

High Regioselective C-H Bond Functionalization: Palladium-catalyzed Arylation of Substituted imidazo[1,2-a]pyridine with Aryl Chlorides

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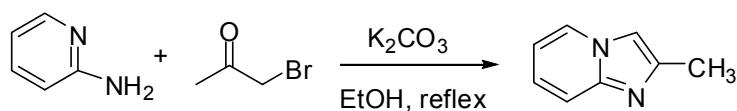
A. General method

General Methods. All the reactions were carried out under a sealed vessel at 120 °C for 24h. ¹H and ¹³C NMR spectra were recorded using a Bruker Avance 400 MHz NMR spectrometer. The chemical shifts are referenced to signals at 7.26 and 77.0 ppm, respectively, and chloroform is solvent with TMS as the internal standard. Mass spectra were recorded on a Shimadzu GCMS-QP5050A spectrometer at an ionization voltage of 70 eV equipped with a DB-WAX capillary column (internal diameter: 0.25 mm, length: 30 m). Elemental analyses were performed with a Vario EL elemental analyzer. TLC was performed by using commercially prepared 100–400 mesh silica gel plates (GF254) and visualization was effected at 254 nm.

B. General Procedure

Synthesis of 1a: 1a (Scheme 1) was easily prepared according to the following procedure:

Pyridin-2-amine (9.4g, 100 mmol) was dissolved in C₂H₅OH (20.0 mL), while K₂CO₃ (27.6, 200 mmol) and 1-bromopropan-2-one (27.2g, 200 mmol) were added at room temperature, respectively. Subsequently, the reaction mixture was refluxed for 20 h and cooled to room temperature, and then the solvent was removed to afford an oily residue. The water (100 mL) was added into residue. The aqueous solution was extracted with EtOAc (5×30 mL) and the combined extract was dried with anhydrous MgSO₄. The solvent was removed and the crude product was separated by column chromatography (eluted with petroleum ether : ethyl acetate=1: 1) to give a pure sample of **1a (yellow oil)**. ¹H NMR (400 MHz, CDCl₃): δ 7.98 (d, *J* = 6.8 Hz, 1H), 7.46 (d, *J* = 9.2 Hz, 1H), 7.29 (s, 1H), 7.06-7.10 (m, 1H), 6.67 (t, *J* = 6.4 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 147.7, 145.0, 143.3, 125.1, 123.9, 116.7, 111.7, 109.4, 14.3



Scheme 1

Synthesis of 3aa: A mixture of 2-methylimidazo[1,2-a]pyridine **1a** (66mg, 0.5 mmol), aryl chlorides **2a** (78.4mg, 0.7mmol), Pd(OAc)₂ (2.5 mol%), BuAd₂P(mol 10%) Cs₂CO₃ (1.5 mmol) in NMP (2 mL) is stirred for 24h at 120 °C. After completion of the reaction (monitored by TLC), 8 mL water was added. The aqueous solution was extracted with diethyl ether (3×8 mL) and the combined extract was dried with anhydrous MgSO₄. The solvent was removed and the crude product was separated by column chromatography (eluted with petroleum ether : ethyl acetate=2: 1) (R_f=0.24) to give a pure sample of **3aa** (yellow oil).

C. Analytical data for 3aa-3en.

2-methyl-3-phenylimidazo[1, 2-a]pyridine(3aa)

Yellow oil; IR (KBr) 3414, 1501, 1401, 1343, 1267, 751; ¹H NMR (400 MHz, CDCl₃): δ 8.49(d, *J* = 6.8 Hz, 1H), 7.66 (q, *J* = 7.2 Hz, 1H), 7.50 (s, 2H), 7.42 (t, *J* = 7.2, 3H), 7.11 (t, *J* = 8.0 Hz, 1H), 6.67 (t, *J* = 6.8 Hz, 1H), 2.47 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 144.4, 132.1, 132.0, 129.4, 129.2, 128.6, 128.1, 124.1, 123.0, 116.9, 111.9, 13.9; MS (EI) m/z (%): 208, 191, 151, 128, 102, 78, 77; Calcd. C, 80.74; H, 5.81; N, 13.45; Found: C, 80.29; H, 5.77; N, 13.36;

3-(4-fluorophenyl)-2-methylimidazo[1, 2-a]pyridine(3ab)

Yellow oil; IR (KBr) 3451, 1550; ¹H NMR (400 MHz, CDCl₃): δ 8.01(d, *J* = 6.0 Hz, 1H), 7.43-7.60 (m, 3H), 7.16-7.27 (m, 3H), 6.74 (t, *J* = 6.4 Hz, 1H), 2.45 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 163.7, 161.2, 144.5, 141.0, 131.5, 131.4, 124.2, 124.2, 122.8, 117.0, 116.4, 116.2, 112.1, 13.8; MS(EI)m/z(%): 226, 222, 207, 180, 157, 133, 79, 78, 51; Calcd. C, 74.32; H, 4.90; N, 12.38; Found: 74.81; H, 4.84; N, 12.30;

3-(3-fluorophenyl)-2-methylimidazo[1, 2-a]pyridine (3ac)

Yellow oil; IR (KBr) 3449, 1555; ^1H NMR (400 MHz, CDCl_3): δ 8.09 (d, $J = 7.8$ Hz, 1H), 7.07-7.46 (m, 4H), 7.15-7.18 (m, 2H), 6.74 (t, $J = 6.4$ Hz, 1H), 2.49 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 164.4, 161.9, 144.7, 141.4, 132.0, 130.7, 125.0, 124.4, 122.9, 117.0, 116.2, 115.1, 112.2, 13.9; MS(EI) m/z (%): 226, 207, 180, 133, 79, 78, 51; Calcd. C, 74.32; H, 4.90; N, 12.38; Found: C, 74.85; H, 4.85; N, 12.30;

3-(2-fluorophenyl)-2-methylimidazo[1, 2-a]pyridine(3ad)

Yellow oil; IR (KBr) 3447, 1552; ^1H NMR (400 MHz, CDCl_3): δ 7.80 (d, $J = 6.4$ Hz, 1H), 7.57 (d, $J = 8.8$ Hz, 1H), 7.41-7.45 (m, 2H), 7.15-7.32 (m, 3H), 6.74 (t, $J = 6.0$ Hz, 1H), 2.45 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 161.5, 159.1, 145.0, 142.3, 132.1, 132.0, 130.5, 130.4, 124.7, 124.3, 123.8, 116.8, 116.5, 116.2, 13.8; MS (EI) m/z (%): 226, 208, 205, 180, 140, 105, 103, 78, 77; Calcd. C, 74.32; H, 4.90; N, 12.38; Found: C, 74.84; H, 4.86; N, 12.31;

2-methyl-3-(m-tolyl)imidazo[1, 2-a]pyridine (3ae)

Yellow oil; IR (KBr) 3442, 1504, 795; ^1H NMR (400 MHz, CDCl_3): δ 8.08 (d, $J = 7.2$ Hz, 1H), 7.54 (d, $J = 9.2$ Hz, 1H), 7.40 (t, $J = 7.6$, 1H), 7.23 (t, $J = 6.8$, 3H), 7.12 (t, $J = 8.0$ Hz, 1H), 6.68 (t, $J = 6.8$ Hz, 1H), 2.48 (s, 3H), 2.42 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.4, 140.7, 138.8, 130.0, 129.0, 128.9, 126.5, 124.0, 123.1, 121.5, 116.8, 111.8, 21.5, 13.9; MS (EI) m/z (%): 222, 207, 191, 144, 77; Calcd. C, 81.05; H, 6.35; N, 12.60; Found: 81.52; H, 6.31; N, 12.49;

2-methyl-3-(o-tolyl)imidazo[1, 2-a]pyridine (3af)

Yellow oil; IR (KBr) 3445, 1500, 754; ^1H NMR (400 MHz, CDCl_3): δ 7.56 (q, $J = 7.2$ Hz, 2H), 7.26-7.38 (m, 4H), 7.14 (t, $J = 8.0$, 1H), 6.68 (t, $J = 6.8$, 1H), 2.34 (s, 3H), 2.06 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.4, 140.8, 139.0, 131.7, 130.6, 129.2, 128.3, 126.4, 123.9, 123.4, 116.8, 111.8, 19.4, 13.7; MS (EI) m/z (%): 222, 207, 180, 144, 128, 103, 78, 77; Calcd. C, 81.05; H, 6.35; N, 12.60; Found: C, 80.58; H, 6.39; N, 12.71;

2-methyl-3-(p-tolyl)imidazo[1, 2-a]pyridine (3ag)

Yellow oil; IR (KBr) 3440, 1498, 750; ¹H NMR (400 MHz, CDCl₃): δ 8.03 (d, *J* = 6.8 Hz, 1H), 7.53 (d, *J* = 8.8 Hz, 1H), 7.31 (s, 4H), 7.10 (t, *J* = 7.6, 1H), 6.66 (t, *J* = 6.4 Hz, 1H), 2.46 (s, 3H), 2.42 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 144.3, 140.6, 138.0, 129.8, 129.4, 129.3, 126.4, 123.9, 123.0, 121.4, 116.8, 111.8, 21.3, 13.8; MS(EI)m/z(%): 222, 207, 191, 165, 149, 132, 73; Calcd. C, 81.05; H, 6.35; N, 12.60; Found: C, 81.49; H, 6.40; N, 12.47;

3-(4-(tert-butyl)phenyl)-2-methylimidazo[1, 2-a]pyridine(3ah)

Yellow oil; IR (KBr) 3453, 2894, 1495; ¹H NMR (400 MHz, CDCl₃): δ 8.10 (d, *J* = 7.2 Hz, 1H), 7.68 (d, *J* = 7.2 Hz, 1H), 7.54 (d, *J* = 8.0, 2H), 7.38 (d, *J* = 8.4, 2H), 7.13 (t, *J* = 8.0 Hz, 1H), 6.69 (t, *J* = 6.8 Hz, 1H), 2.48 (s, 3H), 1.39 (s, 9H); ¹³C NMR (100 MHz, CDCl₃): δ 151.2, 144.3, 140.7, 132.1, 129.1, 128.6, 126.1, 124.0, 123.2, 116.9, 111.8, 34.8, 31.3, 13.9; MS (EI) m/z (%): 264, 249, 207, 205, 147, 110, 105, 77; Calcd.C, 81.78; H, 7.63; N, 10.60; Found: C, 81.24; H, 7.68; N, 10.67;

3-(2-ethylphenyl)-2-methylimidazo[1, 2-a]pyridine (3ai)

Yellow oil; IR (KBr) 3440, 1674, 1500; ¹H NMR (400 MHz, CDCl₃): δ 7.54-7.69 (m, 1H), 7.46 (t, *J* = 6.0 Hz, 4H), 7.24 (d, *J* = 7.2, 1H), 7.15 (t, *J* = 7.6, 1H), 6.69 (t, *J* = 6.4 Hz, 1H), 2.49 (s, 3H), 2.36 (s, 3H), 1.00(t, *J* = 6.8, 3H); ¹³C NMR(100 MHz, CDCl₃): δ 145.4, 141.0, 132.2, 132.1, 129.7, 129.1, 128.6, 128.5, 126.5, 123.8, 123.3, 116.8, 111.8, 26.3, 15.4, 13.7; MS(EI)m/z(%): 236, 221, 208, 180, 166, 143, 142, 115, 77; Calcd.C, 81.32; H, 6.82; N, 11.85; Found: C, 81.90; H, 6.78; N, 11.90;

4-(2-methylimidazo[1, 2-a]pyridin-3-yl)benzotrile (3aj)

Yellow oil; IR (KBr) 3422, 2226, 1640, 1538; ¹H NMR (400 MHz, CDCl₃): δ 8.13 (d, *J* = 6.8, 1H), 7.82 (d, *J* = 6.8 Hz, 2H), 7.60 (d, *J* = 7.2, 2H), 7.46 (d, *J* = 7.2, 1H), 7.23 (t, *J* = 8.4 Hz, 1H), 6.81 (t, *J* = 6.8, 1H), 2.51 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 145.2, 142.5, 133.0, 132.1, 129.4, 128.6, 125.1, 122.7, 118.5, 117.3, 112.7, 111.3, 14.1; MS(EI)m/z(%): 233, 207, 205, 131, 103, 77; Calcd.C, 77.23; H, 4.75; N, 18.01;

Found: Calcd.C, 77.71; H, 4.80; N, 17.91;

2-methyl-3-(naphthalen-1-yl)imidazo[1, 2-a]pyridine (3ak)

Yellow oil; IR (KBr) 3450, 1621; ¹H NMR (400 MHz, CDCl₃): δ 7.96 (t, *J* = 8.8 Hz, 2H), 7.57-7.65 (m, 2H), 7.50 (q, *J* = 6.8, 3H), 7.32-7.40 (m, 2H), 7.14 (q, *J* = 8.0 Hz, 1H), 6.58 (t, *J* = 6.8 Hz, 1H), 2.38 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 144.7, 142.1, 134.0, 132.3, 129.7, 129.6, 128.8, 126.9, 126.3, 125.7, 125.2, 124.0, 123.8, 116.8, 111.7, 13.9; MS (EI) *m/z* (%): 258, 223, 207, 183, 152, 128, 105, 79, 77; Calcd. C, 83.69; H, 5.46; N, 10.84; Found: C, 83.14; H, 5.50; N, 10.91;

3-(4-chlorophenyl)-2-methylimidazo[1, 2-a]pyridine (3al)

Yellow oil; IR (KBr) 3450, 1643, 1494, 749; ¹H NMR (400 MHz, CDCl₃): δ 8.03(d, *J* = 6.8 Hz, 1H), 7.51(q, *J* = 5.2 Hz, 3H), 7.40 (d, *J* = 7.2 Hz, 2H), 7.16 (t, *J* = 8.4 Hz, 1H), 6.73 (t, *J* = 6.8 Hz, 1H), 2.45 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 144.7, 141.3, 134.1, 132.1, 130.9, 130.7, 129.5, 128.5, 124.3, 122.9, 117.1, 112.2, 13.9; MS(EI)*m/z*(%): 242, 235, 207, 192, 164, 115, 103, 78, 77; Calcd.C, 69.28; H, 4.57; N, 11.54; Found C, 68.85; H, 4.54; 11.61;

6-chloro-3-(3-fluorophenyl)-2-methylimidazo[1, 2-a]pyridine(3bc)

Yellow oil; IR (KBr) 1635, 1384, 748; ¹H NMR (400 MHz, CDCl₃): δ 8.09 (s, 1H), 7.51 (t, *J* = 9.6 Hz, 1H), 7.36 (t, *J* = 8.8 Hz, H), 7.23 (t, *J* = 7.6 Hz, 1H), 7.15 (q, *J* = 6.8 Hz, 2H), 6.44 (t, *J* = 8.8 Hz, 1H), 2.45(s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 164.4, 162.0, 156.8, 146.4, 137.5, 131.1, 125.7, 125.0, 120.9, 117.4, 116.1, 115.6, 109.4, 13.9; MS(EI)*m/z*(%): 260, 226, 223, 207, 205, 158, 133, 112, 105, 78, 77; Calcd.C, 64.50; H, 3.87; N, 10.75; Found: C, 65.00; H, 3.90; N, 10.64;

6-chloro-2-methyl-3-(*m*-tolyl)imidazo[1, 2-a]pyridine(3be)

Yellow oil; IR (KBr) 1638, 1385; ¹H NMR (400 MHz, CDCl₃): δ 8.091 (s, 1H), 7.44-7.58 (m, 2H), 7.27 (q, *J* = 7.6 Hz, 3H), 7.12 (t, *J* = 9.2 Hz, 1H), 2.46 (s, 6H); ¹³C NMR (100 MHz, CDCl₃): δ 146.5, 139.2, 137.5, 130.0, 129.4, 129.4, 129.2, 126.5,

125.2, 121.0, 117.2, 21.5, 13.9; MS(EI)m/z(%): 256, 241, 219, 207, 165, 127, 115, 78, 76; Calcd.C, 70.18; H, 5.10; N, 10.91; Found: C, 70.72; H, 5.06; N, 10.83;

3-(4-(tert-butyl)phenyl)-6-chloro-2-methylimidazo[1, 2-a]pyridine(3bh)

Yellow oil; IR (KBr) 2960, 1383, 745; ¹H NMR (400 MHz, CDCl₃):δ 8.13 (s, 1H), 7.58 (t, *J* = 7.2 Hz, 3H), 7.39 (t, *J* = 7.2 Hz, 2H), 7.12 (t, *J* = 9.2 Hz, 1H), 2.47 (s, 3H), 1.40 (s, 9H); ¹³C NMR (100 MHz, CDCl₃):δ 151.7, 146.4, 137.5, 132.0, 131.9, 129.2, 126.3, 125.2, 121.0, 120.2, 117.2, 34.8, 31.3, 13.9; MS(EI)m/z(%): 298, 283, 248, 207, 191, 139, 128, 77; Calcd.C, 72.35; H, 6.41; N, 9.37; Found: C, 72.81; H, 6.36; N, 9.30;

3-phenyl-2-(trifluoromethyl)imidazo[1, 2-a]pyridine(3ca)

Yellow liquid, IR (KBr) 1166, 1123, 759; ¹H NMR (400 MHz, CDCl₃):δ 7.94 (d, *J* = 6.8, 1H), 7.70 (d, *J* = 8.8 Hz, 1H), 7.51-7.57 (m, 3H), 7.47 (t, *J* = 6.0, 2H), 7.28 (q, *J* = 8.4 Hz, 1H), 6.48 (t, *J* = 7.2, 1H); ¹³C NMR (100 MHz, CDCl₃):δ 144.3, 130.3, 129.8, 129.2, 126.7, 126.5, 126.4, 124.0, 118.7, 113.9, 113.8; MS(EI)m/z(%):262, 241, 193, 77, 51;Calcd.C, 64.12; H, 3.46; N, 10.68; Found: C, 64.57; H, 3.43; N, 10.60;

3-(m-tolyl)-2-(trifluoromethyl)imidazo[1, 2-a]pyridine(3ce)

Yellow liquid; IR (KBr) 1164, 1124; ¹H NMR (400 MHz, CDCl₃):δ 7.90 (d, *J* = 6.8, 1H), 7.64 (d, *J* = 9.2 Hz, 1H), 7.38 (t, *J* = 7.6, 1H), 7.21-7.29 (m, 4H), 6.79 (t, *J* = 6.8 Hz, 1H), 2.39 (s, 3H); ¹³C NMR (100 MHz, CDCl₃):δ 144.3, 139.0, 130.8, 130.6, 129.0, 127.4, 126.6, 126.2, 124.1, 118.7, 113.8, 21.4; MS (EI) m/z (%): 276, 248, 221, 207, 183, 118, 78; Calcd.C, 65.21; H, 4.01; N, 10.14; Found: C, 65.65; H, 4.07; N, 10.02;

