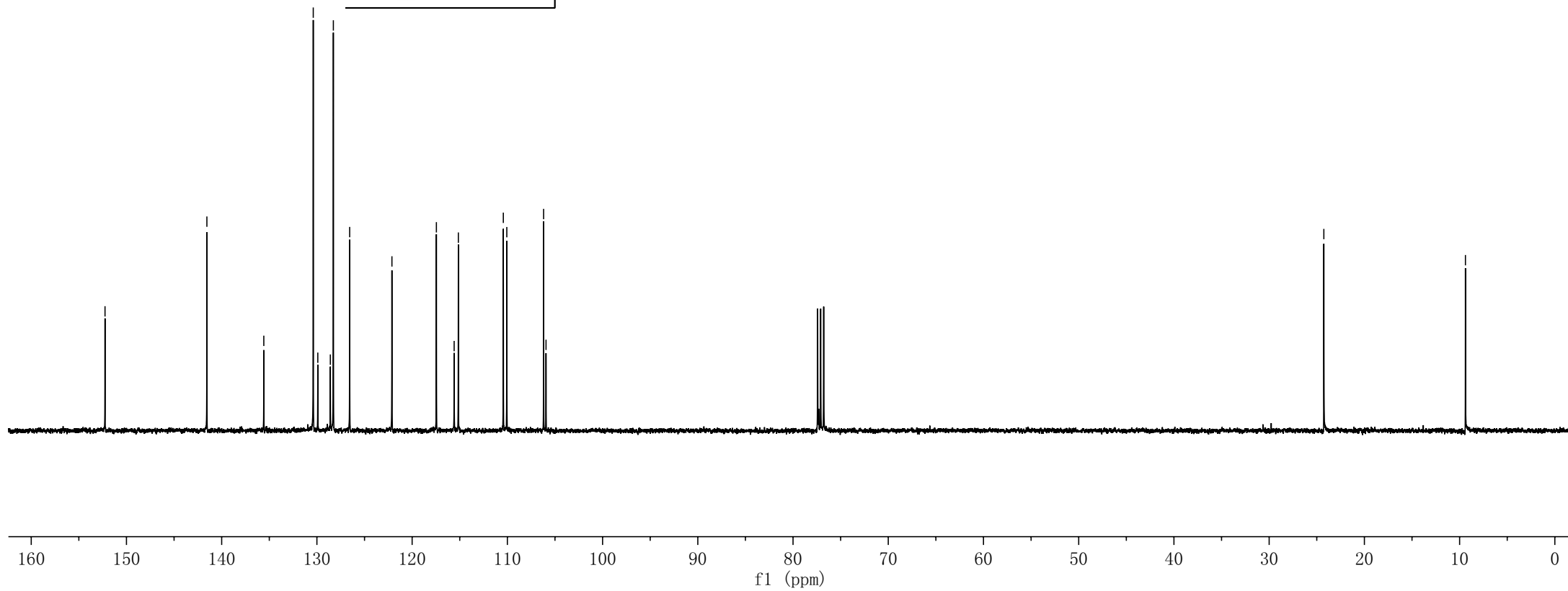
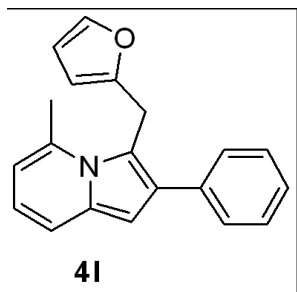
gx-B8

CDC13

—152.25
—141.55
135.58
130.38
129.91
128.59
128.27
126.56
—122.12
117.45
115.59
115.15
110.42
110.06
106.19
105.94

