Synthesis and characterization of graphene oxide/attapulgite composite hybrid material for use in water treatment

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Abstract

The advantages of nanomaterials have gained the interest of the scientific community over the recent years. In the field of water treatment, new applications bloomed by the use of nanomaterials such as carbon-based nanomaterials, including Graphene Oxide (GO). Clean water is becoming crucial due to the constantly growing industry and the increasing pollution of the environment. This study aims to synthesize and utilize a hybrid material using graphene oxide and attapulgite that can be applied in water treatment as an absorbent. Both materials exhibit unique properties and are being used for environmental purposes, particularly for the removal of pollutants from water. Graphene oxide/attapulgite (GO/ATP) composite hybrid material was successfully synthesized by a simple hydrothermal method. This method is relatively eco-friendly as no harmful or high toxicity reagents were used during the synthesis process. The ATP was confirmed to be incorporated into the GO layers, by means of X-ray powder diffraction (XRD), Fourier Transform infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA) and scanning electron microscopy (SEM). The synthesis process was influenced by the interaction between the GO functional groups and the silanol surface groups (Si-OH) of ATP. The raw attapulgite was treated with hydrochloric acid (HCl) prior to its use, in order to increase its surface area, pore volume and active silanol surface groups (Si-OH). The increased number of active Si-OH groups made the attachment of the attapulgite nanorods to the GO layers more efficient.

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