LIBRARY

An Introduction to Metal Matrix Composites

T.W. Clyne and P.J. Withers
(Cambridge University Press, 1993)
ISBN: 0-521-48357-3

The book, *An Introduction to Metal Matrix Composites*, by T.W. Clyne and P.J. Withers, with a length of approximately 500 pages, discusses essentially all important aspects of continuously and particulate reinforced metal matrix composites. It consists of a description of basic composite mechanics followed by Eshelby's inclusion approach to the modeling of composites. This theoretical framework predicts properties such as composite elastic constants, residual stresses arising from cooling, and the stress required for the onset of inelastic deformation. The derived equations are illustrated with numerous experimental examples. A description of the plastic deformation of composites identifies the reasons for their tension-compression asymmetry and for their often low proportional limits. Similarly, the book discusses and illustrates creep properties, including the dramatic enhancement of creep by thermal cycling. The mechanical properties of the interfacial region between the matrix and the reinforcing phase are, of course, very important. In particular, the book describes and illustrates the measurement of the mechanical properties of interfaces, for example, by fiber push-out tests. Based on such measurements, expressions for the energy absorption of composites during fracture are derived. The authors' discussion of the influence of reaction layer thicknesses on composite strength is followed by a description of the interfacial chemistry leading to such reaction layers.

A chapter on fracture and failure deals with issues such as crack/void nucleation and growth, failure strain, and fracture toughness as a function of reinforcement volume fraction. The book addresses also thermal and electrical conduction as well as miscellaneous properties such as tribological behavior, mechanical damping, and environmental effects. Other chapters are devoted to fabrication techniques for composites, the development of the matrix microstructures in composites (which is influenced by the reinforcing phase), and testing and characterization techniques. The book concludes with a chapter on applications of metal matrix composites, which contains a number of case studies of successful composites.

The authors present, as far as possible, composite behavior in terms of simple, easily derived equations. At the same time, they are careful to point out the limitations of the individual approaches. The authors provide ample literature references in case the reader intends to follow up on a particular topic. Whenever possi-

https://doi.org/10.1557/S0883769400045437 Published online by Cambridge University Press

ble, the authors employ the Eshelby approach to determine mechanical (and also thermal) composite properties and make every attempt to enable the reader to use this approach. The book contains a consistent nomenclature, and a summary of the symbols used for the various parameters, subscripts, and superscripts. The equations derived are in many cases illustrated by actual experimental results. The book includes many tables with experimental parameters pertaining to real composites and their components. The figures usually contain descriptive captions, making them easy to follow.

In conclusion, Clyne and Wither's book offers a wealth of information on the subject of metal matrix composites, and it caters to a wide range of readers ranging from those with a mostly experimental interest in metal matrix composites to those looking for ways to improve their theoretical description.

Reviewer: Jaochim H. Schneibel, of the Metals and Ceramics Division at Oak Ridge National Laboratory, currently researches mechanical properties of iron aluminide alloys, processing and properties of iron aluminide composites, and liquid phase and solid-state sintering.

Advertisers in This Issue

For free information about the products and services offered in this issue, fill out and mail the Reader Service Card, or FAX it to (312) 922-3165.

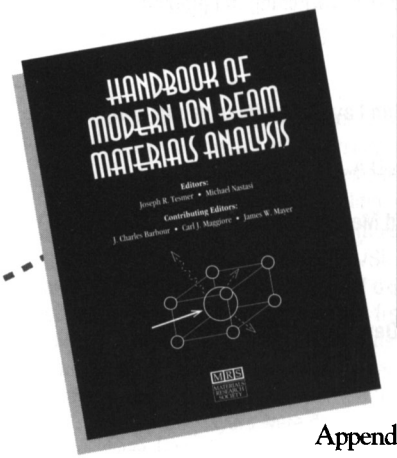
Most Comprehensive Database on Ion Beam Analysis Ever Published!

HANDBOOK OF MODERN ION BEAM MATERIALS ANALYSIS

JUST PUBLISHED
August 18

Editors:
Joseph R. Tesmer
Michael Nastasi

Contributing Editors:
J. Charles Barbour
Carl J. Maggiore
James W. Mayer



Written and compiled by over 30 leading authorities in the field of ion beam analysis

Important reference tool for technicians, students and professionals alike

A must for all accelerator labs

Excellent introduction to the lab practices and fundamentals of ion beam analysis

Useful as a teaching text for undergraduate seniors or first-year graduate students

For libraries, the most recent and comprehensive collection of nuclear data for the applications of ion beam materials analysis

The ***Handbook of Modern Ion Beam Materials Analysis*** is a compilation of updated techniques and data for use in the ion-beam analysis of materials. The information presented is unavailable collectively from any other source, and places a strong emphasis on practical examples of the analysis techniques as they are applied to common problems. The book's 13 chapters cover discussions and examples, while 18 appendices provide extensive compilations of relevant data.

Order the ***Handbook of Modern Ion Beam Materials Analysis*** today!

1995, Hardbound, 700 Pages
ISBN: 1-55899-254-5
Order Code: IBH-BWA

$160.00 MRS Members
$200.00 U.S. List
$230.00 Foreign

Chapters

1. Introduction
2. Energy Loss
3. Nuclear Theory
4. Backscattering Spectrometry
5. Elastic Recoil Detection: ERD
6. Nuclear Reaction Analysis: Particle-Particle Reactions
7. Nuclear Reaction Analysis with (Particle, γ) Reactions
8. Nuclear Reactions for Hydrogen Analysis
9. Charged Particle Activation Analysis
10. Channeling
11. Instrumentation and Laboratory Practice
12. Pitfalls in Ion Beam Analysis
13. Radiological Safety

Appendices

1. Elements
2. Physical Constants, Conversions, and Useful Combinations
3. Stopping and Range
4. Scattering and Reaction Kinematics
5. K Factors for RBS
6. Rutherford Cross Sections
7. Non-Rutherford Elastic Backscattering Cross Sections
8. Actual Coulomb Barriers
9. Elastic Recoil Detection Data
10. Deuterium-Induced Nuclear Reaction Parameters
11. Particle-Particle Nuclear Reaction Cross Sections
12. (Particle, γ) Data
13. Hydrogen Nuclear Reaction Data
14. Activation Analysis Data
15. Channeling Data
16. Thin-Film Materials and Preparation
17. Accelerator Energy Calibration and Stability
18. Radiation Hazards of (α,n) Reactions

950189

Special Savings on Course Adoptions

Order the ***Handbook of Modern Ion Beam Materials Analysis*** in quantities of five or more (for classroom use) and save up to **20%** on your order!

MRS
MATERIALS RESEARCH SOCIETY

Order From:
Materials Research Society
9800 McKnight Road
Pittsburgh, PA 15237-6006 USA
Phone: 412-367-3012; Fax: 412-367-4373

Circle No. 25 on Reader Service Card.