Supporting Information

Chitosan-Proline supported palladium (II) a green nanocatalyst for Suzuki cross-coupling reaction in water

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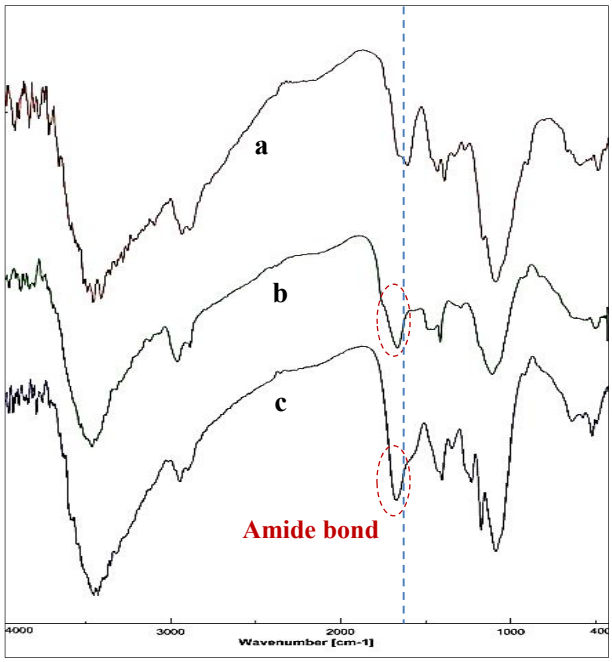

Fig. 1FT-IR Spectra. a) Chitosan, b) Chitosan modified by proline, c) CS-proline-Pd (II) complex

^{1}H-NMR, ^{13}C-NMR, FT-IR and boiling points of some biaryl derivatives

Data section

4-nitro-1,1'-biphenyl

White solid, melting point: 88°C

^{1}H-NMR (4 00MHz, $CDCl_3$, ppm, TMS): δ = 8.3 (d, *J*= 8.7Hz, 2H), 7.7 (d, *J*= 8.7 Hz, 2H), 7.65 (dd, *J*= 1.8, 5.4Hz, 2H), 7.55-7.40 (m, 3H).

^{13}C-NMR (100MHz, $CDCl_3$, ppm): δ = 147.63, 147.09, 138.75, 129.01, 128.92, 127.81, 127.40, 124.23.

FT-IR (KBr, cm^{-1}): ν = 3367, 3242, 1596, 1513, 1345, 853, 739, 699.

9-phenylphenanthrene

White solid, melting point: 60-62°C

^{1}H-NMR (400MHz, ppm, $CDCl_3$, TMS) δ =8.80(d, *J*=8.0 Hz, 1H), 8.74 (d, *J*= 8.4 Hz, 1H), 7.92 (t, *J*= 8.8Hz, 2H), 7.4-7.7 (m, 10H).

^{13}C-NMR (100MHz, $CDCl_3$, ppm): δ = 140.82, 138.76, 131.54, 131.06, 130.66, 130.02, 129.91, 128.67, 128.30, 127.55, 127.32, 126.93, 126.80, 126.62, 126.49, 126.38, 122.92, 122.51.

FT-IR (KBr, cm^{-1}): ν = 3150, 3056, 3021, 1593, 1491, 1450, 893, 746, 700, 588**.**

4-methoxy-1,1'-biphenyl

White solid, melting point: 116-118°C

^{1}H-NMR (400MHz, ppm, $CDCl_3$): δ = 7.44-7.48(t, 2H, *J*= 8.8Hz), 7.31-7.35 (t, 4H, *J*= 8Hz), 7.20-7.24 (t, 1H, *J*= 7.2Hz), 6.89-6.91 (d, 2H, *J*= 8.8 H), 3.77(s, 3H).

^{13}C-NMR (100MHz, $CDCl_3$, ppm): δ = 141.11, 138.32, 137.08, 129.48, 128.71, 127.10, 126.88, 21.15.

4-Acetylbiphenyl

White solid, melting point: 119-121°C

^{1}H-NMR (400MHz, $CDCl_3$, ppm, TMS): δ = 7.95-7.97 (d, *J*=8.4Hz, 2H), 7.60-7.62 (dd, *J*= 8.1, 1.5 Hz, 2H), 7.54-7.56 (d, *J*= 8.8 Hz, 2H), 7.38-7.41 (t, *J*= 6 Hz, 2H), 7.32-7.34 (m, 1H), 2.56 (s, 3H).

