
Compositional Variation of a Vermiculite as Related to Particle Size

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Abstract: A vermiculite regolith sample from Llano, County, Texas, was divided into 16– 32, 8– 16, 4– 8, 2– 4, 1– 2, ½– 1, ¼–½, 1 10 – ¼, and 5 100 – 1 10 micron equivalent spherical diameter size-classes. A well-crystallized vermiculite found in association with the regolith was ground to –400 mesh.

The samples were analyzed by X-ray diffractometry and differential thermal analysis, and cation exchange capacity measurements were made for selected size fractions. Chemical analyses by X-ray fluorescence revealed a systematic increase in silicon with decreasing particle size. An increase in the iron content and a decrease in magnesium were also directly correlated to a decrease in the crystallite size. Aluminum content was constant throughout the range of particle sizes.

X-ray analyses showed that the coarser particles were trioctahedral, whereas the smaller crystallites were dioctahedral. These data were supported by recast formulae based on the chemical analyses. The recast formulae were substantiated by DTA and cation exchange capacity data as being reasonable approximations of actual formulae.

These observations are interpreted as an expression of chemical alteration that clay minerals may undergo in an aqueous environment. The crystallographic, cation exchange capacity, DTA, and swelling properties are a function of the chemical composition of the crystallites. Chemical composition of the crystallites is shown to be directly correlated to particle size.

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