THE UNIVERSITY OF HONG KONG

DEPARTMENT OF CIVIL ENGINEERING

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Optimizing the performance of low-carbon cement and concrete

Dr. Jiaqi Li
Incoming Assistant Professor
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Date: July 9, 2024 (Tuesday)
Time: 10:00 a.m. – 11:30 a.m.
Venue: Room 612B, 6/F Haking Wong Building
The University of Hong Kong

Abstract

Th production of Portland cement, the primary binder of concrete, contributes to ~8% of global anthropogenic CO_2 emissions. Partial cement replacement by vitreous (alumino)silicates sourced from industrial byproducts and other additives decarbonizes concrete products at scale. This decarbonation approach typically alters the structure of calcium silicate hydrate (C-S-H), the key binding phase of concrete, at multiple length scales. Understanding the structure and mechanical properties of C-S-H is critical to optimizing the performance of low-carbon concrete. The microstructure and mechanical properties of C-S-Hs in low-carbon concrete have been well understood and optimized to the limits. However, the nanostructure and nanomechanical properties of C-S-Hs remain debated. Advanced characterization techniques are powerful to unveiling the nanostructure and intrinsic mechanical properties of C-S-Hs. The experimental studies of C-S-Hs at the nanoscale are important for validating computational models and micromechanical properties of various cement-based materials. The limitations of some popular sample preparation routines and material/mechanical characterization techniques are also discussed.

About the Speaker

Dr. Jiaqi Li is an incoming Assistant Professor in the Department of Civil and Environmental Engineering at the University of Michigan. He serves as the deputy director of DOE-funded Center for Coupled Chemo-Mechanics of Cementitious Composites for Enhanced Geothermal Systems. In the past three years, Jiaqi has secured $10 million credit in research funding as a PI/co-PI from DOE, DARPA, etc. for the research of carbon-negative cement, waste recycling, self-healing construction materials, and geothermal well cement. He has published 25 refereed journal articles as the first/corresponding authors, including 12 on *Cement and Concrete Research*. Prior to his career-track Research Scientist position at Lawerence Livermore National Laboratory, he worked as the Ernest Lawrence Fellow (PI) in Livermore. He received postdoctoral training from Lawerence Berkeley National Laboratory and University of California, Berkeley. Jiaqi received his PhD and MS in Civil and Environmental Engineering, with a concentration in structural engineering, mechanics, and materials, all from Berkeley. His BE in Civil Engineering is from Beijing University of Technology.

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