Swelling Characteristics of Hydroxy-Aluminum Interlayered Clays*

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Abstract: The hypothesis tested was that macroscopic swelling of montmorillonitic clays is reduced by the presence of interlayer minerals. Fine and coarse clay fractions of Camargo and Panther Greek bentonite samples were artificially interlayered by reaction of $Al_2(SO_4)_3$ and NaOH in 0 · 5% suspensions of the clays. All four clay fractions reacted similarly to artificial interlayering. At an Al:clay ratio of 16 meq Al/g clay the CEC was completely lost, surface area was reduced and X-ray basal spacings were altered. No macroscopic swelling occurred in samples treated with 16 meq of Al/g of clay. At smaller concentrations of hydroxy-aluminum 8 and 2 meq Al/g clay, the clay properties were less drastically altered. Extraction of interlayered clays with Na citrate restored the original C.E.C., surface area, and basal spacings of all samples and resulted in some slight enhancement of C.E.C. and surface areas of the coarse fractions. Treatment with hot Na citrate resulted in an increase in swelling ability but only slight increases in C.E.C. and surface area. Evidence presented supports the hypothesis that macroscopic swelling of montmorillonitic clays is greatly reduced by interlayer materials. Reduced swelling due to interlayering occurs even when other clay properties may be slightly different from those of nontreated samples. Indications are that interlayer material occurs naturally in the clays studied and this may apply to other bentonite deposits.

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