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Editorial: Advanced cementitious materials and structures under extreme conditions

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Editorial on the Research Topic
Advanced cementitious materials and structures under extreme conditions

The safety of essential engineering structures needs to consider the structural performance when the structures are under extreme loading conditions or exposed to extreme environments during their service life, such as seismic loads, impact loads, high temperatures, and corrosive environments, which may result in severe damage to the structures and cause tremendous casualties and property loss. The application of advanced materials, such as fiber reinforced cementitious composite and other sustainable materials, has gained worldwide interest in recent years due to their superior characteristics to traditional construction materials. By using these advanced materials as a substitute or retrofitting material, it is expected that the performance of engineering structures could be improved substantially.

The objective of this special issue is to publish original research on the investigation of advanced materials in civil engineering structures, in particular, their applications in structures under extreme loading and/or environmental conditions. The articles published in this special issue cover various topics, including 1) fibre-reinforced composites; 2) recycled waste; 3) durability; 4) seismic behavior and 5) extreme environment. The detailed contributions offered by each paper are as follows.

The paper entitled by Zhang et al. investigated the seismic behavior of steel reinforced concrete (SRC) special-shaped column joints, which is a critical issue in the design and application of SRC special-shaped columns. A new reinforcement design was proposed in this study, and experimental tests were carried out on three SRC special-shaped column joints and one normal reinforced concrete special-shaped column joint. The joints designed in this study have shown good stiffness, high load-bearing capacity and excellent ductility. The conclusions derived from this article can also be a reference in engineering practice.

The paper entitled by Tian ei al. explored the potential application of ultra-high performance concrete (UHPC) hot water tanks as thermal energy storage. In particular, the influence of long-term autoclaving on the mechanical properties and microstructure

of UHPC was studied. It was found that the compressive strength of UHPC could stay robust while the flexural strength was vulnerable to the long-term autoclaving. The partial replacement of cement by fly ash could mitigate the detrimental effect of long-term autoclaving. This study therefore revealed the influence of long-term autoclaving on UHPC and provided guidance for the development of an applicable and sustainable UHPC for hot water tanks.

The paper entitled by Zeng et al. proposed an FRP-confined seawater sea-sand concrete-filled stainless steel tube (F-SSCFSST) column for application in coastal/offshore structures, which could potentially relieve the overexploitation of freshwater and river-sand. Experimental tests were conducted to investigate the cyclic behavior of the proposed column. The influences of three loading patterns (i.e., single full unloading/reloading, repeated full unloading/reloading, and combination of repeated full and partial unloading/reloading) were studied. In addition, a prediction model for FRP-confined concrete was evaluated in this study.

We, the guest editors, hope that the readers will benefit from this special issue that reflects the evolving needs of the community, and help disseminate knowledge between researchers, manufacturers, and designers involved in the application of advanced materials in civil engineering structures.

Author contributions

XL contributed to conception, wrote the first draft of the manuscript, manuscript revision, read, and approved the submitted version. JJ and PD contributed to manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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