
Influence of Exchange Ions on the *b*-Dimensions of Dioctahedral Vermiculite*

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* Contribution from the Department of Soil Science, North Carolina Agr. Exp. Sta., North Carolina State University, Raleigh. Published with the approval of the Director as Paper No. 2274 of the Journal Series.

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Abstract: The 1– 5 μ size fractions of different ground muscovites were treated for a 30-day period for K^+ removal with a pH 7.5 solution containing sodium tetraphenylboron. The initial K^+ contents ranged from 211 to 219 me/100 g. After the extraction period, the final K contents ranged from 21 to 37 me/100 g. The apparent structural charge on the expanded material decreased to values ranging from 156 to 184 me/100 g, which are within the charge range for natural vermiculites. The *b*-dimensions of these laboratory-produced vermiculites were found to vary with the exchange ion and with the hydration state of the ion. For hydrated samples, saturation with Cs^+ , Li^+ , and Mg^{2+} ions increased the observed *b*-dimension in comparison to that of the corresponding parent mica, whereas saturation with Sr^{2+} and La^{3+} ions had little effect on *b*. After dehydration at 350° C, only Cs^+ -saturated samples had a *b*-dimension greater than that of the parent mica. The observed *b*-dimension for the dehydrated samples was found to be a direct function of the crystal radius of the interlayer ion. Apparently, as the ion dehydrates, the surface oxygen triads rotate until some of the oxygens "lock" onto the ion, limiting the minimum *b*-dimension. Before dehydration, however, the water of hydration in the interlayer region is evidently held with sufficient energy to limit rotations of the oxygen triads that give rise to a decrease in *b*. When Li^+ and Mg^{2+} ions occupy the interlayer region, their water network apparently even produces a slight increase in the observed *b*-dimension.

Clays and Clay Minerals; 1967 v. 15; no. 1; p. 149-161; DOI: [10.1346/CCMN.1967.0150115](https://doi.org/10.1346/CCMN.1967.0150115)

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