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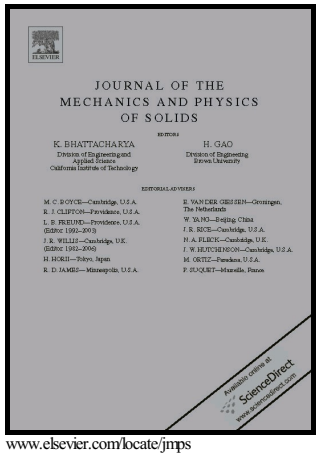

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Anisotropic failure and size effects in periodic honeycomb materials: a gradient-elasticity approach

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Abstract

This paper proposes a fracture mechanics model for the analysis of crack propagation in periodic honeycomb materials. The model is based on gradient-elasticity what enables to account for the effect of the material structure at the macroscopic scale. For simulating the propagation of cracks along an arbitrary path, the numerical implementation is elaborated based on an extended finite element method with the required level of continuity. The two main features captured by the model are directionality and size effect. The numerical predictions are consistent with experimental results on honeycomb materials but also with results reported in the literature for microstructurally short cracks in metals.

Keywords: crack propagation, gradient-elasticity, digital image correlation, identification

1. Introduction

Since the pioneering works in (1), (2), (3), (4) and many others, Linear Elastic Fracture Mechanics (LEFM) has been extensively and successfully used for analyzing crack propagation in brittle materials. Recent advances in numerical simulations, especially the eXtended Finite Element Method (X-FEM) (5; 6), allow one for simulating

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