Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Fe_3O_4@SiO_2@PolyIonene/Br_3^- core–shell-shell magnetic nanoparticles: a novel catalyst for the synthesis of imidazole derivatives in solvent-free conditions

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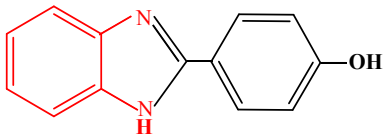
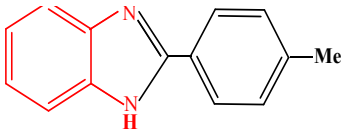
Spectroscopic data:

2-(4-Hydroxyphenyl)-1H-benzimidazole (Table 3, Entry 3):



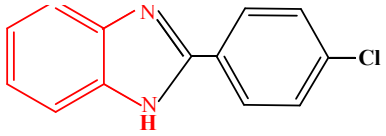
^{1}H NMR (200 MHz, DMSO-d_6): δ 5.04 (br, 1H, OH), 6.91 (d, J = 8.7 Hz, 2H), 7.12-7.21 (m, 2H), 7.48-7.57 (m, 2H), 7.97 (d, J = 8.7 Hz, 2H), 10.02 (br, 1H, NH). ^{13}C NMR (50 MHz, DMSO-d_6): δ 120.1, 121.4, 125.9, 127.6, 133.9, 144.2, 157.1, 165.0.

2-(p-Tolyl)-1H-benzimidazole (Table 3, Entry 4):



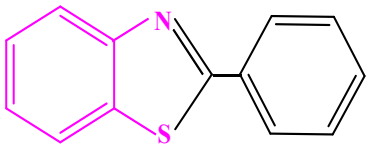
^{1}H NMR (200 MHz, DMSO-d_6): δ (ppm): 2.57 (s, 3H) 7.14-7.20 (m, 2H), 7.34 (t, J = 8.0 Hz, 2H), 7.49 (t, J = 8.0 Hz, 1H), 7.62 (t, J = 8.0 Hz, 1H), 8.03-8.07 (m, 2H), 12.92 (br, 1H, NH). ^{13}C NMR (50 MHz, DMSO-d_6): δ (ppm): 21.3, 111.5, 119.1, 122.3, 127.3, 129.9, 135.3, 144.2, 151.7.

2-(4-Chlorophenyl)-1H-benzimidazole (Table 3, Entry 6):



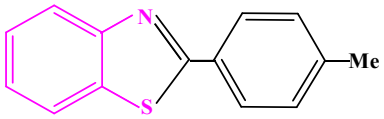
^{1}H NMR (200 MHz, DMSO-d_6): δ (ppm): 7.35-7.41 (m, 2H), 7.76-7.83 (m, 4H), 8.32-8.39 (m, 2H), 13.17 (br, 1H, NH). ^{13}C NMR (50 MHz, DMSO-d_6): δ (ppm): 111.9, 119.4, 122.3, 123.2, 128.6, 129.5, 135.2, 150.6.

2-Phenylbenzothiazole (Table 4, Entry 1):



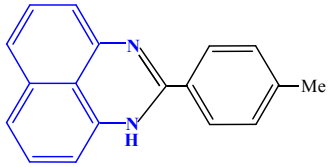
^{1}H NMR (200 MHz, DMSO-d_6): δ (ppm): 7.54–7.59 (m, 5H), 8.07-8.13 (m, 4H). ^{13}C NMR (50 MHz, DMSO-d_6): δ (ppm): 123.3, 123.8, 126.5, 127.6, 128.1, 130.3, 132.3, 133.7, 135.3, 154.4, 168.2.

2-(p-Tolyl)benzothiazole (Table 4, Entry 4) :



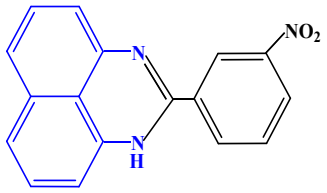
^{1}H NMR (200 MHz, $CDCl_3$), δ (ppm): 2.40 (s, 3 H), 7.24-7.48 (m, 4 H), 7.85-8.03 (m, 4 H). ^{13}C NMR (50 MHz, $CDCl_3$), δ (ppm): 22.0, 122.0, 123.5, 125.4, 126.7, 127.9, 130.2, 131.3, 135.4, 141.9, 154.6, 168.7.

2-(p-Tolyl)-2,3-dihydro-1H-perimidine (Table 5, Entry 3):



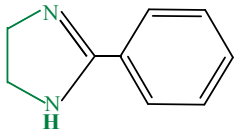
IR (KBr): ν = 3365, 3039, 2922, 1601, 1485, 1417. ^{1}H NMR (400 MHz, DMSO-d_6): δ (ppm): 2.35 (s, 3H, CH_3), 5.34 (s, 1H, CH), 6.49-7.51 (m, 12H, CH_{arom}, 2NH). ^{13}C NMR (100 MHz, DMSO-d_6): δ (ppm): 20.8, 66.6, 104.2, 112.4, 115.1, 126.8, 127.8, 128.7, 134.3, 137.7, 138.8, 143.1.

2-(3-Nitrophenyl)-2,3-dihydro-1H-perimidine (Table 5, Entry 5):

