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Supporting Information

An efficient multicomponent synthesis of 2,4,5-trisubstituted and 1,2,4,5-tetrasubstituted imidazoles catalyzed by a magnetic nanoparticle supported Lewis acidic deep eutectic solvent.

Thanh Thi Nguyen, Ngoc-Phuong Thi Le, The Thai Nguyen and Phuong Hoang Tran*

*Department of Organic Chemistry, Faculty of Chemistry, University of Science, Vietnam National University, Ho Chi Minh City 721337, Vietnam.

Corresponding author: E-mail: thphuong@ hcmus.edu.vn

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Section S1. Chemicals and analytical Techniques

Materials

Imidazole (99%), iron(II) chloride hexahydrate (99%), iron(II) sulfate heptahydrate (99%), potassium hydroxide (85%), benzyl (≥99%), aniline (≥99,5%), ammonium acetate (≥98%) were purchased from Acros Organics. Zinc chloride (≥98%), 3-(chloropropyl) trietoxysilane (95%), benzaldehyde (99%), 2-nitrobenzaldehyde (98%), 4-nitrobenzaldehyde (98%), 3-hydroxybenzaldehyde (99%), 4-hydroxybenzaldehyde (98%), 2-hydroxybenzaldehyde (97%), 4-florobenzaldehyde (98%), 4-methylbenzaldehyde (97%), 4-methoxybenzaldehyde (98%), 4-*N*,*N*-dimethylbenzaldehyde (99%), 4-chlorobenzaldehyde (97%), 4-t-butylbenzaldehyde (97%), 2-carboxybenzaldehyde (97%), 2-methyl-5-hydroxybenzaldehyde (97%) were obtained from Sigma-Aldrich Chemical Company. Ethyl acetate (≥99,5%), petroleum ether (≥99,5%), sodium sulfate anhydrous (≥99%) were prepared from Xilong Chemical Co., Ltd. Ethanol (≥99,5%) was obtained from Chemsol Co., Ltd. TLC (silica gel 60 F_{254}) layer was obtained from Merk.

Analytical Techniques

^{1}H and ^{13}C nuclear magnetic resonance (NMR) spectra were recorded on a Bruker Advance II 500 MHz NMR spectrometer. Fourier Transform infrared (FT-IR) spectra were recorded from KBr pellets using a Bruker Vertex 70 system. Raman spectra were recorded on a Horiba Xplora One using a 532 nm argon ion laser. ICP-MS was recorded on a PerkinElmer 350X. Thermal gravimetric analysis (TGA) was performed on a TA Q500 thermal analysis system with the sample held in a platinum pan in a continuous airflow. TEM was recorder from JEOL JEM-1400 series 100kV Transmission Electron Microscope.

Section S2. Synthesis and characterization of LADES@MNP catalyst

Synthesis of Fe_3O_4 nanoparticles: The magnetic nanoparticle Fe_3O_4 was synthesized by co-precipitation method reported in the literature. The mixture of $FeCl_2$ and $FeCl_3$ was dissolved in 200 mL water under ultrasonic irradiation. The pH value of the solution was adjusted to 12.0 by adding amount of potassium hydroxide solution (1.0 M). After sonication for 120 mins, Fe_3O_4 was washed repeatedly water and ethanol, separated with a magnetic and drying at 80 ^oC for 12 hours.

Coating Fe_3O_4 nanoparticles of silica: The coating of a layer of silica on the surface of the nano Fe_3O_4 was carried out by refluxing the mixture of Fe_3O_4 (1 g), 3 mL ammonia solution and 3 mL of tetraethylorthosilicate (TEOS) in 100 mL ethanol. After 8 h, the black precipitate ($SiO_2@Fe_3O_4$) was collected using a magnet, followed by washing with ethanol three times and drying at 80 °C for 6 h. 5 g $SiO_2@Fe_3O_4$ were dispersed in 100 mL toluene by sonication for 30 min and (3-chloropropyl)triethoxysilane (4.820 g, 20.0 mmol) was then added. After refluxing for 12 hours, the reaction mixture was cooled to room temperature. The product ($Fe_3O_4@SiO_2@(CH_2)_3Cl$) was separated, wash with ethanol and dried for further application.

Synthesis of LADES: The reaction of urea (20.0 mol) and zinc chloride (5.0 mmol) was involved at 100 ^oC and strirring to afford clear solution. DES $[Urea]_4[ZnCl_2]$ was used without further purification.

Procedure for the synthesis of LADES@MNP: The mixture of 3.0 g $Fe_3O_4@SiO_2@(CH_2)_3Cl$ and DES $[Urea]_4[ZnCl_2]$ (1.880 g, 5.0 mmol) were added round-bottomed flask and strirred at 90 ^oC for 18 hours. Lastly, the $Fe_3O_4@SiO_2@(CH_2)_3$-Urea-$ZnCl_2$ catalyst was rinsed three times with ethanol and water, collected magnetically from solution mixture, and dried under reduced pressure at 60 °C for 6 h.

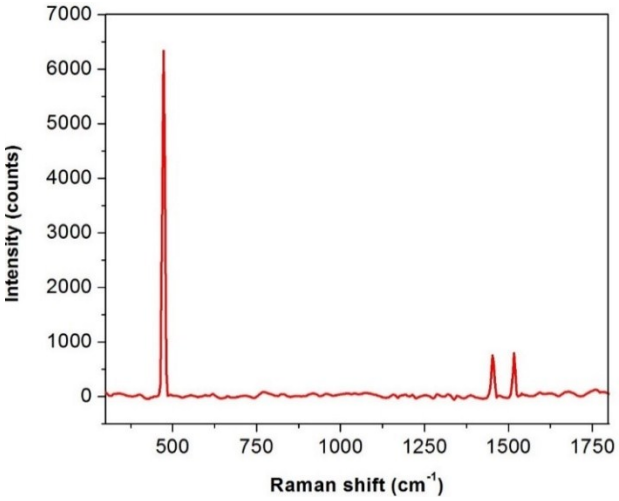


Figure S1. Raman spectra of LADES@MNP

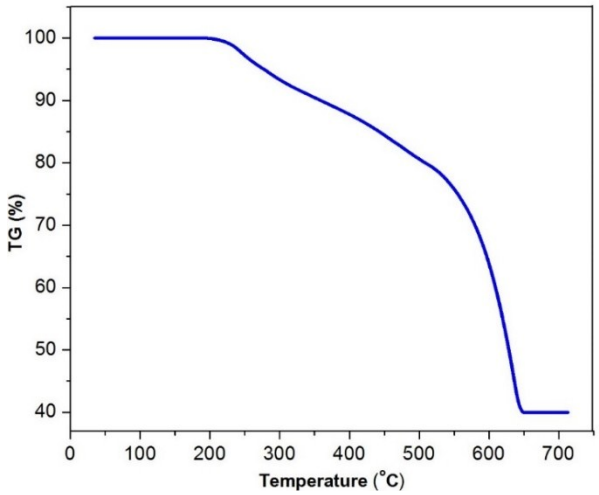


Figure S2. TG analysis of LADES@MNP

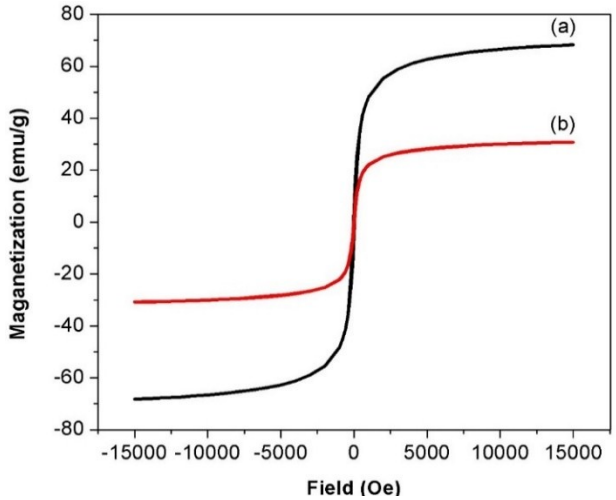
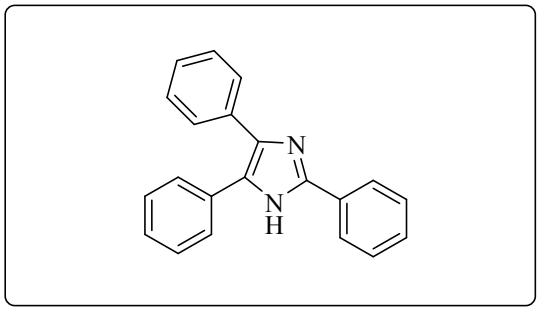


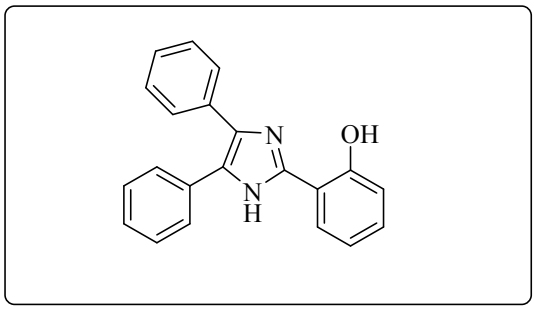
Figure S3. Magnetic curves of Fe_3O_4 (a) and LADES@MNP (b)

Section S3. Spectral data of products

2,4,5-Triphenyl-1*H*-imidazole[24] ($C_{21}H_{16}N_2$, 1a): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield : 123 mg (83%); mp. 276-277 ^oC (lit. mp. 267-269 ^oC) ; FT-IR (KBr) 3417, 3037, 2967, 1600, 1502, 1487, 1460, 766, 696 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.69 (s, 1H), 8.09 (d, J = 7.5 Hz, 2H), 7.55 (d, J =7.5 Hz, 2H), 7.52-7.43 (m, 6H), 7.38 (dd, J = 7.0 Hz, 2H), 7.31 (dd, J = 7.5 Hz, 2H), 7.22 (dd, J = 7.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 145.5, 137.1, 135.2, 131.1, 130.3, 128.7, 128.7, 128.5, 128.2, 128.2, 127.8, 127.1, 126.5, 125.2.

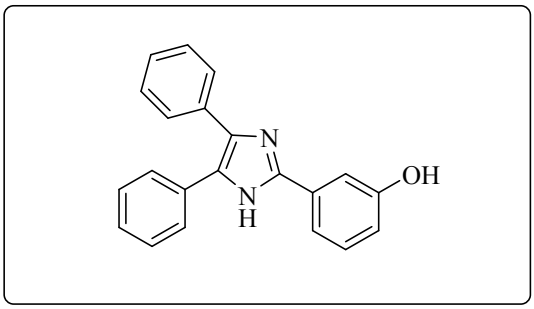


2-(4,5-Diphenyl-1*H*-imidazol-2-yl)phenol[24] ($C_{21}H_{16}N_2O$, 1b): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 140 mg (90%); mp. 212-213 ^oC (lit. mp. 202-205 ^oC); FT-IR (KBr) 3421, 3213, 3061, 1607, 1494, 1443, 1383, 1261, 758, 694 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 13.01 (s, 1H),12.93(s, 1H), 8.01 (d, J = 10 Hz, 1H), *7*.52-7.40 (m, 7H), 7.32 (dd, J = 7.5 Hz, 2H), 7.26-7.23 (m, 2H), 6.96-6,90 (m, 2H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 157.0, 146.2, 134.5, 133.9, 130.6, 130.4, 129.1, 128.9, 128.7, 127.6, 127.4, 127.1, 125.3, 119.2, 117.2, 113.2.

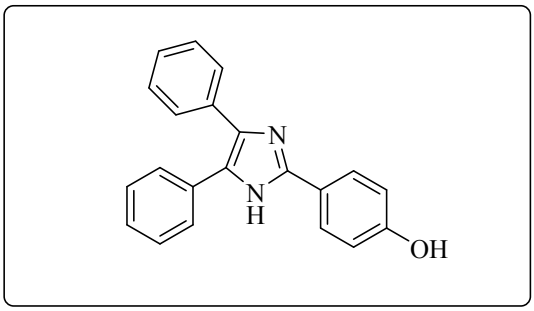


3-(4,5-Diphenyl-1*H*-imidazol-2-yl)phenol[33] ($C_{21}H_{16}N_2O$, 1c): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 125 mg (80%); mp. 263-264 ^oC (lit. mp. 258-260 ^oC) ;

FT-IR (KBr) 3372, 3060, 3017, 2914, 1618, 1502, 1230, 1193, 762, 695 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.61 (s, 1H), 9.55 (s, 1H), 7.54-7.49 (m, 5H), 7.44 (dd, J = 7.0 Hz, 2H), 7.37 (dd, J = 7.5 Hz, 2H), 7.32-7.20 (m, 4H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 157.6, 145.6, 137.0, 135.2, 131.6, 131.1, 129.7, 128.6, 128.5, 128.2, 128.1, 127.7, 127.1, 126.5, 116.1, 115.4, 112.2.

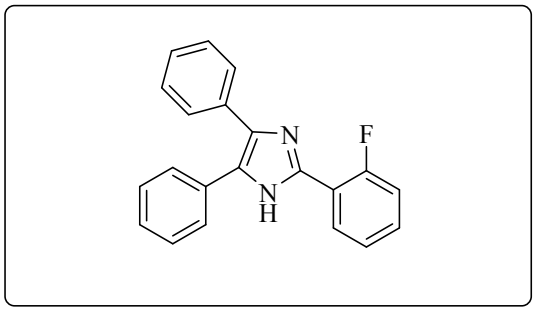


4-(4,5-Diphenyl-1H-imidazol-2-yl)phenol[24] ($C_{21}H_{16}N_2O$, 1d): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; yellow solid; yield: 142 mg (91%); mp. 264-265 ^oC (lit. mp. 232-233 ^oC); FT-IR (KBr) 3448, 2952, 2828, 1597, 1474, 1441, 1394, 1317, 1129, 1038, 967, 764, 692 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.41 (s, 1H), 9.70 (s, 1H), 7.90 (d, J = 9.0 Hz, 2H), 7.54 (d, J = 7.5 Hz, 2H), 7.49 (d, J = 7.5 Hz, 2H), 7.44 (d, J = 7.5 Hz, 2H), 7.36 (dd, J = 7.0 Hz, 1H), 7.30 (dd, J = 7.0 Hz, 2H), 7.21(dd, J = 7.0 Hz, 1H), 6.85 (d, J = 8.5 Hz, 2H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 170.0, 157.4, 145.7, 136.3, 135.1, 131.0, 128.3, 128.0, 127.8, 127.2, 127.0, 126.7, 126.5, 126.0, 121.3, 115.1.

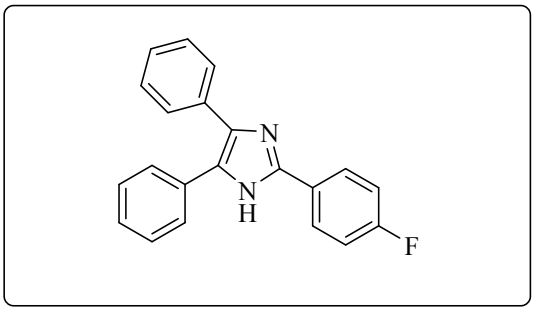


2-(2-Fluorophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}FN_2$, 1e): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; yellow solid; yield: 119 mg (76%); mp. 217-218 ^oC; FT-IR (KBr) 3443, 3059, 2952, 2826, 1725, 1641, 1485, 1442, 1382, 1245, 1130, 1041, 766, 699 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.64 (s, 1H), 7.80 (dd, J = 4.0 Hz, 1H), 7.61 (dd, J = 4.0 Hz, 1H),

7.55 (d, J = 7.5 Hz, 2H), 7.50-7.46 (m, 4H), 7.43 (dd, J = 7.0 Hz, 2H), 7.36 (dd, J = 7.0 Hz, 2H), 7.31 (dd, J = 7.5 Hz, 2H), 7.23 (dd, J = 7.0 Hz, 1H) ppm; ^{13}C NMR (125 MHz, DMSO-d_6) δ 143.7, 136.3 (d, J = 222.5 Hz), 131.9 (d, J = 6.3 Hz), 131.2, 130.6 (d, J = 4.0 Hz), 130.4, 129.0, 128.5, 128.4, 128.1, 127.5 (d, J = 5.0 Hz), 126.9.

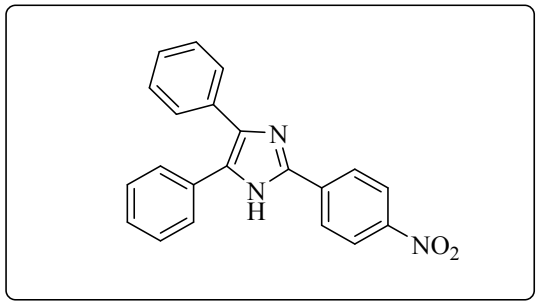


4-(4-Fluorophenyl)-4,5-diphenyl-1*H*-imidazole[35] ($C_{21}H_{15}FN_2$, 1f) Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 100 mg (64%); mp. 253-254 ^{o}C; FT-IR (KBr) 3418, 3030, 2856, 1606, 1541, 1494, 1444, 1382, 1322, 1226, 1023, 832, 767, 694 cm^{-1}; ^{1}H NMR (500 MHz, 13C NMR (125 MHz, DMSO-d_6) δ) δ 12.69 (s, 1H), 8.12 (dd, J_1 = 5.5 Hz, J_2 = 7.5 Hz, 2H), 7.54 (d, J = 7.5 Hz, 2H), 7.50 (d, J = 7.0 Hz, 2H), 7.45 (dd, J = 7.5 Hz, 2H), 7.39-7.29 (m, 5H), 7.22 (dd, J = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 162.1 (d, J = 245.0 Hz), 144.7, 137.1, 135.1, 131.0, 128.7, 128.4, 128.2 (d, J = 30.0 Hz), 127.8, 127.4 (d, J = 7.5 Hz), 127.1, 126.6, 115.7 (d, J = 21.0 Hz).

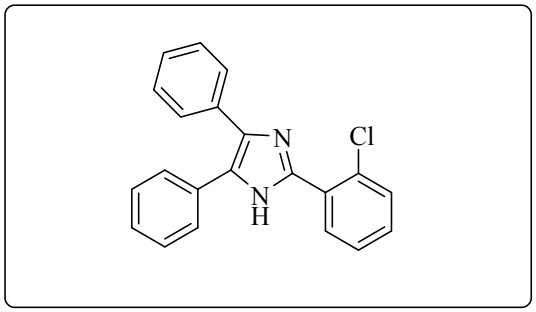


2-(4-Nitrophenyl)-4,5-diphenyl-1*H*-imidazole[24] ($C_{21}H_{15}N_3O_2$, 1g): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; orange solid; yield: 140 mg (82%); mp. 202-203 ^{o}C (lit. mp. 199-201 ^{o}C); FT-IR (KBr) 3418, 3030, 2856, 1606, 1541, 1494, 1444, 1382, 1322, 1226, 1023, 832, 768, 694 cm^{-1}; ^{1}H NMR (500 MHz, DMSO-d_6) δ 13.50 (s, 1H), 8.40-8.39 (m, 5H), 8.29-8.24 (m, 4H), 7.86-7.81 (m, 3H), 7.72 (d, J = 4Hz, 1H), 7.51-7.46 (m, 2H); ^{13}C NMR (125 MHz, DMSO-

d_6) δ 159.4, 136.9, 132.8, 131.8, 131.2, 130.9, 129.3, 129.0, 128.8, 128.5, 128.2, 127.7, 127.4, 126.5, 126.2, 126.1, 124.1, 122.7.

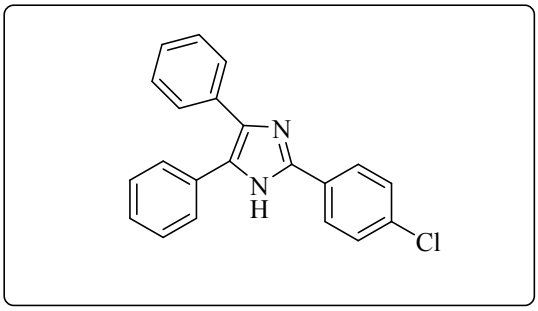


2-(2-Chlorophenyl)-4,5-diphenyl-1*H*-imidazole[32] ($C_{21}H_{15}ClN_2$, 1h): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 145 mg (88%); mp. 212-214 ^oC (lit. mp. 190-191 ^oC); FT-IR (KBr) 3415, 2951, 2826, 1601, 1440, 1392, 1315, 1196, 1128, 1038, 966, 907, 763, 691 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.64 (s, 1H), 7.81-7.80 (m, 1H), 7.62-7.60 (m,1H); 7.55-7.42 (m, 8H), 7.38-7.29 (m, 3H), 7.23 (dd, J = 7.0 Hz, 1H) ppm; ^{13}C NMR (125 MHz, DMSO-d_6) δ 143.1, 136.5, 134.8, 131.3, 131.2, 130.6, 129.9, 129.8, 129.7, 128.3, 127.9, 127.4, 126.9, 126.3.

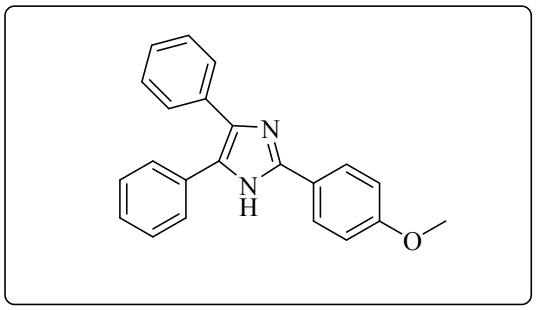


2-(4-Chlorophenyl)-4,5-diphenyl-1*H*-imidazole[24] ($C_{21}H_{15}ClN_2$, 1i): Analytical TLC on silica gel, 1:9ethyl acetate/hexane; white solid; yield: 141 mg (85%); mp. 267-268 ^oC (lit. mp. 262-264 ^oC) ; FT-IR (KBr) 3415, 1603, 1485, 1433, 1128, 1092, 830, 765, 696 cm^{-1}; 1H NMR (500 MHz, DMSO-d_6) δ 12.78 (s, 1H), 8.09 (d, J = 8.0 Hz, 2H), 7.54-7.43 (m, 7H), 7.39 (d, J = 7.0 Hz, 1H), 7.31 (dd, J = 7.0 Hz, 2H), 7.23 (d, J = 7.0 Hz, 1H) ppm; ^{13}C NMR (125 MHz, DMSO-d_6) δ

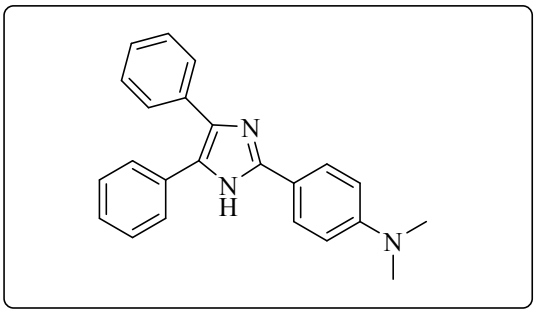
144.7, 137.6, 135.3, 133.1, 131.2, 129.5, 129.1, 129.0, 128.9, 128.8, 128.5, 128.2, 127.4, 127.2, 127.0.



