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Supplementary Material

Palladium supported on natural nanozeolite clinoptilolite as a catalyst for ligand-free C-C and C-O cross coupling reactions in aqueous medium

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N_2 adsorption/desorption isotherms and BJH pore size distribution curves

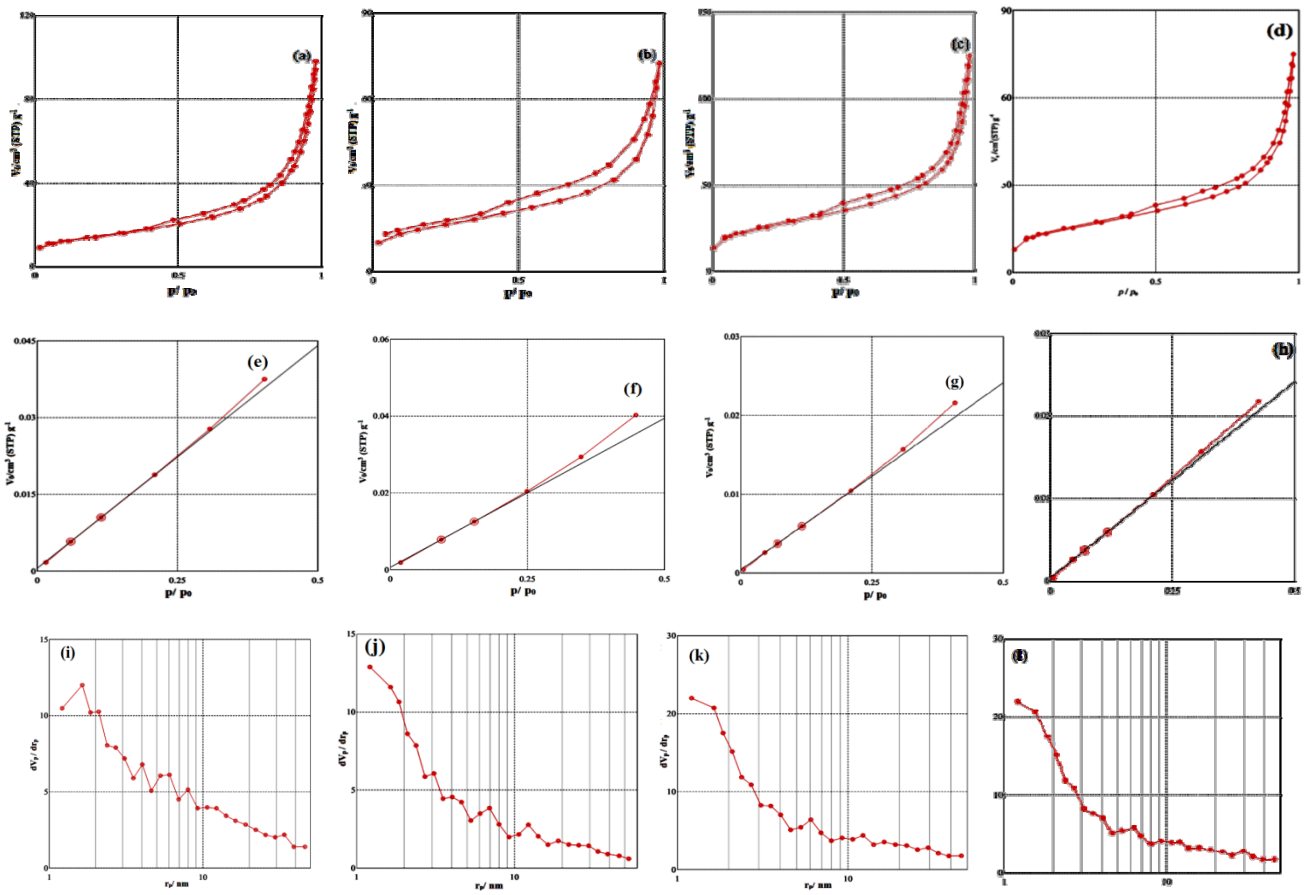


Fig S1. N_2 adsorption/desorption isotherms of (a) Nano CP, (b) AT-Nano CP, (c) AT-Nano CP-Pd^0 and (d) AT-Nano CP-Pd^0 recovered after 8rd cycles.