—24.26

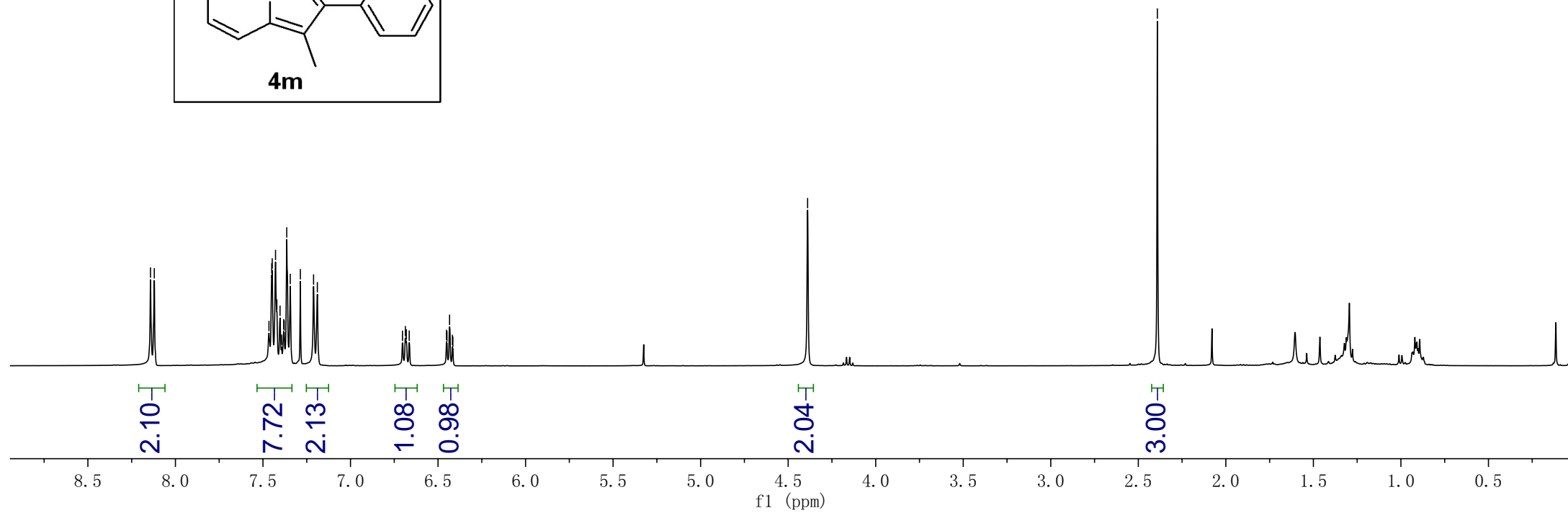
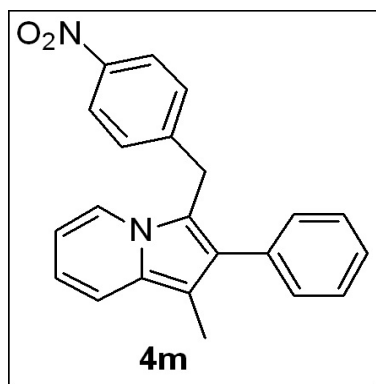
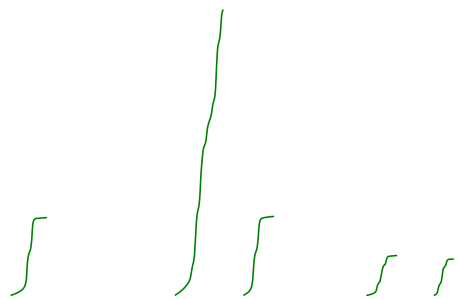
—9.39



hj-8-1-8

CDC13

8.14
8.12
7.45
7.45
7.43
7.36
7.34
7.29
6.70
6.69
6.68
6.66
6.45
6.45
6.43
6.42
6.42
—4.39
—2.39



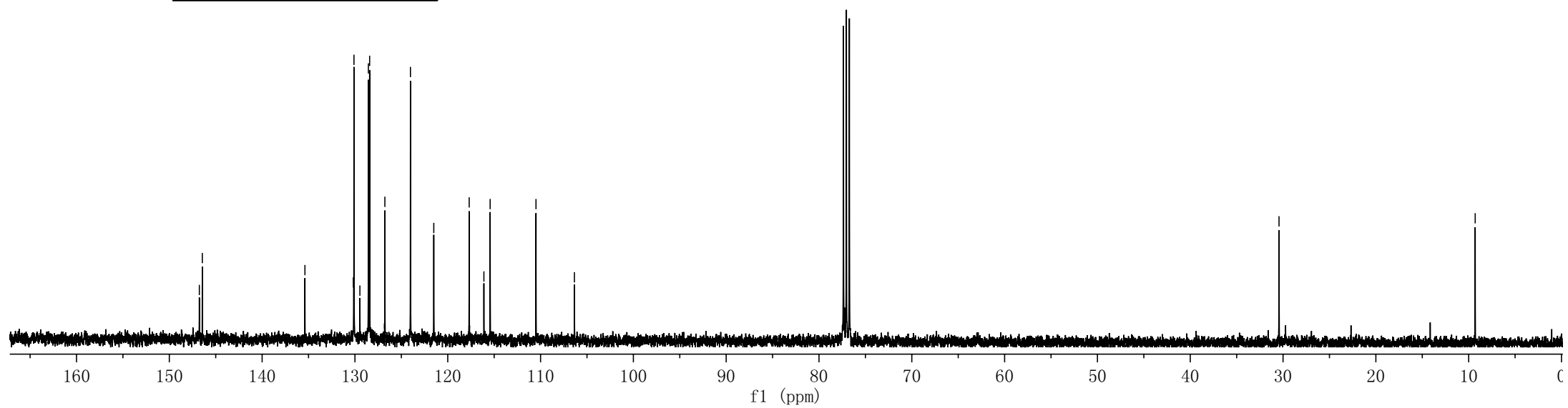
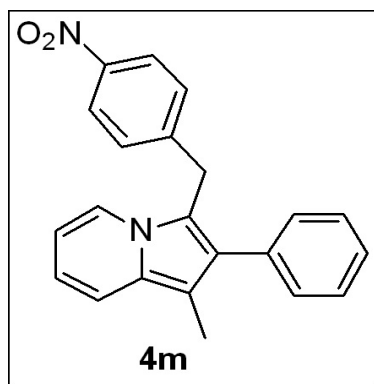
hj-8-1-8

