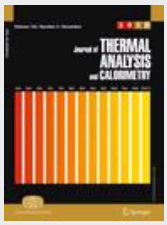
期刊文章



Thermal analysis and Infrared emission spectroscopic study of kaolinite – potassium acetate intercalate complex

期刊	Journal of Thermal Analysis and Calorimetry
出版社	Akadémiai Kiadó, co-published with Springer Science+Business Media B.V., Formerly Kluwer Academic Publishers B.V.
ISSN	1388-6150 (Print) 1572-8943 (Online)
学科	Chemistry, Sciences, Polymer Sciences, Physical Chemistry, Inorganic Chemistry, Measurement Science, Instrumentation
期	Volume 103, Number 2
页	507-513
DOI	10.1007/s10973-010-0917-3
Subject Group	化学和材料科学
在线日期	2010年6月17日

添加入标记条目中
添加入收藏条目中
推荐此文章

检索 高级检索

提交

在所有内容之内检索
在此期刊之内检索
在此期之内检索

输出此章节

RIS | 文本

PDF (427.4 KB) HTML First Page Preview

作者

Hongfei Cheng[1, 2, 3], Jing Yang[2], Ray L. Frost[2], Qinfu Liu[3], Zhiliang Zhang[3]

[1]School of Mining Engineering, Inner Mongolia University of Science and Technology, Baotou, 014010 China
[2]Chemistry Discipline, Faculty of Science and Technology, Queensland University of Technology, 2 George Street, GPO Box 2434, Brisbane, QLD 4001, Australia
[3]School of Geoscience and Surveying Engineering, China University of Mining and Technology, Beijing, 100083 China

摘要

Abstract
The thermal behavior and decomposition of kaolinite–potassium acetate intercalation complex was investigated through a combination of thermogravimetric analysis and infrared emission spectroscopy. Three main changes were observed at 48, 280, 323, and 460 °C which were attributed to (a) the loss of adsorbed water, (b) loss of the water coordinated to acetate ion in the layer of kaolinite, (c) loss of potassium acetate in the complex, and (d) water through dehydroxylation. It is proposed that the potassium acetate intercalation complex is stability except heating at above 300 °C. The infrared emission spectra clearly show the decomposition and dehydroxylation of the kaolinite intercalation complex when the temperature is raised. The dehydration of the intercalation complex is followed by the loss of intensity of the stretching vibration bands at region 3600–3200 cm^{-1}. Dehydroxylation is followed by the decrease in intensity in the bands between 3695 and 3620 cm^{-1}. Dehydration is completed by 400 °C and partial dehydroxylation by 650 °C. The inner hydroxyl group remained until around 700 °C.

Keywords

Kaolinite, Potassium acetate, Intercalation complex, Infrared emission spectroscopy

Fulltext Preview (Small, Large)

被引用文献

共 6 篇最新文献

1. Sahnoune, F. (2011) Thermal analysis of dehydroxylation of Algerian kaolinite. *Journal of Thermal Analysis and Calorimetry* [CrossRef]
2. Frost, Ray L. (2011) Thermal stability of stercorite H(NH4)Na (PO4) • 4H2O : A cave mineral from Petrogale Cave, Madura, Eucla, Western Australia. *Journal of Thermal Analysis and Calorimetry* [CrossRef]
3. Frost, Ray L. (2011) Thermal Stability of newberyite Mg (PO3OH) • 3H2O : A cave mineral from Skipton Lava Tubes, Victoria, Australia. *Journal of Thermal Analysis and Calorimetry* [CrossRef]
4. Park, Yuri (2011) A thermoanalytical assessment of an organoclay. *Journal of Thermal Analysis and Calorimetry* [CrossRef]

5. Zhang, Jinshan (2011) Mid-infrared and near-infrared spectroscopic study of kaolinite-potassium acetate intercalation complex. *Journal of Molecular Structure* [CrossRef]
6. Frost, Ray L. (2011) Thermal stability of the ‘cave’ mineral ardealite Ca2(HPO4)(SO4) • 4H2O. *Journal of Thermal Analysis and Calorimetry* [CrossRef]

