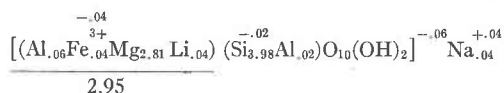


calculated for us by Margaret D. Foster of the Geological Survey, can be written thus:



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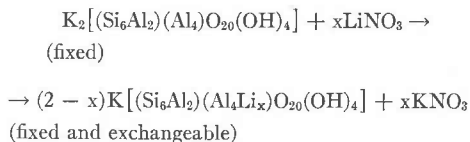
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REMOVAL OF REACTION PRODUCTS FROM MUSCOVITE
TREATED WITH MOLTEN LITHIUM NITRATE¹

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White (1954, 1956) published a method for reducing the negative layer charge of dioctahedral muscovite in which the muscovite is treated with lithium nitrate at 300° C. The reaction can be represented thus (White, 1958):



In this reaction the lithium ions displace potassium ions from layer positions, and some of the lithium ions migrate into empty octahedral sites. The net result is the lowering of layer charge.

Norrish (1954) showed that the layer charge is inversely proportional to the swelling ability of a clay mineral: hence, the reduction of layer charge should result in expansion of muscovite. White (1954, 1956, 1958) and Bronson *et al.* (1960) observed expansion in dioctahedral muscovite after treatment with molten lithium nitrate.

This method of reducing layer charge, accompanied by initiation and

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increasing of expanding properties is an excellent means of studying artificial weathering. In our work, it was found that potassium ions which had become exchangeable as a result of molten lithium nitrate treatment, were fixed again when the treated mineral was dispersed in water. The fixation of potassium by clay minerals is a well known phenomenon. It was necessary to devise a method for the removal of the products of reaction before suspension of the mineral in aqueous solution. The method of treating the muscovite is described by White (1954, 1956, 1958) and by Bronson *et al.* (1960).

PROCEDURE FOR REMOVAL OF REACTION PRODUCTS

Pour the molten sample as a "thin cake" on to a stainless steel plate and allow to cool.

If the sample is allowed to cool in the reaction vessel, it is hard and massive and very difficult to put into suspension.

Break the "thin cake" into small pieces as soon as it is cool enough to be handled comfortably.

If the sample remains in the air too long, it takes up moisture and becomes hydrated. The potassium ions from the potassium nitrate would become fixed and prevent expansion.

The small pieces of treated muscovite and the reaction products are immersed in isopropyl alcohol and shaken in a mechanical shaker to make a suspension. This non-aqueous system will not rehydrate. Wash repeatedly with isopropyl alcohol by centrifugation.

LiNO_3 , which is soluble in isopropyl alcohol, is removed.

Wash the sample three times with a 50:50 solution of ethylene glycol and isopropyl alcohol. In our work this solution was made 0.5 N to a single cation, and the clay mineral became saturated with the cation by the third washing. Lithium, sodium, potassium, ammonium, calcium, magnesium and iron were used as saturating cations, each one having been added as the chloride.

KNO_3 is soluble in ethylene glycol. The potassium ions are removed while the suspension is still non-aqueous and there is no opportunity for potassium fixation.

The muscovite of reduced-layer charge can finally be washed with water and the aqueous suspension used for further study.

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UNUSUAL CRYSTAL GROUPS FROM GREENE COUNTY, MISSOURI

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Some interesting crystal groups from "King's Butte," Greene County, Missouri, have been described by Ellis (1947) as being pseudomorphs of goethite after twinned pyrite crystals. These groups, when well developed, consist of three tabular crystals oriented at right angles to one another. The tabular crystals are themselves twinned and exhibit chevron shaped striae, such as are often seen on marcasite. Two other sets of striae, one in the centers of the blades and the other on their ends, are also present. Figure 1 illustrates a crystal group of this nature.

Ellis based his identification of pyrite as the original mineral on the pronounced cubic symmetry of the groups and an x -ray diffraction pattern of unaltered material from the centers of some groups. Further investigation of this material has revealed that the tabular crystals were

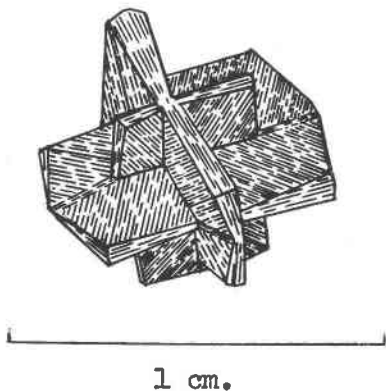


FIG. 1. Drawing of a crystal group from King's Butte showing the mutually perpendicular blades which exhibit chevron and other twinning striae.

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