
Lithium and Potassium Absorption, Dehydroxylation Temperature, and Structural Water Content of Aluminous Smectites*

Leonard G. Schultz

U.S. Geological Survey, Federal Center, Denver, Colo. 80225

* Publication authorized by the Director, U.S. Geological Survey.

Abstract: X-ray analysis of Li⁺- and K⁺-saturated samples, differential thermal analysis (DTA), thermal gravimetric analysis (TGA), and chemical analysis of 83 samples enable a distinction to be made between Wyoming, Tatatilla, Otay, Chambers, and non-ideal types of montmorillonite, and between ideal and non-ideal types of beidellite. The Greene-Kelly Li⁺-test differentiates between the montmorillonites and beidellites. Re-expansion with ethylene glycol after K⁺-saturation and heating at 300° C depends upon total net layer charge and not upon location of the charge. Wyoming-type montmorillonites characteristically have low net layer charge and re-expand to 17 Å, whereas most other montmorillonites and beidellites have a higher net layer charge and re-expand to less than 17 Å.

Major differences in dehydroxylation temperatures cannot be related consistently to the amount of Al³⁺-for-Si¹⁺ substitution, nor to the amount of Mg, Fe, type of interlayer cations, or particle size. The major factor controlling temperature of dehydroxylation seems to be the amount of structural (OH). Of 19 samples analyzed by TGA, montmorillonites and the one ideal beidellite that give dehydroxylation endotherms on their DTA curves between 650° and 760° C all contain nearly the ideal amount of 4(OH) per unit cell, but the non-ideal montmorillonites and beidellites that give dehydroxylation peaks between 550° and 600° C do not. Non-ideal beidellites contain more than the ideal amount of structural (OH) and non-ideal montmorillonites seem to contain less, although the low temperature of dehydroxylation of the latter could also be due to other structural defects. Change in X-ray diffraction intensity of the 001 reflection during dehydroxylation suggests that the extra (OH) of beidellite occurs at the apex of SiO₄ or AlO₄ tetrahedrons with the H⁺ of the (OH)⁻ polarized toward vacant cation sites in the octahedral sheet.

Clays and Clay Minerals; August 1969 v. 17; no. 3; p. 115-149; DOI: [10.1346/CCMN.1969.0170302](https://doi.org/10.1346/CCMN.1969.0170302)
© 1969, The Clay Minerals Society
Clay Minerals Society (www.clays.org)