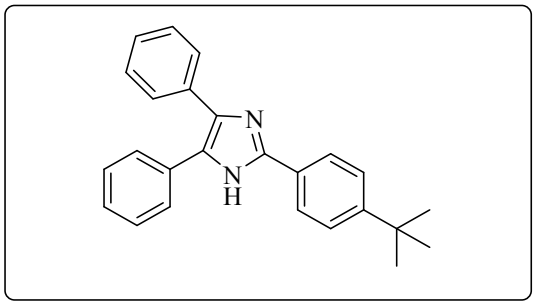
2-(4-Methoxyphenyl)-4,5-diphenyl-1*H*-imidazole[24] ($C_{22}H_{18}N_2O$, 1k): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 137 mg (84%); mp. 258-259 °C (lit. mp. 220-223 °C); FT-IR (KBr) 3416, 2959, 2837, 1612, 1492, 1443, 1249, 1200, 1030, 968, 829, 765, 695 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.51 (s, 1H), 8.01 (d, J = 8.0 Hz, 2H), 7.54 (d, J = 7.5 Hz, 2H), 7.49 (d, J = 7.5 Hz, 2H), 7.43 (dd, J = 7.0 Hz, 2H), 7.36 (dd, J = 7.5 Hz, 1H), 7.30 (dd, J = 7.5 Hz, 2H), 7.21 (dd, J = 7.5 Hz, 1H), 7.04 (d, J = 7.5 Hz, 2H), 3.81 (s, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 159.4, 145.6, 136.8, 135.3, 131.2, 128.6, 128.4, 128.2, 127.6, 127.6, 127.0, 126.7, 126.4, 123.1, 114.1, 55.2.



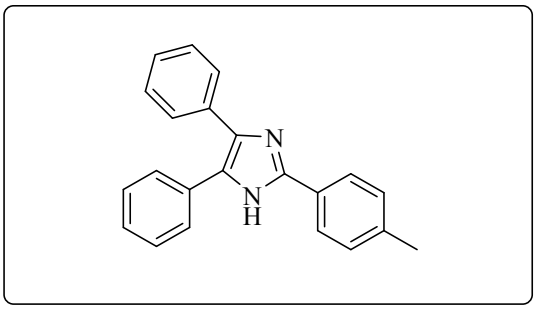
4-(4,5-Diphenyl-1*H*-imidazol-2-yl)-*N*,*N*-dimethylaniline[33] ($C_{23}H_{21}N_3$, 1l): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 149 mg (88%); mp. 258-259 °C (lit. mp. 256-259 °C); FT-IR (KBr) 3417, 2797, 1616, 1496, 1444, 819, 765, 696 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.31 (s, 1H), 7.90 (d, J = 9.0 Hz, 2H), 7.53 (d, J = 7.0 Hz, 2H), 7.48 (d, J = 7.0 Hz, 2H), 7.42 (t, J = 7.0 Hz, 2H), 7.35 (d, J = 7.0 Hz, 1H), 7.29 (t, J = 7.0 Hz, 2H), 7.21 (d, J = 7.0 Hz, 1H), 6.79 (d, J = 9.0 Hz, 2H), 2.96 (s, 6H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 150.3, 146.5, 136.5, 135.5, 131.4, 128.6, 128.3, 128.1, 127.4, 127.0, 126.3, 118.3, 111.9, 39.9.



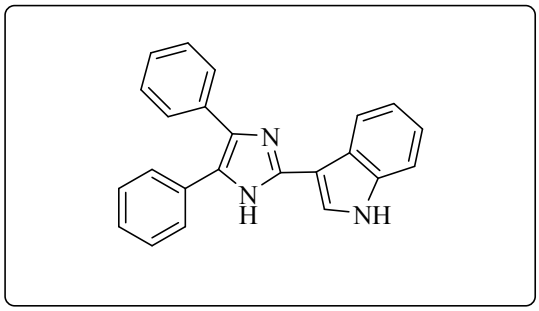
2-(4-(*tert*-Butyl)phenyl)-4,5-diphenyl-1*H*-imidazole ($C_{24}H_{22}N_2$, 1m): Analytical TLC on silica gel, 1:9 ethyl acetate/*n*-hexane; white solid; yield: 165 mg (94%); mp. 285-286 ^oC; FT-IR (KBr) 3416, 3057, 2963, 2867, 1603, 1492, 1450, 1385, 1268, 976, 838, 765, 696 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.61 (s, 1H), 8.01 (d, J = 8.0 Hz, 2H), 7.55 (d, J = 7.0 Hz, 2H), 7.50 (d, J = 6.0 Hz, 4H), 7.44 (d, J = 7.0 Hz, 2H), 7.38 (d, J = 7.0 Hz, 1H), 7.30 (dd, J = 7.0 Hz, 2H), 7.23 (d, J = 7.0 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 151.1, 145.9, 137.3, 135.6, 131.5, 129.0, 128.8, 128.5, 128.3, 128.0, 127.4, 126.8, 125.7, 125.3, 34.76, 31.4.



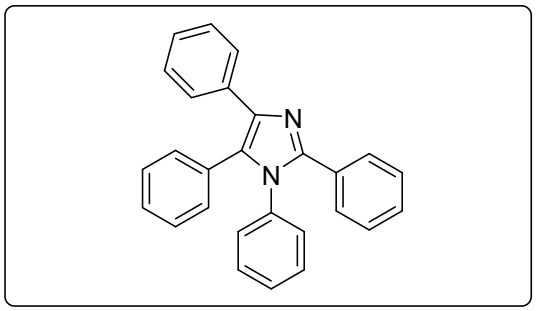
4,5-Diphenyl-2-(*p*-tolyl)-1*H*-imidazole[24] ($C_{22}H_{18}N_2$, 1n): Analytical TLC on silica gel, 1:9ethyl acetate/hexane; white solid; yield: 147 mg (95%); mp. 231-232 ^oC (lit. mp. 233-235 ^oC); FT-IR (KBr) 3416, 3028, 1602, 1493, 1449, 1384, 1322, 1200, 1127, 968, 822, 765, 695 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.59 (s, 1H), 7.97 (d, J = 8.0 Hz, 2H), 7.55 (d, J = 7.5 Hz, 2H), 7.51 (d, J = 7.5 Hz, 2H), 7.44 (dd, J = 7.5 Hz, 2H), 7.37 (dd, J = 7.5 Hz, 1H), 7.31-7.28 (m, 4H), 7.22 (dd, J = 7.5 Hz, 1H), 2.35 (s, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 146.0, 138.0, 137.2, 135.6, 131.5, 129.6, 129.0, 128.7, 128.5, 128.3, 128.0, 127.4, 126.8, 125.5, 21.2.



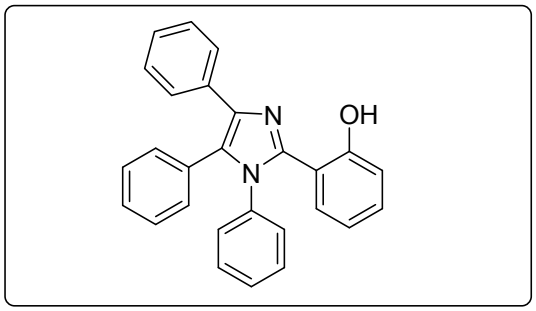
3-(4,5-Diphenyl-1*H*-imidazol-2-yl)-1*H*-indole ($C_{23}H_{17}N_3$, 1o): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 156 mg (93%); mp. 306-307 ^oC; FT-IR (KBr) 3413, 3049, 2959, 1606, 1492, 1443, 1335, 1245, 846, 757, 694 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12. 27 (s, 1H), 11.37 (s, 1H), 8.48 (d, J = 7.5 Hz, 1H), 8.00 (s, 1H), 7.64 (d, J = 7.5 Hz, 2H), 7.52 (d, J = 7.0 Hz, 2H), 7.46-7.43 (m, 3H), 7.37-7.31 (m, 3H), 7.23-7.14 (m, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 143.4, 135.9, 135.6, 135.4, 131.3, 128.4, 127.8, 127.1, 126.6, 125.8, 125.4, 124.8, 123.4, 121.5, 121.2, 119.4, 111.3, 106.5.



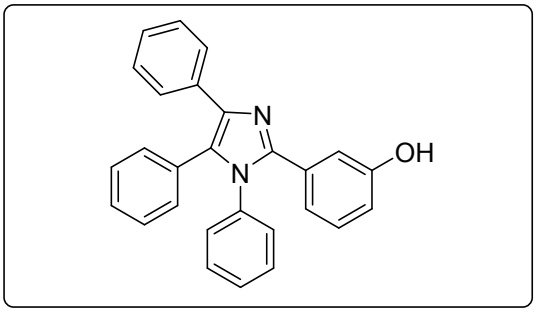
1,2,4,5-Tetraphenyl-1*H*-imidazole[32] ($C_{27}H_{20}N_2$, 2a): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 136 mg (73%), mp. 213-217 ^oC; FT-IR (KBr, 4000-400 cm^{-1}): 3419, 3054, 1594, 1490, 1446, 1320 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$-d_1) δ 7.43-7.42 (m, 8H), 7.42-7.04 (m, 11H); ^{13}C NMR (125 MHz, $CDCl_3$-d_1) δ 147.1, 137.3, 134.6, 131.3, 131.0, 130.9, 130.7, 129.2, 129.1, 128.6, 128.5, 128.4, 128.3, 128.2, 128.1, 128.0, 127.6, 126.7, 125.4.



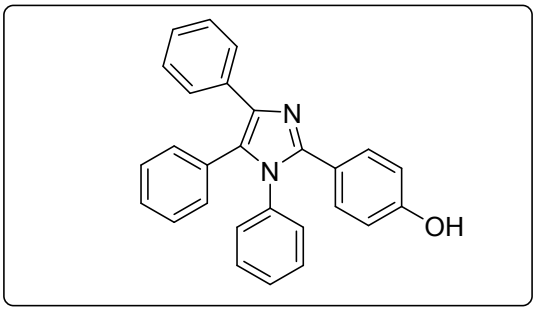
2-(2-Hydroxyphenyl)-1,4,5-triphenyl imidazole[17] ($C_{27}H_{20}N_2O$, 2b): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 151 mg (78%), mp. 250-254 ^oC; FT-IR (KBr) 3420, 3060, 2930, 1645, 1591, 1487, 1381, 1252 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.57 (s, 1H), 7.45-7.29 (m, 16H), 6.94 (d, J = 8.0 Hz, 1H), 6.67-6.62 (m, 1H), 6.55 (t, J = 8.0 Hz, 1H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 157.3, 144.4, 136.6, 134.4, 133.2, 131.3, 130.8, 130.2, 129.6, 129.4, 129.3, 128.7, 128.7, 128.5, 128.4, 126.9, 126.8, 126.1, 118.1, 116.9, 113.9.



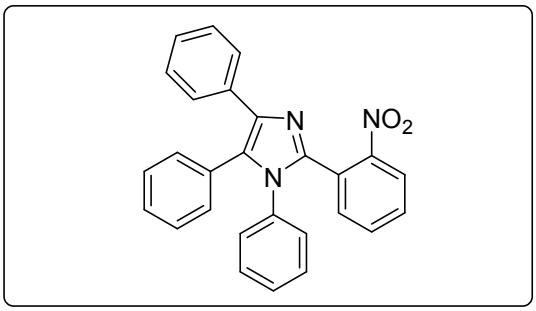
2-(3-Hydroxyphenyl)-1,4,5-triphenyl imidazole[34] ($C_{27}H_{20}N_2O$, 2c): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 155 mg (80%), mp. 202-205 ^oC; FT-IR (KBr) 3400, 3057, 1594, 1490, 1448, 1396, 1320 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 9.50 (s, 1H), 7.48 (d, J = 7.7 Hz, 2H), 7.32-7.15 (m, 13H), 7.17 (t, J = 7.1 Hz, 1H), 6.68 (t, J = 8.7 Hz, 2H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 157.1, 146.1, 136.7, 136.7, 134.4, 131.5, 131.2, 131.2, 130.4, 129.1, 129.1, 128.7, 128.4, 128.4, 128.2, 126.4, 126.3, 118.9, 115.4, 115.4.



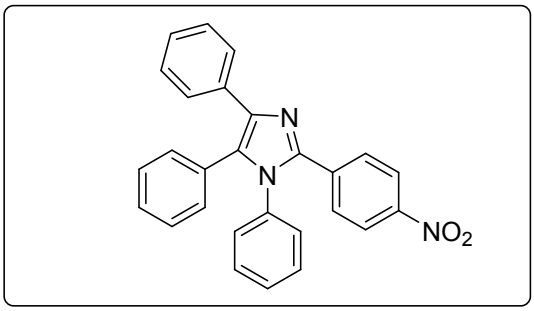
2-(4-Hydroxyphenyl)-1,4,5-triphenyl imidazole[32] ($C_{27}H_{20}N_2O$, 2d): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 146 mg (75%), mp. 285-289 ^oC; FT-IR (KBr) 3423, 2923, 1598, 1456, 1379, 1270 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 9.67 (s, 1H), 7.47-7.22 (m, 17H), 6.65 (s, 2H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 157.6, 146.4, 136.9, 136.4, 134.6, 131.1, 130.6, 130.6, 129.8, 129.1, 128.8, 128.6, 128.4, 128.3, 128.1, 126.3, 121.3, 114.9.



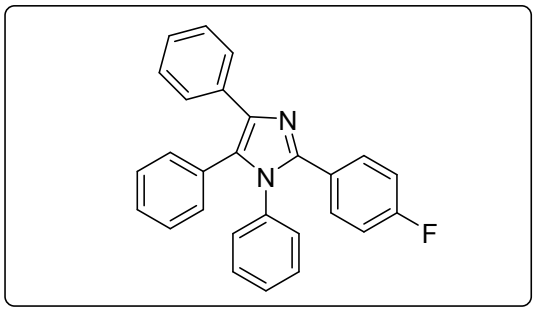
2-(2-Nitrophenyl)-1,4,5-triphenyl imidazole[33] ($C_{27}H_{19}N_3O_2$, 2e): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 146 mg (70%); mp. 213-216 ^oC; FT-IR (KBr) 3427, 3060, 1593, 1509, 1398, 1343 cm^{-1}; ^1H NMR (500 MHz, $CDCl_3$-d_1) δ 7.90 (d, J = 8.0 Hz, 1H), 7.67 (d, J = 7.5 Hz, 1H), 7.60 (dd, J = 19.9, 7.5 Hz, 3H), 7.50 (t, J = 8.0 Hz, 1H), 7.26-7.14 (m, 11H), 6.94 (d, J = 7.5 Hz, 2H); ^{13}C NMR (125 MHz, $CDCl_3$-d_1) δ 149.3, 143.7, 139.1, 136.1, 134.6, 133.8, 133.3, 131.4, 131.0, 130.7, 130.3, 129.3, 128.8, 128.6, 128.4, 127.8, 127.1, 127.0, 124.8.



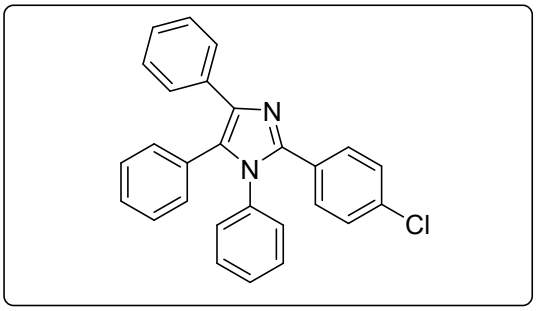
2-(4-Nitrophenyl)-1,4,5-triphenyl imidazole[33] ($C_{27}H_{19}N_3O_2$, 2f): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 188 mg (90%), mp. 194-198 ^oC; FT-IR (KBr) 3430, 3054, 2926, 2851, 1594, 1449, 1339, 1241 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 8.15 (d, J = 8.5 Hz, 2H), 7.62 (d, J = 8.5 Hz, 2H), 7.51 (d, J = 7.5 Hz, 2H), 7.39-7.27 (m, 12H), 7.21 (t, J = 7.5 Hz, 1H).; ^{13}C NMR (125 MHz, DMSO-d_6) δ 146.7, 143.8, 137.8, 136.3, 136.2, 133.9, 132.8, 131.1, 129.9, 129.5, 129.3, 128.8, 128.7, 128.6, 128.5, 128.3, 126.8, 126.4, 123.5.



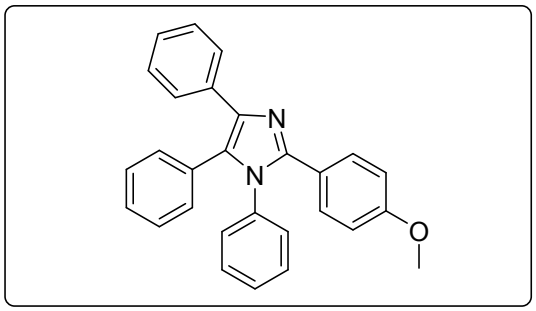
2-(4-Florophenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{19}N_2F$, 2g): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 164 mg (84%), mp. 194-197 ^oC; FT-IR (KBr) 3434, 3050, 1596, 1487,1378, 1224 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.48 (d, J = 8.0 Hz, 2H), 7.42-739 (m, 2H), 7.34-7.23 (m, 6H), 7.27-7.23 (m, 6H), 7.19-7.13 (m, 6H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 161.9 (d, J = 246.25 Hz), 145.2, 136.8, 136.5, 135.6, 134.3, 131.3, 131.1, 130.5, 130.4, 130.5, 130.3, 129.5 (d, J = 11.13 Hz), 129.2, 128.8, 128.7, 128.5, 128.4, 128.2, 126.9 (d, J = 3.38 Hz), 126.5, 126.3, 115.2 (d, J = 21.5 Hz).



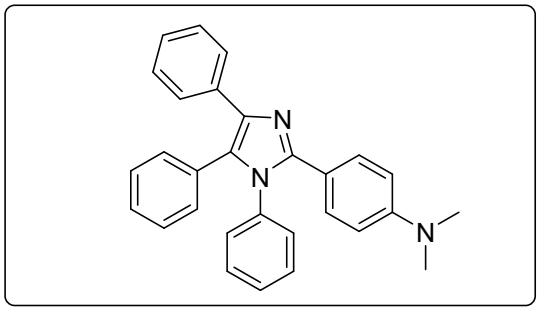
2-(4-Chlorophenyl)-1,4,5-triphenyl imidazole[32] ($C_{27}H_{19}N_2Cl$, 2h): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 150 mg (74%), mp. 184-188 ^oC; FT-IR (KBr) 3057, 1595, 1487, 1404 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.49 (d, J = 8.0 Hz, 2H), 7.37-7.24 (m, 16H), 7.18 (dd, J = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 145.4, 137.5, 136.9, 134.7, 133.6, 132.1, 131.6, 130.7, 130.3, 129.7, 129.7, 129.4, 129.2, 129.0, 128.9, 128.8, 128.7, 127.0, 126.8.



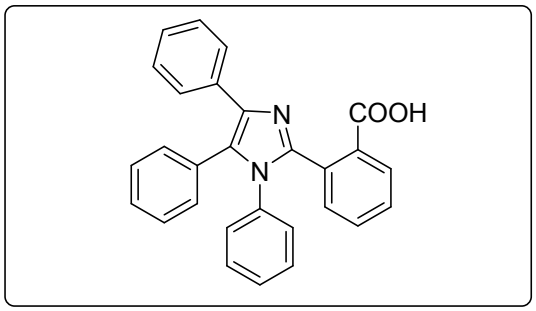
2-(4-Methoxyphenyl)-1,4,5-triphenyl imidazole[32] ($C_{28}H_{22}N_2O$, 2k): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 143 mg (71%), mp. 174-177 ^oC; FT-IR (KBr) 3417, 3053, 2945, 1603, 1484, 1378, 1247 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.48 (d, J = 7.5 Hz, 2H), 7.34-728 (m, 8H), 7.24 (dd, J = 7.5 Hz, 6H), 7.16 (dd, J = 7.5 Hz, 1H), 6.84 (d, J = 8.5 Hz, 2H), 3.72 (s, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 159.2, 146.0, 136.8, 136.5, 134.5, 131.1, 130.8, 130.5, 129.6, 129.1, 128.8, 128.7, 128.4, 128.3, 128.1, 126.3, 122.8, 113.6, 55.1.



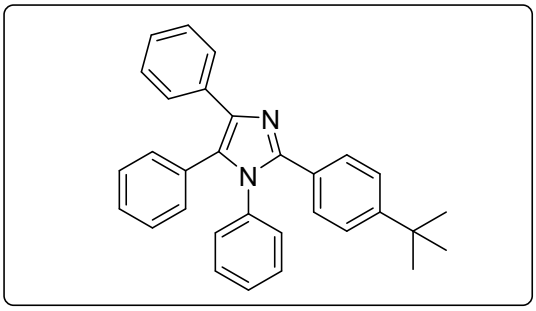
2-(4-*N*,*N*-dimethylaminophenyl)-1,4,5-triphenyl imidazole ($C_{29}H_{25}N_3$, 2l): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 187 mg (90%), mp. 207-209 ^oC; FT-IR (KBr) 3416, 2804, 1608, 1488, 1439, 1367, 1194 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.47 (d, J = 7.5 Hz, 2H), 7.33-7.27 (m, 7H), 7.23-7.17 (m, 8H), 6.57 (d, J = 8.5 Hz, 2H), 2.88 (s, 6H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 149.9, 146.7, 137.1, 136.3, 134.7, 131.2, 130.7, 130.4, 129.1, 129.0, 128.8, 128.5, 128.4, 128.2, 128.1, 126.3, 126.2, 117.7, 111.3.



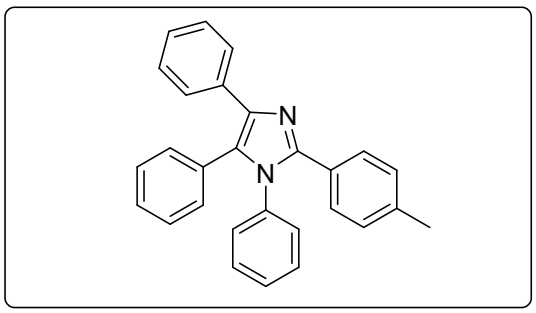
2-(2-Carboxyphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{20}N_2O_2$, 2m): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 193 mg (93%), mp. 294-298 ^oC; FT-IR (KBr) 3416, 3059, 2848, 1598, 1497, 1368, 1238 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.90-7.83 (m, 3H), 7.64 (t, J = 6.0 Hz, 1H), 7.52-7.51 (m, 7H), 7.40-7.37 (m, 5H), 7.33-7.31 (m, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 169.0, 144.9, 132.7, 130.7, 130.2, 129.0, 128.8, 128.6, 128.5, 127.6, 127.3.



