# Contents

**Symposium on Dynamic Behavior of Materials—Part II**

# *Symposium on Dynamic Behavior of Materials*

## Foreword

The dynamic behavior of materials encompasses a broad range of phenomena with technological applications in military and civilian sectors. The articles in this section are based on the papers presented at the 1998 symposium on the Dynamic Behavior of Materials sponsored by the Mechanical Behavior of Materials Committee. The first symposium on this subject was held in October 1994 (published in two parts: October 1995 and July 1996) and the second in October 1998, both in Rosemont, Illinois. The two symposia have had excellent participation in terms of papers presented and the audience attending the sessions.

It is clear that a field of research is emerging and it is being realized that materials aspects are of utmost importance in dynamic events. This field of research is evolving along the lines similar to other important fields in the mechanical behavior of materials, e.g., creep, fatigue, fracture. The macromechanical and physical processes that govern the phenomena manifest themselves, at the microstructural level, by a dazzling complexity of morphologies and effects. Nevertheless, they can be quantitatively treated. We are at the exciting stage where this knowledge is enhancing our predictive capability and enabling large scale computations that are realistic and cannot only assist, but also guide the design process. In contrast to quasi-static deformation and fracture, the following effects play an increasingly important role in dynamic events:

1. Mass inertia: this leads to the propagation of elastic, plastic, and shock waves.
2. Thermal inertia: this leads to thermo-viscoplastic instabilities, more commonly known as adiabatic shear bands.
3. Thermal activation and viscosity: the behavior of dislocations, the primary carriers of plastic deformation, is strongly influenced by velocity. Dynamic deformation drives dislocations into regimes unattainable under quasistatic deformation.

The multiple technological applications of this field include crashworthiness, machining, and the important military effects in armor, penetration, projectiles, explosions, and, in general, the design of conventional and nuclear weapons. The dynamic processing of materials (compaction, synthesis, welding, forming, etc.) is also of considerable importance. It is hoped that, through the publication of the papers of these symposia, the materials community becomes exposed to this research field that was often relegated to specialized symposia.


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