PROLEGOMENA

A symposium on Material Instabilities was held at the University of Missouri-Rolla in October 1991 in conjunction with the 22nd Midwestern Mechanics Conference. Contributors to the symposium were invited to submit full length papers for possible publication, after the usual review, in a special supplement to the *Applied Mechanics Reviews*. This resulted in the sixteen papers that are included in this issue. They represent a small collection of papers on the fascinating subject of material instabilities, with special emphasis on the shear banding phenomenon in single crystals, polycrystals, clays, and granular materials.

The papers are arranged in three groups addressing various aspects of material instabilities, namely, theoretical, numerical, and experimental. Some of the papers give comprehensive reviews of the subject, providing a very valuable document for both beginning and established researchers in this area. Three of these contributions, by Needleman and Tvergaard, Nemat-Nasser, and Shawki, are major review articles and they appear alphabetically at the beginning of the issue followed by the other articles which are also arranged in alphabetical order.

The article by Needleman and Tvergaard reviews the theoretical and numerical aspects of the localization phenomena. The article by Nemat-Nasser addresses fundamental concepts underlying the phenomenological theories of elastic-plastic deformations at finite strains and rotations, emphasizing the constitutive parameters which underline strain localization and material instability. The paper by Shawki provides an overview of the current understanding of shear band formation at high strain rates.

Efforts are made in many of the papers to characterize not only the onset of instability, but also the postlocalization behavior and the evolution of the resulting heterogeneous pattern of deformation, using both micromechanics and macromechanics approaches. One of the main problems addressed in many of these papers is that of scaling and the manner in which the scale of the microstructure determines the size and magnitude of relevant macroscopic parameters, including width of the shear band, and the dependence of the flow stress on higher order gradients.

We wish to thank all the participants whose contributions and attendance at the sessions made the symposium a successful one.

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