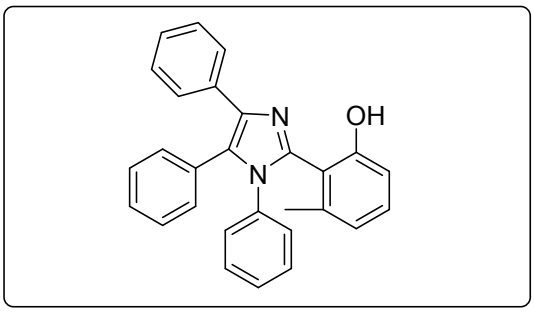
2-(4-*tert*-Butylphenyl)-1,4,5-triphenyl imidazole ($C_{31}H_{29}N_2$, 2o): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 188 mg (88%), mp. 193-196 ^oC; FT-IR (KBr) 3430, 3056, 2957, 1598, 1491, 1266 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.48 (d, J = 7.5 Hz, 2H), 7.35-7.15 (m, 17H), 1.24 (s, 9H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 150.8, 146.0, 136.8, 136.7, 134.5, 131.2, 131.2, 130.5, 129.2, 128.8, 128.5, 128.4, 128.2, 127.9, 127.6, 126.5, 126.4, 125.0, 34.4, 31.0.



2-(4-Methylphenyl)-1,4,5-triphenyl imidazole[33] ($C_{28}H_{22}N_2$, 2p): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 145 mg (75%), mp. 187-190 ^oC; FT-IR (KBr) 3427, 3047, 2920, 1593, 1489, 1442, 1377, 1320 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 7.50-7.47 (m, 2H), 7.31 (m, 6H), 7.27-7.24 (m, 9H), 7.09 (d, J = 8.0 Hz, 2H), 2.26 (s, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 146.1, 137.8, 136.7, 136.7, 134.5, 131.1, 131.1, 130.5, 129.1, 128.8, 128.7, 128.7, 128.4, 128.4, 128.2, 128.1, 127.6, 126.4, 126.4, 20.7.



2-(2-Hydroxy-5-methylphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{23}N_2O$, 2q): Analytical TLC on silica gel, 1:9 ethyl acetate/hexane; white solid; yield: 187 mg (93%), mp. 200-202 ^oC; FT-IR (KBr) 3428, 3055, 2914, 2793, 1596, 1495, 1379, 1247 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ 12.32 (s, 1H), 7.44-7.20 (m, 15H), 6.98 (d, J = 8.0 Hz, 1H), 6.83 (d, J = 8.0 Hz, 1H), 6.40 (s, 1H), 1.89 (s, 3H); ^{13}C NMR (125 MHz, DMSO-d_6) δ 155.1, 144.6, 136.7, 134.4, 133.2, 131.3, 130.7, 130.6, 129.7, 129.3, 129.1, 128.7, 128.7, 128.5, 128.4, 127.2, 126.9, 126.3, 126.1, 116.7, 113.4, 20.1.



Section S4. Copies of ^{1}H and ^{13}C NMR spectra of all products

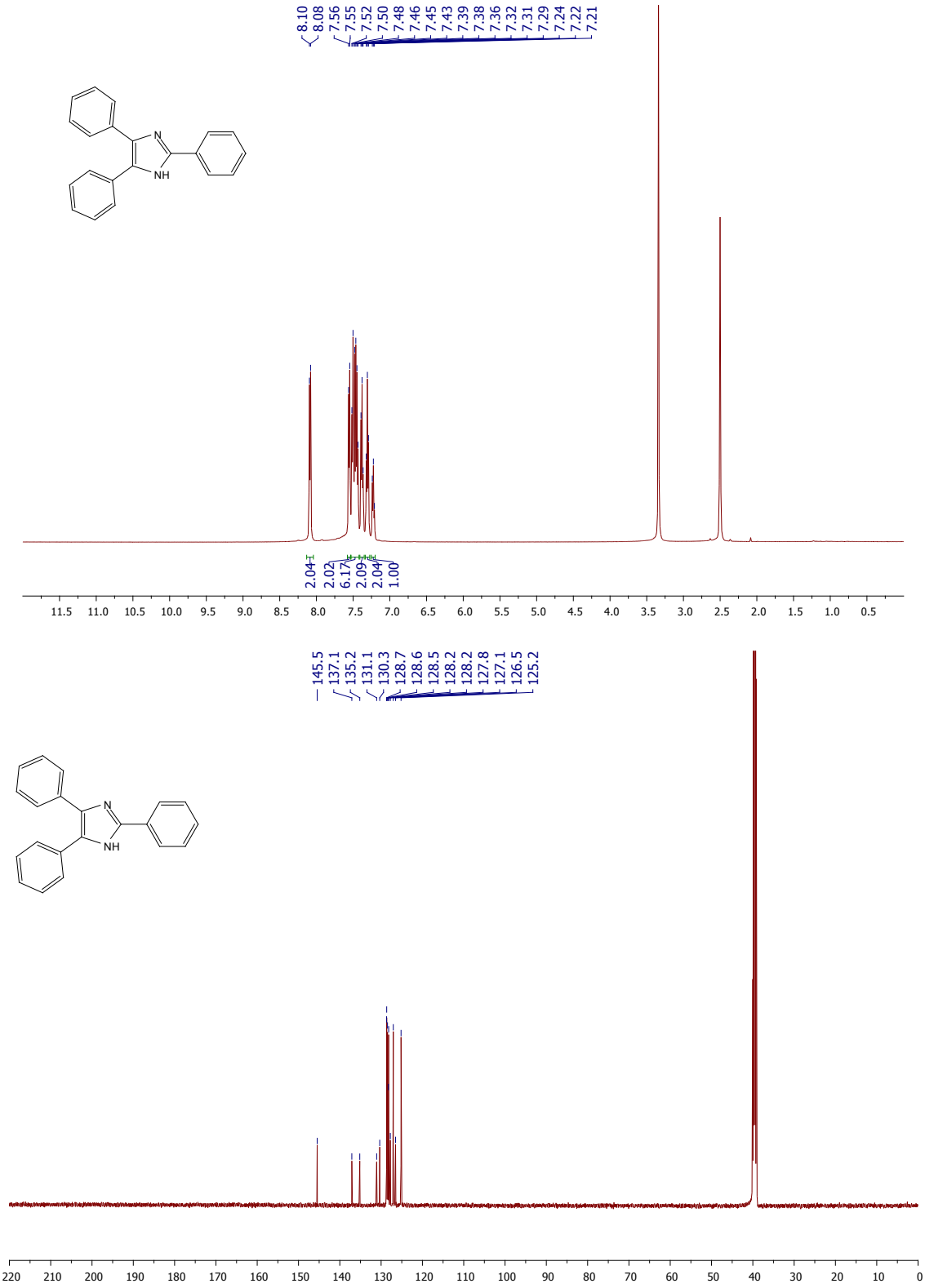


Figure S1. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2,4,5-triphenyl-1*H*-imidazole ($C_{21}H_{16}N_2$, 1a)

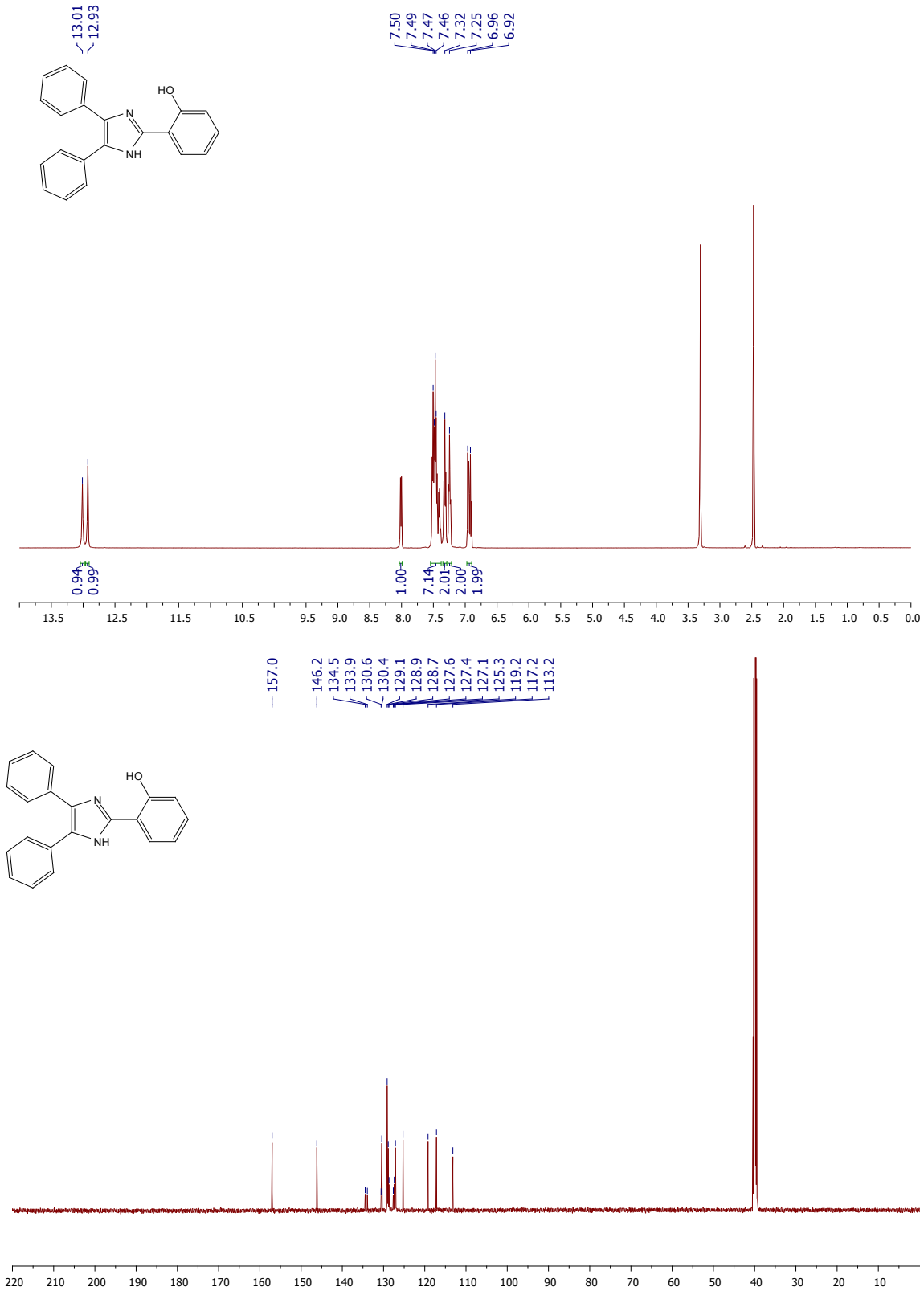


Figure S2. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4,5-diphenyl-1*H*-imidazol-2-yl)phenol ($C_{21}H_{16}N_2O$, 1b)

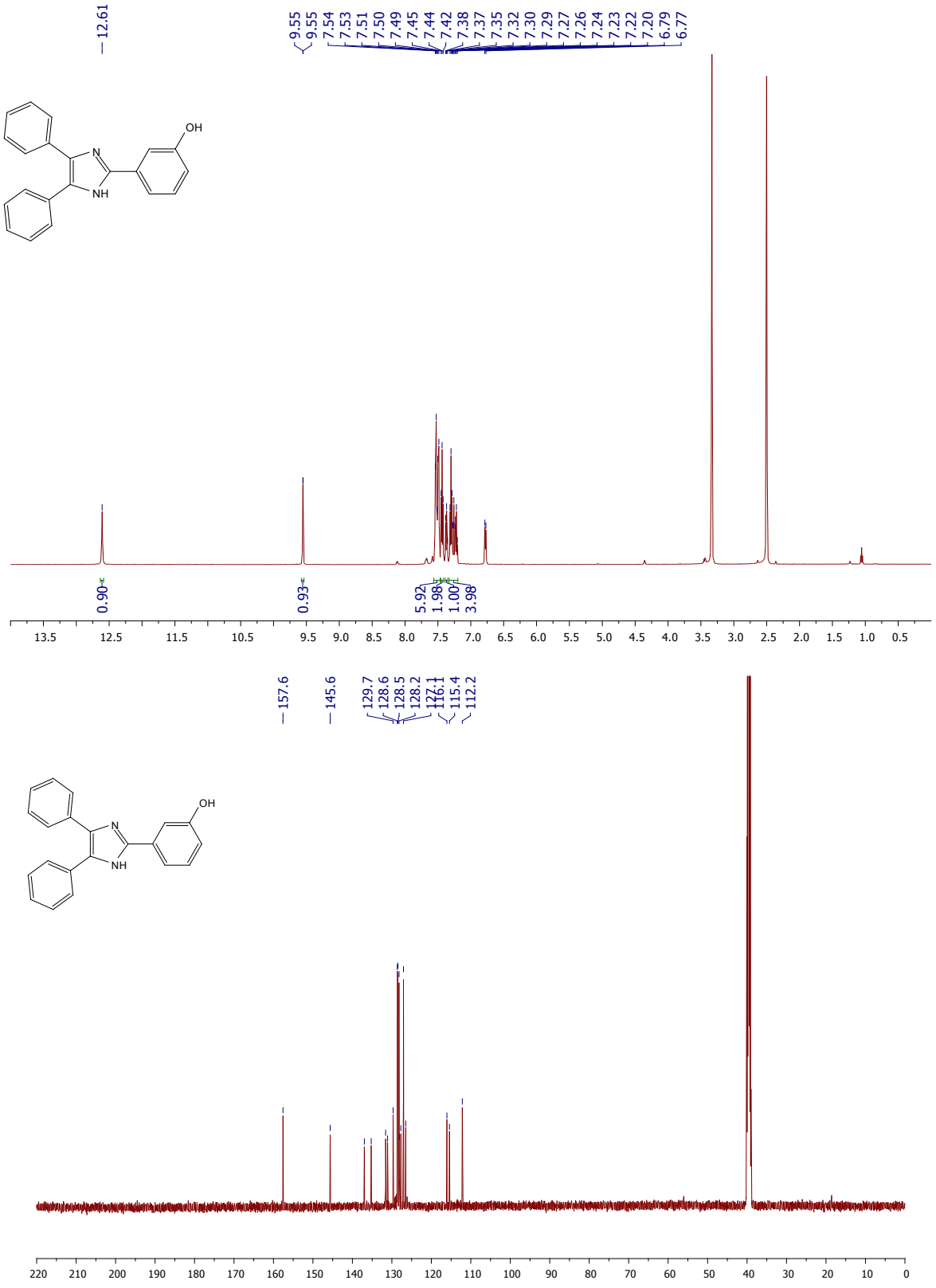


Figure S3. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 3-(4,5-diphenyl-1*H*-imidazol-2-yl)phenol ($C_{21}H_{16}N_2O$, 1c)

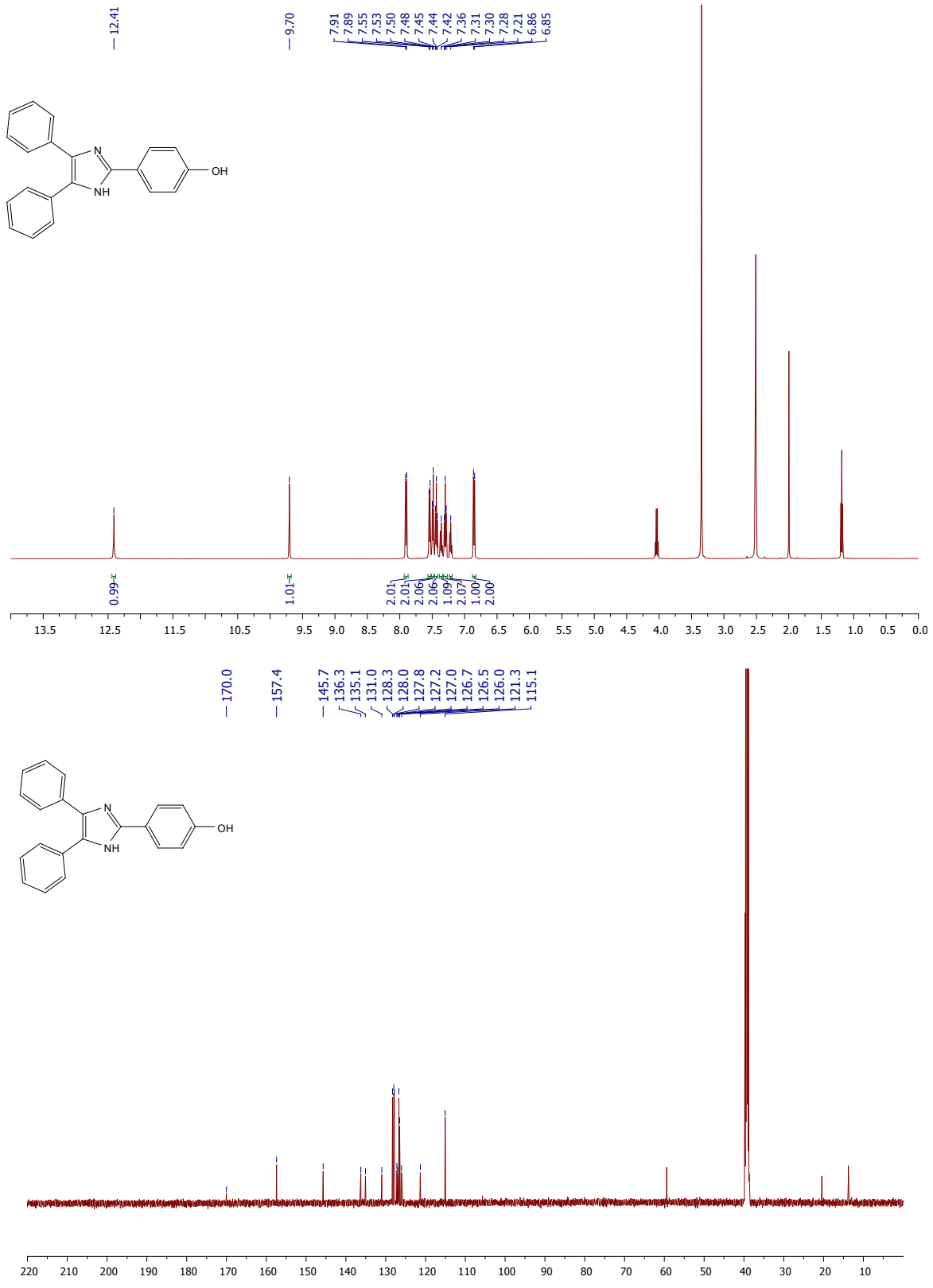


Figure S4. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 4-(4,5-diphenyl-1*H*-imidazol-2-yl)phenol ($C_{21}H_{16}N_2O$, 1d)

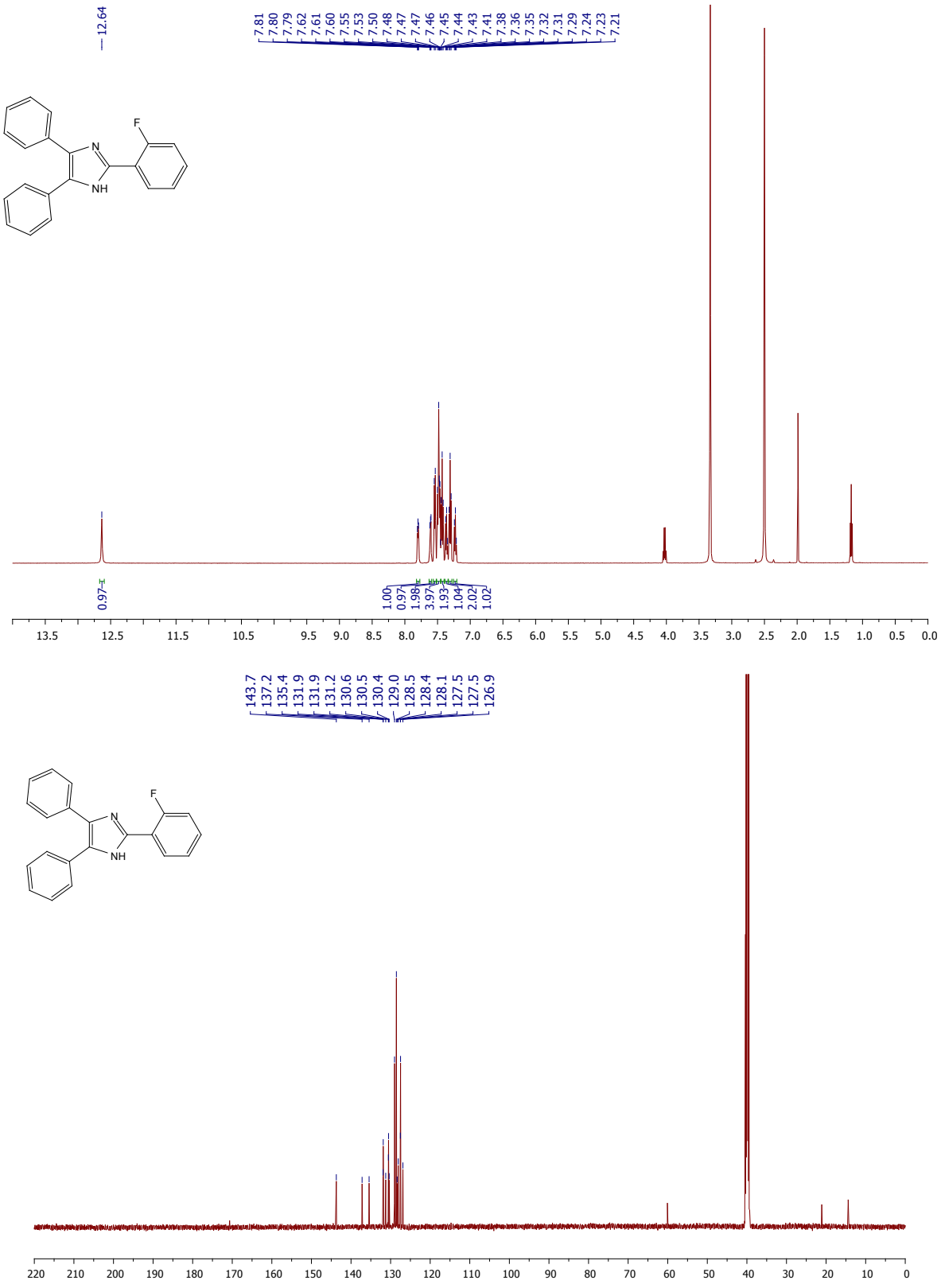


Figure S5. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-fluorophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}FN_2$, 1e)

