Correlation of Hydraulic Conductivity of Clay–Sand Compacted Specimens with Clay Properties

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Abstract

Hydraulic conductivity of compacted specimens consisting of 1 of 16 clay samples and siliceous sand/natural soils was measured using permeameters with flexible wall cells. Clay samples studied were eight natural bentonites, one purified montmorillonite, five standard clay samples, one synthetic hectorite, and two cation-exchanged bentonites. The clay content to whole solid was fixed at 11.5% w/w, and the mixtures were rammed in a mold to form disk compactions. A higher hydraulic conductivity was observed with increase in the Ca/Na ratio of clay. Hydraulic conductivity was also affected by bentonite content of the clays and the mineral content. A relation between the hydraulic conductivity and the characteristic index properties of the clays such as chemical concentration, methylene blue adsorption capacity (MB), and so on were elucidated, and then a polynomial expression was derived to reproduce measured hydraulic conductivity data. This relation was then utilized to estimate hydraulic conductivity of blended bentonites from characteristic properties of the component bentonites.

Keywords

Hydraulic conductivity;
Bentonite;
Smectite;
Soil;
Mineral liner