

SUPPORTING INFORMATION

Efficient Ligand-Free Hiyama Cross-Coupling Reaction Catalyzed by Functionalized SBA-15-Supported Pd Nanoparticles

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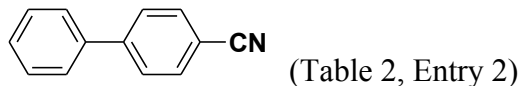
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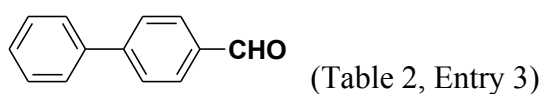
4-Phenylacetophenone^[1]

¹H NMR (CDCl₃, 300 MHz) δ 2.62 (s, 3H), 7.39 – 7.48 (m, 3H), 7.61 (d, *J* = 8.1 Hz, 2H), 7.68 (d, *J* = 8.1 Hz, 2H), 8.02 (d, *J* = 8.1 Hz, 2H).



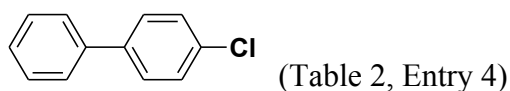
4-Cyanobiphenyl^[2]

¹H NMR (CDCl₃, 300 MHz) δ 7.39 – 7.50 (m, 3H), 7.56 – 7.59 (m, 2H), 7.64 – 7.72 (m, 4H). ¹³C NMR (CDCl₃, 75 MHz) δ 110.8, 118.9, 127.1, 127.6, 128.6, 129.0, 132.5, 139.0, 145.5.



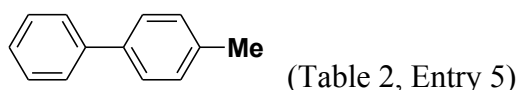
4-Phenylbenzaldehyde^[3]

¹H NMR (CDCl₃, 300 MHz) δ 7.37 – 7.50 (m, 3H), 7.61 – 7.64 (m, 2H), 7.94(d, *J* = 8.1 Hz, 2H), 7.94(d, *J* = 8.1 Hz, 2H), 10.0 (s, 1H).



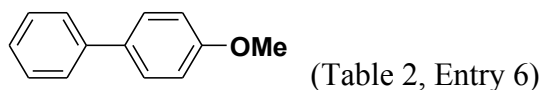
4-Chlorobiphenyl^[1]

¹H NMR (CDCl₃, 300 MHz) δ 7.38 – 7.51 (m, 5H), 7.54 – 7.61 (m, 4H). ¹³C NMR (CDCl₃, 75 MHz) δ 126.9, 127.5, 128.3, 128.4, 133.3, 139.6, 139.9.



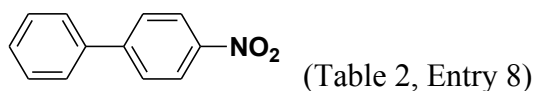
4-Methylbiphenyl^[2]

¹H NMR (CDCl₃, 300 MHz) δ 2.45 (s, 3H), 7.29 – 7.31 (m, 2H), 7.35 – 7.40 (m, 1H), 7.45 – 7.50 (m, 2H), 7.54 – 7.56 (m, 2H), 7.62 – 7.65 (m, 2H).



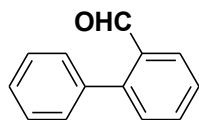
4-Methoxybiphenyl^[1]

¹H NMR (CDCl₃, 300 MHz) δ 3.87 (s, 3H), 7.02 (d, *J* = 8.7 Hz, 2H), 7.32 – 7.37 (m, 1H), 7.43 – 7.48 (m, 2H), 7.56 – 7.61 (m, 4H).



4-Nitrobiphenyl^[4]

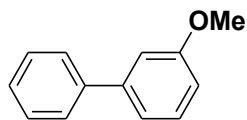
¹H NMR (CDCl₃, 300 MHz) δ 7.43 – 7.52 (m, 3H), 7.61 (d, *J* = 8.1 Hz, 2H), 7.72 (d, *J* = 8.7 Hz, 2H), 8.28 (d, *J* = 8.7 Hz, 2H).



(Table 2, Entry 9)

2-Phenylbenzaldehyde ^[1]

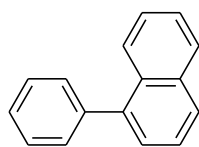
¹H NMR (CDCl₃, 300 MHz) δ 7.35 – 7.45 (m, 2H), 7.45 – 7.66 (m, 6H), 8.01 (d, J = 7.5 Hz, 1H), 9.97 (s, 1H).