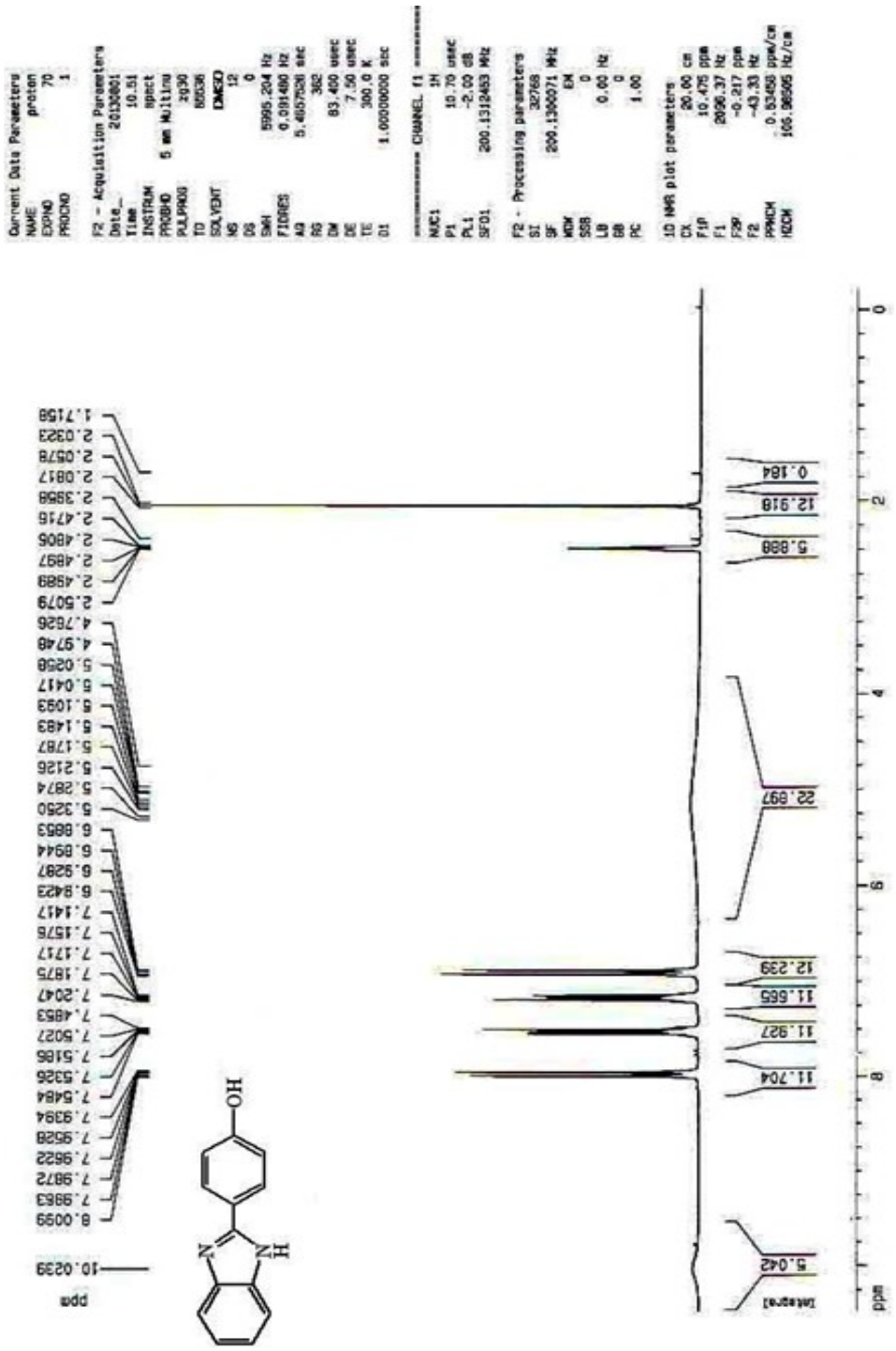


IR (KBr): ν = 3344, 3226, 2821, 1606, 1529, 1415, 1333. ^{1}H NMR (400 MHz, DMSO-d_6): δ (ppm): 5.56 (s, 1H, CH), 6.52-8.45 (m, 12H, CH_{arom}, 2 NH). ^{13}C NMR (100 MHz, DMSO-d_6): δ (ppm): 64.8, 104.6, 112.4, 115.6, 122.6, 123.2, 126.9, 129.9, 134.2, 134.6, 142.2, 144.5, 147.6.

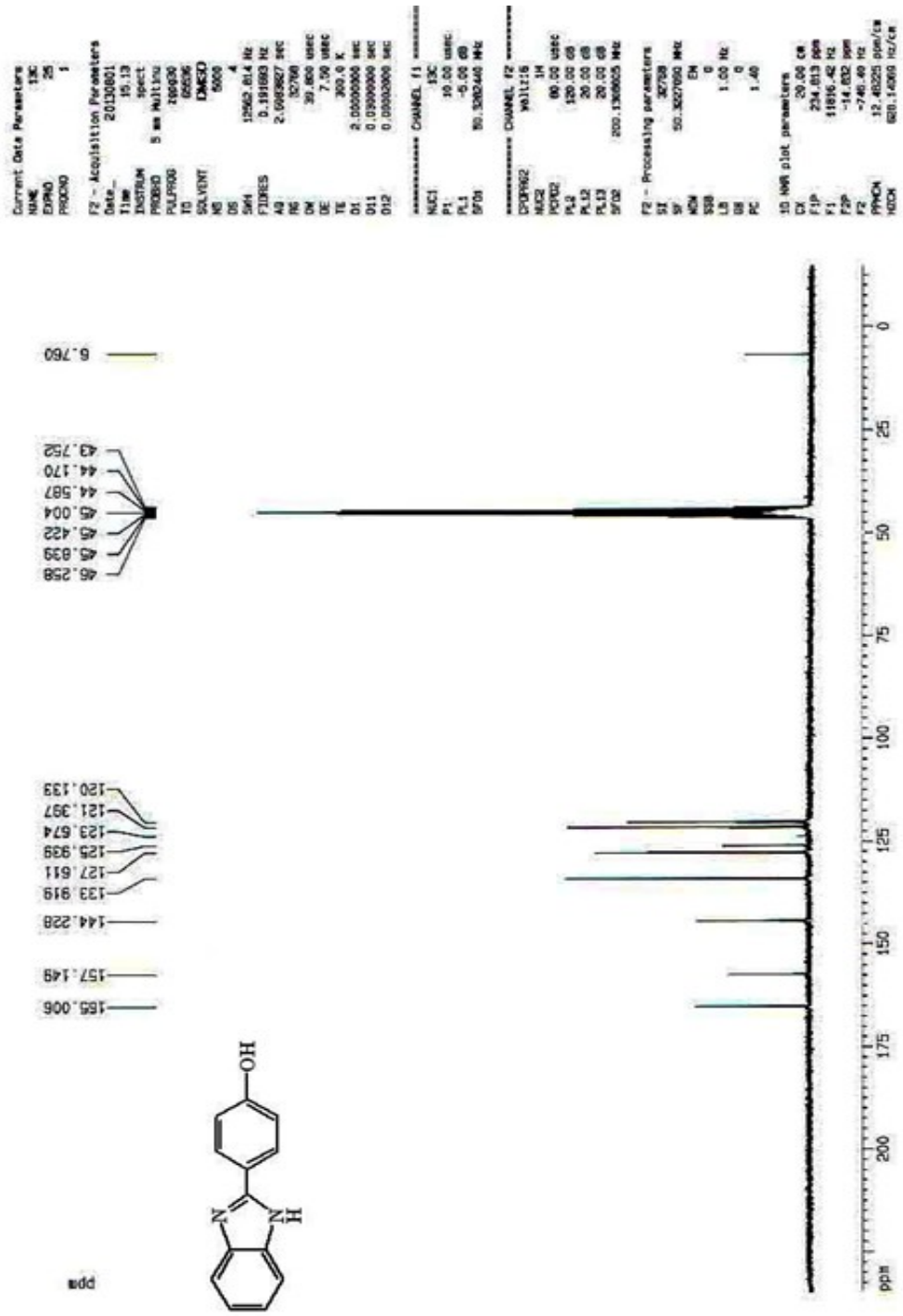
2-Phenyl-1H-imidazole (Table 6, Entry 1):



