Fatigue of Materials
S. Suresh
ISBN: 0-521-36510-4

This comprehensive, up-to-date text-
book includes a substantial treatment of fa-
tigue in ceramics and polymers as well as
in metallic materials. The emphasis is on
the basic science of fatigue, although the
short but useful final chapter includes de-
sign considerations and case studies. A ba-
sic knowledge of dislocations is assumed,
but there is a brief introduction to contin-
uum mechanics, a more substantial intro-
duction to linear elastic fracture me-
chanics, and a helpful initial overview. Top-
ics on which much attention has been fo-
cused in recent years are well covered,
such as crack closure, threshold condi-
tions, and the short crack problem. The ex-
tensive bibliography indicates that this is a
very comprehensive and up-to-date treat-
ment, especially from the fundamental
and mechanistic points of view of the sub-
ject. Indeed, if used in a course on fatigue,
some degree of selection and possibly reor-
dering of the material would probably be
required. However, this well-written book
certainly will be a major reference in a field
that continues to be of major importance in
engineering and materials science.

Reviewer: G. W. Groves is a lecturer in the De-
partment of Materials at the University of Ox-
ford.

Sol-Gel Science: The Physics and Chemistry of Sol-Gel
Processing
C. Jeffrey Brinker and George W. Scherer
ISBN: 0-12-134970-5

Over the past 15 years, sol-gel processing,
and synthesis of materials has grown
from oddity status into a major interdisci-
plinary research and technological activity
encompassing chemistry, physics, chemical
engineering, and materials science. The
rapid emergence of the field has resulted in
the dispersion of its archival literature in a
variety of conference proceedings and
journals.

In this book, the authors have admirably
accomplished their objective of presenting
"a coherent account of the principles of sol-
gel processing." As the first textbook-
quality publication describing the entire
field of sol-gel science, the authors have
had the opportunity (or onerous task) of
presenting the fundamental principles un-
derlying the unique characteristics of sol-
gel systems.

The book is organized in the order of sol-
gel processing, with the early chapters de-
scribing the chemical synthesis principles
underlying hydrolysis and condensation.
Subsequent chapters progress through ge-
lation, aging of gels, deformation and flow,
drying, structural evolution, surface chem-
istry, chemical modification, and sintering.
The last three chapters discuss more spe-
cialized topics, such as comparisons of gel-
derived and conventionally produced
ceramics, film formation, and applications.
The phenomenology and fundamentals of
each topic are thoroughly discussed and
extensively referenced with more than 100
references following every chapter.

Each chapter is an excellent account of
the specific topic, not surprising since the
authors are pioneers in the sol-gel field and
have contributed greatly to the develop-
ment of its scientific foundations. A note-
worthy feature is the critical analysis of
topics and the authors' attempt to point
out areas of controversy as well as those
requiring more research.

At $140, the book is somewhat expensive
for students but should be in the personal library of anyone doing research in the field. The time and money saved by first reading this book makes it well worth the price.

Reviewer: Gary L. Messing is professor of ceramic science and engineering and director of the Center for Particle Science and Engineering at Pennsylvania State University.

**Materials and the Designer**

E.H. Cornish
ISBN: 0-521-38580-6

The first point of interest about this book is that the author works in industry (STC, United Kingdom) and, as an industrialist, gives the book's content and style a distinctly different slant from other standard textbooks written by academics on the selection and use of materials. The major difference is that there is considerably less emphasis on the property/microstructure relation than in previous books, and a greater proportion of this book deals with general properties of material classes, their responses to service environments, and their processability. The economic decisions made during design are highlighted, and a number of general graphical techniques are illustrated to aid the selection process, as used by the author's company. I was slightly disappointed by the author's lack of specific examples illustrating his points. However, by emphasizing the importance of decisions about machining and other processing specifications, the book shows how industry considers materials selection as part of design for manufacture rather than an exercise in its own right.

In some areas the book is slightly old-fashioned. The choice of metals used in the chapter on general metal properties reflects some of the concerns appropriate 10 years ago. There are similar lapses in the section on ceramics, with only the briefest description of the importance of statistical techniques in design and little on the importance of damage in determining strength. The chapters on sources of material information are useful as a general guide and cover both U.K. and U.S. sources in English. There is perhaps a slight overemphasis on U.K. sources due to the author's nationality.

To conclude, I found this an interesting, different perspective on materials selection showing some of the basic concerns of industry. As an undergraduate or graduate textbook, it is better suited for mechanical engineers than for materials science students. It is clearly not a book around which to base a course but is probably a useful addition to a library.

Reviewer: Brian Derby is a university lecturer in the Department of Materials, Oxford University.
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Co-Editors: Z. A. Munir and J. B. Holt

Journal of Materials Synthesis and Processing, to be published quarterly as of January 1993, is an international forum for peer-reviewed original papers and review articles on all aspects of high temperature synthesis and processing of materials, including ceramic, intermetallic, and composite materials. Papers are now being accepted for the first issue of Materials Synthesis and Processing. All inquiries should be directed to: Z. A. Munir, Division of Materials Science and Engineering, University of California, Davis, CA 95616-5294.

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