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**PROCEEDINGS**

# A Phase-Field Framework for Modeling Cohesive Fracture and Multiple Crack Evolutions in Fiber-Reinforced Composites

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**ABSTRACT**

This work proposes a novel multi-phase-field formulation to characterize the distinct damage mechanisms and quasi-brittle fracture behaviors in FRC. The phase field driving forces for each failure mechanisms are first defined based on an anisotropic energy split scheme. Then, the PF degradation functions pertinent to each failure mode are properly defined with corresponding material fracture quantities, which enables the derivation of embedded Hashin failure criteria for fiber- and matrix failures respectively. Furthermore, the material damaged stiffness is redefined within the anisotropic CDM framework, and a linear CZM is mathematically derived for each of the typical failure mechanisms. Finally, the model validation is demonstrated by the high-fidelity simulation of several benchmark examples, and good agreements between current predictions and available experimental data or alternative computational results are observed. The present findings and future scope highlight the predictive capability of the proposed scheme for analyzing fracture behavior of composites.

**KEYWORDS**

Multi-phase-field; cohesive fracture; progressive failure; fiber reinforced composites

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