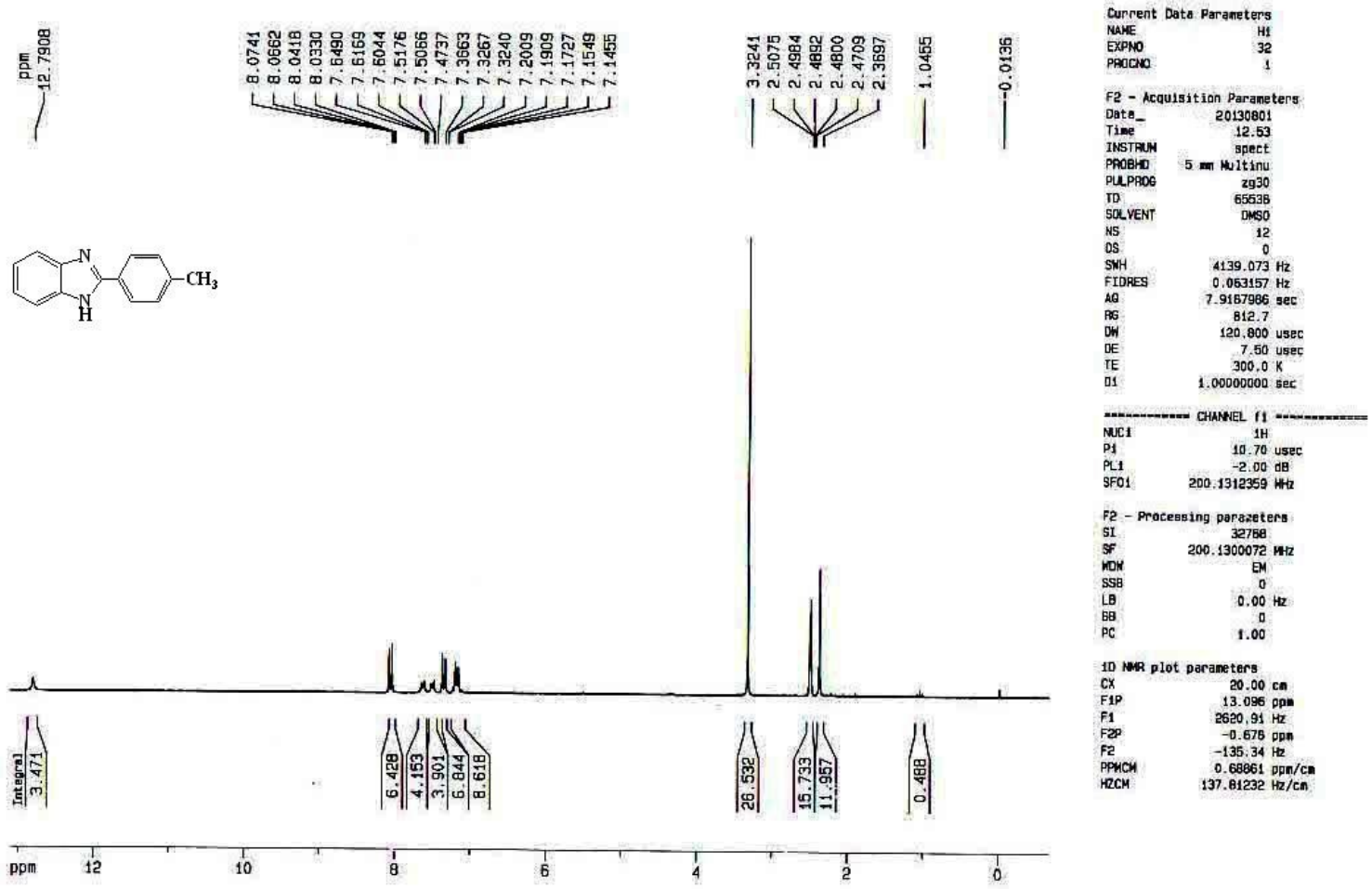
^{1}H NMR (200 MHz, DMSO-d_6): δ 7.19-7.23 (m, 2H), 7.51-7.61 (m, 5H), 8.16-8.21 (m, 2H), 12.91 (br, 1H, NH). ^{13}C NMR (50 MHz, DMSO-d_6): δ 120.1, 123.2, 127.0, 127.3, 129.7, 130.7, 131.0, 152.1.



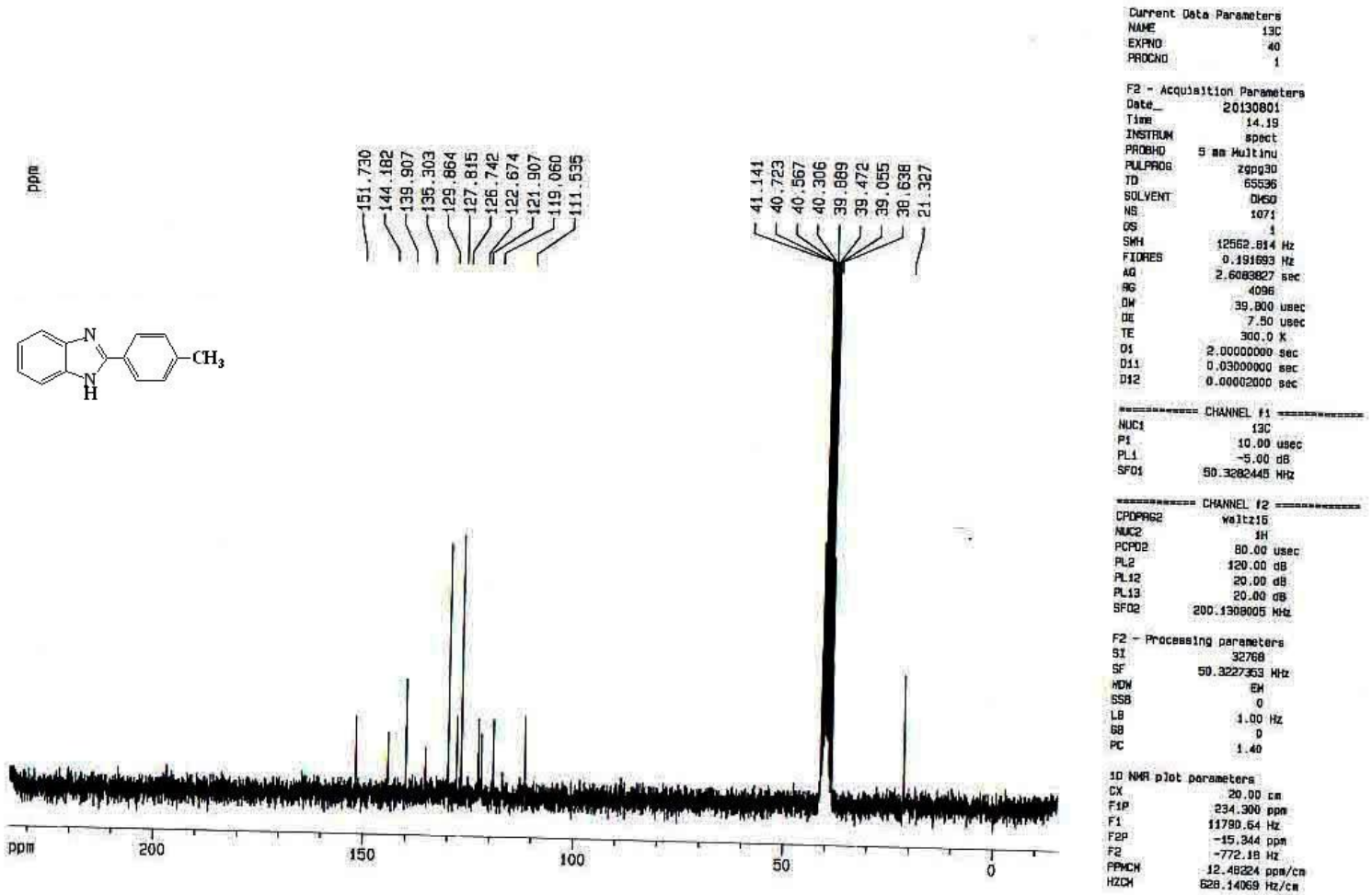
^{1}HNMR spectra of 2-(4-Hydroxyphenyl)-1H-benzimidazole