3-(4-(tert-butyl)phenyl)-2-(trifluoromethyl)imidazo[1, 2-a]pyridine(3ch)

White solid, Mp: 132-133°C; IR (KBr) 2961, 1641, 1384, 1163, 1120; ¹H NMR (400 MHz, CDCl₃):δ 8.01 (d, *J* = 6.8 Hz, 1H), 7.73 (d, *J* = 9.2 Hz, 1H), 7.58 (d, *J* = 8.0 Hz,

2H), 7.42 (d, $J = 8.0$ Hz, 2H), 7.31 (q, $J = 8.0$ Hz, 1H), 6.84 (t, $J = 6.8$ Hz, 1H), 1.40 (s, 9H); ^{13}C NMR (100 MHz, CDCl_3): δ 152.9, 144.2, 130.0, 126.3, 126.1, 124.2, 123.6, 118.7, 113.6, 53.4, 34.9, 31.3; MS(EI) $m/z(\%)$: 318, 303, 275, 138, 77, 51; Calcd. C, 67.91; H, 5.38; N, 8.80; Found: C, 68.45; H, 5.33; N, 8.74;

3-(2-ethylphenyl)-2-(trifluoromethyl)imidazo[1, 2-a]pyridine(3ci)

Yellow liquid, IR (KBr) 1510, 1165, 1125; ^1H NMR (400 MHz, CDCl_3): δ 7.73 (d, $J = 9.2$ Hz, 1H), 7.41-7.56 (m, 1H), 7.35-7.38 (m, 2H), 7.26-7.34 (m, 3H), 6.82-6.85 (m, 1H), 2.34-2.41 (m, 1H), 2.23-2.29 (m, 1H), 1.02 (t, $J = 7.6$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 145.0, 139.2, 131.9, 130.6, 129.0, 126.5, 126.2, 125.4, 124.1, 118.7, 113.8, 26.1, 15.0; MS(EI) $m/z(\%)$: 290, 272, 246, 196, 184, 77; Calcd. C, 66.20; H, 4.51; N, 9.65; Found: Calcd. C, 66.71; H, 4.48; N, 9.59;

3-(4-chlorophenyl)-2-(trifluoromethyl)imidazo[1, 2-a]pyridine(3cl)

White solid, Mp: 102-104 °C; IR (KBr) 1385, 1279, 1165, 1125; ^1H NMR (400 MHz, CDCl_3): δ 7.93 (d, $J = 7.2$ Hz, 1H), 7.73 (d, $J = 8.8$ Hz, 1H), 7.54 (q, $J = 4.8$ Hz, 2H), 7.43 (d, $J = 8.4$ Hz, 2H), 7.26-7.35 (m, 1H), 6.86-6.90 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3): δ 144.5, 136.1, 131.7, 129.6, 126.5, 125.2, 123.8, 118.8, 114.1; MS(EI) $m/z(\%)$: 262, 241, 193, 77, 51; Calcd. C, 56.68; H, 2.72; N, 9.44; Found: C, 56.23; H, 2.77; N, 9.53;

ethyl 3-(4-tert-butylphenyl)-5-methylimidazo[1,2-a]pyridine-2-carboxylate (3dh)

White solid, Mp: 82-84 °C; IR (KBr) 2961, 1721, 1385, 1223, 1176; ^1H NMR (400 MHz, CDCl_3): δ 7.62 (d, $J = 9.2$ Hz, 1H), 7.43 (q, $J = 6.4$ Hz, 3H), 7.33 (t, $J = 8.4$ Hz, 2H), 7.26 (s, 1H), 6.48 (d, $J = 6.8$ Hz, 1H), 4.25 (q, $J = 8.4$ Hz, 2H), 1.37 (s, 9H), 1.17 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3): δ 163.5, 152.3, 145.7, 137.4, 132.1, 132.0, 131.5, 128.5, 125.9, 124.2, 117.3, 114.6, 60.6, 34.8, 31.4, 14.1; MS(EI) $m/z(\%)$: 337, 275, 264, 249, 207, 92, 91, 79, 73, 65; Calcd. C, 74.97; H, 7.19; N, 8.33; Found: Calcd. C, 74.39; H, 7.25; N, 8.44;

2, 3-diphenylimidazo[1, 2-a]pyridine (3ea)

White solid, Mp: 156-157 °C; IR (KBr) 1639, 1385, 749, 698; ¹H NMR (400 MHz, CDCl₃): δ 7.90 (d, *J* = 7.2 Hz, 1H), 7.64 (d, *J* = 7.6 Hz, 3H), 7.41-7.50 (m, 5H), 7.26 (t, *J* = 7.6 Hz, 3H), 7.13-7.23 (m, 1H), 6.67 (t, *J* = 6.4 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 144.8, 142.4, 134.2, 130.7, 129.9, 129.6, 128.9, 128.3, 128.1, 127.5, 124.7, 123.3, 121.1, 117.5, 112.3; MS (EI) m/z (%): 270, 269, 190, 165, 135, 77; Calcd. C, 84.42; H, 5.22; N, 10.36; Found: C, 84.57; H, 5.17; N, 10.26;

2-phenyl-3- (m-tolyl)imidazo[1, 2-a]pyridine (3eb)

White solid, Mp: 147-148 °C; IR (KBr) 1639, 1383; ¹H NMR (400 MHz, CDCl₃): δ 7.92 (d, *J* = 6.8 Hz, 1H), 7.66-7.70 (q, *J* = 8.8 Hz, 3H), 7.38-7.53 (m, 2H), 7.30 (s, 3H), 7.16-7.28 (m, 3H), 6.69-6.72 (m, 1H), 2.39 (s, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 144.7, 142.1, 139.3, 134.2, 131.1, 130.7, 129.8, 129.7, 129.5, 128.3, 128.1, 127.9, 127.4, 124.6, 123.4, 121.3, 117.5, 112.2, 21.5; MS (EI) m/z (%): 284, 268, 190, 178, 140, 134, 78; Calcd. C, 84.48; H, 5.67; N, 9.85; Found: C, 84.51 ; H, 5.62; N, 9.77;

3- (3-fluorophenyl)-2-phenylimidazo[1, 2-a]pyridine (3ec)

White solid, Mp: 150-152 °C; IR (KBr) 1635, 1385; ¹H NMR (400 MHz, CDCl₃): δ 7.96 (d, *J* = 7.2 Hz, 1H), 7.64-7.69 (m, 3H), 7.49 (q, *J* = 9.2 Hz, 1H), 7.15-7.32 (m, 7H), 6.73-6.76 (m, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 164.5, 162.1, 145.0, 142.9, 132.0, 131.3, 131.2, 128.4, 128.2, 127.7, 126.5, 125.0, 123.1, 119.7, 117.6, 117.4, 116.1, 115.9, 112.6; MS(EI) m/z (%): 289, 288, 287, 266, 259, 208, 184, 143, 134, 78; Calcd. C, 79.15; H, 4.54; N, 9.72; Found: C, 79.25; H, 4.51; N, 9.79;

3- (2-fluorophenyl)-2-phenylimidazo[1, 2-a]pyridine (3ed)

White solid, Mp: 154-155 °C; IR (KBr) 1636, 1508, 1383, 746; ¹H NMR (400 MHz, CDCl₃): δ 7.95 (d, *J* = 7.2 Hz, 1H), 7.63-7.69 (m, 3H), 7.40-7.43 (m, 2H), 7.18-7.32 (m, 6H), 6.74-6.76 (m, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 164.2, 161.7, 144.8, 142.6, 132.8, 132.7, 130.7, 128.7, 128.4, 128.1, 127.6, 126.1, 124.9, 123.1, 119.9,

117.6, 117.5, 116.9, 116.7, 112.5; MS (EI)m/z (%): 288, 287, 269, 268, 165, 134, 121, 78; Calcd. C, 79.15; H, 4.54; N, 9.72; Found: C, 79.72; H, 4.51; N, 9.62;

3- (4- (tert-butyl)phenyl)-2-phenylimidazo[1, 2-a]pyridine (3eh)

White solid, Mp: 64-65 °C; IR (KBr) 2959, 1639, 1384, 746, 698; ¹H NMR (400 MHz, CDCl₃): δ 7.95 (t, *J* = 6.4 Hz, 1H), 7.66-7.71 (m, 3H), 7.51 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 2H), 7.25-7.28 (m, 3H), 7.15-7.17 (m, 1H), 6.68-6.71 (m, 1H), 1.39 (s, 9H); ¹³C NMR (100 MHz, CDCl₃): δ 152.0, 144.7, 142.2, 134.3, 130.8, 130.3, 129.6, 128.3, 128.3, 128.1, 127.4, 126.4, 124.6, 123.5, 121.2, 117.4, 112.1, 34.9, 31.4; MS (EI)m/z (%): 326, 311, 295, 269, 141, 78; Calcd. C, 84.63; H, 6.79; N, 8.58; Found: C, 85.56; H, 6.74; N, 8.51;

3- (2-ethylphenyl)-2-phenylimidazo[1, 2-a]pyridine (3ei)

Yellow liquid; IR (KBr) 1633, 1503, 1383; ¹H NMR (400 MHz, CDCl₃): δ 7.68 (q, *J* = 1.2 Hz, 3H), 7.45-7.55 (m, 3H), 7.32-7.38 (m, 2H), 7.16-7.26 (m, 4H), 6.67-6.71 (m, 1H), 2.21-2.42 (m, 2H), 0.91 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃): δ 145.2, 144.7, 142.0, 134.3, 132.1, 130.0, 129.5, 128.8, 128.4, 127.4, 127.2, 127.1, 124.6, 123.4, 120.2, 117.4, 112.2, 26.2, 14.9; MS (EI)m/z (%): 299, 298, 297, 283, 269, 204, 180, 141, 94, 78; Calcd. C, 84.53; H, 6.08; N, 9.39; Found: C, 85.48; H, 6.05; N, 9.32;

3- (4-chlorophenyl)-2-phenylimidazo[1, 2-a]pyridine (3el)

White solid, Mp: 173-175 °C; IR (KBr) 1641, 1503, 1385, 746; ¹H NMR (400 MHz, CDCl₃): δ 7.91-7.93 (m, 1H), 7.63-7.69 (m, 3H), 7.47-7.50 (m, 2H), 7.37-7.40 (m, 2H), 7.25-7.31 (m, 3H), 7.18-7.22 (m, 1H), 6.72-6.76 (m, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 145.0, 142.8, 134.9, 133.9, 132.0, 129.9, 128.4, 128.4, 128.1, 127.7, 124.9, 123.0, 119.7, 117.7, 112.5; MS (EI)m/z (%): 306, 304, 268, 190, 134, 121, 78; Calcd. C, 74.88 ; H, 4.30; N, 9.19; Found: C, 75.69 ; H, 4.26; N, 9.12;

3- (3, 5-dimethylphenyl)-2-phenylimidazo[1, 2-a]pyridine (3em)

White solid, Mp: 124-125 °C; IR (KBr) 1676, 1513, 1385, 748, 701; ¹H NMR (400

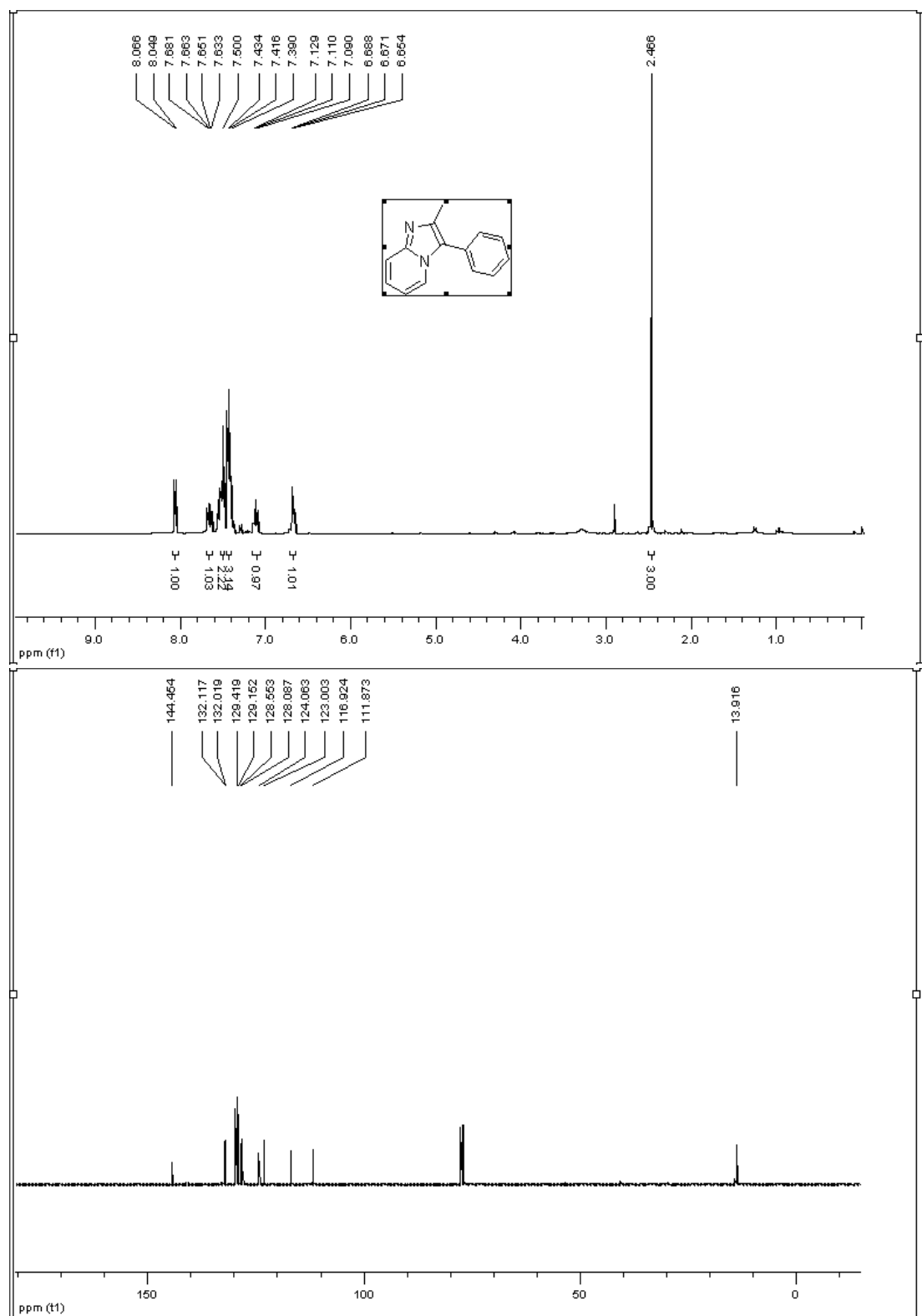
MHz, CDCl₃): δ 7.90 (d, J = 6.8 Hz, 1H), 7.66-7.73 (m, 3H), 7.48-7.52 (m, 1H), 7.26-7.30 (m, 2H), 7.05-7.18 (m, 3H), 6.68-6.71 (m, 1H), 2.35 (s, 6H); ¹³C NMR (100 MHz, CDCl₃): δ 144.6, 141.9, 139.2, 134.3, 130.8, 130.7, 129.7, 129.6, 128.3, 128.3, 128.1, 128.0, 127.4, 124.6, 123.5, 117.4, 112.1, 21.4; MS (EI)m/z(%):299, 298, 297, 282, 268, 190, 178, 141, 78; Calcd. C, 84.53 ; H, 6.08; N, 9.39; Found: C, 85.37 ; H, 6.04; N, 9.33;

3- (3-chlorophenyl)-2-phenylimidazo[1, 2-a]pyridine (3en)

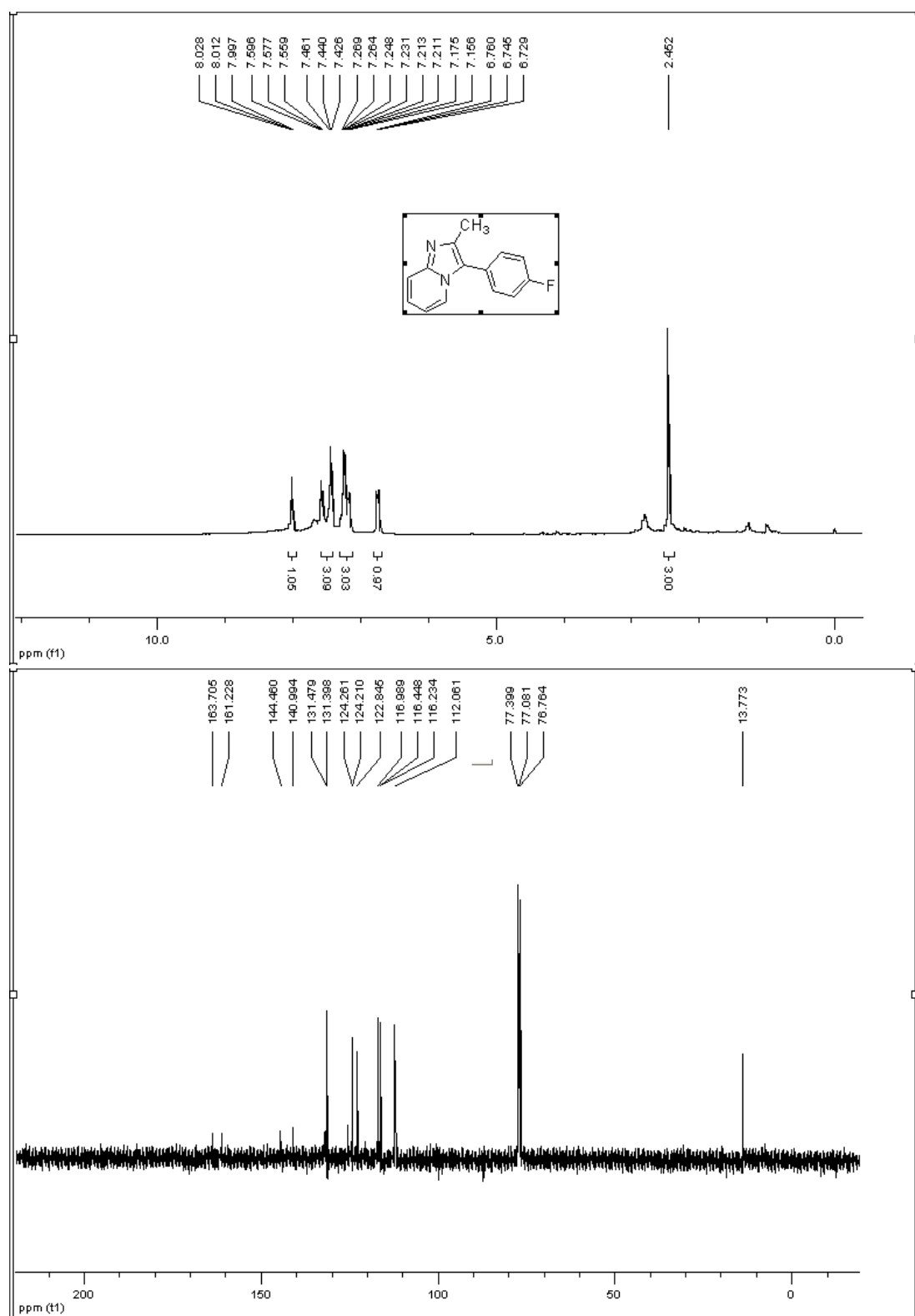
White solid, Mp: 125-126 °C;IR (KBr) 1503, 1383, 745, 695; ¹H NMR (400 MHz, CDCl₃): δ 7.91 (d, J = 6.8 Hz, 1H), 7.64-7.68 (m, 3H), 7.41-7.45 (m, 3H), 7.24-7.31 (m, 4H), 7.16-7.20 (m, 1H), 6.72 (t, J = 6.4 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃): δ 145.0, 143.0, 135.3, 133.8, 131.8, 130.9, 130.4, 129.1, 128.4, 128.2, 127.8, 125.0, 123.1, 119.5, 117.6, 112.6; MS (EI)m/z (%): 305, 304, 303, 268, 190, 164, 134, 120, 78; Calcd. C, 74.88 ; H, 4.30; N, 9.19; Found: C, 74.31 ; H, 4.33; N, 9.26;

