ORDOVICIAN K-BENTONITES OF IOWA

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ABSTRACT

THIN beds of altered volcanic ash, called K-bentonite, are distributed widely in Ordovician strata of the eastern United States. This study reports the mineralogy and stratigraphy of eight such beds found in limestones and shales of the Decorah and Galena formations (Middle Ordovician) of northeast Iowa and adjacent parts of Minnesota, Wisconsin and Illinois.

The clay-size material of the Iowa bentonites consists almost entirely of randomly interstratified illite–montmorillonite, with a range of illite : montmorillonite ratios from 4 : 1 to 7 : 3. Thus, they are similar to Ordovician K-bentonites reported by others from eastern states. The mica polytype is dioctahedral $1M_d$ to 1M of low temperature origin. In contrast, the predominant clay mineral in the normal marine limestones and shales is well-crystallized, $2M_1$, dioctahedral illite. The contacts between bentonites and limestones or shales are distinct; in a few exposures a thin zone of finely laminated, reworked bentonite is observed directly above the bentonite. The bentonites themselves are unlaminated.

Accessory sand-size mineral grains from bentonites consist of euhedral apatite, euhedral zircon, sanidine, pyrite, biotite and hornblende, whereas those from shales are organic apatite, quartz and calcite. The bentonite assemblage is suggestive of volcanic origin, and is similar to Ordovician K-bentonites east of Iowa.

Differential thermal analysis reveals that the clay mineral of bentonites altered at low temperatures through a montmorillonite stage and became more micalike by K fixation. In contrast, DTA indicates that the illite of shales originated as mica and is slightly weathered toward a montmorillonitelike phase. Laboratory saturation of clays from adjacent bentonites and shales with K^+ demonstrates similar relationships.

The usefulness of bentonites as key horizons for correlation within the Ordovician is limited by several difficulties. Removal of ash by contemporaneous reworking, the probable multiple centers of volcanic activity in the Appalachian region and the great number of essentially identical bentonites within a stratigraphic interval are major problems.

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