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ON THE BELTZ-RICE NONLOCAL CONTINUUM MODEL AND ENERGY COMPETITION MECHANISM

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ABSTRACT

In this work, we developed a cohesive Peierls–Rice–Beltz nonlocal continuum theory and apply it to model brittle and ductile fracture behaviors in crystal solids, which is based on a meso-scale Peierls–Rice–Beltz cohesive potential function. By doing so, we have successfully encompassed both brittle and ductile fracture in one model. The main novelties of this work are: (1) We have established a numerical framework of energy competition mechanism for crystalline materials, (2) We have carried out quantitative analysis on competition between decohesion and dislocation behaviors, (3) We have demonstrated the capability of the proposed model in capturing meso-scale dislocations, lattice slips and mixed mode fracture. Several numerical examples have been presented, in which we show that the proposed approach is a simple, efficient and effective method to model inelastic fracture in the nonlocal cohesive media.