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Accelerating Chemo- and Regioselective Hydrogenation of Alkynes over Bimetallic Nanoparticles in a Metal-Organic Framework

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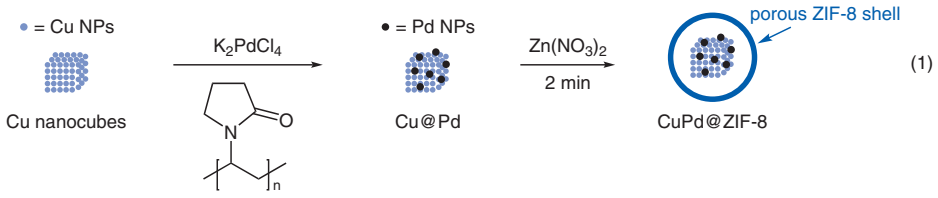
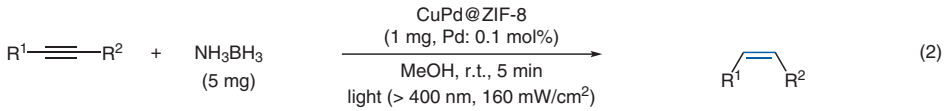
Hydrogenation of Alkynes to Alkenes on Pd NPs Supported on Cubic Cu in a Metal–Organic Framework

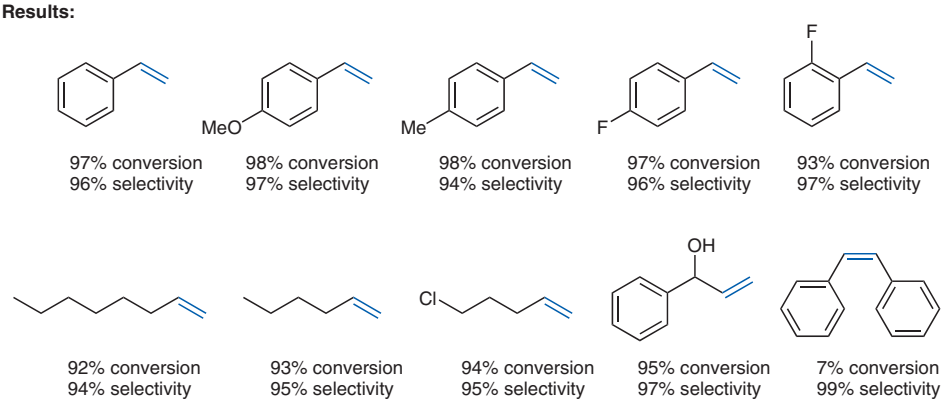


(1)



(2)

Results:



97% conversion, 96% selectivity
98% conversion, 97% selectivity
98% conversion, 94% selectivity
97% conversion, 96% selectivity
93% conversion, 97% selectivity
92% conversion, 94% selectivity
93% conversion, 95% selectivity
94% conversion, 95% selectivity
95% conversion, 97% selectivity
7% conversion, 99% selectivity

Significance: Pd nanoparticles supported on cubic Cu in a porous ZIF-8 [Zn(2-methylimidazole)$_2$] shell (CuPd@ZIF-8) was prepared according to Equation 1. CuPd@ZIF-8 catalyzed controlled hydrogenation of alkynes by using NH_3BH_3 as a hydrogen source in MeOH for five minutes under light irradiation to give the corresponding alkenes in ≤98% conversion with 99% selectivity (eq. 2).

Comment: The authors have previously reported the preparation of cubic Cu (*Angew. Chem. Int. Ed.* **2011**, *50*, 10560). CuPd@ZIF-8 was characterized by means of XRD, BET, SEM, TEM, HRTEM, HAADF-STEM, XPS, and ICP-AES analyses. The turnover frequency of the hydrogenation of phenylacetylene reached 6799 min^{-1}.

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Category

Polymer-Supported Synthesis

Key words

copper catalysis
palladium catalysis
photocatalysis
metal–organic framework
hydrogenation
alkynes