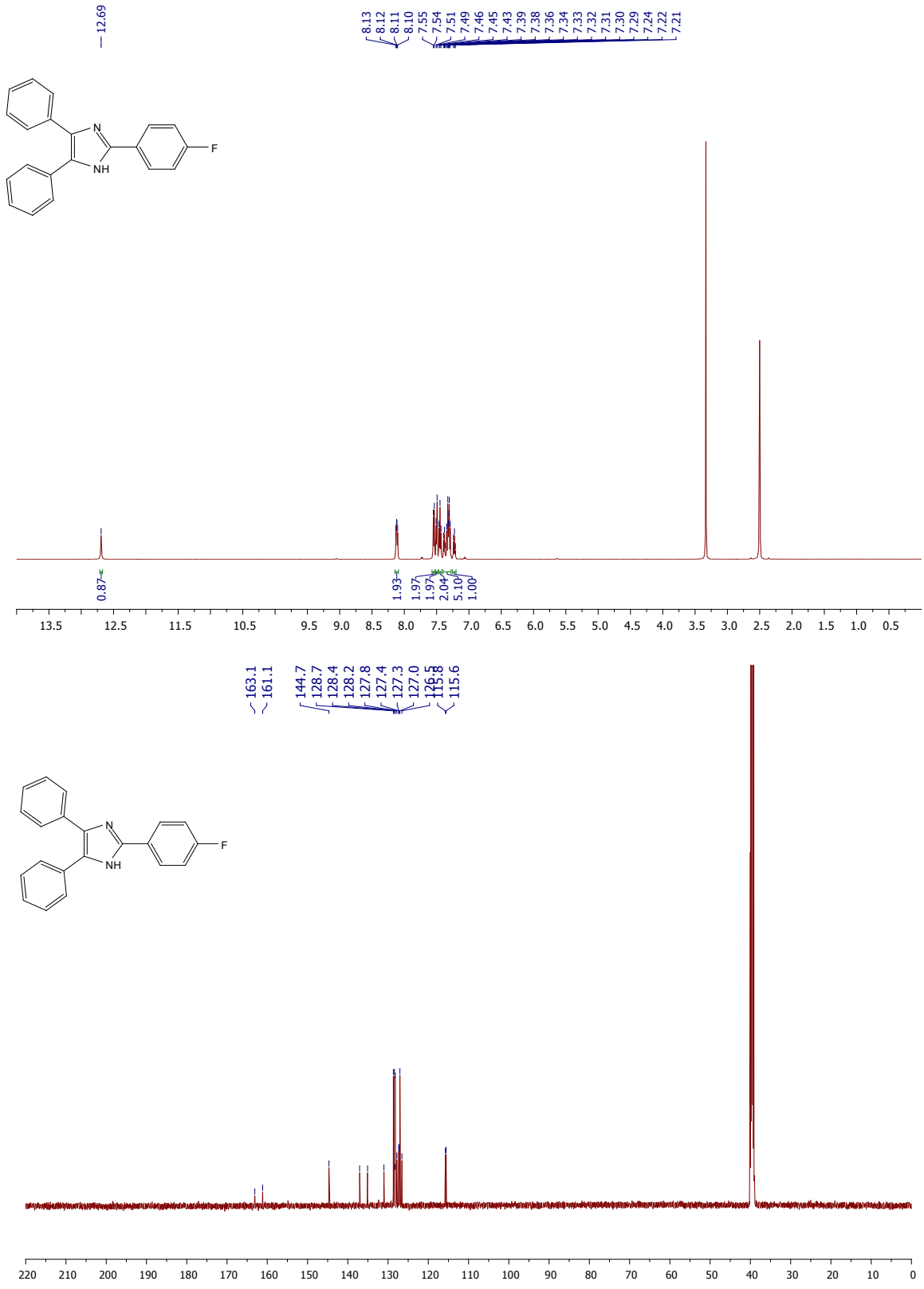


Figure S6. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-fluorophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}FN_2$, 1f)

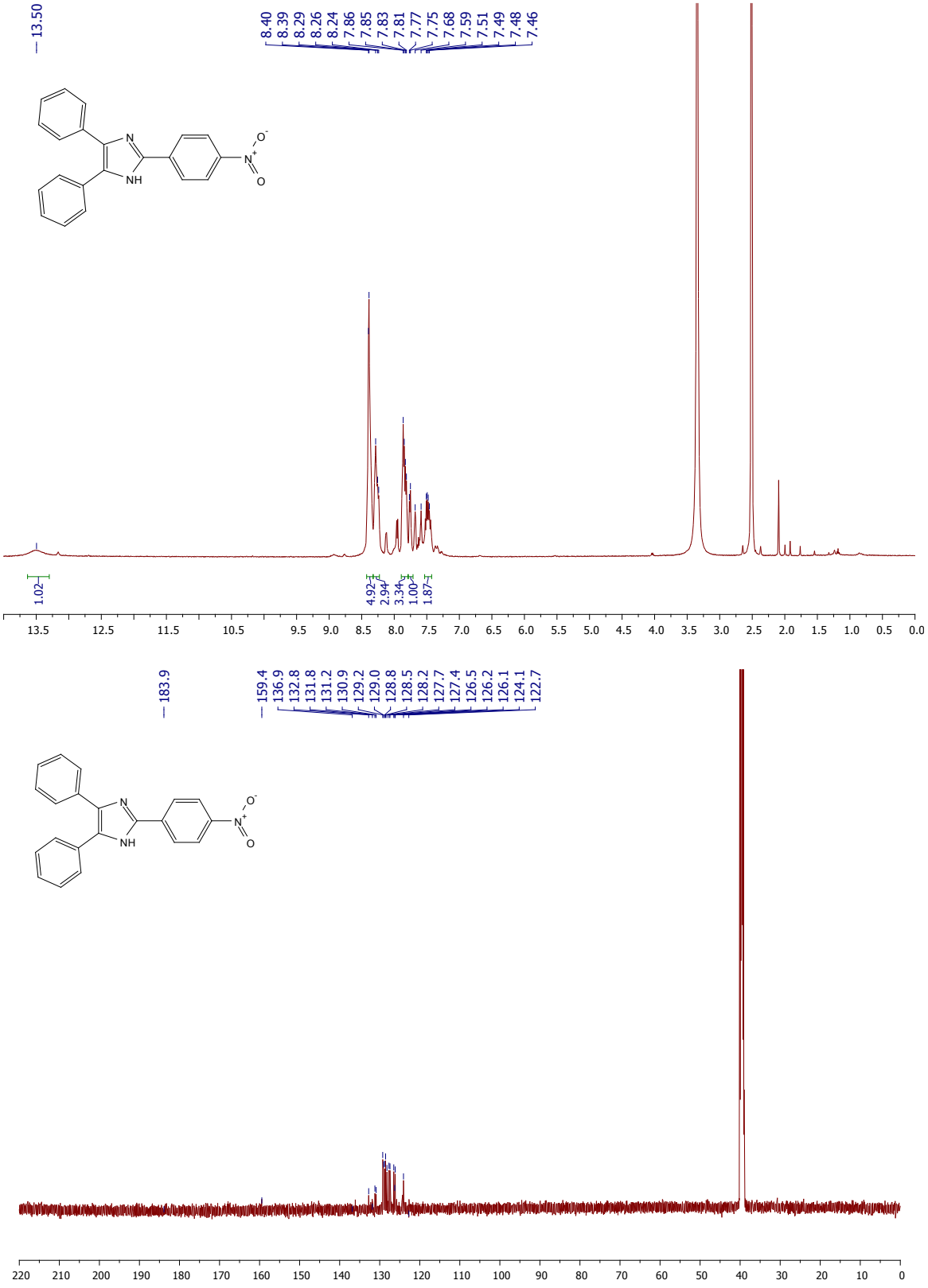


Figure S7. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-nitrophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}N_3O_2$, 1g)

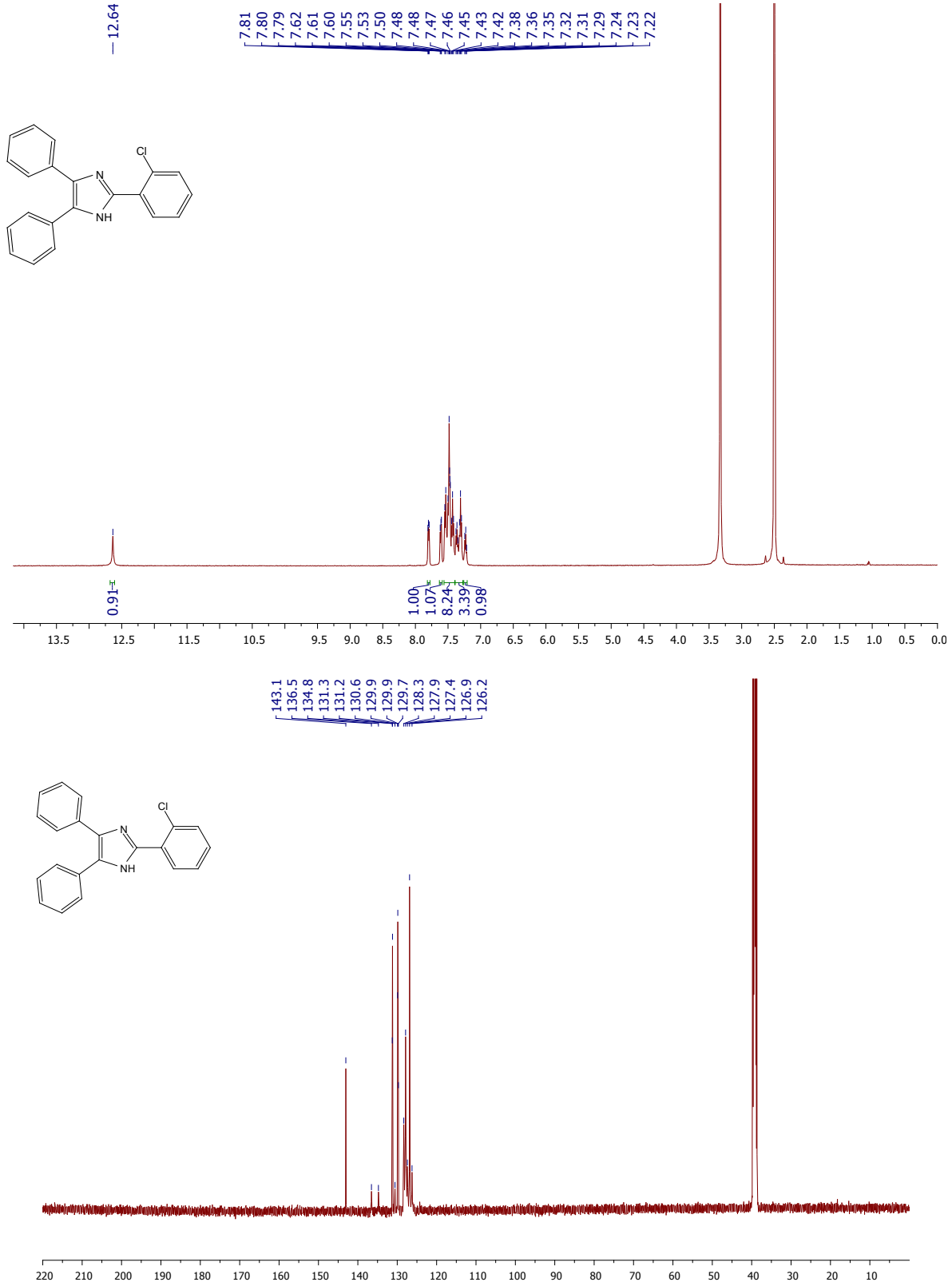


Figure S8. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-chlorophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}ClN_2$, 1h)

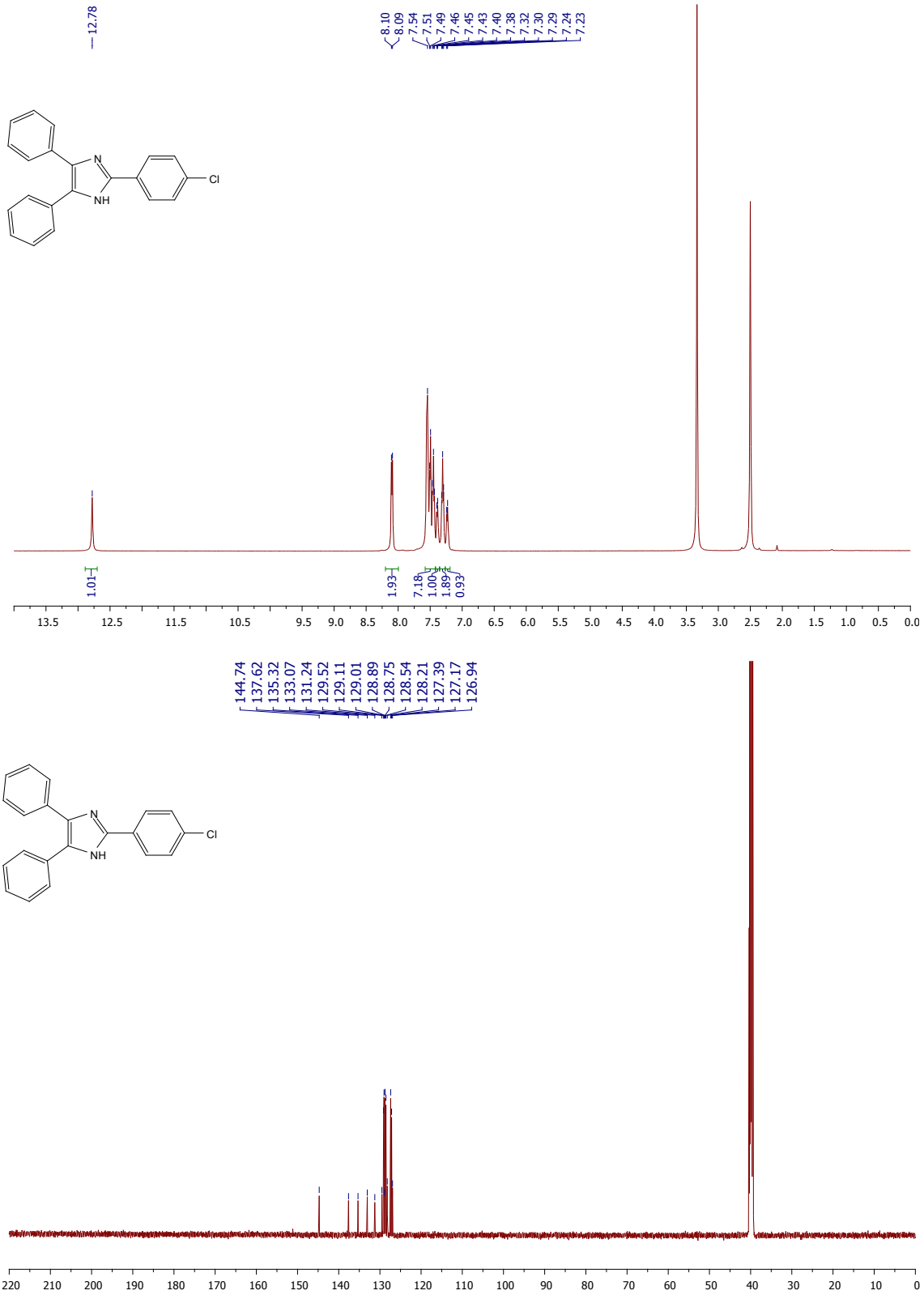


Figure S9. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-chlorophenyl)-4,5-diphenyl-1*H*-imidazole ($C_{21}H_{15}ClN_2$, 1i)

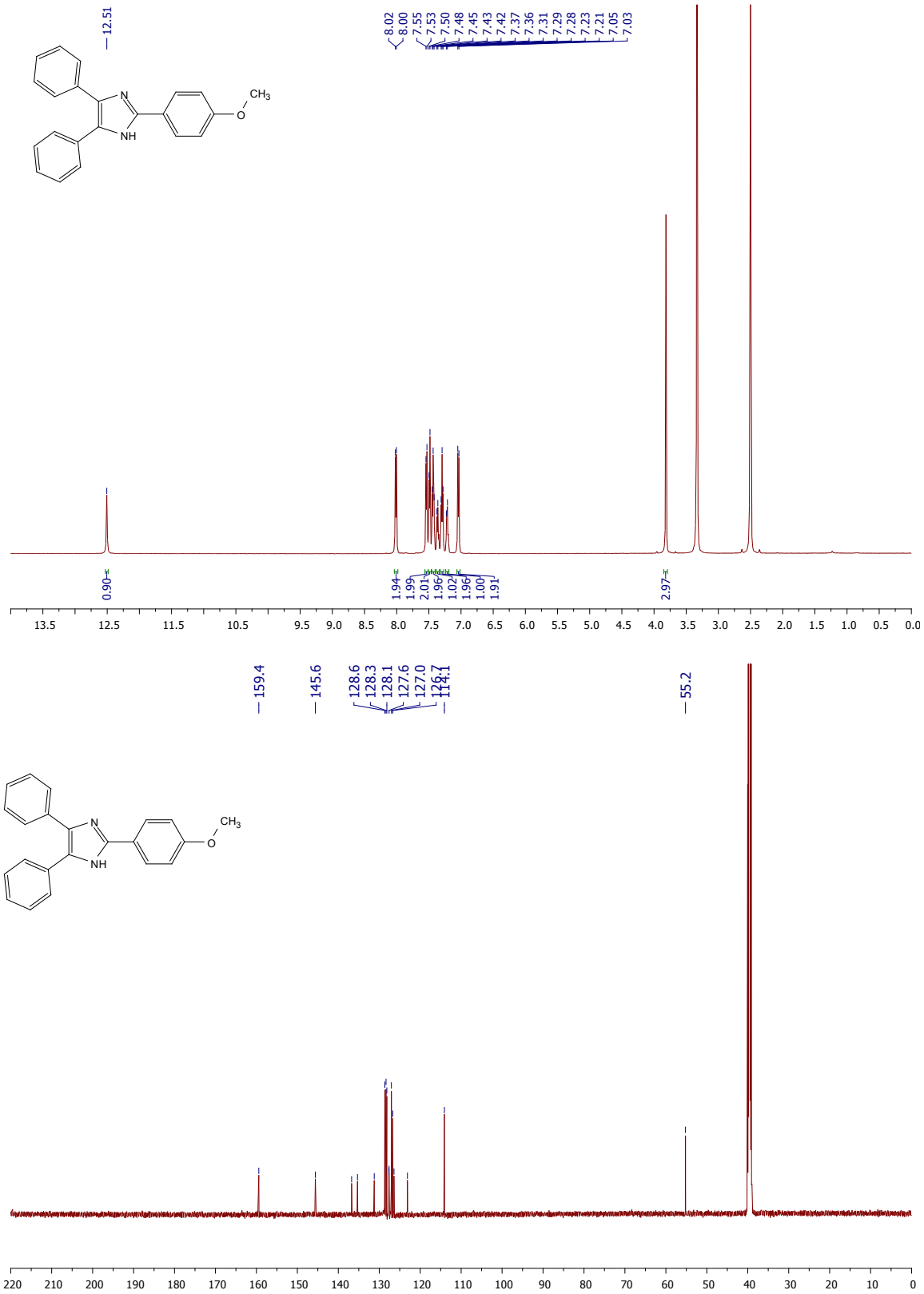


Figure S10. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-methoxyphenyl)-4,5-diphenyl-1*H*-imidazole ($C_{22}H_{18}N_2O$, 1k)

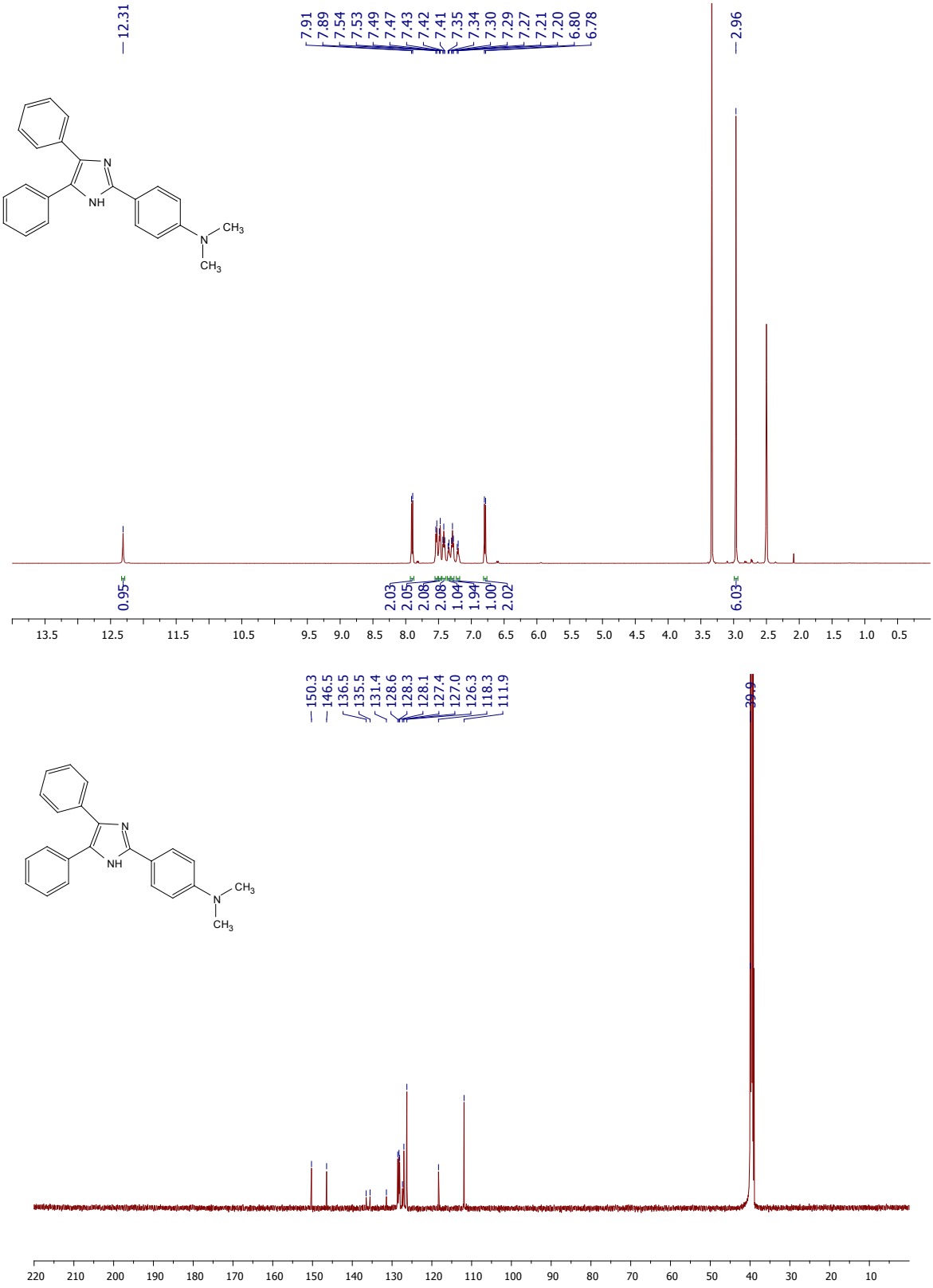


Figure S11. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 4-(4,5-diphenyl-1*H*-imidazol-2-yl)-*N*,*N*-dimethylaniline ($C_{23}H_{21}N_3$, 1l)

