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## Supporting Information

MS Title: Reaction modes and mechanism in indolizine photooxygenation reactions  
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Jian-Hua Xu\*

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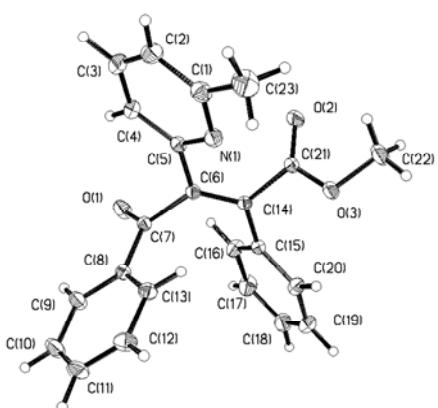
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## 1. General Experimental Conditions

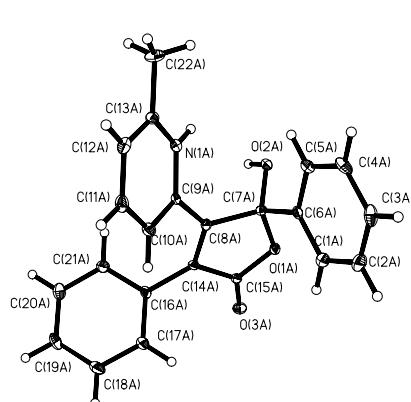
Melting points were measured on a Yanaco microscopic melting point apparatus and uncorrected.  $^1\text{H}$ NMR spectra were recorded on a Bruker spectrometer at 300MHz with  $\text{CDCl}_3$  or  $d_6\text{-DMSO}$  as solvent and internal standard. *J*-Values are give in Hz. IR spectra were taken with a Shimadzu IR 440 spectrometer in KBr pellets. Mass spectra were recorded with a VG ZAB-HS spectrometer. Elemental analyses were obtained using a Perkin-Elmer 240 C analyzer. Fluorescence and phosphorescence spectra were recorded on a HITACHI F-4500 Fluorescence Spectrophotometer. Acetonitrile (AR grade) was distilled from Phosphorus pentoxide, methanol was treated by magnesium and distilled before use. Other reagents were CP or AR grade and were used as received without further purification. Petroleum ether refers to the fraction with boiling point in the range 60-90 °C.

## 2. Crystallgraphic structure of 2a, 3a, 3b, 5a, 6d and 9f

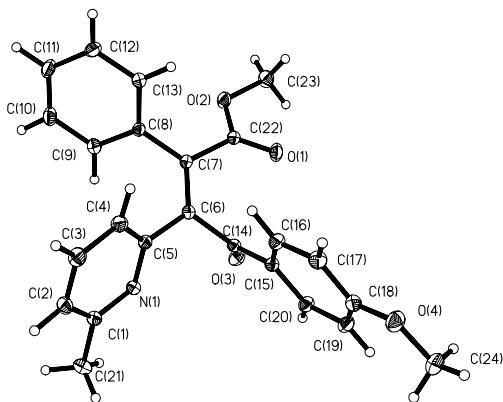
2a



3a



3b



Crystal Structures of compounds **3a** (*Acta Cryst.* (2002). E**58**, 790), **5a** (*Acta Cryst.* (2002). E**58**, 1400), **6d** (*Acta Cryst.* (2002). E**58**, 1060) and **9f** (*Acta Cryst.* (2002). E**58**, 1427) have been published.

### 3. Analytical and spectroscopic data for all compounds 2-9 (a-f)

**E-3-Benzoyl-3-(6-methyl-2-pyridinyl)-2-phenylacrylic acid methyl ester (2a).** Colorless crystals from petroleum ether – ethyl acetate, mp 86-88 °C; IR (KBr) 3090, 2980, 1721, 1666, 1580, 1492, 1449, 1299, 1244, 1209, 1161, 946, 786, 738, 696; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.61 (s, 3H, Me), 3.83 (s, 3H, OMe), 7.11 (d, *J* = 7.7 Hz, 1H), 7.16- 7.39 (m, 8H, ArH), 7.45 (t, *J* = 7.4 Hz, 1H), 7.53 (t, *J* = 7.4 Hz, 1H), 7.92 (d, *J* = 8.0 Hz, 2H); MS *m/z* 357 (M<sup>+</sup>, 5.68), 342 (8.27), 325 (67.81), 296 (12.46), 270 (35.86), 105 (base), 66 (60.67). Anal. Calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>3</sub>: C, 77.31; H, 5.32; N, 3.92. Found: C, 77.29; H, 5.35; N, 3.98.

**Z-3-Benzoyl-3-(6-methyl-2-pyridinyl)-2-phenylacrylic acid methyl ester (3a).** Colorless crystals from petroleum ether – ethyl acetate, mp 138-140 °C; IR (KBr) 3050, 2952, 1720, 1684, 1584, 1455, 1319, 1230, 1101, 1021, 789, 762, 700; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.62 (s, 3H, Me), 3.51 (s, 3H, OMe), 7.22-7.61 (m, 10H, ArH), 7.78 (br, 1H), 8.34 (d, *J* = 6.7 Hz, 2H); MS *m/z* 357 (M<sup>+</sup>, 15.62), 342 (21.17), 329 (40.81), 328 (37.38), 325 (21.10), 313 (20.68), 298 (20.71), 296 (22.34), 270 (92.87), 105 (base), 77 (85.67). Anal. Calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>3</sub>: C, 77.31; H, 5.32; N, 3.92. Found: C, 77.29; H, 5.36; N, 3.95.

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**Dihydro-3,5-diphenyl-4-(6-methyl-2-pyridinyl)-5-hydroxyfuran-2-one (4a).** Colorless crystals from petroleum ether – ethyl acetate, mp 148-150 °C; IR (KBr) 3054, 2745, 2575, 1745, 1589, 1570, 1492, 1448, 1384, 1267, 1200, 1088, 975, 918, 810, 787, 746, 722, 701; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.56 (s, 3H, Me), 6.99 (d, *J* = 7.8 Hz, 1H), 7.11 (d, *J* = 7.8 Hz, 1H), 7.29-7.55 (m, 11H), 7.99 (br, 1H); MS *m/z* 343 (M<sup>+</sup>, 15.62), 342 (21.17), 329 (40.81), 328 (37.48), 325 (21.10), 313 (20.68), 298 (20.71), 296 (22.34), 270 (92.87), 105 (base), 77 (85.67). Anal. Calcd for C<sub>22</sub>H<sub>17</sub>NO<sub>3</sub>: C, 76.96; H, 4.96; N, 4.08. Found: C, 76.91; H, 4.98; N, 4.11.

**1-(6-Methyl-2-pyridinyl)-2-phenylthanedione (5a).** Colorless crystals from petroleum ether – ethyl acetate, mp 80-82 °C; IR KBr) 3069, 1699, 1589, 1477, 1317, 1216, 987, 930, 847, 757, 684; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.5 (s, 3H, Me), 7.37 (d, *J* = 7.7, 1H), 7.51 (t, *J* = 7.7 Hz, 2H), 7.63 (td, *J* = 7.4, 1.1 Hz, 1H), 7.81 (t, *J* = 7.7 Hz, 1H), 7.94 (d, *J* = 8.3 Hz, 2H), 8.01 (d, *J* = 7.5 Hz, 1H); MS *m/z* 225 (M<sup>+</sup>, 10.93), 196 (30.39), 169 (19.17), 105 (base), 92 (25.51), 77 (58.29). Anal. Calcd for C<sub>14</sub>H<sub>11</sub>NO<sub>2</sub>: C, 74.65; H, 4.89; N, 6.22. Found: C, 74.62; H, 4.91; N, 6.15.

**3-Benzoyl-3-(6-methyl-2-pyridinyl)-2-phenyl-2-oxiranecaboxaldehyde (6a).** White crystals from ether, mp 130-132°C (dec.). This compound decomposes slowly on silica gel column at room temperature or when crystallized from ethyl acetate. It was separated by thin layer chromatography on silica gel plates at temperatures below 5 °C. IR (KBr) 3062, 2968, 2926, 1726, 1689, 1594, 1576, 1450, 1252, 1210, 1180, 1096, 1027, 799, 768, 696; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.59 (s, 3H, Me), 7.13 (d, *J* = 7.8 Hz, 1H), 7.16-7.58 (m, 10H), 7.91 (dd, *J* = 1.3, 8.3 Hz, 2H), 9.70 (s, 1H, CHO), MS *m/z* 315 (M<sup>+</sup>□28, 15.75), 314 (M<sup>+</sup>□CHO, 63.28), 270 (9.75), 238 (12.43), 223 (7.75), 106 (7.69), 105 (base), 92 (19.44), 77 (63.21). Anal. Calcd for C<sub>22</sub>H<sub>17</sub>NO<sub>3</sub>: C,

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77.0; H, 4.96; N, 4.08. Found: C, 76.9; H, 4.94; N, 4.10.

**E-3-(4-Methoxybenzoyl)-3-(6-methyl-2-pyridinyl)-2-phenylacrylic acid methyl ester (2b).**

White crystals from petroleum ether – ethyl acetate, mp 118-120 °C (dec); IR (KBr) 2949, 2840, 1724, 1665, 1594, 1509, 1447, 1424, 1318, 1247, 1161, 1024, 952, 921, 849, 806, 745, 705; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.66 (s, 3H, Me), 3.80 (s, 3H, OMe), 3.81 (s, 3H, OMe), 6.80 (d, *J* = 8.8 Hz, 2H), 7.18-7.41 (m, 7H, ArH), 7.59 (br, 1H), 7.95 (d, *J* = 6.9 Hz, 2H); MS *m/z* 387 (M<sup>+</sup>, 3.58), 372 (9.30), 358 (25.87), 344 (26.12), 328 (14.32), 326 (20.10), 300 (63.71), 135 (base), 107 (21.48), 92 (47.19), 77 (58.91). Anal. Calcd for C<sub>24</sub>H<sub>21</sub>NO<sub>4</sub>: C, 74.42; H, 5.43; N, 3.62. Found: C, 74.41; H, 5.46; N, 3.65.

**Z-3-(4-Methoxybenzoyl)-3-(6-methyl-2-pyridinyl)-2-phenylacrylic acid methyl ester (3b).**

White crystals from petroleum ether – ethyl acetate, mp 140-142 °C (dec); IR (KBr) 3015, 2951, 1708, 1668, 1597, 1509, 1447, 1320, 1251, 1162, 1016, 795, 775, 758, 697; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.33 (s, 3H, Me), 3.58 (s, 3H, OMe), 3.86 (s, 3H, OMe), 6.86 (t, *J* = 6.6 Hz, 2H), 6.94 (d, *J* = 8.9 Hz, 2H), 7.20-7.32 (m, 6H), 8.05 (d, *J* = 8.8 Hz, 2H); MS *m/z* 387 (M<sup>+</sup>), 372 (9.30), 358 (18.33), 344 (13.28), 326 (12.22), 300 (52.59), 191 (11.29), 165 (11.42), 135 (base), 107 (22.18), 92 (50.20), 77 (62.15). Anal. Calcd for C<sub>24</sub>H<sub>21</sub>NO<sub>4</sub>: C, 74.42; H, 5.43; N, 3.62. Found: C, 74.40; H, 5.42; N, 3.63.

