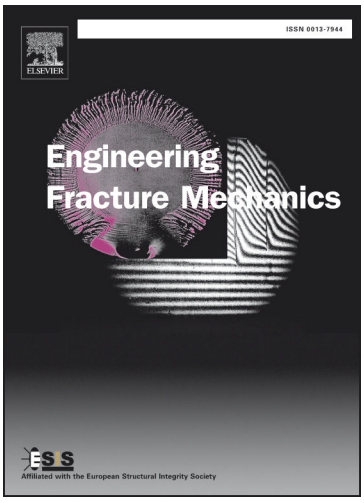

Numerical simulation of crack propagation and branching in functionally graded materials using peridynamic modeling

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Numerical simulation of crack propagation and branching in functionally graded materials using peridynamic modeling

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Abstract

In this study, a bond-based peridynamic (PD) model for functionally graded materials(FGMs) was introduced to simulate various dynamic brittle fractures in FGMs. The PD analyses of dynamic crack propagation and branching in FGMs were discussed, and the results of the two convergence studies under uniform grid refinement (*m*-convergence) and decreasing radius of PD horizon (δ-convergence) were presented. The influence of material gradient pattern on crack curving and branching in FGMs under dynamic loads was analyzed. In addition, the propagation of a single crack in FGMs subjected to dynamic biaxial loads was studied. The effects of loading conditions and gradient patterns of FGMs were investigated. The results of these investigations suggest that both the material gradient patterns and the loading conditions can affect the crack propagation in FGMs, whereas the influence of a specific form of elastic modulus on the fracture behavior of FGMs is limited.

Key words: Peridynamics; Functionally graded materials; Dynamic fracture; Crack curving and branching; Dynamic biaxial loads

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