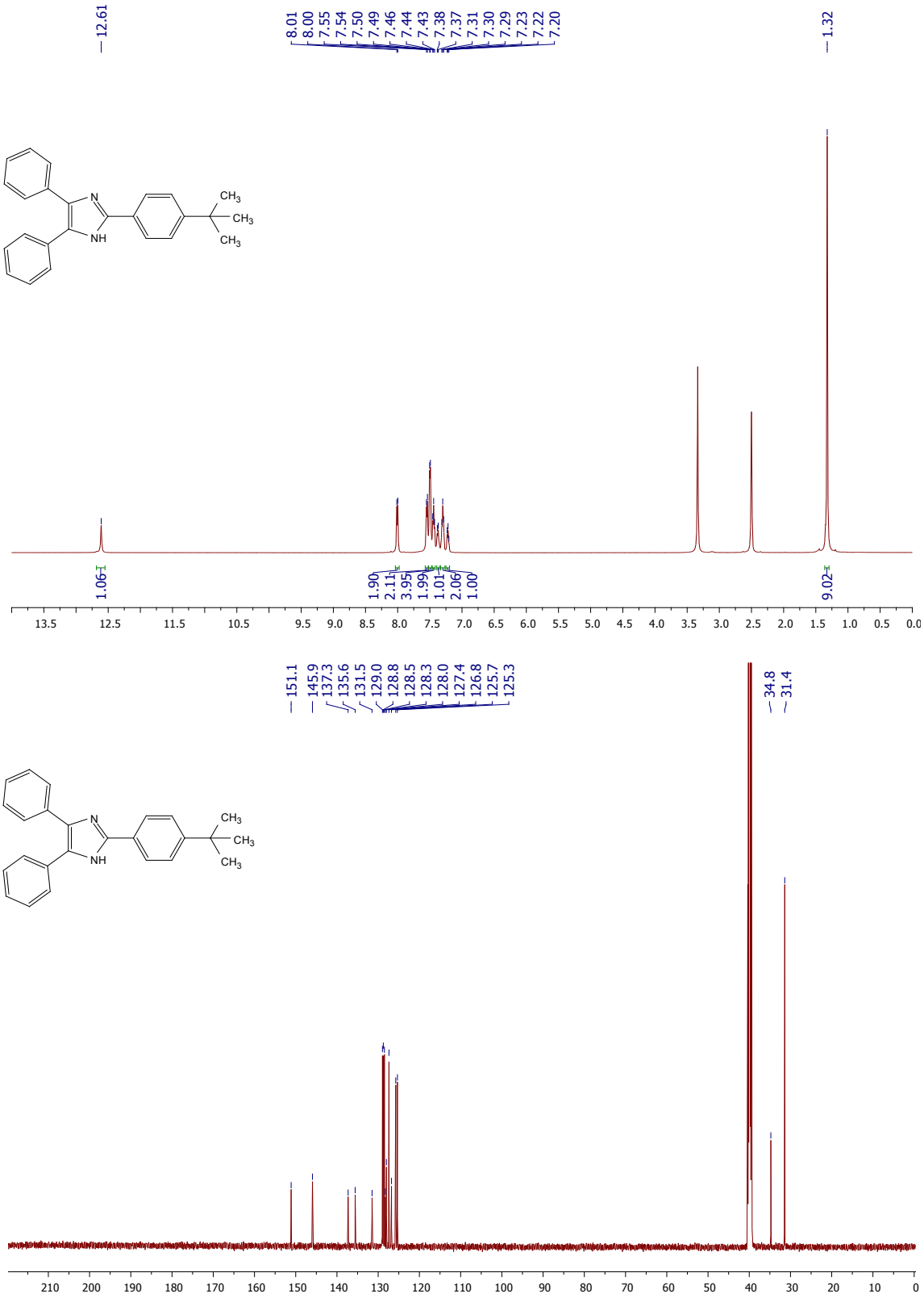


Figure S12. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-(*tert*-butyl)phenyl)-4,5-diphenyl-1*H*-imidazole ($C_{24}H_{22}N_2$, 1m)

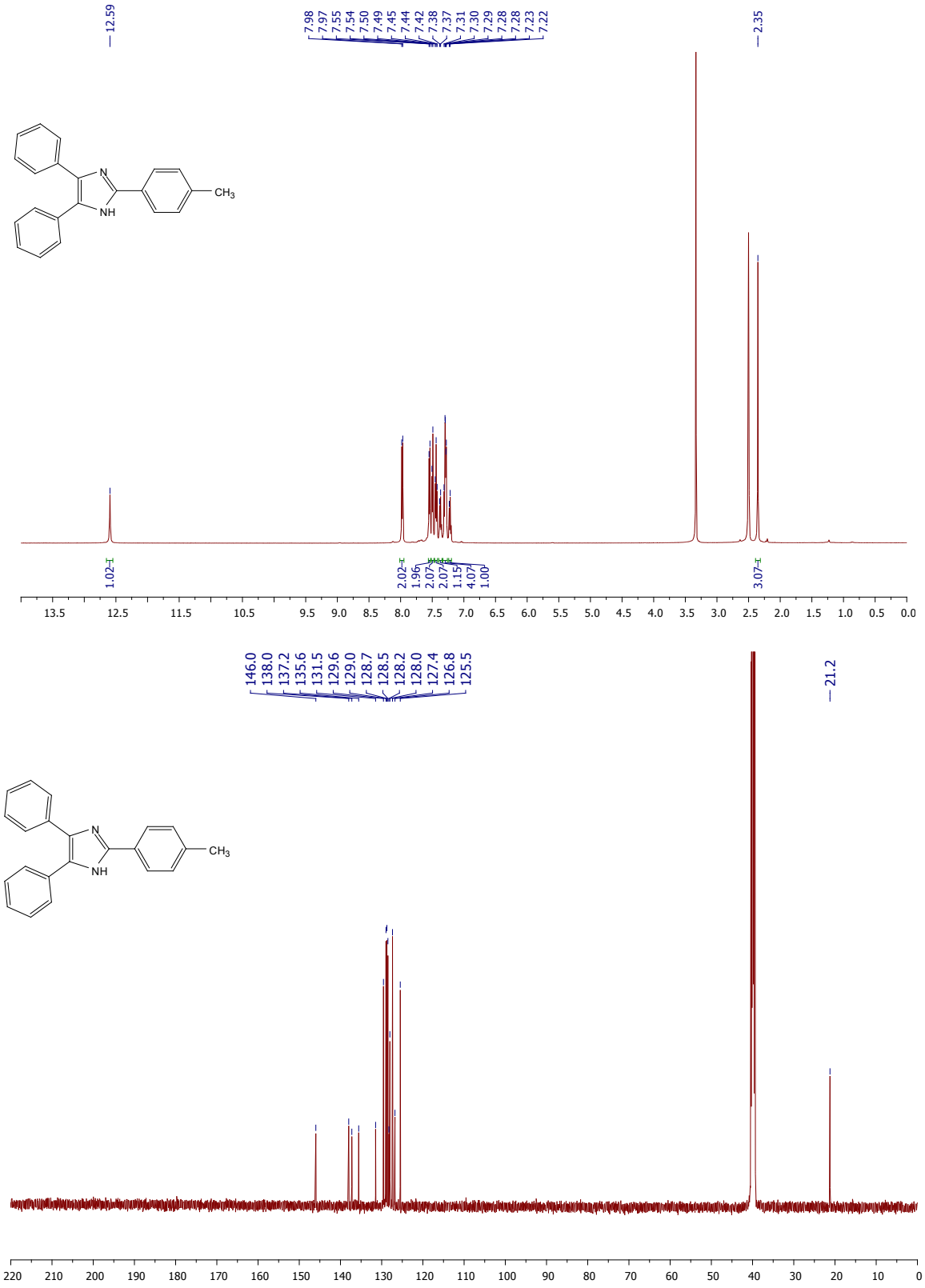


Figure S13. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 4,5-diphenyl-2-(*p*-tolyl)-1*H*-imidazole ($C_{22}H_{18}N_2$, 1n)

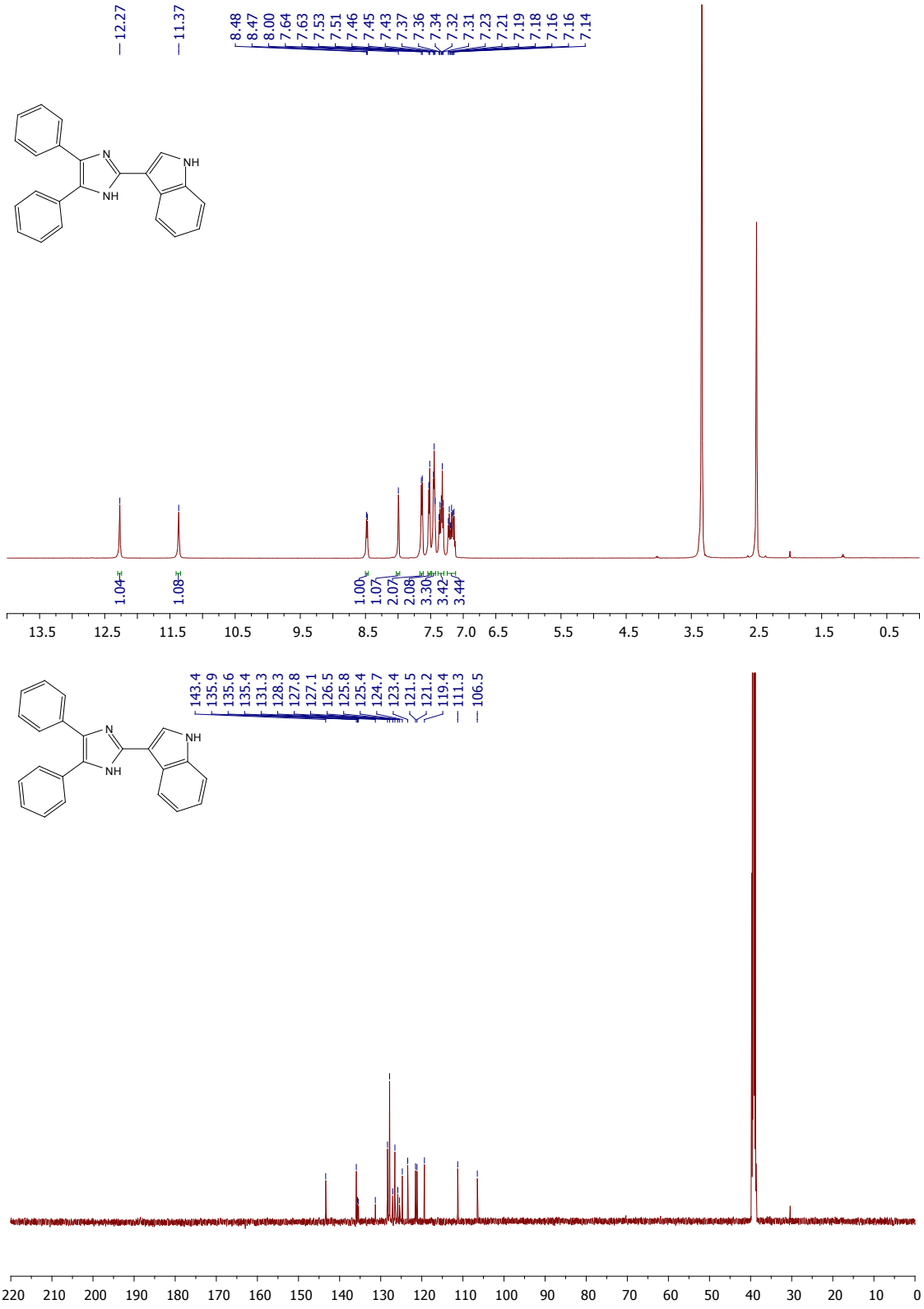
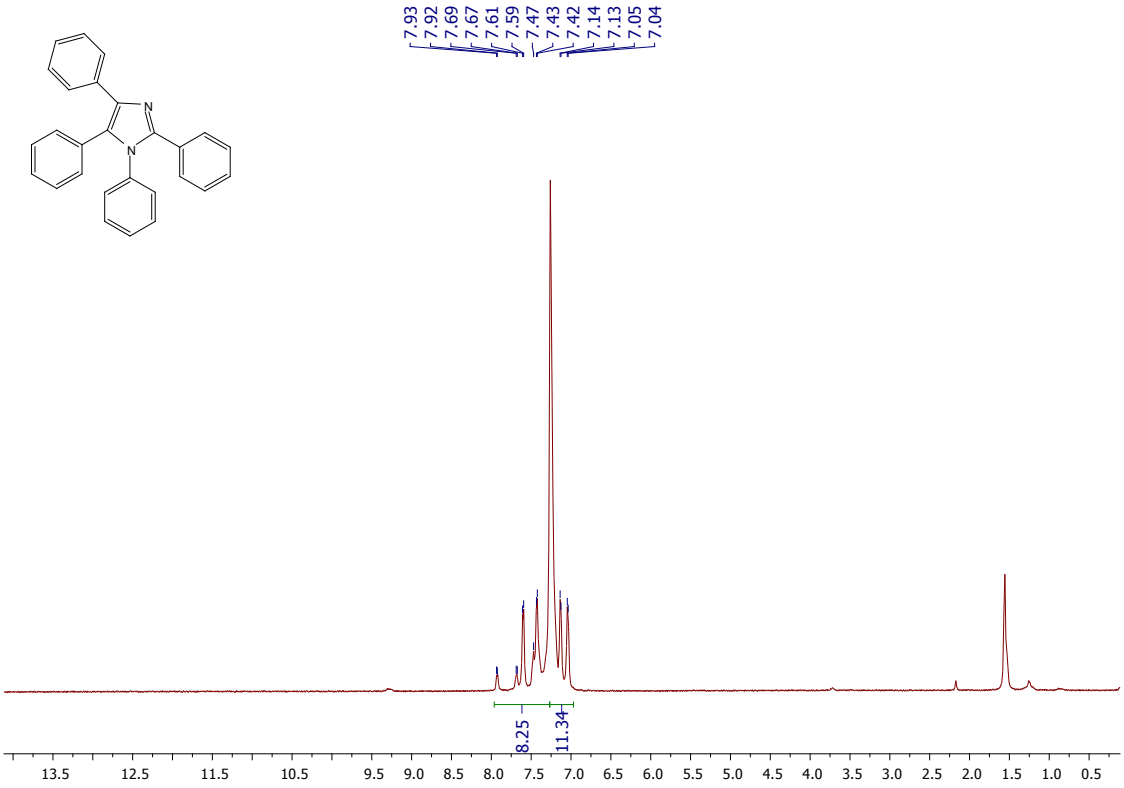


Figure S14. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 3-(4,5-diphenyl-1*H*-imidazol-2-yl)-1*H*-indole ($C_{23}H_{17}N_3$, 1o)



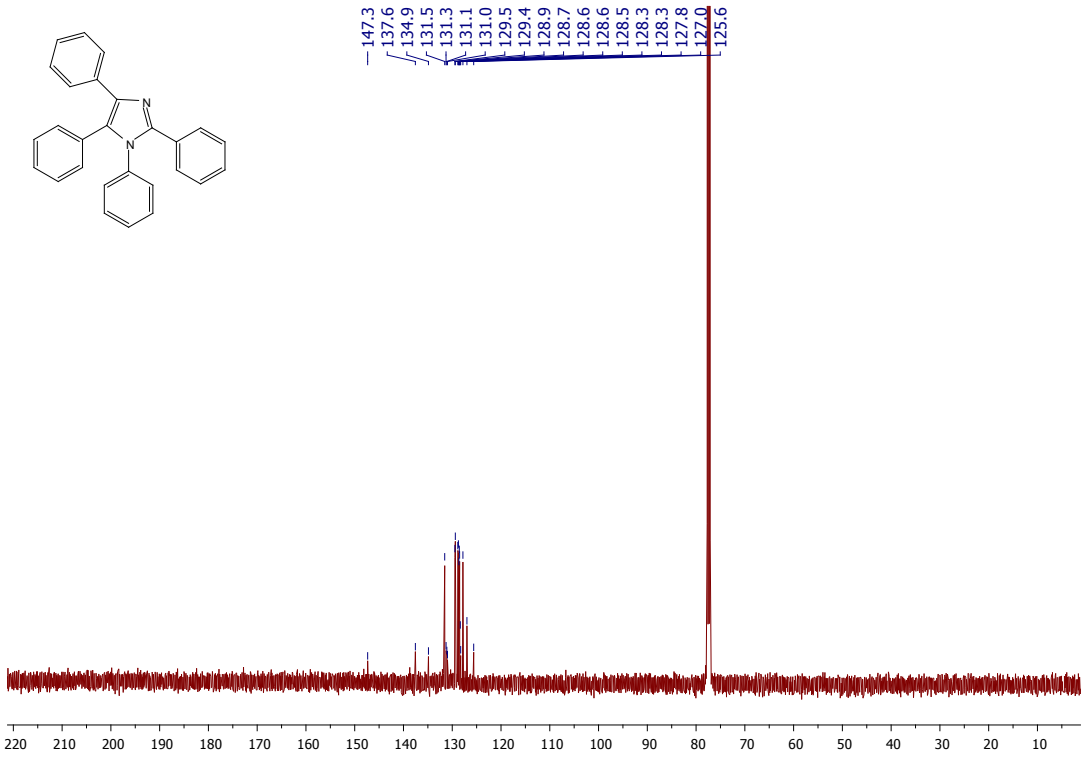
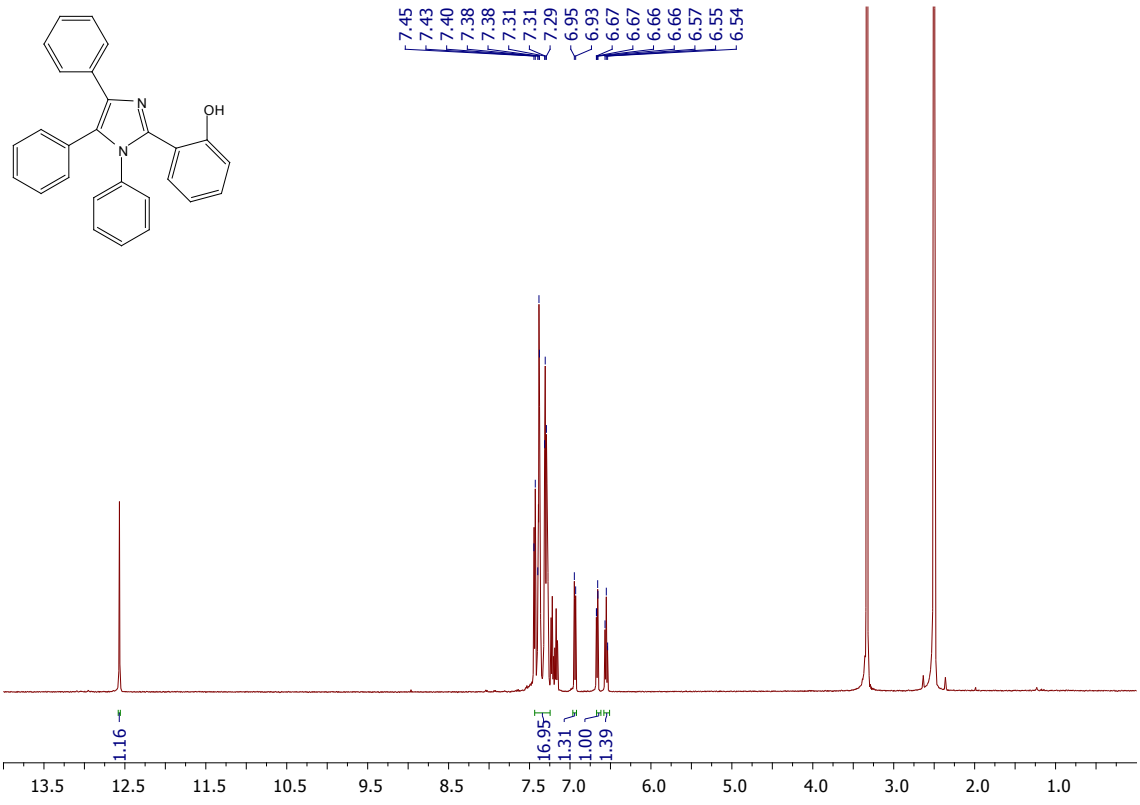


Figure S15. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 1,2,4,5-tetraphenyl imidazole ($C_{27}H_{20}N_2$, 2a)



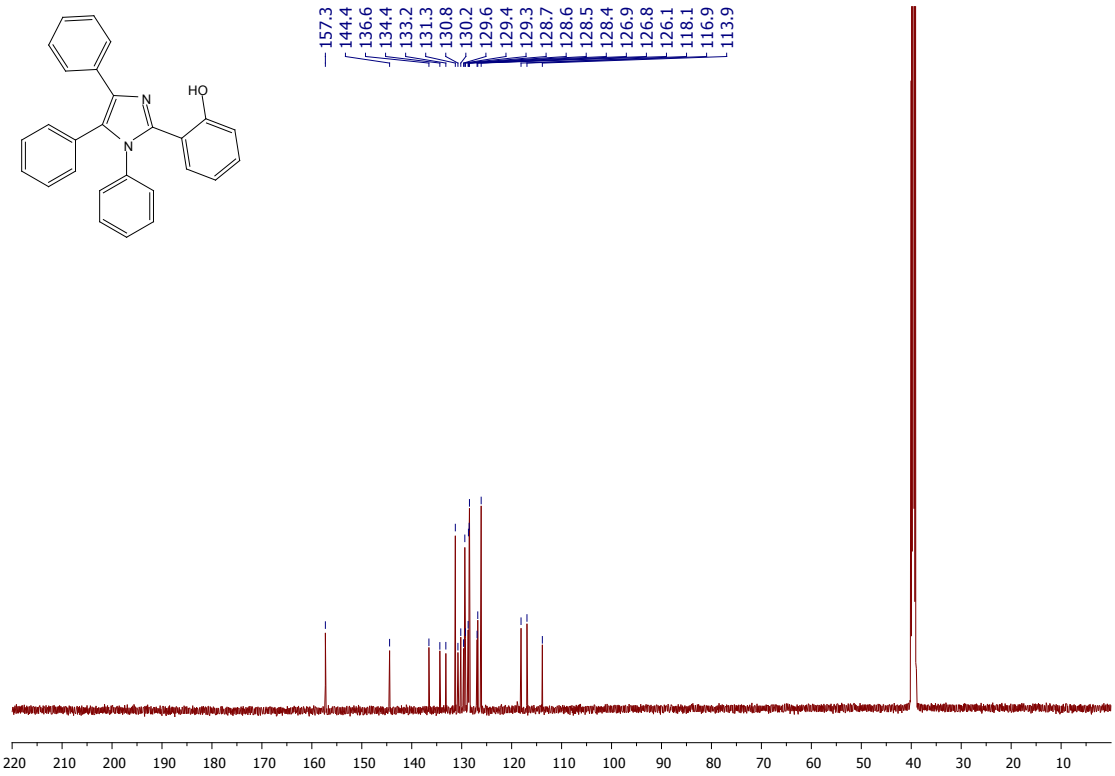
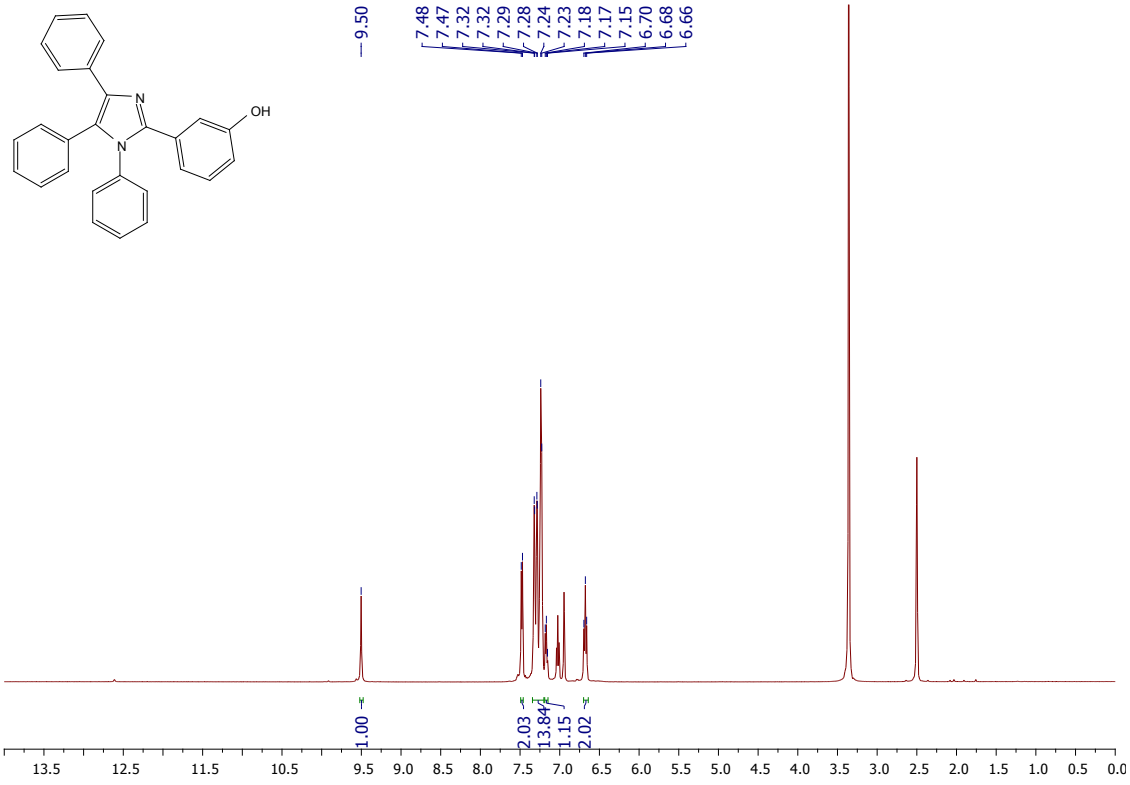


