

Combination of carbon nanotube and cyclodextrin nanosponge chemistry to develop a heterogeneous Pd-based catalyst for ligand and copper free C-C coupling reactions

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Abstract

Carbon nanotubes and cyclodextrin nanosponge were hybridized and used as a support for embedding Pd(0) nanoparticles and developing a novel and heterogeneous catalyst, Pd@CDNS-CNT, for promoting ligand and copper-free Sonogashira and Heck coupling reactions in aqueous media and mild reaction condition. Cyclodextrin nanosponge could contribute to catalysis through encapsulating the reagents and transferring them in the vicinity of Pd nanoparticles. The results established that the catalytic activity of Pd@CDNS-CNT was superior to those of Pd@CNT, Pd@CDNS and Pd@CNT + CDNS, indicating the synergism between the components of the hybrid system. Notably, various aryl halides including aryl iodide, bromide and chloride were useful substrates for the coupling reactions and affording the corresponding products in high to excellent yields in short reaction times. Moreover, the catalyst was recyclable up to six reaction runs with negligible Pd leaching.

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