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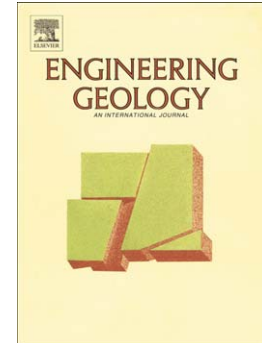
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EFFECTS OF ORGANIC MATTER ON STIFFNESS OF OVERCONSOLIDATED STATE AND ANISOTROPY OF ENGINEERED ORGANOCLAYS AT SMALL STRAIN

H. Choo¹, B. Bate², and S.E. Burns³

ABSTRACT

Organic rich soils are frequently encountered beneath infrastructure components that are sensitive to dynamic loading, such as bridges in earthquake prone regions. Because the engineering properties of these soils can be significantly impacted by the presence of organic matter, it is important to characterize their small strain dynamic properties. However, natural organic matter, is heterogeneous and highly variable; consequently, this experimental investigation quantified the dynamic behaviors of six organoclays that were synthesized under controlled laboratory conditions using quaternary ammonium cations as organic carbon in the clay interlayer. The small strain properties of these clays were measured with bender element tests to quantify the effects of organic carbon content on the dynamic properties of the soils, particularly on the overconsolidation and stiffness anisotropy. Experimental results demonstrated that the preloading effect of organoclays decreased with increasing total organic content due to the decrease in permanent fabric change and the release of lateral stress locking. Because of relatively limited rebound of organoclays (C_s/C_c : 0.025-0.07) as compared to inorganic soils (C_s/C_c : 0.1-0.2), the exponent for preloading ratio in the G_{max} estimating formula is larger than 0.34, suggesting that tested organoclays showed a significant preloading effect when compared to inorganic soils. Additionally, organoclays tested in this study showed inherent anisotropy ($G_{max}(HH)/G_{max}(VH)$ when $K_0=1$: 0.93-1.42) and cross anisotropy in HV and VH directions ($G_{max}(HV)/G_{max}(VH)$: 0.74-1.21), demonstrating behaviors that were comparable to that of inorganic soils.

Keywords: organoclay; total organic content; overconsolidated state; stiffness anisotropy; maximum shear modulus; bender element test

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