Public Abstract
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Title:IRON OXIDE GRAPHENE OXIDE NANOCOMPOSITES AS ADSORBENTS

Iron oxides and carbon containing materials are recognized for their potential in the water treatment field as adsorbent materials for removing many contaminations such as heavy metals and organic matter. One of these iron oxides is hematite, which was examined by many researchers during the last few years, and it showed pleasing adsorption capacity. As a carbon containing material, graphene oxide is a rising star in many fields due to its vast properties and its ability to enhance the properties of other materials that are mixed with it. The aim of this work is to investigate the possibility of increasing the adsorption capacity of hematite further by the addition of graphene oxide to form a new composite material. In short, the raw materials for the new composite were synthesized. Lepidocrocite was synthesized from ferrous chloride then acidic acid was added to it to form ferroxane nanoparticles (precursor of hematite) while graphene oxide was synthesized from graphite by applying modified Hummer's method. The following step was characterizing the raw materials (ferroxane and graphene oxide) to look at their properties (size, surface charge, surface area, and morphology) before composing them. The major factor that controlled the composing process was the electrostatic attacking, in order to get fast aggregation instead of growing aggregation, and the chosen pH for composing the raw material was determined to be around pH 4. Two weight ratios were chosen for the new composite materials aggregates, 5% graphene oxide to 95% iron oxide (5% GO/IO-A) and 10% graphene oxide to 90% iron oxide (10% GO/IO-A). For the purpose of fabricating the new composites onto the ceramic membranes, many ways were tried, but none of them formed a stable surface layer on the ceramic membrane. The composites were sintered at 410 ºC to form 5% GO/IO and 10% GO/IO composites. Then, the same characterization methods applied to the raw materials were applied to measure the properties of the new composites. Arsenic, As (v), was chosen to be the adsorbate material in the adsorption experiments. To conduct the adsorption isotherms experiment, different concentrations of arsenic solutions, between 0.5 ppm to 10 ppm, were prepared from sodium arsenate, and the concentration of the adsorbents, composites, in each sample was 400 ppm. The experimental conditions were pH 4.5 and pH 7 with ionic strength of 1 mM one time, and 100 mM in the second time. As for the adsorption kinetics experiment, a solution of 10 ppm of As (v) with ionic strength of 100 mM at pH 7 was prepared and 500 mg of the adsorbents were added to each 1 L of the solution. The results showed a slight decrease in the surface area of the new composites (65.98, 68.05 m2/g for the 5% GO/IO and 10% GO/IO composites, respectively) than the hematite (73.87 m2/g) while the surface area of the graphene oxide was 151.4 m2/g. In addition, the highest adsorption capacity occurred for the 10% GO/IO composite at pH 7 and ionic strength 100 mM (almost 18 mg As(v)/g adsorbent). The kinetics experiments demonstrated that almost 60% of As(v) was adsorbed by both composites after two hours while the saturation occurred after 17 hours with 7.9 mg/g, 8.8 mg/g and for the 5% GO/IO and 10% GO/IO composites, respectively.