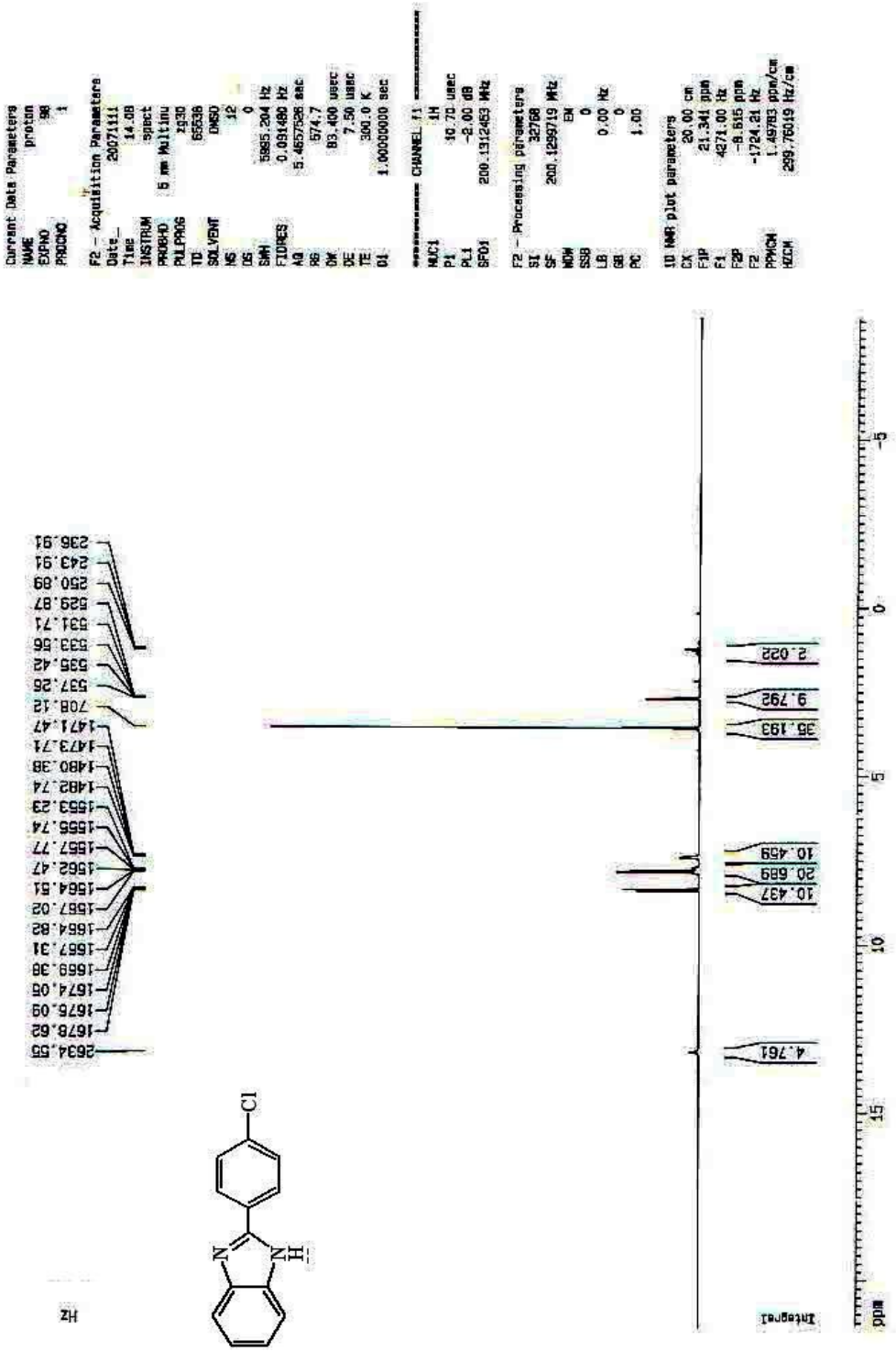
^{13}CNMR spectra of 2-(4-Hydroxyphenyl)-1H-benzimidazole