Figure S16. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-hydroxyphenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{20}N_2O$, 2b)



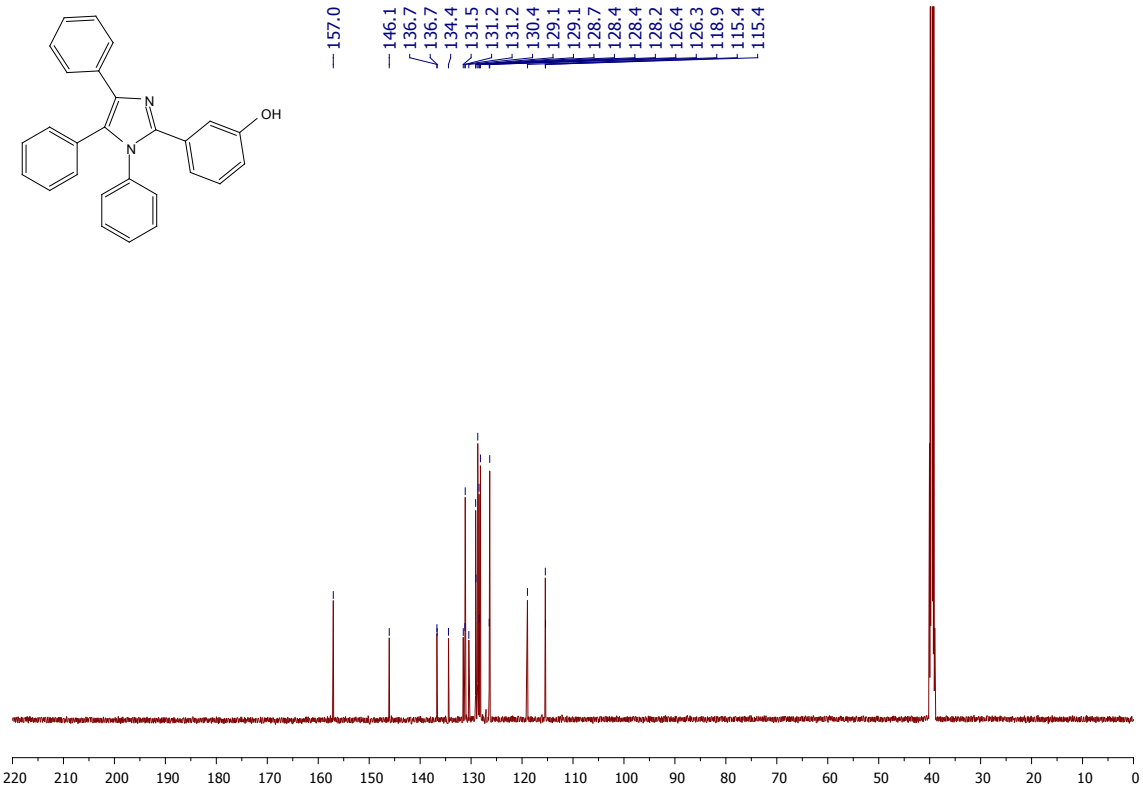
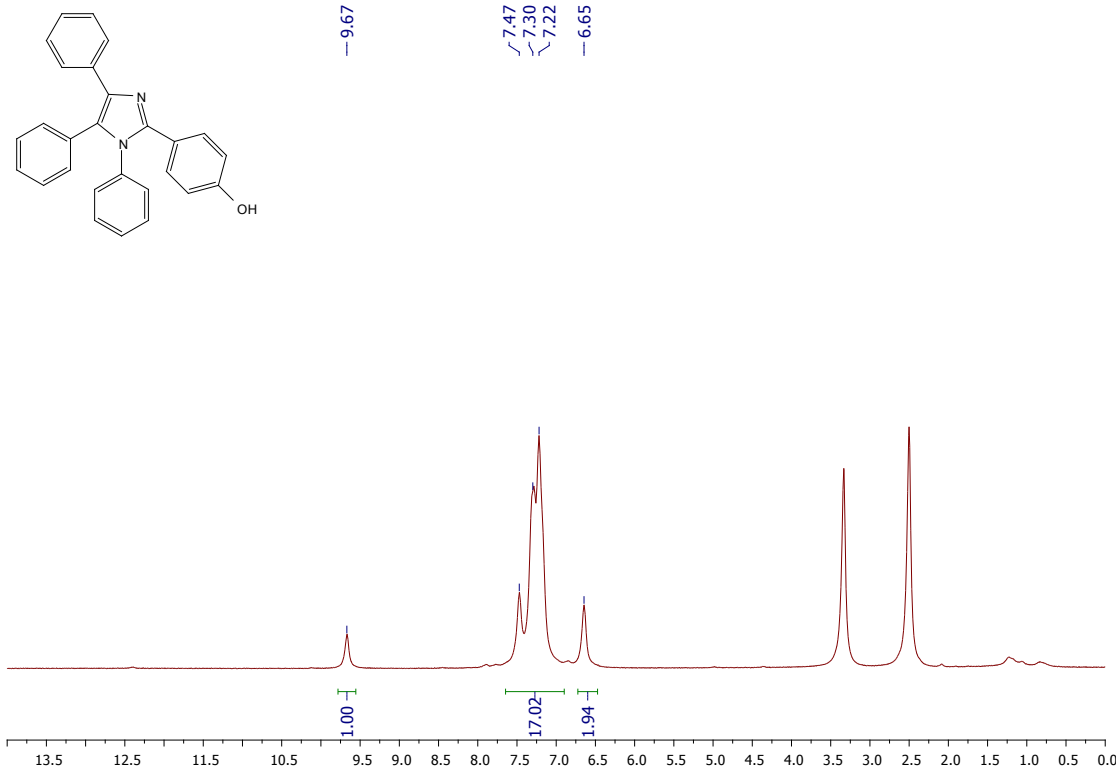


Figure S17. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(3-hydoxyphenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{20}N_2O$, 2c)



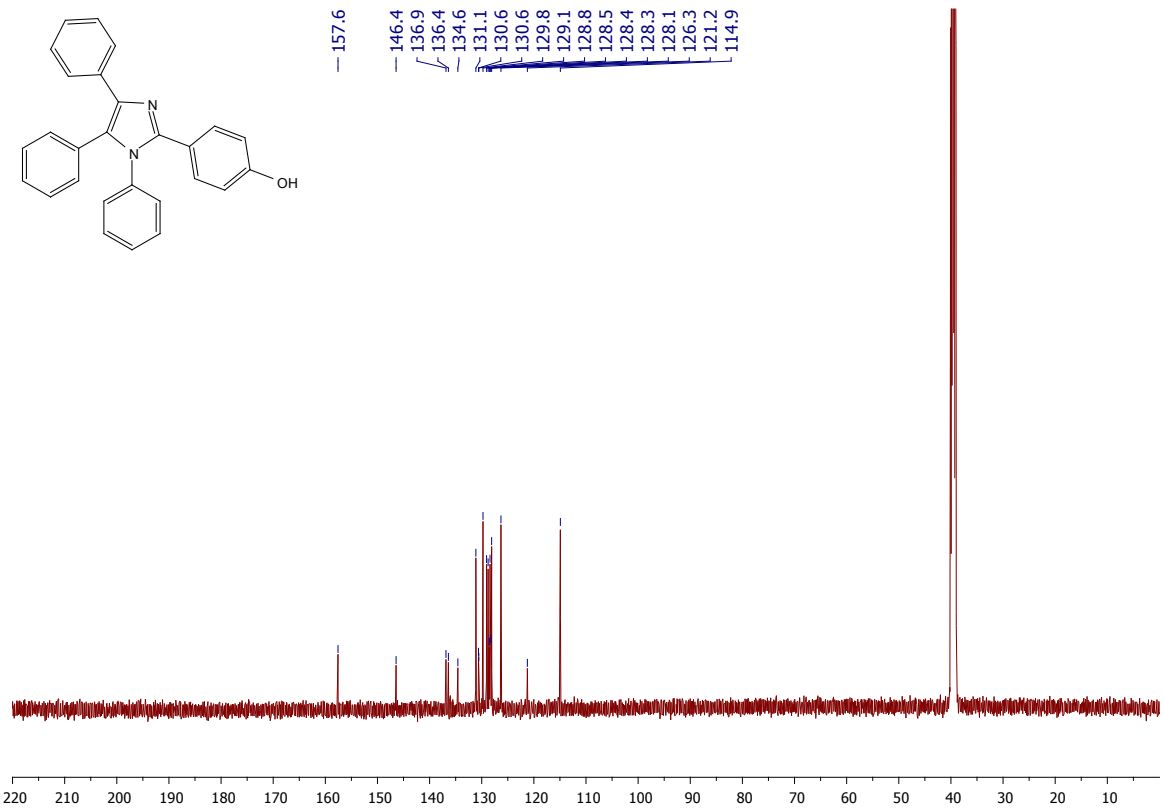
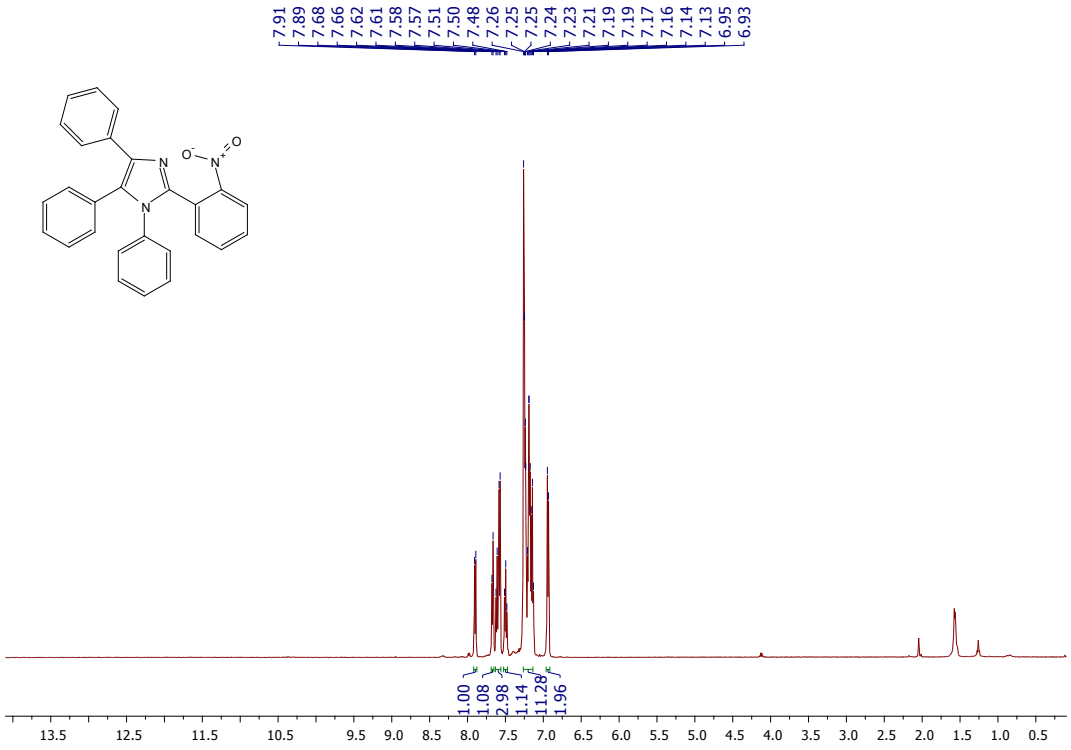


Figure S18. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-hydroxyphenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{20}N_2O$, 2d)



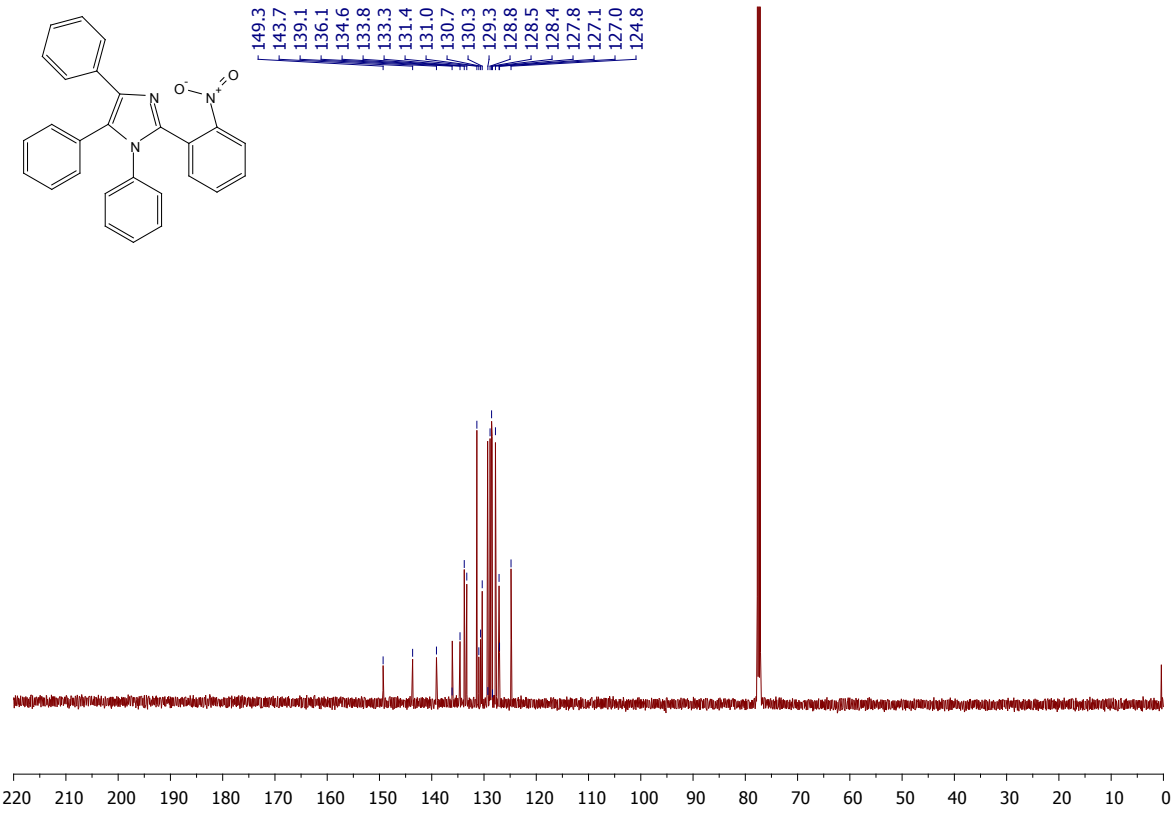
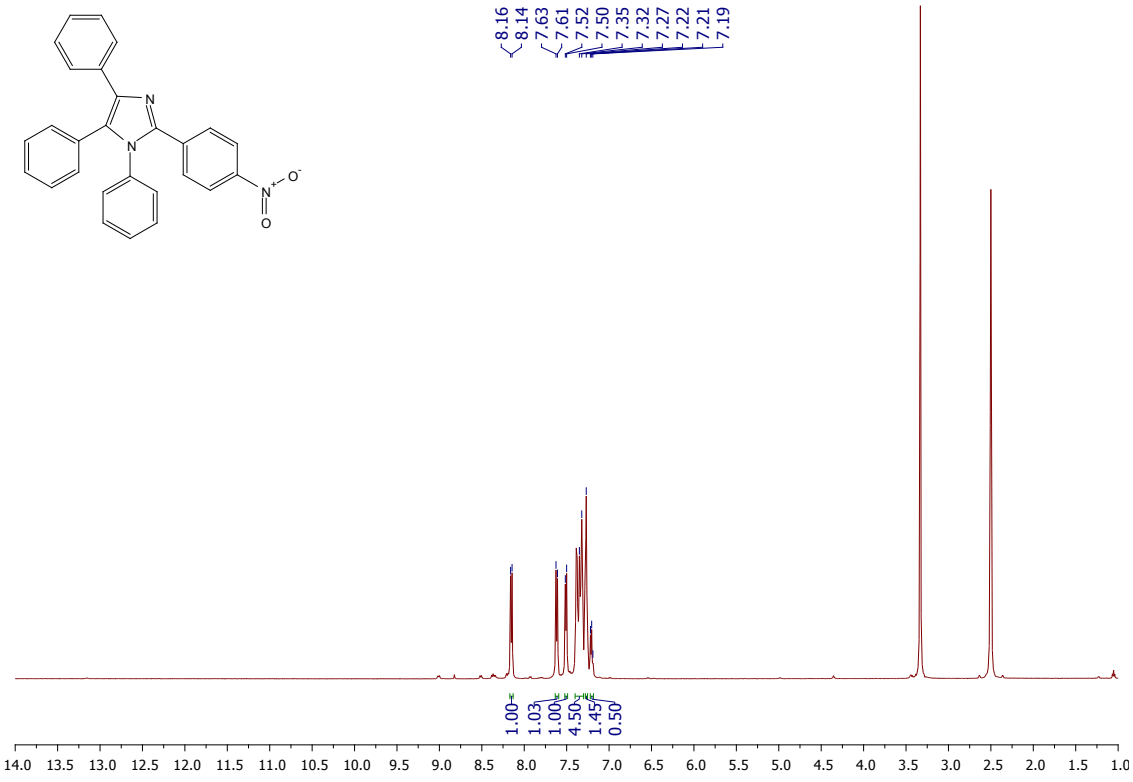


Figure S19. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-nitrophenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{19}N_3O_2$, 2e)



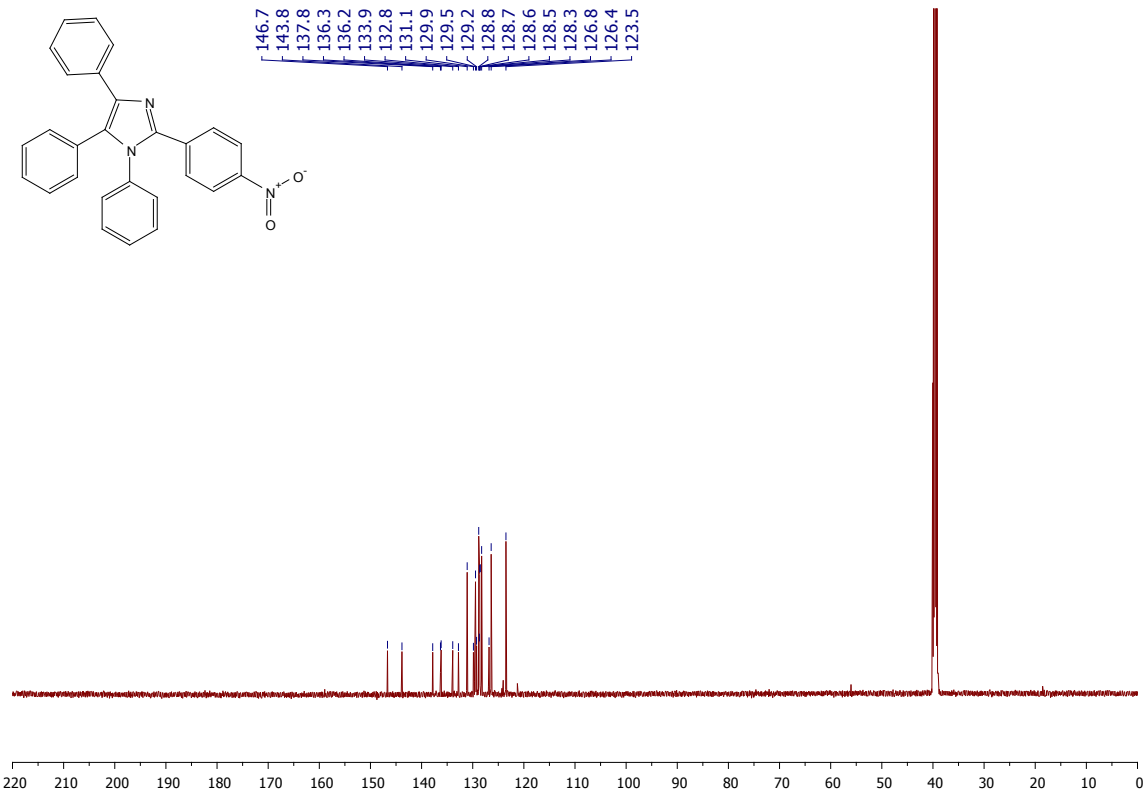
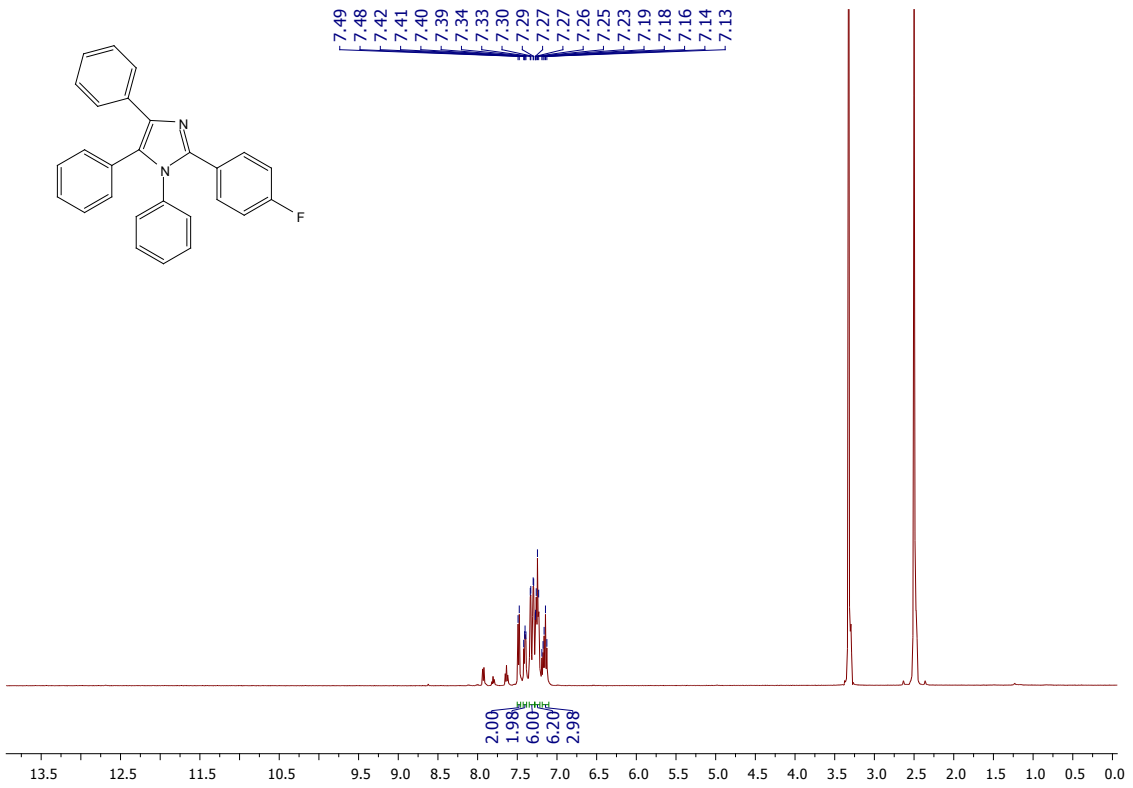


