

ALKALI-ACTIVATED CONCRETE FOR SUSTAINABLE INFRASTRUCTURE: POTENTIAL, PROGRESS AND CHALLENGES AHEAD

Speaker

Prof. Guang Ye

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Abstract

Alkali-activated concrete (AAC) represents a promising route to significantly reduce the carbon footprint of the built environment while valorizing industrial by-products. Despite its considerable potential, widespread adoption of AAC remains limited. This seminar will explore the fundamental chemistry and material behavior underpinning alkali-activated materials and their relevance to sustainable construction.

A key focus will be placed on the work of the RILEM Technical Committee 294-MPA, which is dedicated to evaluating the mechanical properties of AAC. The committee's forthcoming State-of-the-Art Report will be highlighted, offering a critical synthesis of current knowledge on mix design, microstructure-property relationships, long-term performance, and pathways toward standardization. The presentation will also assess the applicability of existing design codes and propose more accurate design methodologies tailored to AAC structures.

To bridge theory and practice, a case study from the Netherlands will be presented, detailing the development of self-compacting alkali-activated concrete used in a traffic bridge deck. This example illustrates the integration of material design, structural requirements, and durability considerations in a real-world project.

The seminar will conclude by addressing persistent challenges—spanning research, engineering practice, and societal acceptance—such as gaps in codification, long-term durability validation, and public perception. Finally, priorities for future collaborative research and development efforts will be outlined to accelerate the transition toward climate-resilient construction.

Biography

Dr. Guang Ye is a Professor of Advanced Construction Materials in the Materials and Environment Section at Delft University of Technology (TU Delft), where he leads the Concrete Modelling and Materials Behavior group. He received his PhD with honors from TU Delft in 2003 and completed a postdoctoral fellowship at Ghent University, Belgium. In 2005, he was awarded the prestigious NWO VENI grant and subsequently advanced through faculty ranks at TU Delft to full professor. Since 2006, he has also served as a guest professor at Ghent University and several institutions in China, including the Chinese Building Academy, Southeast University, and South China University of Technology. Dr. Ye's research focuses on alternative cementitious binders (e.g., alkali-activated materials), material properties of concrete, and numerical simulation of material behavior. He has authored over 400 publications and co-edited eight conference proceedings, with contributions to six books. He is a Fellow of RILEM and chairs Technical Committee 294-MPA on Mechanical Properties of Alkali-Activated Materials, while also actively participating in other RILEM and fib committees. He currently serves as Associate Editor-in-Chief for the Journal of Structural Concrete and Associate Editor for Materials and Structures. He has also been on the editorial boards of Cement and Concrete Research since 2014 and Low Carbon Materials and Green Construction since 2022.



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