



# **Fundamentals of Strength: Principles, Experiment, and Applications of an Internal State Variable Constitutive Formulation**

*Paul S. Follansbee*

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**Offers data, examples, and applications supporting the use of the mechanical threshold stress (MTS) model**

Written by Paul S. Follansbee, an international authority in the field, this book explores the underlying theory, mechanistic basis, and implementation of the mechanical threshold stress (MTS) model. Readers are introduced to such key topics as mechanical testing, crystal structure, thermodynamics, dislocation motion, dislocation–obstacle interactions, hardening through dislocation accumulation, and deformation kinetics. The models described in this book support the emerging theme of Integrated Computational Materials Engineering (ICME) by offering a foundation for the bridge between length scales characterizing the mesoscale (mechanistic) and the macroscopic.

*Fundamentals of Strength* begins with a chapter that introduces various approaches to measuring the strength of metals. Next, it covers:

- Structure and bonding
- Contributions to strength
- Dislocation–obstacle interactions
- Constitutive law for metal deformation
- Further MTS model developments
- Data analysis: deriving MTS model parameters

The next group of chapters examines the application of the MTS model to copper and nickel, BCC metals and alloys, HCP metals and alloys, austenitic stainless steels, and heavily deformed metals. The final chapter offers suggestions for the continued development and application of the MTS model.

To help readers fully understand the application of the MTS model, the author presents two fictional materials along with extensive data sets. In addition, end-of-chapter exercises give readers the opportunity to apply the models themselves using a variety of data sets.

Appropriate for both students and materials researchers, *Fundamentals of Strength* goes beyond theory, offering readers a model that is fully supported with examples and applications.

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