

# Advances in Civil Engineering Materials

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The journal publishes high-quality, original papers on topics relating to the properties and performance of civil engineering materials. These are materials such as concrete, asphalt, steel, polymers and polymeric composites, and wood for use in civil and environmental engineering applications, such as pavements, bridges, buildings (including nonstructural elements such as insulation, and roofing), and environmental systems (including water treatment). The journal core topics are characterization, physical properties, constructability, and durability of these materials. Characterization may include chemical composition, nanostructure, and microstructure. Physical properties include strength, stiffness, and fracture behavior. Constructability includes such topics as construction methods, quality control and quality assurance, life cycle analysis, and sustainability. Durability may be determined using either field performance or accelerated laboratory testing. Papers relating to sustainability of engineering materials or to the impact of materials on sustainability of engineering structures are especially encouraged.

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# Overview

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High performance cementitious materials (HPCM) are a broad class of cement-based materials with specific designs to meet increasing needs in construction. While there is no universal consensus on the scientific definition for HPCM and the definition evolves over time, HPCM exceeds the properties and performance of “ordinary” cementitious materials. In most contexts, HPCM characteristics are considered to be those that support the desirable strength, durability, resilience, and sustainability of civil infrastructure, including tensile ductility, autogenous crack-width control, and material “greenness.” To this end, HPCM are often made with selected high-quality ingredients and optimized mixture designs.

Multiple methods have been proposed to achieve the high performance. A striking example is the vision-changing nanotechnology, due to its potential to fine-tune material properties on the extremely small scale. Researchers in civil engineering are enthusiastic about improving the macroscopic performance by altering the microstructures. Adding nano-additives such as carbon nanotubes and nanoclay has found significant benefits. Another route to improve the performance is to seek alternative binders, which include magnesium phosphate cement and limestone calcined clay cement. Besides the combinations of novel ingredients, characterization of HPCM is a non-trivial area, including exploring effective methods to characterize corrosion and hydration. In addition, numerical tools are often highlighted, on the paradigm of the relationships between material microstructures, processing, material properties, and performance, where micromechanics is referred to as the unifying link between mechanical performance and microstructural properties.

In this special issue of *Advances in Civil Engineering Materials*, we acknowledge the overwhelming support from a broad community worldwide. We gladly publish 24 papers, spanning cement composites with specialty additives, fundamental studies on methods, numerical and analytical investigations, and two reviews on some latest trends. We aim to provide the cementitious community with up-to-date findings to reflect the dynamism of the HPCM field.

We appreciate the contributions from the authors for their striking findings. We would like to thank Dr. Jason Ideker for the significant support throughout the entire review and editorial process. We gratefully acknowledge the efforts by Alyssa Conaway and Sara Welliver in the production of this special issue.

Yizheng Cao  
Guest Editor