BET pore size distribution curves of (e) Nano CP, (f) AT-Nano CP, (g) AT-Nano CP-Pd^0 and (h) AT-Nano CP-Pd^0 recovered after 8rd cycles.

BJH pore size distribution curves of (i) Nano CP, (j) AT-Nano CP, (k) AT-Nano CP-Pd^0 and (l) AT-Nano CP-Pd^0 recovered after 8rd cycles.

2-Diphenylethyne (3a): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.43-7.47 (m, 2H), 7.48-7.50 (m, 1H), 7.61-7.63 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 82.3, 120.8, 129.4, 130.5, 132.9.

1-Methyl-4-(phenylethynyl)benzene (3b): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 2.35 (s, 3H), 7.19-7.23 (d, J = 7.8 Hz, 2H), 7.36-7.42 (m, 3H), 7.47-7.51 (m, 2H), 7.55-7.59 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 22.3, 88.9, 89.2, 120.2, 123.5, 128.2, 128.6, 129.4, 131.2, 132.1, 137.9.

1-Methoxy-4-(phenylethynyl)benzene (3c): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 3.92 (s, 3H), 6.92-6.98 (m, 3H), 7.35-7.42 (m, 2H), 7.49-7.56 (m, 4H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 54.5, 87.6, 88.9, 115.2, 115.9, 123.7, 128.2, 129.1, 131.6, 133.4, 158.7

1-Nitro-4-(phenylethynyl)benzene (3d): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.28-7.37 (m, 3H), 7.48-7.59 (m, 2H), 7.63 (d, J = 8.5 Hz, 2H), 8.24 (d, J = 8.5 Hz, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 89.2, 95.3, 121.8, 123.4, 128.1, 128.9, 130.2, 132.1, 132.5, 145.4.

1-Methyl-2-(phenylethynyl)benzene (3e): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.24-7.59 (m, 9H), 2.59 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 88.4, 89.2, 120.2, 123.6, 128.1, 128.4, 129.3, 131.2, 131.6, 137.8.

Trimethyl(phenylethynyl)silane (3f): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 0.28 (s, 9H), 7.15-7.21 (m, 3H), 7.44-7.39 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): 0, 93.8, 104.7, 123.3, 128.1, 128.6, 132.2.

2-(p-Tolylethynyl)pyridine (3g): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 2.36 (s, 3H), 7.15 (d, *J* = 7.8 Hz, 1H), 7.21-7.28 (m, 2H), 7.42-7.55 (m, 3H), 7.68 (m, 1H), 7.68 (d, *J* = 4.7 Hz, 1H); ^{13}C-NMR (100 MHz, $CDCl_3$): 21.5, 88.7, 89.5, 119.2, 122.6, 127.1, 129.1, 131.9, 136.4, 139.2, 143.4, 149.5.

2-(Trimethylsilylethynyl)aniline (3h): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 0.27 (s, 9H), 4.42 (br., 2H), 6.55-6.72 (m, 2H), 7.12 (t, J = 7.8 Hz, 1H), 7.32 (d, J = 7.3 Hz, 1H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 0.1, 53.6, 98.7, 104.9, 107.6, 115.2, 118.3, 129.7, 132.1, 148.5.

4-((Trimethylsilyl)ethynyl)benzaldehyde (3i): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 0.27 (s, 9H), 7.62 (d, J = 8.4 Hz, 2H), 7.85 (d, J = 8.4 Hz, 2H), 10.12 (s, 1H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 0, 53.5, 98.4, 128.5, 129.6, 132.9, 136.7, 192.3.

Oxydibenzene (5a): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.08-7.12 (m, 5H), 7.34-7.39 (m, 5H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 117.5, 120.8, 129.2, 155.6.

1-Methyl-4-phenoxybenzene (5b): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 2.25 (m, 3H), 6.78-6.83 (m, 2H), 6.88-6.91 (m, 2H), 6.94-7.02 (m, 3H), 7.19-7.24 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 21.2, 118.2, 119.4, 123.1, 131.2, 133.4, 155.4, 159.2.

1-Methyl-4-(4-nitrophenoxy)benzene (5c): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 2.40 (s, 3H), 6.98-7.04 (m, 4H), 7.25-7.29 (m, 2H), 8.20-8.22 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 21.2, 117.5, 121.2, 126.7, 131.6, 135.4, 142.7, 153.4, 163.9.