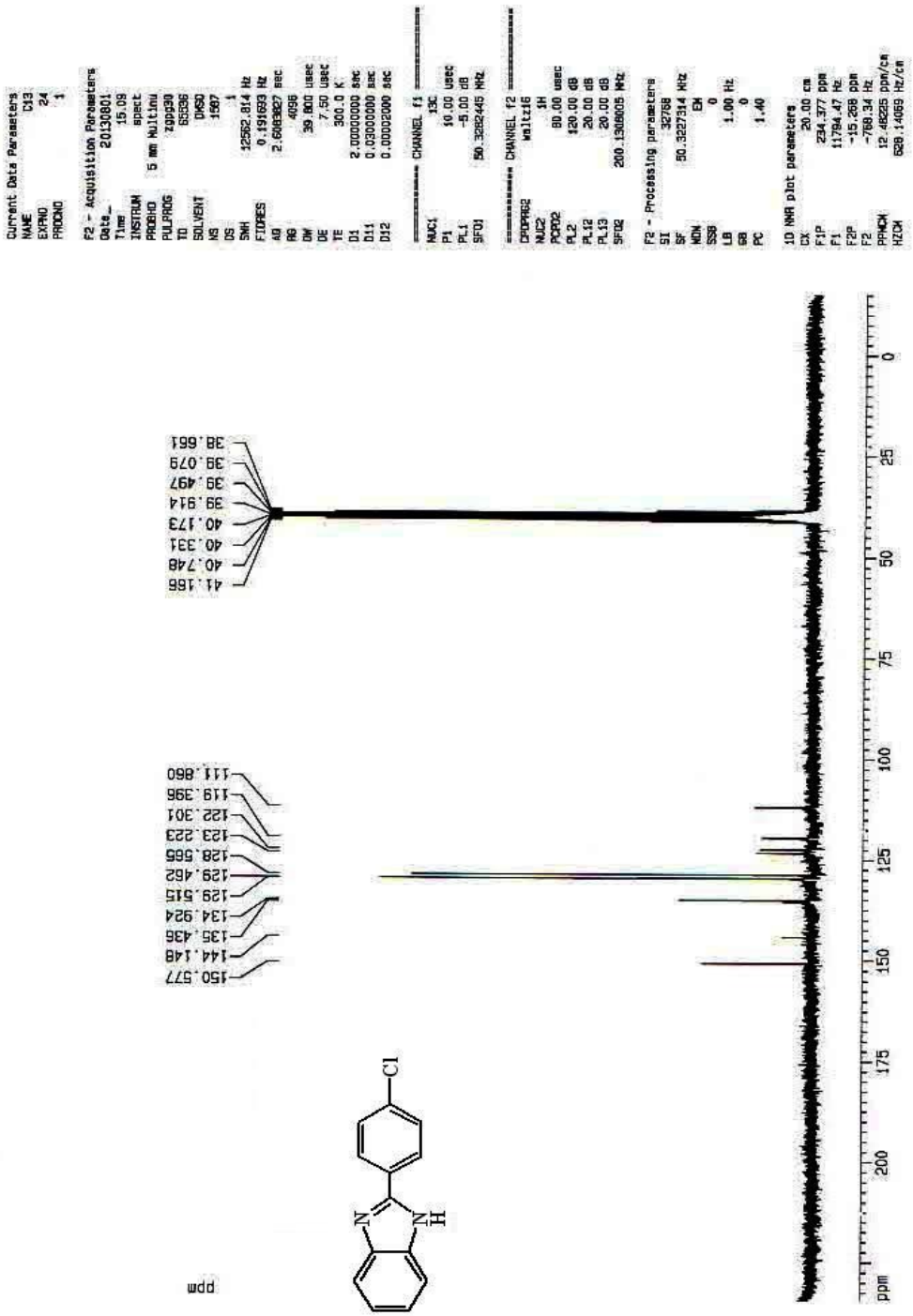
[1]HNMR spectra of 2-(p-Tolyl)-1H-benzimidazole



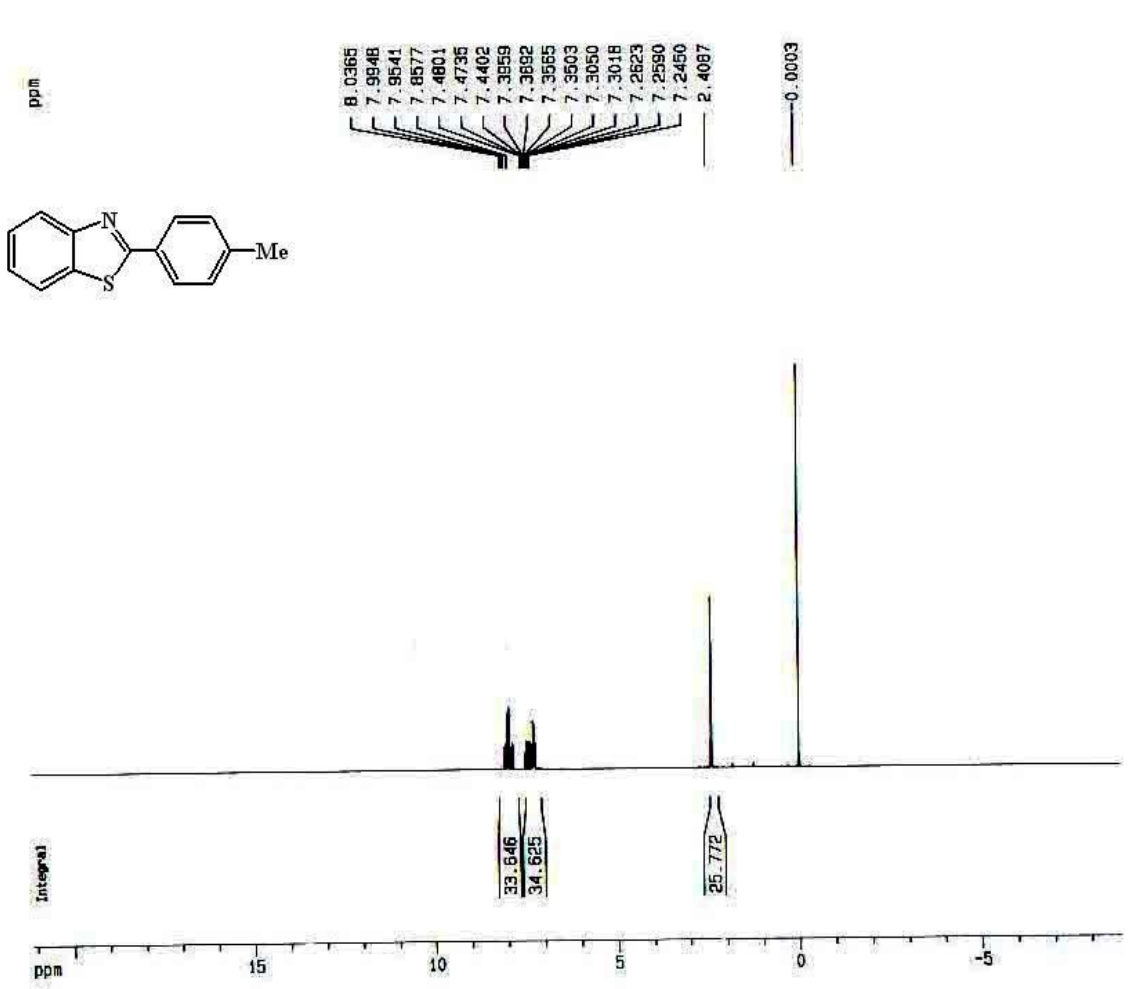
^{13}CNMR spectra of 2-(p-Tolyl)-1H-benzimidazole



