Dual Pd and CuFe$_2$O$_4$ Nanoparticles Encapsulated in a Core/Shell Silica Microsphere for Selective Hydrogenation of Arylacetylenes


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Significance: A dual catalyst containing Pd and CuFe$_2$O$_4$ nanoparticles in a core/shell silica microsphere (SiO$_2$@CuFe$_2$O$_4$-Pd) for selective hydrogenation of arylacetylenes to styrenes was described. A sequential modification of SiO$_2$ with CuFe$_2$O$_4$ and Pd nanoparticles led to the formation of the dual catalyst SiO$_2$@CuFe$_2$O$_4$-Pd. The hydrogenation of arylacetylenes was performed in hexane under H$_2$ (1 atm) using SiO$_2$@CuFe$_2$O$_4$-Pd to give the corresponding styrenes in 98–99% conversion with 73–98% selectivity.

Comment: SiO$_2$@CuFe$_2$O$_4$-Pd was prepared on the basis of the authors’ previous work (Chem. Mater. 2008, 20, 6738). The SiO$_2$@CuFe$_2$O$_4$-Pd catalyst was recovered by using an external magnet and reused in the hydrogenation of phenylacetylene (1st use: 98% conversion, 98% selectivity; 2nd use: 99% conversion, 98% selectivity; 3rd use: 98% conversion, 97% selectivity). SiO$_2$@CuFe$_2$O$_4$-Pd was characterized by powder X-ray diffraction, TEM, EDX, HR-SEM, ICP, field-dependent magnetization, etc.