1-Tert-butyl-4-(4-nitrophenoxy)benzene (5d): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 1.45 (s, 9H), 7.04-7.06 (m, 2H), 7.07-7.09 (m, 2H), 7.45-7.49 (m, 2H), 8.25-8.29 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 32.4, 117.1, 120.1, 125.7, 127.2, 142.5, 148.7, 153.2, 163.8.

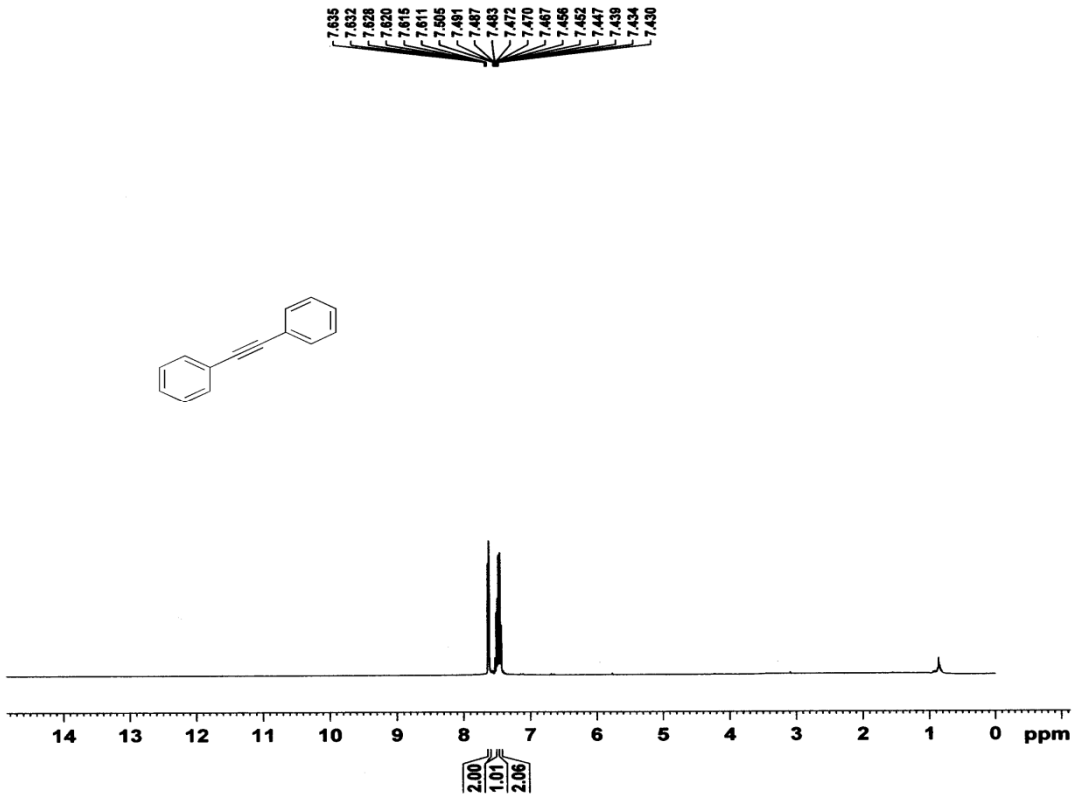
1-Methoxy-4-phenoxybenzene (5e): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 3.84 (s, 3H), 6.85-6.89 (d, J = 8.2 Hz, 2H), 7.23-7.46 (m, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 54.5, 113.7, 115.2, 122.4, 125.9, 127.8, 128.3, 129.1, 131.4, 132.9, 136.7.

1-Nitro-4-phenoxybenzene (5f): ^{1}H-NMR (400 MHz, DMSO-d_6): δ 7.01-7.04 (m, 2H), 7.10-7.13 (m, 2H), 7.26-7.30 (m, 1H), 7.44-7.48 (m, 2H), 8.19-8.22 (m, 2H); ^{13}C-NMR (100 MHz, DMSO-d_6): δ 117.1, 120.5, 125.4, 125.9, 130.3, 142.6, 154.7, 163.4.

1-Bromo-4-(4-nitrophenoxy)benzene (5g): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 6.97-7.06 (m, 4H), 7.53-7.55 (m, 2H), 8.21-8.22 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 116.9, 118.1, 123.2, 125.8, 133.8, 142.4, 155.1, 163.2.