CDC13

146.76
146.45
135.39
130.10
129.47
128.55
128.42
126.78
124.02
121.50
117.69
116.10
115.43
110.49
106.35

—30.43

—9.30



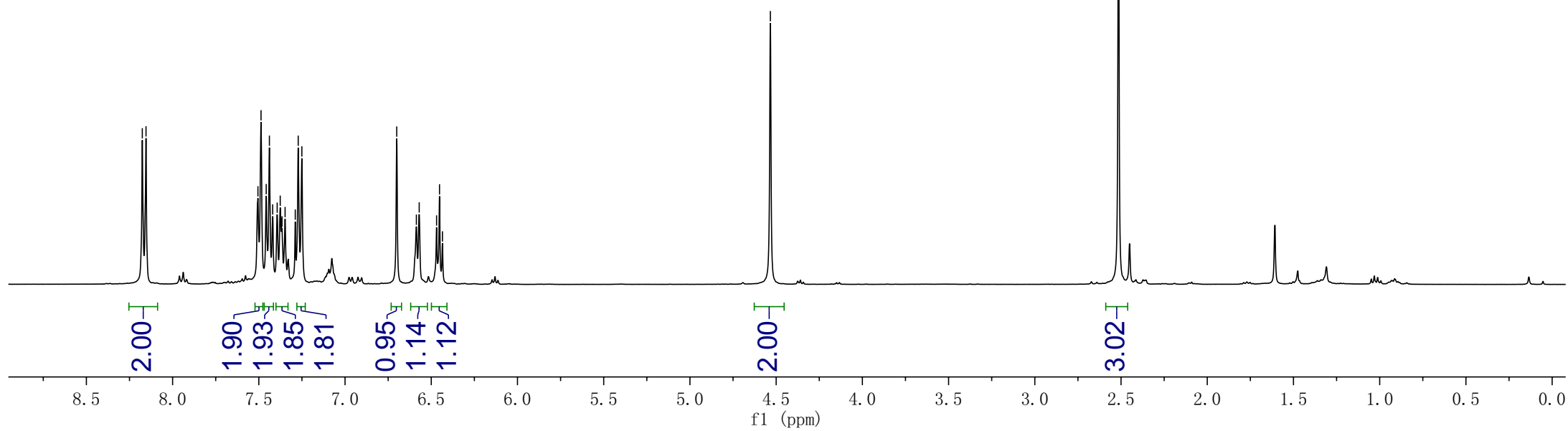
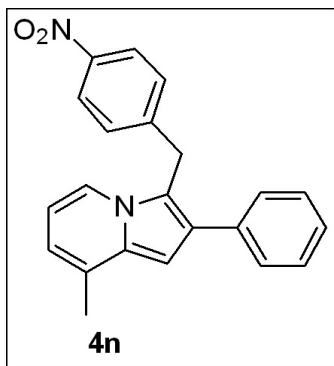
gx-B9