**3-(4-Methoxybenzoyl)-3-(6-methyl-2-pyridinyl)-2-phenylacrylic acid (4b)** White crystals from petroleum ether – ethyl acetate, mp 118-120 °C; IR (KBr) 3385, 3100, 2955, 1755, 1610, 1519, 1456, 1307, 1255, 1176, 1034, 970, 845, 790, 742, 69; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.68 (s, 3H, Me), 3.79 (s, 3H, OMe), 6.84 (d, *J* = 8.8 Hz, 2H), 6.91 (d, *J* = 7.7 Hz, 2H), 7.35-7.47 (m, 7H), 7.63 (s, 1H); MS *m/z* 373 (M<sup>+</sup>, 2.68), 328 (22.24), 317 (29.91), 300 (base), 266 (25.77), 238 (85.79),

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194 (84.19), 193 (29.97), 165 (19.16), 152 (20.58), 135 (78.19), 92 (41.76), 77 (44.08). Anal. Calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>4</sub>: C, 73.99; H, 5.09; N, 3.75. Found: C, 73.95; H, 5.07; N, 3.72.

**1-(6-Methyl-2-pyridinyl)-2-(4-methoxyphenyl)ethanедione (5b)** White crystals from petroleum ether – ethyl acetate, mp 106 -108 °C; IR (KBr) 3080, 2938, 1693, 1658, 1603, 1573, 1510, 1459, 1425, 1265, 1218, 1172, 1030, 984, 914, 749; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.62 (s, 3H, Me), 3.91 (s, 3H, OMe), 6.98 (dt, *J* = 7.0, 2.3 Hz, 2H), 7.45 (d, *J* = 7.7 Hz, 1H), 7.90 (t, *J* = 7.7 Hz, 1H), 7.96 (dt, *J* = 7.0, 2.3 Hz, 2H), 8.03 (d, *J* = 7.6 Hz, 1H); MS *m/z* 255 (M<sup>+</sup>, 9.22), 135 (base), 92 (14.04), 77 (12.11). Anal. Calcd for C<sub>15</sub>H<sub>13</sub>NO<sub>3</sub>: C, 70.60; H, 5.10; N, 5.49. Found: C, 70.58; H, 5.08; N, 5.46.

**3-(4-Methoxybenzoyl)-3-(6-methyl-2-pyridinyl)-2-phenyl-2-oxiranecarboxaldehyde (6b)** Acquired from silica gel column as oil, after dissolving the oil in ether and evaporation of the ether in vacuo, yellow solid was obtained, mp 184-186°C; IR (KBr) 3067, 2926, 2843, 1726, 1679, 1598, 1510, 1454, 1261, 1170, 1024, 847, 793, 753, 699; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.60 (s, 3H, Me), 3.81 (s, 3H, OMe), 6.80 (d, *J* = 8.8 Hz, 2H), 7.13 (d, *J* = 7.7 Hz, 1H), 7.20-7.22 (m, 3H), 7.34 (d, *J* = 7.6 Hz, 1H), 7.53-7.62 (m, 3H), 7.93 (d, *J* = 8.8 Hz, 2H), 9.70 (s, 1H, CHO); MS *m/z* 373 (M<sup>+</sup>, 7.63), 344 (base), 300 (19.44), 253 (28.74), 135 (23.25), 105 (87.14), 92 (18.60), 77 (43.78). Anal. Calcd for C<sub>23</sub>H<sub>19</sub>NO<sub>4</sub>: C, 73.99; H, 5.09; N, 3.75. Found: C, 73.95; H, 5.06; N, 3.73.

**E-3-(6-Methyl-2-pyridinyl)-3-(4-nitrophenyl)-2-phenylacrylic acid methyl ester (2c).** Not fully separated from **3c**. <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.57 (s, 3H, Me), 3.82 (s, 3H, OMe), 7.06 (d *J* = 7.8 Hz, 1H), 7.13 (d, *J* = 7.8 Hz, 1H), 7.16-7.19 (m, 2H), 7.30-7.40 (m, 3H), 7.56 (t, *J* = 7.8 Hz, 1H), 8.01 (d, *J* = 8.9 Hz, 2H), 8.12 (d, *J* = 8.8 Hz, 2H).

**Z-3-(6-Methyl-2-pyridinyl)-3-(4-nitrophenyl)-2-phenylacrylic acid methyl ester (3c).**

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Colorless crystals from petroleum ether – ethyl acetate, mp 106 - 108 °C; IR (KBr) 3105, 3067, 2951, 1726, 1679, 1586, 1526, 1451, 1346, 1232, 1101, 1018, 845, 803, 761, 699;  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  2.31 (s, 3H, Me), 3.62 (s, 3H, OMe), 6.74 (d,  $J = 7.8$  Hz, 1H), 6.91 (d,  $J = 7.7$  Hz, 1H), 7.26-7.30 (m, 3H), 7.33-7.36 (m, 3H), 8.21 (d,  $J = 8.8$  Hz, 2H), 8.31 (d,  $J = 8.9$  Hz, 2H); MS  $m/z$  402 ( $\text{M}^+$ , 48.58), 387 (24.52), 374 (44.62), 373 (59.98), 371 (39.29), 359 (33.92), 343 (42.67), 315 (base), 314 (24.22), 252 (25.39), 150 (74.84), 104 (82.08), 76 (51.68). Anal. Calcd for  $\text{C}_{23}\text{H}_{18}\text{N}_2\text{O}_5$ : C, 68.66; H, 4.48; N, 6.97. Found: C, 68.63; H, 4.49; N, 6.99.

**3-Phenyl-4-(6-methyl-2-pyridinyl)-5-hydroxy-5-(4-nitrophenyl)furan-2-one (4c).** Colorless crystals from petroleum ether – ethyl acetate, mp 178 -180 °C; IR (KBr) 3359 (br), 3123, 3082, 1732 (br), 1650, 1586, 1522, 1494, 1434, 1379, 1351, 1277, 1215, 1176, 1073, 995, 861, 843, 785, 748, 701;  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  2.60 (s, 3H, Me), 7.03 (d,  $J = 7.7$  Hz, 1H), 7.19 (d,  $J = 7.9$  Hz, 1H), 7.46-7.51 (M, 6H), 7.72 (d,  $J = 8.7$  Hz, 2H), 8.17 (d,  $J = 8.6$  Hz, 2H); MS  $m/z$  388 ( $\text{M}^+$ , 36.81), 369 (22.30), 322 (28.84), 315 (43.26), 266 (31.34), 238 (38.99), 194 (base), 92 (26.08). Anal. Calcd for  $\text{C}_{22}\text{H}_{16}\text{N}_2\text{O}_5$ : C, 68.04; H, 4.12; N, 7.22. Found: C, 68.01; H, 4.10; N, 7.20.

**1-(6-Methyl-2-pyridinyl)-2-(4-nitrophenyl)ethanone (5c).** Colorless crystals from petroleum ether – ethyl acetate, mp 160 -162 °C; IR (KBr) 3135, 3110, 1699, 1679, 1594, 1526, 1459, 1351, 1324, 1257, 1213, 987, 925, 843, 806, 775, 752, 721, 704;  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ )  $\delta$  2.52 (s, 3H, Me), 7.45 (d,  $J = 7.7$  Hz, 1H), 7.89 (t,  $J = 7.7$  Hz, 1H), 8.05 (d,  $J = 7.7$  Hz, 1H), 8.12 (d,  $J = 8.9$  Hz, 2H), 8.37 (d,  $J = 8.9$  Hz, 2H); MS  $m/z$  270 ( $\text{M}^+$ , 13.91), 241 (15.46), 214 (9.20), 150 (13.49), 120 (32.24), 104 (18.80), 92 (base), 76 (16.51). Anal. Calcd for  $\text{C}_{14}\text{H}_{10}\text{N}_2\text{O}_4$ : C, 62.22; H, 3.70; N, 10.37. Found: C, 62.20; H, 3.72; N, 10.35.

**3-(6-Methyl-2-pyridinyl)-3-(4-nitrobenzoyl)-2-phenylacrolein (6c).** White solid mp 172

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-17.4 °C; IR (KBr) 1677, 1653, 1601, 1591, 1523, 1344, 1247, 1221, 855, 785, 734, 695; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 2.62 (s, 3H, Me), 7.21 (d, *J* = 7.6 Hz, 1H), 7.22 (d, *J* = 7.4 Hz, 1H), 7.51 (t, *J* = 7.7 Hz, 2H), 7.60 (t, *J* = 7.9 Hz, 1H), 7.63 (t, *J* = 7.6 Hz, 1H), 8.05 (d, *J* = 7.6 Hz, 2H), 8.16 (d, *J* = 8.7 Hz, 2H), 8.29 (d, *J* = 8.7 Hz, 2H), 8.38 (s, 1H, CHO); <sup>13</sup>C NMR (75 MHz, CDCl<sub>3</sub>) δ 24.91, 76.99, 77.42, 77.84, 120.77, 124.44, 125.54, 129.25, 129.30, 129.81, 134.27, 137.15, 137.89, 141.32, 150.65, 151.04, 159.96, 189.19, 196.63; MS *m/z* 372 (M<sup>+</sup>, 74.56), 315 (12.73), 295 (13.00), 267 (38.58), 239 (base), 222 (45.27), 194 (24.63), 193 (24.96), 150 (28.09), 120 (15.53), 105 (87.73), 92 (37.72), 77 (94.29). Anal. Calcd for C<sub>22</sub>H<sub>16</sub>N<sub>2</sub>O<sub>4</sub> : C, 70.78; H, 5.88; N, 7.53. Found: C, 70.76; H, 5.85; N, 7.56.

**E-3-Benzoyl-3-(2-pyridinyl)-3-phenylacrylic acid methyl ester (2d).** White crystals from petroleum ether – ethyl acetate, mp 96 - 98 °C; IR (KBr) 3054, 3003, 2950, 1725, 1671, 1581, 1468, 1431, 1257, 1157, 1021, 938, 785, 745, 711, 697; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 3.78 (s, 3H, Me), 7.17-7.20 (m, 3H), 7.27-7.46 (m, 6H, ArH), 7.68 (t, *J* = 7.7 Hz, 1H), 7.92 (dd, *J* = 1.3, 8.4 Hz, 3H), 8.66 (m, 1H); MS *m/z* 343 (M<sup>+</sup>, 27.04), 314 (59.55), 300 (18.64), 284 (18.45), 256 (65.02), 179 (14.15), 127 (10.82), 105 (base), 77 (94.84). Anal. Calcd for C<sub>22</sub>H<sub>17</sub>NO<sub>3</sub> : C, 54.50; H, 4.96; N, 4.08%. Found: C, 54.48; H, 4.93; N, 4.09.