4,4'-Oxybis(nitrobenzene) (5h): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 7.15-7.23 (m, 2H), 8.28-8.35 (m, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 119.34, 126.4, 145.2, 162.7.

2-Phenoxynaphthalene (5i): ^{1}H-NMR (400 MHz, $CDCl_3$): δ 6.69-7.42 (m, 6H), 7.44-8.16 (m, 6H); ^{13}C-NMR (100 MHz, $CDCl_3$): δ 112.6, 117.9, 123.1, 123.8, 124.2, 125.4, 126.7, 127.8, 130.1, 135.2, 152.8, 156.7.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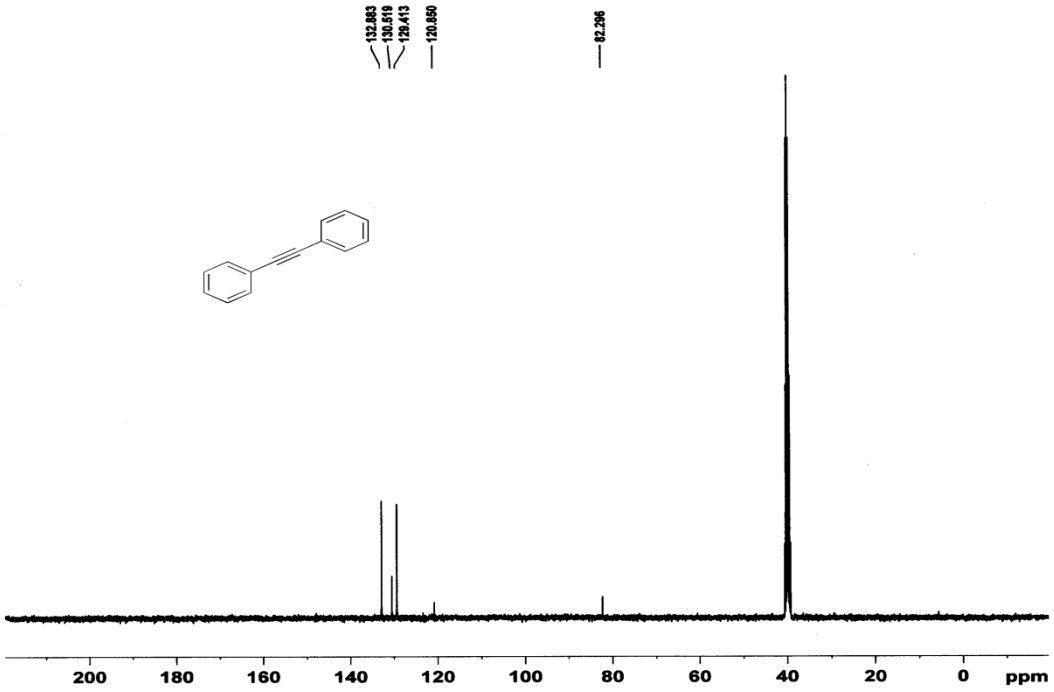
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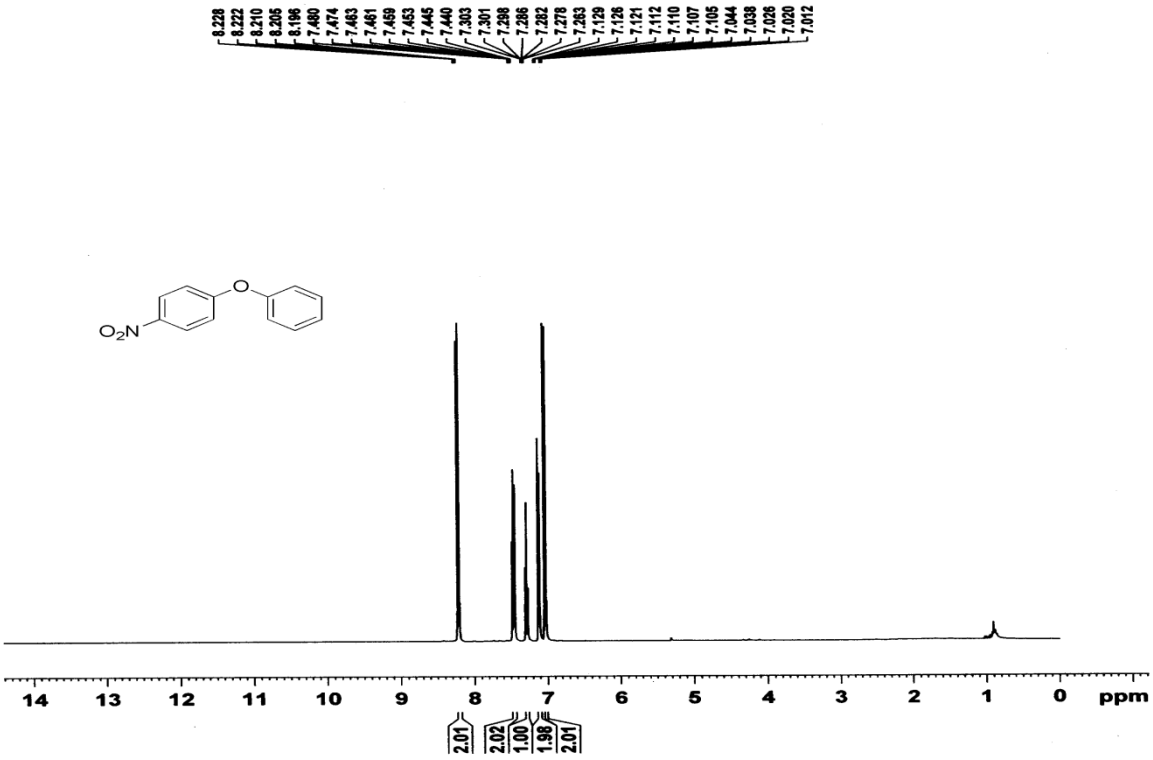
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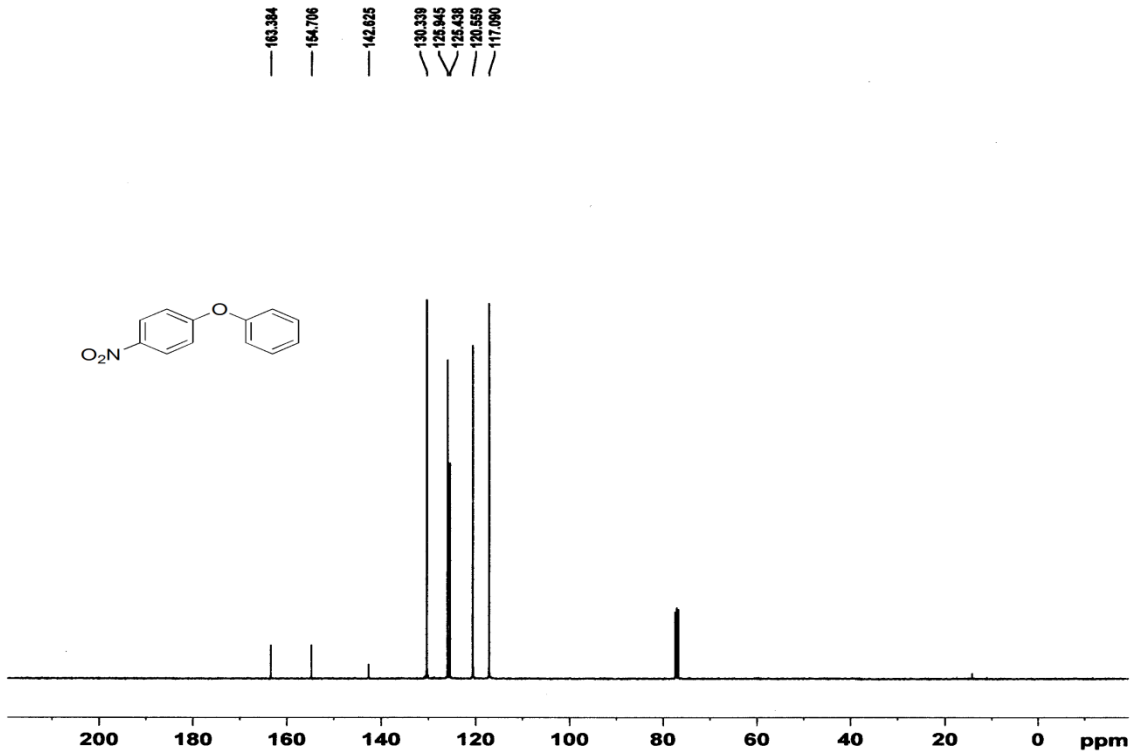
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