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Pd nanoparticles immobilized on halloysite decorated with a cyclodextrin modified melamine-based polymer: a promising heterogeneous catalyst for hydrogenation of nitroarenes

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Abstract

For the first time, a hybrid system composed of halloysite (Hal) and a cyclodextrin modified melamine-based polymer is developed and employed for immobilization of Pd(0) nanoparticles. The resulting catalytic hybrid system, Pd@HTMC, was then applied as a heterogeneous catalyst for hydrogenation of nitroarenes to the corresponding anilines. The results established that Pd@HTMC could promote hydrogenation under very mild reaction conditions and in a relatively short time. Moreover, investigation of a sterically demanding substrate, nitro-naphthalene, as well as a substrate with a competing functional group, 4-nitroacetophenone, confirmed that the catalyst is capable of hydrogenation of a sterically demanding substrate while selectively hydrogenating the nitro functional group over keto-functionality. The

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recyclability experiment proved that the catalyst was recyclable up to six reaction runs with a slight loss of the catalytic activity and Pd leaching. Moreover, a hot filtration test confirmed the heterogeneous nature of the catalyst. Finally, the contribution of the cyclodextrin modified melamine-based polymer to the catalysis was confirmed by comparison of the catalytic activity of Pd@HTMC with control catalysts.