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# Effect of Magnesium on the Hydraulic Conductivity of Na-Smectite-Sand Mixtures<sup>1</sup>

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**Abstract:** Changes in hydraulic conductivity (HC) and clay dispersion of smectite-sand mixtures as a function of exchangeable Na in Na-Ca and Na-Mg systems were measured. The charge density on the smectites had no effect on Na-Ca and Na-Mg equilibrium, and the affinity of the clays for Na was similar in both systems. A decrease in HC at 0.01 M concentration was found to be due to clay swelling. Mg was found to be less effective than Ca in preventing the breakdown of the packets by low concentrations of exchangeable Na, and Na-Mg-smectite swelled more than Na-Ca-smectites.

Na-Mg-clay particles dispersed more readily than Na-Ca-clay particles when the mixtures were leached with distilled water; however, if the electrolyte concentration in the clay-sand mixture was controlled by the leaching solutions, no difference between the Na-Mg- and Na-Ca-clays was noted. Thus, the effect of Mg on clay mixtures leached with distilled water was apparently due to the effect of Mg on the hydrolysis of the clays. Increase in charge density increased the stability of the R<sup>2+</sup> clay packets, and higher concentrations of Na were needed to break the packets. Mg was less effective than Ca in stabilizing the packets, and lower concentrations of Na were needed to break the Mg-packets.

**Key Words:** Charge density • Dispersion • Hydraulic conductivity • Magnesium • Salinity • Smectite • Swelling

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