Preface

Pressure-Sensitive Materials are widely used in modern engineering applications. As usual they are lightweight structures and have analogs in nature (for example bones). But there are a lot of other application fields. This monograph is devoted to the modeling and simulation of pressure-sensitive materials since the standard methods and equations are partly not applicable. For problems of manufacturing of such materials we refer to the special literature.

The monograph summarizes new trends and established methods in the field of pressure-sensitive materials. It contains six chapters prepared by different research groups. "Basic Equations of Continuum Mechanics" gives an overview on the general continuum mechanics in which the modeling of pressure-sensitive materials is embedded. In addition, some examples of special constitutive equations for incompressible and compressible materials are presented. These examples are mostly related to rubber-like materials. "Phenomenological Yield and Failure Criteria" presents classical and improved criteria of limit states of materials. The classical criteria are applicable only in the cases of ideal ductile or absolutely brittle materials. Various possibilities to develop improved criteria are described. Finally, three examples (gray cast iron, polyoxymethylene (POM), and polyvinyl chloride (PVC) hard foam) demonstrate the application of different approaches in modeling certain limit behavior. "Plasticity of Cellular Metals (Foams)" presents cellular metals, e.g., made by solidification of molten metal foam, which have interesting mechanical properties, among them high specific strength and stiffness coupled with inflammability and good damping properties. The analysis of such materials is not a trivial problem, especially beyond the elastic range, since the micro-mechanical behavior has a great influence on the macroscopic properties. "Transmission Conditions for Thin Elasto-Plastic Pressure-Dependent Interphases" is devoted to the behavior of thin soft elasto-plastic interphases. The case of pressure-independent (von Mises) as well as pressure-dependent yield condition is theoretically treated and finite element calculations are presented. "Effect of Pressure-Dependency of the Yield Criterion on the Strain Rate Intensity Factor" presents several rigid

plastic models, for which the equivalent strain rate (quadratic invariant of the strain rate tensor) approaches infinity in the vicinity of maximum friction surfaces. In this case special methods in the analysis are necessary. "Mechanical Response of Porous Materials: the Gurson Model" is devoted to a special model applicable for pressure-sensitive materials under the influence of damage effects: the Gurson model. Some theoretical and numerical aspects are discussed.

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