



## book reviews

**DEFORMATION AND FRACTURE MECHANICS OF ENGINEERING MATERIALS**, by Richard W. Hertzberg, John Wiley & Sons, New York, 1976, 605 pp., \$21.95.

REVIEWED BY FRANK E. HAUSER<sup>1</sup>

This book is an impressive compilation of classical as well as current knowledge of plastic deformation and fracture in materials.

In the first section, after a review of generalized Hooke's law, the macroscopic aspects of plastic deformation are discussed. This is followed by an excellent summary of current dislocation theory which in turn is applied to explain the mechanical behavior of crystalline solids. A separate chapter on deformation twinning and deformation texturing is followed by a chapter on high temperature deformation. This chapter includes, in addition to the usual Temperature-Stress-Strain Rate relationships, sections on superplasticity and on the concept of deformation mechanism maps. A concise and up-to-date chapter on deformation of plastics brings the first section of the book to a close.

The second section entitled, "Fracture Mechanics of Engineer-

ing Materials" covers more than a simple presentation of the continuum mechanics and transition temperature approach to fracture. Design philosophy, that is the use of fracture mechanics for predicting behavior is stressed repeatedly. There also are chapters on the effect of microstructural and metallurgical variables as well as environmental factors on fracture toughness. In the chapters on fatigue and fatigue crack propagation the author is clearly in his own field of expertise. This enables him to extract the important concepts from the large aggregate of theories and experimental results in the literature. The only shortcoming is the one page treatment of fatigue crack initiation. Since in high cycle fatigue the initiation process constitutes most of the lifetime of a part, the importance of this process tends to be buried by the great amount of information presented on crack propagation. The final chapter applies fracture mechanics in a systematic way to failure analysis. Six case histories are presented and the author stresses the different and independent approaches one can take in analyzing a particular failure.

This book is a well-written source of information for mechanical metallurgists or design engineers who wish to update themselves on recent progress in the area of material deformation and fracture. Applications of the concepts to real problems are included in several sections. The book is also suitable as a text for a first year graduate course on mechanical behavior of materials. There are extensive reference lists and some problems at the end of each chapter.

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