**2-Benzoyl-2-(2-pyridinyl)-3-phenyl-3-phenylglyoxyloxirane (6d).** Colorless crystals from petroleum ether – ethyl acetate, mp 142 - 144 °C; IR (KBr) 3057, 1705, 1689, 1665, 1583, 1489, 1470, 1296, 1213, 1177, 1123, 1101, 838, 769, 725, 687; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 7.14-7.25 (m, 5H), 7.41 (t, *J* = 7.7 Hz 2H), 7.52-7.61 (m, 4H), 7.67 (d, *J* = 7.4 Hz, 1H), 7.71-7.74 (m, 2H), 7.96 (d, *J* = 4.7 Hz, 1H), 7.99 (dd, *J* = 1.4, 8.5 Hz, 2H), 8.31 (dd, *J* = 1.4, 8.5 Hz 2H); MS *m/z* 433 (M<sup>+</sup>, 0.22), 328 (10.87), 300 (base), 256 (5.92), 105 (93.74), 77 (55.53). Anal. Calcd for

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C<sub>28</sub>H<sub>19</sub>NO<sub>4</sub> : C, 77.60; H, 4.39; N, 3.23%. Found: C, 77.56; H, 4.37; N, 3.23.

**Z-3-(2-Pyridinyl)-2-phenylacrylic acid methyl ester (2e).** Oil; IR (KBr) 3056, 2946, 1729, 1625, 1583, 1495, 1471, 1429, 1365, 1281, 1212, 1097, 1011, 939, 833, 779, 744, 693; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 3.94 (s, 3H, OMe), 6.97 (s, 1H), 7.16 (br, 1H), 7.28-7.44 (m, 4H), 7.57 (dd, *J* = 7.8, 1.5 Hz, 2H), 7.66 (m, 1H), 8.59 (m, 1H); MS *m/z* 239 (M<sup>+</sup>, 31.56), 238 (base), 180 (33.21), 152 (10.67), 78 (20.15), 77 (9.09). Anal. Calcd for C<sub>15</sub>H<sub>13</sub>NO<sub>2</sub> : C, 75.31; H, 5.44; N, 5.86. Found: C, 75.29; H, 5.46; N, 5.84.

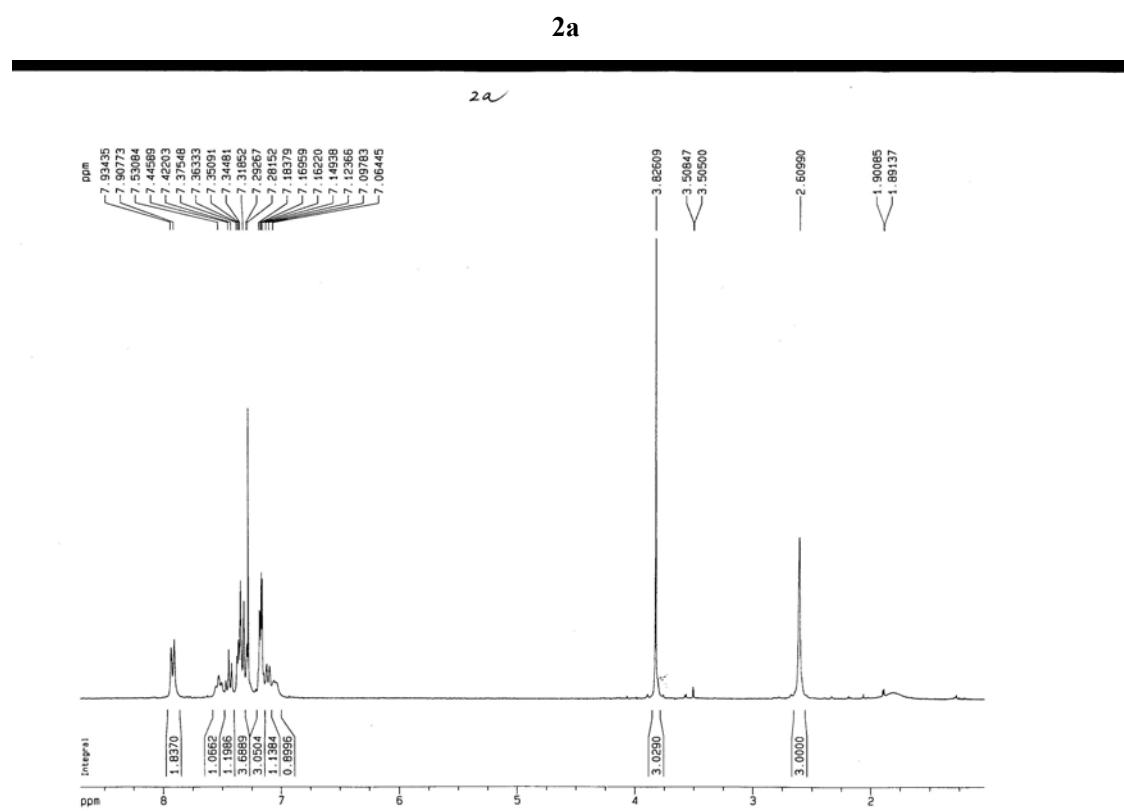
**2-Phenyl-3-(2-pyridinyl)oxiranecarboxylic acid (6e).** White solid, mp 178-180 °C (dec); IR (KBr) 3037, 2493 (br), 1725, 1647, 1618, 1496, 1410, 1303, 1231, 977, 865, 773, 684, 655, 624; <sup>1</sup>H NMR (300 MHz, DMSO-d<sub>6</sub>) δ 7.12 (s, 1H), 7.30 (m, 1H), 7.36-7.47 (m, 3H), 7.52-7.60 (m, 3H), 7.83 (td, *J* = 5.5 1.5 Hz, 1H), 8.56 (d, *J* = 4.5 Hz, H); MS *m/z* 224 (M-OH, 6.11), 208 (6.56), 181 (25.30), 180 (base), 179 (5.64), 178 (5.16), 152 (8.41), 102 (4.02), 90 (3.84), 79 (6.09), 78 (8.85), 77 (4.87), 52 (6.34), 51 (8.35). Anal. Calcd for C<sub>14</sub>H<sub>11</sub>NO<sub>3</sub> : C, 69.71; H, 4.56; N, 5.81. Found: C, 69.69; H, 4.62; N, 5.79.

**2-(2-Pyridinyl)maleic acid dimethyl ester (7f) or (8f)** Oil; IR (KBr) 3004, 2953, 1741, 1721, 1634, 1582, 1435, 1357, 1297, 1250, 1028, 1007, 892, 791, 750; <sup>1</sup>H NMR (300 MHz, CDCl<sub>3</sub>) δ 3.73 (s, 3H, OMe), 3.92 (s, 3H, OMe), 6.84 (s, 1H), 7.21-7.26 (ddd, *J* = 0.9, 4.8, 7.6 Hz, 1H), 7.39 (d, *J* = 7.9 Hz, 1H), 7.66 (td, *J* = 7.8, 1.8 Hz, 1H), 8.58 (m, 1H); MS *m/z* 221 (M<sup>+</sup>, 12.54), 206 (25.59), 190 (57.06), 162 (34.68), 133 (17.19), 130 (65.56), 117 (57.72), 105 (44.31), 104 (90.03), 103 (73.85), 91 (25.20), 78(base), 76 (75.00), 59 (41.81). Anal. Calcd for C<sub>11</sub>H<sub>11</sub>NO<sub>4</sub> : C, 59.73; H, 4.98; N, 6.33. Found: C, 59.75; H, 4.99; N, 6.31.

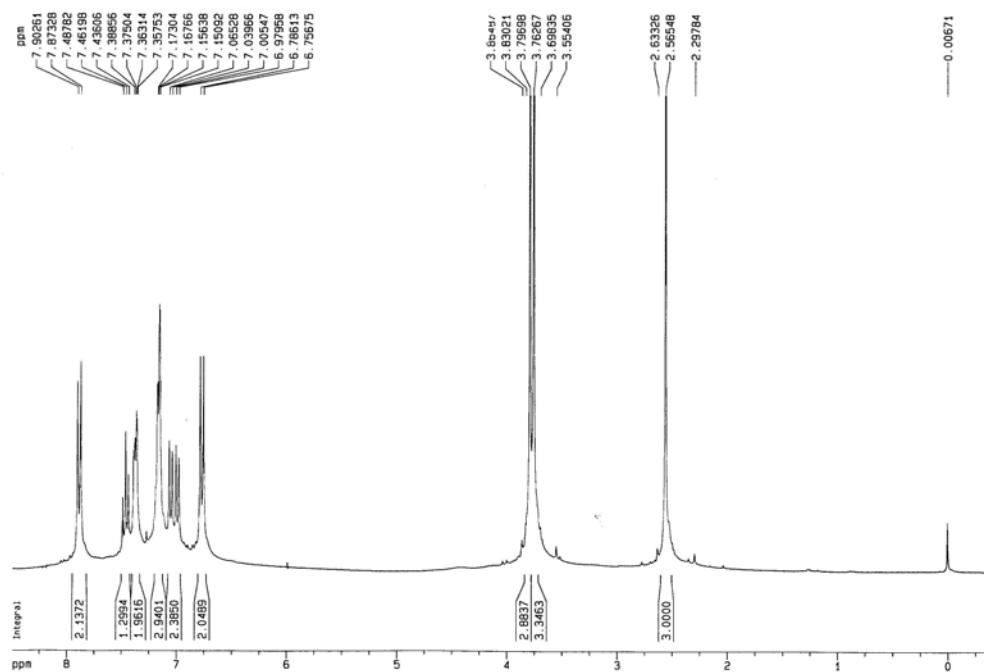
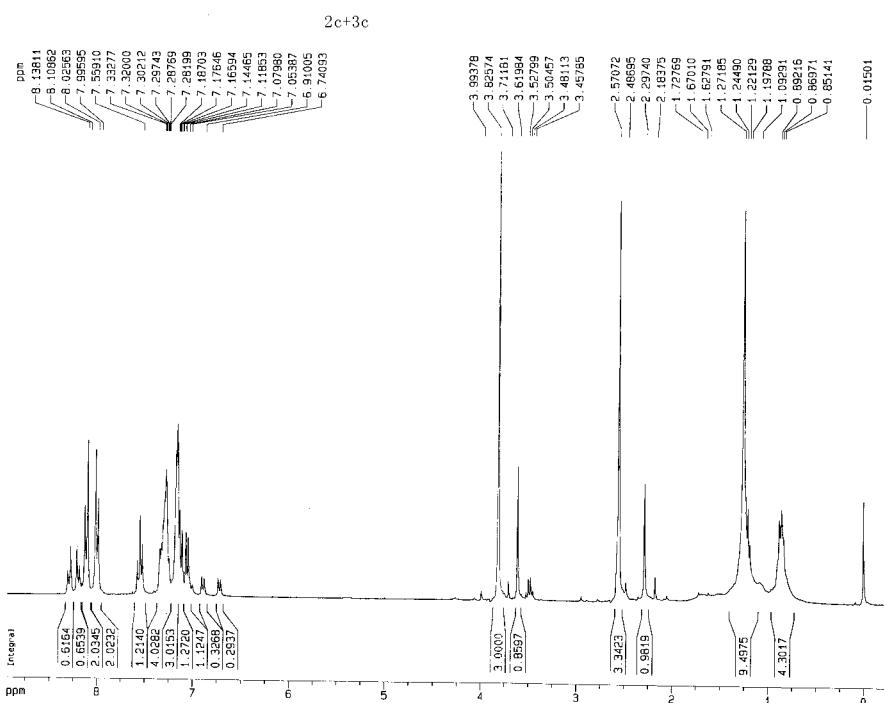
**3-Benzoyl-5-methoxyl-6-hydroxyindolizine-1-carboxylic acid methyl ester (9f)** Yellow crystals

