
Changes in Particle Morphology During Illitization: An Experimental Study

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Abstract: Smectite was reacted at several temperatures between 200° C and 500° C to produce interstratified illite/smectite (I/S) with different proportions of expandable layers. Dispersed and sedimented products were examined using a transmission electron microscope. Particle size and aspect ratio showed no systematic change as a function of reaction extent during R0 illitization. However, particles exhibited rounded edges during the early stages of the reaction, suggesting some dissolution of primary smectite. Additionally, increasing particle contrast in the electron beam suggests thickening of particles with increasing reaction extent. The thickening of particles is thought to be produced by the nucleation and precipitation of secondary illite layers on primary smectite layers. In the most extensively reacted I/S, particles have become aggregated into clumps or quasicrystals by lateral growth of illite layers. Internal uniformity of crystallographic alignment of individual growing crystals within each aggregate was reflected in the increasing frequency of 60° and 120° interfacial angles within each aggregate. In highly illitic I/S, these aggregates took on an overall euhedral form and became crystallographically contiguous, producing single crystal electron diffraction patterns.

Key Words: Illitization • Morphology • Particle • TEM

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