

Postprint of Study on Mechanical Properties of Reinforced Re-entrant Honeycomb

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Date: 2025-04-21T15:54:20+00:00

Abstract

Based on the re-entrant hexagonal honeycomb (RHH) configuration, an enhanced re-entrant honeycomb (ERH) structure is proposed by embedding diagonal brace structures within its unit cells. Quasi-static compression tests were conducted to investigate its static mechanical properties, revealing the deformation mechanism of the ERH unit cell. The dynamic response of ERH under low-velocity (10 m/s) and high-velocity (100 m/s) impact loading was studied using finite element simulation, with specific analysis of its deformation mode, dynamic Poisson's ratio, and energy absorption capacity. The study found that embedding diagonal brace structures within the cells does not significantly affect the negative Poisson's ratio characteristic of the original structure, but rather enhances the honeycomb structure's ability to resist impact-induced deformation. Through comparative analysis of the specific energy absorption of the two honeycomb structures, the energy absorbed per unit mass of ERH can be increased by 38.53% and 13.85% compared to RHH under low-velocity and high-velocity impact loading, respectively, indicating that the embedded diagonal brace structure can also improve the energy absorption capacity of the honeycomb structure.

Full Text

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Note: Figure translations are in progress. See original paper for figures.

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