J Therm Anal Calorim (2011) 103:507–513
DOI 10.1007/s10973-010-0917-3

Thermal analysis and Infrared emission spectroscopic study of kaolinite–potassium acetate intercalate complex

Hongfei Cheng · Jing Yang · Ray L. Frost · Qinfu Liu · Zhilong Zhang

Received: 21 April 2010 / Accepted: 3 June 2010 / Published online: 17 June 2010

Abstract The thermal behavior and decomposition of kaolinite–potassium acetate intercalation complex was investigated through a combination of thermogravimetric analysis and infrared emission spectroscopy. Three main changes were observed at 48, 280, 323, and 460 °C which were attributed to (a) the loss of adsorbed water, (b) loss of the water coordinated to acetate ion in the layer of kaolinite, (c) loss of potassium acetate in the complex, and (d) water through dehydroxylation. It is proposed that the potassium acetate intercalation complex is stability except heating at above 300 °C. The infrared emission spectra clearly show the decomposition and dehydroxylation of the kaolinite intercalation complex when the temperature is raised. The dehydration of the intercalation complex is followed by the loss of intensity of the stretching vibration bands at region 3600–3200 cm^{-1}. Dehydroxylation is followed by the decrease in intensity in the bands between 3695 and 3620 cm^{-1}. Dehydration is completed by 400 °C and partial dehydroxylation by 650 °C. The inner hydroxyl group remained until around 700 °C.

Keywords Kaolinite · Potassium acetate · Intercalation complex · Infrared emission spectroscopy

H. Cheng
School of Mining Engineering, Inner Mongolia University of Science and Technology, Baotou 014010, China

H. Cheng · J. Yang · R. L. Frost (✉)
Chemistry Discipline, Faculty of Science and Technology, Queensland University of Technology, 2 George Street, GPO Box 2434, Brisbane, QLD 4001, Australia
e-mail: r.frost@qut.edu.au

H. Cheng · Q. Liu · Z. Zhang
School of Geoscience and Surveying Engineering, China University of Mining and Technology, Beijing 100083, China

Introduction

Kaolinite has been and continues to be one of the most important and useful industrial minerals. It is widely applied in the fabrication of paper, paints and inks, rubber and plastic, ceramic raw material, fiberglass, cracking catalysts, cosmetics, medicines, etc. [1–3]. Recent advances in the preparation of hybrid organic–inorganic materials by intercalation of organic molecules into kaolinite represent a clear possibility of new and interesting materials [4]. Kaolinite can interact with organic molecules by intercalation which is a process of insertion of molecules between the kaolinite layers. This process involves the breaking of hydrogen bonds between the kaolinite layers and the formation of new hydrogen bonds with the inserting molecule [5].

Therefore, an important part of research in laboratory is focused on the preparation of the complexes of kaolinite intercalated by organic molecules. This area, essentially making the clay into a single-layered mineral, has gained much attention over recent decades. The inserting molecule breaks the hydrogen bonds formed between the kaolinite hydroxyl groups and the oxygen of the next adjacent siloxane layer, then forms hydrogen bonds with either the hydrophobic surface of the kaolinite (the siloxane layer) or the hydrophilic part of the kaolinite surface (the hydroxyl surfaces of the gibbsite-like layer). A further possibility exists in that the inserting or adsorbing molecule may interact with the surfaces of the kaolinite [6, 7]. The kaolinite intercalated with reactive guest molecules can also be used as precursors for the intercalation of nonreactive organic molecules via the displacement of intercalated molecules. In addition to the formation of new organoclay nanohybrid materials, intercalation can lead to the covalent grafting of organic molecules. Therefore,

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

online dictionary / online szótár
5th European Conference of the International Federation for Medical and Biological Engineering
Frontiers in Organic Synthesis Technology 3. - FROST 3

Remote Address: 122.70.132.162 • Server: MPSHQWBRDR02P
HTTP User Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.2; SV1; .NET CLR 1.1.4322; .NET CLR 2.0.50727; .NET CLR 3.0.4506.2152; .NET CLR 3.5.30729)