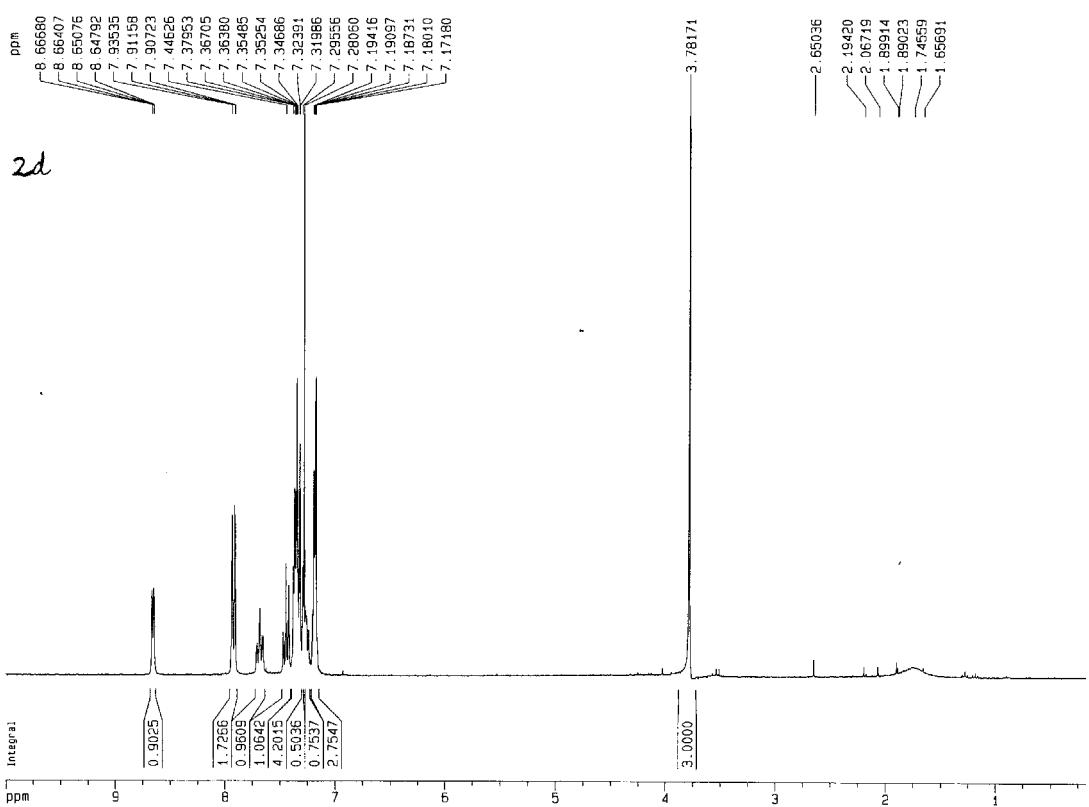
from petroleum ether – ethyl acetate mp 162 - 164 °C; IR (KBr) 3017, 1667, 1627, 1597, 1514, 1452, 1410, 1279, 1235, 1036, 909, 776, 755, 726, 702, 671; <sup>1</sup>H NMR (300MHz, CDCl<sub>3</sub>) δ 3.82 (s, 3H, OMe), 3.92 (s, 3H, OMe), 6.19 (d, *J* = 8.3 Hz, 1H), 6.81 (d, *J* = 8.3 Hz, 1H), 7.50-7.60 (m, 4H), 7.81 (dd, *J* = 1.5, 8.6 Hz, 2H), 11.1 (s, 1H); MS *m/z* 325 (M<sup>+</sup>, 50.63), 293 (16.62), 278 (base), 250 (22.71), 177 (30.83), 105 (20.27), 77 (30.95). Anal. Calcd for C<sub>18</sub>H<sub>15</sub>NO<sub>5</sub>: C, 66.46; H, 4.61; N, 4.31. Found: C, 66.43; H, 4.59; N, 4.29.

