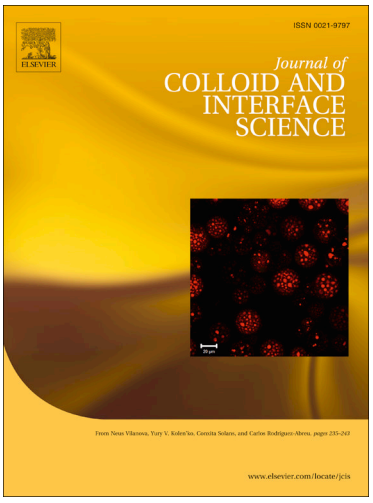

Superparamagnetic silica core-shell hybrid attached to graphene oxide as a promising recoverable catalyst for expeditious synthesis of TMS-protected cyanohydrins

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Superparamagnetic silica core-shell hybrid attached to graphene oxide as a promising recoverable catalyst for expeditious synthesis of TMS-protected cyanohydrins

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Abstract

Fe_3O_4/SiO_2 core-shell hybrid covalently attached to graphene oxide (Fe_3O_4/SiO_2/PTS-GO) nanoparticles were prepared and fully characterized using different techniques including Fourier transform infrared (FTIR) spectroscopy, X-ray powder diffraction (XRD), field emission scanning electron microscopy (FESEM), energy dispersive X-ray (EDX) spectroscopy, transmission electron microscopy (TEM) and atomic force microscopy (AFM). The efficiency of Fe_3O_4/SiO_2/PTS-GO nanoparticles was demonstrated in trimethylsilyl cyanide (TMSCN) addition to a wide range of aldehydes and ketones in high to quantitative yields under extremely mild conditions. The low catalyst loading, reusability of the catalyst, avoiding the use of any hazardous solvent, short reaction time at ambient temperature and straightforward work up procedure are some of the attractive advantages of this protocol.

Keywords: Fe_3O_4/SiO_2-functionalized graphene oxide, Magnetic nanoparticles, Nanocomposites, Cyanohydrins, Green chemistry.

1. Introduction

Cyanohydrins and corresponding trimethylsilyl (TMS) ethers are versatile intermediates in the synthesis of various important biologically-active compounds such as functionalized α-amino acids, α-hydroxy acids, α-hydroxy aldehydes and β-amino alcohols as well as ferroelectrics and liquid crystals [1-3]. Particularly, cyanosilylation is the key step in synthesis of clopidogrel (Plavix®) and oxybutynin (Ditropan), blood clot inhibitor and antispasmodic agents used to reduce the risk of heart attack and stroke [4,5] and relieve urinary and bladder difficulties [6], respectively.