EDITORIAL

Introduction to the Special Issue on Mechanics of Composite Materials and Structures

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Plate, shell and panel are basic structures used in engineering and industry. These structures play an important role as main supporting component in all kinds of structures in machinery, civil engineering, ship building, flight vehicle manufacturing, etc. Composite materials and structures are widely used in aerospace, marine, automobile industries due to their designable characteristic, lightweight advantageous, high specific strength and stiffness. Common configurations include laminated materials, hybrid layered materials, sandwich core materials and structures (foam, honeycomb, corrugated and lattice cores, etc.). How to establish an accurate analytical and numerical model is one of the most important subjects in composite materials and structures. The topics discussed in this special issue include aspects of core-face bonding and reinforcement, enhancement of core mechanical properties and panel performance (including the role of structural hierarchy), and multifunctional advantages offered by different core constructions. In addition, the special issue discusses potential applications, including in morphing wing design, impact resistance and ultralightweight applications. Future research directions are discussed.

A total of 7 articles are selected for this special issue based on a robust peer reviewed process. The articles are authored by researchers from universities, and reflect state of the research developments and initiatives in the Mechanics of Composite Materials and Structures.

The first paper "Study on the Mechanical Properties of Ni-Ti-Cu Shape Memory Alloy Considering Different Cu Contents" contributed by Liu et al. [1] developed a thermodynamic constitutive model for Ni-Ti-Cu SMA considering different copper contents, based on the experimental data and the constitutive model of the NiTi SMA.

In the second paper entitled "Investigation on the Mechanical Properties of Polycrystalline Mg Using Molecular Dynamics Simulation", Liu [2] investigated the effects of grain size, temperature, and strain rate on the tensile properties of polyMg by the Molecular dynamics (MD) simulation method.

The third paper "Design of Multi-Coupled Laminates with Extension-Twisting Coupling for Application in Adaptive Structures" by Cui et al. [3] introduced a creative design method for improving

the comprehensive mechanical properties of the composite structure from the perspective of the multi-couplings of the laminate. They also present a promising application for designing the bending-twisting coupled box structure with it.

In their paper "Debonding Failure in FRP Reinforced SHCC Beams Induced from Multiple Flexural-Shear Cracks under Three-Point Bending Test" written by Hu et al. [4], the authors perform an investigation on the flexural behavior, failure mode and the debonding strain of strain hardening cement-based composites beam externally bonded with glass fiber-reinforced polymer.

The fifth paper "Fabrication and Statics Performance of Pyramidal Lattice Stitched Foam Sandwich Composites" written by Zhao et al. [5] proposed a kind of pyramidal lattice stitched foam sandwich composite materials, which are manufactured by integrating top and bottom panels with pyramidal lattice core to overcome the weak interface between the core and the skins of the sandwich structure.

Finally, Yang et al. [6,7] conducted a comprehensive study on the failure mechanism, strength prediction and progressive damage failure of Z-pins reinforced composite single lap adhesive joints in a combination of numerical simulation and experimental characterization, in their papers "Damage Failure Analysis of Z-Pins Reinforced Composite Adhesively Bonded Single-Lap Joint" and "Experimental and Numerical Study on Mechanical Properties of Z-pins Reinforced Composites Adhesively Bonded Single-Lap Joints".

As a final remark, we wish the broader readers of researchers, practitioner, and students who are interested in related topics, can benefit or gain some inspiration from this special issue.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

References

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