Northeastern

Department of Civil and Environmental Engineering

Distinguished Seminar Series

NT- and BT-based Functional Construction Materials and Low-carbon, Eco-friendly Construction Materials

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12pm-1pm
West Village F 020

Abstract

High performing functional construction materials have gained attention due to their impact on the industry and economy, and increase in the demand. Thereby, we have been focusing on the development of construction materials integrating nano- and bio-technology. Nano-technology enabled a significant improvement in the performance of which cannot be attained in the micro-scale. A typical examples of which were conducted by our research team include carbon-nano materials-based piezoresistive sensors, electromagnetic wave shielding/absorbing materials, piezoelectric composites, self-heating elements, etc. Our study of BT-construction converged technologies with an emphasis on bio-active rehabilitation capabilities is focused on crack repair of civil structures by self-healing phenomena of micro-organism (bacillus) which precipitates calcium carbonate within cracks. In addition, we will also present our progress on the PZT transducers, which was adopted for a structural health monitoring purpose. Our ultimate goal of developing NT- and BT-integrated construction material is commercialization and utilization for the field application, and we expect this to be accomplished in the near future.

Development of construction materials with a lower carbon footprint is a topic of numerous studies. Studies on geopolymer as an alternative to Portland cement began decades ago and are still active. We will present our recent progress on this topic, specifically in regard with alkali-activated slag or fly ash which can yield a comparable performance to Portland cement. We will also present the mechanical properties and durability issues of geopolymer in view of materials science and based on fundamental atomic/nanoscale chemistry.

Bio

Dr. H.K. Lee, Professor and Head of the Civil and Environmental Engineering Department at Korea Advanced Institute of Science and Technology (KAIST), received his B.S. and M.S. degrees from Seoul National University, Korea, in 1988 and 1990, respectively, and earned his Ph.D. degree in Civil Engineering from the University of California, Los Angeles in 1998. He has published 109 peer-reviewed archival papers, and 153 international conference proceedings. His primary research interests are development of multi-functional concrete with nano- and bio-materials, retrofit of concrete structures with advanced composites, structural health monitoring by PZT transducers and understanding the performance of complex systems mainly through micromechanics. He was the co-editor-in-chief of *International Journal of Concrete Structures and Materials* and editor-in-chief of *Magazine for Computational Structural Engineering Institute of Korea*. In addition, he is an International Committee Chairman of Korea Concrete Institute (KCI), a fellow of The Korean Academy of Science and Technology and an honorable fellow of International Conference on Computational and Experimental Engineering and Sciences (ICCES). He is the recipient of numerous awards including the “Outstanding Research Medal” awarded by the ICCES in 2014 and "Certificate of Excellence in Research" awarded by the Minister of Science, ICT and Future Planning in South Korea in 2013.

Haeng-Ki Lee, PhD

Professor and Head, Civil & Environmental Engineering Department

KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY

KAIST Korea Advanced Institute of Science and Technology Civil & Environmental Engineering

Education

- **PhD, Civil Engineering, *UNIVERSITY OF CALIFORNIA – LOS ANGELES***
- **MS, Civil Engineering, *SEOUL NATIONAL UNIVERSITY, KOREA***
- **BS, Civil Engineering, *SEOUL NATIONAL UNIVERSITY, KOREA***

Research Interests

- **Micromechanics based materials modeling**
- **New construction materials development**
- **Structural retrofitting & strengthening, performance prediction**

Selected Service and Awards

- **Secretary, US Geotechnical Society**
- **Secretary, Korean Geotechnical Society**
- **Editor-in-Chief, Magazine for Computational Structural Engineering Institute of Korea**
- **Fellow, Korean Academy of Science & Technology**
- **Scientist of National Merit, Ministry of Science & Technology (2013)**
- **Outstanding Research Medal (ICCES 2014)**