^{1}HNMR spectra of 2-(4-Chlorophenyl)-1H-benzimidazole



^{13}CNMR spectra of **2-(4-Chlorophenyl)-1H-benzimidazole**



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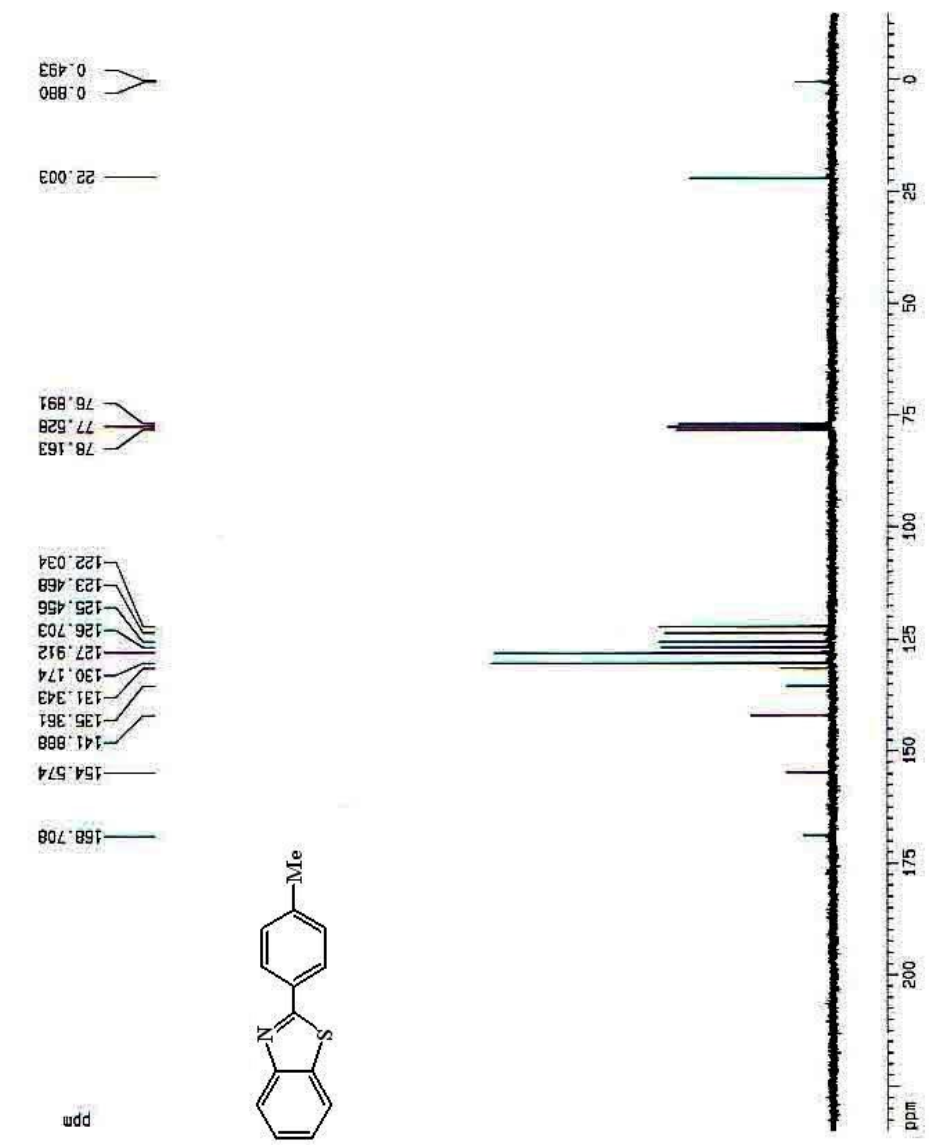
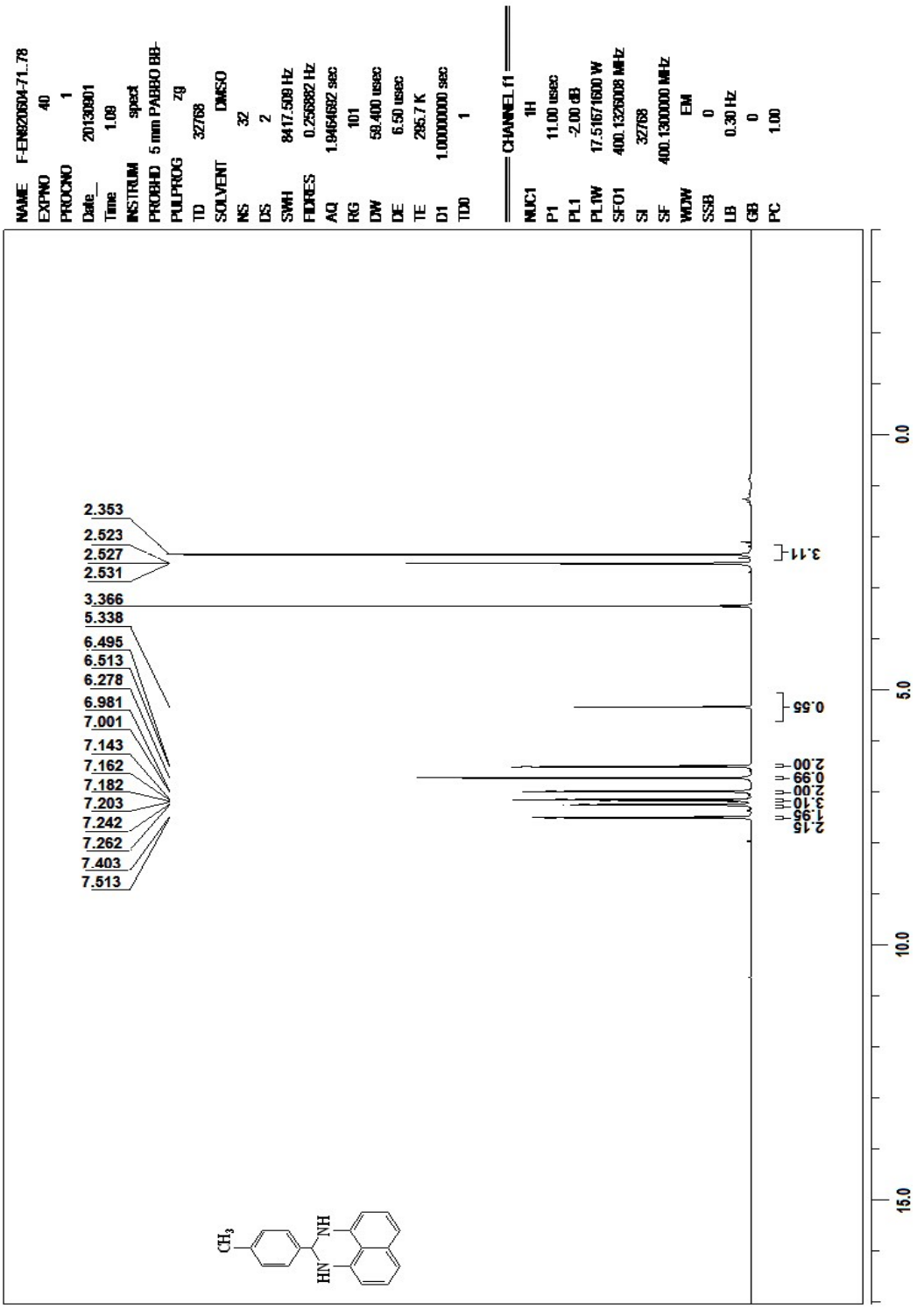
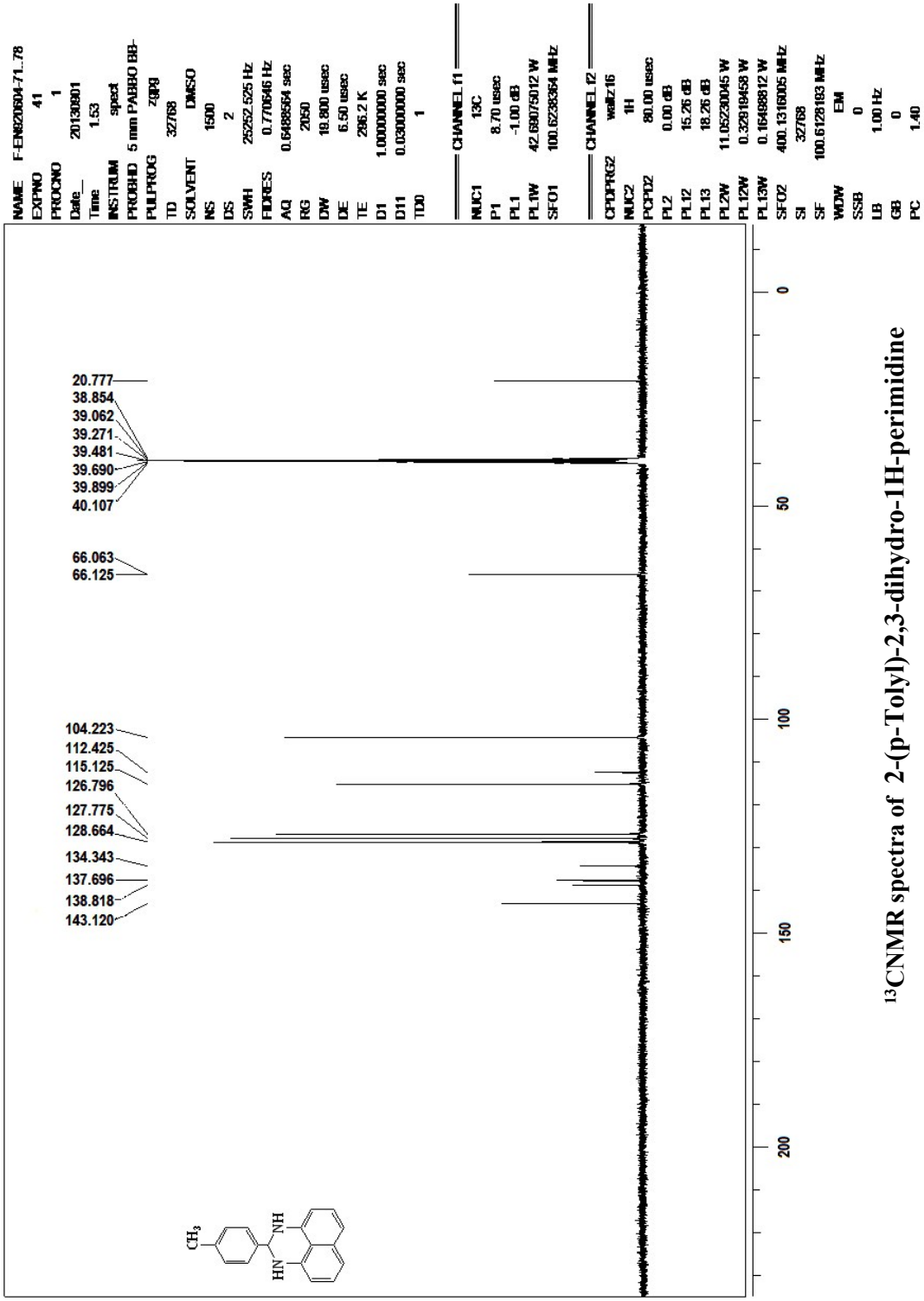
^{1}HNMR spectra of 2-(p-Tolyl)benzothiazole



