

Supporting Information

Synthesis, characterization and application of $\text{Ni}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ nanoparticles for the one pot synthesis of triaryl-1*H*-imidazoles

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2,4,5-Triphenyl-1H-imidazole (1)

M.p.: 275-276 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.24 (t, 1H, *J* = 7.2 Hz), 7.32 (t, 2H, *J* = 7.2 Hz), 7.39 (t, 2H), 7.44-7.53 (m, 6H), 7.57 (d, 2H, *J* = 7.6 Hz), 8.10 (d, 2H, *J* = 7.2 Hz), 12.76 (1H, br) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 125.66, 127.03, 127.55, 128.28, 128.66, 128.76, 128.9, 128.95, 129.18, 129.2, 130.74, 131.47, 135.6, 137.57, 145.85 ppm; IR (KBr, cm⁻¹): 3433, 3029, 1598, 1499, 1453, 1199, 1128, 964, 766, 734, 696.

2-(2-Chlorophenyl)-4,5-diphenyl-1H-imidazole (2)

M.p.: 198-200 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.24 (t, 1H, *J* = 7.1 Hz), 7.31-7.39 (m, 3H), 7.42-7.53 (m, 6H), 7.57 (d, 2H, *J* = 7.2 Hz) 7.61-7.64 (m, 1H), 7.81-7.83 (m, 1H), 12.69 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 127.08, 127.7, 128.24, 128.39, 128.7, 129.18, 130.46, 130.68, 130.73, 131.31, 132.02, 132.07, 135.5, 137.37, 143.8 ppm; IR (KBr, cm⁻¹): 3446, 3061, 1599, 1501, 1478, 1321, 1203, 1068, 762, 692, 604.

2-(4-Chlorophenyl)-4,5-diphenyl-1H-imidazole (3)

M.p.: 262-264 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.22-7.57 (m, 12H), 8.11 (d, 2H, *J* = 8.4 Hz), 12.81 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 127.12, 127.41, 127.59, 128.42, 128.71, 128.89, 129.27, 129.31, 129.47, 131.33 133.31, 135.42, 137.78, 144798 ppm; IR (KBr, cm⁻¹): 3439, 3060, 1599, 1498, 1485, 1451, 1325, 1130, 1090, 971, 829, 765, 731, 696, 601.

2-p-tolyl-4,5-diphenyl-1H-imidazole (4)

M.p.: 236-237 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 2.36 (s, 3H), 7.23 (t, 1H, *J* = 7.4 Hz), 7.31 (t, 4H, *J* = 7.2 Hz), 7.38 (t, 1H, *J* = 7.2 Hz), 7.45 (t, 2H, *J* = 7.4 Hz), 7.51 (d, 2H, *J* = 7.2 Hz), 7.56 (d, 2H, *J* = 7.6 Hz), 7.99 (d, 2H, *J* = 8.0 Hz) 12.63 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 55.67, 114.57, 123.53, 126.92, 127.55, 128.1, 128.82, 129.12, 131.63, 135.77, 137.24, 145.19, 146.13, 159.9 ppm; IR (KBr, cm⁻¹): 3419, 3029, 1598, 1497, 1449, 1130, 1067, 970, 823, 765, 729, 693, 671.

2-(4-Methoxyphenyl)-4,5-diphenyl-1H-imidazole (5)

M.p.: 232-235 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 3.82 (s, 3H), 7.06 (d, 2H, *J* = 6.8 Hz), 7.23-7.58 (m, 10H), 8.05 (d, 2H, *J* = 7.2 Hz), 12.56 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 55.7, 114.6, 123.5, 126.9, 127.2, 127.5, 128.0, 128.1, 128.6, 128.8, 129.1, 131.6, 131.7, 135.8, 137.2, 146.0, 146.1, 159.9 ppm; IR (KBr, cm⁻¹): 3431, 3060, 1614, 1493, 1293, 1249, 1177, 1030, 968, 829, 765, 695.

2-(4-Bromophenyl)-4,5-diphenyl-1H-imidazole (6)

M.p.: 264-266 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.25 (t, 1H, *J* = 7.4 Hz), 7.33 (t, 2H, *J* = 7.0 Hz), 7.40 (t, 1H, *J* = 7.8 Hz), 7.46 (t, 2H, *J* = 7.2 Hz), 7.51-7.58 (m, 6H), 8.12 (d, 2H, *J* = 7.2 Hz), 12.82 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 127.12, 127.44, 127.59, 128.42, 128.71, 128.91, 129.59, 129.63, 129.59, 131.33, 133.31, 135.42, 137.78, 144.79 ppm; IR (KBr, cm⁻¹): 3447, 3030, 1598, 1499, 1482, 1450, 1431, 1131, 1071, 825, 765, 730, 693, 501.

