Effect of gypsum-anhydrite on the behavior of expansive clays.

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Abstract

The unique chemical features of calcium sulfate are manifested by phase transformation of the mineral as a result of the reversible hydration-dehydration reaction and dissolution. Due to the harsh climatic and environmental conditions in Eastern Saudi Arabia, such chemical features of calcium sulfate add to the potential hazards to local expansive clays. This research was formulated to study the interaction of calcium sulfate phases, specially gypsum and anhydrite, with expansive clays. For this purpose, laboratory investigation of the geotechbnical, mineralogical, volume change, and leaching characteristics of the expansive clay, calcium sulfate phases and their mixtures were investigated.

The results indicated that gypsum is the stable phase of calcium sulfate up to 130 °C, whereas anhydrite is stable beyond 220 °C. The geotechnical properties of clay-calcium sulfate mixtures varied linearly according to the weighted average of the constituents of each mixture. Anhydrite had the highest swell capabilities whereas gypsum swelled relatively marginally. The swell potential of clay decreased as the amount of calcium sulfate was increased and the effect was more pronounced when gypsum is used. The swell pressure was the highest in the conventional odometer ring followed by the large-scale circular mold and then by the large-scale square mold. The average lateral pressure was one third the average vertical pressrue. For circular sampels, vertical pressure is maximum at the edge and minimum at the center of the sample. For the square samples, vertical pressure was highest at the corner and least at the centre of the sample. Upon leaching, the void ratio reduced such that the decrease was more pronounced when brine is used as the percolating fluid.