(Table 2, Entry 10)

3-Methoxybiphenyl ^[4]

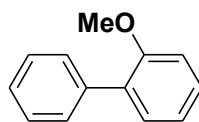
¹H NMR (CDCl₃, 300 MHz) δ 3.82 (s, 3H), 6.87 (d, J = 8.1 Hz, 1H), 7.12 – 7.18 (m, 2H), 7.30 – 7.36 (m, 2H), 7.41 (t, J = 7.8 Hz, 2H), 7.57 (d, J = 7.5 Hz, 2H).



(Table 2, Entry 11)

1-Phenylnaphthalene ^[2]

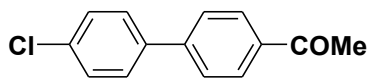
¹H NMR (CDCl₃, 300 MHz) δ 7.49 – 7.63 (m, 9H), 7.92 – 8.03 (m, 3H). ¹³C NMR (CDCl₃, 75 MHz) δ 125.3, 125.7, 126.0, 126.9, 127.2, 127.6, 128.2, 130.0, 131.6, 133.7, 140.2, 140.7.



(Table 2, Entry 12)

2-Methoxybiphenyl ^[1]

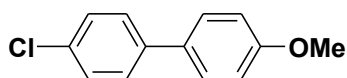
¹H NMR (CDCl₃, 300 MHz) δ 3.81 (s, 3H), 6.98 – 7.04 (m, 2H), 7.31 – 7.35 (m, 3H), 7.40 – 7.44 (m, 2H), 7.53 – 7.55 (m, 2H).



(Table 3, Entry 1)

4-Acetyl-4'-chlorobiphenyl ^[1]

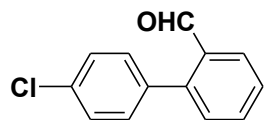
¹H NMR (CDCl₃, 300 MHz) δ 2.60 (s, 3H), 7.39 (d, J = 8.4 Hz, 2H), 7.51 (d, J = 8.4 Hz, 2H), 7.60 (d, J = 8.1 Hz, 2H), 7.99 (d, J = 8.1 Hz, 2H).



(Table 3, Entry 2)

4-Chloro-4'-methoxybiphenyl ^[2]

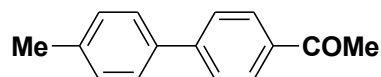
¹H NMR (CDCl₃, 300 MHz) δ 3.84 (s, 3H), 6.97 (d, J = 8.7 Hz, 2H), 7.37 (d, J = 8.7 Hz, 2H), 7.45 – 7.50 (m, 4H).



(Table 3, Entry 3)

4'-Chlorobiphenyl-2-carboxaldehyde ^[5]

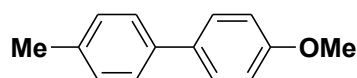
¹H NMR (CDCl₃, 300 MHz) δ 7.26 – 7.30 (m, 2H), 7.36 – 7.42 (m, 3H), 7.47 (t, J = 7.5 Hz, 1H), 7.61 (dt, J = 7.5 Hz, 1.5 Hz, 1H), 7.99 (dd, J = 7.8 Hz, 1.5 Hz, 1H), 9.93 (s, 1H).



(Table 3, Entry 4)

4-Acetyl-4'-methylbiphenyl ^[1]

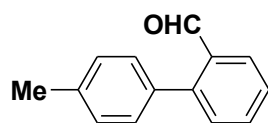
¹H NMR (CDCl₃, 300 MHz) δ 2.40 (s, 3H), 2.61 (s, 3H), 7.26 (d, J = 8.1 Hz, 2H), 7.52 (d, J = 8.1 Hz, 2H), 7.65 (d, J = 8.4 Hz, 2H), 8.00 (d, J = 8.4 Hz, 2H).



(Table 3, Entry 5)

4'-Methoxy-4-methylbiphenyl ^[1]

