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Laboratory triaxial test behavior of xanthan gum biopolymer treated sands

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ABSTRACT

Gel-type biopolymers have been introduced as new environmentally friendly soil binders that have shown substantial strengthening effects in laboratory experimental programs. Although the shear resistance of gel-type biopolymer treated sands has been verified with direct shear tests and uniaxial compressive tests, there has been no attempt to examine shear behavior under different confining stress conditions. Therefore, this study investigates gel-type biopolymer treated sands with laboratory triaxial tests to describe shear behavior with isotropic confinement taken into account. In this study, sand is treated at 0.5% and 1.0% to soil content in mass (m_b/m_s), and xanthan gum which is a gel-type biopolymer have been used. It is assumed that the shear behavior of the gel-type biopolymer treated sands differs according to curing conditions (initial and dried), due to biopolymer hydrogel matrix formation and accompanying gel strength variation.

1. INTRODUCTION

Soil stabilization has been widely utilized at construction sites and in social infrastructure. From bitumen to natural pozzolan materials such as volcanic ash, many materials have been evaluated in attempts to develop a more effective soil stabilizing material (Chang et al. 2016). Following the Industrial Revolution, cement and gypsum has been broadly researched and used at many construction sites due to its high cost-effectiveness (Horpibulsuk et al. 2004; Ngowi 1997; Prusinski and Bhattacharja 1999; Sherwood 1993). However, with climate change a growing concern, there is a need to develop an alternative solution. Carbon emission charges for geotechnical engineering have reached approximately 2% based on cement usage (Chang et al. 2016), and

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