### 3. <sup>1</sup>HNMR (300MHz, CDCl<sub>3</sub>) of compounds 2-9(a-f)

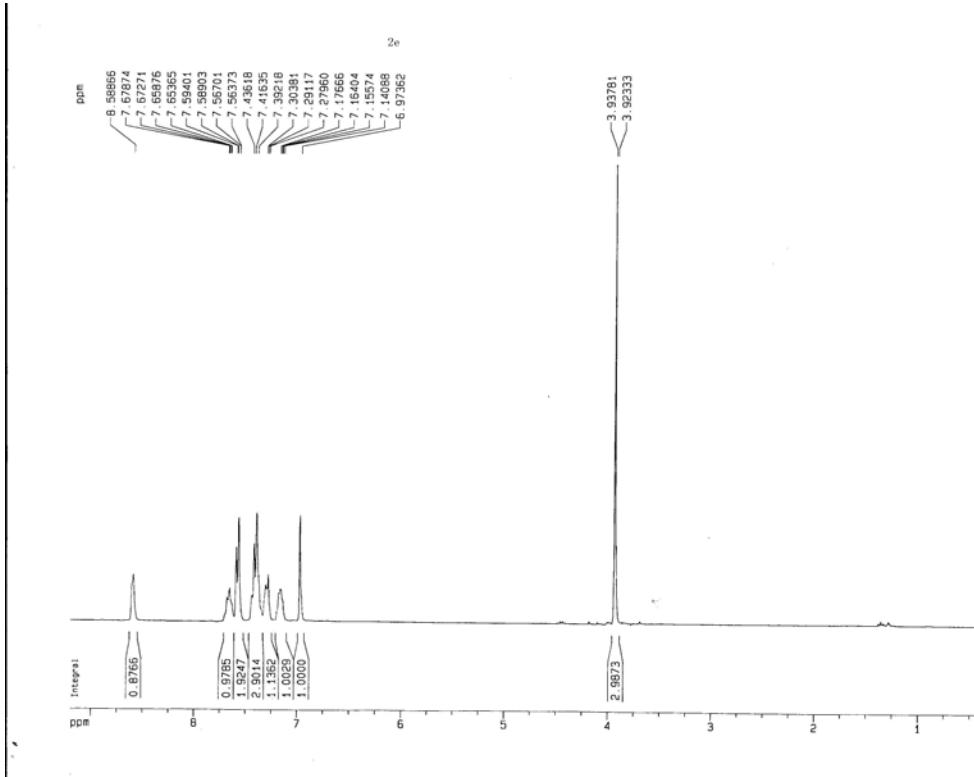


**2b**

**2c+3c****2d**

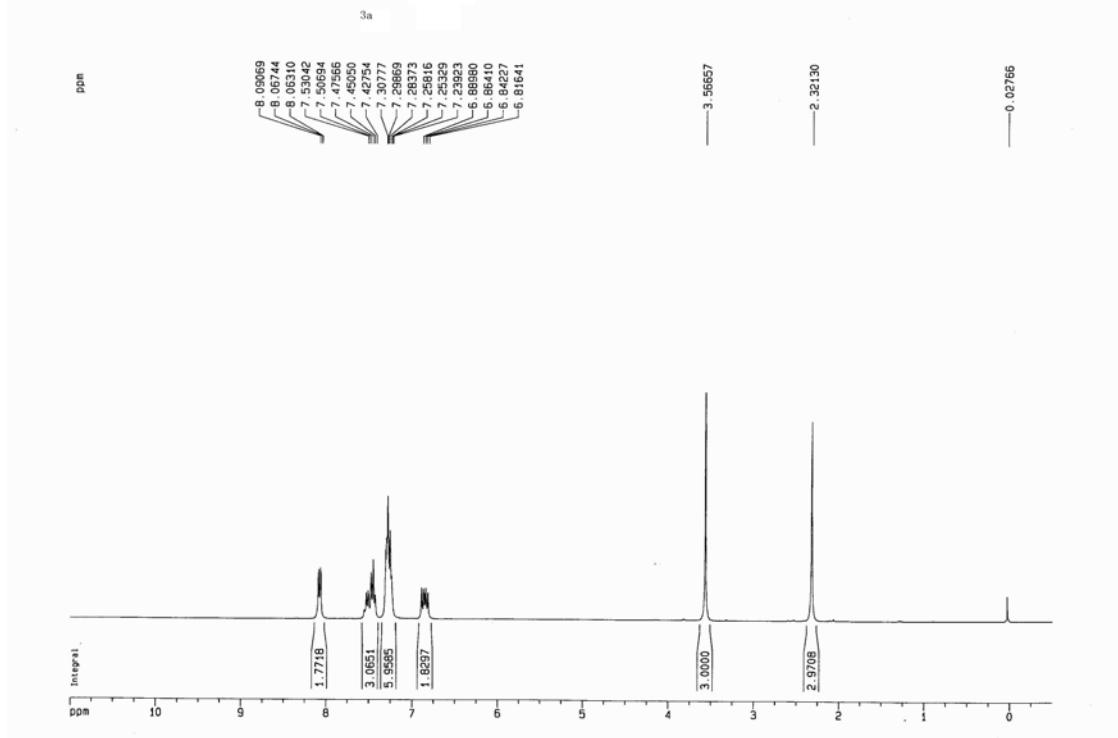


**2e**

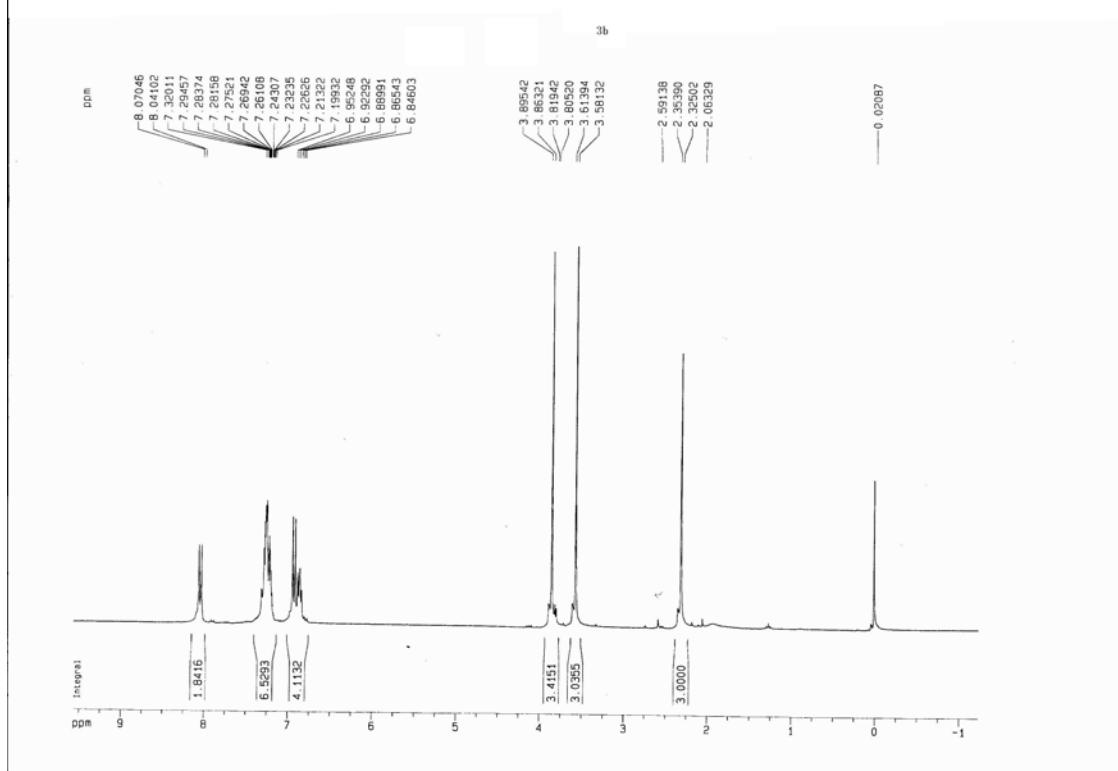


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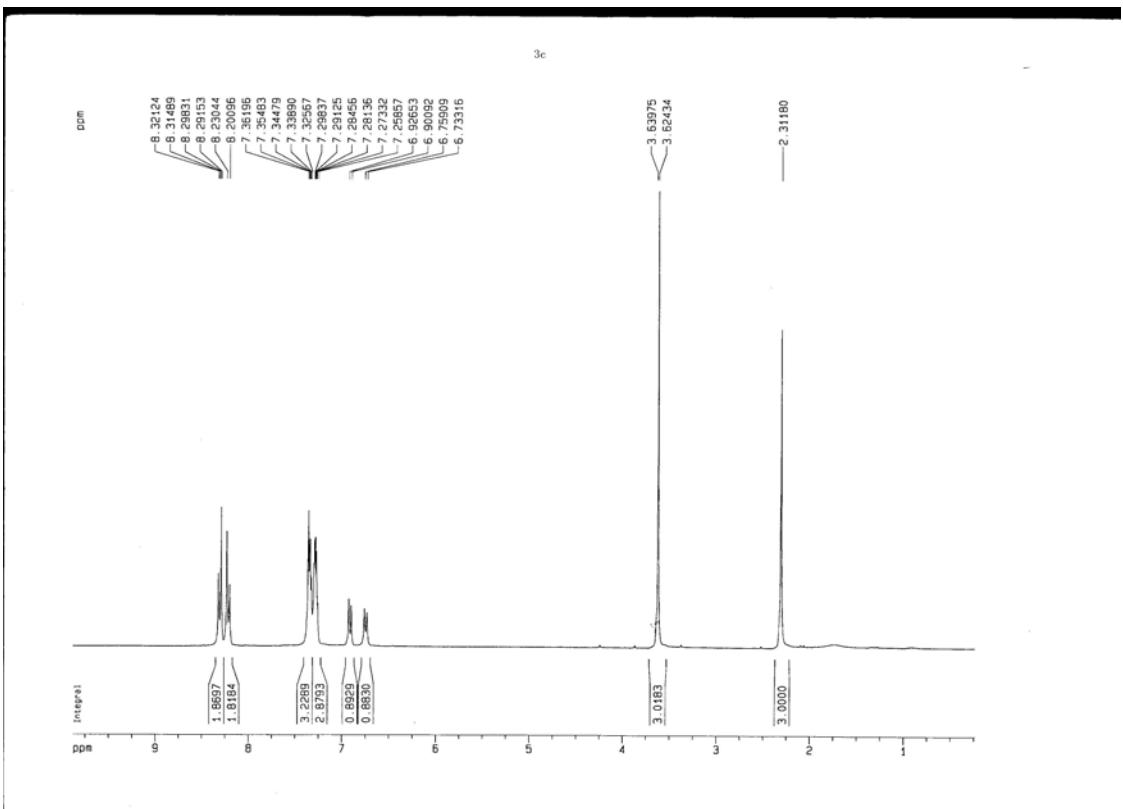
**3a**



