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Editorial

Integrated Lightweight Composites and Structures with Multifunctional Properties for Engineering Application

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Traditional composites, including polymer matrix composites (PMCs), metal matrix composites (MMCs), and ceramic matrix composites (CMCs), have been widely investigated for decades. Usually, the lightweight characteristic is the eternal pursuit of the composites and their structures for engineering applications, in order to improve the effective load and lower the cost. Previous works simply focused on the lightweight design of compositses and structures but merely focused on the functional design of composites and structures for various engineering application environments, such as high mechanical load, high temperature, corrosion, low thermal expansion, wave absorption, wave transmission, and vibration suppression. Therefore, how to combine the lightweight and multifunctional characteristics has attracted much attention recently.

Therefore, the integrated lightweight and multifunctional composites and structures not only exhibit the lightweight behavior but also present multifunctional characteristics (e.g., load bearing, protective, ablative, heat insulative, wave absorbing and transmitting, vibration suppressing, explosion resistive, low thermal expansive, and anticorrosive properties). The main challenges involved in integrated lightweight and multifunctional composites and structures, such as the design theory and method, fabrication technology, and characterization method, need to be specially focused and studied.

The aim of this special issue is to publish the latest research progress and findings in the field of integrated lightweight and multifunctional composites and structures and to promote the applications of integrated lightweight and multifunctional composites and structures for engineering.

The paper entitled "Mechanical Characterization of Lightweight Foamed Concrete" focused on the mechanical characterization of lightweight foamed concrete, which shows excellent physical characteristics such as low self-weight, relatively high strength, and superb thermal and acoustic insulation properties. The paper entitled "Strength and Failure Mechanism of Composite-Steel Adhesive Bond Single Lap Joints" described the strength and failure mechanism of composite-steel adhesive bond single lap joints because the joints of composite steel are very important for lightweight structures for engineering applications. The paper entitled "Undrained Dynamic Behavior of Reinforced Subgrade under Long-Term Cyclic Loading" studied the undrained dynamic behavior of reinforced subgrade under long-term cyclic loading, owing to lightweight structures sometimes working under a long-term cyclic loading environment. Sometimes, the lightweight structures sever under impact environments, so the paper entitled "Impact Analysis of Brake Pad Backplate Structure and Friction Lining Material on Disc-Brake Noise" presented the impact analysis study of the brake pad backplate structure and friction lining material on disc brake noise. The fifth paper entitled "A Study on the Fundamental Quality of Magnesia-Phosphate-Formed Mortar Composites Using Superabsorbent Polymer for Development of Concrete for Biological Panel" focused on the fundamental quality of magnesia-phosphate-formed mortar composites using the superabsorbent polymer for development of concrete for the biological panel, owing to this composite

showing excellent absorption ability together with the lightweight characteristic. For the functions of these lightweight structures, the sixth paper entitled "Improvement of the Acoustic Attenuation of Plaster Composites by the Addition of Short-Fibre Reinforcement" investigated the acoustic attenuation of plaster composites by the addition of short-fibre reinforcement. The seventh paper entitled "Improving Electromagnetic Shielding Ability of Plaster-Based Composites by Addition of Carbon Fibers" described a novel composite structure with a high electromagnetic shielding ability. The eighth paper entitled "The Bending Responses of Sandwich Panels with Aluminium Honeycomb Core and CFRP Skins Used in Electric Vehicle Body" described the bending responses of sandwich panels with an aluminium honeycomb core and CFRP skins used in the electric vehicle body. And after all, for significant ceramic matrix composites, typically C/SiC composites were also studied. Joining of C/SiC composites to other materials is very common during the application of lightweight structures; the ninth paper entitled "Joining of C_f/SiC Ceramic Matrix Composites: A Review" presented a perspective review on the joining technologies of the C/SiC composites by the guest editors.

We do hope this special issue can give some thinking and references of the integrated lightweight and multifunctional composites and structures and can promote their engineering applications.

Conflicts of Interest

The editors declare that they have no conflicts of interest.

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