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A Study of Particle Debonding with Anisotropy

Brian Nyvang Legarth

Department of Mechanical Engineering, Solid Mechanics, Technical University of Denmark, Denmark

Reinforcement of materials by adding second phase particles usually causes the fracture toughness to decrease due to void nucleation and growth by debonding along the particle-matrix interface. This work applies a unit cell model with periodical boundary conditions to numerically investigate effects of plastic as well as geometrical anisotropy on this failure mechanism for an elastic-viscoplastic matrix containing rigid inclusions. The periodical boundary conditions allows for any choice of initial angle between the tensile direction and the principal axes of anisotropy. Geometrical anisotropy is induced by the shape and the distribution of the inclusions. The average stress-strain response of the cell is evaluated and debonding is observed as a sudden stress drop. Depending on the initial orientation of the principal axes of plastic anisotropy, debonding in the present material is significantly delayed due to a reduced yield stress. Some results show identical stress-strain responses but laterally reversed deformation modes.

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