

EVENING TALK ON RECENT ADVANCES IN BIO-BASED GEOTECHNICS

(Organised by the Geotechnical Engineering Technical Division, IEM)

BEM Approved CPD/PDP Hours: 2.0 Ref No: IEM17/HQ/241/T

Day/Date : Thursday, 20th July 2017
Time : 5:30 pm – 7:30 pm
Venue : Auditorium, Wisma IEM, PJ
Presenter : Assoc. Prof. Leon Andreas van Paassen

Abstract:

In standard geotechnical engineering practice the composition of soils and related physical properties are considered to be static. However, biochemical processes in the subsurface can alter the composition of soils and change the properties which determine the geotechnical behavior. These natural processes are considered to be slow, but still they may be sufficiently fast to affect the durability of civil infrastructure, resulting significant maintenance requirements. On the other hand these processes may also be actively stimulated to change the properties of soils and enhance the engineering behavior. For example, biologically induced mineral precipitation can be used to increase the strength and stiffness of porous materials, mitigating liquefaction and erosion or improving bearing capacity of foundations and stability of slopes and excavations in granular soils. At the same time, these minerals fill up pores and fractures and create (reactive) hydrological barriers which control migration of contaminants, prevent leakage during CO₂ sequestration or improve the durability of ageing construction materials. Although many recent developments involve Microbial Induced Calcium carbonate Precipitation (MICP), bio-mediated precipitation of other minerals, as well as biofilms and biologically produced gas or changes in the pore water chemistry, can be used to alter material behavior in engineering applications. This contribution provides an overview on recent advances, including experimental studies at various scales, using either specific micro-organisms or enrichment of indigenous microbial communities, theoretical and numerical studies aimed to improve fundamental insight on the biogeochemical conversions and coupled to the hydro-mechanical properties. Besides the scientific and technological advances, also market potential, sustainability performance and other factors, which determine the successful implementation of these new bio-based technologies are discussed.

Profile of Speaker:



Leon van Paassen is Associate Professor at Arizona State University (ASU) and Senior Investigator at the NSF Engineering Research Centre for Bio-mediated and Bio-inspired Geotechnics (CBBG). He received an MSc in Applied Earth Sciences in 2002 from Delft University of Technology with a specialisation in Engineering Geology. During and after his graduation he worked several years as a geotechnical engineering consultant at IFCO Foundation Expertise and at research institute Deltares. In 2009 he obtained his PhD from the Department of Biotechnology of Delft University of Technology. His PhD research on 'Biogrout, Microbially induced carbonate precipitation as ground improvement method' resulted in several publications, patents and was awarded with several national and international awards. In his current research he integrates the fields of environmental biotechnology and geotechnical engineering. He investigates how natural or human-induced biochemical processes affect soil behaviour and aims to develop sustainable solutions, which improve efficient use of resources and energy and reduce the environmental impact of civil and mining engineering industry.

Ir. Lee Peir Tien
 Chairman, Geotechnical Engineering Technical Division, IEM

ANNOUNCEMENTS TO NOTE

- **Non-IEM members** may also attend the talk but will need to pay a registration fee of **RM50** and an administrative fee of **RM15**. GST is inclusive.
- Limited seats are available on a "first come first served" basis (maximum 100 participants). **To secure your seat, kindly register online at www.myiem.org.my.**

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