**Facile Synthesis of GO-Exfoliation/Goethite Functional Material and It Application in the Adsorption Of Cu(II).**

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**Highlights**

* GO-exfoliation/goethite functional material was first reported.
* The new material has higher adsorption capacity for Cu(II) than goethite.
* It can be used in a wide range of pH from 4 to 9.
* It is harmless to environment and has a good application foreground.

**1. Introduction**

It is widely recognized that Cu(II) has harmful effects on the environment and human health. The removal of Cu(II) from wastewater has become a hot issue in the world. The methods of removing Cu(II) have adsorption[1], ion exchange[2], chemical precipitation[3], etc. Among them, adsorption is a fast and relatively cost-effective technology for water treatment[4]. This work aims to prepare a new adsorption material to effectively remove Cu(II) from aqueous solution.

**2. Methods**

In this research, graphene oxide (GO)/goethite functional material was synthesized through a facile method. It consisted of the following steps. (1) The Hummers method was used for the preparation of GO-exfoliation[5]. (2) Goethite was prepared using a method based on the report of Atkinson[6]. (3) The functional material was synthesized via the ultrasonic method in aqueous solution with GO-exfoliation and goethite as precursors.

Adsorption experiments: the adsorption of Cu(II)onto the material was analyzed vs. temperature, adsorption time, pH values, as well as the associated adsorption isotherms. Then XRD, BET and TEM were used to explore the characteristics of the material.

**3. Results and discussion**

The results showed that GO has high surface areas and abundant oxygen-containing function groups. It can be used as an adsorbent in water treatment but difficult to be separated from water due to its hydrophilicity. The degree of GO-exfoliation was important for the adsorption capacity. The active functional material made it easier to be separated from water. The analytical results showed that the material has excellent adsorption efficiency than GO and goethite alone. The proportion of GO and goethite also played a key role for its adsorption capacity. This adsorption processes were rapid as occurred within the first 10 minutes and reached equilibrium in about 30 minutes. Adsorbent with a high removal capacity was important in the performance of adsorbing Cu(II). The calculated adsorption capacity was 125.47mg/g for Cu(II), which decreased with increasing adsorption time. The material had good adsorption capacity in a wide range of pH from 4 to 9. Pseudo-second-order adsorption kinetic and Langmuir adsorption isotherm were applied to study Cu(II) adsorption process[7]. The main adsorption process is chemical adsorption. So the functional material would be useful for the purpose of environmental protection in design.

**4. Conclusions**

The results prove that the new material possesses high potential for the removal of Cu(II) in wastewater. GO, using as a kind of two-dimensional support, plays a key role to help the material to remove Cu(II). In addition, GO can be readily obtained from cheap natural graphite in large scale. As precursors are environment-friendly, it can practically usable for Cu(II) separation from water.

**References**

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