Figure S20. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-nitrophenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{19}N_3O_2$, 2f)



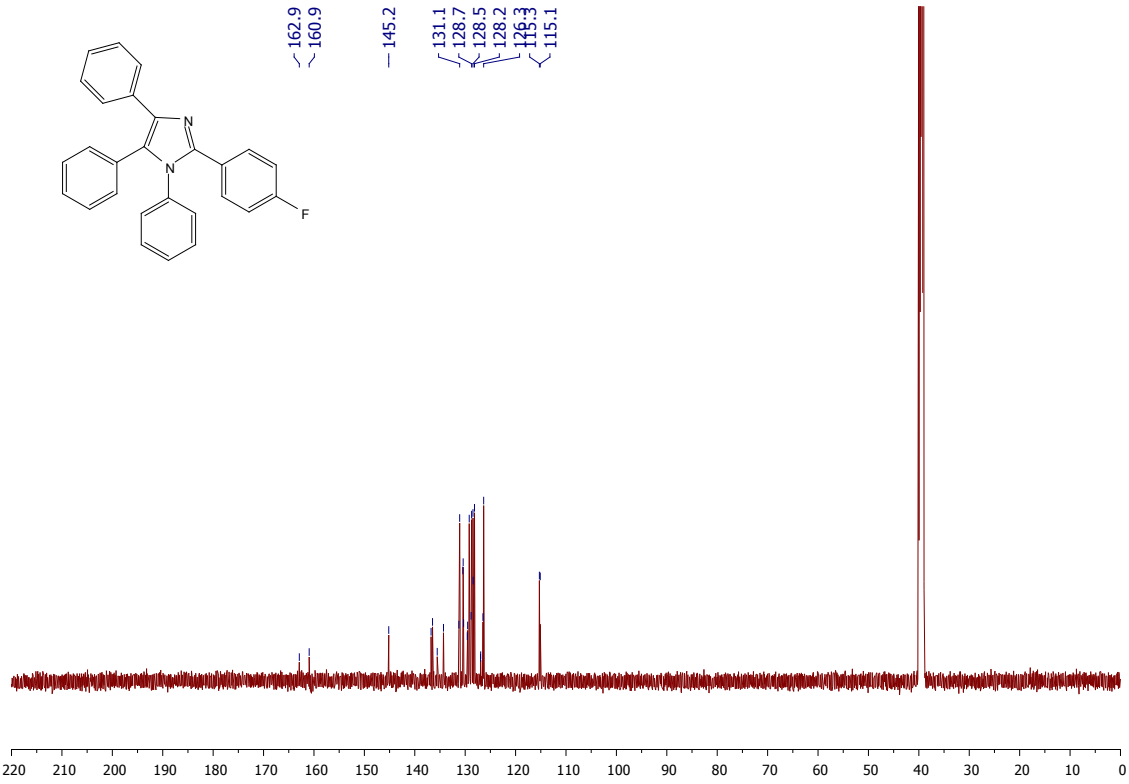
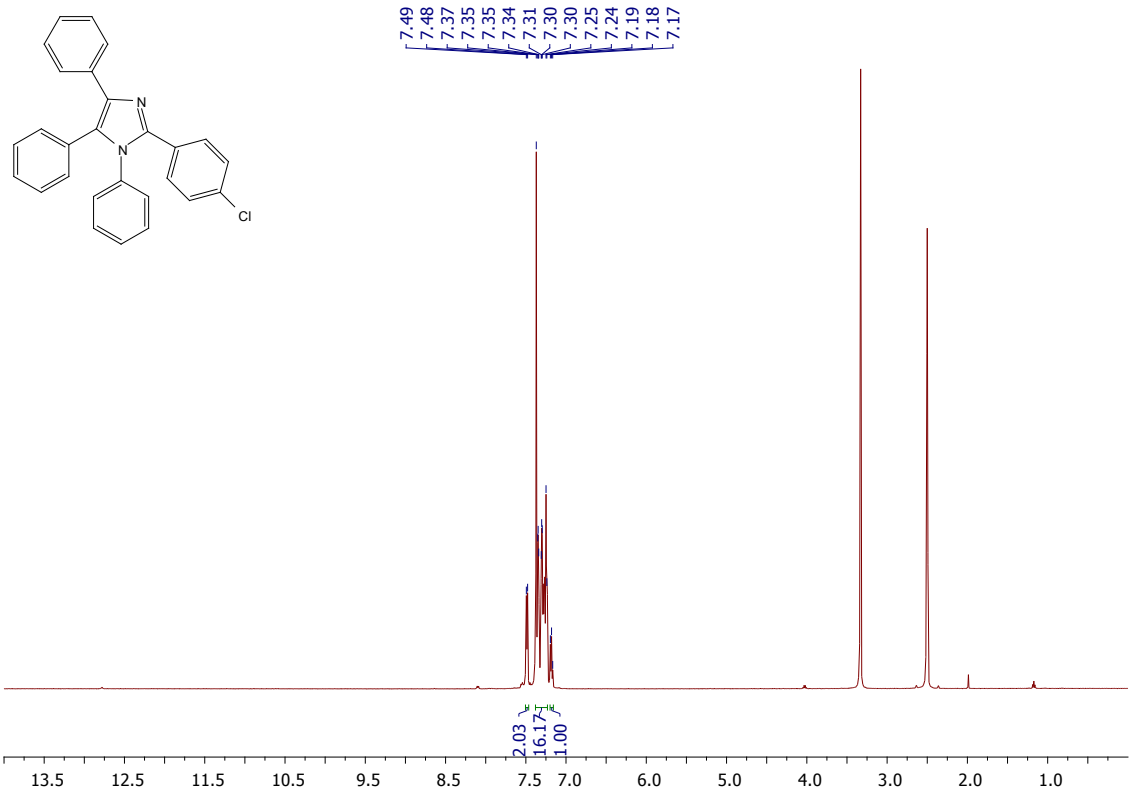


Figure S21. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-florophenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{19}N_2F$, 2g)



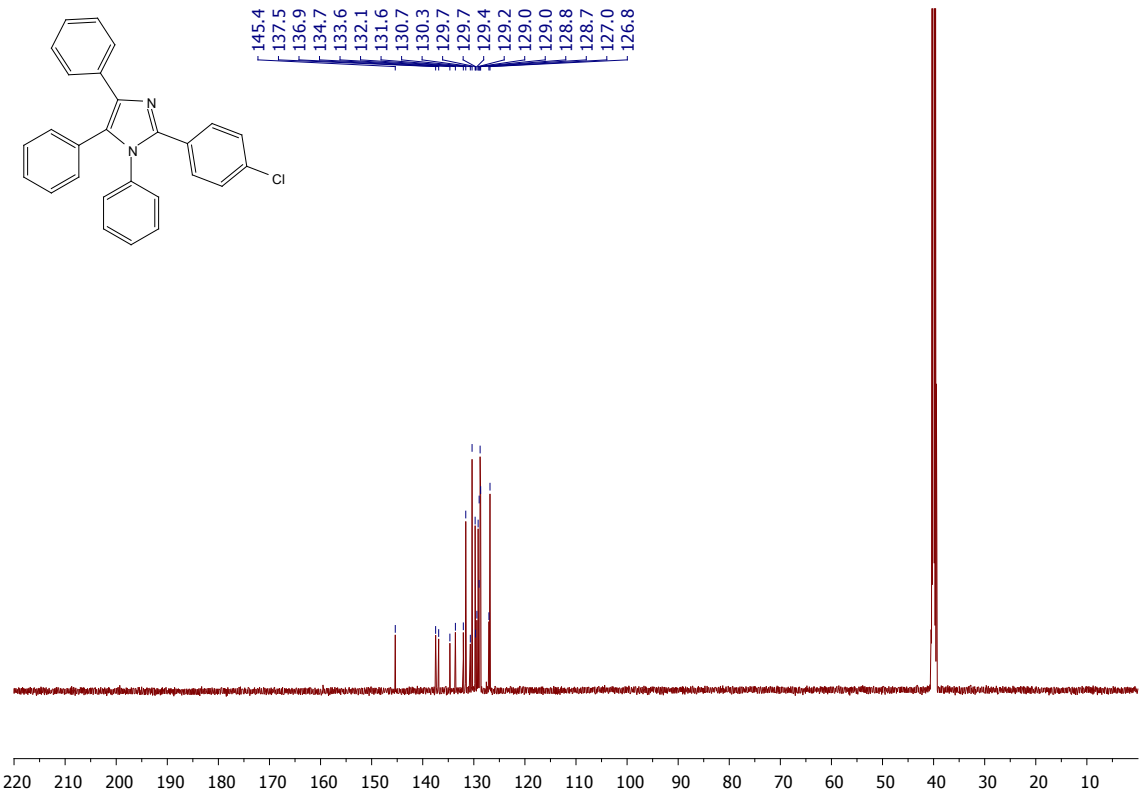
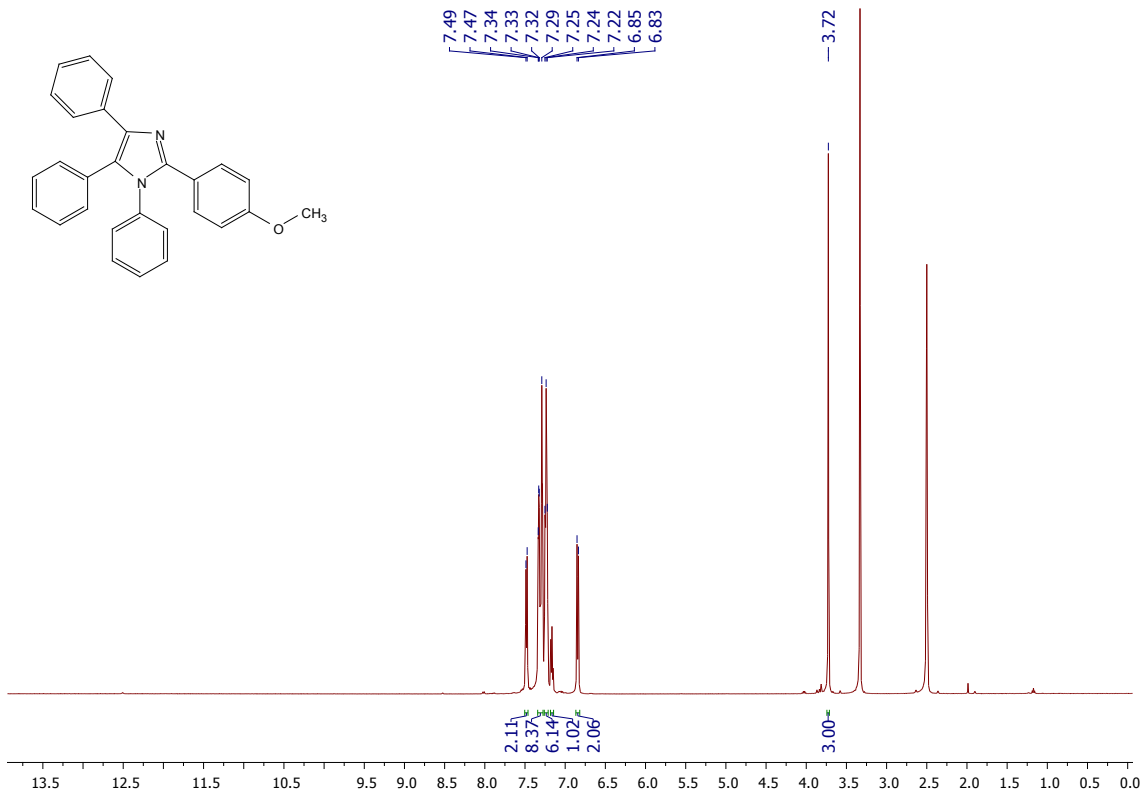


Figure S22. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-chlorophenyl)-1,4,5-triphenyl imidazole ($C_{27}H_{19}N_2Cl$, 2h)



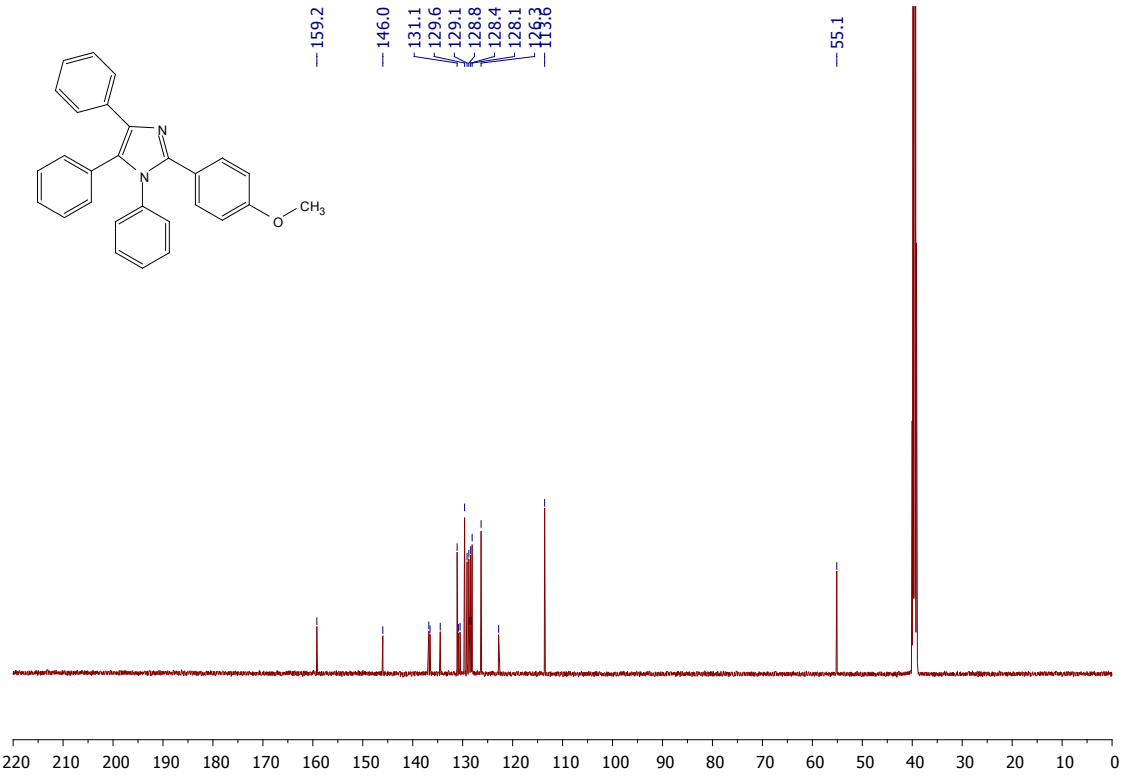
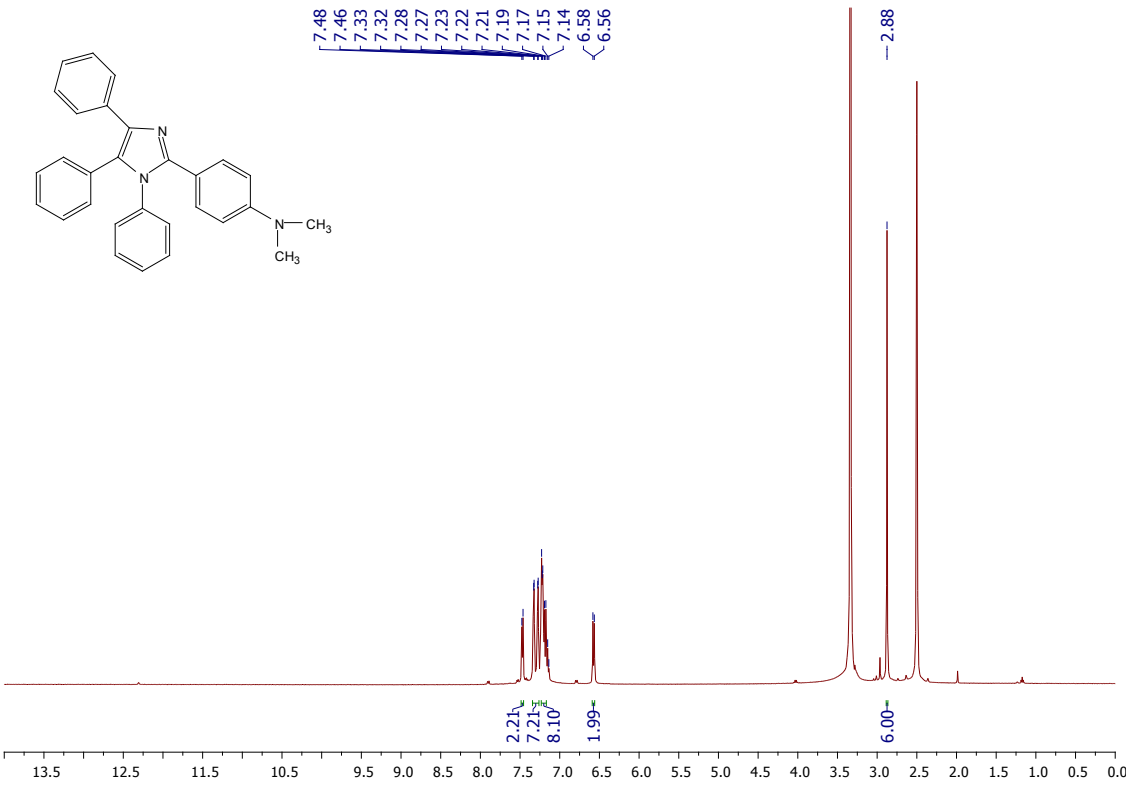


Figure S23. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-methoxyphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{22}N_2O$, 2k)



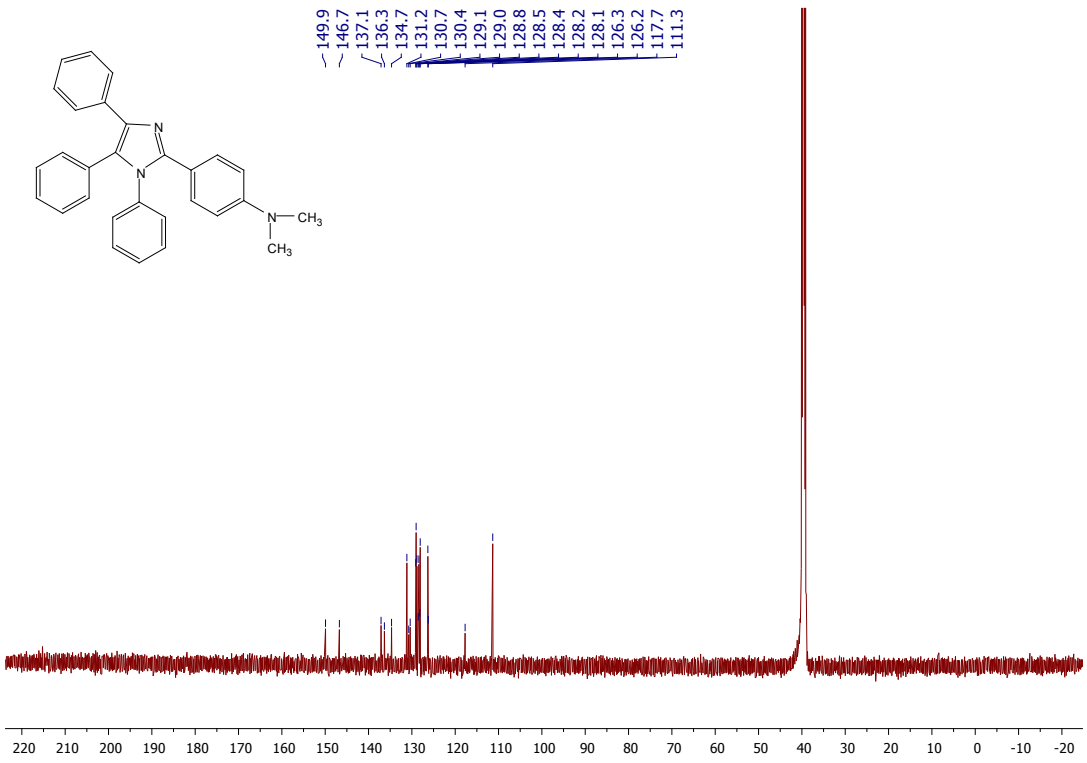
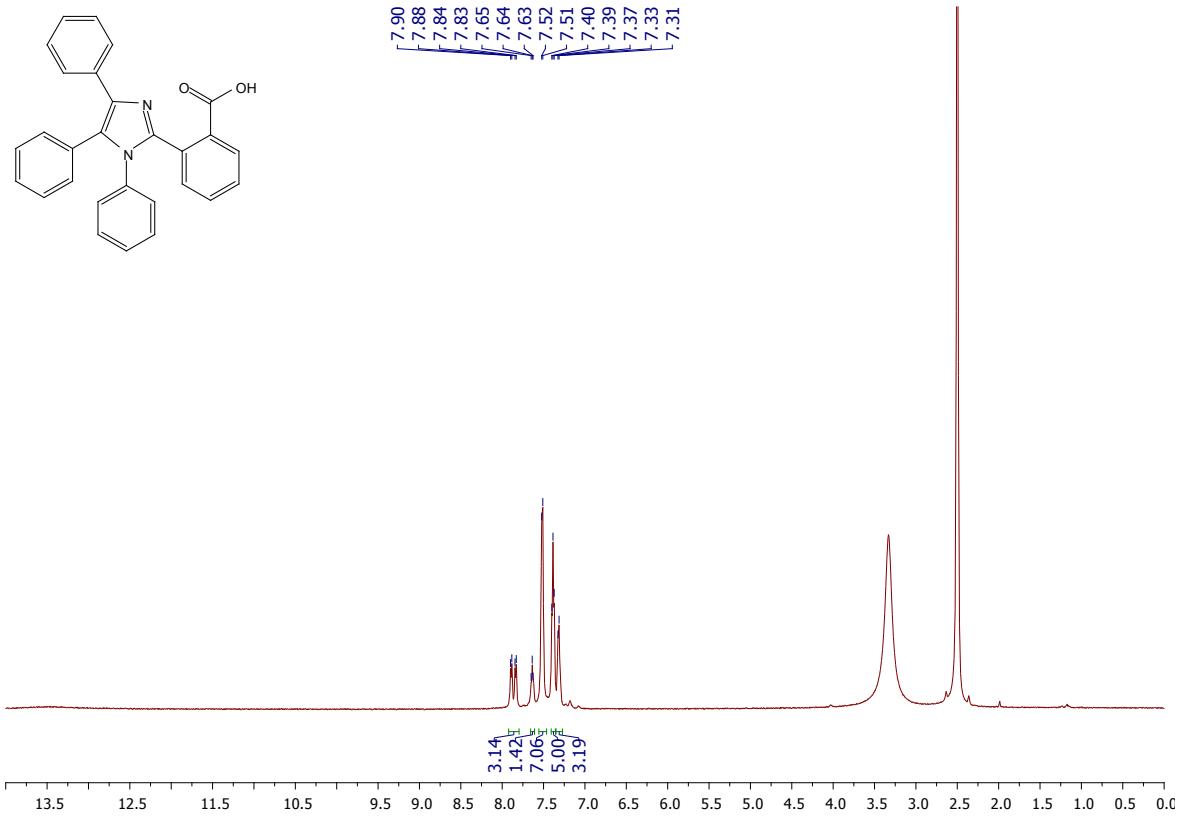


