
The Influence of Alkaline Solutions on the Alteration of the Clay Minerals

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Abstract: The influence of an alkaline environment on clay mineral alterations in the laboratory was studied by means of one-dimensional structural analyses. Samples of illite, illite-mixed-layered material, kaolinite, and two montmorillonites (smectites) were treated with NH_4OH solutions of pH 8.5, 9.5, 10.5, 11.5, and 12.5 for 6, 12, 24, 48, 72, and 96 hr at 60° C.

One-dimensional structural analyses of the treated samples are quite demonstrative in determining the effects of laboratory-controlled degradation. These analyses show an oscillatory change in the population of the tetrahedral and octahedral structural sites which is consistent with a core-rind structural concept of the clay minerals. Leaching of clay minerals takes place by the alternate growth of the rind and destruction of this frayed edge by agitation. The extent to which the rind develops is controlled by particle size, variability of chemical composition, and the amount of agitation. The order of increasing development of the frayed edge is; kaolinite, illite, illite-mixed-layered material, and then the montmorillonite.

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