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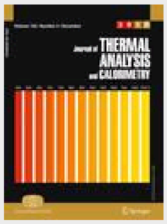

Desorption of benzoic and stearic acid adsorbed upon montmorillonites: a thermogravimetric study

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作者

Longfei Lu[1, 2], Ray L. Frost[1], Jingong Cai[2]

[1]Inorganic Materials Research Program, School of Physical and Chemical Sciences, Queensland University of Technology, 2 George Street, GPO Box 2434, Brisbane, QLD 4001, Australia

[2]State Key Laboratory of Marine Geology, Tongji University, Shanghai, 200092 China

摘要

Abstract The desorption of benzoic acid and stearic acid from sodium and calcium montmorillonites has been studied using thermogravimetric and differential thermogravimetric analysis. Desorption of benzoic acid from sodium montmorillonites occurs at 140 ° C and from calcium montmorillonites at 179 ° C. This increase in temperature is attributed to the benzoic acid bonding to the calcium in the interlayer. A lowering of the dehydroxylation temperature of montmorillonites is observed with acid adsorption. Stearic acid desorbs at 218 ° C as observed by the DTG curves. The desorption pattern differs between the sodium montmorillonites and the calcium montmorillonites.

Keywords

Thermogravimetric analysis, Differential thermogravimetric analysis, Montmorillonites, Desorption, Benzoic acid, Stearic acid

被引用文献

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Introduction

Clay minerals are the most abundant inorganic minerals in natural systems. The surface properties of colloidal clay particles play the major role in the formation, structure and strength of aggregates in sediments and soils. Sediment organic matter (SOM), mainly polarity organic molecules such as carboxylic acids, has strong affinity to the surface of clay minerals. Through their interaction by physical or chemical bonds, organoclay complexes are formed. Sorption of SOM is considered to be a major process in the preservation of organic matter (OM) in sediments and soils. Association of OM with minerals provides protection against not only rapid microbial decay but also oxidation. Kennedy et al. [1] provided evidence that SOM was preserved quite well in interlayer of smectite clay in Cretaceous black shale. But the protective effect of clay minerals on pyrogenation of SOM is not well known. The adsorption of acids on clays is important for our understanding of soils [2–4]. Equally important is to understand the adsorption-desorption phenomena [5–7]. If acids such as benzoic acid and stearic acid adsorb on soil containing clays then fundamentally natural organoclays are formed.

Organoclays form an important type of modified clay material. Their uses are many including some environmental applications [8–12]. Organoclays are particularly useful in water purification e.g. by the removal of oil and toxic chemicals from water [10, 13–15]. Remediation of industrial waste waters is enabled through the use of organoclays [16, 17]. These types of materials are useful for the remediation of contaminated soils [18–20] and they are also applied as clay liners in landfills. The development of some new nanocomposite materials is due to use of organoclays [21–24]. Organo-montmorillonites are synthesized by introducing cationic surfactants such as quaternary ammonium compounds into the interlayer space through ion exchange [25–27]. Long-chain alkylammonium cations can form a hydrophobic medium within the clay interlayer, and act in analogy to a bulk organic phase. The intergallery distance of d(001) plane of the clay which has not been organically modified, is relatively small, and the intergallery environment is hydrophilic. Intercalation of an

L. Lu · R. L. Frost (✉)
Inorganic Materials Research Program, School of Physical and Chemical Sciences, Queensland University of Technology, 2 George Street, GPO Box 2434, Brisbane, QLD 4001, Australia
e-mail: r.frost@qut.edu.au

L. Lu · J. Cai
State Key Laboratory of Marine Geology, Tongji University, Shanghai 200092, China

Akadémiai Kiadó
H-1519 Budapest, Pf. 245
Telephone: +36-1-464-8222
email: journals@akkrt.hu

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