

A Phase Field Approach to Model Crack Interface Interaction in Ceramic Matrix Composites

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Abstract : There are various failure modes in ceramic matrix composites; notable ones are fiber breakage, matrix cracking and fiber matrix debonding. Crack nucleation and propagation in microstructure of such composites requires an understanding of interaction of crack with the multiple inclusion heterogeneous system and interfaces. In order to assess structural integrity, the material parameters especially of the interface that governs the crack growth should be determined. In the present work, a nonlocal phase field approach is proposed to model the crack interface interaction in such composites. Nonlocal approaches help in understanding the complex mechanisms of delamination growth and mitigation and operates at a material length scale. The performance of the proposed formulation is illustrated through representative numerical examples. The model proposed is implemented in the framework of the finite element method. Several parametric studies on interface crack interaction are conducted. The proposed model is easy and simple to implement and works very well in modeling fracture in composite systems.

Keywords : composite, interface, nonlocal, phase field

Conference Title : ICFM 2021 : International Conference on Fracture Mechanics

Conference Location : Oslo, Norway

Conference Dates : June 24-25, 2021