# Determination of the Coefficients of Volume Change with Respect to Concentration and Pressure in Saturated Shale

Mohammad Deriszadeh and Ron C. K. Wong
University of Calgary, Calgary, AB, Canada.

Theoretical models on the volume change of saturated argillaceous materials (e.g., shale) were investigated using experimental study. The behavior of clay minerals as an effective source on the volume change of shale was studied. Different compositions of clay powders reconstituted with sodium chloride solution at various concentration levels were tested under external loading-unloading cycles. Experimental data showed that current theoretical models could only be suitable for particle suspensions and cannot describe the volume change behavior of saturated samples with considerable solid to solid contacts. Coefficients of volume change with respect to changes in pore fluid pressure and concentration as well as external loading were defined for modeling purposes. Experimental results were applied to find the correlations among the defined coefficients of volume change and concentration and pressure of pore fluid as well as external loading. Obtained coefficients were applied for simulating the volume change (swelling/consolidation) of shale. Swell tests data on natural shale samples recovered from the field as well as artificial cores are presented along with calculated values to verify the theoretical model based on the defined coefficients.