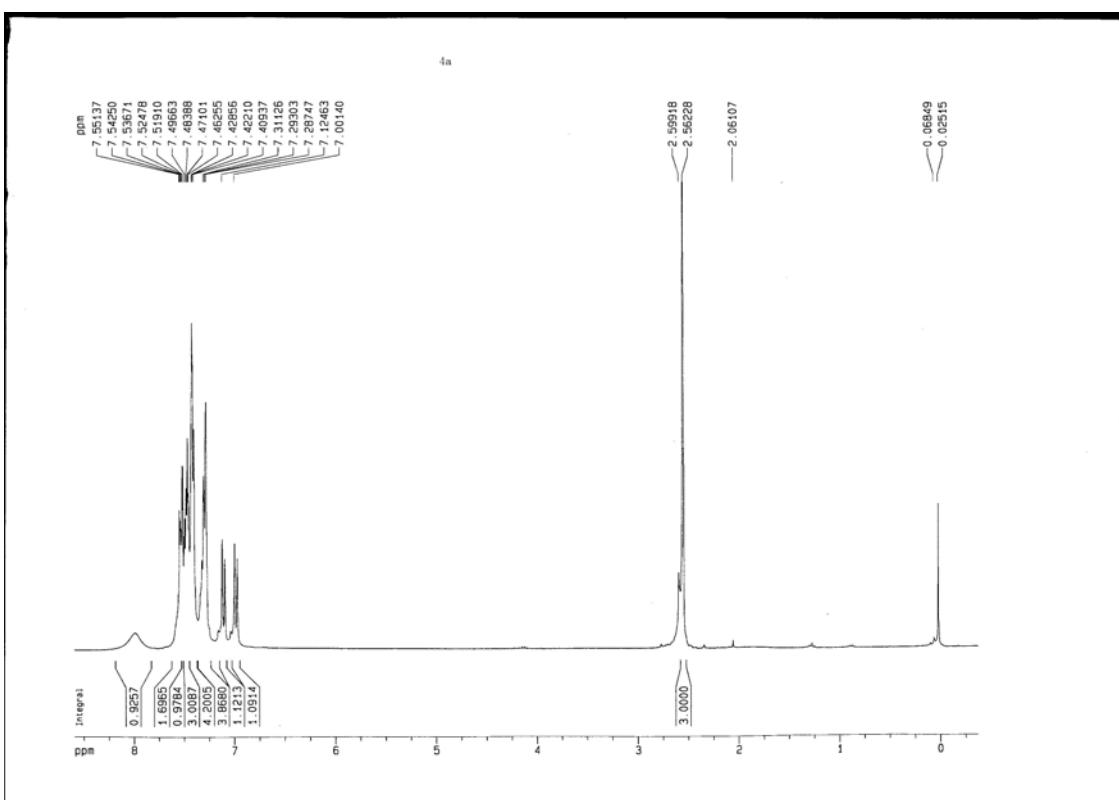
**3b**



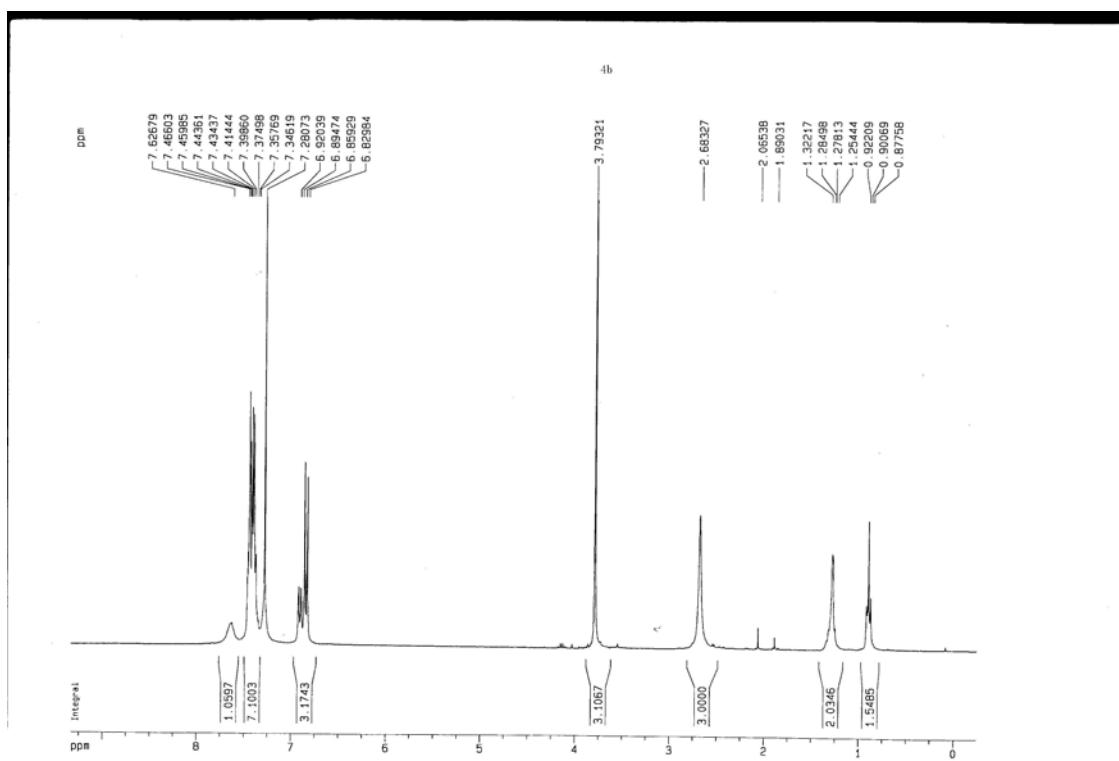
**3c**



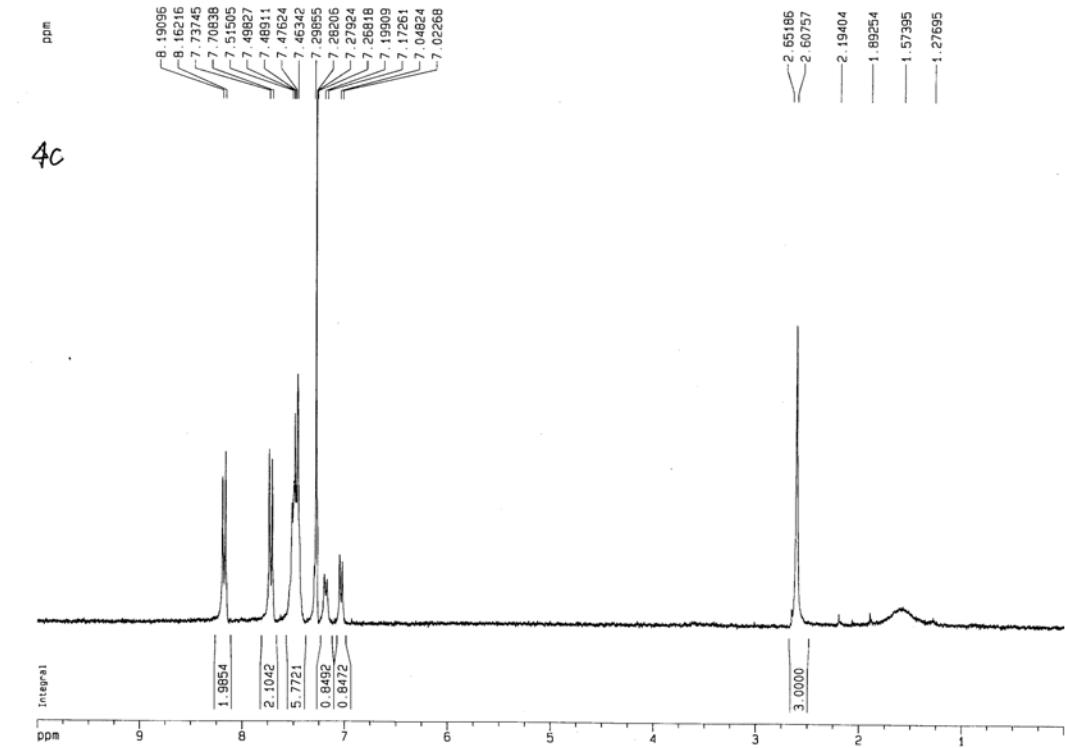
**4a**



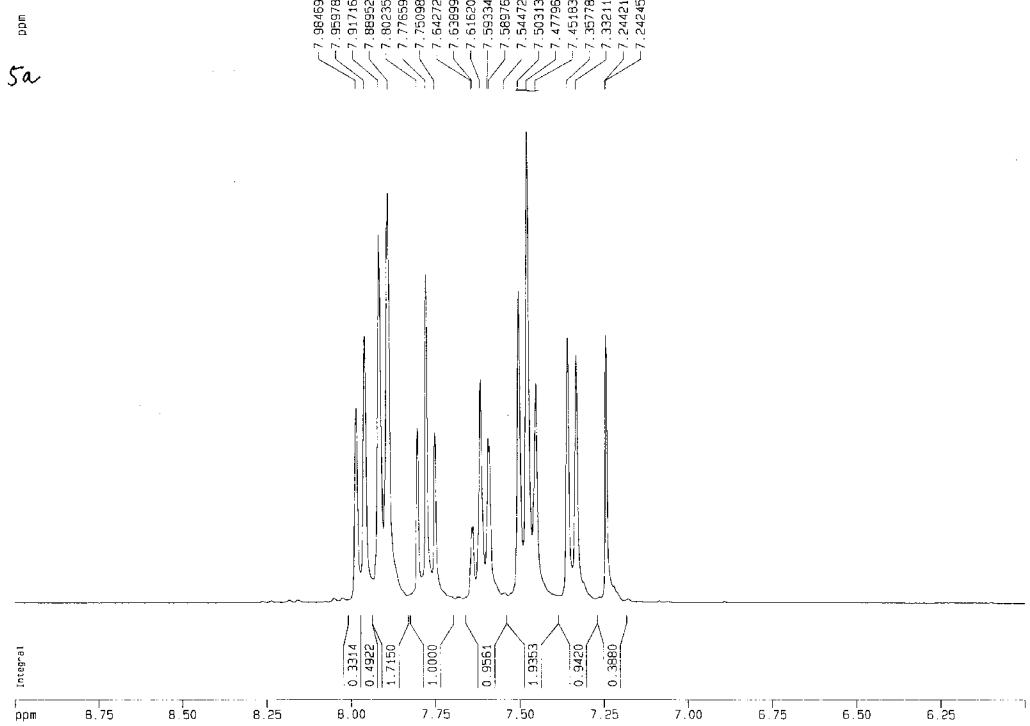
**4b**



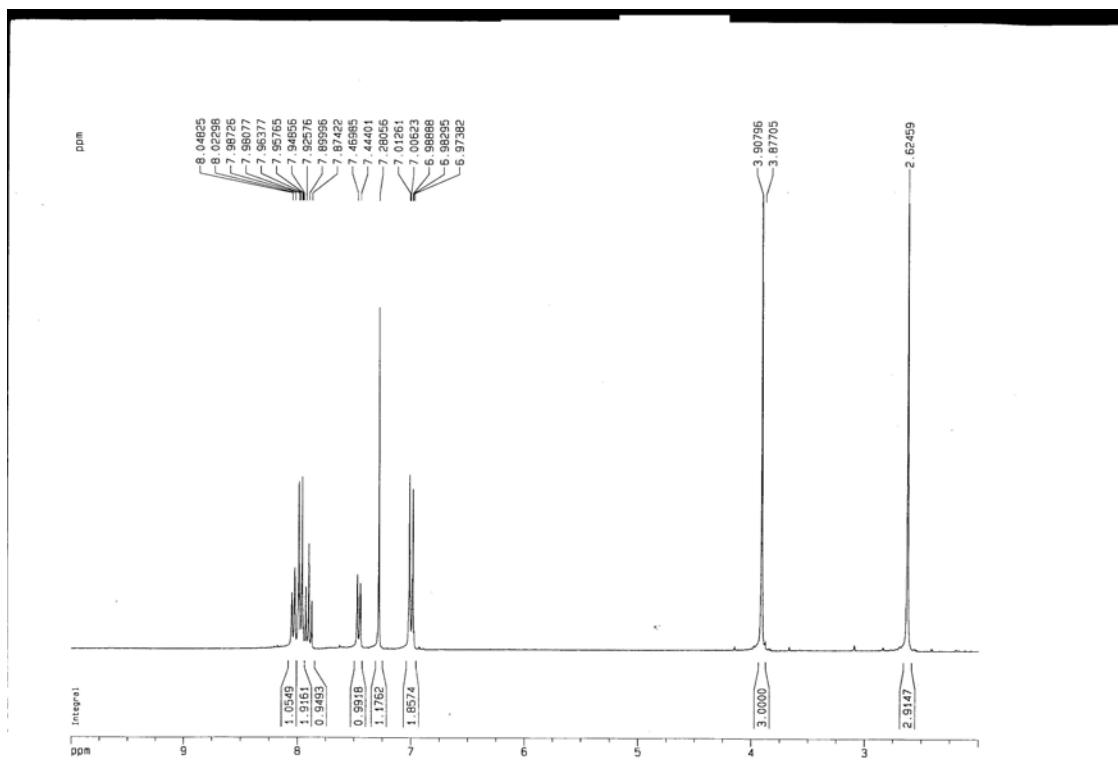
**4c**



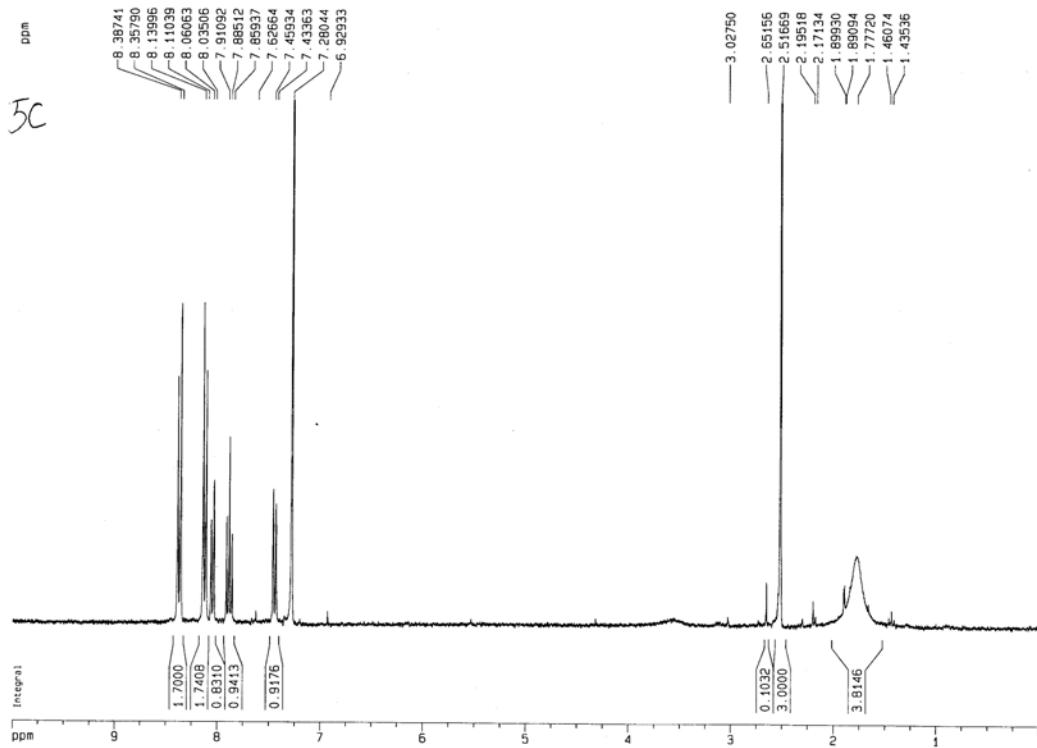
**5a**



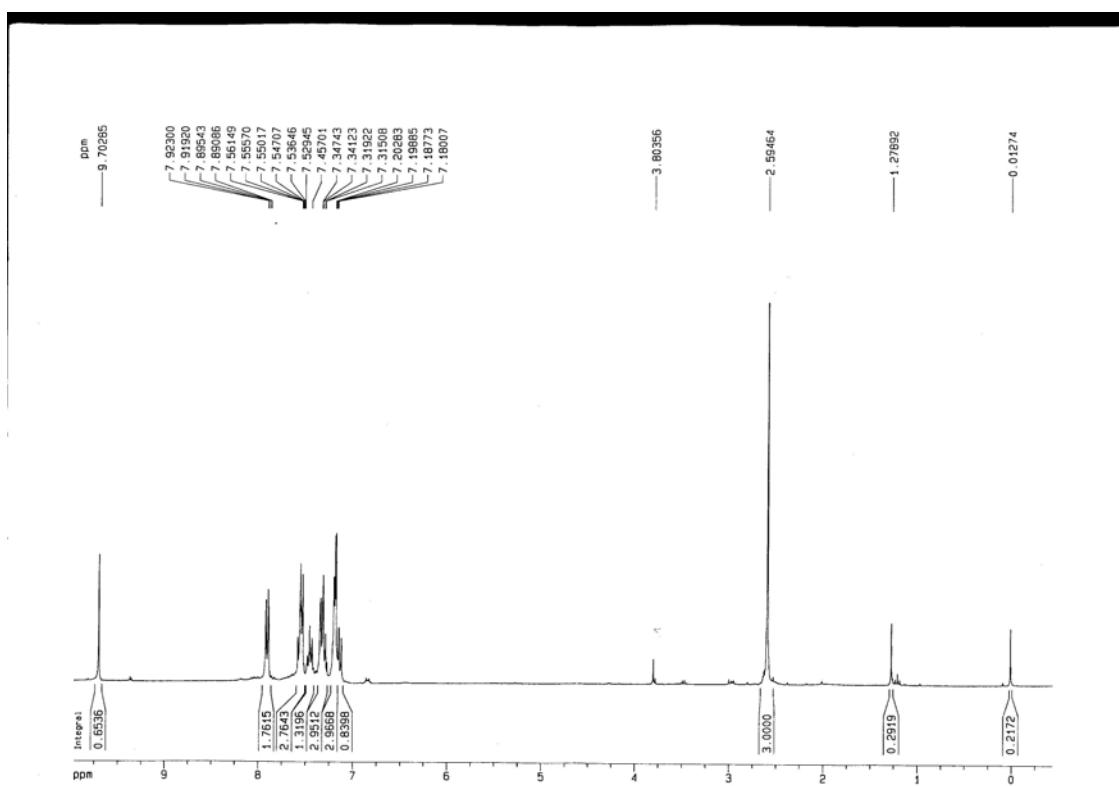
5b



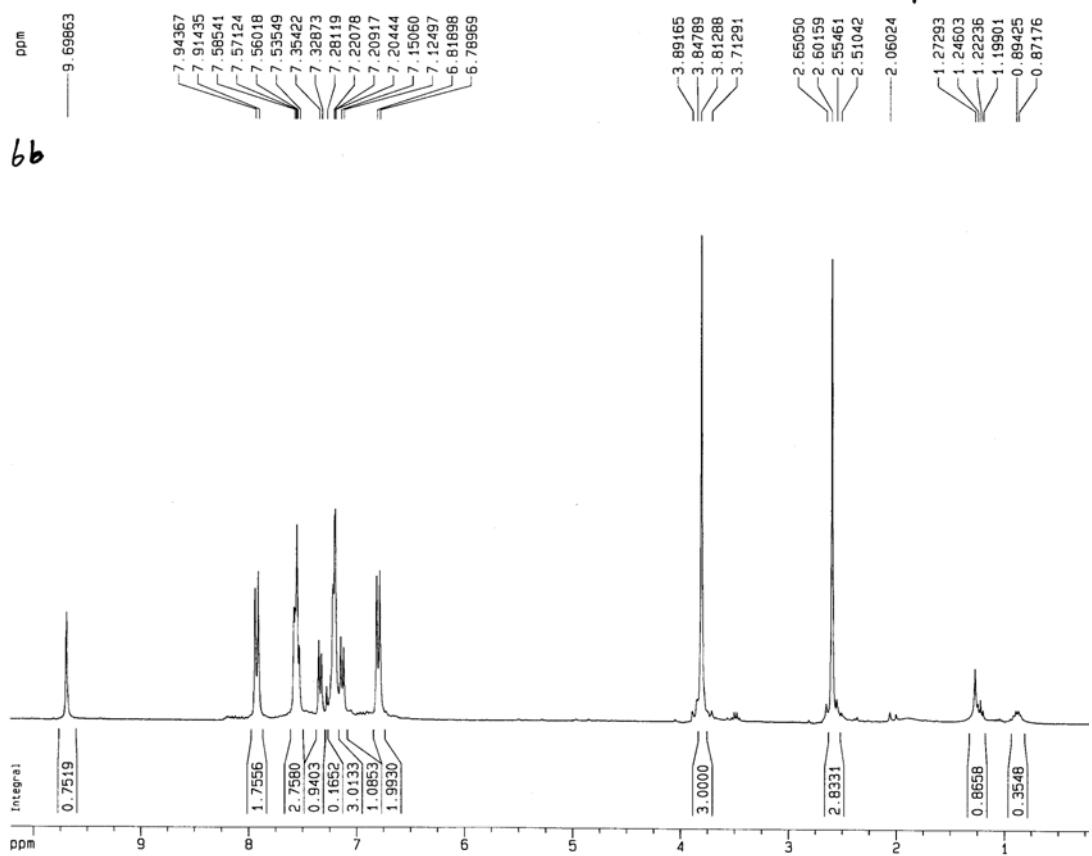
**5c**



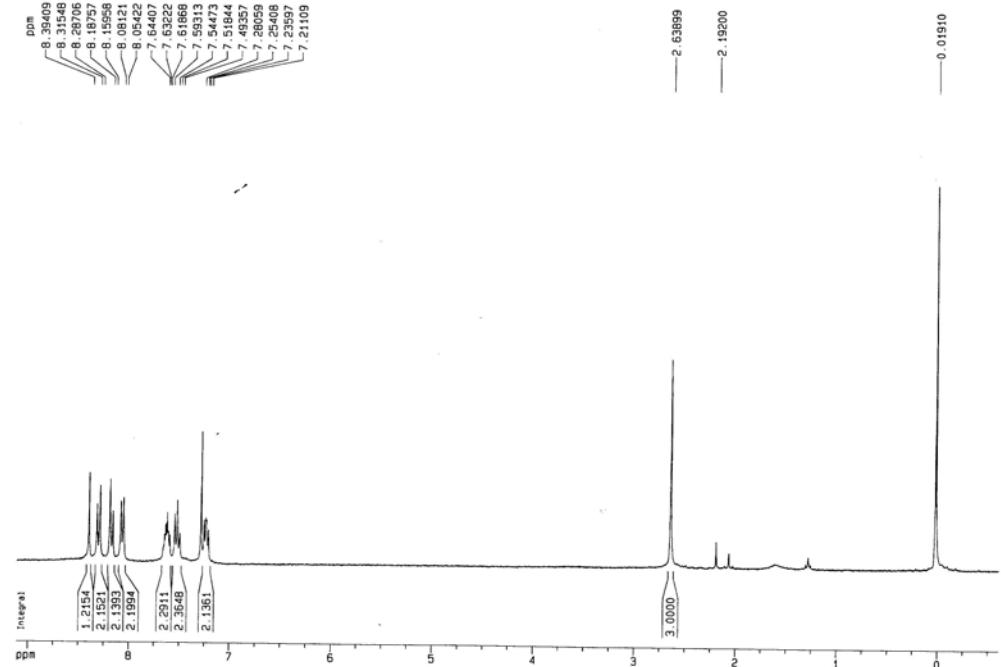
