Synthesis of Magnetic Nanoparticles coated with cysteine and its application

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Abstract In this dissertation, three approaches of magnetic nanoparticles preparation and their surface functionalization, their application as Nano catalysts in multi-component reactions, and the use of synthesized nanoparticles as a color absorbent were considered. At first, the Fe3O4 Nanoparticles were prepared with co-precipitation method. Then, amino acid cysteine was synthesized on the surface of Fe3O4 by aggregation of its COOH functional group, with OH functional group. Subsequently, the –SH functional group of cysteine in Fe3O4@Cys-SH was oxidized to –SO3H. The structure of synthesized Fe3O4@Cys-SO3H Nanoparticles were defined by TEM, SEM, XRD, and FT-IR methods. Then the synthesized nanoparticles were used to optimize the multi-component reactions of Indazolo[1,2-b]Phthalazine, which improved the time and effectiveness of the reaction. This Nanocatalyst was also employed to synthesize new derivatives of spiro[chromeno[4',3':3,4]pyrazolo[1,2-b]phthalazine-7,3'-indoline], and that the obtained products were prepared in a short time and with an excellent yield. Further, the efficiency of Fe3O4@Cys-SH as a cationic absorbent in anionic carmoisine color removal aqueous solutions were studied. The results showed that, at pH=2, 0.1 g of adsorbent and the mixing time of 30 minutes, 91% of color was removed. The advantage of using this magnetic Nanocatalyst is that it can be recycled with the external magnetic field, and without any significant reduction in its activity, it can be used several times.

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