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An efficient approach for metal ions removal by using magnetic nanoparticle

The stricter environment regulation concerns the heavy metals makes it necessary to develop various new technologies or to improve existent for their removal from environmental. Nanoparticles are receiving widespread interest in a variety of environmental problems including the treatment of surface water, groundwater, and industrial wastewaters due to their unique, beneficial chemical, physical, mechanical properties and exploit properties of matter at atomic and molecular levels. [1] Recently, magnetic nanoparticles have been widely studied for the separation and extraction of target heavy metal ions from wastewater. The advantage of superparamagnetic nanoparticles (MNPs) is that they can be separated by an external magnetic field and the magnetic particles' surfaces can be modified to suit their application. Cobalt-ferrite (CoFe2O4) nanoparticles prepared via co-precipitation method were functionalized with tetraethyl orthosilicate (TEOS) and 3-mercaptopropyl trimethoxysilane (MPTMS) with purpose of cleaning waste water contaminated with heavy metal ions. The influence of the different experimental parameters (reaction time, reaction temperature and different TEOS:MPTMS ratios) on the coating CoFe2O4 nanoparticles with a thin layer of silica and after functionalized with thiol group was systematically studied. Silanes adsorb to the particle surface with alkoxy (Si(OR)4) groups at one end, while functional substituents (-SH) at the opposite end stay extended into surrounding aqueous medium and chemically interact with heavy metal contaminates. Functionalized CoFe2O4 nanoparticles were characterizing using IR spectroscopy, X-ray diffraction (XRD), transmission electron microscopy/high-resolution transmission electron microscopy (TEM/HRTEM) and energy-dispersive X-ray spectroscopy (EDXS). The synthesized cobalt-ferrite nanoparticles and functionalized with TEOS or/and MPTMS were used for treating the wastewater contaminated with heavy metal ions, such as Pb2+ and Hg2+. Effect of treatment has been demonstrated using atomic absorption spectroscopy (AAS). This research is sponsored by NATO's Public Diplomacy Division in the framework of "Science for Peace".

Biography

Aleksandra Lobnik with University of Maribor, Slovenia. She has published several papers in reputed journals.

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