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# Non-local plasticity effects on notch fracture mechanics

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**Abstract**

We investigate the influence of gradient-enhanced dislocation hardening on the mechanics of notch-induced failure. The role of geometrically necessary dislocations (GNDs) in enhancing cracking is assessed by means of a mechanism-based strain gradient plasticity theory. Both stationary and propagating cracks from notch-like defects are investigated through the finite element method. A cohesive zone formulation incorporating monotonic and cyclic damage contributions is employed to address both loading conditions. Computations are performed for a very wide range of length scale parameters and numerous geometries are addressed, covering the main types of notches. Results reveal a strong influence of the plastic strain gradients in all the scenarios considered. Transitional combinations of notch angle, radius and length scale parameter are identified that establish the regimes of GNDs-relevance, laying the foundations for the rational application of gradient plasticity models in damage assessment of notched components.

*Keywords:*

Strain gradient plasticity, Finite element analysis, Notch, Fracture, Fatigue

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