Smectite Tactoid Formation induced by Confined and Double Layer Monovalent Cations. (S02-pils152744-Oral)

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Abstract:

Soil colloid dispersion is an important phenomenon, which influences soil erosion, toxin and nutrient transport, crusting of surface soils, siltation in rivers and lakes. The mechanisms governing colloidal dispersion behavior are associated with both interlayer expansion (crystalline swelling) and double layer swelling of expandable clays. The classical DLVO theory predicts that high ionic strength compresses the electric double layer associated with colloidal surfaces inducing flocculation. With increasing monovalent cation concentration ratios, the DLVO predicts an increase in osmotic pressure in the electric double layer, hence soil colloid dispersion. However, DLVO theory does not predict the formation and destruction of quasicrystals. With increasing CRx, the 1.4 nm XRD peaks both broaden and decrease in intensity suggesting that Ca-quasicrystals are becoming smaller. At high CRx, broad and low-intensity 1.2 nm XRD peaks start to appear, suggesting the formation of potassium- or ammonium-quasicrystals. Results of the study indicate that soil colloid dispersion is influenced by both DLVO phenomena and quasicrystal formation and destruction.

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