

((Supplementary Data))

Nanocatalytic one-pot, four-component synthesis of some new triheterocyclic compounds consisting of pyrazole, pyran, and pyrimidinone rings

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Spectral data

Compound 5b: IR (KBr) ν = 3138, 3041, 2907, 1678, 1579, 1518, 1349; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.37 (br, 1H), 10.27 (s, 2H), 8.11 (d, 2H, $J=8.0$ Hz), 7.33 (d, 2H, $J=8.0$ Hz), 2.26 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 159.99, 151.20, 150.63, 145.54, 143.64, 131.78, 127.98, 123.12, 114.47, 104.86, 91.02, 31.04, 9.96.

Compound 5d: IR (KBr) ν = 3215, 3054, 1686, 1623, 1588, 1488, 1369, 836, 870; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.01 (br, 1H), 10.19 (s, 2H), 7.27 (d, 2H, $J=8.0$ Hz), 7.06 (d, 2H, $J=8.0$ Hz), 5.41 (s, 1H), 2.23 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.35, 150.57, 141.58, 134.64, 129.92, 128.59, 128.06, 127.71, 127.27, 89.45, 30.16, 9.96.

Compound 5e: IR (KBr) ν = 3077, 3003, 2951, 2228, 1671, 1624, 1602, 1378; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.30 (br, 1H), 102.40 (s, 2H), 7.69 (d, 2H, $J=8.0$ Hz), 7.25 (d, 2H, $J=8.0$ Hz), 5.49 (s, 1H), 2.24 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.07, 150.61, 148.85, 143.70, 132.17, 131.83, 131.47, 127.80, 119.05, 108.22, 104.84, 89.73, 31.08, 9.95.

Compound 5f: IR (KBr) ν = 3212, 1689, 1606, 1511, 1426, 1249, 1177; ^1H NMR (DMSO- d_6 , 400 MHz): δ 12.96 (br, 1H), 10.15 (s, 2H), 6.96 (d, 2H, $J=8.0$ Hz), 6.77 (d, 2H, $J=8.0$ Hz), 5.37 (s, 1H), 3.69 (s, 3H), 2.22 (s, 1H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.57, 157.06, 154.89, 150.59, 137.46, 134.35, 128.10, 127.63, 125.12, 113.92, 113.18, 54.89, 9.99.

Compound 5g: IR (KBr) ν = 3221, 2962, 1690, 1622, 1462, 1388; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.12 (br, 1H), 10.18 (s, 2H), 7.08 (d, 2H, $J=8.0$ Hz), 6.97 (d, 2H, $J=8.0$ Hz), 5.40 (s, 1H), 2.81 (sep, 1H, $J=8$ Hz), 2.22 (s, 3H), 1.17 (s, 3H), 1.116 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.60, 150.60, 145.18, 143.50, 139.92, 129.43, 126.58, 126.49, 125.72, 105.91, 91.39, 32.89, 23.95, 23.90, 23.52, 9.98; MS (m/z): 339.3, 258.2, 243.1, 228.2, 213.1, 185.1, 128.1, 109.1.

Compound 5h: IR (KBr) ν = 3182, 3039, 1680, 1652, 1495, 1400, 1363, 1193; ^1H NMR (DMSO- d_6 , 400 MHz): δ 12.88 (br, 1H), 10.13 (s, 2H), 6.88 (d, 2H, $J=8.0$ Hz), 6.62 (d, 2H, $J=8.0$ Hz), 5.35 (s, 1H), 2.83 (s, 6H), 2.22 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 162.70, 154.12, 150.28, 146.09, 136.49, 127.20, 119.93, 112.61, 111.16, 109.47, 91.43, 40.58, 29.50, 10.01.

Compound 5i: IR (KBr) ν = 3200, 2937, 1686, 1625, 1592, 1506, 1462, 1129; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.16 (br, 1H), 10.17 (s, 2H), 6.37 (s, 2H), 5.39 (s, 1H), 3.65 (s, 6H), 3.62 (s, 3H), 2.24 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 167.46, 152.28, 150.54, 143.64, 138.41, 135.82, 112.42, 111.41, 106.68, 104.38, 91.03, 59.88, 56.02, 55.67, 30.35, 10.03.

Compound 5j: IR (KBr) ν = 3430, 3202, 3026, 1685, 1646, 1624, 1453, 1394, 1263; ^1H NMR (DMSO- d_6 , 400 MHz): δ 12.96 (br, 1H), 10.19 (s, 2H), 6.50 (d, 2H, $J=8.0$ Hz), 6.46 (d, 2H, $J=8.0$ Hz), 5.35 (s, 1H), 2.22 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.64, 156.98, 150.59, 144.07, 143.59, 128.63, 124.76, 117.39, 113.71, 112.29, 89.35, 30.32, 9.97.

Compound 5k: IR (KBr) ν = 3212, 3050, 1688, 1650, 1495, 1363, 1199; ^1H NMR (DMSO- d_6 , 400 MHz): δ 13.16 (br, 1H), 10.22 (s, 2H), 7.84-7.82 (m, 1H), 7.79-7.75 (m, 2H), 7.50 (s, 1H), 7.44-7.42 (m, 2H), 7.24 (d, 1H, $J=8.0$ Hz), 5.60 (s, 1H), 2.28 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 160.55, 150.55, 143.62, 140.12, 132.81, 131.45, 129.39, 127.50, 127.31, 127.19, 126.08, 125.77, 125.10, 124.29, 105.74, 81.06, 30.64, 10.05; MS (m/z): 346.1, 292.1, 351.1, 178.1, 152.0, 128.0, 109.0.

Compound 5l: IR (KBr) ν = 3021, 2954, 1694, 1610, 1479, 1391, 1303; ^1H NMR (DMSO- d_6 , 400 MHz): δ 12.29 (br, 1H), 11.14 (s, 2H), 7.34-7.27 (m, 4H), 5.37 (s, 1H), 2.19 (s, 3H), 2.16 (s, 3H); ^{13}C NMR (DMSO- d_6 , 100 MHz): δ 167.76, 153.64, 151.65, 150.63, 143.12, 135.47, 131.86, 130.18, 128.04, 125.44, 89.19, 19.37, 16.91, 10.28.







































