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Deformation and Damage Mechanisms of All-CFRP Honeycomb Sandwich Panels Under Gelatin Impact Based on the Bird Strike

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ABSTRACT

Carbon fiber reinforced polymer (CFRP) honeycomb sandwich panels possess excellent comprehensive performance, endowing them with great application prospects in aerospace components. Against the background of bird strike, soft impact represents a typical dynamic load that aerospace structures might confront. To clarify the impact resistance of such composite structures under analogous soft impact scenarios, all-CFRP honeycomb sandwich panels were manufactured via the mold fabrication method in this research. A light gas gun was adopted to realize high-velocity impact loading of gelatin projectiles (80~150 m/s), and the deformation behaviors and failure characteristics of the panels under varying impact velocities were thoroughly examined. A precise finite element model was built. By virtue of this validated model, the impact-bearing process and energy dissipation properties of the structure were analyzed in depth, and further studies were carried out to investigate the effects of core parameters, impact angles and other parameters on the structural impact response. The research outcomes offer experimental guidance for the optimal design and practical engineering application of all-composite honeycomb sandwich structures in the aerospace industry.

KEYWORDS

High-velocity impact; composite honeycomb; mechanical property; impact behaviour

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