

# RECENT RESEARCHES ON CLAY MINERALS IN BELGIUM AND THE NETHERLANDS

*by*

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## ABSTRACT

Subjects of contemporary research in Benelux are enumerated.

## INTRODUCTION

As in other countries, clay minerals science in the "Benelux" covers a large field, at the opposite ends of which are respectively found the ceramics and soils studies. However, as compared with the situation in the U.S.A., where exploratory field surveys are very important, this kind of activity is almost absent in these over-populated areas. Such researches were performed on a large scale in the former colonies of both countries but their object is beyond the scope of this review.

### 1. SOLID STATE

The production of mullite from kaolin minerals has been investigated at the University of Brussels by Dekeyser and collaborators (1962), who have shown that mullite is obtained at 600°C by reacting aluminum fluoride with kaolinite. On heating such a material at 1300°C the yield of larger crystals is more appreciable than the one observed by heating untreated kaolinite. In connection with the same problem, high temperature interface reaction processes between platelets made from  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , or between these plates and kaolinite, have been studied by Dekeyser (1963). After treatment at 1600°C mullite crystal formation and orientation is determined by observing the interface by optical microscopy, X-ray diffraction and X-ray fluorescence.

At the University of Louvain the mechanism of the dehydroxylation process of kaolinite has been the subject of papers published by Toussaint, Fripiat and Gastuche (1963) and Fripiat and Toussaint (1963).

Similar studies on octahedral hydroxides are now in progress. Infrared spectroscopy is broadly applied to these problems.

Fripiat, Léonard and Barake (1963) recently investigated the organization of silica gels prepared under various conditions, while Uytterhoeven,

Hellinckx and Fripiat (1963) have taken into consideration the sintering processes of such gels. New researches on the same subject are carried out at Louvain.

## 2. SYNTHESIS, GENESIS AND ALTERATION OF CLAY MINERALS

At the University of Brussels Wollast (1961, 1963) has studied the genesis of the bauxite ores of the low Congo River, and investigated recently in collaboration with Garrels the kinetics of alteration of K-feldspar in aqueous solutions, the results being still to be published.

At the University of Louvain Gastuche, De Kimpe, Herbillon (1959–1963) and collaborators have carried out a very complete set of experiments in order to synthesize *in vitro*, under conditions as close as possible to the “natural” ones, the octahedral hydroxides and the kaolin minerals. A report on this work is given to this conference.

The alteration in acid conditions of kaolinite, gibbsite, glauconite and biotite has been taken into consideration by Gastuche, Cloos and Vielvoye (1960–1963). They are now engaged in the study of amorphous materials coating the clay surfaces.

The removal of octahedral layers were studied by physical means and specially by infrared spectroscopy by Gastuche and Fripiat (1962). Genesis of soil clays in the Congo has been the object of numerous studies published by the Louvain group. The importance in the synthesis process of the starting materials organization state has been recently emphasized by Fripiat and Gastuche (1963).

## 3. SURFACE CHEMISTRY OF CLAY MINERALS AND RELATED MATERIALS

The surface properties study of clay minerals, alumino-silicates, alumina and silica has been largely developed at the University of Louvain by Fripiat, Uytterhoeven, Gastuche and collaborators.

An almost complete report of the work done at Louvain in this field is given at this conference.

## 4. IONIC EXCHANGE MECHANISMS

At the State Agricultural University at Wageningen, Bolt and his group has recently investigated the equilibrium distribution between solution and clay using isotopic exchange.

Studies on the long-term release of K from illite are under way, employ-

ing  $K^{40}$  (Sumner and Bolt, 1962; Bolt, Sumner and Kamphorst, 1963; de Haan, Bolt and Pieters, 1963). Researches on the rate of diffusion of  $Ca^{45}$  into pure calcite and dolomite are also undertaken. Results obtained in mixed clay-carbonate systems indicate the formation of coating (presumably a Ca-silicate) at the contact between clay and carbonate (Lahav and Bolt, 1963). de Haan and Bolt (1963) have also studied the negative and positive adsorption of inorganic anions by some clay minerals.

At the University of Louvain, Laudelout and Eeckman (1961) have followed by kinetic techniques the spontaneous "aluminization" process of montmorillonite. Laudelout's group is continuing a careful work on the Al-H relationship in acid clays.

Laudelout and Martin (1963) have used a microcalorimeter for measuring the enthalpy and entropy changes of cationic exchanges in montmorillonite suspensions.

Cloos and Fripiat (1963) have studied the cation exchange mechanism between two solid materials, i.e. amberlite IR 120 and montmorillonite.

Due to the lack of information this review is surely not complete. As far as the author is aware there is no clay minerals group in the Netherlands but a very active Ceramic Society. In Belgium the opposite situation exists: there is no ceramic group but a recently organized Clay Minerals Group. Researches in the Universities are generally well known among scientists trained in this particular field but the situation is quite different for the industrial works which have not been touched here.

In fact a big gain could be made if European countries could unify their meetings on clay minerals into one annual conference comparable to the National Clay Conference. Among numerous benefits, it would allow one to write much more easily such a review.

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