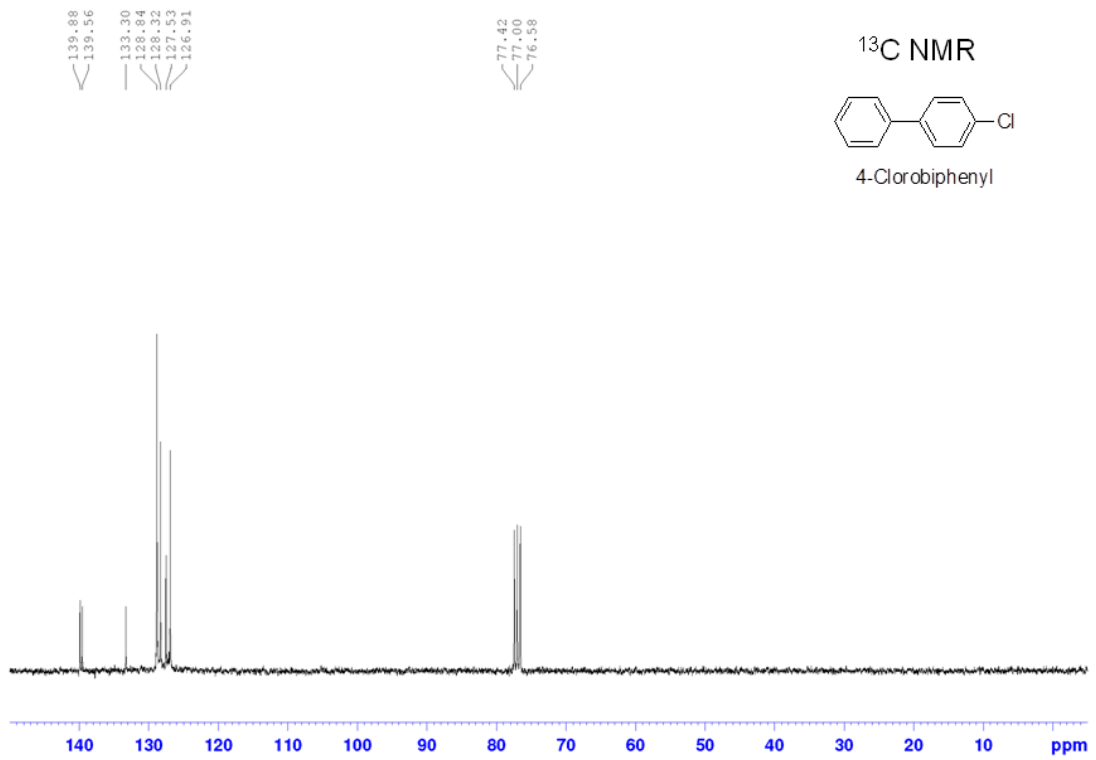
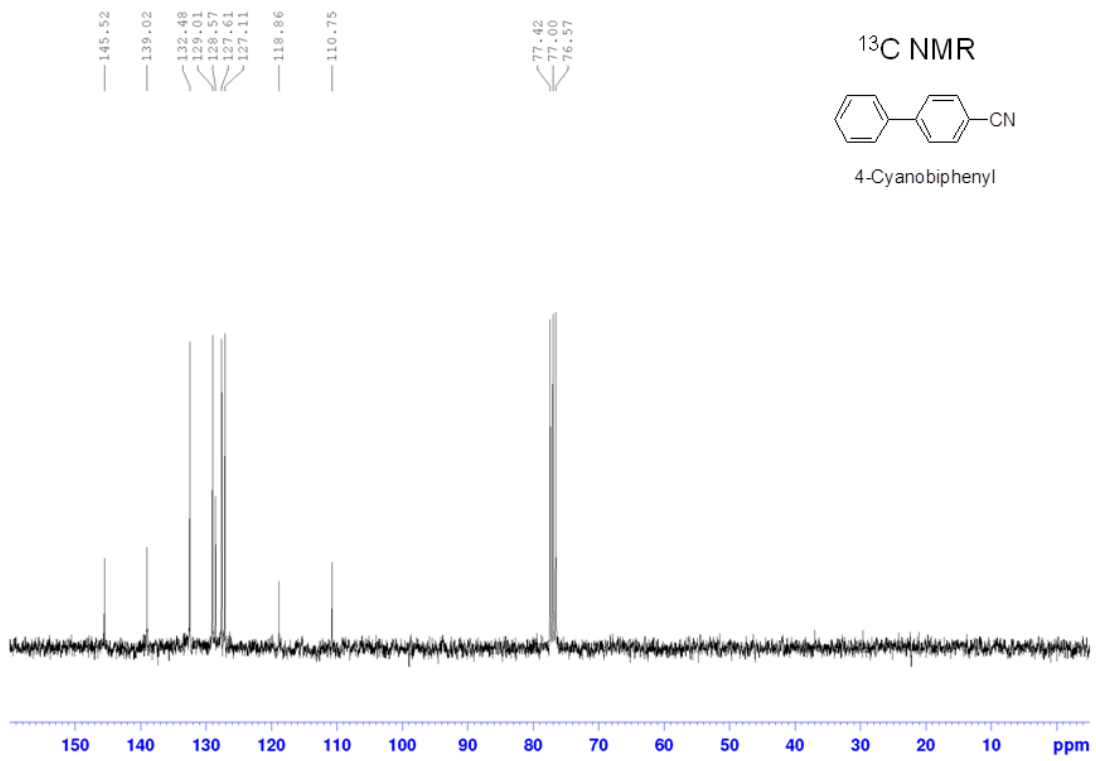
¹H NMR (CDCl₃, 300 MHz) δ 2.43 (s, 3H), 3.87 (s, 3H), 7.01 (d, J = 8.7 Hz, 2H), 7.27 (d, J = 8.1 Hz, 2H), 7.50 (d, J = 8.1 Hz, 2H), 7.56 (d, J = 8.4 Hz, 2H).

