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PROCEEDINGS

Analytical Mixed Mode Partition Method for One Dimensional Fracture of Composite DCBs

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ABSTRACT

Fracture analysis is a problem playing a fundamental role in the fields of Aerospace Mechanics and Structural Mechanics. The paper deals with the analysis of the most essential among the fracture problems: the one-dimensional crack in a double cantilever beam. The report presents a reliable analytical method to correctly partition the energy release rates into pure fracture modes, appliable to both isotropic and composite beams with clearly known mechanical properties, subject to shearing or bending loads. The adopted strategy is based on the Timoshenko's kinematic model and exploits the theoretical definition of the I and II pure energy release rate modes. Following this study, a promising analytical expansion of the outlined approach is introduced. The obtained, innovative method only requires the geometrical features of the beam for the partitioning of the energy release rate. The concluding pages of the paper uncover the underlying principles and complexities of the problem, presenting the development of a general analytical method for beams subject to any kind of load. All the proposed analytical methods have been extensively validated against numerous numerical solutions, proving themselves to be a valid alternative to computational expensive FEM codes.

KEYWORDS

Energy release rate; mixed mode partitions; fracture; composite material; failure

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