Distribution of grout material within 1-m sand column in insitu calcite precipitation technique

By Debendra Neupane, Hideaki Yasuhara, Naoki Kinoshita, and Heriansyah Putra

This study evaluates the potential of improving an insitu calcite grouting technique. The grout is composed of an equimolar solution of urea–CaCl2 and an enzyme named urease. We examine the distribution of the grout materials and precipitated calcite within sand columns with a diameter of 5 cm and a height of 100 cm. In the first series of experiments, the concentration distributions of the individual grout materials (i.e., urea, CaCl2, and urease) within the sand specimen are evaluated. In the second series of experiments, an enzyme-reagent mixed solution (i.e., grout) is injected into the sand columns to evaluate the distribution of calcite. Sand samples are collected from various vertical locations within the treated column sand the amount of precipitated calcite is evaluated. Furthermore, attempts are made to achieve the uniform distribution of the injected grout and hence uniform calcite distribution throughout the specimen.
The results show that a uniform distribution of the grout materials up to a distance of 1m from the inlet is achievable. It is also observed that a relatively uniform distribution of calcite is achievable as long as the rate of calcite precipitation is well controlled. Full paper available in 2015 Soils and Foundation