Mineralogy, Crystallinity, O^{18}/O^{16}, and D/H of Georgia Kaolins

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Abstract: Mineralogy, kaolin crystallinity, Fe content, δO^{18}, and δD were determined for late Cretaceous "soft" and early Tertiary "hard" Georgia kaolins. The crystallinity of the <0.5-, 0.5 – 1.0-, and 1.0 – 2.0- μm size fractions of soft kaolins was higher than that of equivalent size fractions of hard kaolins. δO^{18} and δD of the soft and hard kaolins ranged between 18.5 to 23.1‰, and −64 to −41‰, respectively, and could not be used to discriminate soft from hard kaolins. The trends of crystallinity vs. δO^{18} were different for kaolins collected at different localities, and, for a given sample, δO^{18} generally decreased with increasing crystallinity and with increasing crystallite size. These data indicate that the Tertiary kaolins could not have been simply derived from the Cretaceous kaolins by winnowing unless post-sedimentation recrystallization of one or both occurred. δD vs. δO^{18} systematics indicate that the late Cretaceous to early Tertiary Georgia kaolins crystallized over a temperature range of about 15 ° C in the presence of waters that varied little in isotopic composition.

Key Words: Crystallinity • Hardness • Isotope • Kaolin • Origin • Oxygen isotopes

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