

Supporting Information

Pd @ Aluminum Foil: A Highly Efficient and Environment-Friendly “Tea Bag” Style Catalyst with High TON

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General Remarks. ^1H NMR and ^{13}C NMR were recorded for solutions in CDCl_3 with TMS as the internal standard. X ray fluorescence spectra (Thermo Scientific) were used to analysis the element existing on the Al foil surface. The morphologies and microstructures of the samples were observed using a Hitachi S-4800 field emission scanning electron microscope (FE-SEM). Melting points are uncorrected. All reactions were monitored by TLC with silica gel coated plates. The chemical reagents were all analytical pure and were pechased from reagent company. The Al foil was merchant available (Al > 99.9%) .The products were purified by column chromatogram. The reactions were performed under nitrogen atmosphere.

Prepation of the catalyst Pd@Al foil. Under nitrogen atmosphere, 5 pieces of Al foil (1 cm×1 cm, area) was stirred in a solution of $\text{Pd}(\text{OAc})_2$ (5.3 mg) in xylene (15 mL) at 100 °C for 3 h. Then, these materials was rinsed by deionized water and alcohol. Each of the pieces could be used as catalyst in Suzuki cross coupling reactions as mentioned in the article.

Typical procedure for the Suzuki-Miyaura cross-coupling catalysed by the Pd@Al foil. Phenylboronic acid (117 mg, 0.75 mmol), K_2CO_3 (138 mg, 1.0 mmol) and a piece of Pd @ Al foil was added into a Schlenk tube. Under nitrogen atmosphere, a solution of iodobenzene (0.5 mmol) in alcohol (3 mL) was injected by syringe. The mixture was heat at 60 °C without stirring. The reaction was monitored by TLC (eluent: petroleum ether). When the reaction terminated, 5 mL of water was added and the liquid was extracted by ether (5 mL ×3). The combined organic layer was then washed by saturated NaCl solution (5 mL ×2) and dried by a little anhydrous MgSO_4 . Evaporation of the solvent provided almost the pure (examined by ^1H NMR) product biphenyl. The product could also be further purified by column chromatogram (eluent: petroleum ether).

Compound 3a: White solid, m.p. 68-69 ° C. IR (KBr): 3045, 2980, 2870, 1945, 1876, 1696, 1647, 1480, 1429, 1370, 1347, 1307, 1171, 1142, 1112, 1089, 1075, 1027, 1000, 903, 729, 697 cm^{-1} . ^1H NMR (600 MHz, CDCl_3 , TMS): δ 7.33–7.34 (m, 2H), 7.41–7.44 (m, 4H), 7.58–7.59 (m, 4H) ppm. Known product.^{13(in article)}

Compound 3b: White solid, 45-46 °C. IR (KBr): 3057, 3029, 2922, 2864, 1904, 1799, 1659, 1602, 1486, 1445, 1404, 1383, 1331, 1211, 1112, 1076, 1039, 1008, 909, 823, 757, 735, 697, 558 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.22–7.57 (m, 9H), 2.38 (s, 3H) ppm. Known product.¹³

Compound 3c: White solid, 56-57 °C. IR (KBr): 1698, 1601, 1440, 1330, 1304, 1181, 738, 688 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 9.89 (s, 1H), 7.42–8.17 (m, 9H) ppm. Known product.¹³

Compound 3d: Oil. IR (film): 3061, 3031, 2975, 2923, 1946, 1602, 1482, 1456, 1386, 1168, 1102, 1077, 1028, 967, 911, 858, 793, 752, 698, 617, 576, 528, 444 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.15–7.57 (m, 9H), 2.39 (s, 3H) ppm. Known product.¹³

Compound 3e: White solid, 85-86 °C. IR (film): 3033, 3002, 2962, 2937, 2836, 1606, 1582, 1522, 1486, 1464, 1407, 1316, 1288, 1271, 1251, 1201, 1184, 1118, 1036, 1036, 1014, 834, 805, 760, 715, 687, 571, 489 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 6.85–7.43 (m, 9H), 3.71 (s, 3H) ppm. Known product.¹³

Compound 3f: White solid, 71-72 °C. IR (film): 2976, 2928, 2882, 1604, 1585, 1519, 1486, 1449, 1393, 1284, 1270, 1244, 1202, 1175, 1118, 1050, 913, 836, 805, 761, 745, 715, 691, 550, 491 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 6.96–7.55 (m, 9H), 4.07 (t, *J* = 6.6 Hz, 2H), 1.44 (t, *J* = 6.6 Hz, 3H) ppm. Known product.¹³

Compound 3g: White solid, 162-163 °C. IR (film): 3452, 1638, 1600, 1463, 1427, 1226, 1120, 1029, 913, 744, 698, 590 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.41–7.62 (m, 9H), 5.45 (s, 3H) ppm. Known product.¹³

