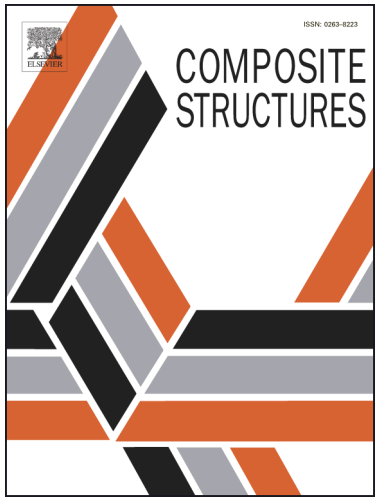

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Penetration resistance of hybrid metallic honeycomb structures with ceramic insertions against long-rod tungsten projectiles

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Abstract

To examine the effects of different core arrangements of hybrid honeycomb structures on the penetration resistance against a vertical long-rod tungsten projectile, we conducted artillery-launched experiments on three targets. They were fabricated using titanium alloy panels with ceramic insertions in upright, transverse parallel, or transverse orthogonal arrangements, respectively. Furthermore, numerical simulation was used to explore the underlying mechanisms of these hybrid structures. The results showed that the penetration resistance of the targets is significantly improved when the arrangement of honeycomb cores changes from upright to transverse parallel or transverse orthogonal. Exploration of the underlying mechanisms showed that the reasonable core arrangements of hybrid honeycomb structures directly determine the extent of energy absorbing from the impact projectiles. The hybrid structure with transverse core arrangement show better constraint conditions for ceramic prisms by metallic webs to blunt and erode the projectiles compared to that with upright core arrangement, and the hybrid structure with ceramic insertions in transverse parallel arrangement has the best penetration resistance owing to a good constraint condition for ceramic prisms by metallic webs and proper inhomogeneity of substructures.

Keywords: Metallic honeycomb structures; Zirconia toughened alumina; Penetration resistance; Long-rod projectile

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