

Surprising Behaviour of Kaolinitic Soils under Alkaline Environment

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Abstract : Soil environment gets contaminated due to rapid industrialisation, agricultural-chemical application and improper disposal of waste generated by the society. Unexpected volume changes can occur in soil in the presence of certain contaminants usually after the long duration of interaction. Alkali is one of the major soil contaminant that has a considerable effect on behaviour of soils and capable of inducing swelling potential in soil. Chemical heaving of clayey soils occurs when they are wetted by aqueous solutions of alkalis. Mineralogical composition of the soil is one of the main factors influencing soil-alkali interaction. In the present work, studies are carried out to understand the swell potential of soils due to soil-alkali interaction with different concentrations of NaOH solution. Locally available soil, namely, red earth containing kaolinite which is of non-swelling nature is selected for the study. In addition to this, two commercially available clayey soils, namely ball clay and china clay containing mainly of kaolinite are selected to understand the effect of alkali interaction in various kaolinitic soils. Non-swelling red earth shows maximum swell at lower concentrations of alkali solution (0.1N) and a slightly decreasing trend of swelling with further increase in concentration (1N, 4N, and 8N). Marginal decrease in swell potential with increase in concentration indicates that the increased concentration of alkali solution exists as free solution in case of red earth. China clay and ball clay both falling under kaolinite group of clay minerals, show swelling with alkaline solution. At lower concentrations of alkali solution both the soils shows similar swell behaviour, but at higher concentration of alkali solution ball clay shows high swell potential compared to china clay which may be due to lack of well ordered crystallinity in ball clay compared to china clay. The variations in the results obtained were corroborated by carrying XRD and SEM studies.

Keywords : alkali, kaolinite, swell potential, XRD, SEM

Conference Title : ICSMGE 2015 : International Conference on Soil Mechanics and Geotechnical Engineering

Conference Location : Paris, France

Conference Dates : February 23-24, 2015