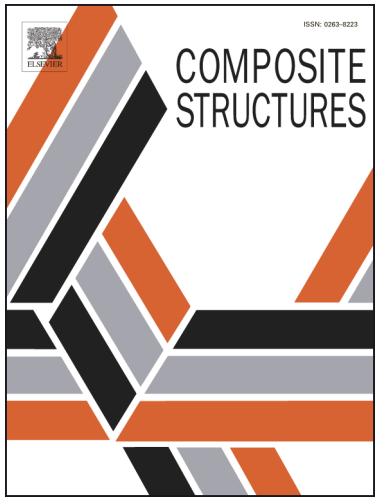

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Mesh objective implementation of a fibre kinking model for damage growth with friction

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Abstract

A newly developed physically based model for the longitudinal response of laminated fibre-reinforced composites during compressive damage growth is implemented in a Finite Element (FE) software. It is a mesoscale model able to capture the physics of kink-band formation by shear instability, the influence of the matrix in supporting the fibres and the rotation of the fibres during compression, resulting in more abrupt failure for smaller misalignments. The fibre kinking response is obtained by solving simultaneously for stress equilibrium and strain compatibility in an FE framework.

Strain softening creates pathological sensitivity when the mesh is refined. To make the model mesh objective, a methodology based on scaling the strain with the kink-band width is developed. The FE implementation of the current model is detailed with focus on mesh objectivity, and generalized to irregular meshes. The results show that the current model can be used to predict the whole kinking response in a 3D framework and thus account for the correct energy dissipation.