Transmission Electron Microscope Data for Rectorite: Implications for the Origin and Structure of "Fundamental Particles" [1]

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Abstract: Alternating mica-like and smectite-like layers of rectorite give rise to periodically varying contrast in 10-Å lattice fringes, yielding a periodicity of 20 Å in a transmission electron microscopic study. Expansion of rectorite using dodecylamine hydrochloride yields a three-layer repeat of thickness 32–35 Å, consisting of a basic 20-Å unit, identical to that in images of collapsed, dehydrated rectorite, and a 12–15-Å thick, intercalated organic layer.

Thin packets of layers derived by grinding the sample are only 20 Å thick, or multiples thereof. Serrated edges of rectorite grains likewise have steps 20 Å in height, implying that mechanical cleavage occurs readily along the weakly bonded, smectite-like interlayers. The "fundamental" 20-Å unit is proposed to be compositionally centered on an interlayer bounded by two identical T-O-T layers, each of which has compositionally different tetrahedral sheets. Such structural considerations suggest that resultant 20-Å, units ("rectorite units") are unique in structure and chemistry relative to true illite. These results further imply that grinding and other treatment of coherent crystals of clay minerals may produce individual unit layers. Moreover, when coupled with size-separation, such treatment may yield X-ray powder diffraction data that reflect reconstituted layer sequences.

Key Words: "Fundamental particles," • Illite • Interstratification • Lattice fringe images • Rectorite • Smectite • Transmission electron microscopy

Clays and Clay Minerals; April 1986 v. 34; no. 2; p. 180-186; DOI: 10.1346/CCMN.1986.0340208

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