

The Transverse Interface Strength of the Fiber-Matrix Interface in Polymer Matrix Composites

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Abstract

The transverse tensile strength of the fiber-matrix interface plays an important role in controlling a number of failure modes in polymer matrix composites (PMCs). These include the transverse failure of 90° plies, as well edge delamination in PMC laminates. On the other hand, while significant attention has been focused in the PMC literature on interface shear failure, such as under pull-out conditions, little attention has been focused on the interface tensile strength. In order to avoid edge effects, a cruciform geometry was selected for evaluating the tensile strength. SiC fibers with different types of coatings were evaluated inside an epoxy matrix, and the bond strength was estimated from the mechanical test data. Interface failure was confirmed using optical, dye penetrant, and an ultrasonic shear wave back reflection technique. Tests using straight sided specimens confirmed that singularities at specimen edges have significant influence on interface failure, and hence must be avoided for obtaining valid interface strength data.