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PROCEEDINGS

Dynamic Response of Sandwich Panel with Re-Entrant Honeycomb Core Reinforced by Catenary Under Air Blast

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ABSTRACT

Honeycomb cored sandwich structures have been attracted extensive attentions attributed to outstanding explosion and impact protection capability. Herein, in order to improve the anti-blast performance of re-entrant honeycombs (RH) cored sandwich panel, the conventional RH is reinforced by introducing catenary in the form of connecting both ends of horizontal cell walls and catenary. The results show that the deformation mode of the reinforced RHs (RRH) becomes more stable and regular compared to RHs, and the energy absorption of classic RHs can be enhanced because the reinforced structures and the improved auxetic deformation are employed simultaneously. Subsequently, the RRHs is used as the core of sandwich panels. The blast resistance of the RRH cored sandwich panels is investigated using numerical method verified against the blast experiment in the literature. Compared to the RH cored sandwich panel with the same mass, the RRH one can obtain a 22.3% decline in the permanent deflection of back panel, and a 10.7% enhancement in energy absorption. When RRH and RH cores share the same thickness, the former can achieve a 76.1% decrease in the permanent deflection of back sheet and a 19.4% improvement in energy absorption. The reason for better anti-blast performance of RRH cored sandwich panel than RH one is the fact that the RRH core can raise the utilization rate of global sandwich structure and promote more plastic hinges to dissipate the blast energy and decrease the permanent deflection of back panel. Subsequently, a parameteric investigation is conducted to explore the effect of the thickness distribution of facesheets, core thickness, catenary height, and load conditions on the dynamic response of sandwich panel under air blast. Besides, limited by the high strength and strong attenuation of blast, the negative Poisson' ratio of RRH cored sandwich panel cannot be employed effectively. The present investigation provides a useful reference for the design of sandwich panels with auxetic materials.

KEYWORDS

Re-entrant honeycomb; reinforced design; sandwich panel; blast resistance; energy absorption

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