

# Effect of uniform distributions of bonded and debonded fibers on the growth of the fiber/matrix interface crack in cross-ply $[0_n^\circ, 90^\circ]_S$ laminates with different fiber contents under transverse loading

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## Abstract

A set of criteria is proposed to predict the initiation and propagation of fiber-matrix interface debonds and the transition to collective mesoscopic behavior in the form of transverse cracks. It features:

- a group of deterministic equations to determine the driving quantities of the fracture process: Energy Release Rates and dilatational energy;
- a set of probabilistic expressions to quantify the random distributions of critical values.

## 1. Introduction

## 2. RVE models & FE discretization

*2.1. Models of Representative Volume Element(RVE)*

*2.2. Finite Element (FE) discretization*

## 5 3. Results & Discussion

*3.1. Effect of  $0^\circ$  ply thickness on the interaction between debonds in a  $90^\circ$  ply with a single layer of fibers*

*3.2. Effect of  $0^\circ$  ply thickness on the interaction between layers of fully bonded fibers and a centrally located line of debonded fibers in a  $90^\circ$  ply*

10 *3.3. Effect of  $0^\circ$  ply thickness on the interaction of debonds in a  $90^\circ$  ply with multiple layers of fibers*

subsectionComparison with the single fiber model with equivalent boundary conditions

## 4. Conclusions & Outlook