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Removal of Cu(II) Ions from Aqueous Solution by KH-570 Modified Attapulgite Clay

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Abstract Attapulgite clay (ATP) was modified by Silane coupling agent (KH-570) to create more efficient sites for Cu(II) adsorption. The natural and KH-570 modified attapulgite clay were characterized by Fourier transform infrared spectrometer (FTIR) and SEM. The effects of various experimental parameters such as the amount of modifier, the quality of KH-570 modified ATP, adsorption time, adsorption temperature on Cu(II) adsorption onto KH-570modified ATP were studied in detail. The results showed that the 30% of modifier (The quality of the modifier mass fraction attapulgite) had the best adsorption capacity. When the dosage of modified attapulgite clay was 0.5g and the absorption time was 240min under 20℃, the adsorption rate of Cu(II) in wastewater approached 97%. Meanwhile, the type of absorption was Langmuir isotherm. Desorption experiments showed that the adsorption mechanism of KH-570 modified ATP to Cu(II) was the chemical adsorption.

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Removal of Cu(II) Ions from aqueous solution by KH-570 modified Attapulgite Clay

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Keywords: modified attapulgite clay (ATP) by KH-570, Copper ions, Adsorption

Abstract. Attapulgite clay (ATP) was modified by Silane coupling agent (KH-570) to create more efficient sites for Cu(II) adsorption. The natural and KH-570 modified attapulgite clay were characterized by Fourier transform infrared spectrometer (FTIR) and SEM. The effects of various experimental parameters such as the amount of modifier, the quality of KH-570 modified ATP, adsorption time, adsorption temperature on Cu(II) adsorption onto KH-570 modified ATP were studied in detail. The results showed that the 30% of modifier (The quality of the modifier mass fraction attapulgite) had the best adsorption capacity. When the dosage of modified attapulgite clay was 0.5g and the adsorption time was 240min under 20°C, the adsorption rate of Cu(II) in wastewater approached 97%. Meanwhile, the type of adsorption was Langmuir isotherm. Desorption experiments showed that the adsorption mechanism of KH-570 modified ATP to Cu(II) was the chemical adsorption.

Introduction

Toxic metal compounds are frequently used in industrial processes and are widely distributed in the environment. Copper is one of the most widespread heavy metal elements in environment. The U.S. Environmental Protection Agency provides that the content of copper in drinking water should not exceed 1.3mg/L [1]. Thus, the research on the low-cost adsorbents for copper and on wastewater treatment technology of low concentration copper has been a hot spot in various areas.

Attapulgite clay is a crystalline hydrated magnesium silicate with a fibrous morphology, large specific surface area and moderate cation exchange capacity, which is beneficial for the adsorption of heavy metals from solution. Until now, numerous studies have reported on the adsorption of heavy metals from aqueous solution by natural or inorganic-modified attapulgite. Attapulgite clay has been drawn more attention in the field of wastewater treatment because of its unique physical and chemical properties and possible applications [2~8].

Nowadays, in order to increase its surface, enhance the adsorption capacity and improve the ability of removing pollutants from water, the most commonly method of modified attapulgite clay is inorganic modification. While there are few reports concerning the performance of organic modified attapulgite clay applied in removing metal compounds.

Then, in the present study, attapulgite clay was modified by KH-570 to improve its surface property and adsorption capacity of Cu(II). The objectives of this work were to determine the adsorption efficiency of KH-570 modified attapulgite clay, and to evaluate the factors affecting the adsorption process. The possible adsorption mechanism was also discussed.

Experimental

Reagent. Attapulgite(ATP)(China). CuSO₄·5H₂O(A.R.,China). KH-570(A.R.,China). Ethanol(A.R.,China). EDTA(A.R.,China). NH₄CL(A.R.,China). CCL₄(A.R.,China). Deionized water and double-distilled water.

The preparation of KH-570 modified attapulgite clay. ATP (5.0g) was dissolved in 100mL distilled water in a 250mL three-neck flask under stirring and heating. After the ATP had completely dissolved, the KH-570 (30%) was added into the system at 80°C, then continued to stir for 3h. After

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