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PROCEEDINGS

Explicit Dynamics Simulation and Design of Sandwich Composite Structures Reinforced by Multilayer Lattice

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ABSTRACT

Dynamic simulation and design of complex composite structures with energy-absorbing lattice are critically important for aircraft applications. In this study, high-velocity impact behaviors (deformation and damage modes) of sandwich composite structures with multilayer lattice are numerically studied by using explicit dynamics computation. First, the modeling strategy for sandwich composite panels with the multilayer lattice and foam core is developed by using Finite Element Method (FEM). In FEM model, the beam, shell, and solid elements are applied together for both the computational accuracy and efficiency. The unit cell model of the lattice is used considering the periodicity of the multilayer structure. Second, the soft-body projectile to simulate the bird-strike loading is modeled by using Smoothed Particle Hydrodynamics (SPH). Impact dynamics behaviors (damage mechanism, deformation modes and energy variation) of the multilayer lattice-reinforced panels are investigated in detail by the FEM/SPH calculation. Last, the impact-resistant performances of various lattice designs are compared and assessed.

KEYWORDS

Lattice composite structure; crashworthiness; multilayer design; energy absorption; FEM/SPH simulation

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