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Localized Necking Criterion Based on Acoustic Tensor for Materials with Anisotropic Damage

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Localized Necking Criterion Based on Acoustic Tensor for Materials with Anisotropic Damage C.L.Chow and M.Jie Department of Mechanical Engineering, The University of Michigan – Dearborn, Dearborn, MI 48128, USA Abstract The paper presents the development of a criterion of localized necking for strain-softening materials. The criterion takes into account of the material behavior of anisotropic damage and anisotropic plasticity. The critical condition of damage evolution is of primary interest in this study. For localized necking as a consequence of plastic instability, the singularity of acoustic tensor is taken as the critical condition for localized necking in strain-softening materials. Effective tangent modulus tensor for materials with anisotropic damage is established. The damage-coupled localized necking criterion, along with inclination angle of localization band, for strain-softening materials is derived. The closed-form expression of localized necking criterion offers potential applications in the analysis of failure in strain-softening materials such as hot metals, rocks, soil, solder, etc. It is observed that the critical damage value at localized necking is not a constant but depends on stress and strain states.

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