D. NMR Spectra

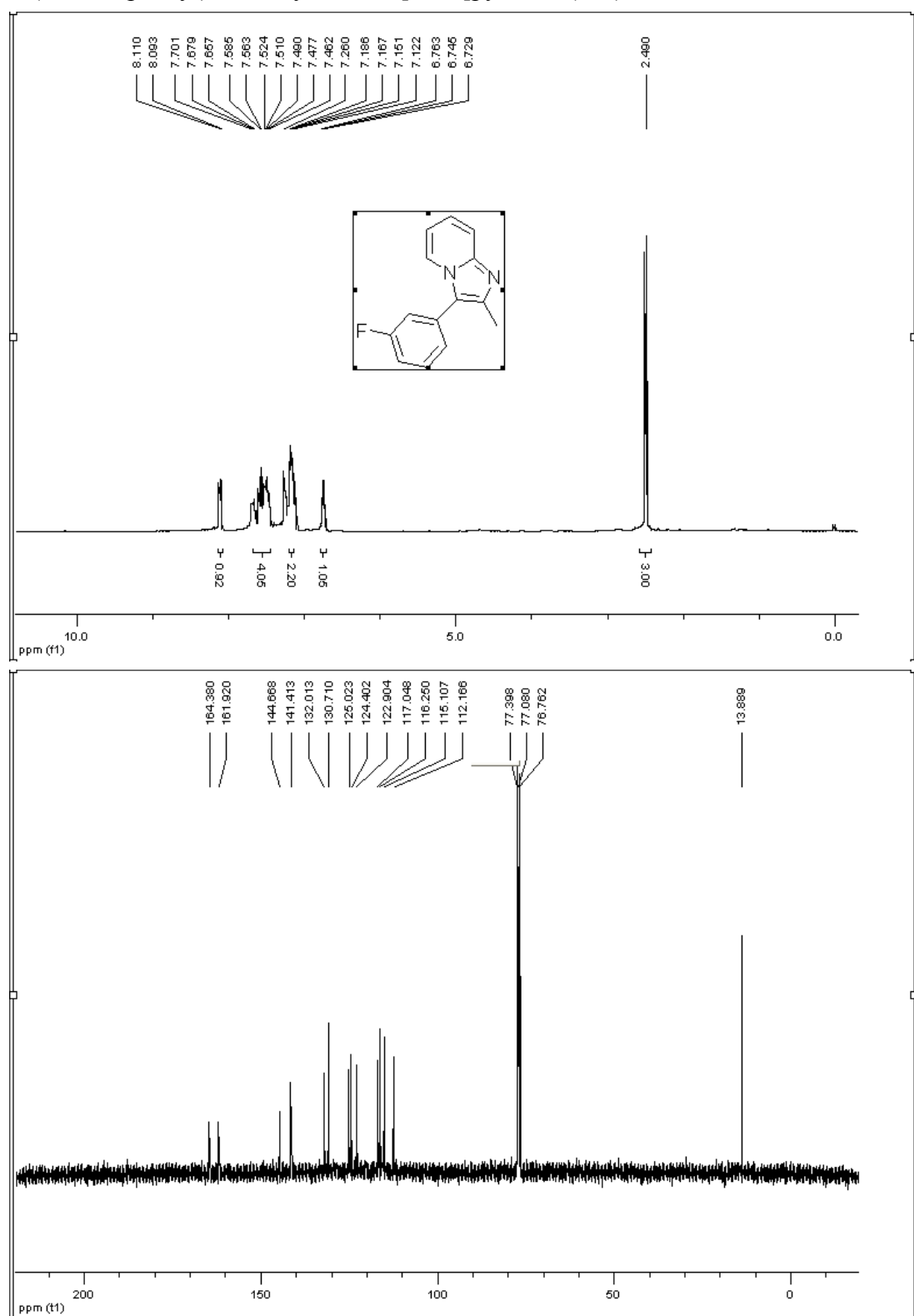
2-methyl-3-phenylimidazo[1,2-a]pyridine(3aa)



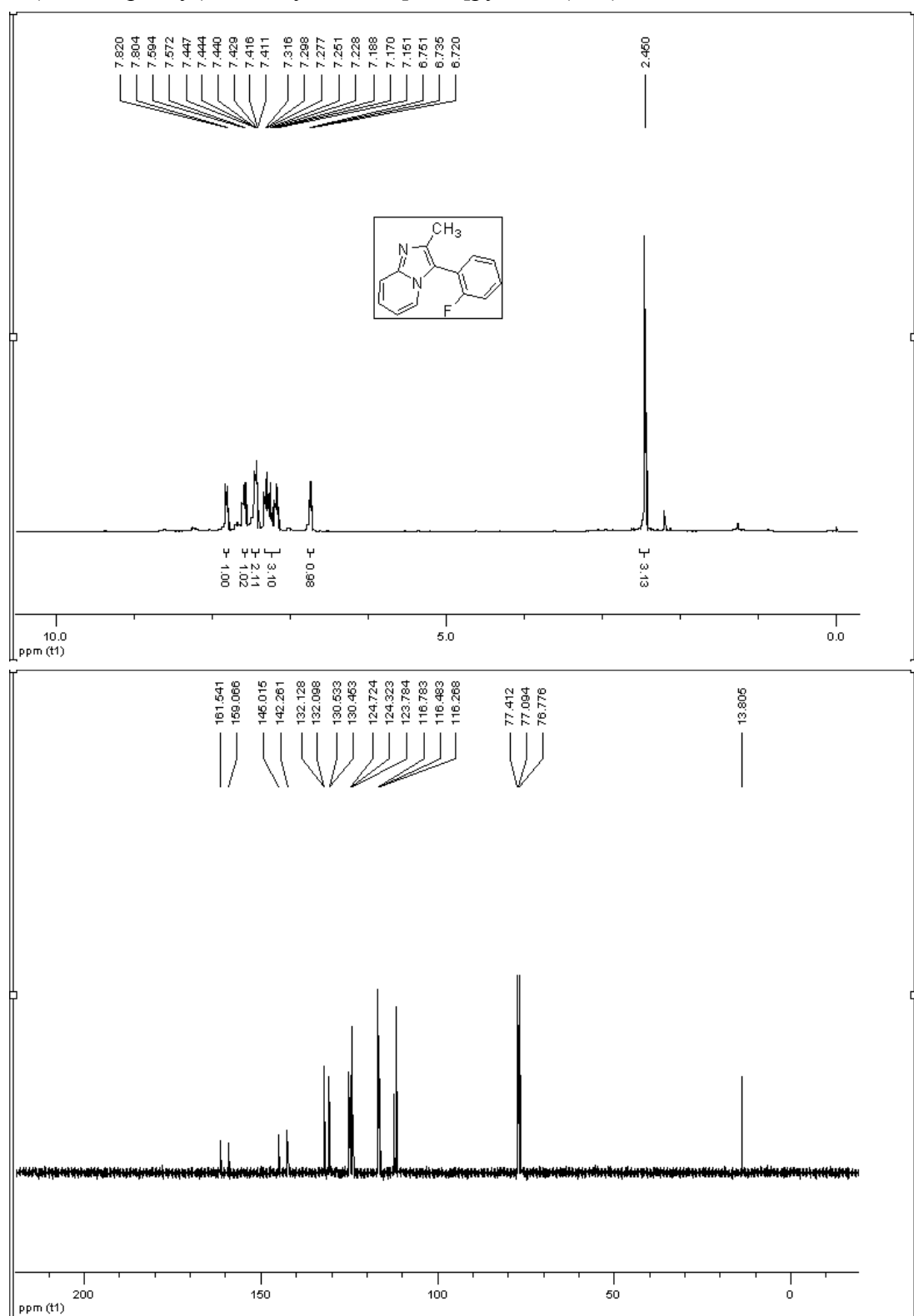
3-(4-fluorophenyl)-2-methylimidazo[1,2-a]pyridine(**3ab**)



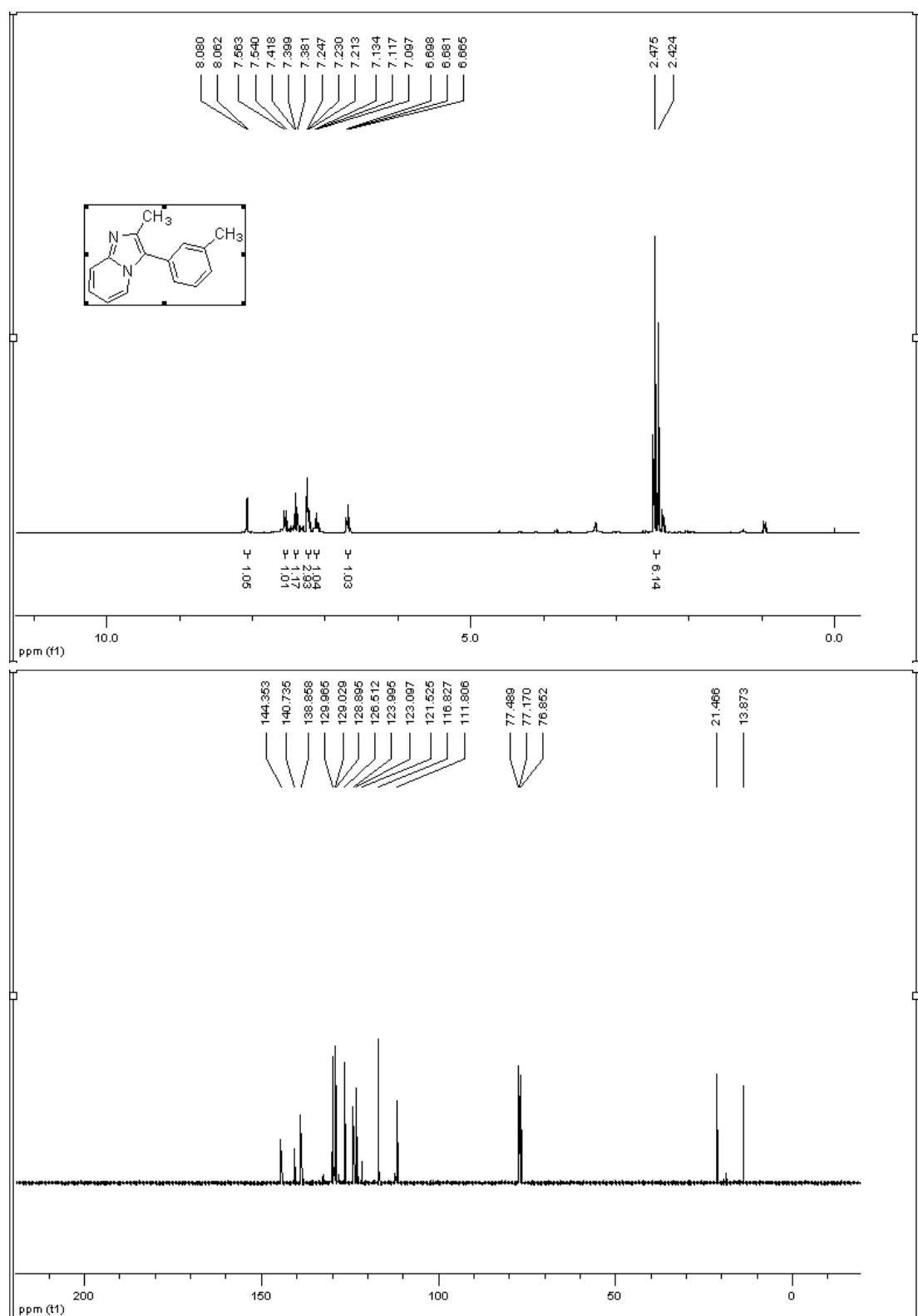
3-(3-fluorophenyl)-2-methylimidazo[1,2-a]pyridine (**3ac**)



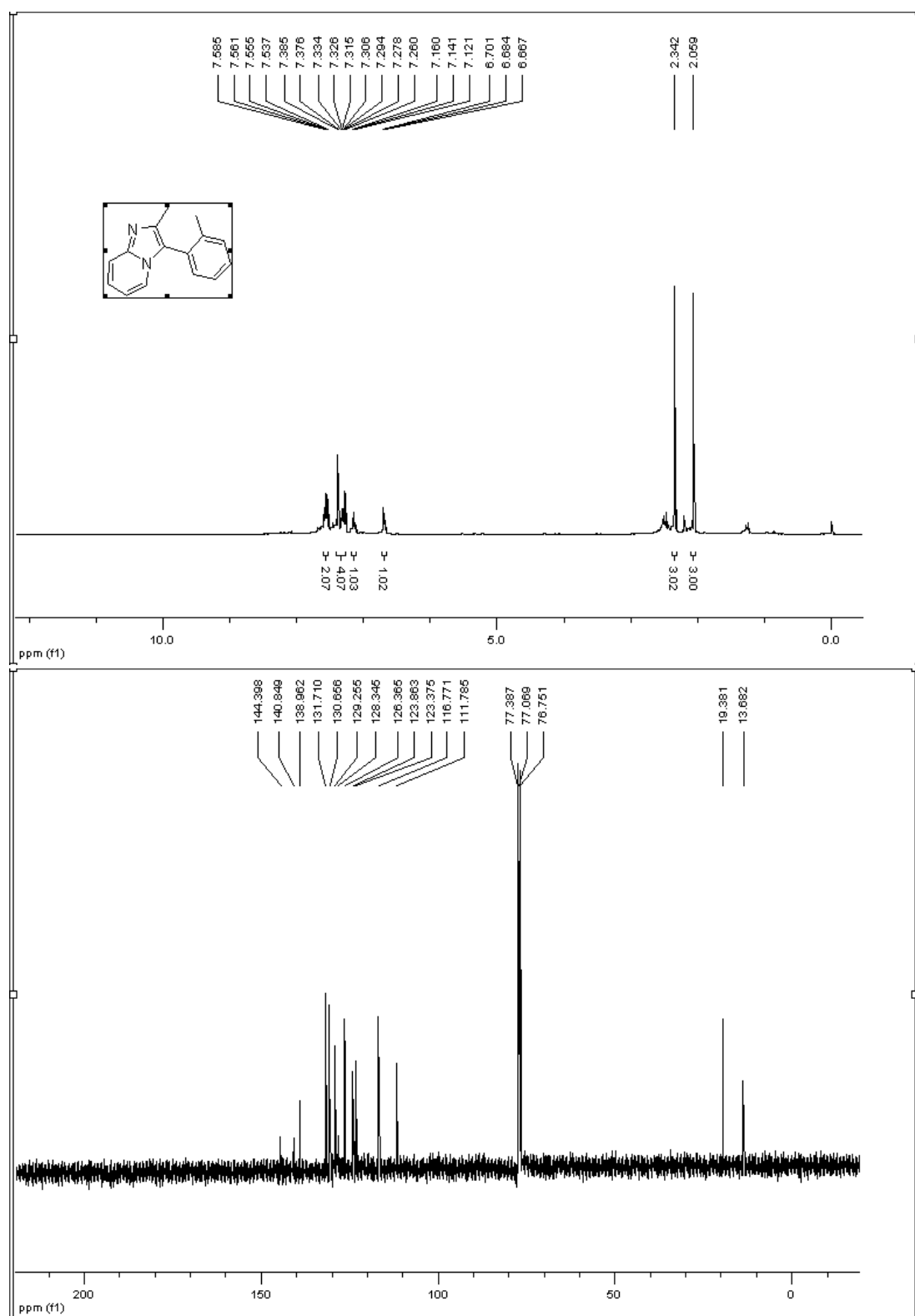
3-(2-fluorophenyl)-2-methylimidazo[1,2-a]pyridine(3ad)



