



Book Reviews

The Nature and Properties of Engineering Materials, by Zbigniew D. Jastrzebski, John Wiley & Sons, N.Y.

REVIEWED BY RANGA KOMANDURI¹

The Nature and Properties of Engineering Materials by Zbigniew D. Jastrzebski is the 3rd Edition originally published in 1959 and subsequently edited in 1976. This reviewer is quite familiar with the 2nd Edition. The book is well written with a good balance between materials science and materials engineering contents. It is intended for engineering students at the sophomore or junior level and does this purpose ably. It probably serves better the nonmetallurgical students, although quite appropriate for the metallurgists.

The 636 page book contains the following 15 chapters; a table of contents; seven appendices with summaries of properties of metals, plastics, and rubber (in English and SI units); and a subject index.

- Chapter 1 Atoms and Molecules
- Chapter 2 Structure of Solids
- Chapter 3 Phase Transformations and Phase Equilibria
- Chapter 4 Defects and Imperfections in Solids
- Chapter 5 Rate Processes and Crystallization
- Chapter 6 Surface and Interfacial Phenomena
- Chapter 7 Mechanical Properties
- Chapter 8 Metals
- Chapter 9 Ceramics and Related Materials
- Chapter 10 Polymers
- Chapter 11 Electronic Properties
- Chapter 12 Magnetic Properties
- Chapter 13 Thermal Properties
- Chapter 14 Composite Materials
- Chapter 15 Corrosion

As the author points out in the Preface, Chapters 3, 4, 5, 7, 8, 9, 10, 11, and 14 have undergone changes in their organization and/or contents to reflect some of the developments in the field. Also, in this edition, the author has incorporated the SI units as the main units followed by English units in the parentheses.

As regards the organization of the subject matter, this reviewer would like to offer the following constructive suggestion which may be of some help for future editions. All chapters dealing with properties could have been arranged in a consecutive manner (i.e., Chapters 7, 11, 12, and 13) prior to the topics on materials. Likewise, chapters dealing with engineering materials, i.e., metals, ceramics, polymers, and composites (Chapters 8, 9, 10, and 14) could have been followed in a consecutive manner. This could have been followed sequentially by Chapter 6 dealing with Surface and Interfacial Phenomena, and Chapter 15 dealing with Corrosion. Also some chapters contain material more than what the title indicates. For example, the chapter on Electronic Properties

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also contain coverage of electronic materials. Similar examples can be given from some of the other chapters. Since the objective of this edition, according to the author, is to incorporate numerous advances in both materials science and materials technology, it would have been better to cover Optical, electronic, magnetic, and superconducting materials in separate chapters. This way, the technological significance of these materials would have been brought to light. Apart from this, the subject content has been well organized with good illustrations, example problems, relevant references, and many questions at the end of each chapter.

There are a few books on Material Science and Engineering which are exemplary in their treatment of the subject matter at the level they are intended. *The Nature and Properties of Engineering Materials* by Zbigniew D. Jastrzebski, in this reviewers' opinion, is definitely in that category. It is, therefore, highly recommended as a textbook for engineering students and as a reference to libraries and practicing engineers.

Materials and the Designer, by E. H. Cornish

REVIEWED BY RANGA KOMANDURI

Materials and the Designer by E. H. Cornish is a welcome addition to this field. With concerns for quality, reliability, maintainability, and cost of manufactured products it is increasingly becoming a necessity to introduce materials and processing issues at the early design stage. Topics such as life cycle engineering, simultaneous or concurrent engineering are emerging and getting serious attention. This book seeks to identify those parameters which must be considered by the designer in the selection of materials for use in engineering applications.

The 282 page book contains an introduction, the following 14 chapters, a list of references, bibliography, and a subject index.

Introduction

1. The Impact of Design on Manufacturing Industry
2. Expertise Required for the Design Process
3. An Introduction to Materials
4. Properties of Metals and Alloys
5. Properties of Ceramics
6. Properties of Polymers
7. Properties of Composites
8. Materials Performance in Service
9. Finishes and Coatings as Protective Systems
10. Materials Reliability and Service Life
11. Factors Controlling the Selection of Substitute Materials
12. Material Forming Processes and Design
13. Sources of Information on Materials
14. Standards and Materials

The product designer is likely to focus his skills primarily

upon the mechanical, aesthetic, and functional requirements of products. The author rightly emphasizes in the Preface that to be effective the product designer needs a broader knowledge including knowledge on the materials and processing technology. The author's contention is that the product designer should have this knowledge with ramifications on materials availability, materials selection based on properties and performance requirements, the behavior of materials under different processing conditions, the factors involved in the substitution of materials, materials performance and reliability in service, choice of the production methods, and other aspects pertinent to materials and processes. This reviewer commends this view and would like to extend this concept one step further by not limiting it only to designers. It appears that such an approach would be immensely valuable to all engineering students. In fact, this book could as well be titled as *Materials and the Engineer*. Perhaps a course on this subject may be given at the Junior level followed by a senior project. The junior students by then would have taken first level courses in materials, processes, and design. With this background, the subject matter would be a logical extension. Those who subsequently join industry and become product designers would automatically have this background. In addition this book can be used for a practicing engineer as a short course.

Chapter 1 deals with the impact of design on manufacturing industry and intends to demonstrate how a judicious selection of materials in terms of their performance, properties, availability, and cost together with the appropriate processing

technology could enhance the profitability of a manufacturing operation. Chapter 2 deals with the expertise required for the design process. It cautions that cost may be built into a product by default, unless the design is optimized for appropriate materials and technology. Several chapters follow dealing with materials beginning with a general introduction to materials (Chapter 3) followed by a discussion of specific materials such as metals and alloys, polymers, ceramics, and composites (Chapters 4 to 7). Numerous materials with a wide range of properties, performance limitations and cost are available. It is important to select the optimal material for the right application. To delineate areas of opportunities for materials selection, the author introduces the concept of an "envelope of properties". Three additional chapters dealing with materials performance in service, materials reliability and service life, and factors controlling the selection of substitute materials follow (Chapters 8, 10, and 11). A chapter on finishes and coatings as systems for protection in adverse environments is also included (Chapter 9). On the processing side, a chapter dealing with material forming processes and design for various materials is included (Chapter 12). The last two chapters of the book deal with the source of information on materials, and on standards and materials (Chapters 13 and 14). The book contains practical information in tabular form as well as in the form of figures.

The book is well written and covers material from a perspective useful to all engineers. It should be of interest to engineering students as well as practicing engineers. It is, therefore, recommended both as a reference and a textbook.