CDC13

8.18
8.15
7.51
7.49
7.46
7.44
7.27
6.70
6.59
6.57
6.47
6.45
6.44

4.53

2.51



gx-B9

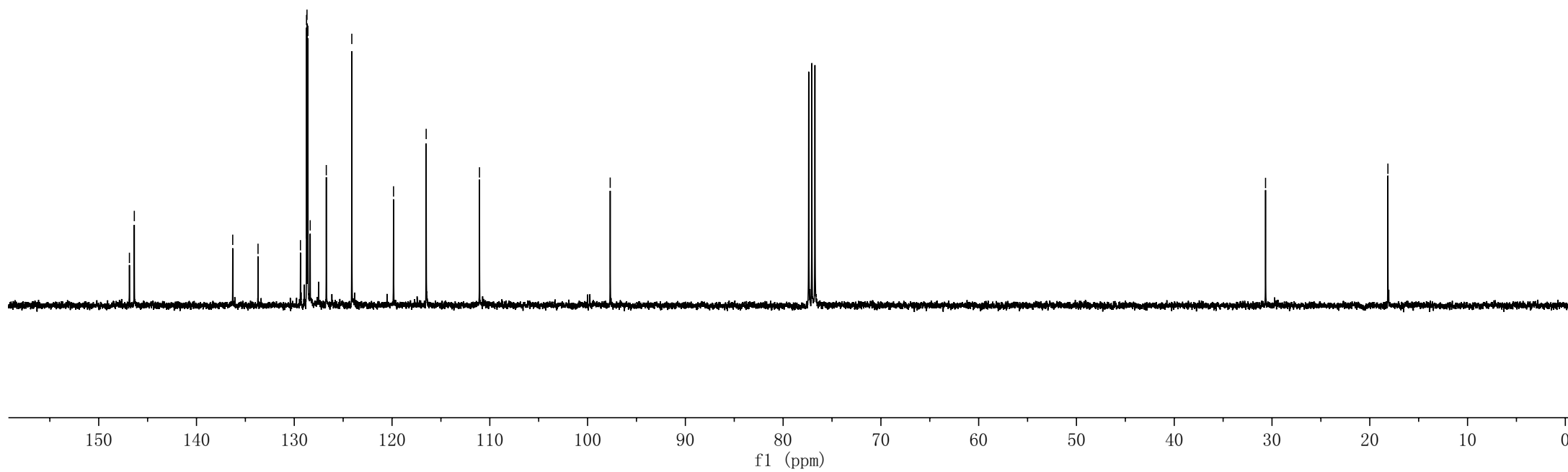
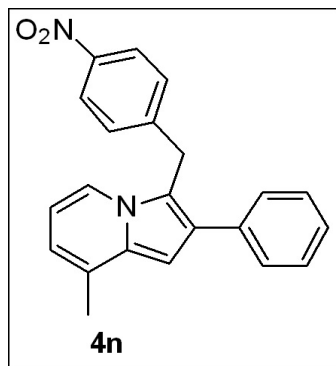
CDC13

146.86
146.36
136.29
133.71
129.37
128.75
128.70
128.60
128.37
126.72
124.11
119.85
116.51
111.06

—97.69

—30.66

—18.15



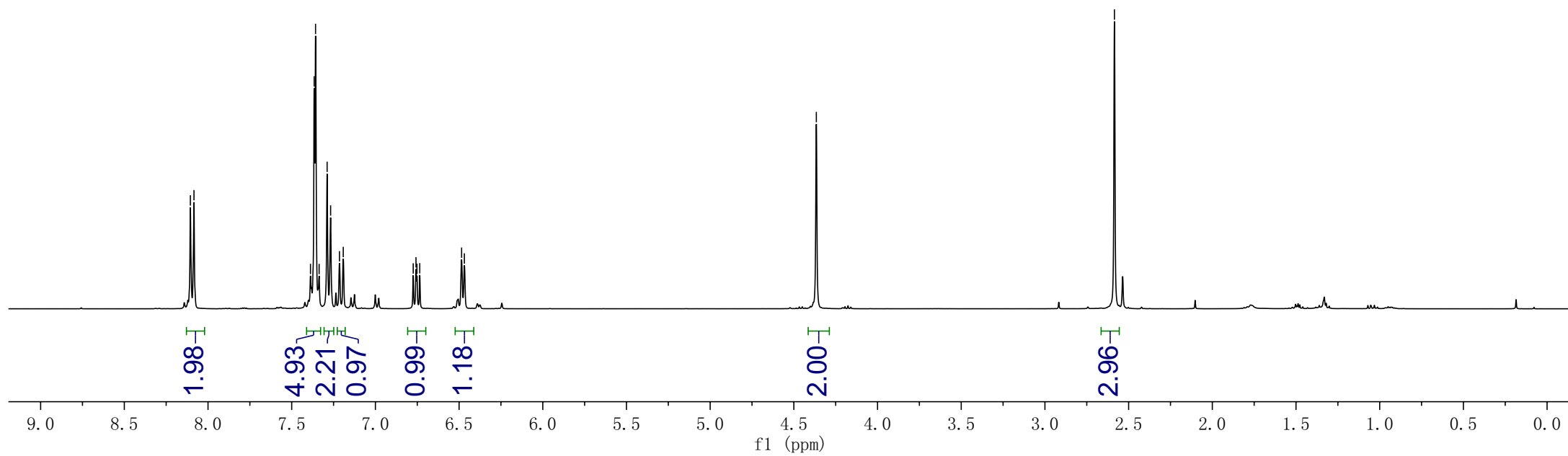
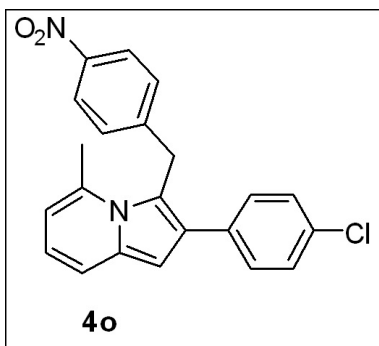
gx-B6