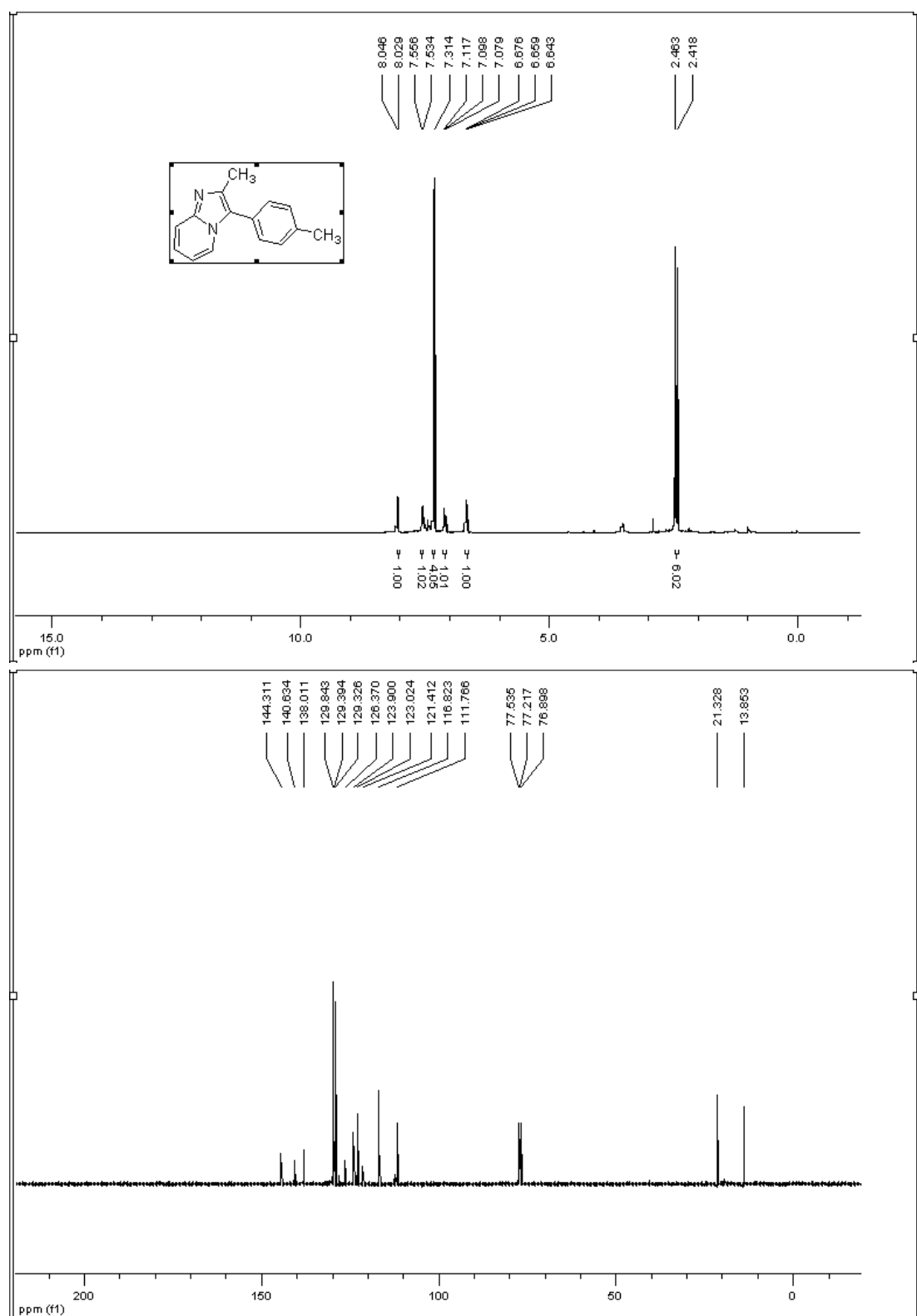
2-methyl-3-(m-tolyl)imidazo[1,2-a]pyridine (**3ae**)



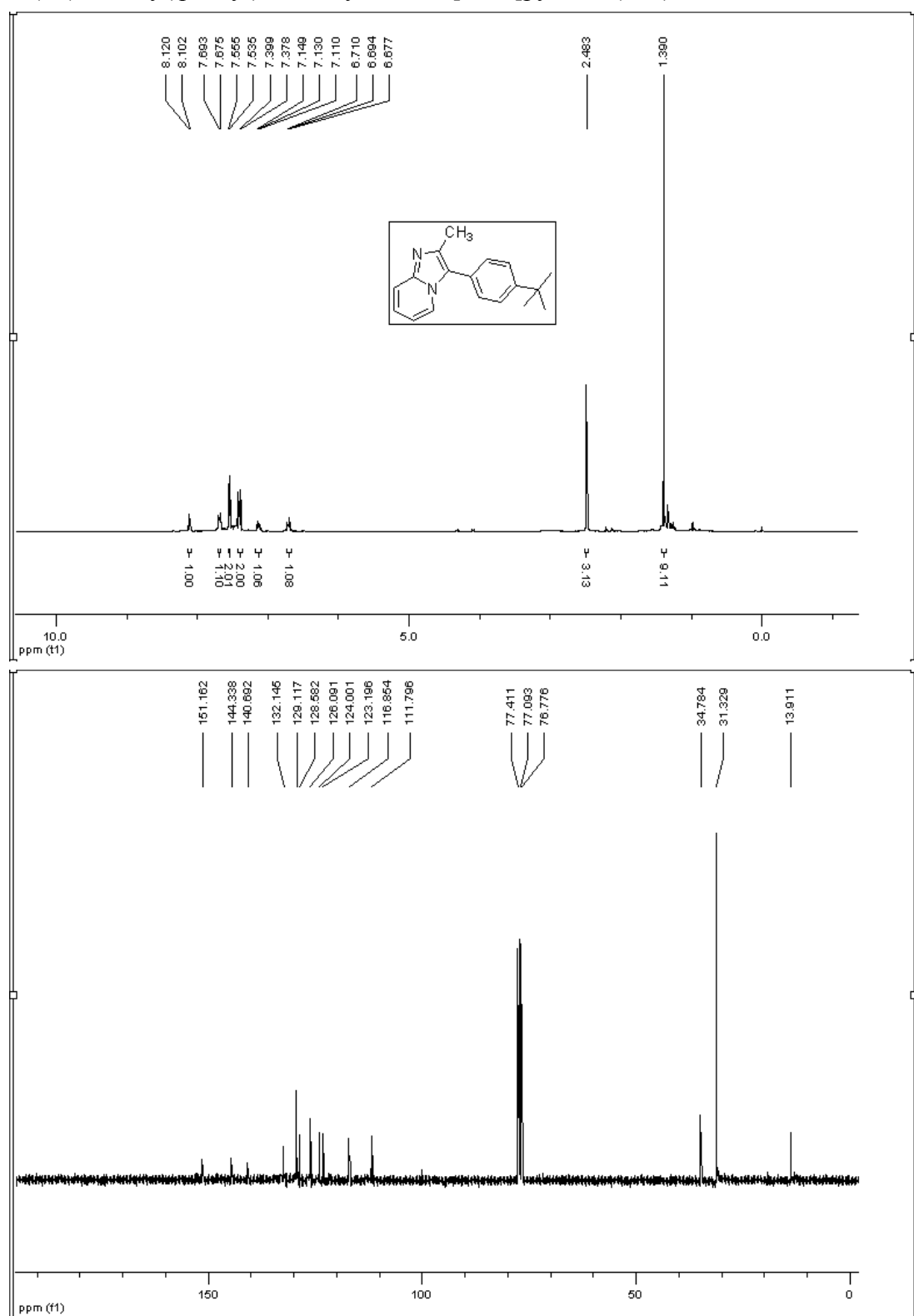
2-methyl-3-(o-tolyl)imidazo[1,2-a]pyridine (**3af**)



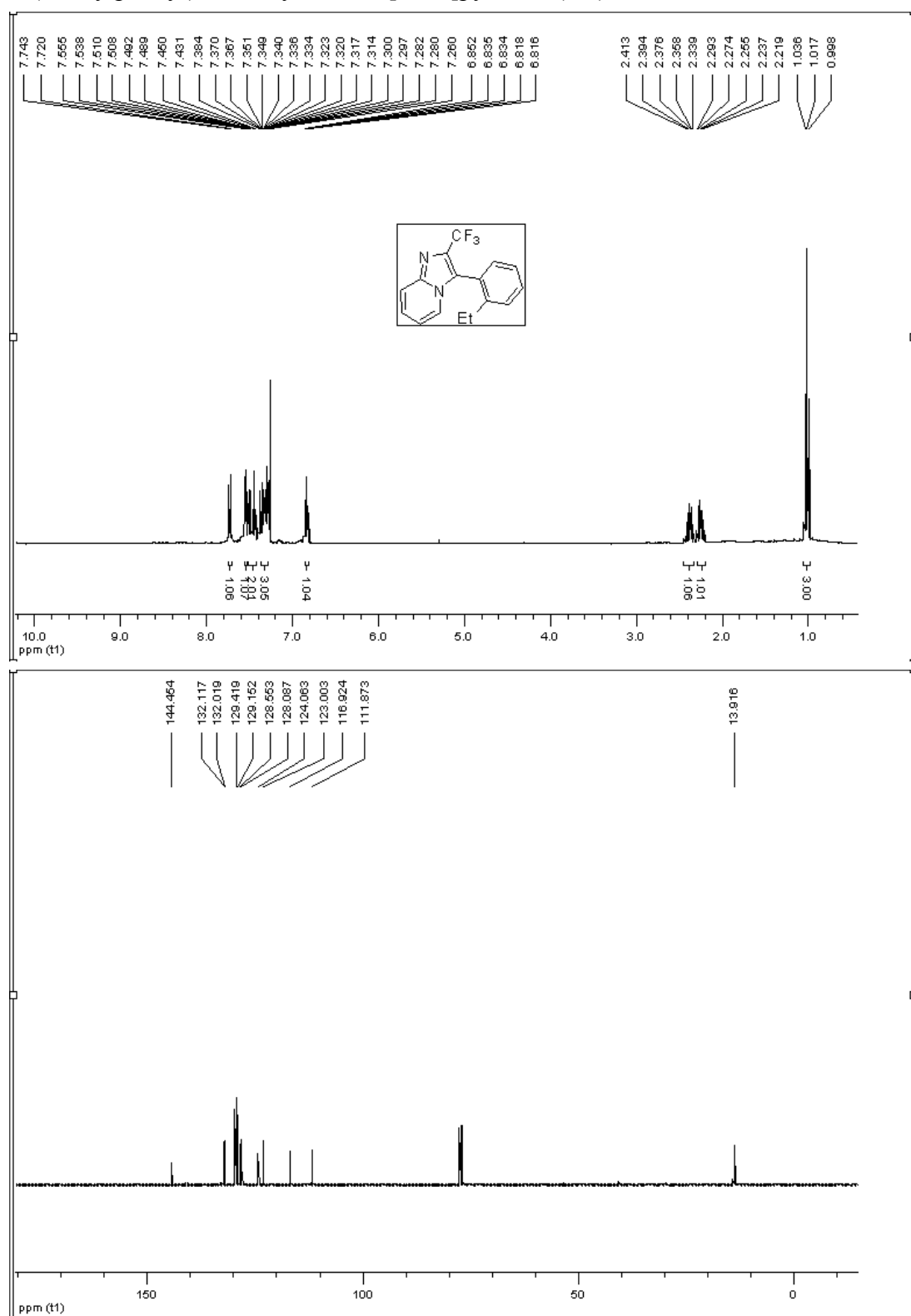
2-methyl-3-(p-tolyl)imidazo[1,2-a]pyridine (**3ag**)



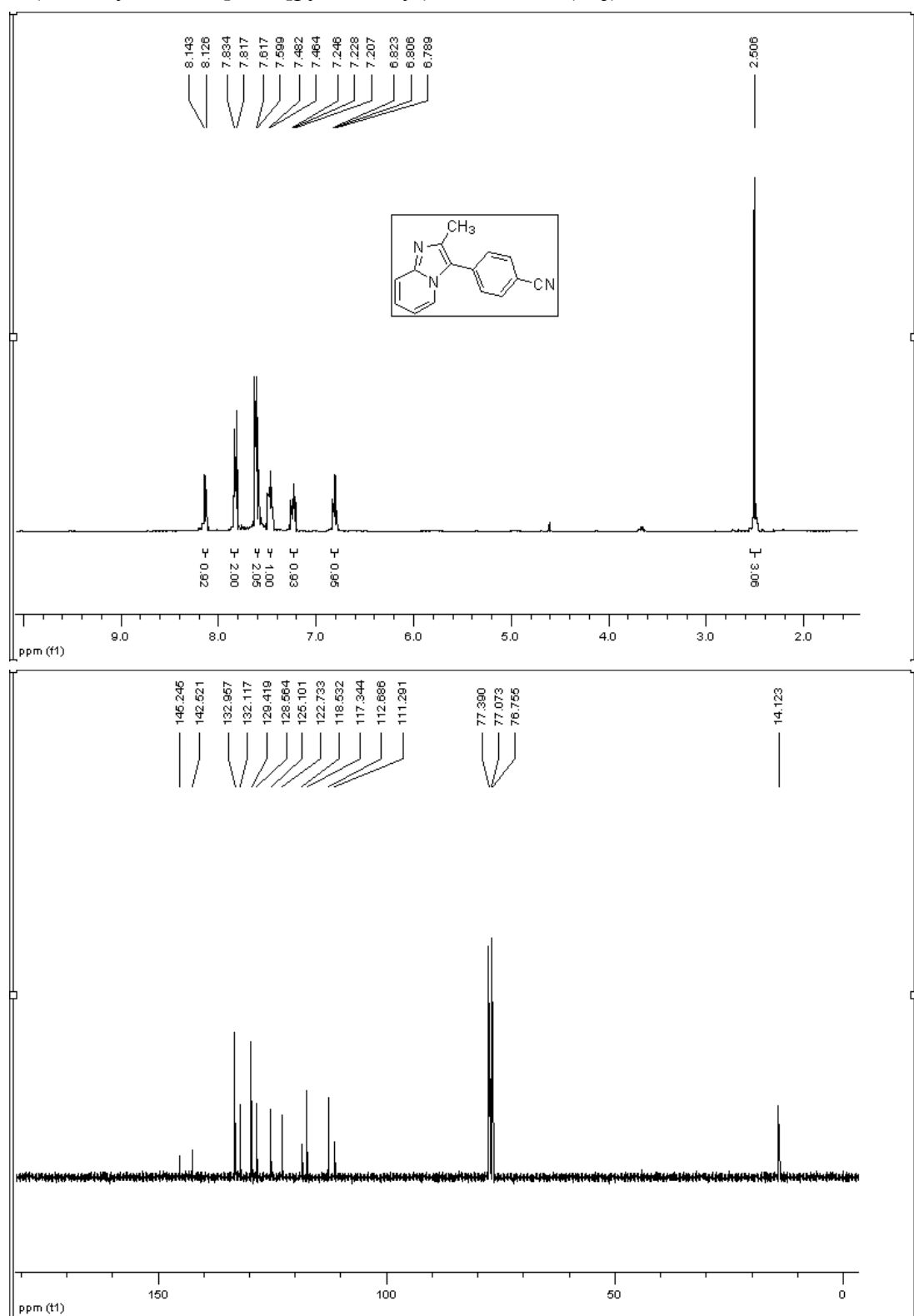
3-(4-(tert-butyl)phenyl)-2-methylimidazo[1,2-a]pyridine(3ah)



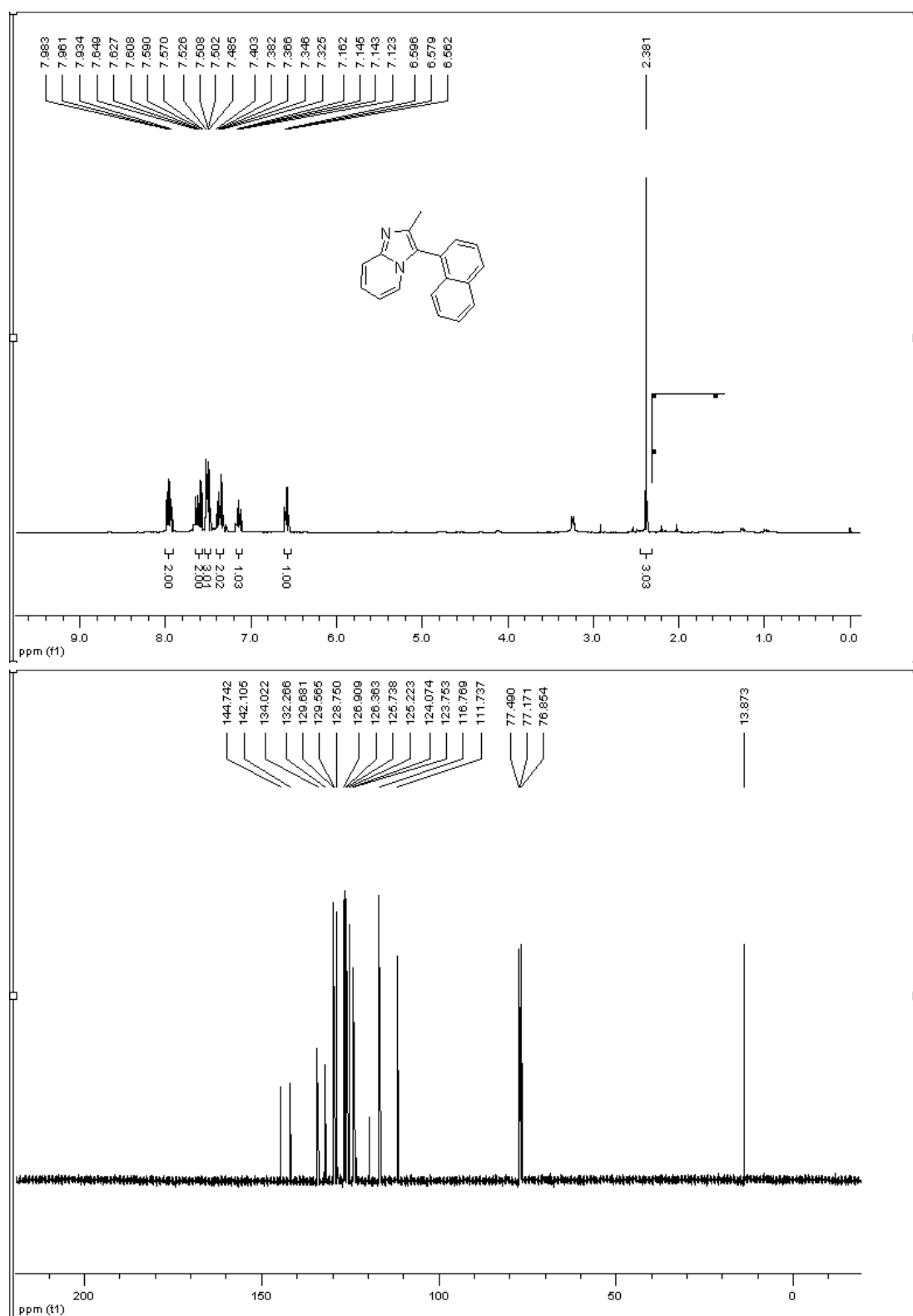
3-(2-ethylphenyl)-2-methylimidazo[1,2-a]pyridine (3ai)



