MAGNETIC NANOCOMPOSITES WITH MESOPOROUS STRUCTURES: A PROMISING ADSORBENT FOR THE REMOVAL OF ANIONIC AND CATIONIC DYES FROM AQUEOUS SOLUTIONS

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Abstract

The presence of synthetic organic dyes in water represents an environmental and ecological issues worldwide and requires feasible solutions in face of the short-term risk to human health and stability of eco-systems. Therefore, the magnetic mesoporous composites (MMC) were synthesized by surfactant template sol–gel method, using cetyl-trimethylammonium bromide (CTAB) as mesoporous structure generator and investigated for anionic and cationic dyes removal from aqueous solutions. The magnetic iron oxide nanoparticles were obtained by reverse co-precipitation, followed by mesoporous silica coating through modifed sol–gel method. The obtained materials were characterized by FT-IR spectroscopy, X-ray difraction, transmission electron microscopy, Mössbauer spectroscopy, nitrogen adsorption, small-angle X-ray scattering and magnetization measurements. The infuence of CTAB amount on the morpho-textural and structural properties of nanocomposites was studied. XRD and Mössbauer spectroscopy showed that the obtained nanocomposites were composed of pure maghemite nanoparticles, and TEM images revealed particles size around 10 nm, embedded in silica matrix. The combination of magnetic properties and high surface area values made suitable the obtained nanocomposites to be used as adsorbents. The obtained magnetic nanocomposites present high surface area values, high removal efficiency of dyes, even after four adsorbtion-desorbtion cycles, and magnetic properties, facilitating the removal of adsorbents from aqueous media.

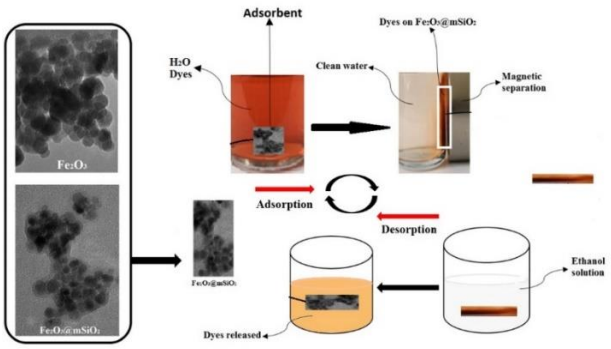

Figure 1. Illustration of the removal of dyes from aqueous media using magnetic nanocomposites with mesoporous structures

This work was supported by Program 4 of the "Coriolan Dragulescu" Institute of Chemistry, Research Projects and 4.2 and the authors thanks to Romanian Academy.