CLAY-MINERAL RESEARCH IN BELGIUM (1945-1955)

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ABSTRACT

From 1945 to 1949 clay-mineral studies in Belgium were connected with the Comité Belge pour l'Etude des Argiles. In 1947 this group organized the C. I. P. E. A., which in turn helped to form active national groups of clay workers. Clay-mineral research is now pursued in five laboratories in Belgium. Projects in Brussels include industrial problems, study of reactions of silicates and the oxides of Al, Ca, and Mg; quantitative determinations by x-ray spectrometry; and the use of a differential thermobalance and electron microscopy. Basic clay-mineral problems involving agriculture are being studied at Heverlee, where investigations include studies of fixation of iron on kaolinites and examination of the topography of kaolinite minerals attacked by different reagents. A group at Tervuren has been concerned with formation, deferrization, and determination of oxides by D. T. A. The Laboratoire National des Silicates at Mons is investigating creep phenomena in refractories. The activities of the Ghent group are described in a separate paper.

Postwar work concerning clay minerals was connected first with C. O. B. E. A. (Comité Belge pour l'Etude des Argiles). This committee, sponsored by a number of large and small groups interested in clays as raw materials, was set up to survey the clay mineral resources of Belgium, to study them by a great variety of methods, and to provide advice for their possible utilization. The work was done in several private laboratories as well as in universities. A number of substantial reports were published by Dr. Lépingle, who acted as secretary and coordinator. The scope of the work set up by C. O. B. E. A. was too wide, the idea of cooperative research too new, the interests too different, and the funds too low. C. O. B. E. A., although still in existence, became inactive around 1949. It is fair to state that C. O. B. E. A. did extremely good work. Internationally, it organized, in 1947, the first postwar meeting devoted purely to clay minerals; this occasion was marked by the creation of C. I. P. E. A., which brought about the formation of active national groups. So far as Belgium was concerned, it directed attention to problems of clay mineralogy, and some of the workers who were attracted to it by C. O. B. E. A. continued their activity in this field.

At the present time, this type of research is pursued in five laboratories, namely: (a) the Department of Chemical Engineering of the University of Brussels under Prof. Ir. W(alter) De Keyser; (b) the Laboratories of the I. N. E. A. C., at Heverlee near Louvain, director Dr. J. Fripiat; (c) a section of the Chemical Laboratories of the Belgian Congo at Tervuren near Brussels; leader, Dr. G. Waegemans; (d) the Laboratoire National des Silicates, at Mons; director, Ir. H. Detaille; (e) the Department of Crystallography and Mineralogy of the University of Ghent, Prof. Dr. W(illy) Dekeyser.

We will now review briefly the activities of these groups.

In the Department of Chemical Engineering of Brussels University, Prof. W(alter) L. De Keyser is concerned mainly with problems which have, broadly speaking, an industrial background. Next to clay minerals, he is also interested in the reactions of silicates and the oxides of aluminum, calcium and magnesium.

Attention recently has been given to the possibility of determining quantitatively amounts of silicates and reaction products by x-ray spectrometry (De Keyser, 1954).

A differential thermobalance, developed recently (De Keyser, 1953), has some definite advantages over the usual type of thermobalance. The samples are put in equal amounts in two furnaces, which are controlled in such a way that a small and constant temperature difference exists between both samples during the entire run. By this procedure the registered curve; i.e., the difference in weight of both samples at different temperatures, can be represented by $dp/dt = f'(t)$ if we represent the total loss of weight p of a sample as $p = f(t)$, t being the temperature. Electron microscopy is also used, in collaboration with Dr. Degueldre.

I. N. E. A. C. is an institution created more than twenty-five years ago for improving agriculture in the Belgian Congo. So far, it has been highly successful. The organization has research and control stations in Africa, while basic problems are studied by a small group working in Belgium. Dr. J. Fripiat (who directs the group) and his collaborators are concerned primarily with clay minerals and sesquioxides as constituents of tropical soils. With Miss M. C. Gastuche he (Fripiat and Gastuche, 1952) has recently studied the surfaces of kaolinites and the layers of iron oxide which can cover them. Surface measurements by various methods, electron microscopy, and x-ray and electron diffraction were used for the examination of samples of natural kaolinites, minerals freed of iron by different methods and in various circumstances, and also of specimens on which oxides (γ-FeOOH, FeOOH, Fe_2O_3) were artificially precipitated in various conditions. This important study gave the following results:

(a) The iron oxide layers that cover the surface of natural kaolinite can be divided into two groups, which behave in different ways.

(b) Two types of kaolinite-iron oxide complexes exist, which have different surface structures and surface properties. One lowers the surface absorption, and the other increases it.

(c) The occurrence of each type depends on the kaolinite underlayer and seems to be determined by the nature of the planes forming the lateral boundary of the crystal.

The behavior of kaolinites under different conditions has also been studied. Interesting results on their etching have been obtained.

Two years ago, Dr. J. D'Hoore, who belongs to the African group of the same institution (I. N. E. A. C.), made a notable contribution to the study of laterites.

The Chemical Laboratories of the Belgian Congo, at Tervuren near Brussels, are concerned with chemical aspects of African raw materials. A group working under Dr. G. Waegemans is interested in clay minerals. Deferrization, water retention, and identification and dosage of iron oxides by D. T. A. are topics under investigation. Much attention has also been given to laterites (Waegemans, 1954; Waegemans and Vanderstappen, 1950).

The Laboratoire National des Silicates handles problems of pure technology, makes tests for industry, and also makes control apparatus. One of the topics under investigation at present is related to high-temperature creep phenomena in refractories (Detaille, 1955).

As the work of the Ghent group forms the bulk of a separate paper, it will not be reviewed here.

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