
Compositional Variation in Component Layers in Natural Illite/Smectite

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Abstract: Published chemical data for suites of mixed-layer minerals from diagenetic sedimentary rocks, hydrothermally altered tufts, and a metasomatic bentonite bed indicate that the layer charge and composition of the different components of illite/smectite (I/S) differ from one geological environment to another. It appears that the composition of the elemental smectite and illite layers in the I/S is more or less constant for samples within each geologic setting. In the examples considered, the smectite layers are predominantly montmorillonitic in character (i.e., the charge is in the octahedral site), whereas the illite layers show different types of charge sites, depending upon the suite studied. Illite layers appear to have about the same charge in all three suites studied, slightly more than 0.7 per $\text{O}_{10}(\text{OH})_2$ unit, whereas the smectite layers in the different suites range in charge from about 0.3 to 0.7 per $\text{O}_{10}(\text{OH})_2$ unit. Cation-exchange capacities reflect these differences in charge, although not ideally. The differences in the composition of the component layers in each geologic suite of mixed-layer clays are probably due either to differences in the bulk chemistry of the rocks in the different suites or to differences in intensive variables, such as temperature and pressure, of the regime under which they have formed.

Key Words: Bentonite • Cation-exchange capacity • Diagenesis • Hydrothermal • Illite • Interstratification • Smectite

Clays and Clay Minerals; December 1986 v. 34; no. 6; p. 651-657; DOI: [10.1346/CCMN.1986.0340605](https://doi.org/10.1346/CCMN.1986.0340605)

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