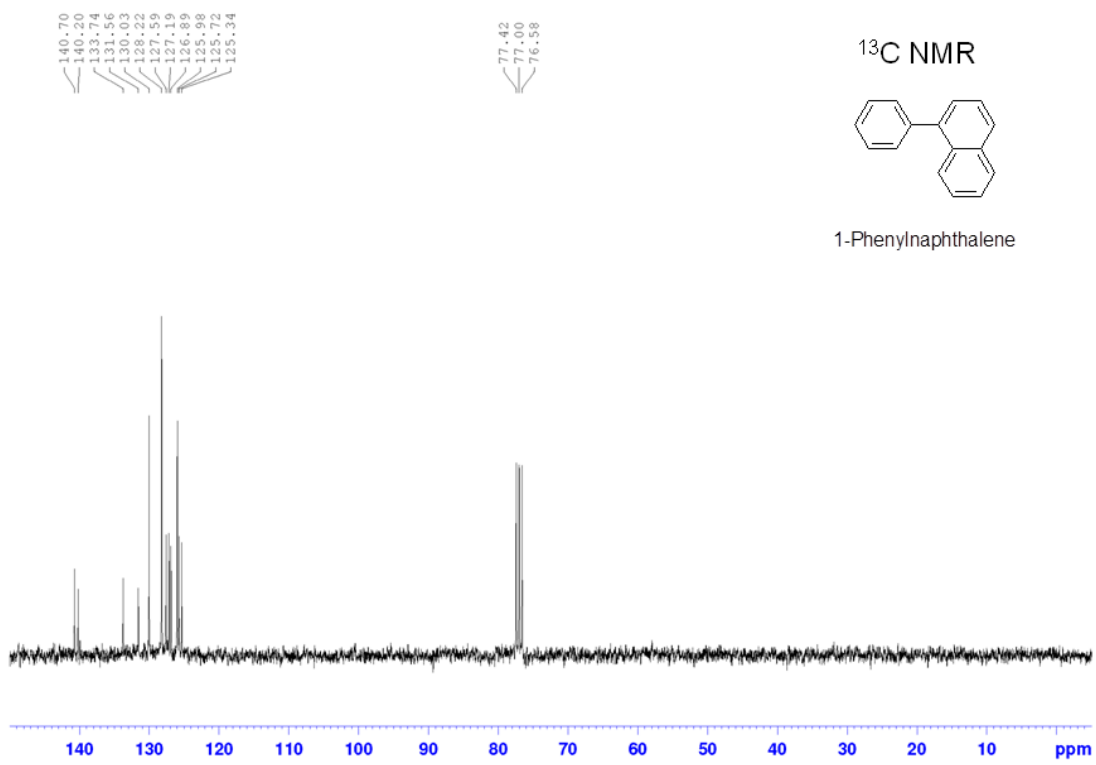


(Table 3, Entry 6)

4'-Methylbiphenyl-2-carboxaldehyde ^[6]

¹H NMR (CDCl₃, 300 MHz) δ 2.42 (s, 3H), 7.24 – 7.26 (m, 4H), 7.41 – 7.48 (m, 2H), 7.58 – 7.64 (m, 1H), 8.00 (d, J = 7.8 Hz, 1H), 9.98 (s, 1H).





References

- [1] S. N. Chen, W. Y. Wu, F. Y. Tsai, *Tetrahedron*, **2008**, *64*, 8164 – 8168.
- [2] W. Y. Wu, T. C. Lin, T. Takahashi, F. Y. Tsai, C. Y. Mou, *ChemCatChem.*, **2013**, 1011 – 1019
- [3] T. Yanase, Y. Monguchi, H. Sajiki, *RSC Adv.*, **2012**, *2*, 590 – 594.
- [4] L. Zhang, P. Li, H. Li, L. Wang, *Catal. Sci. Technol.*, **2012**, *2*, 1859 – 1864.
- [5] F. Ye, Y. Shi, L. Zhou, Q. Xiao, Y. Zhang, J. Wang, *Org. Lett.*, **2011**, *13*, 5020 – 5023.
- [6] D. Srimani, S. Sawoo, A. Sarkar, *Org. Lett.*, **2007**, *9*, 3639 – 3642.