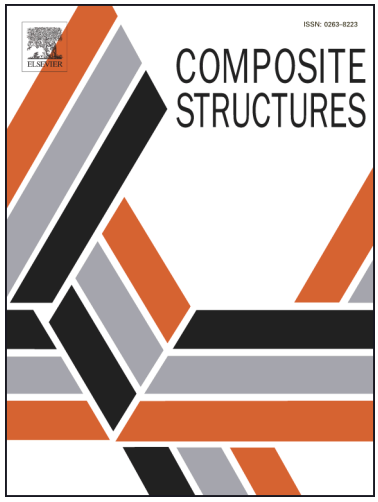

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Experimental investigation on the mechanical behaviour of 3D carbon/carbon composites under biaxial compression

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ABSTRACT

The effects of complex state of stress on the compressive behaviour of 3D carbon/carbon composites are investigated by application of uniaxial and biaxial loadings using a specially developed Zwick cruciform testing facility. The shape of the biaxially loaded cruciform specimen is optimised to avoid premature fracture outside the gauge section. A semi-analytical method is proposed to determine the stress components in the gauge section of the biaxial specimen. The experimentally obtained failure stress relation, which traces an elliptical path in the principal stress space, can be well represented by the Tsai criterion with a stress interaction parameter of F_{12}=-0.85. Macro-fracture morphology and SEM micrographs are examined and the results show that the failure mechanisms of the composites vary with the loading ratio. The results also suggest that the biaxial stress interaction effect is represented by a domain in the biaxial specimen, which is characterised by torsion and bending fractures in the dislocated fibres between two adjacent Z yarns.

*Keywords:*A. Carbon-carbon composites(CCCs); B. fracture; C. mechanical properties;

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