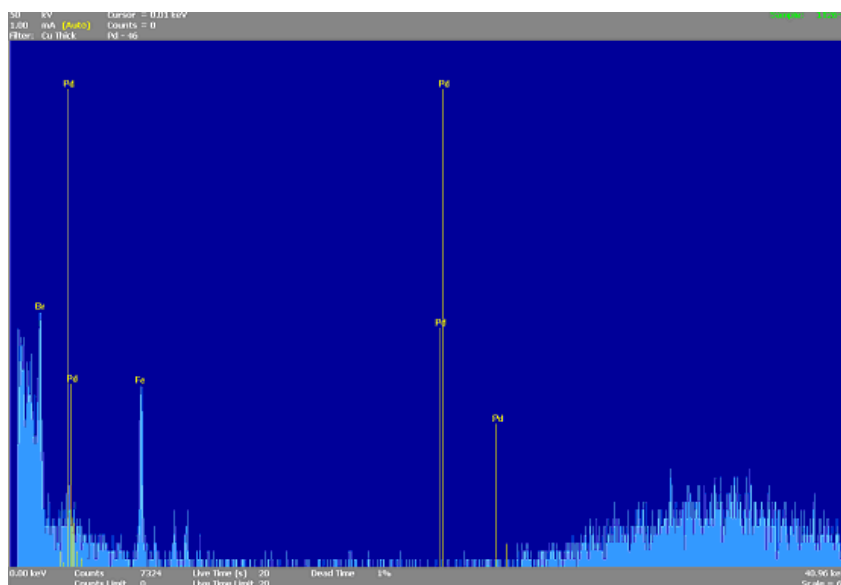
Compound 3h: White solid, 88-89 °C. IR (film): 3031, 3001, 2938, 2834, 1599, 1573, 1479, 1420, 1297, 1217, 1178, 1076, 1054, 1038, 1020, 913, 862, 789, 757, 698, 613, 566, 517 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 6.95–7.66 (m, 9H), 3.91 (s, 3H) ppm. Known product.¹³

Compound 3i: White solid, 86-87 °C. IR (film): 3060, 2926, 1593, 1564, 1474, 1415, 1354, 1304, 1081, 1045, 1000, 881, 792, 753, 719, 696, 613, 582, 497, 447, 422 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.24–7.31 (m, 3H), 7.36–7.39 (m, 3H), 7.48–7.50 (m, 3H), ppm. Known product.¹³

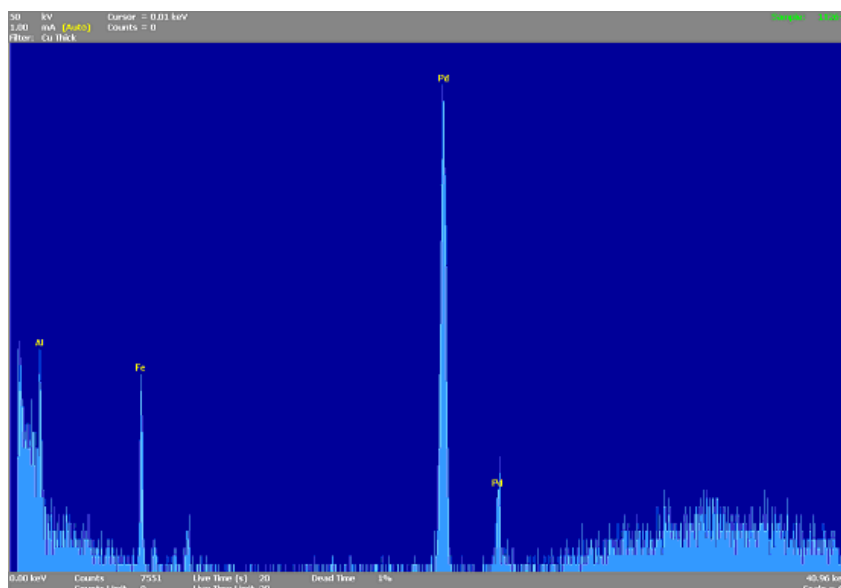
Compound 3j: White solid, 114-115 °C. IR (film): 2978, 2868, 1636, 1527, 1501, 1349, 1262, 1119, 914, 874, 806, 747, 730, 694 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.28–8.48 (m, 9H) ppm. Known product.¹³

Compound 5: Oil, IR (film): 3057, 2924, 1578, 1476, 1440, 1348, 1265, 1158, 1071, 1022, 999, 913, 865, 796, 738, 691 cm⁻¹. ¹H NMR (600 MHz, CDCl₃, TMS): δ 7.23–7.54 (m, 15H), 6.58 (s, 1H) ppm. ¹³C NMR (150 MHz, CDCl₃): δ 104.4, 122.7, 128.0, 128.2, 128.3, 128.4, 128.5, 128.7, 129.2(d), 129.5(d), 132.8, 134.3 ppm. MS (EI, 70 eV): *m/z* (%) 337 (19) [M+1], 336 (8) [M], 259 (43), 102 (100); *Anal. Calcd for* C₂₀H₁₆Se: C, 71.64; H, 4.81. Found: C, 71.92; H, 5.02.

X ray fluorescence spectra analysis of Al foil before treatment (no palladium observed on the surface)



X ray fluorescence spectra analysis of Al foil after treatment (palladium observed on the surface)



¹H NMR spectrums