CDC13

8.11
8.08
7.37
7.36
7.29
7.27
7.19
6.77
6.76
6.75
6.74
6.48
6.47

4.37

2.58



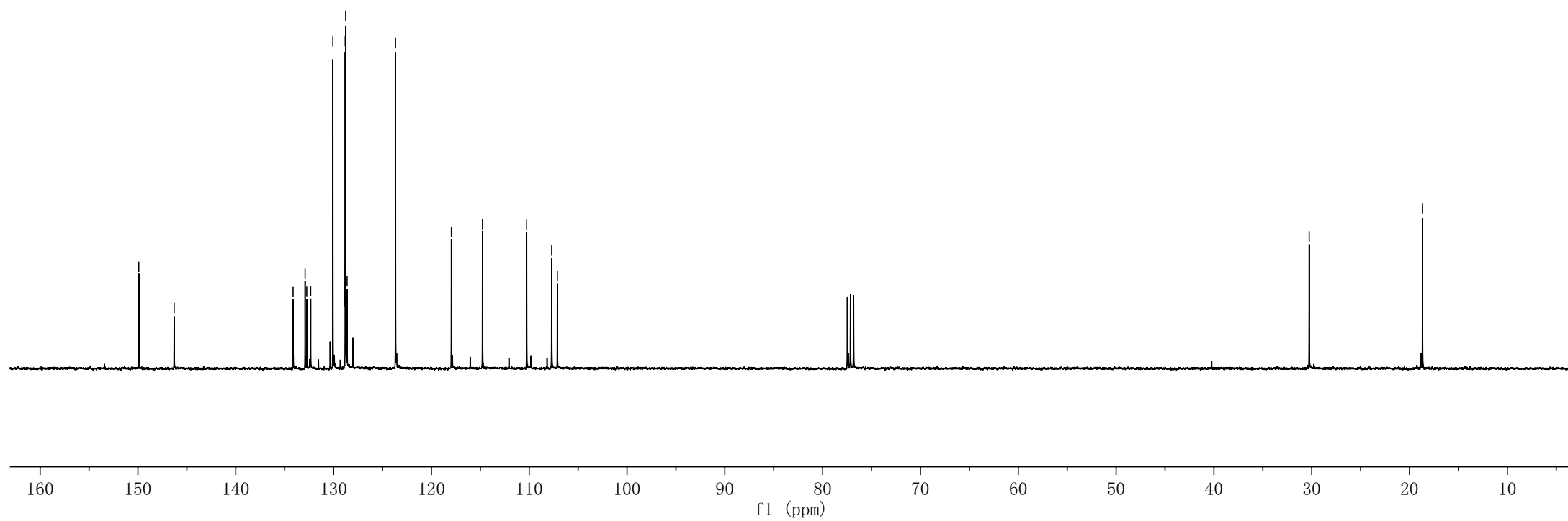
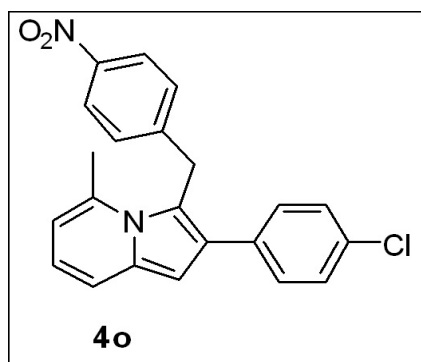
gx-B6

CDC13

— 149.91
— 146.30
— 134.14
— 132.91
— 132.74
— 132.34
— 130.07
— 128.81
— 128.77
— 128.62
— 123.67
— 117.96
— 114.78
— 110.26
— 107.70
— 107.12