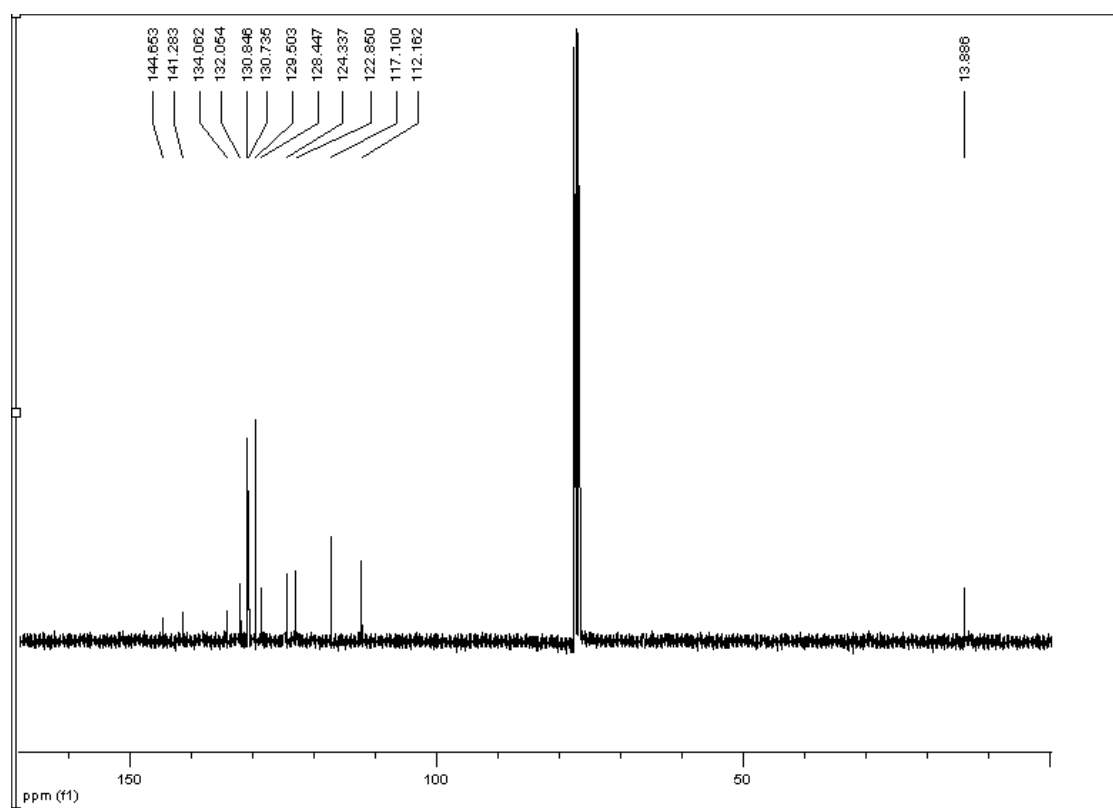
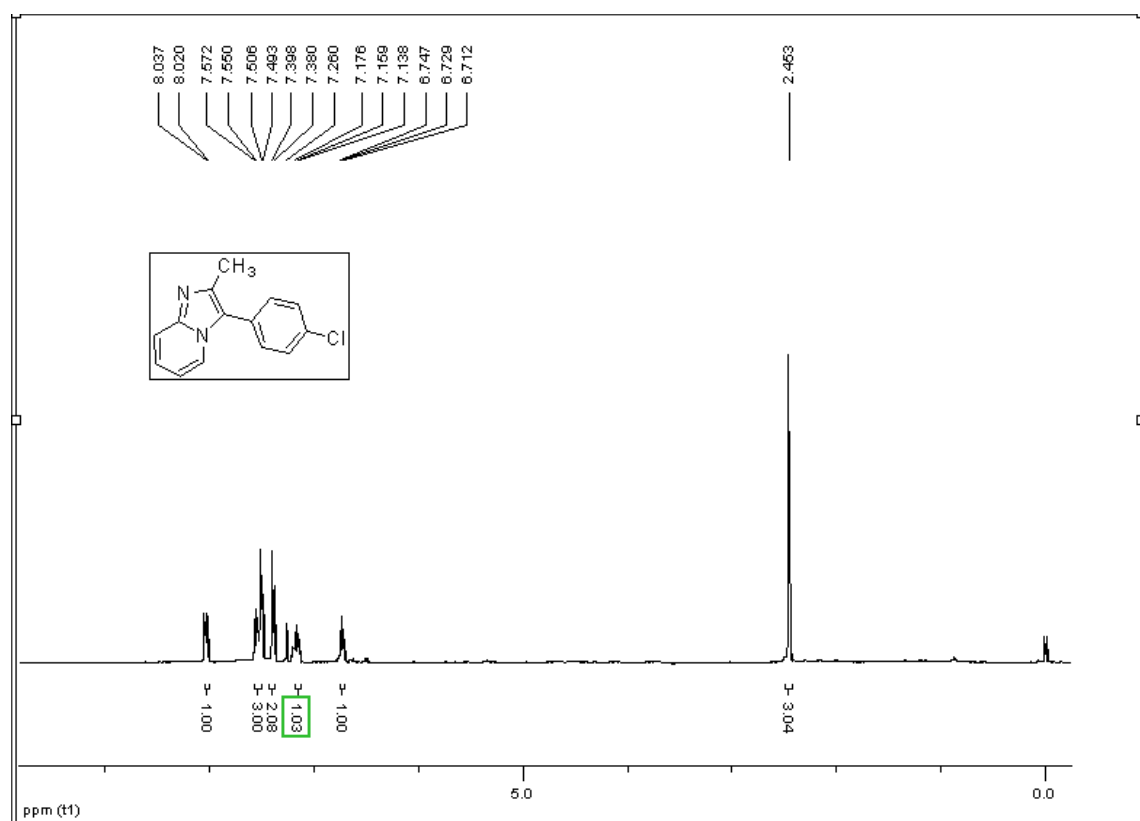
4-(2-methylimidazo[1,2-a]pyridin-3-yl)benzonitrile (**3aj**)



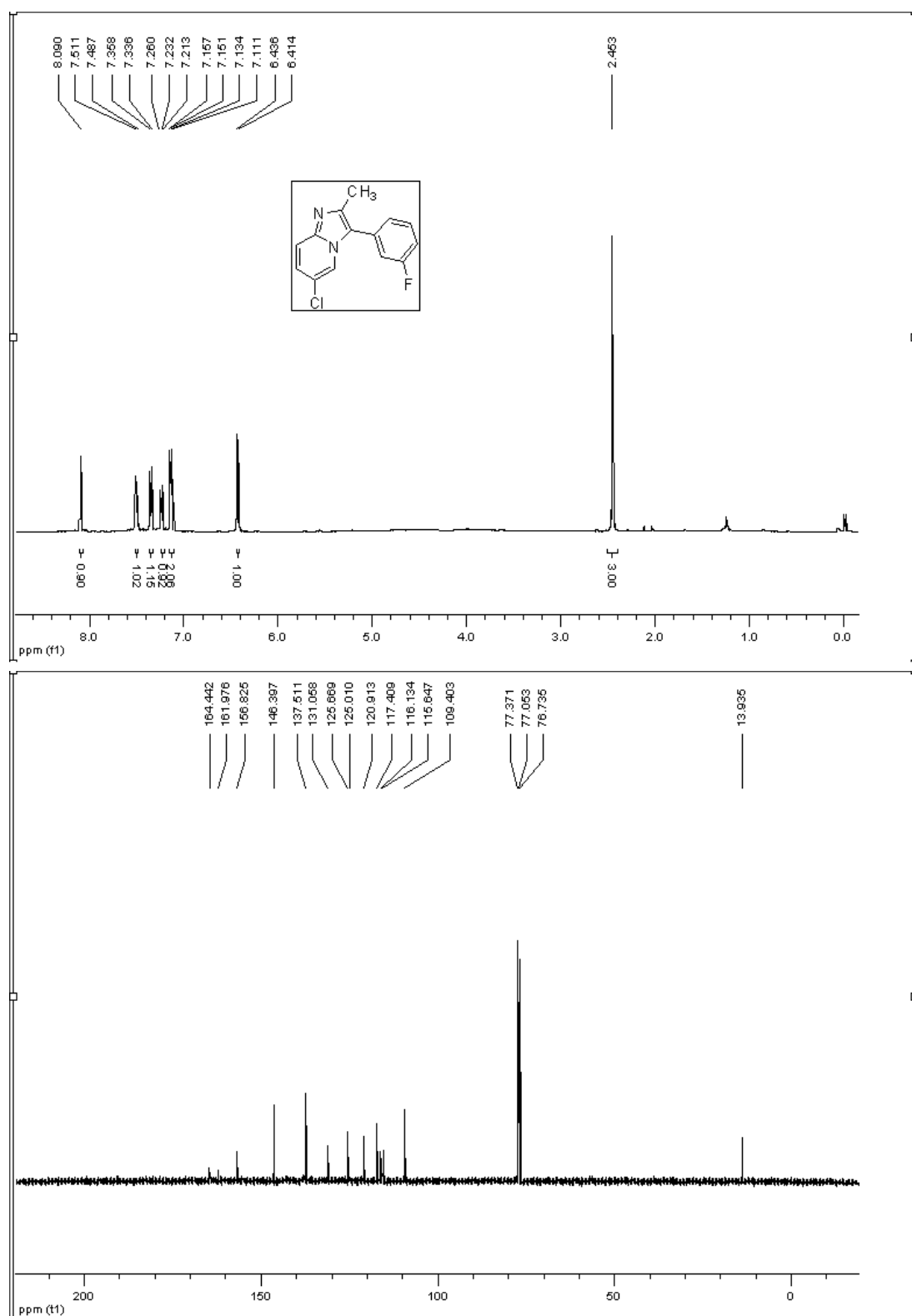
2-methyl-3-(naphthalen-1-yl)imidazo[1,2-a]pyridine (**3ak**)



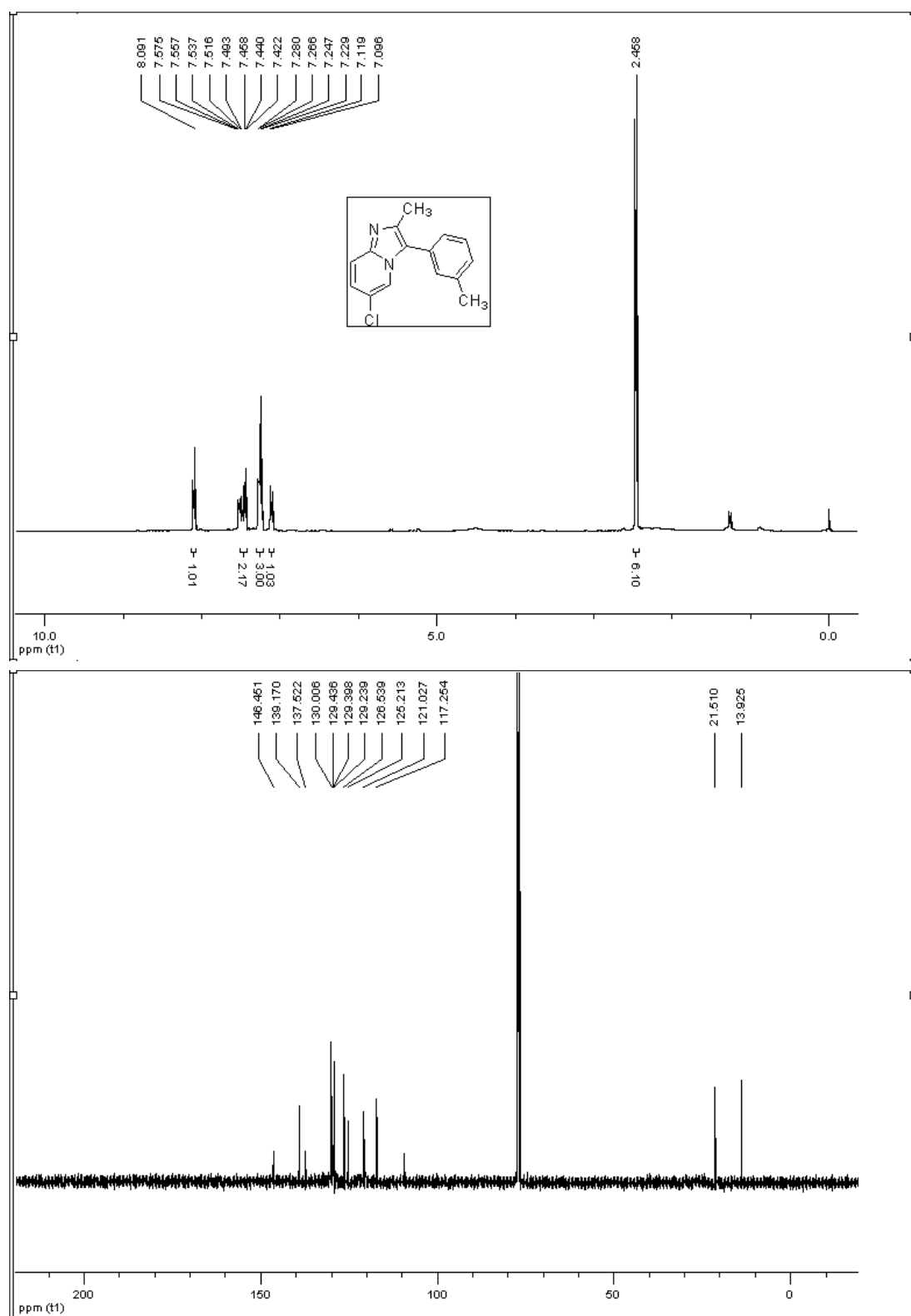
3-(4-chlorophenyl)-2-methylimidazo[1,2-a]pyridine (**3al**)



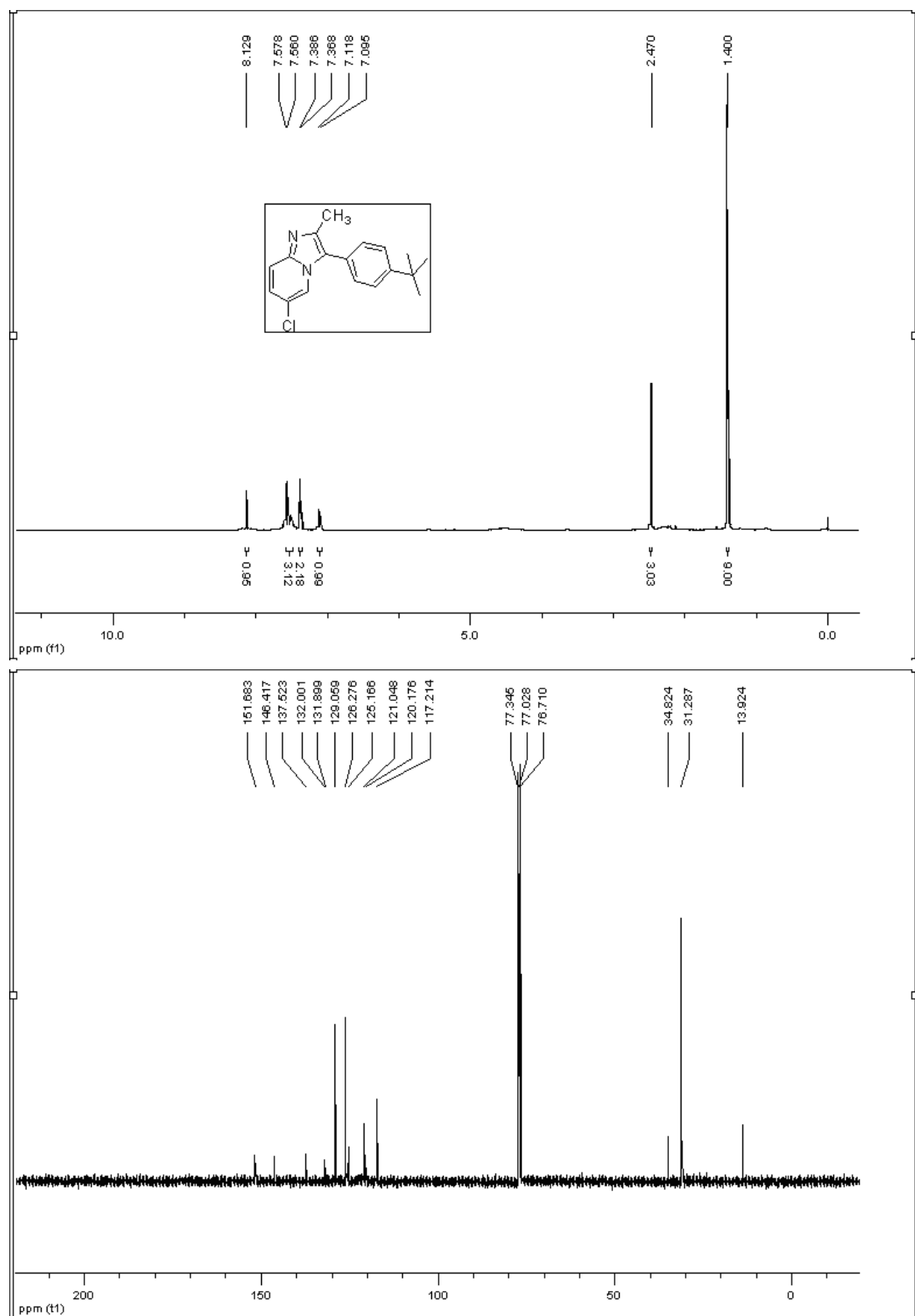
6-chloro-3-(3-fluorophenyl)-2-methylimidazo[1,2-a]pyridine(3bc)



