
pH Dependent Ion Exchange Properties of Soils and Clays from Mazama Pumice*

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Abstract: Cation exchange capacity (CEC) measurements were made for whole pumice soil samples by several methods, including standard procedures involving cation saturation, excess salt removal, and cation displacement steps, and a $^{45}\text{Ca}^{2+}$ radioisotope dilution procedure. Results indicated that the vesicular pores of the pumice soil material affected attainment of ion diffusion equilibria, and, hence, introduced a large source of error in the measurements. On this basis, the validity of ion exchange values obtained for these soils was concluded to be subject to considerable doubt. More important, however, the solute and/or solution exclusion or retention exhibited by pumice particles during the course of CEC procedures was thought to be highly significant with respect to the probable influence exerted on physical, chemical, and biological properties of the soils in the field situation.

Interpretation of pH dependent cation and anion exchange capacity measurements of the $<2\mu$ clay fraction of the pumice soils was confounded by the occurrence of hydroxy interlayered 2 : 1 phyllosilicate materials in admixture with the amorphous components. Since the interlayered materials contributed an indeterminate proportion of the total pH dependent charge of the mixture, it was further concluded that the measurement of this property was of little direct value in assessing the relative amounts of amorphous and crystalline components in the clay fractions of the soils investigated. However, the values obtained revealed fundamental aspects of ion exchange behavior which are important to understanding the complex systems involved.

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