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GRAPHENE OXIDE DECORATED WITH $NiFe_2O_4$ NANOPARTICLES FOR HEXAVALENTE CHROMIUM ADSORPTION

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Graphene oxide is a nano technological material with excellent optical, mechanical and electrical properties. Its structure is made of sp^2 hybridized carbon bound atoms, organized in hexagonal form, in a two dimension structure and with functional groups attached to it, including epoxide, hydroxyl and carbonyl groups. Graphene oxide is mostly applied in semiconductor materials, due to its properties and which also can be enhanced by modifying the functional groups on its structure or even adding new chemical groups. For instance, $NiFe_2O_4$ nanoparticles have a bandgap of 2.0 eV or lower, decorating graphene oxide structure with $NiFe_2O_4$ improves the magnetic response of graphene oxide and considering the semiconductor features of graphene oxide, its photocatalytic response. One of the possible applications for this nanomaterial is as an adsorbent for environmental pollutants from contaminated aqueous solutions. Heavy metals can attach to graphene oxide functional groups and it can be easily removed with a magnet, avoiding the exhaustive centrifugation process. The aim of this study was obtain graphene oxide decorated with $NiFe_2O_4$ nanoparticles and test it as an adsorbent for hexavalent chromium from contaminated aqueous solutions. Graphene oxide was synthesized through modified Hummers method and $NiFe_2O_4$ nanoparticles were prepares through a modified hydrothermal route. $NiFe_2O4$/ graphene oxide hybrid was prepared via a hydrothermal method. In detail, 1 mmol of $Ni(NO_3)_2$ $6H_2O$ and 2 mmol of $Fe(NO_3)_3$ $9H_2O$ were dissolved in 25 mL of deionized water, containing a dispersion of 0,4 g of graphene oxide initially dispersed in 30 mL of deionized water by sonication for 30 min to get a homogeneous suspension of graphene oxide. The pH of the dispersion was adjusted to 13 by adding 6 M NaOH solution. The mixture was transferred to a 150 mL a Teflon reactor and maintained at 200 °C for 10 h and then cooled to room temperature

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naturally. The resulting precipitate was filtrated, washed thoroughly with deionized water, and dried at 100 °C during 2 h. Scanning electron microscopy was used to analyze the morphology of sample and $NiFe_2O_4$ clusters were observed in graphene oxide structure. X- ray diffraction was performed in order to determine the ferrite phase decorating the graphene oxide. The system will be dispersed in Cr(VI) solutions in order to investigate the kinetics of adsorption and photocatalysis.

Keywords: Graphene Oxide. $NiFe_2O_4$. Hexavalent Chromium adsorption.