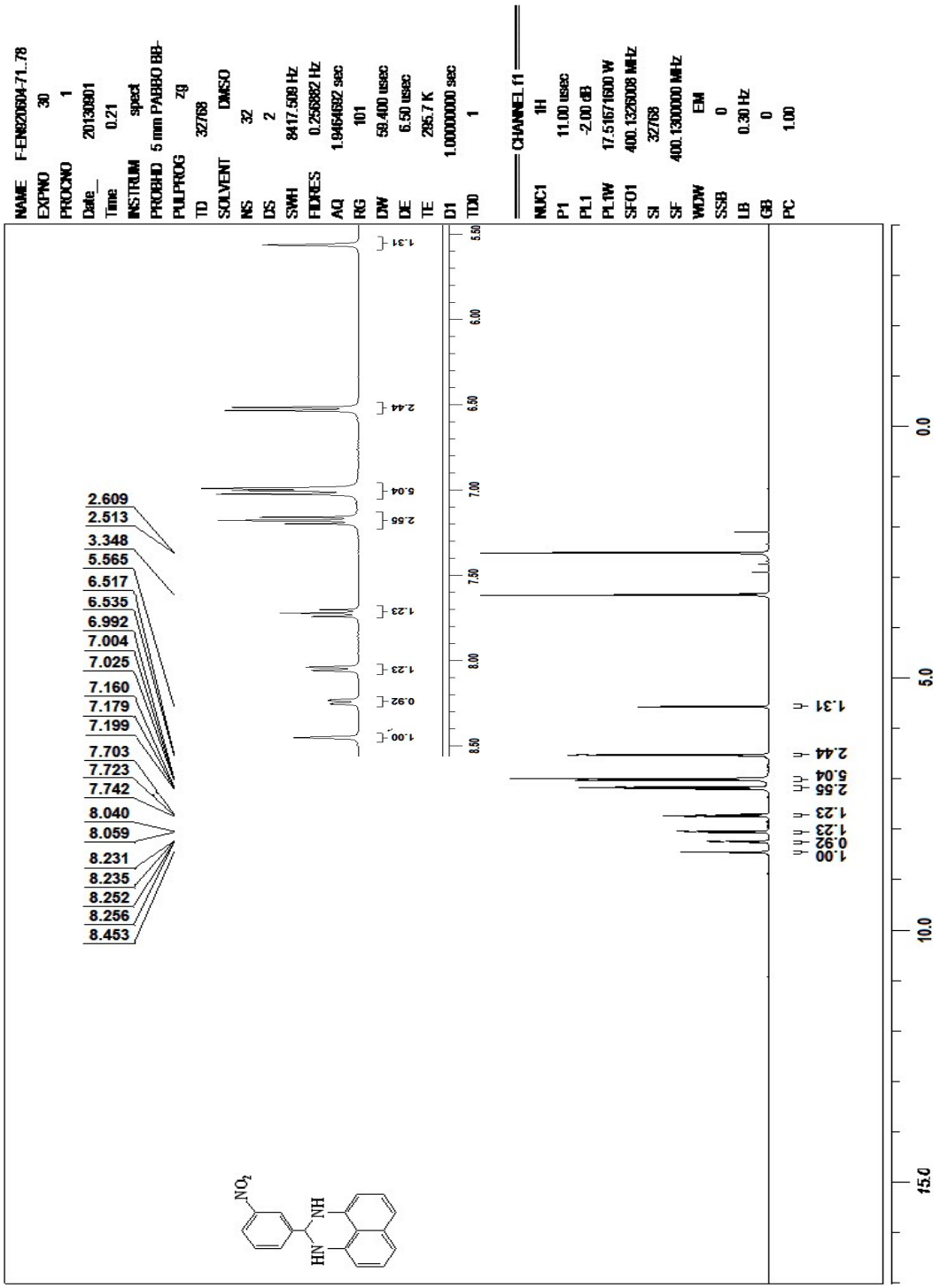
^{13}CNMR spectra of 2-(p-Tolyl)benzothiazole



