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Functionalization of chitosan to prepare an appropriate catalyst and investigation of its catalytic properties

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Every year around the world, a vast amount of organic waste is produced from aromatic nitro compounds and their derivatives due to their wide application in the production of pesticides, herbicides, insecticides, and synthetic dyes. They have a huge adverse effect on the environment due to their difficult degradation process. In the same direction, developing heterogeneous catalysts using chitosan (CS) and magnetic (Fe_3O_4) as supports has attracted enormous interest due to their availability, low cost, and non-toxicity[1-3].

In this work, a heterogeneous catalyst was fabricated as a result of facile modification of NH_2 groups of the chitosan on the Fe_3O_4/CS surface and subsequent metalation of the obtained NS donors. The prepared catalyst was characterized using Fourier transform infrared (FT-IR) spectroscopy, thermogravimetric analysis (TGA), X-ray Diffraction (XRD), vibrating sample magnetometer (VSM), CHN elemental analysis, inductively coupled plasma optical emission spectroscopy (ICP/OES), field emission scanning electron microscopy (FE-SEM), and energy dispersive X-ray spectroscopy (EDX). The performance of the synthesized catalyst on the reduction of various nitroarene compounds to corresponding amino arenes was evaluated at ambient conditions. UV–vis absorption spectra were recorded in different intervals to monitor the reaction changes at room temperature. The reduction of 4-nitrophenol in optimized reaction conditions reached 91% conversion. The catalyst was easily separated by an external magnet and the recovered catalyst was reused without significant loss of catalytic activity[4].

Keywords: chitosan; magnetic nanoparticles; catalyst; reduction of nitroarene.

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