^{13}C-NMR (100MHz, $CDCl_3$, ppm): δ = 198.14, 146.21, 140.31, 136.31, 129.38, 129.34, 128.66, 127.70, 127.65, 27.08.

FT-IR (KBr, cm^{-1}): ν = 2920, 1726, 1670, 1402, 1268 ,1120, 764, 690, 593.

Figure section

2-chloro-1,1'-biphenyl

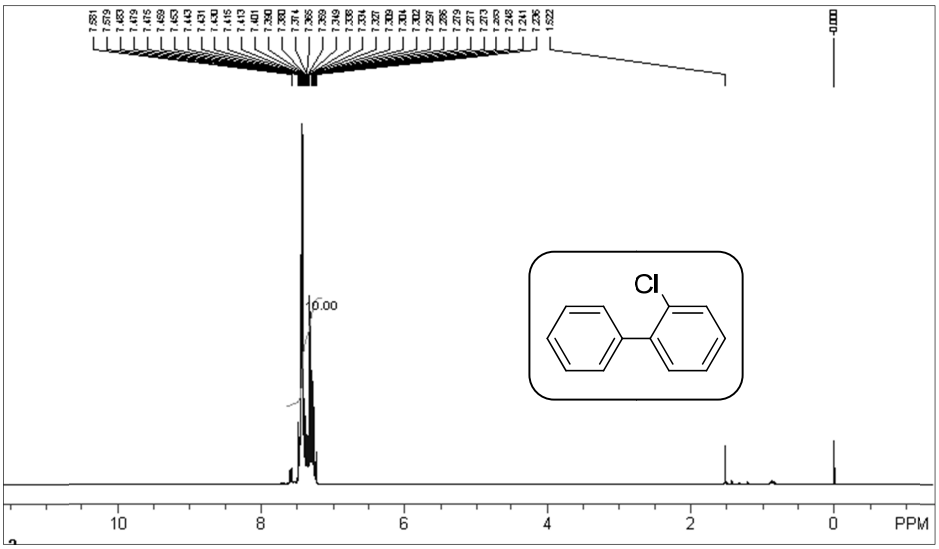

