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Energy Absorption Characteristics of Bio-Inspired Honeycomb Column Thin-Walled Structure Under Impact Loading

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Abstract

Beetles have developed the elytra that are interesting and impressive strategy for thriving in their native environments. The elytra, although formed from simple biopolymer constituents, take on many effective designs. In present work, internal structure of elytra is discussed and three bionic structures named as the bio-inspired honeycomb column thin-walled structure (BHTS) are proposed. Then the crushing behavior and energy absorption characteristics of the BHTS under axial impact loading are investigated by numerical simulation. This study reveals not only the relationship between the adding mode and energy absorption characteristics, but also the influence of column diameter on the BHTS. The findings show that the BHTS represents a significant improvement over honeycomb structures and show potential applications in the field of protective equipment.

Keywords: metals and alloys; microstructure; scanning electron microscopy; computer simulations

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