
Chemical and Physical Properties of Paleozoic Potassium Bentonites from Kinnekulle, Sweden

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Abstract: The <1- μm fraction of 17 bentonite samples from KinnekuUe, southwest Sweden, were studied by chemical analysis, X-ray powder diffraction, and cation-exchange capacity. The bentonites are interbedded with undeformed, flat-laying Ordovician and Silurian sediments and were formed by the transformation of volcanic ash (dated at about 450 Ma) into smectite, which later converted to mixed-layer illite/smectite (I/S). The reaction, possibly driven by heat from an overlying diabase intrusion (about 300 Ma), stopped at different stages of conversion, as evidenced by the I/S which ranges in composition from 60 to 10% smectite layers. A 2-m-thick bed shows zonation, with decreasing smectite proportions towards the upper contact. The zonation is not symmetrical towards the lower contact. In thin beds the illite proportion is higher and the regularity of ordering is inversely proportional to the thickness of the bed. K:Rb and K:Sr ratios follow the illite pattern; the ratios are highest at the contact and in thin beds. The inhibiting effect of Ca and Mg on the smectite-to-illite conversion probably was the cause of less-reacted smectite in the center of the thick bed.

Key Words: Bentonite • Igneous intrusion • Illite • Interstratification • Potassium • Smectite • X-ray powder diffraction

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