

CLAYS and CLAY MINERALS

at a glance

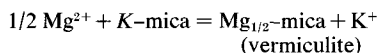
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LABORATORY ALTERATION OF TRIOCTAHEDRAL MICAS

Syed N. Hoda and William C. Hood 343
Artificial alteration of thirty-five trioctahedral and one dioctahedral micas by solutions varying in strength from 0.001 to 1.00 molal magnesium sulfate was found to approximate a normal exchange reaction after surface effects are eliminated. The equilibrium constants for the reaction:



range from 0.0001 to 0.0028 and average 0.0010 in value. X-ray diffraction study reveals that iron-rich micas tend to develop a 1:1 mixed-layer biotite-vermiculite structure in weak magnesium sulfate solutions whereas magnesium-rich biotite and phlogopite alter to vermiculite. Mica composition also influences the degree of alteration of mica to vermiculite. High fluorine and octahedral multivalent cation contents tend to retard the reaction whereas high magnesium content and perhaps high calcium contents tend to favor the alteration. The equilibrium constant data indicate that vermiculite and hydrobiotite are more stable than trioctahedral micas in most weathering environments.

REACTIONS BETWEEN FULVIC ACID AND Cu^{2+} -MONTMORILLONITE

M. Schnitzer and H. Kodama 359
Shaking of water-soluble fulvic acid with Cu^{2+} -montmorillonite at pH 2.5 increased the interlamellar spacing from 10.0 to 15.1 Å. The spacings were measured at ≈ 0% relative humidity. The extent of interlayer adsorption decreased with increase in pH. Differential thermal analysis and thermogravimetric examinations showed that in addition to interlayer adsorption, fulvic acid was also retained on external clay surfaces. The FA was held so tightly by the Cu^{2+} -clay that > ¾ of the total amount

adsorbed, including degradation products formed from it, resisted decomposition even when heated to 1000°C. IR spectra showed that β-diketone groups in fulvic acid reacted with Cu^{2+} in or on the clay to form acetylacetonate-type chelates. Indications were obtained that the mechanism postulated for the FA- Cu^{2+} -clay interaction may also apply to reactions between FA and montmorillonite saturated with other di- and trivalent metal ions. Reactions of FA in aqueous solutions with metal ions in the presence of clays differ from those in the absence of clay. Montmorillonite appears to affect the conformation of the fulvic acid polymer in a way that favours reactions between C=O groups and metal ions, a type of reaction that has so far not been observed in aqueous solutions in the absence of clay.

THE STABILITY OF GIBBSITE AND BOEHMITE AT THE SURFACE OF THE EARTH

Ward Chesworth 369
Two mutually exclusive views exist concerning the relative stabilities of gibbsite and boehmite in soils. These are examined in terms of experimental and thermodynamic evidence and it is shown that all three possible divariant assemblages of two phases that can exist between gibbsite, boehmite and H_2O may do so at 25°C and 1 atmosphere total pressure depending on the status of H_2O . It is further shown that the conditions of $\mu\text{H}_2\text{O}$ needed to stabilize boehmite + H_2O relative to gibbsite + H_2O or gibbsite + boehmite, are unlikely to occur in natural waters in the zone of weathering.

IMOGOLITE AND ALLOPHANE FORMED IN SAPROLITE OF BASALT ON MAUI, HAWAII

K. Wada, T. Henmi, N. Yoshinaga and S. H. Patterson 375
Inorganic gel and allophane collected from basaltic saprolite on Maui, Hawaii, and studied by Patterson in 1964 were reexamined. The main constituent of the gel is imogolite, and gibbsite and allophane are the minor con-

stituents. Electron and X-ray diffraction patterns, DTA curve, and an infrared spectrum of the gel are characteristic of imogolite. The allophane is virtually noncrystalline to X-rays but contains a small amount of imogolite in relatively short threads. High-resolution electron micrographs indicate differences in structural organization between allophane and imogolite and suggest crystallization of imogolite from allophane.

DETERMINATION OF CHLORITE COMPOSITIONS BY X-RAY SPACINGS AND INTENSITIES

S. W. Bailey

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The cell dimensions and compositions of four chlorites whose crystal structures have been determined in detail are used to test existing graphs and regression equations designed to give tetrahedral and octahedral compositions. It is found that the thicknesses of the tetrahedral sheet, the 2:1 octahedral sheet, the interlayer sheet, and the space between the 2:1 layer and the interlayer can vary

appreciably from specimen to specimen quite independently of tetrahedral composition. Total octahedral composition, the number of octahedral vacancies, cation ordering, and the distribution of trivalent cations and of charge between the two octahedral sheets must have effects on $d(001)$ that are additional to the effect of tetrahedral compositions with an average error of 10%, or about 0.1 Al^{IV}, for most trioctahedral chlorites. They are not valid for dioctahedral or di-, trioctahedral species. Equations derived from the data of von Engelhardt and of Shirozu relating the b parameter to octahedral Fe, Mn content give results with an average error of 10%, or 0.1 Fe, Mn for the four test chlorites provided Cr is included with the Fe, Mn, as does a regression equation by Kepezhinskas that contains terms for both the b parameter and $d(001)$. Methods using the (00l) intensities or structure amplitudes give less consistent results for heavy atom contents than the spacing methods, but can be used to give approximate values for the asymmetry in distribution of heavy atoms between the 2:1 octahedral sheet and the interlayer.