
Cation Exchange Capacity of Layer Silicates and Palagonitized Glass in Mafic Volcanic Rocks: A Comparative Study of Bulk Extraction and *In Situ* Techniques

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Abstract: The cation exchange capacities (CEC) and extractable cations in smectite, corrensite and palagonitized glass from hydrothermally-altered pillow lavas and hyaloclastite breccias were measured by both bulk wet chemical and *in situ* microanalytical techniques. Smectite has CEC's between 60 and 120 meq/100 g, palagonitized glass between 30 and 60 meq/100 g, and corrensite approximately 35 meq/100 g as determined by the *in situ* CsCl-exchange method. These experiments generally verify that Cs exchanges for those cations that are presumed (from the stoichiometry implied by microprobe analyses) to occupy interlayer sites in sheet silicates. Results of conventional CEC determinations are consistent with those determined by the *in situ* experiments: the individual microanalytical values for smectite and palagonitized glass bracket the bulk CEC values. The *in situ* experiments imply that Mg is the major extractable cation in smectite, Ca in corrensite, and both Mg and Ca in the palagonitized glass. We speculate that discrepancies between the equivalents of extractable cations predicted from elemental analysis and the equivalents of Cs sorbed may be due to the presence of charge-balancing protons that are not detected by the microprobe analyses. The sum of equivalents of cations extracted by NH₄-acetate is about the same as the CEC determined by both the *in situ* and the bulk methods. Cation proportions indicated by NH₄-acetate extractions from bulk samples are also generally consistent with the *in situ* results for all elements except Mg, which is a minor leachate of the NH₄-acetate extractions in all the samples. To explain this discrepancy, we propose that 1) Mg may occupy structural sites within palagonitized glass, which inhibit its extraction by NH₄ or Cs, and/or 2) there is a significant quantity of smectite, unsampled by the electron microprobe analyses, which contains insignificant interlayer Mg.

Key Words: Cation Exchange Capacity • Corrensite • Electron microprobe analysis • Extractable cations • Palagonite • Smectite

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