

DURABILITY PROBLEMS OF HYDRAULIC CONCRETE STRUCTURES AND GEOLOGIC CARBON STORAGE RESERVOIRS

Speaker

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Abstract

The Building Materials Science Group in the Department of Civil and Architectural Engineering at Aarhus University conducts research in various aspects of cement and concrete materials, especially focusing on durability problems and sustainable material solutions. This presentation comprises two parts: 1) abrasion damage of concrete for hydraulic structures; 2) degradation of cement-based materials exposed to geologic carbon storage conditions. Hydraulic structures are important assets of our society. As the service life requirement for large infrastructures is keeping on increasing, long-term durability has become more and more critical. Abrasion damage of concrete caused by sediment-laden flow can be a significant durability problem for hydraulic structures. The first part of the presentation will give an overview of the work conducted in the group, including a new abrasion test method and abrasion damage prediction models. Geologic carbon storage (GCS), a process to capture and store CO₂ in deep geologic formations, is considered an essential technique to meet the demanding "Net-zero emissions" goal. Non-producing oil and gas reservoirs are among the most appealing locations for GCS. However, the success of the strategy relies on the long-term integrity of the reservoirs, which is challenged by the carbonation reactions between the main reservoir sealing material, i.e., cement, and the stored CO₂ creating an acid exposure environment in the presence of high temperature and high pressure. The second part of the presentation will introduce related projects conducted in the group, including cement-steel interface degradation in GCS conditions, and a novel reservoir sealing material solution.

Biography

Dr. Min Wu is currently an Associate Professor at the Department of Civil and Architectural Engineering, Aarhus University. His main research interests are related to different aspects of materials especially for construction uses, including interactions between CO₂ and building materials (particularly in the CCUS context), microstructure and properties of cement-based materials, durability design and service life modeling of reinforced concrete structures, novel and sustainable construction materials, recycling and waste utilization, etc. The research aims to improve our understanding of cement-based materials, and create more synergy between two major aspects of building materials, i.e. sustainability and durability.



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