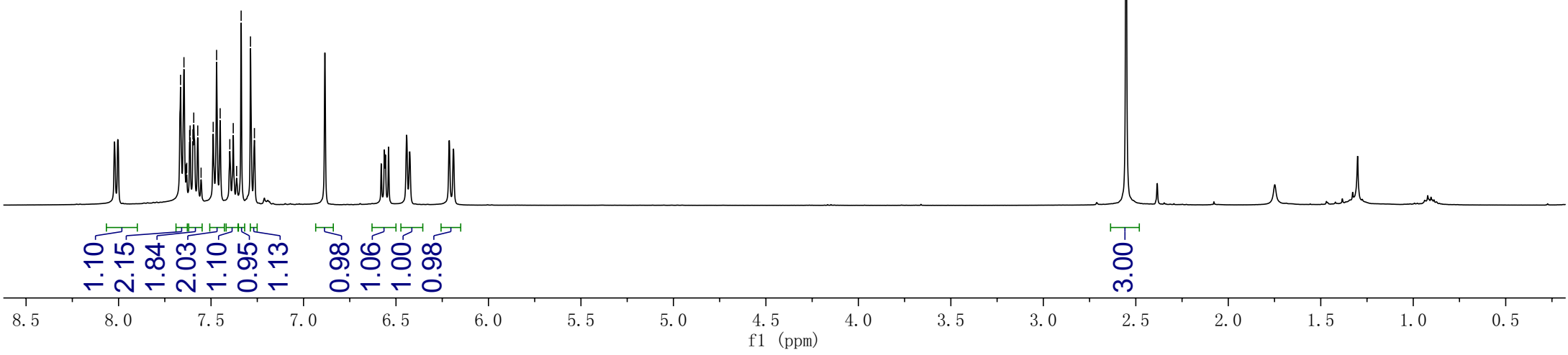
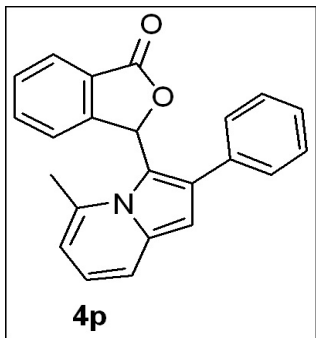
— 30.26

— 18.68



7.66
7.65
7.63
7.63
7.62
7.61
7.60
7.59
7.57
7.55
7.49
7.47
7.45
7.40
7.38
7.36
7.34
7.29
7.27

2.55

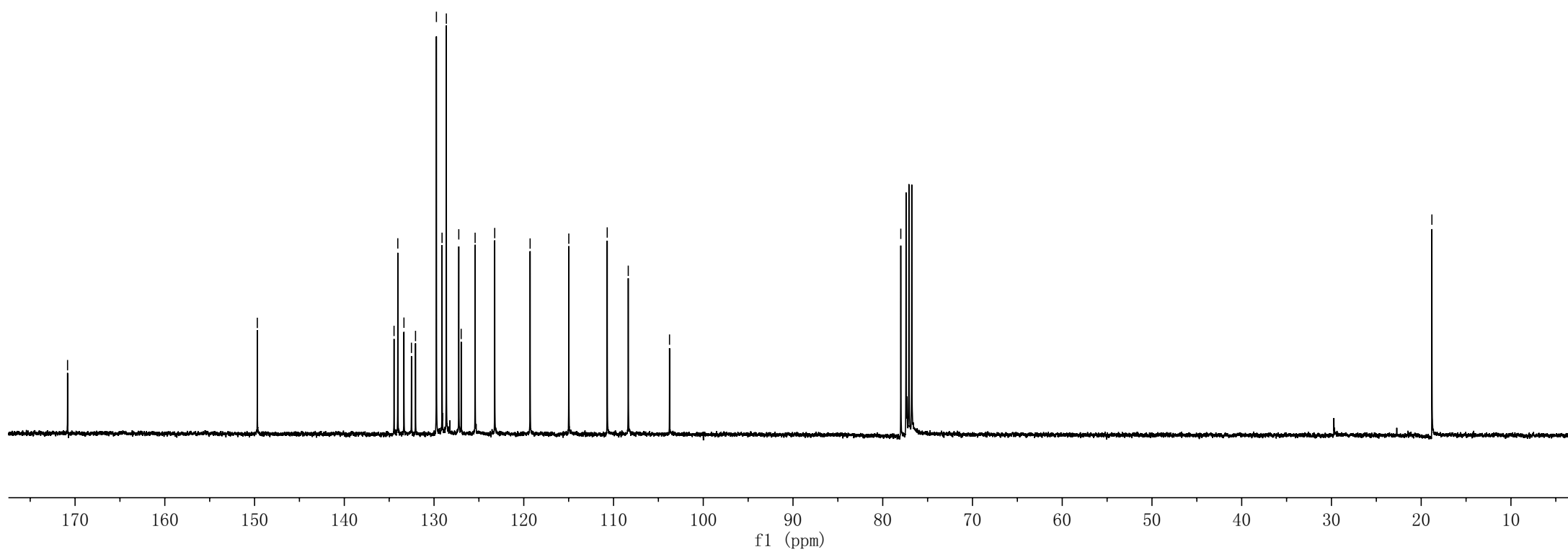
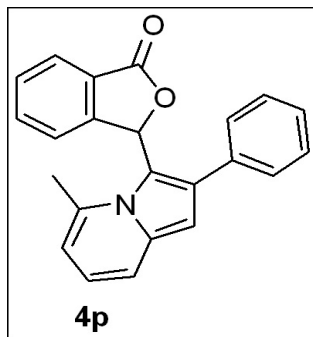


