Cocks, A. C. F.

Inelastic deformation of porous materials. (English) Zbl 0697.73034

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Summary: This paper examines the structure of material constitutive laws for time- independent plastic and creeping porous bodies through the determination of bounds to the flow and strain-rate potentials. The results are a logical extension of conventional plasticity and creep formalisms for incompressible materials. It is demonstrated that the shape of the yield surface for a time-independent plastic material and the surface of constant energy dissipation rate for a creeping solid are a function of stress and void volume fraction only, and independent of material parameters apart from a weak dependence on the creep exponent, n. This condition is not satsfied by the model proposed by *A. L. Gurson* [J. Engng Mater. Tech. Trans. ASME, 99, 2 (1977)] and modifications are suggested to his model and its extension to material hardening. The predictions obtained for a creeping solid are in broad agreement with results of other studies.

MSC:

74B99 Elastic materials
74C99 Plastic materials, materials of stress-rate and internal-variable type
74D99 Materials of strain-rate type and history type, other materials with memory (including elastic materials with viscous damping, various viscoelastic materials)

Keywords:

material constitutive laws; time-independent plastic and creeping porous bodies; bounds to the flow and strain-rate potentials

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