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# Origin and Classification of Coastal Plain Kaolins, Southeastern USA, and the Role of Groundwater and Microbial Action

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**Abstract:** Along the inner Coastal Plain, kaolinite-metahalloysite-rich, neritic muds of Cretaceous-Eocene age have undergone intense postdepositional alteration in the recharge area of the regional groundwater system. Weathering processes have had the following profound effects on the original sediments: 1) strong compositional and textural modification of both clay and non-clay minerals; 2) whitening of the originally darker sediments by partial removal of organic matter, Fe and Mn; and 3) recrystallization of kaolinite and metahalloysite, most conspicuous where there are coarse stacks and vermiforms. Where the combination of initial sediment composition and alteration intensity was most favorable, these changes have produced important deposits of commercial quality, which now sustain the world's largest kaolin production district. The earliest change was partial sequestration of iron as sulfide and concurrent destruction of some organic matter, mediated by sulfate-reducing bacteria. Subsequent weathering resulted in gradual leaching of alkalies, alkaline earths, iron and silica, and attendant nucleation and growth of minerals compatible with the compositional changes. The existence of several closely spaced erosional unconformities, separated by neritic sediments, is proof that weathering conditions commonly changed at a given site, in response to changes in thickness or lithology of the overlying rocks. Dyoxyic → ← oxyic reversals modified both the rate and kind of alteration. ( “Dyoxyic” refers to molecular oxygen concentration too low to be toxic to anaerobes or cause abiotic oxidation; less extreme than “anoxic” .) Kaolins were produced partly by slower dyoxyic weathering in saturated groundwater zones but mainly by more rapid oxyic weathering in unsaturated zones, where bauxites also locally formed. Gradual transformation of some sediments to kaolin rarely began and ended in the same epoch. At several places most of the kaolinization (see “Definitions” ) took place during Recent time, tens of millions of years after deposition of the sediments. Since the kaolins resulted from postdepositional alteration rather than sedimentary processes, they are better referred to as “Coastal Plain” rather than “sedimentary” kaolins.

**Key Words:** Bauxite Origin • Kaolin Classification • Kaolin Origin • Microbial Weathering • Weathering

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