Figure S24. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-*N*,*N*-dimethylaminophenyl)-1,4,5-triphenyl imidazole ($C_{29}H_{25}N_3$, 2l)



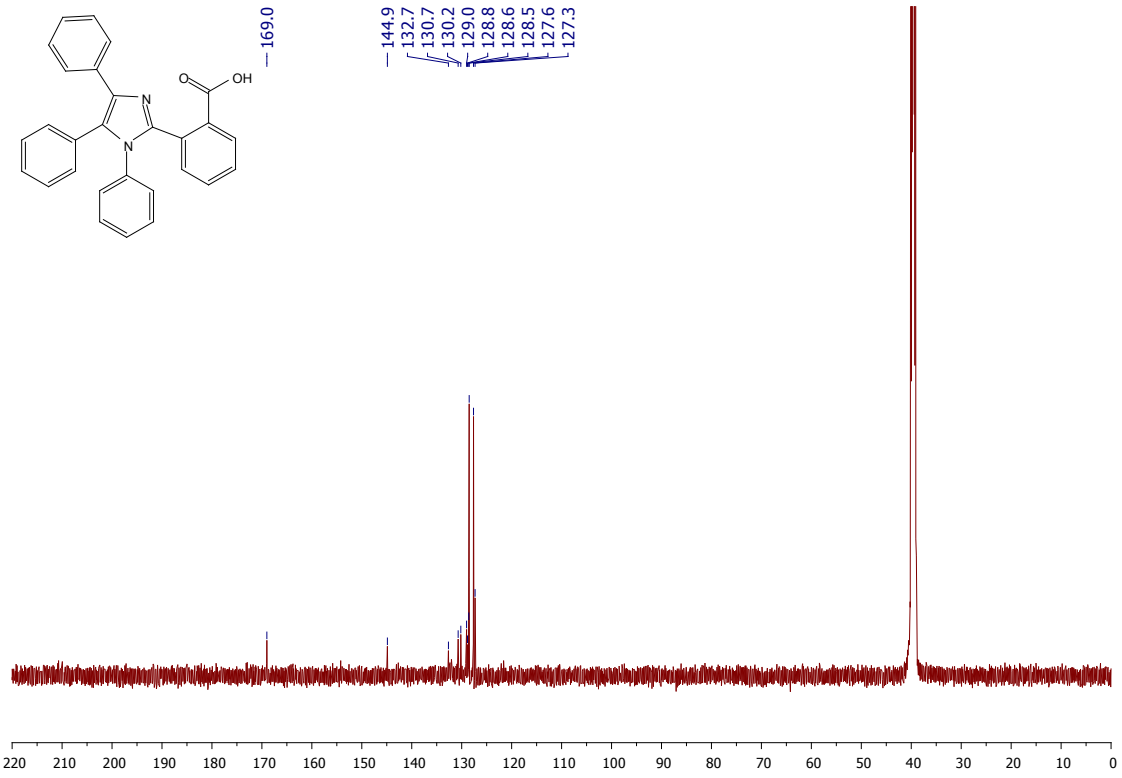
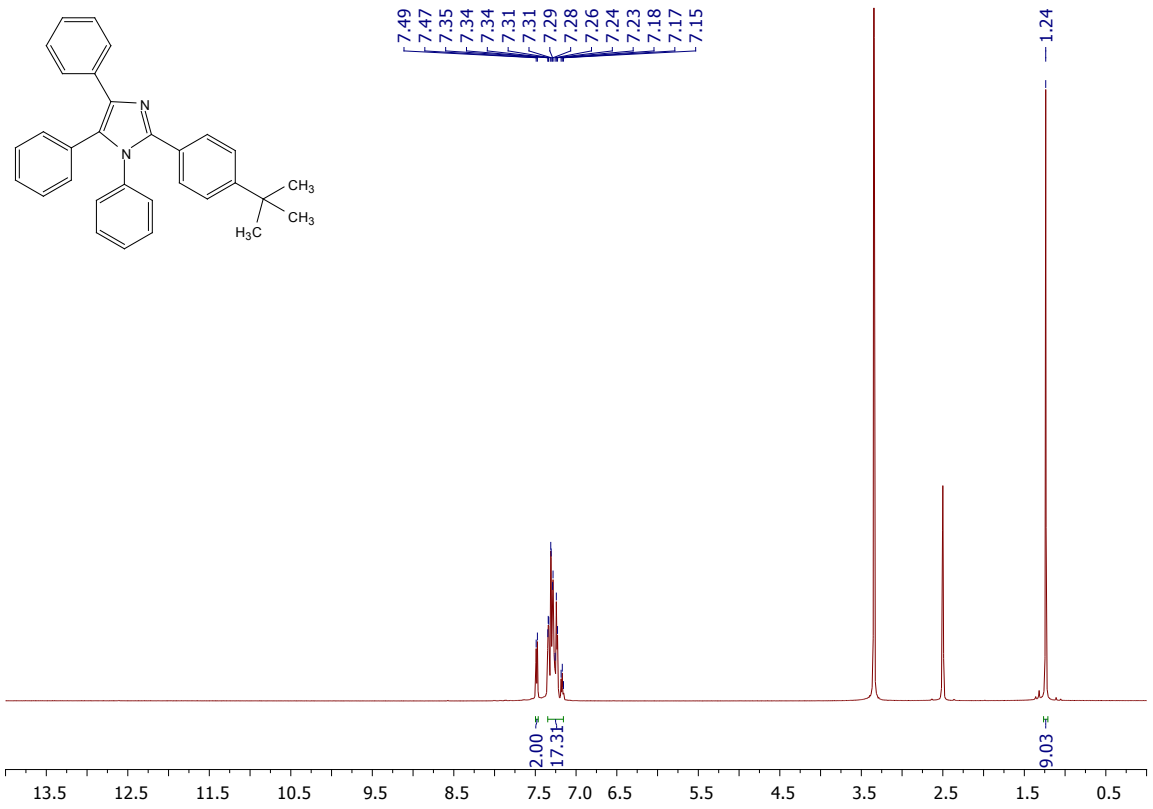


Figure S25. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-carboxyphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{20}N_2O_2$, 2m)



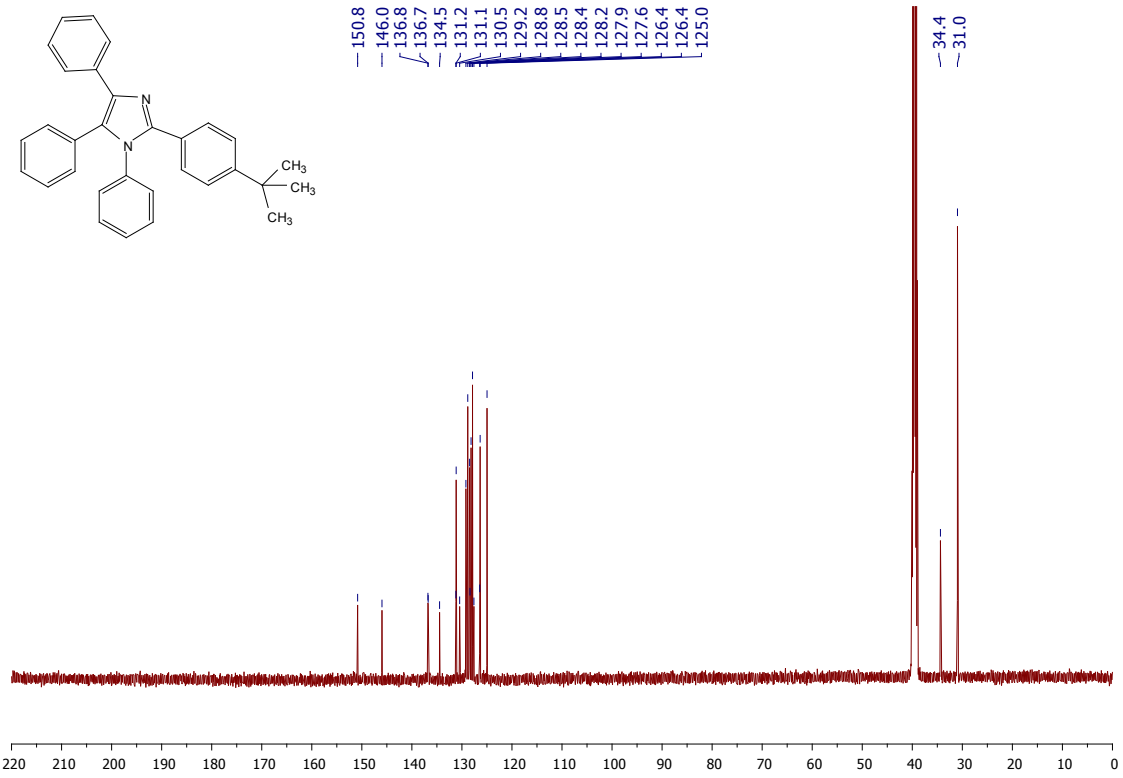
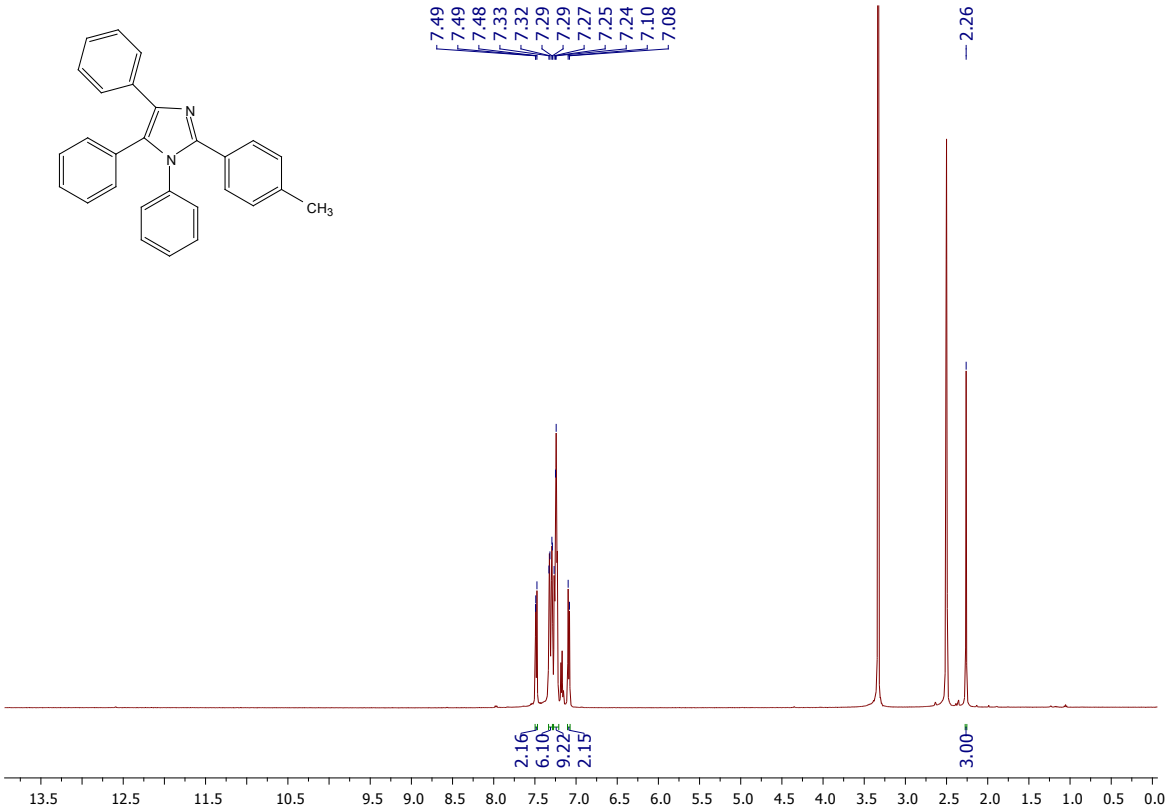


Figure S26. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-*tert*-butylphenyl)-1,4,5-triphenyl imidazole ($C_{31}H_{29}N_2$, 2o)



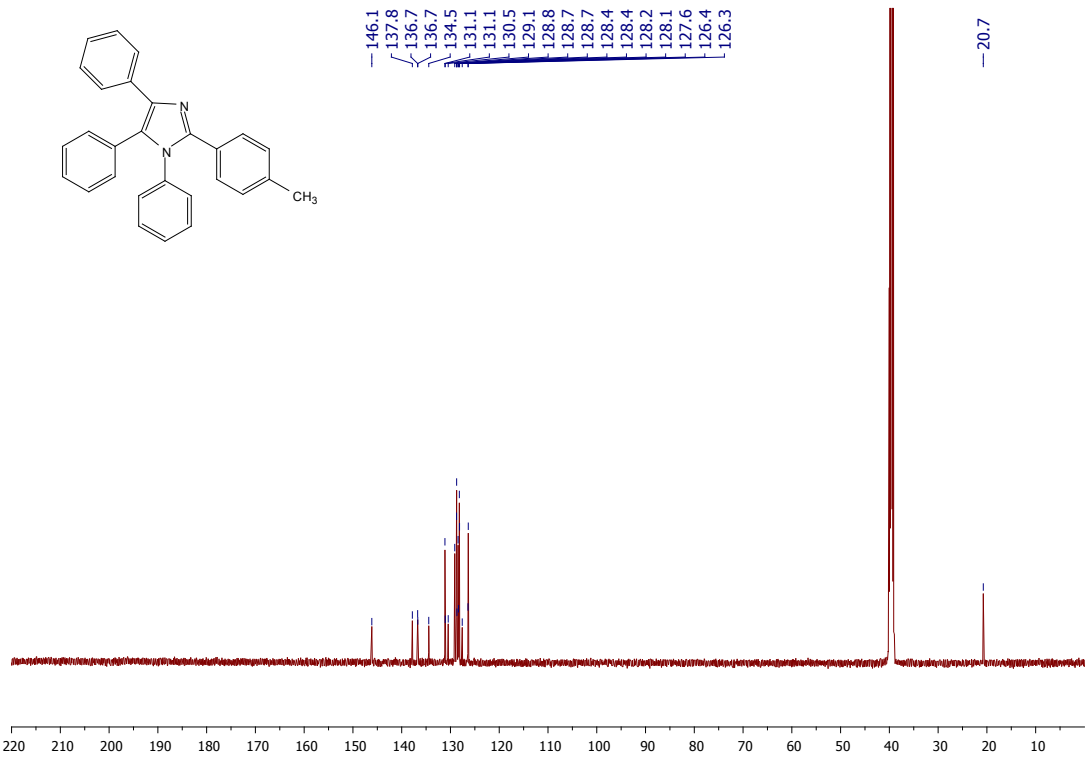
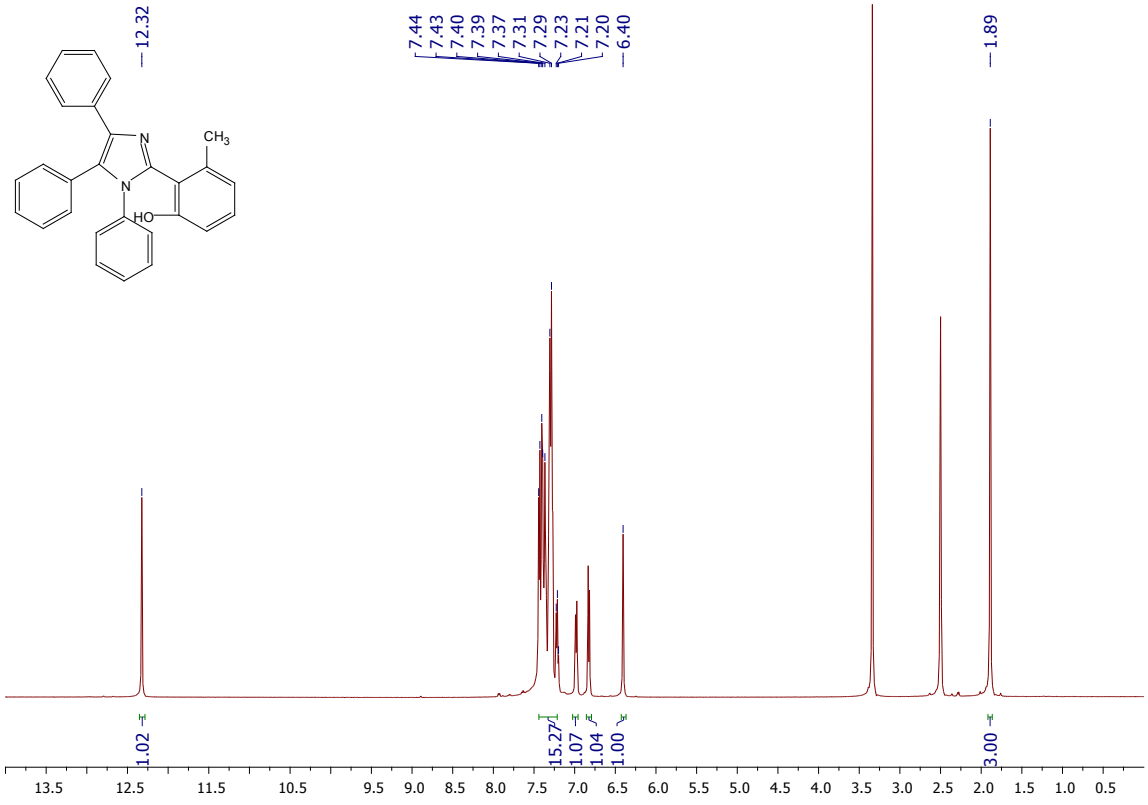


Figure S27. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(4-methylphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{22}N_2$, 2p)



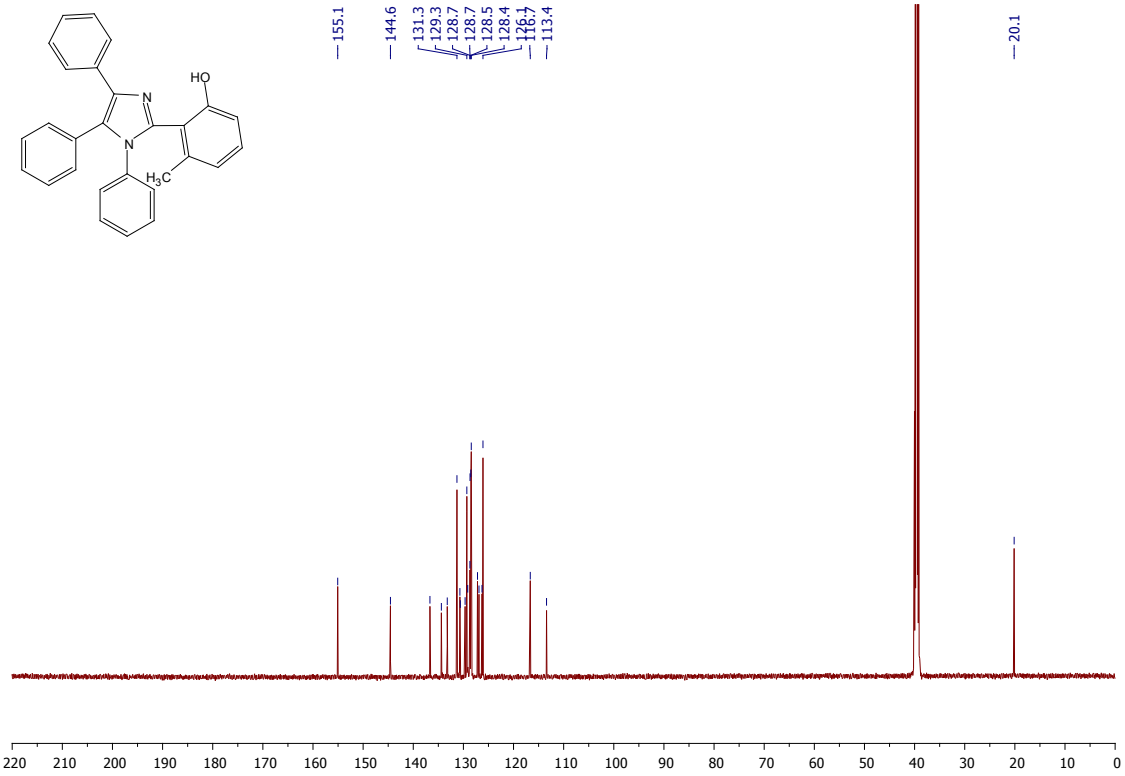


Figure S28. ^{1}H (top) and ^{13}C (bottom) NMR spectra of 2-(2-hydroxy-5-methylphenyl)-1,4,5-triphenyl imidazole ($C_{28}H_{23}N_2O$, 2q)

Section S5. References

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