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A preparation of nano-kaolinite by using hard kaolinte associated with coal measures

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Abstract

With potassium acetate as an intercalation agent, kaolinite-potassium acetate (KAc) intercalation complexes were prepared. Afterwards, nano-kaolinite was successfully made through exfoliated intercalation complexes using power ultrasonic. The intermediate and final products were characterized by X-ray diffraction (XRD), infrared spectroscopy (IR), laser particle size analyzer, and scanning electron microscope (SEM). The results show that intercalation of KAc into kaolinite resulted in a crystal space expansion from a basal spacing of 7.14Å to 14.20 Å, and the intercalation rate was about 80%. KAc intercalation causes the weakening of interlayer stability. It was shown that the particles of nano-kaolinite is very thin lamellar in shape, whose average thickness, average particle size, are 50 nm and 450 nm, respectively.

Key words: *Kaolinite, Potassium acetate, Intercalation complex, Nano-kaolinite, Power ultrasonic*

1. Introduction

Kaolinite is an important industrial mineral because of its various utilization. The thickness of kaolin particles significantly affects their dispersibility, agglomeration and rheological properties, whenever kaolin is used as a coating, pigment or filler in paper, ceramics, rubber, or polymers (Murray and Kogel, 2005; Gardolinski and Lagaly, 2005; Murray and Keller, 1993; Bundy *et al*., 1993; Jasmund and Lagaly, 1993). In the industry, separation of kaolinite particles into thin platelets, also referred to as "delamination", is accomplished by traditional mechanical grinding or stirring. It entails cleaving along the (001) planes, fracturing of platelets, degradation of kaolinite crystal structure, and thus an increase in the specific surface area (Prasad *et al*., 1991; Bundy and Ishley, 1991). Most papers report that short-time milling of kaolinite flakes causes fracturing along the basal planes coupled with an increase of the specific surface. However, prolonged grinding results in the formation of agglomerates with amorphous surface layers and a reduction of the specific surface area (Suraj *et al*., 1997; Sánchez-Soto *et al*., 2000). Likewise, Frost *et al*., (2001; 2004) studied the delamination of kaolinite and observed that the specific surface area increases during

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