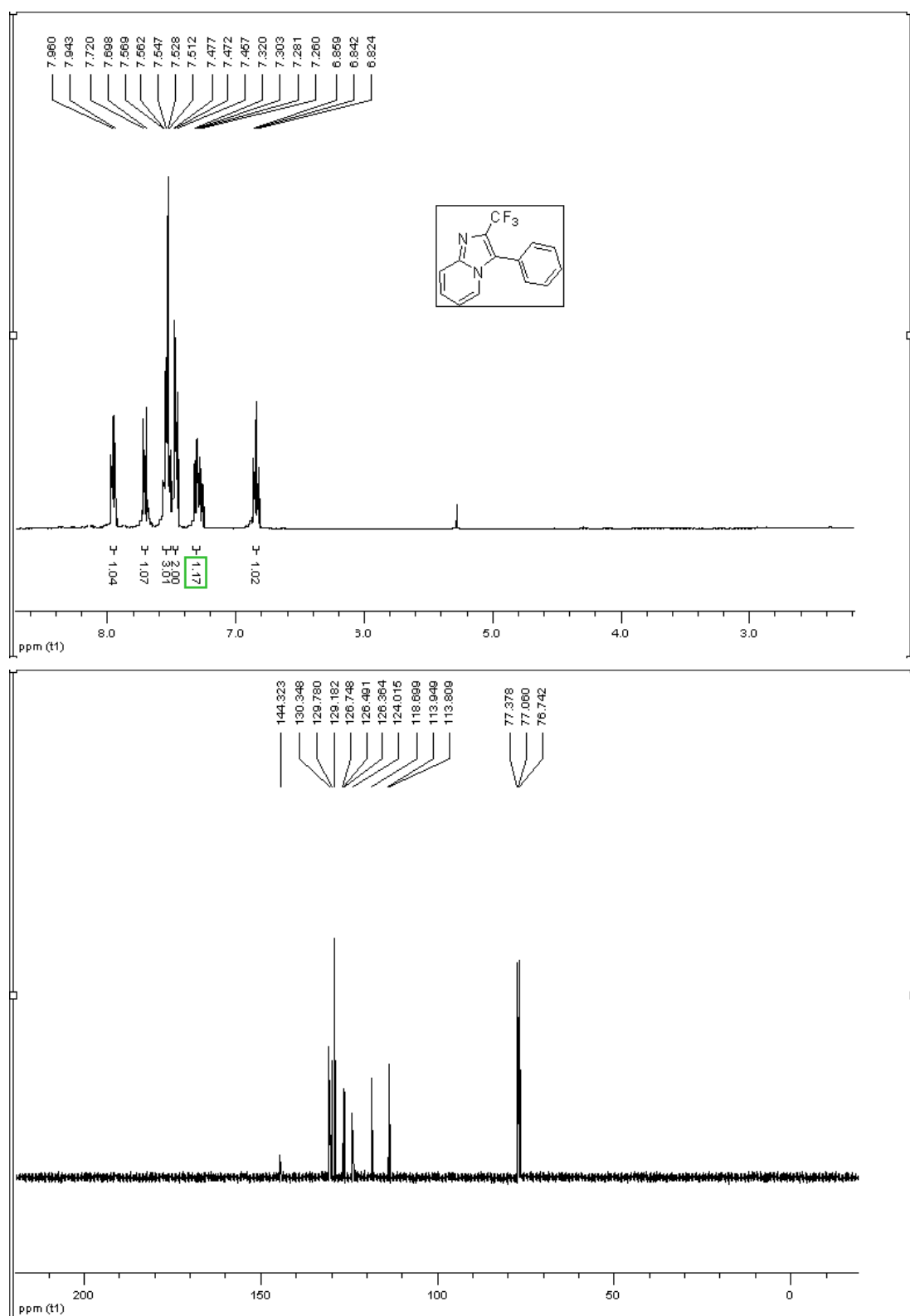
6-chloro-2-methyl-3-(m-tolyl)imidazo[1,2-a]pyridine(3be)



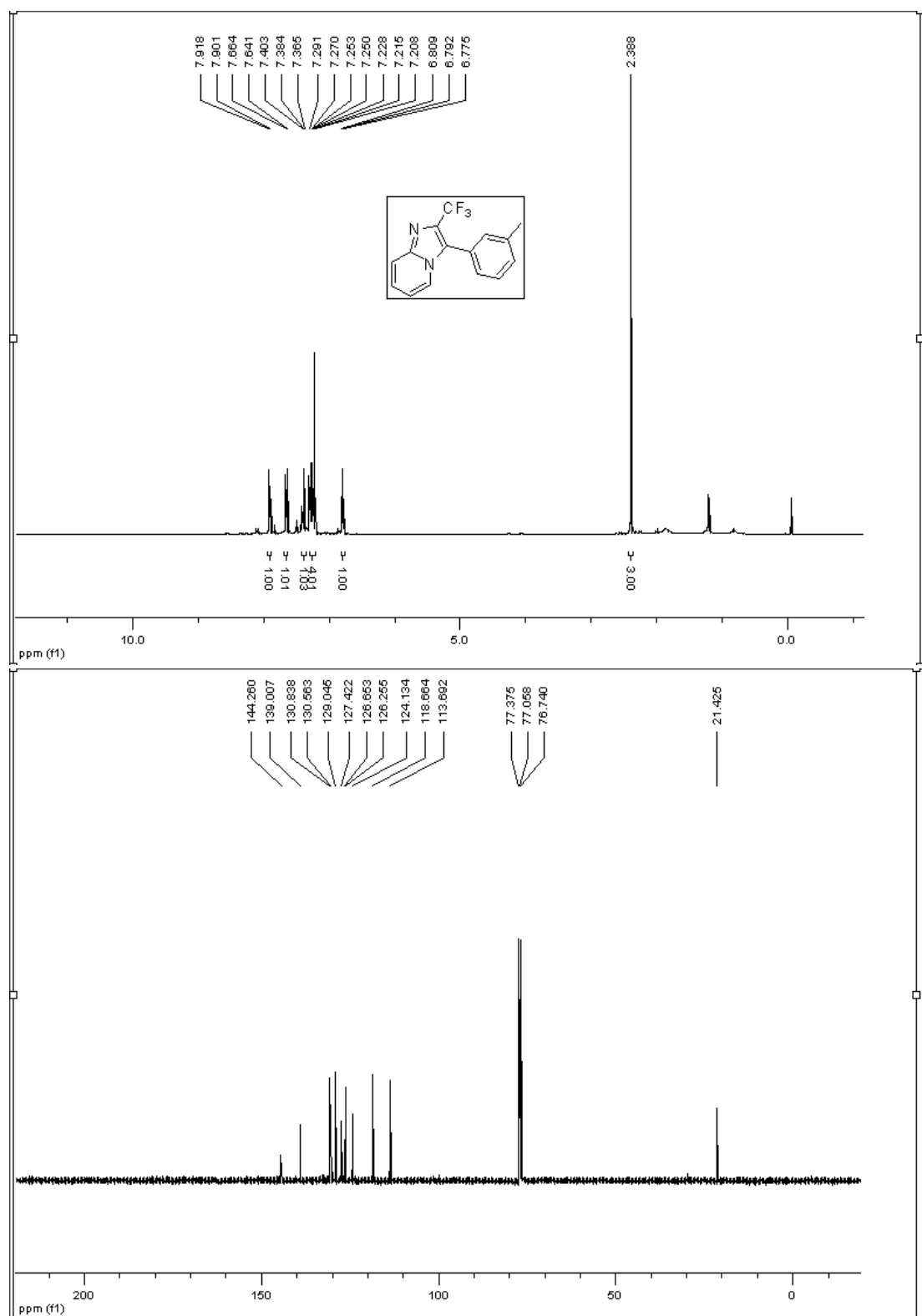
3-(4-(tert-butyl)phenyl)-6-chloro-2-methylimidazo[1,2-a]pyridine(3bh)



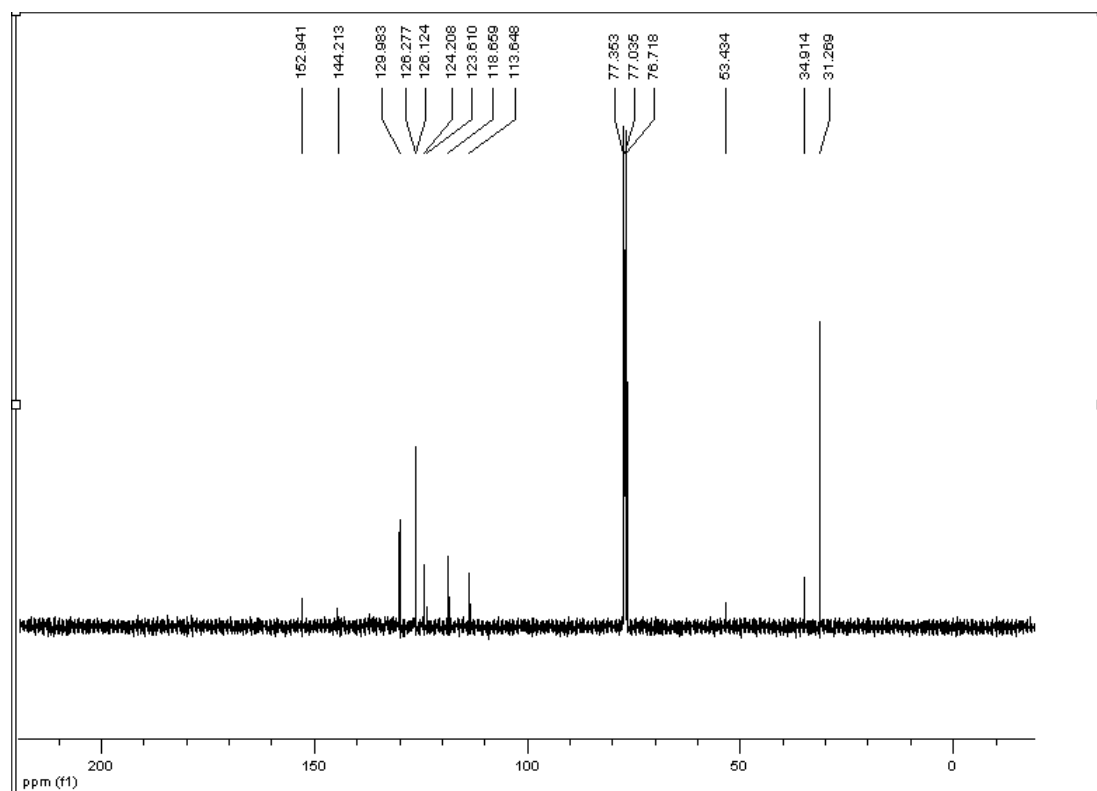
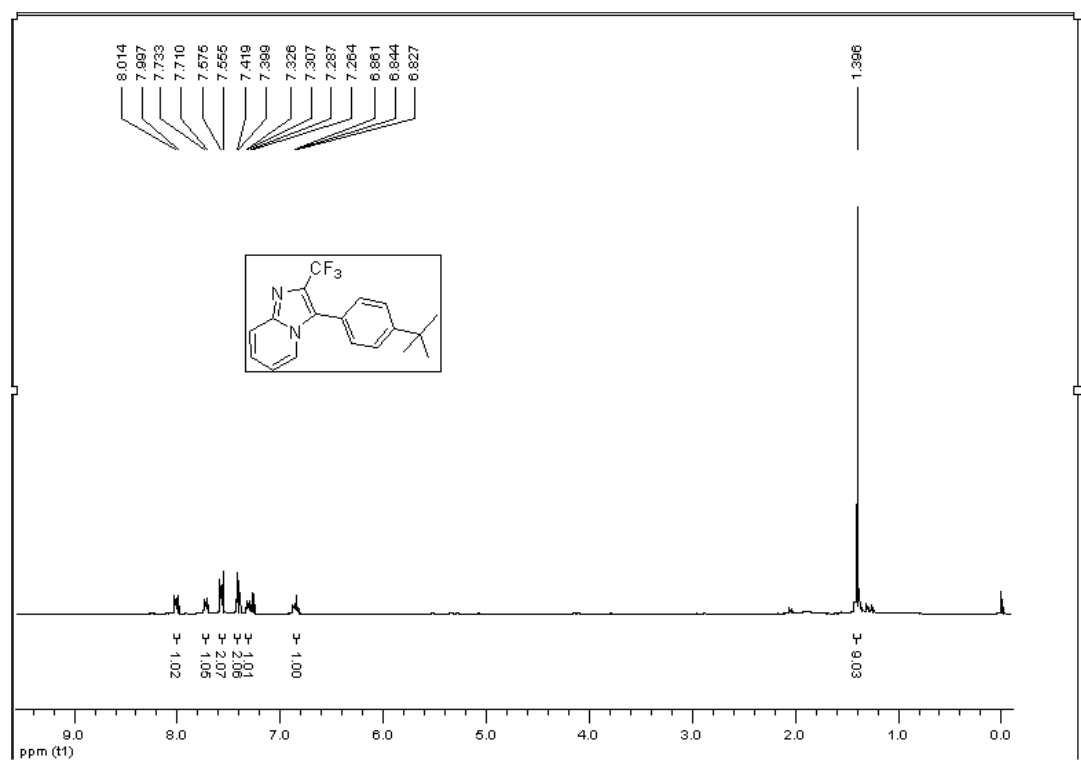
3-phenyl-2-(trifluoromethyl)imidazo[1,2-a]pyridine(3ca)



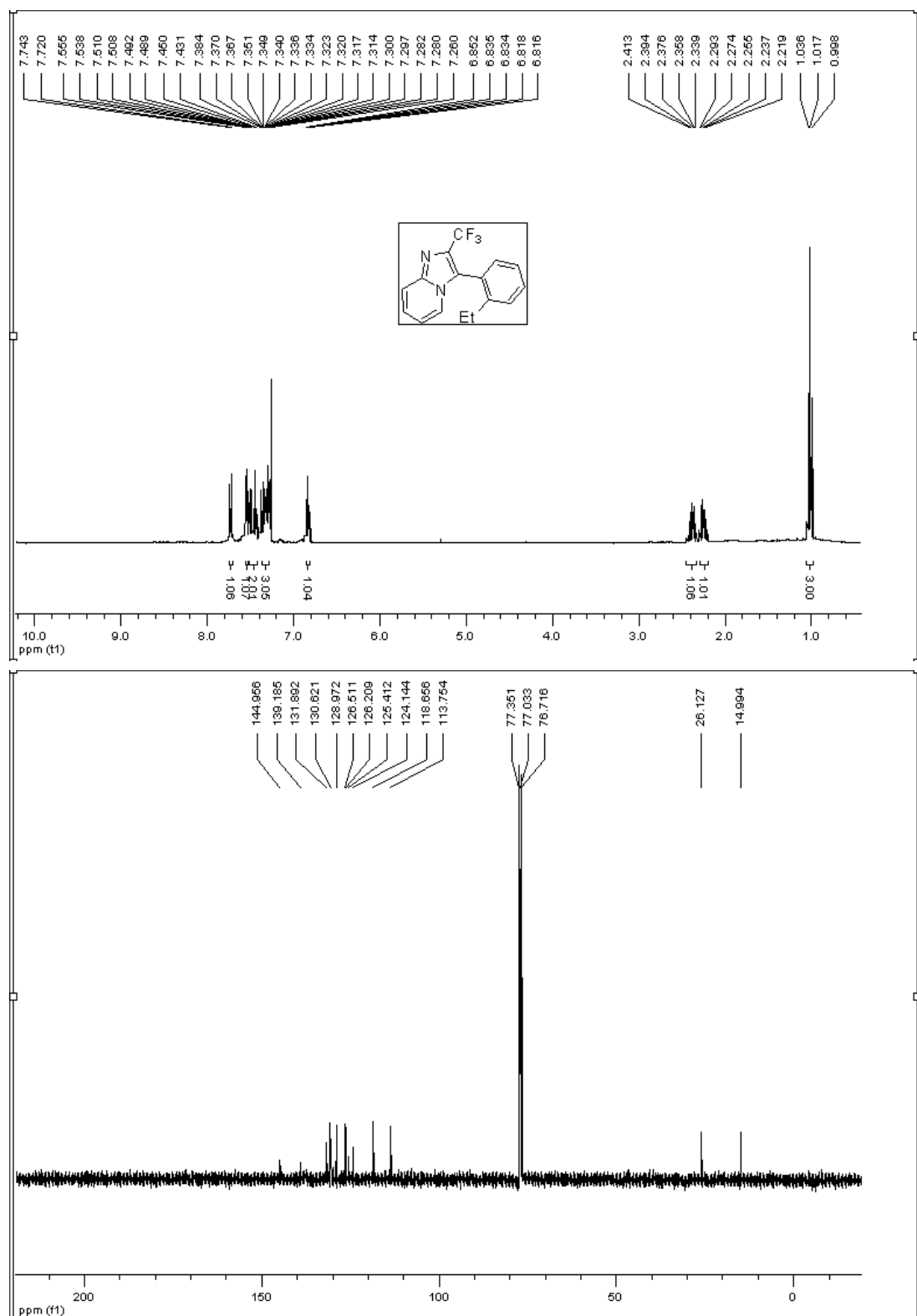
3-(m-tolyl)-2-(trifluoromethyl)imidazo[1,2-a]pyridine(3ce)



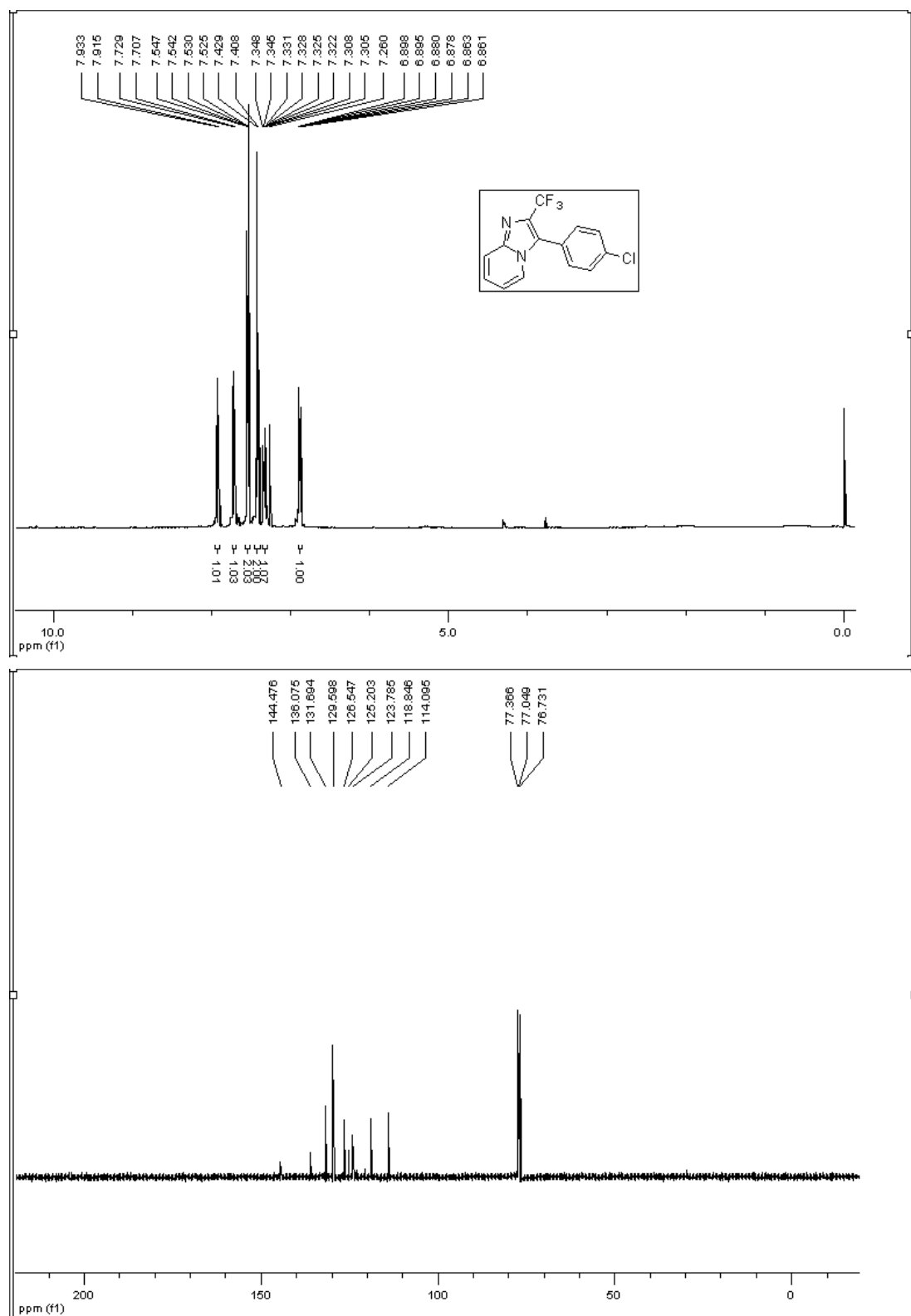
3-(4-(tert-butyl)phenyl)-2-(trifluoromethyl)imidazo[1,2-a]pyridine(3ch)



