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*Editorial*

# Advances in Building Technologies and Construction Materials 2018

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The development of civil engineering in the course of centuries meant a constant struggle with available materials, spans, or height, active loads, and the forces of nature: water, fire, wind, and earthquakes.

While construction activities improve the quality of human lives, they also have significant impact on the environment. The production of construction materials requires energy and generates greenhouse gases. Low-cost or affordable construction technologies and building materials are often pushed as a magic potion in meeting the ever-growing demand for rapid housing delivery in developing economies. New advanced materials offer opportunities to change the way in which we construct and retrofit buildings. They give added value in terms of increased performance and functionality. The reduction of carbon footprint for construction materials can start at the production phase, where energy-efficient processes can be developed and waste or recycled materials can be employed. New materials can also help address the new challenges of durability in a changing climate.

This special issue is the result of the huge success presented by previous special issues of the same topic, and as the previous special issues had a great acceptation by the scientific community with 61 papers submitted and 26 papers accepted for publication.

A considerable number of experimental and numerical papers address new research advances and applications in the concrete material. J. Yue presents a numerical model to analyse the multilevel nonlinear mechanism of the reinforced concrete framed structures in five structural levels. Based on the presented deformation equivalent principle, a generalized stiffness damage model was developed for each structural level. An impact factor was proposed to reflect the damage correlations between different structural levels. In order to verify this method, the proposed method was used to study the damage evolutions at various structural levels of a 12-storey frame structure. Zhao et al. present an extension of Balshin's model to develop a prediction model of compressive strength for three types of high-porosity cast-in-situ foamed concrete (cement mix, cement-fly ash mix, and cement-sand mix) with dry densities of less than 700 kg/m$^3$. Zhao et al. present the development of steel fiber-reinforced expanded-shale lightweight concrete (SFRELC) with high freeze-thaw resistance. Based on the test results, suggestions are given out for the optimal mix proportion of SFRELC to satisfy the durability requirement of freeze-thaw resistance. M. J. Kim and K. Y. Ann evaluate the corrosion risk of internal chloride and external chloride from three different exposure conditions. They concluded that an increase of the drying ratio in the exposure condition resulted in an increase of the corrosion rate after initiation. Also, the authors predicted the chloride penetration with different exposure conditions to determine the service life of the reinforced concrete structure. Lee et al. investigate experimentally the dowel behaviour of rebars in small concrete blocks for the sliding slab track on railway bridges. This work can be useful

for developing a more rational model to represent the actual dowel behaviour of the rebars embedded in small concrete blocks. Gu et al. investigate the macroperformance and microstructure of ultrahigh-performance concrete (UHPC) before and after the freezing-thawing action. They show that UHPC possessed very excellent freezing-thawing resistance due to its dense microstructure. After the freezing-thawing action, cracks occurred, and the authors considered that the mismatch of the thermal expansion coefficients of the aggregate and the paste is the reason for the cracking at the sand-paste interface. Yan et al. investigate the mechanical properties, the mesodamage properties, and the microproperties of cement-emulsified asphalt in plastic concrete by computed tomography, scanning electron microscopy, X-ray diffraction, and thermogravimetric analysis. X. Yang and H. Wang analyse, experimentally, the seismic behaviour of rammed earth walls with precast concrete tie columns. Luo et al. present the development of a new structural material named "steel fiber polymer structural concrete (SFPSC)" with features of both high strength and high toughness and its application to bridge superstructures, in hot-wet environments.

The chemical attack of concrete structures and other building materials is analysed in detail by some authors. S. I. Hong and K. Y. Ann present a study to assess the service life of concrete structures exposed to the tidal zone with the proposed numerical model for predicting the moisture and chloride transport in concrete. Wang et al. study numerically and experimentally the behaviour of the calcium silicate board metallic-framework drywall assembly with a junction box. This is innovative research that put forward, in first time, the quantitative research on influence of the embedded junction box on fire resistance of metal frame walls and analyzes the weakness.

