Green bio-based synthesis of Fe₂O₃@SiO₂-IL/Ag hollow spheres and their catalytic utility for ultrasonic-assisted synthesis of propargylamines and benzo[b]furans

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Abstract

A novel magnetic hybrid system containing nano-magnetic Fe₂O₃ hollow spheres, silica shell, [pmim]Cl ionic liquid and silver nanoparticles was synthesized and characterized. The silver nanoparticles were prepared via biosynthesis using *Achillea millefolium* flower as reducing and stabilizing agent. The hybrid system was successfully used as an efficient and reusable catalyst for promoting green ultrasonic-assisted A3 and KA2 coupling reactions as well as benzo[b]furan synthesis. It was found that decoration of the magnetic core with non-magnetic moieties decreased the maximum saturation magnetization. However, the catalyst was still superparamagnetic and could be simply separated from the reaction mixture using an external magnet. The heterogeneous nature of the catalyst was also confirmed by studying its reusability and stability and the leaching of silver. Use of aqueous media, high yields, short reaction times, broad substrate tolerance and low required amount of catalyst are the merits of this protocol.

Keywords: A3 and KA2 coupling reactions, benzo[b]furan, biosynthesis, magnetic nanoparticles, propargylamine