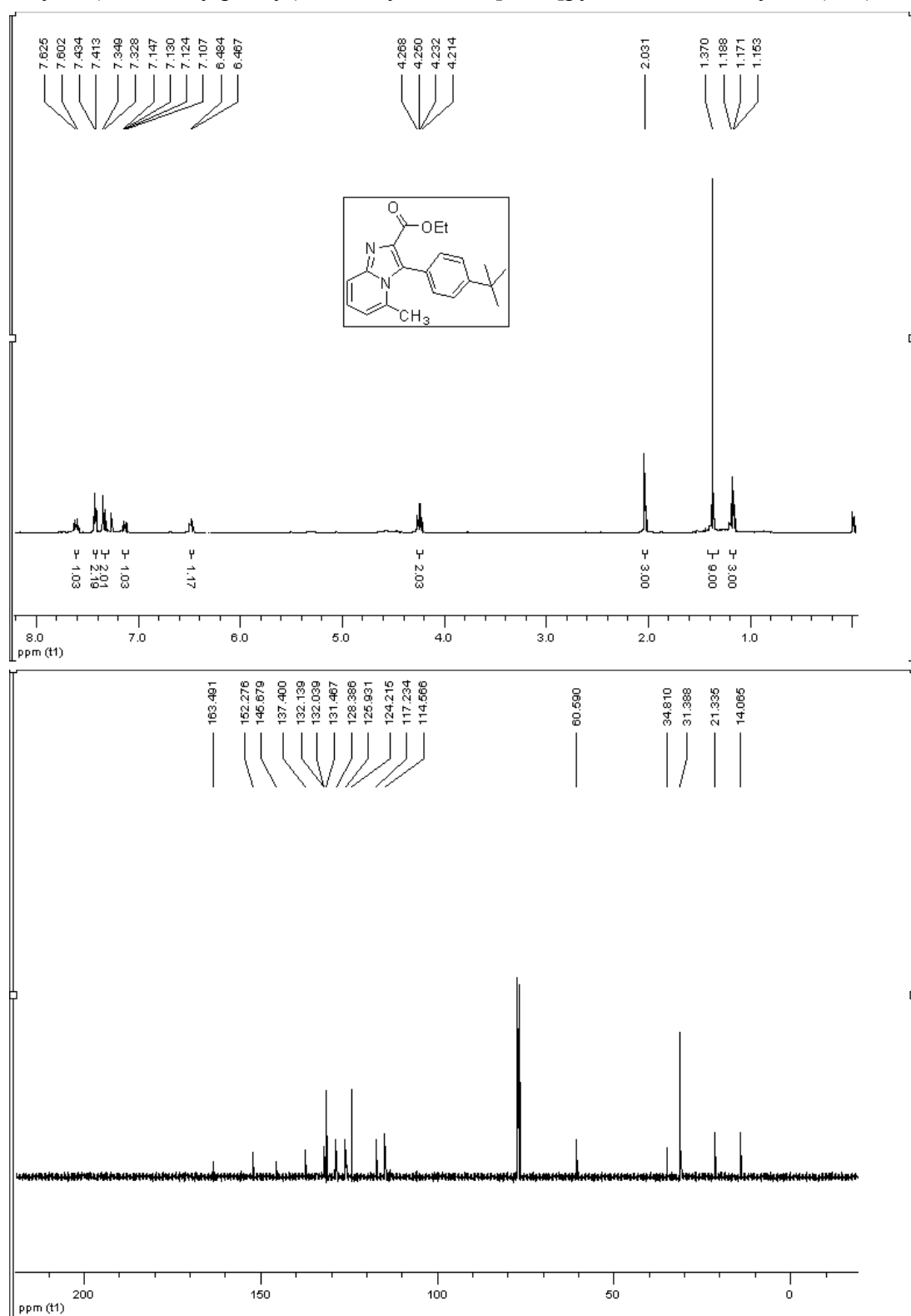
3-(2-ethylphenyl)-2-(trifluoromethyl)imidazo[1,2-a]pyridine(3ci)



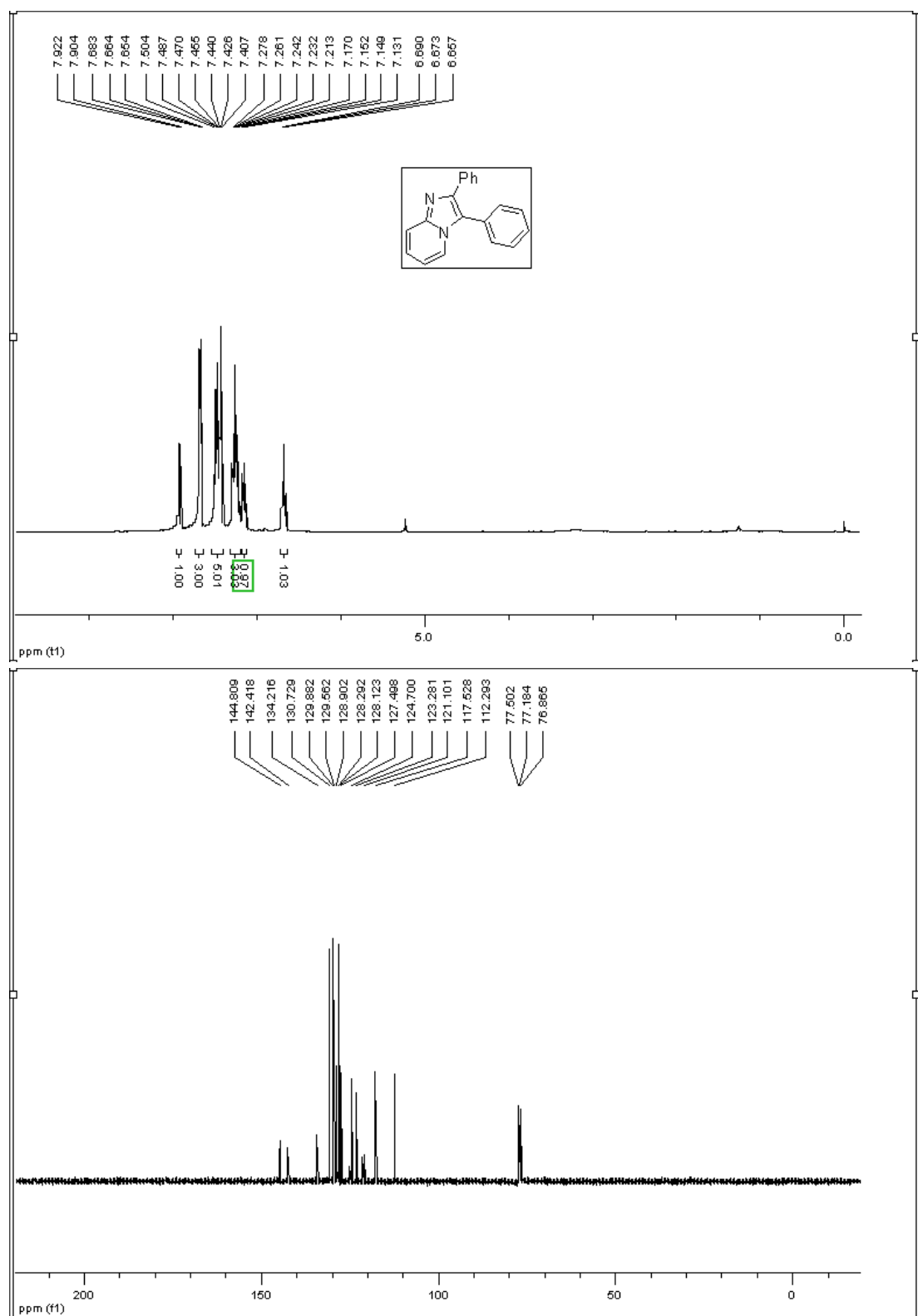
3-(4-chlorophenyl)-2-(trifluoromethyl)imidazo[1,2-a]pyridine(3cl)



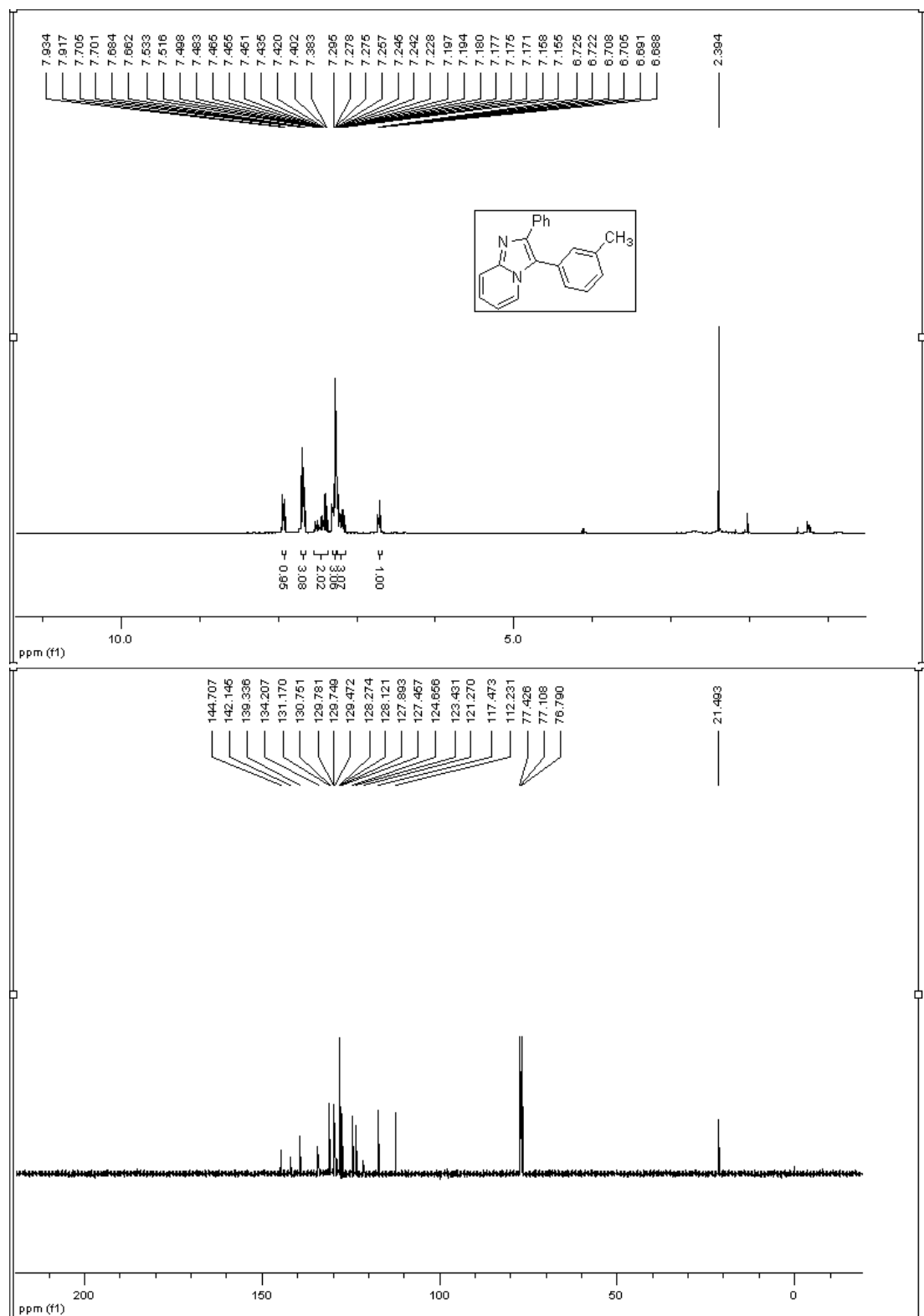
ethyl 3-(4-tert-butylphenyl)-5-methylimidazo[1,2-a]pyridine-2-carboxylate (3dh)



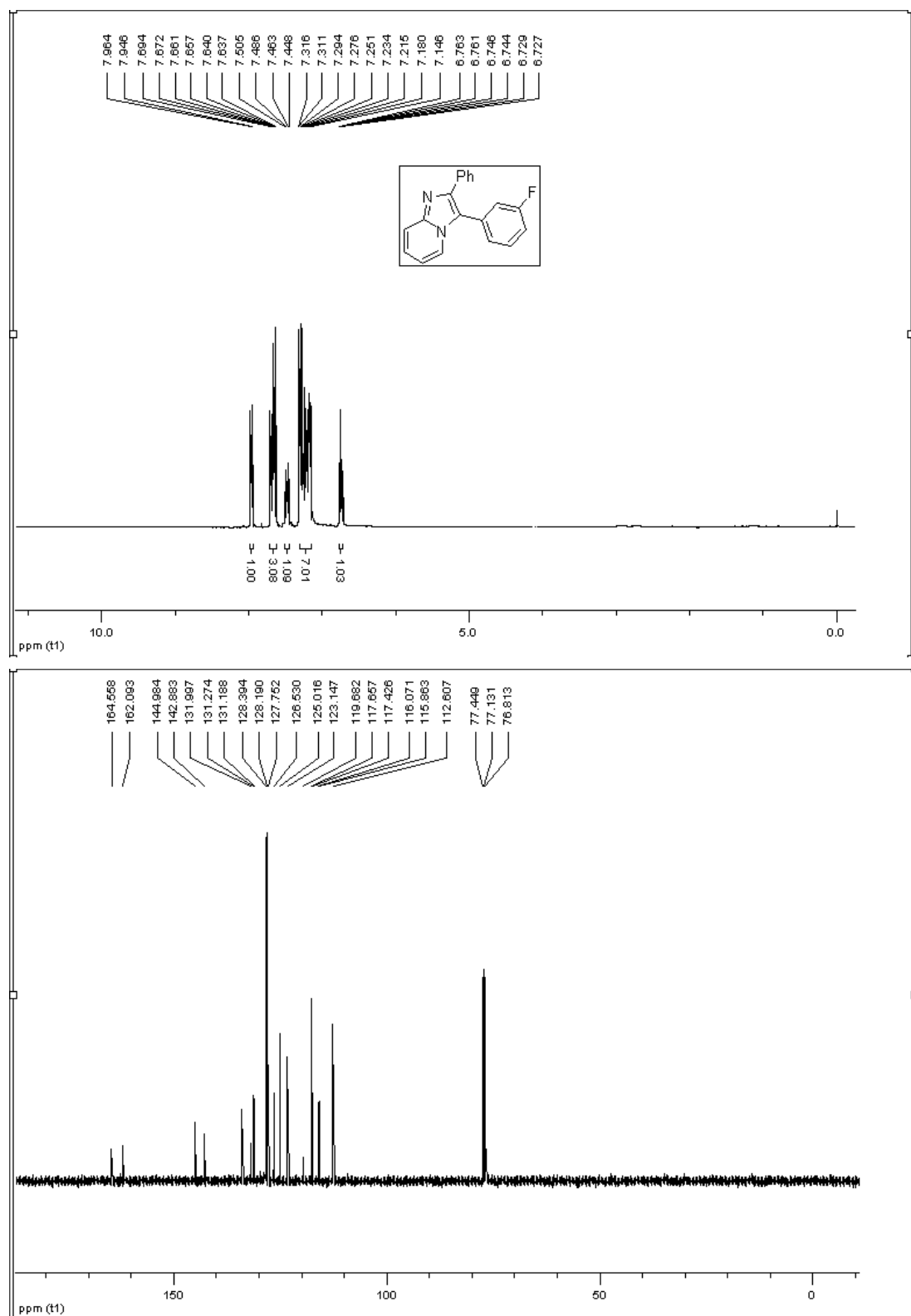
2,3-diphenylimidazo[1,2-a]pyridine(3ea)



