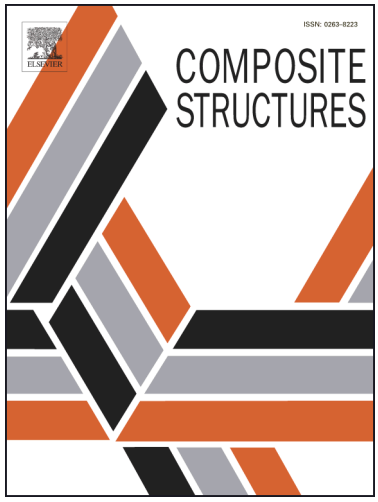

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Effect of Nanoclay and Graphene Inclusions on the Low-Velocity Impact Resistance of Kevlar-Epoxy Laminated Composites

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ABSTRACT

This experimental study shows the effectiveness of geometries (1D and 2D) and surface energies of nanofillers on the impact resistance, damage tolerance and environmental degradation resistance of Kevlar fiber-reinforced Epoxy (KE) composites. In this study, nanofillers up to 10 wt% were added to 70/30 vol% 16-ply KE composites. Impact tests were performed on the composites using a low-velocity impactor, followed by damage area analysis using the C-scan technique. Drop weight tests were performed with the weight of 6.27 kg and 32 J of potential energy. The damaged test panels were exposed to ultraviolet light and moisture for 0, 4 and 8 days. Then water contact angles around the damaged area of each damaged composite panel were measured. Analysis showed that nanoclay (NC) is more effective than graphene (G) in impact resistance (26.9% increase vs 7.5% increase) and the absorption of impact energy (15% increase vs 11.37% decrease). The penetration analysis showed that nanoclay is better at preventing penetration than graphene. The damage area analysis showed the risk mitigation of catastrophic damage with the inclusion of nanofillers, especially NC, due to high impact and penetration resistance which resulted from the uniform distribution of NC and high packing density of NC-filled composites.

Keywords: Kevlar Composite, Nanoclay, Graphene, Low-Velocity Impact, UV Degradation