^{1}HNMR spectra of 2-(p-Tolyl)-2,3-dihydro-1H-perimidine

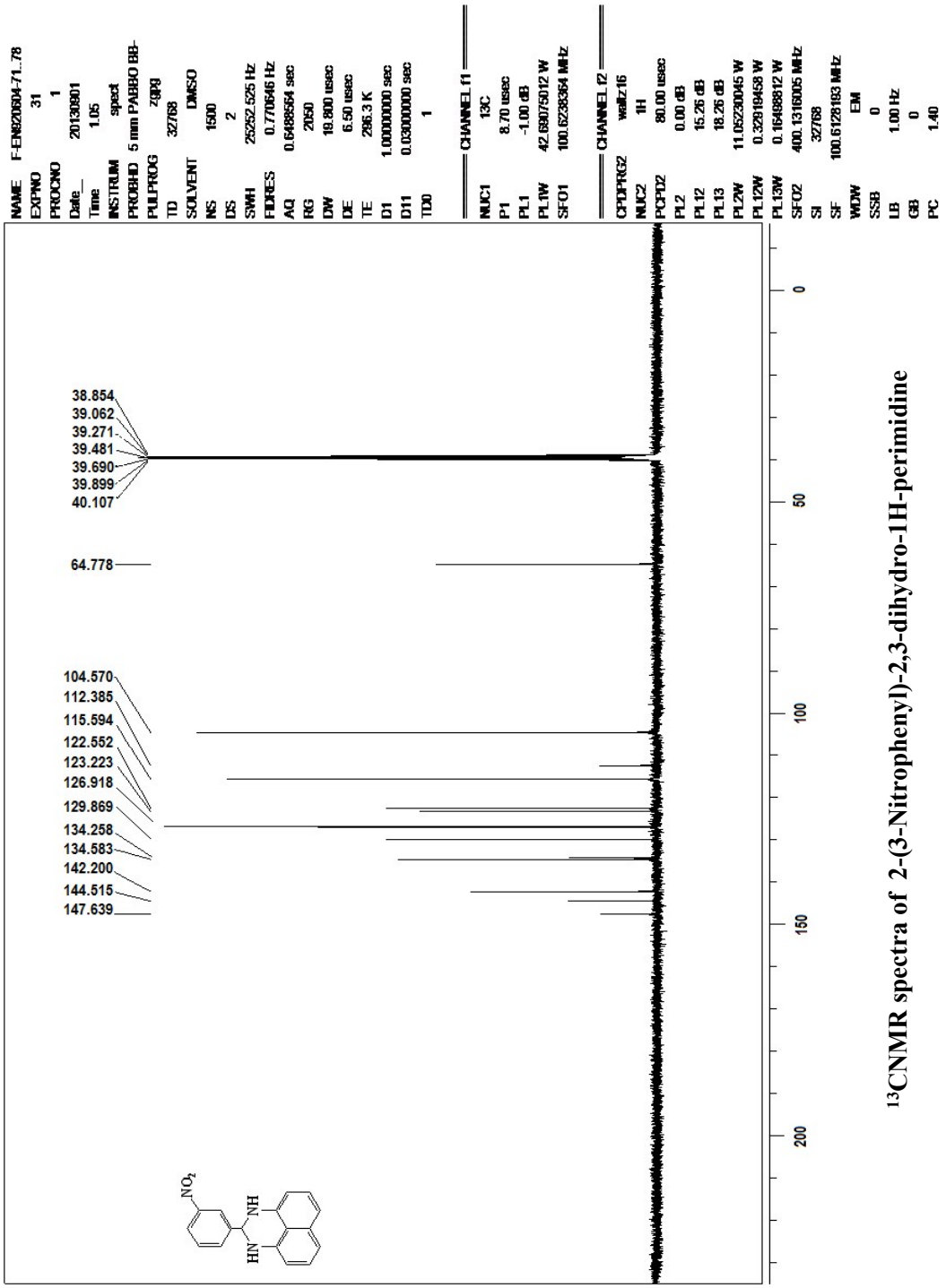


^{13}CNMR spectra of 2-(p-Tolyl)-2,3-dihydro-1H-perimidine



^{1}HNMR spectra of 2-(3-Nitrophenyl)-2,3-dihydro-1H-perimidine

^{1}HNMR spectra of 2-(3-Nitrophenyl)-2,3-dihydro-1H-perimidine



^{13}CNMR spectra of 2-(3-Nitrophenyl)-2,3-dihydro-1H-perimidine