hj-8-77
CDCl₃

—170.84
—149.69
134.46
134.04
133.35
132.52
132.06
129.74
129.11
128.63
127.24
126.98
125.42
123.24
119.29
114.98
110.70
108.36
103.76

—77.99

—18.81

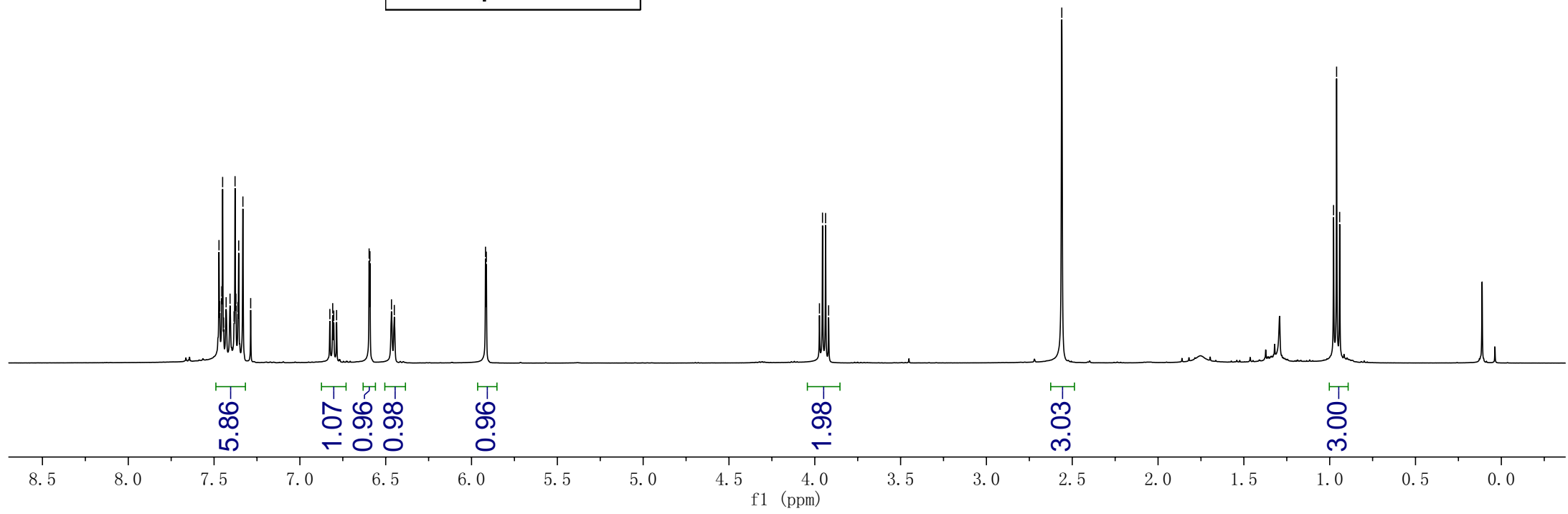
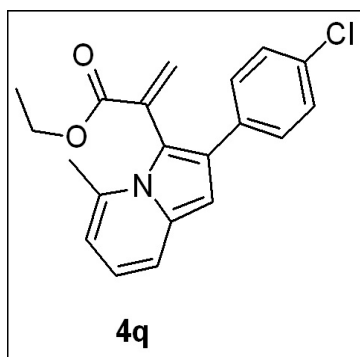
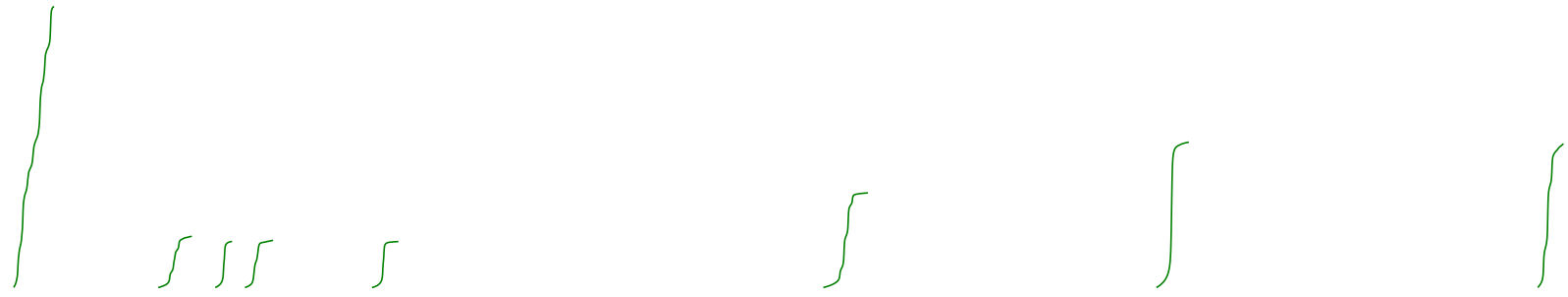