Fig. 2 ^{1}H-NMR (400MHz, $CDCl_3$) spectrum of 2-chloro-1,1'-biphenyl

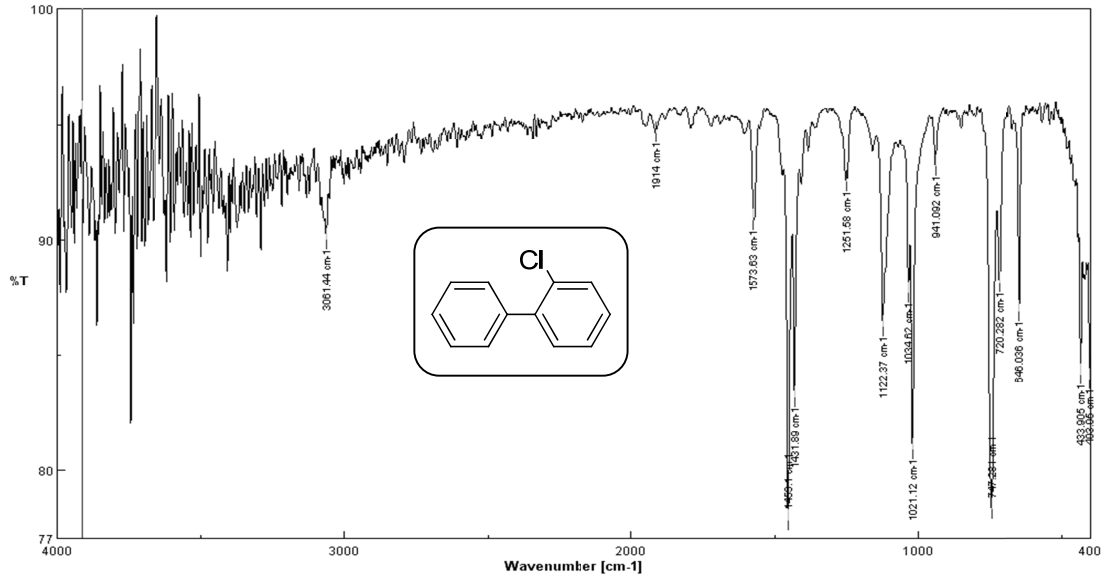

Fig. 3 FT-IR spectrum of 2-chloro-1,1'-biphenyl

4-chloro-1,1'-biphenyl

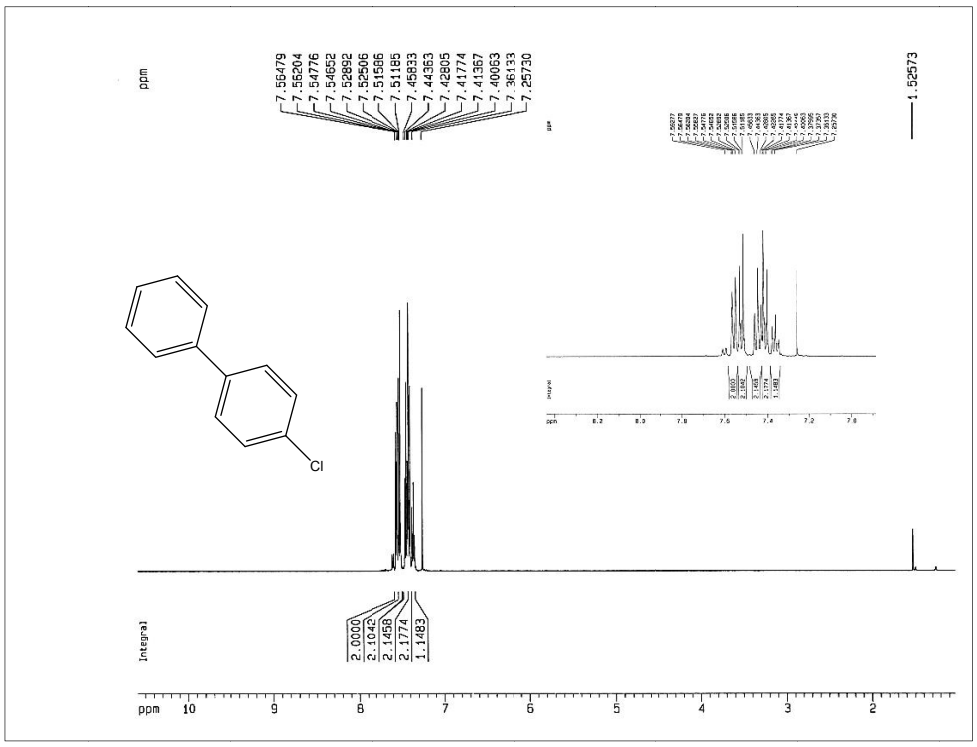

Fig. 4 ^{1}H-NMR (400MHz, $CDCl_3$) spectrum of 4-chloro-1,1'-biphenyl