**6a**

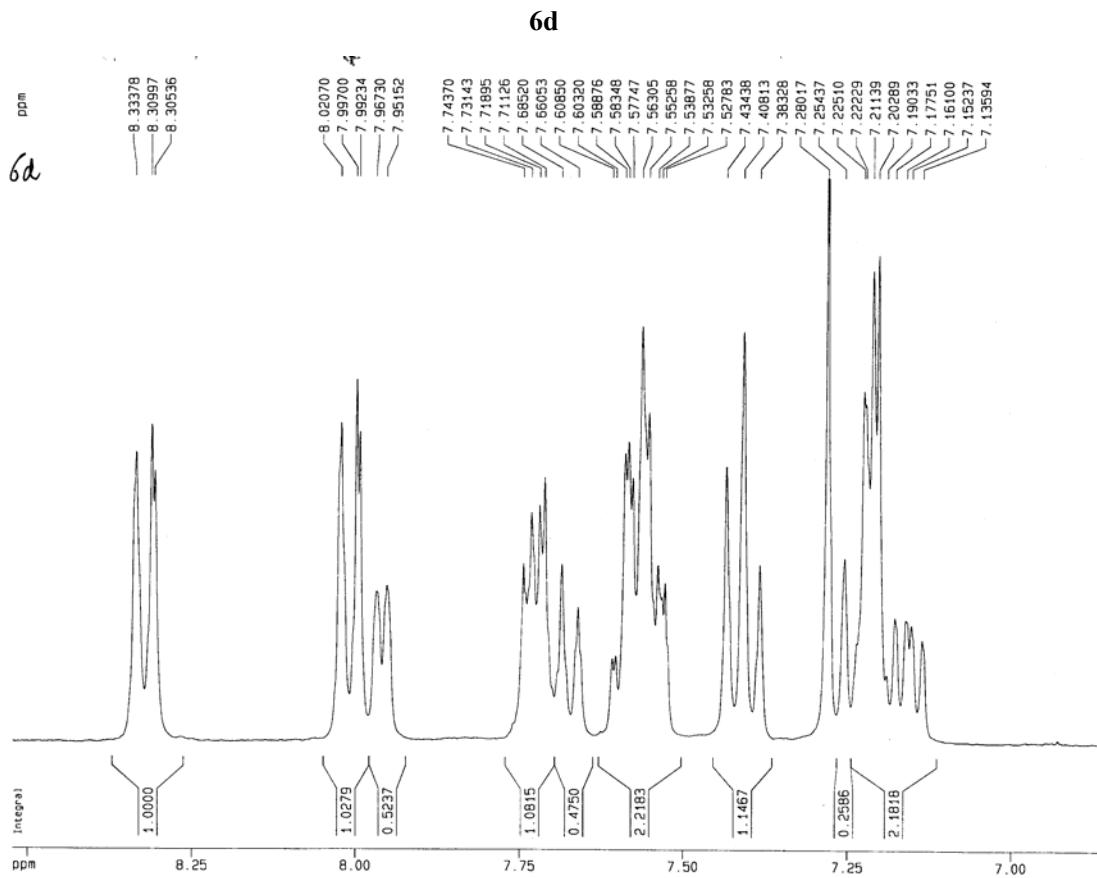


**6b**

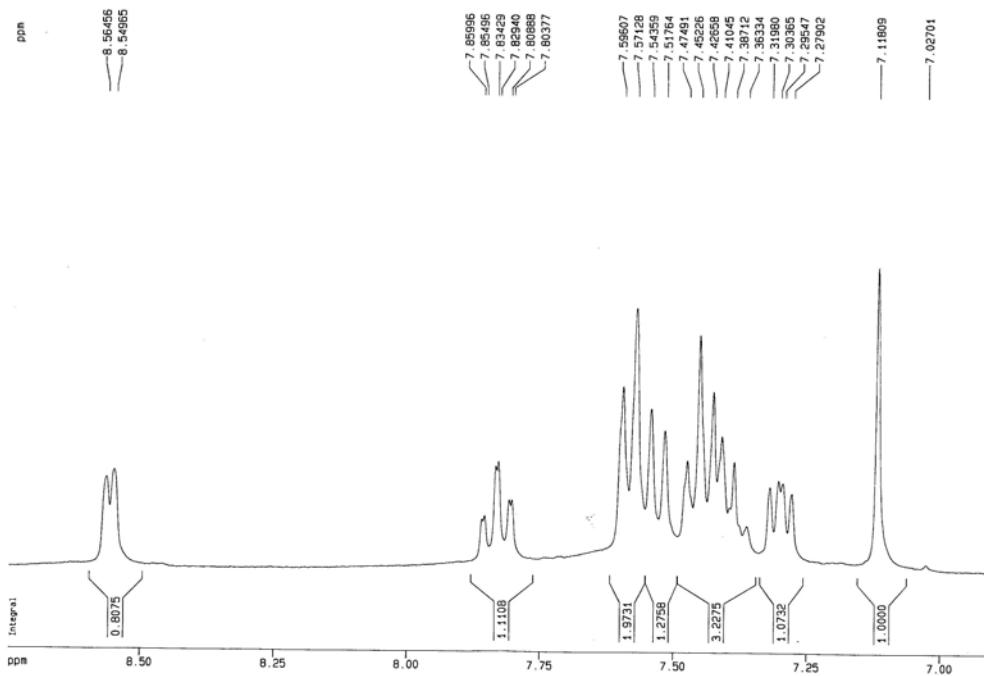


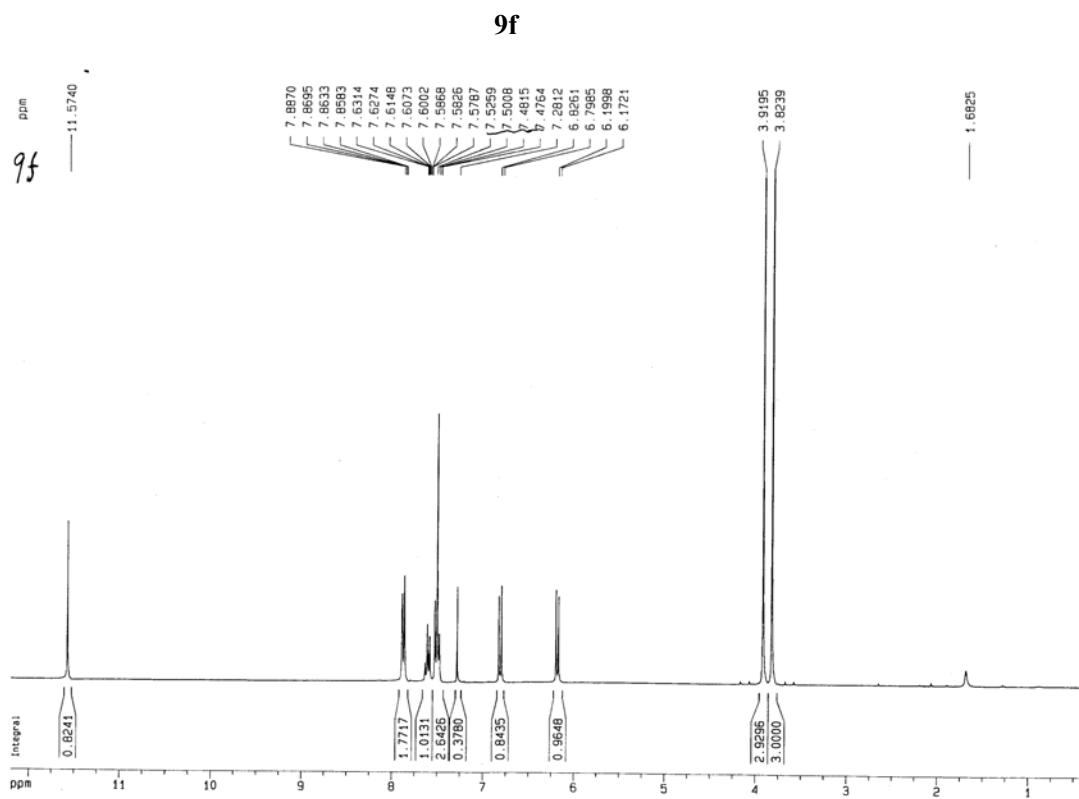
**6c**



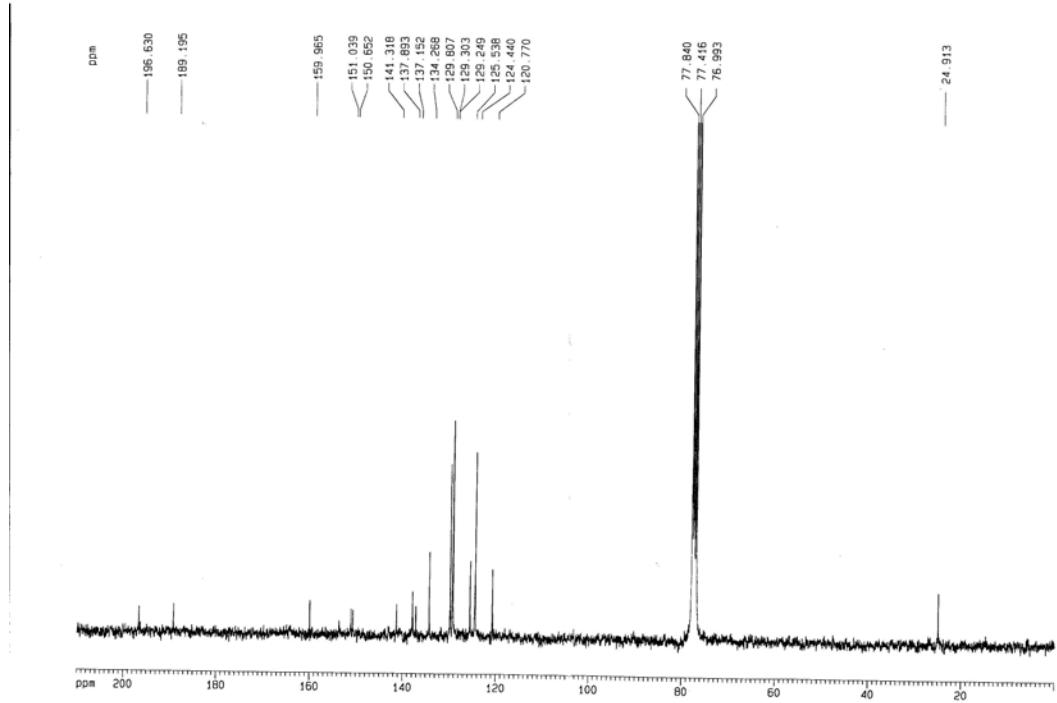


**6e**

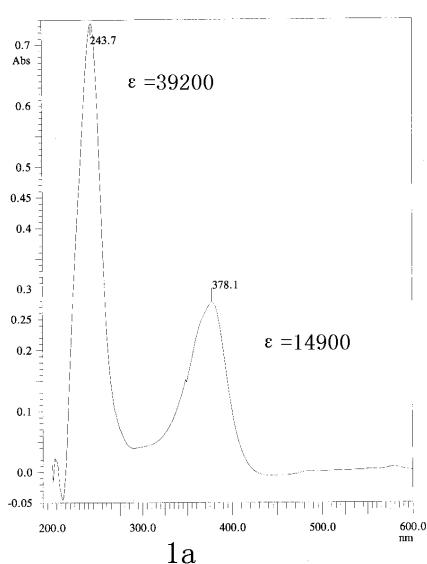




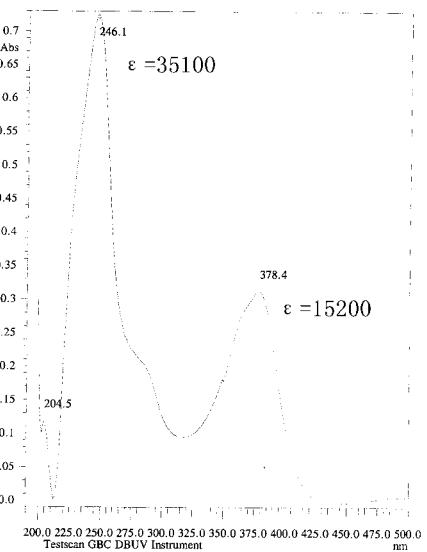
4.  $^{13}\text{C}$  NMR (75MHz,  $\text{CDCl}_3$ ) of compounds **6c**:



5. UV spectra of **1a**, **1b** and CTC spectra of **1a** in :