2-(2-Methoxyphenyl)-4,5-diphenyl-1H-imidazole (7)

M.p.: 208-210 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 3.93 (s, 3H), 7.08 (t, 1H, *J* = 7.2 Hz), 7.17-7.24 (m, 2H), 7.30 (t, 2H, *J* = 7.2 Hz), 7.38-7.50 (m, 6H), 7.54 (d, 2H, *J* = 7.2 Hz), 8.06 (d, 1H, *J* = 7.6 Hz), 11.93 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 56.02, 112.12, 119.3, 121.07, 126.9, 127.55, 127.7, 128.11, 128.03, 129.06, 129.1, 129.32, 130.28, 131.64, 135.7, 136.87, 143.99, 156.47 ppm; IR (KBr, cm⁻¹): 3448, 3063, 1603, 1587, 1478, 1469, 1445, 1249, 1101, 1020, 764, 747, 694, 613.

2-(2,4-Dichlorophenyl)-4,5-diphenyl-1H-imidazole (8)

M.p.: 178-180 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.26-7.59 (m, 11H), 7.79 (d, 1H, *J* = 7.6 Hz), 7.86 (d, 1H, *J* = 7.6 Hz), 12.76 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 127.15, 127.68, 127.95, 128.34, 128.73, 129.17, 129.31, 130.22, 131.2, 132.92, 133.06, 134.37, 135.39, 142.76 ppm; IR (KBr, cm⁻¹): 3446, 3070, 1595, 1550, 1503, 1476, 1426, 1323, 1135, 1099, 881, 770, 698, 498.

2-(4-Nitrophenyl)-4,5-diphenyl-1H-imidazole (9)

M.p.: 240-242 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 7.27-7.75 (m, 10H), 7.90-8.37 (m, 4H), 13.17 (br, 1H), ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 124.74, 126.21, 127.68, 128.96, 136.51, 143.76, 146.99 ppm; IR (KBr, cm⁻¹): 3392, 3078, 1598, 1579, 1513, 1442, 1336, 1246, 1111, 970, 853, 763, 6954.

2-Phenyl-4,5-di-p-tolyl-1H-imidazole (10)

M.p.: 269-271 °C; ¹H NMR (400 MHz, DMSO-d₆): δ = 2.30 (s, 3H), 2.36 (s, 3H), 7.12 (d, 2H, *J* = 8.0 Hz), 7.25 (d, 2H, *J* = 8.0 Hz), 7.38-7.50 (m, 7H), 8.09 (d, 2H, *J* = 7.6 Hz), 12.61 (br, 1H) ppm; ¹³C NMR (100 MHz, DMSO-d₆): δ = 21.25, 21.33, 125.6, 127.49, 128.22, 128.62, 128.7,

129.14, 129.24, 129.67, 130.84, 132.88, 136.02, 137.37, 137.5, 145.53 ppm; IR (KBr, cm^{-1}): 3436, 3029, 1519, 1500, 1478, 1412, 1322, 1124, 816, 719, 690.

2-(4-methoxyphenyl)-4,5-dip-tolyl-1H-imidazole(11)

M.p.: 258-260 °C; ^1H NMR (400 MHz, DMSO-d_6): δ = 2.36 (s, 6H), 3.82 (s, 3H), 7.11-7.13 (d, 2H, J = 8.0 Hz), 7.23-7.30 (dd, 4H, J = 8.0 Hz), 7.38-7.40 (d, 2H, J = 8.0 Hz), 7.44-7.45 (d, 2H, J = 7.8 Hz), 8.06-8.08 (d, 2H, J = 8.0 Hz), 12.54 (br, 1H) ppm; ^{13}C NMR (100 MHz, DMSO-d_6): δ = 21.33, 55.77, 124.40, 127.48, 127.89, 128.29, 128.44, 129.10, 129.22, 129.65, 129.72, 133.10, 136.02, 137.57, 137.79, 138.13, 148.73 ppm; IR (KBr, cm^{-1}): 3441, 3018, 1523, 1498, 1429, 1321, 1126, 970, 820, 728.





















