Weathering and Orientation in Triassic Clay Sediments of New Jersey

William Lodding and Edward Sturm

Department of Geology, Rutgers—The State University, New Brunswick, New Jersey
Department of Geology, Brooklyn College of the City University of New York, Brooklyn, New York

Abstract: The composition of clay mineral suites derived from Triassic argillite and shale were compared with those of the consolidated parent sediments. Lockatong argillite, near the weathered zone, is composed mainly of illite, chlorite, and feldspar. In the clay horizon immediately above it, illite replaces the feldspar and kaolinite increases with distance from the contact until, near the top of the weathered zone, it is almost the only clay mineral present. A similar study was carried out on Brunswick shale. Here the parent rock consists mainly of illite, and some kaolinite, montmorrilonite, quartz, and feldspar. The kaolinite increases gradually as one progresses upward through the weathered zone, montmorillonite decreases, but approximately 30 per cent illite is still found in the top layers. Chlorite in the argillite near the weathered zone is randomly oriented while illite shows strong preferred orientation, probably indicating that chlorite formed in place during weathering. Illite in the Brunswick shale shows strong preferred orientation.

These two Triassic sediments are less than 5 miles apart and one may assume that they had a similar post-depositional environment. The difference in diagenetic development is striking and must be attributed mainly to the chemical composition and lithology of the parent sediment.

The orientation of clay particles in the solid rock was studied with the aid of an X-ray diffraction technique based on the analysis of cylindrical samples. Three-dimensional intensity data thus obtained were presented by vectors whose ends form a surface which is characteristic of the orientation of the particles. Generally the vectors generate hemispherical normal distributions whose principal vector coincides with the normal to the bedding plane.

Clays and Clay Minerals; July 1968 v. 16; no. 2; p. 179-186; DOI: 10.1346/CCMN.1968.0160209

Clay Minerals Society (www.clays.org)