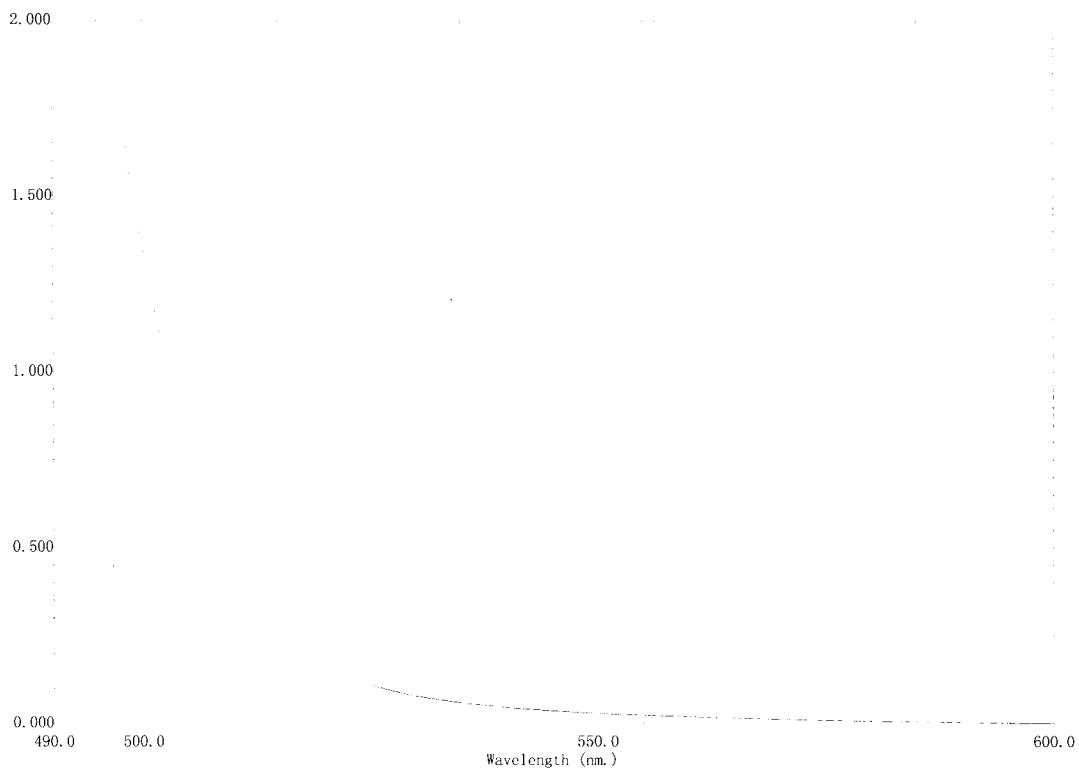
1a



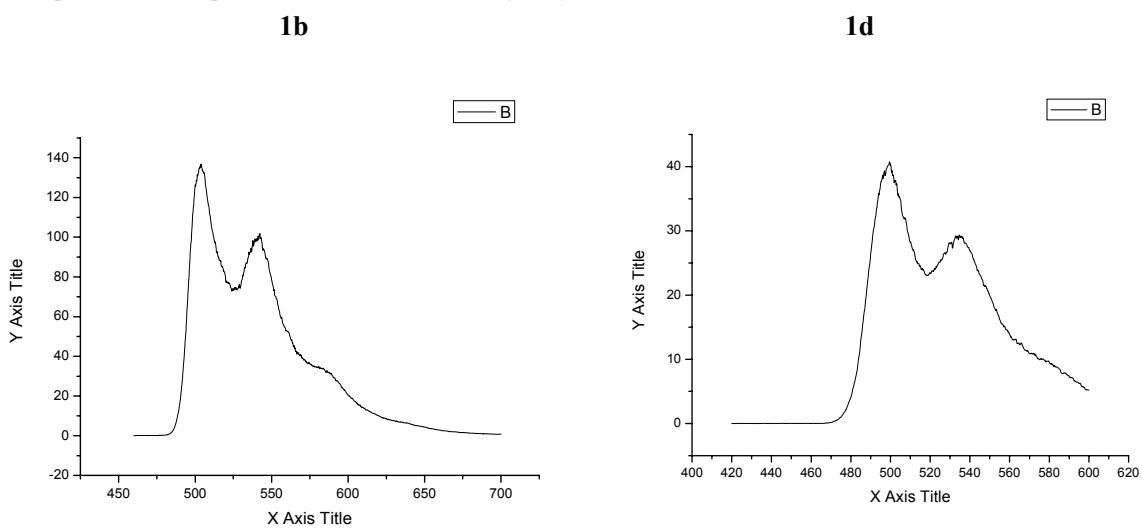
1b

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UV spectra of **1a** in oxygen free and oxygen saturated acetonitrile solution ( $[1a] \approx 0.028 \text{ mol/L}$ )



6. Phosphorescence spectra of **1b**, **1d** and **1f** in glassy acetonitrile at 77K:



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**1f**

