Title: Liquefaction Mitigation using Nanomaterials
Where: Holmes Hall 244
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Felipe Ochoa, Ph.D.
Assistant Professor, Dept. of Civil Engineering, University of Chile
Email: fochoac@uchile.cl

Bio

Professor Felipe Ochoa is a geotechnical engineering researcher, professor, and practitioner. He graduated with a M.S. in geotechnical engineering from the University of Chile in 2007 and a M.Eng. and Ph.D. from Purdue University in 2011 and 2015. His main interests are geotechnical engineering of critical infrastructure, liquefaction mitigation, tailings, and landslides, areas in which he has also performed research as a PI and Co-PI, participating in four research projects funded by research agencies.

Abstract

The presentation examines the effect of small percentages (1–5%) by dry mass of laponite – a synthetic nanoclay with a plasticity index exceeding 1000% – on the cyclic response of sands. The work is based on cyclic triaxial tests performed on specimens prepared by pluviating sand and laponite under dry conditions and then permeating with water. 1% laponite impacts all stages of the cyclic tests, from the response during the first loading cycle to liquefaction as it increases the cyclic resistance. Further benefits are observed with a longer pre-shear aging period with higher dosages (3–5%) of laponite. The observed behavior is associated with reduced mobility of the sand particles during cyclic loading due to (1) bonding/bridging at the particle contacts due to the charged laponite fines being attracted to the sand grains; and (2) formation of a pore fluid with solid like properties. The first appears to be the dominant behavior with 1% laponite, while it is proposed that the second is the response in the samples with higher dosages of laponite. The results presented provide new insight into the effects of high plastic fines on the cyclic response of sands, the “extreme” effects of the plasticity of the fines, and most significantly the possible use of laponite for liquefaction mitigation.