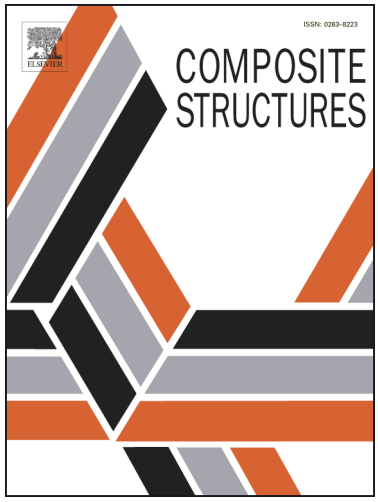

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Effect of interphase region on the elastic behavior of unidirectional glass-fiber/epoxy composites

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Abstract

Using a FEA homogenization technique, this study presents the influence of interphase region on composites. Numerical models using ABAQUS™ are developed in order to predict the mechanical behavior of a unidirectional composite (E-glass fibers/epoxy) under monotonic transverse traction. A Representative Volume Element description with a random distribution of the fibers is used. Linear elastic constitutive materials and Kinematic Uniform Boundary Conditions are considered.

A numerical/experimental comparison is made in order to validate the model. The thickness and the modulus of the interphase have been determined by experimental measurements based on Atomic Force Microscopy and introduced in the numerical simulation, the effect of these properties as well as the effect of the interphase Poisson's ratio, on the effective elastic properties of the composite is discussed. The obtained results are in good agreement with the experimental values previously measured by tensile test on macroscopic samples. The fact of considering the interphase improves the accuracy of the prediction of the composite mechanical elastic behavior.

Keywords: Interface/interphase, Polymer-matrix composites (PMCs), Glass fibres, Finite Element Analysis (FEA).

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