

Analysis of Parent Source Material of Calcium Bentonite in Smith County, Mississippi

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ABSTRACT

Bentonite deposits of the Glendon and Bucatunna formations of the Oligocene Vicksburg Group located in Smith County, Mississippi, were examined to determine the depositional environment, diagenetic history and origin of the bentonite. The Mississippi bentonite deposits consist of calcium montmorillonite, a smectite clay with an aluminum silicate and calcium structure. A widely accepted theory is that calcium bentonite deposits formed as a result of weathering of volcanic ash deposits. The hypothesis tested is that the Glendon and Bucatunna bentonite deposits are not a result of weathered volcanic ash, but are a result of weathered marl. Core samples were drilled from the Chisholm bentonite mine near Raleigh in Smith County. Samples studied by x-ray diffraction (XRD), scanning electron microscopy (SEM), and petrographic microscopy revealed zones of poorly sorted angular quartz grains, glauconite, pyrite, organic matter, marine fossils (coccoliths, echinoderm fragments, and benthic and planktonic foraminifera), abundant bacteria, micrite, and evidence of extreme diagenesis resulting in significant microporosity (maximum of 24%). Abundant bacteria (filamentous, coccus, and bacillus) along with nanometer-scale organic textures are consistently associated with bentonite, illite, and/or smectite. No evidence of volcanic ash has been found. It appears that the clays in the Glendon and Bucatunna formations of Smith County, Mississippi formed from the weathering, including bacterial activity, of glauconite-bearing marl.