h_j-7-148
CDCl₃
7.47
7.46
7.45
7.43
7.41
7.38
7.37
7.36
7.33
7.29
6.83
6.81
6.60
6.59
6.47
6.45
5.92
5.91

3.97
3.95
3.94
3.92

-2.56

0.98
0.96
0.94



hj-7-14-3

CDC13

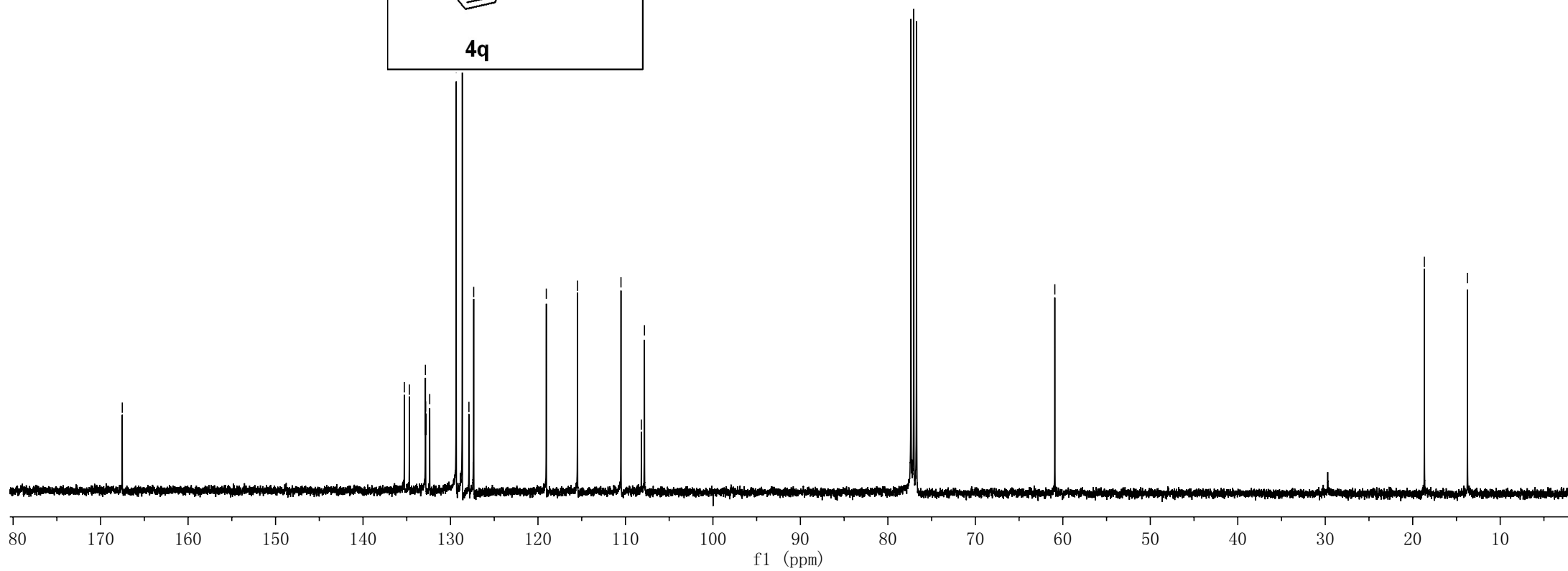
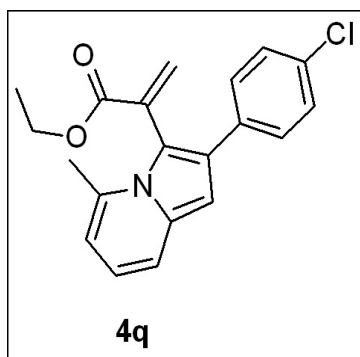
—167.52

135.27
134.70
132.87
132.84
132.38
129.35
128.65
127.89
127.35
119.05
115.48
110.51
108.18
107.83

—60.91

—18.67

—13.75



4r