Besides those, there are several interesting topics in the issue of cement materials. Rubia et al. present the preparation of cement pastes with simultaneous functional additions (micro- and nanosilica and nanozinc oxide) by a novel low shear rate dispersion method, in order to avoid health risks. They concluded that the common manual mixing method and the novel method presented a similar hydration behaviour of the different cement pastes prepared, but the novel method avoided the exposure to the nanoparticles, therefore minimizing health risks. H. Yang and Y. Che analyse the effects of nano-$CaCO_3$/limestone composite particles on the hydration products and pore structure of cementitious materials. Kim et al. investigate the rheological properties of blended cement pastes using a rotational viscometer and a dynamic shear rheometer. The results showed that the rotational viscometer can be used to study the flow characteristics of cement pastes with or without mineral admixtures. Tongyuan et al. present a series of experiments on restriction-induced cracking behaviours as well as free shrinkage, water loss, and mechanical properties of dry-mixed plastering mortar (DMPM), in order to evaluate the cracking resistance of DMPM and analyse the influence of environmental conditions on the cracking tendency of DMPM.

Another important issue is the ecology of building materials. Gómez-Balbuena et al. present the technological application of the solid waste resulted from the activities of carved Quarry extraction in a new polymeric material with properties similar to those of a traditional mortar. They concluded that the polymeric material uses low amounts of cement with respect to the traditional mortar, and it is elaborated with the recycled quarry as they are presented in its granulometry. Al-Khateeb et al. evaluate the use of a waste stone sawdust filler with asphalt binders and compare the mechanical properties of the waste filler-asphalt mastic with those of the asphalt mastic produced using the typical limestone filler. Estévez-Cimadevila et al. study the bending behaviour of T-section beams composed of a glulam web and an upper cross-laminated timber flange. The variation in the stiffness depended on the relation between the compressive and tensile moduli of elasticity parallel to the grain, and its influence on the deflection was analysed using a finite element method. Li et al. study the deterioration mechanism of recycled plaster (R-P). The large specific surface area (SSA), improper preparation temperature, increased water requirement of R-P, and microstructure of its hardened body were analysed. Zhou et al. propose a new connector for the bamboo (timber) frame joint based on a comprehensive analysis of the mechanical performance of several wood connections. The authors, also, proposed a simplified moment-rotation hysteresis model for the joint.

Studies on soils are presented by J. Zhai and X. Cai, who analyse the physical and mechanical characteristics of expansive soils from Pingdingshan (China), which provide a reliable basis for engineering design and can be used in the calculation of slope stability. The finite element method was used to calculate the different positions of the soil slope layers and select the corresponding strength parameters. Lu et al. analyse the influence of cumulative plastic strain, dry-wet cycles, and amplitudes on the soil resistivity. A new damage factor based on resistivity is proposed to evaluate the long-term performance of the compacted clay material. The results show that the dry-wet cycles and amplitudes have a significant effect on the damage of the compacted soil, which indicates that the dry-wet cycling of compacted soil materials should not be ignored in road engineering, especially in rainy and humid areas. Hua et al. present the use of four derived acceleration indexes to characterize the soil compaction degree, including the acceleration peak value, acceleration root mean square value (arms), crest factor value, and compaction meter value. A two-part field compaction test was performed to analyse and judge the test effects of the four indexes on the rockfill and other dam materials. Gao et al. propose a comprehensive chemical grouting construction technology, which comprises initiative closing, concentrated bypass flow, water plugging priority, and twice sand curing for the inclined shaft passing over the drift-sand layer. This engineering application effect is very prominent in controlling water burst and leakage at the drift-sand layer, in mine constructions.

Finally, Wang et al. present a finite element analysis and lightweight optimization design of the main frame structure of a large electrostatic precipitator, and Çıra et al. analyse the effects of material properties of marble on surface roughness and glossiness (surface quality).

We hope that readers of this special issue will find not only accurate data and updated reviews on the building technologies and construction materials field area but also important questions to be resolved. This special issue includes both theoretical and experimental developments, providing a self-contained major reference that is appealing to both the scientists and the engineers. At the same time, these topics will encounter a variety of scientific and engineering disciplines, such as chemical, civil, agricultural, and mechanical engineering.

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