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Experimental and Numerical Analysis on Enhancing Mechanical Properties of CFRP Adhesive Joints Using Hybrid Nanofillers

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Abstract : In this work, multi-walled carbon nanotubes (MWCNTs) and graphene nanoplates (GNPs) were dispersed into epoxy adhesive to investigate their synergy effects on the shear properties, mode I and mode II fracture toughness of unidirectional composite bonded joints. Testing results showed that the incorporation of MWCNTs and GNPs significantly improved the shear strength, the mode I and mode II fracture toughness by 36.6%, 45% and 286%, respectively. In addition, the fracture surfaces of the bonding area as well as the toughening mechanism of nanofillers were analyzed. Finally, a nonlinear cohesive/friction coupled model for delamination analysis of adhesive layer under shear and normal compression loadings was proposed and implemented in ABAQUS/Explicit via user subroutine VUMAT.

Keywords : nanofillers, adhesive joints, fracture toughness, cohesive zone model
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