1,1'-biphenyl

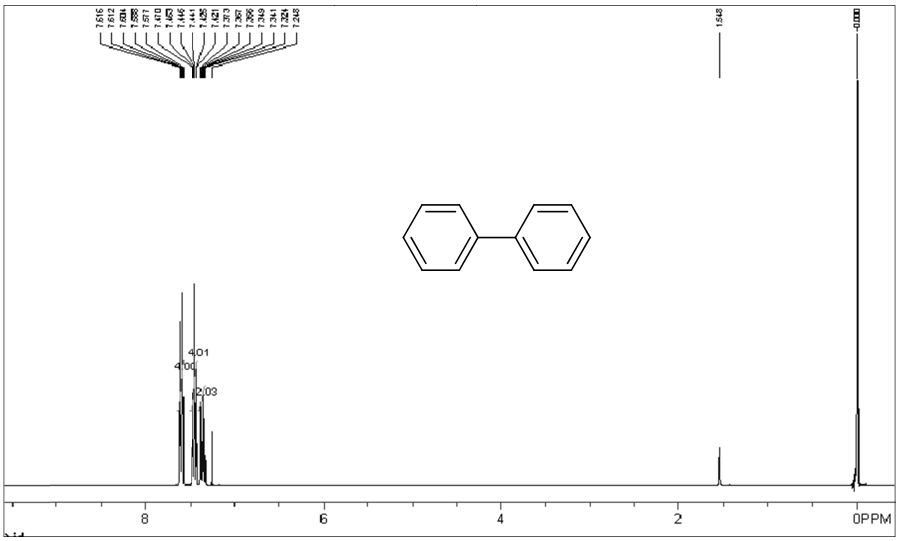

Fig. 5 ^{1}H-NMR (400MHz, $CDCl_3$) spectrum of 1,1'-biphenyl

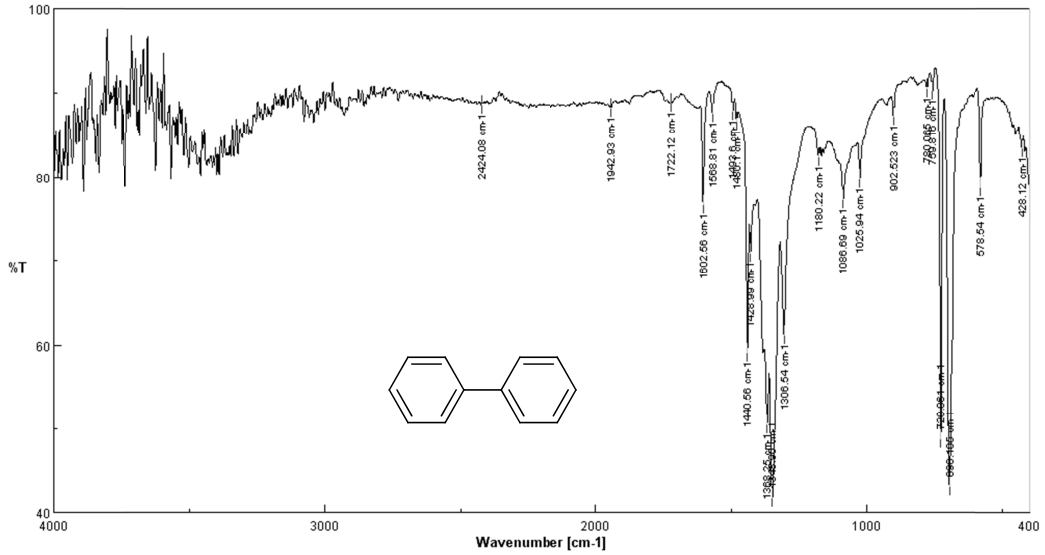

Fig. 6 FT-IR spectrum of 1,1'-biphenyl

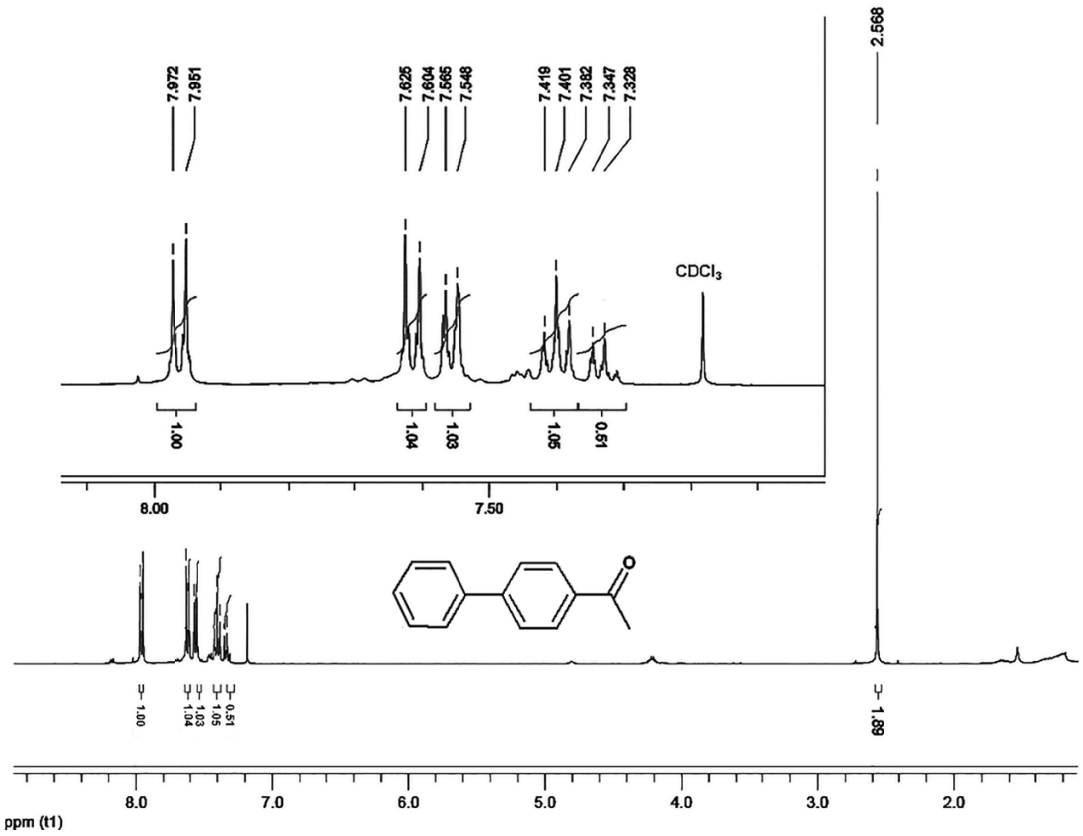