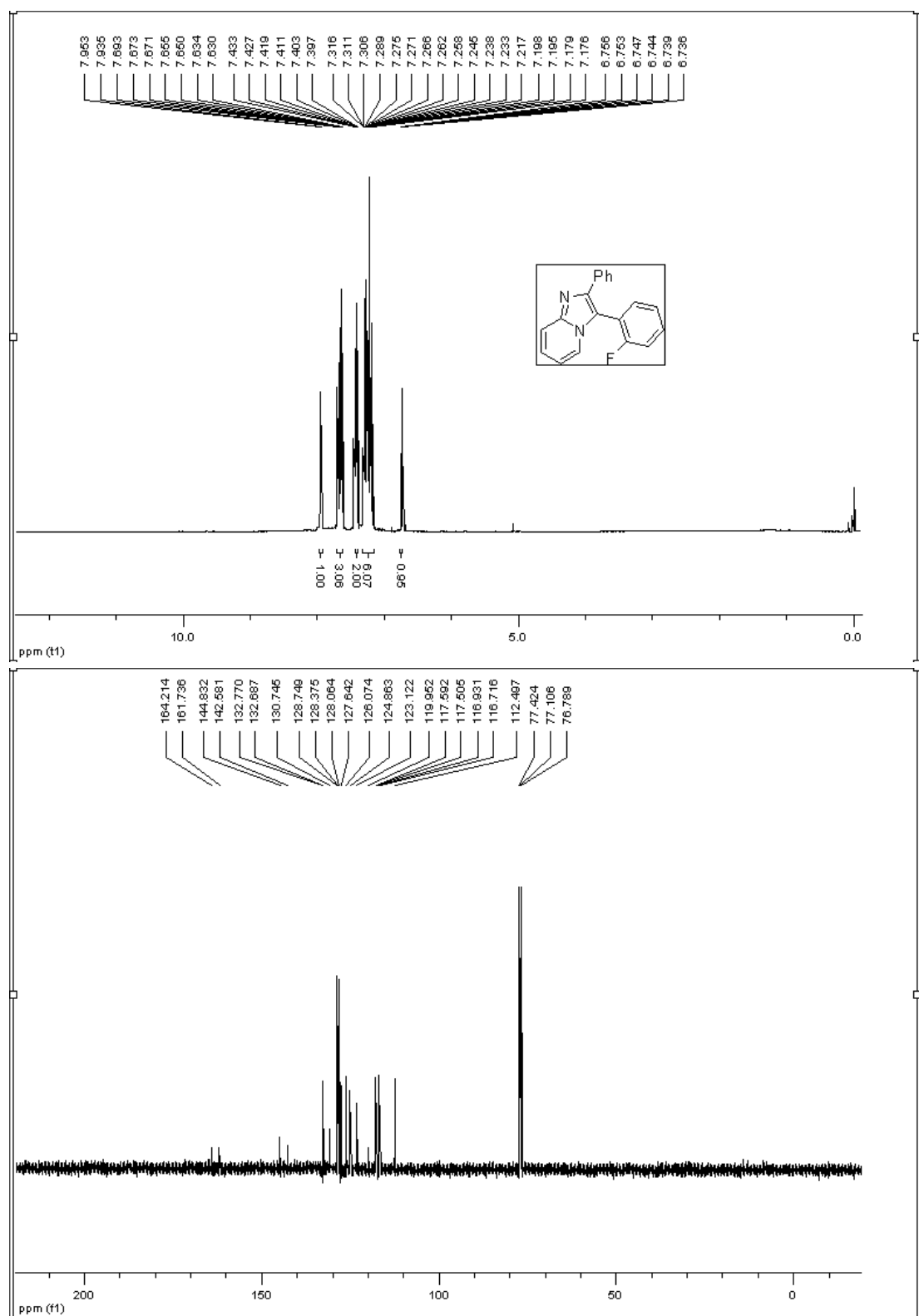
2-phenyl-3-(m-tolyl)imidazo[1,2-a]pyridine(3eb)



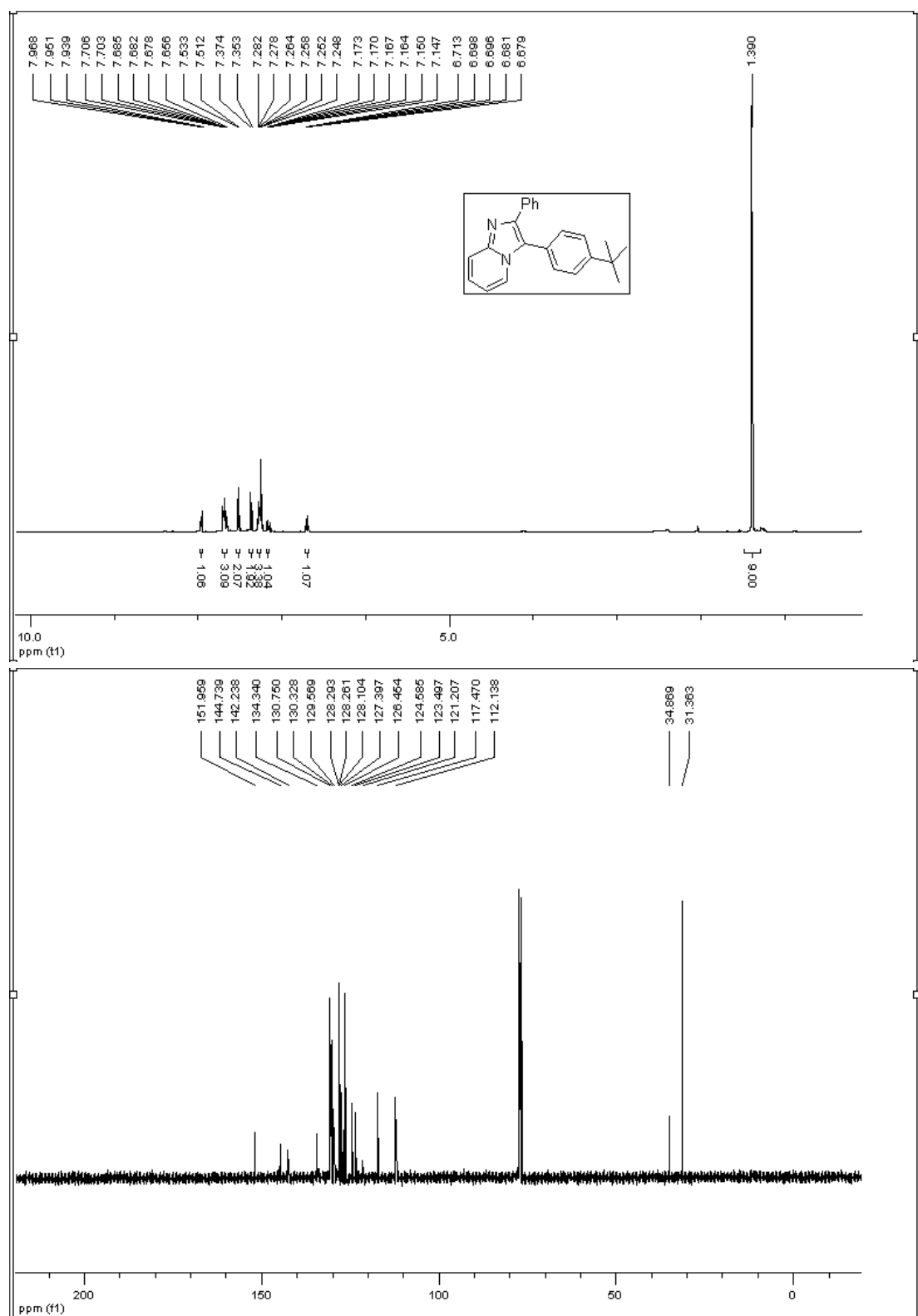
3-(3-fluorophenyl)-2-phenylimidazo[1,2-a]pyridine(3ec)



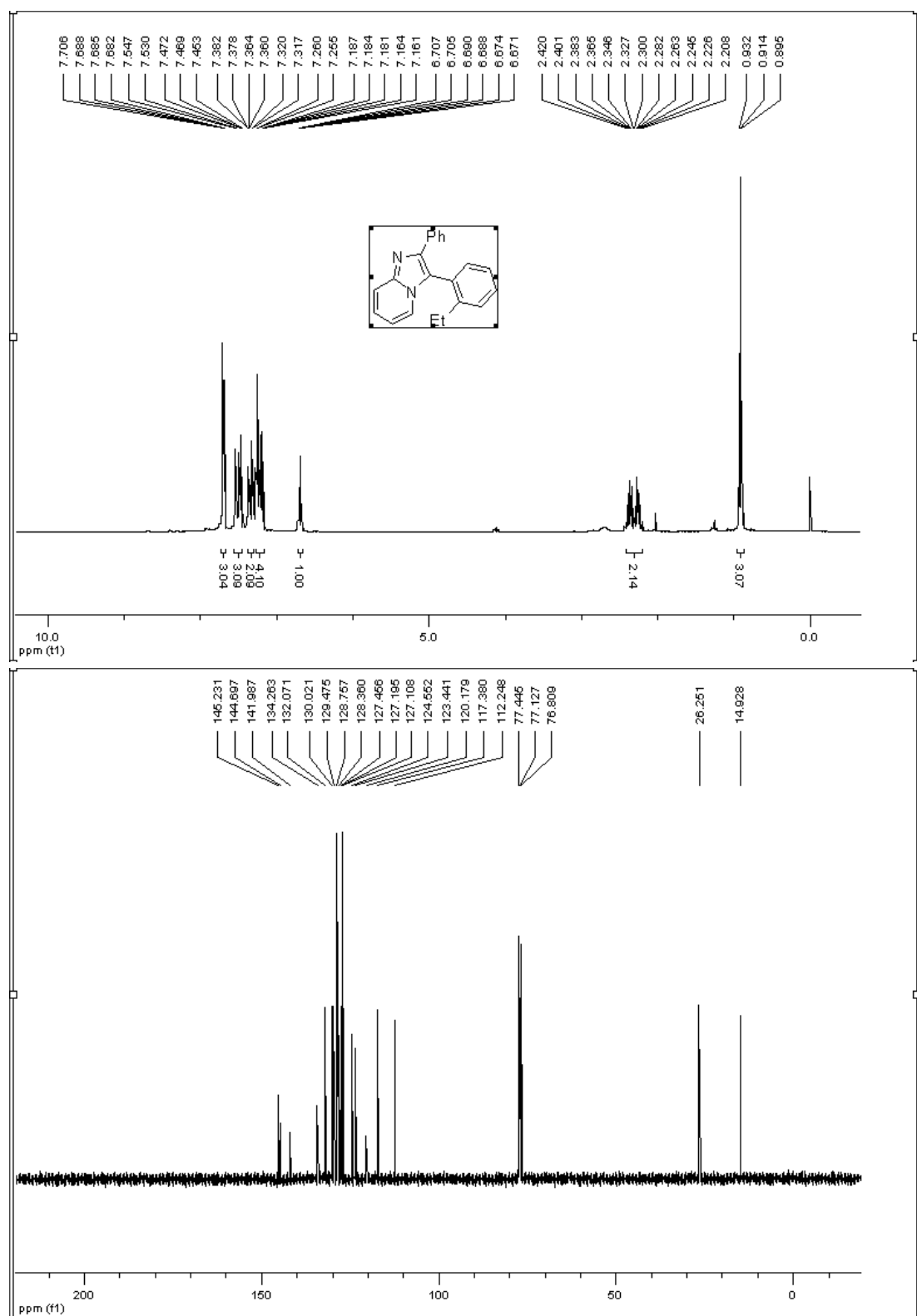
3-(2-fluorophenyl)-2-phenylimidazo[1,2-a]pyridine(3ed)



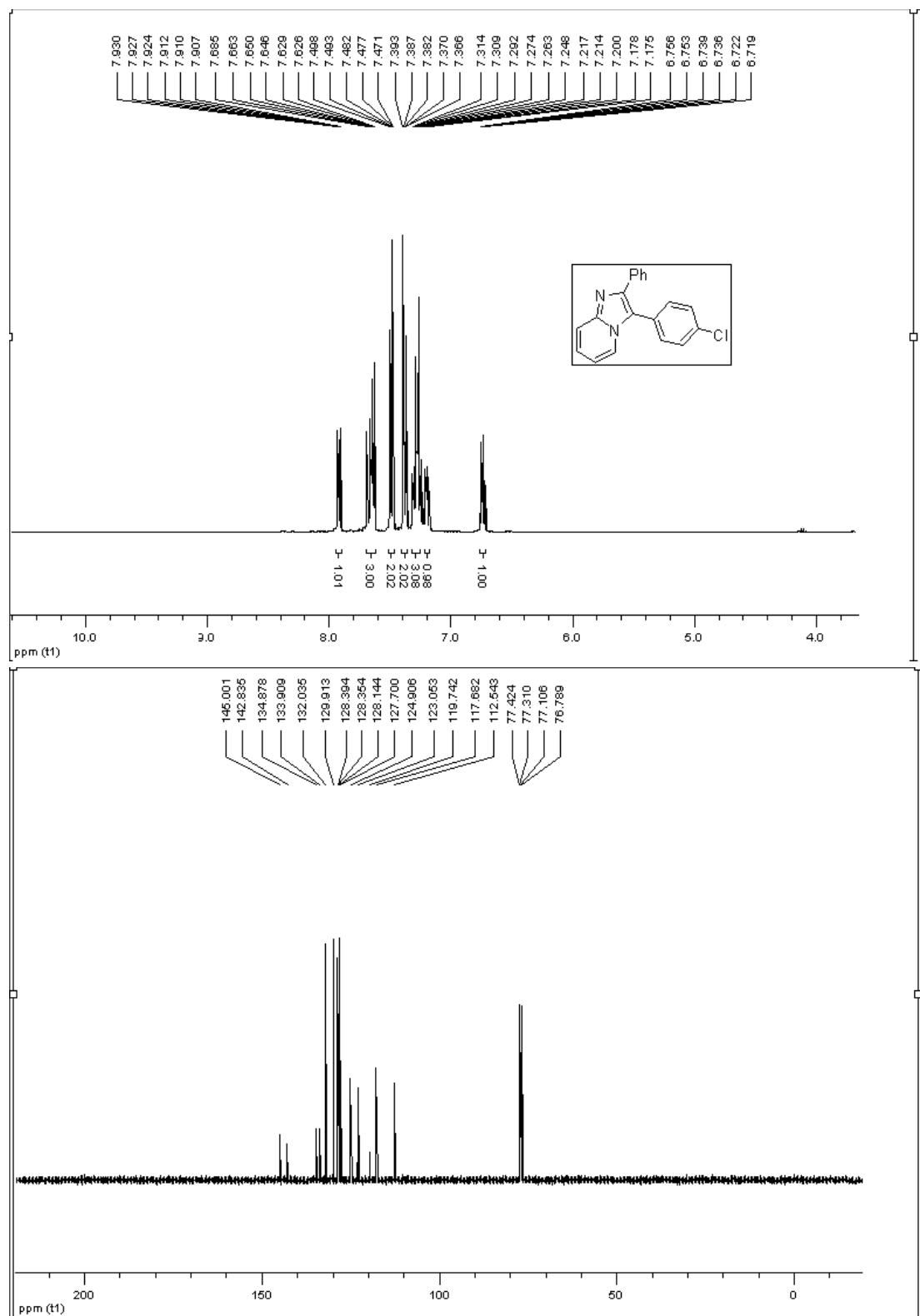
3-(4-(tert-butyl)phenyl)-2-phenylimidazo[1,2-a]pyridine(3eh)



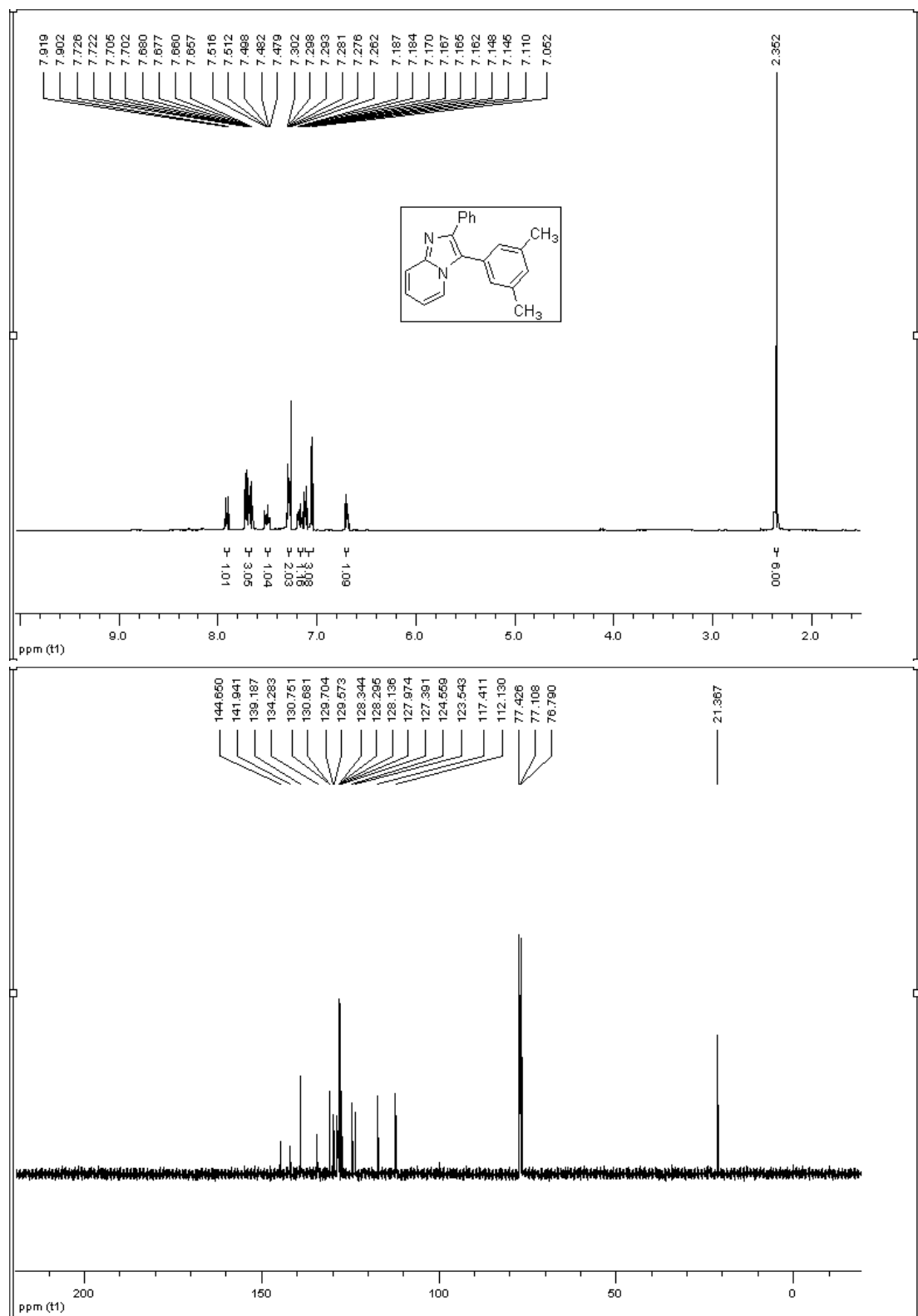
3-(2-ethylphenyl)-2-phenylimidazo[1,2-a]pyridine(3ei)



3-(4-chlorophenyl)-2-phenylimidazo[1,2-a]pyridine(3el)



3-(3,5-dimethylphenyl)-2-phenylimidazo[1,2-a]pyridine(3em)



3-(3-chlorophenyl)-2-phenylimidazo[1,2-a]pyridine(3en)

