

Graduate Seminar



TAE-HYUK KWON, PhD

Associate Professor

Department of Civil and Environmental Engineering

Korea Advanced Institute of Science and Technology (KAIST)

October 14, 2024 (4:00 pm - 5:30 pm), Kupfrian Hall - Room 205

[Zoom Link: Click Here](#) Meeting ID: 994 3917 6432 Passcode: 058807

Toward microbial soil improvement: Micro-scale characteristics of MICP and clay-bacteria interactions

Abstract

Utilization of microbial activities in subsurface has garnered huge interest as it expected to create a new path to novel and groundbreaking soil improvement techniques. In this talk, unique experimental observations on microbially induced calcium carbonate precipitation (MICP) and clay-bacteria interactions are introduced. The first part presents the pore- and grain-scale characteristics of sands treated by MICP. In particular, the test results reveal the pore-scale mineral precipitation habit and its effect on hydraulic conductivity. In addition, grain-scale mechanical strength of cemented grains by MICP is analyzed in relation to the failure mode and cementation level. The second part presents the roles of clay-bacteria interaction in sedimentation and consolidation behaviors of kaolinite clay. The experiment results highlight the accelerated sedimentation rate, fabric changes, and pre-consolidation effect due to the presence of bacteria though its effect differs with fluid pH. Lastly, with some other examples on the use of soft biopolymers, discussion on potentials and challenges of microbial ground improvement follows.

About the Speaker

***Tae-Hyuk Kwon** currently works as an associate professor in Department of Civil and Environmental Engineering at Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea. He received his BSc (2002) followed by an MS (2004) and PhD (2008) at KAIST. During his PhD, he spent one year working as a visiting scholar at Georgia Tech (2005). From 2009 to 2011 he was a postdoctoral fellow at the Earth Sciences Division at Lawrence Berkeley National Laboratory (LBNL). From 2011 to 2013, he worked as a tenure-track assistant professor in the Department of Civil and Environmental Engineering at Washington State University, Pullman, WA, U.S.A. Since 2013, he is leading a research group Geo-Energy Laboratory (GELA) at KAIST, first as an assistant professor (2013–2018) and now as an associate professor since 2018.*



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