Fig. 7 ^{1}H-NMR (400MHz, $CDCl_3$) spectrum of 4-acetylbiphenyl

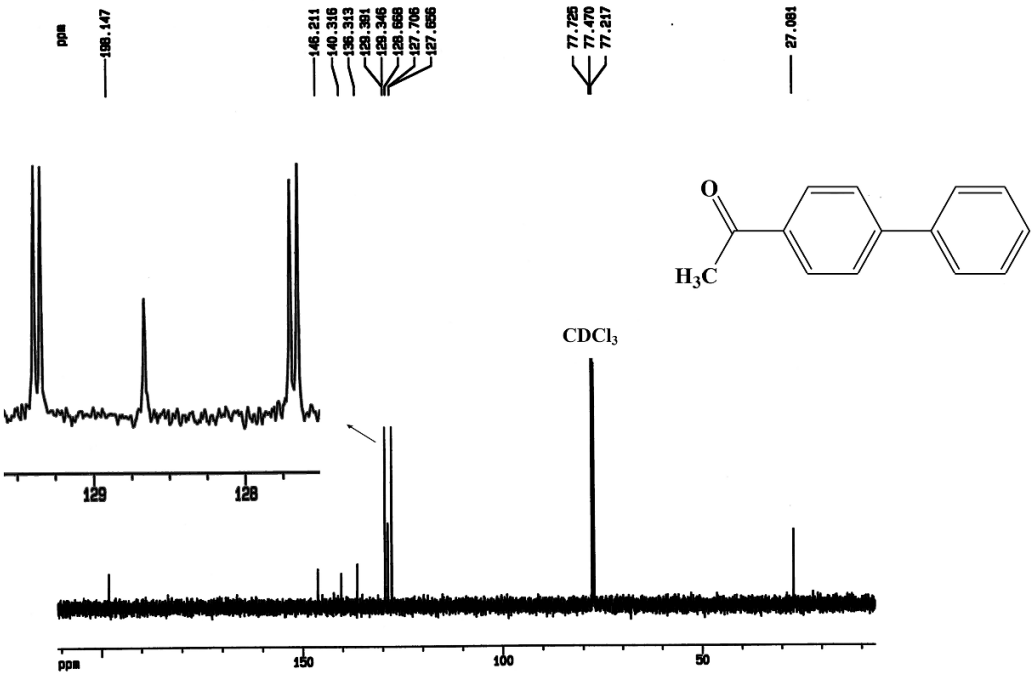

Fig. 8 ^{13}C-NMR (125 MHz, $CDCl_3$) spectrum of 4-acetylbiphenyl

GC-MS analysis

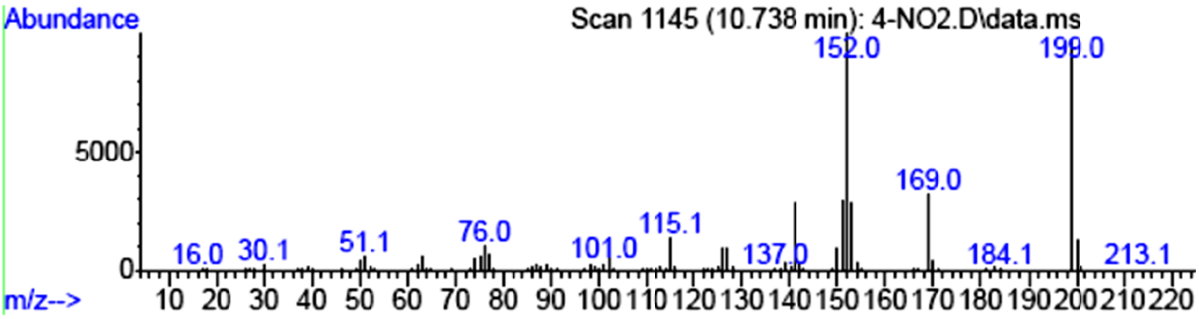

Fig. 9 GC-MS spectrum of 4-nitro-1,1'-biphenyl