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## 期刊文章



### Comparative study of the effects of thermal and mechanical treatments on the structures of clay minerals

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作者

E. Mendelovici<sup>1</sup>

<sup>1</sup>Department of Materials Science, IVIC Apartado 21827, 1020A Caracas, Venezuela

摘要

Abstract

Controlled heating (in air) of clay minerals leads to transformations into disordered structures and recrystallization into new phases at high temperatures. These phase transformations are of topotactic nature. On the other hand, prolonged dry-grinding treatments of the same silicates causes structural amorphization with no recrystallization into new phases. The mechanical energy relaxation mechanism, invoked to explain these differences, accounts for the particle size changes and the large growth of dislocations. The latters affect sensibly the reactivity of the materials submitted to such solid-state treatments.

These processes are monitored mostly by XRD, DTA and IR spectroscopy. The latter method allows to study in some silicates submitted to progressive grinding the location and nature of OH groups and water molecules.

**Keywords**

clay minerals, grinding and thermal treatments, reactivity, structural changes

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1. Buchwald, A. (2009) The suitability of thermally activated illite/smectite clay as raw material for geopolymer binders. *Applied Clay Science* 46(3) [\[CrossRef\]](#)
2. Önal, M. (2008) Thermal analysis of some organoclays. *Journal of Thermal Analysis and Calorimetry* 91(1) [\[CrossRef\]](#)
3. Önal, M. (2007) Thermal analysis of some organoclays. *Journal of Thermal Analysis and Calorimetry* [\[CrossRef\]](#)

*Geosciences*

**COMPARATIVE STUDY OF THE EFFECTS OF THERMAL AND MECHANICAL TREATMENTS ON THE STRUCTURES OF CLAY MINERALS\***

*E. Mendelovici*

Department of Materials Science, IVIC Apartado 21827, Caracas 1020A, Venezuela

**Abstract**

Controlled heating (in air) of clay minerals leads to transformations into disordered structures and recrystallization into new phases at high temperatures. These phase transformations are of topotactic nature. On the other hand, prolonged dry-grinding treatments of the same silicates causes structural amorphization with no recrystallization into new phases. The mechanical energy relaxation mechanism, invoked to explain these differences, accounts for the particle size changes and the large growth of dislocations. The latter affect sensibly the reactivity of the materials submitted to such solid-state treatments.

These processes are monitored mostly by XRD, DTA and IR spectroscopy. The latter method allows to study in some silicates submitted to progressive grinding the location and nature of OH groups and water molecules.

**Keywords:** clay minerals, grinding and thermal treatments, reactivity, structural changes

**Introduction**

The effects of heating on solid materials have been studied for many decades. Thermal treatments deal with controlled heating in the oven in different atmospheres, covering a wide range of temperatures. Grinding treatments of these solids, in mortar and percussive mills, have been as well developed. Thermal or mechanical treatments of some crystalline solids lead to changes of the structure and of the physico-chemical properties of the solid, which may result in the formation of materials with interesting applications. Such physicochemical changes, involving

\* Plenary lectures.

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Akadémiai Kiadó

H-1519 Budapest, Pf. 245

Telephone: +36-1-464-8222

email: [journals@akkt.hu](mailto:journals@akkt.hu)

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