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Effects of $CaCl_2$ solution on physical, index properties of liner materials

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The main task of clay liners in landfills is to mitigate the migration of pollutants to the groundwater sources. Leachate includes different types of inorganic and organic compounds which affect physical, index properties of clay liners that can affect the long-term performance of these clay liners as a barrier. The $CaCl_2$ solution exerts the strongest effect on clay liner materials than any other chemicals in leachate. The objective of this study was to evaluate the effect of inorganic salt $CaCl_2$ on some physical, index properties of expansive soil (Soil M) obtained from Moragahakanda area. Also, the effect of $CaCl_2$ on Soil M amended by 5% (Soil M+5%) and 10% (Soil M+10%) bentonite, on selected physical, index properties was investigated. The effect on physical, index properties was investigated by carrying out Atterberg Limits Tests, Modified Free Swell Index, Specific Gravity, Shrinkage Limit and Mechanical Analysis before and after samples consolidated under pressures of 50, 100, and 200 kPa were subjected to the permeation of 1M $CaCl_2$ solution under gradually increasing constant head of 50, 100 and 150 kPa, up to replacement of their void volumes by as much as 20 times to simulate long-term contact. After long-term contact of consolidated soil samples with $CaCl_2$ solution, the Liquid Limit value of Soil M, Soil M+5% and Soil M+10% was found to be decreased by 22%, 19% and 31% respectively, but only the Plastic - value of Soil M+10% was increased by 12% points. Although LL and PI values were reduced after contact with $CaCl_2$ solution, the soil classification of Soil M (CH) and Soil M+5% (CH) did not change. However, Soil M+10% was reclassified from Clay of Very High Plasticity (CV) to Clay of High Plasticity (CH). These test results indicated that $CaCl_2$ salt affected the plasticity of all candidate soils even up to the extent of changing the soil classification for the expansive soil amended by 10% bentonite.

Key words: Bentonite, $CaCl_2$ solution, clay liners, expansive soil, index properties, physical

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