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Effect of Heat Treatment on Properties of Mineral Attapulgite

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Keywords [Attapulgite](#), [Heat Treatment](#), [Size Distribution](#), [Surface Free Energy](#), [Water Vapor Adsorption](#)

Abstract Mineral attapulgite powders were heat treated at different temperature from 100° C to 800° C. The effect of heat treatment on properties of attapulgite were studied by particle size distribution, surface free energy, and water vapor adsorption performance. The results show that the medium particle size and surface free energy of attapulgite increase and hygroscopic capacity promptly reduce with the increase of heat temperature. The medium particle size of the raw palygorskite is 3.09 μm, and it becomes 14.12 μm after heat treatment at 800 ° C. The surface free energy, polarity component and dispersion component of the natural attapulgite are 45.16mN•m-1, 13.92mN•m-1, 31.24mN•m-1, respectively, and they become 116.22 mN•m-1, 116.22 mN•m-1, 0.0 mN•m-1 after heat treatment at 800° C. Moreover, the hygroscopic capacity of attapulgite in 24h decreases from 17.1 % to 5.6% after heat treatment at 800° C.

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Effect of Heat Treatment on Properties of Mineral Attapulgite

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Keywords: attapulgite; heat treatment; size distribution; surface free energy; water vapor adsorption

Abstract: Mineral attapulgite powders were heat treated at different temperature from 100°C to 800°C. The effect of heat treatment on properties of attapulgite were studied by particle size distribution, surface free energy, and water vapor adsorption performance. The results show that the medium particle size and surface free energy of attapulgite increase and hygroscopic capacity promptly reduce with the increase of heat temperature. The medium particle size of the raw palygorskite is 3.09 μm, and it becomes 14.12 μm after heat treatment at 800 °C. The surface free energy, polarity component and dispersion component of the natural attapulgite are 45.16mN·m⁻¹, 13.92mN·m⁻¹, 31.24mN·m⁻¹, respectively, and they become 116.22 mN·m⁻¹, 116.22 mN·m⁻¹, 0.0 mN·m⁻¹ after heat treatment at 800°C. Moreover, the hygroscopic capacity of attapulgite in 24h decreases from 17.1 % to 5.6% after heat treatment at 800°C.

Introduction

Attapulgite is a crystalline hydrated magnesium aluminum silicate adsorbent, it has received much attention for its potential application both as an environmental indication and important material since it has been found in 1862. It is widely studied[1] and largely scale utilization in the fields of drilling mud, keeping pets, greasing decolour, engineering environment etc. The study on crystal structure, performance, modified technology and changing regular pattern of attapulgite increased especially the mineral deposit of attapulgite has been found in the border of Jiangsu and Anhui provinces. There are a lot of reports about thermal activation, acid activation, surface modification treatment in the practical application involved in the fine texture[6], crystal structure[7], infrared character parameters attribute and so on. However, there is only a little report about the variation of surface free energy of attapulgite during the process of heat treatment.

In this paper, the effect of heat treatment on properties is studied by means of high-temperature heat treatment at different temperature, which can provide the basic data in the fields of heat insulating materials, fire resistive materials and fire retardant materials. Laser particle size analyzer and surface tension apparatus are used as tensiometer for studying the changing regular pattern on size distribution, adsorptive properties, and surface properties containing powder contact angle, surface free energy, polarity component and dispersion component and discussing the mechanics on mineral crystals in the process of heat treatment.

1 Experimental

1.1 Materials

The raw attapulgite (composition by X-ray diffraction: attapulgite 65%, quartz 12%, dolomite 5%, montmorillonite 5% and other clay 2%) was purchased from Jiangsu province, China.

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