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**Hybrid specimens eliminating stress concentrations in tensile and compressive testing of
unidirectional composites**

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Abstract

Two novel approaches are proposed for elimination of stress concentrations in tensile and compressive testing of unidirectional carbon/epoxy composites. An interlayer hybrid specimen type is proposed for tensile testing. The presented finite element study indicated that the outer continuous glass/epoxy plies suppress the stress concentrations at the grips and protect the central carbon/epoxy plies from premature failure, eliminating the need for end-tabs. The test results confirmed the benefits of the hybrid specimens by generating consistent gauge-section failures in tension. The developed hybrid four point bending specimen type and strain evaluation method were verified and applied successfully to determine the compressive failure strain of three different grade carbon/epoxy composite prepregs. Stable failure and fragmentation of the high and ultra-high modulus unidirectional carbon/epoxy plies were reported. The high strength carbon/epoxy plies exhibited catastrophic failure at a significantly higher compressive strain than normally observed.

Keywords:

A. Carbon fibres, B. Delamination, B. Fragmentation, D. Mechanical testing,

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