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Biocompatible starch-halloysite hybrid: An efficient support for immobilizing Pd species and developing a heterogeneous catalyst for ligand and copper free coupling reactions

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Abstract

Combining the exceptional features of halloysite and starch, a unique hybrid was synthesized based on conjugation of amine-functionalized starch with Cl-halloysite nanoclay followed by coordination of Pd (II) acetate. The resultant hybrid catalyst, Pd@Hal-SA, was used as a heterogeneous catalyst for promoting copper and ligand-free coupling reactions under mild reaction condition. The catalyst exhibited high catalytic activity and recyclability (up to 10 reaction runs) with slight loss of the catalytic activity that stemmed from slight Pd leaching. The comparison of the catalytic activity of Pd-Hal, Pd-SA and Pd@Hal-SA confirmed the superior performance of the latter, indicating the contribution of two components, SA and Hal to the catalysis. Moreover, the catalytic activity of Pd@Hal-SA was higher than that of Pd@Hal + SA, implying that the use of hybrid system was more efficient than use of individual components in a separated form, due to the synergism between SA and Hal.

Keywords: Halloysite nanotube, Starch, Pd nanoparticles, Heterogeneous catalyst