BIASED BUT NOT UNDULY SO

Title High Temperature Compounds of Rare Earth Metals with Non Metals

Author G. V. Samsonov

Publisher Consultants Bureau, 1965

Pages *xiii* + 280

Price $17.50

Reviewer Adrian H. Daane

This is a translation of a Russian book that appeared in 1964. It contains a detailed survey of information on borides, carbides, nitrides, silicides, and sulfides of the rare earths and is particularly complete in its coverage of the work that has been done in Russia. The work done in other countries is also well covered, and the bias in favor of the Russian work is no more than would be shown by a corresponding publication from this country.

The book will be of interest to those persons interested in the above compounds of the rare earths, because, in addition to the survey of work done on these materials, Samsonov has discussed the bonding in these compounds from his own point of view. It is well done. The detailed discussion of some of the applications of some of these compounds, particularly the borides, shows a familiarity with work in this country. The use of borides as electron emitting materials in vacuum tubes appears to be at a significant level in Russia.

The methods of preparing many of these compounds suggest that the Russians do not have pure metals available to the degree that they are in this country, because most of the syntheses show a preference for starting with the rare-earth oxides and reducing them with a material that will evolve a volatile oxide. The analyses of the products of these reactions do not include oxygen analyses, and I look with suspicion on such techniques, knowing the extreme difficulty in eliminating the last traces of oxygen from rare-earth compounds. In fact, the effect of small amounts of oxygen on many of the electrical properties of these compounds seems to be a problem that has not been confronted, primarily because of the difficulty in analyzing such refractory materials for oxygen.

The book contains some cumbersome sentences that stem from the the translation being done by someone not completely familiar with the rare-earth elements. For instance, on page six, the phrase "lanthanide compression" is used, whereas "lanthanide contraction" normally would be used. However, the intent of the writer is not obscure, and I found the book interesting and a welcome addition to the growing shelf of books on the rare earths. It will be wanted by high-temperature inorganic chemists and metallurgists for their own personal shelves, and it belongs in any good scientific reference library. With the growing volume of scientific literature available, it is not likely to be a book selected for his personal library by the general scientist or engineer not in this field.

Adrian H. Daane is Professor and Head of the Department of Chemistry at Kansas State University and was formerly Senior Chemist at the Ames Laboratory and Professor of Chemistry at Iowa State University, where he collaborated on work on the rare-earth elements. In 1952, he and D. H. Dennison devised the method of preparing samarium, europium, and ytterbium metals that made the metals available for the first time and showed europium and ytterbium to be alkaline-earth-like in the metallic state. His PhD degree in chemistry is from Iowa State University (1950).

COGENT AND ENTERTAINING

Title Science USA

Author William Gilman

Publisher Viking Press 1965

Pages *xii* + 499

Price $7.95

Reviewer Dudley Thompson

In the process of skimming a book for the purpose of becoming sufficiently familiar with its contents to make a logical choice of reviewer, an editor occasionally finds himself so engrossed with the subject matter or the style of writing that his skimming turns to real reading. When this happens he must either force himself to put the book down, or succumb, let the rest of his work slide, and indulge himself for the time his conscience allows. This book presented such an occasion. Nearly 500 pages later, I had not the slightest regret for having selected the latter course of action.

The flyleaf of this volume opens with the observation that "The middle of a revolution is a bad spot from which to get one's bearings." This is certainly true of the revolutionaries whose subjectivity is suspect, at best. As an interested observer, Mr. Gilman has taken a navigator's position of objectivity, biased slightly in favor of the rebellion, and proceeds to a remarkably complete analysis of the role of science and technology in today's society. True enough, he concentrates on the more glamorous fields with only brief allusions to such fields as astronomy, geology, and low-energy physics, but all in all, credit (and blame) is properly assigned.

Candidly popular in style, the summaries of the status of various research fields are nevertheless accurate and clear. If the specialist complains of a certain naiveté in presentation, the generalist will find the absence of sophistry refreshing.

The author's skill and experience as a writer are most artfully applied in his treatment of the relationship between the scientific community and the federal government. His declaration in the Preface of an intent to write ". . . about real people doing real things . . ." is carried to fruition most capably in this portion of the book. When he complains of the inbred characteristics of the quasi-official

advisory groups, he provides plenty of evidence, circumstantial though it may be, to substantiate his claims. In general, however, his comments are not in the nature of sniping. Rather, they comprise a realistic appraisal of the effects of science, business, and government on one another. He presents a convincing argument against the likelihood of the unlimited ascendancy of technocracy, while recognizing the impact of burgeoning R&D on the economic and political facts of life.

The temptation to preach has been admirably suppressed in a section on the life sciences, neither condemning nor defending the assaults of biology on the so-called "secret of life." If you are looking for answers to the philosophical and moral questions involved, look elsewhere. It was quite clearly Mr. Gilman's intent to avoid giving answers, though he has no hesitation in raising disturbing thoughts, both directly and by inference, throughout this work. He is apparently satisfied (quite properly so, we think) with stimulating his reader to further consideration of the subjects.

In summary, the book comes highly recommended, both to you as a scientist or engineer who wants a quick overview of other fields, and to your reasonably intelligent nonscientific neighbor who expects you to speak with authority on all phases of scientific endeavor. This volume does both for you, and it is cogent and entertaining in the process.

Dudley Thompson is Reactor Operations Group Leader at Brookhaven National Laboratory. He is active in the Reactor Operations Division of ANS, and in January of 1965, was appointed Associate Editor of NUCLEAR APPLICATIONS. *He is a West Point graduate, with an MS from Purdue University.*

MECHANICAL ENGINEERS GO MODERN

Title ASME Handbook, Metals Engineering—Design (2nd Ed)

Editor Oscar J. Horger

Publisher McGraw-Hill Book Company, 1965

Pages *xviii* + 619

Price $22.50

Reviewer Albert R. Kaufmann

This book is a second edition of one volume of a set of four known collectively as the *ASME Handbooks*. The series is sponsored by the Metals Engineering Handbook Board of the American Society of Mechanical Engineers and was first published in the early 1950's. It is not clear to me whether or not the other volumes are to appear as second editions. This is of some importance, since all four books might be needed by a reader to make maximum use of the information in any one of them. For example, the compilation of the properties of materials is to be found in another volume, *Metals Properties*, the first edition of which is somewhat out of date. In spite of this problem, the book being reviewed has much merit by itself.

It may be inferred from the name of the sponsoring agency and from the preface that mechanical engineers (and hopefully all engineers) recognize the complexity of using materials efficiently. In modern structures and machines, it is no longer feasible to ensure satisfactory performance by the simple expedient of using a large factor of safety to cancel out uncertainty in the basic properties, the environmental response, and the product quality of the material being specified. This situation is discussed succinctly in Part I of the book, "Selection of Materials." It is pointed out that many seemingly minor factors in the processing history of the material or in the conditions of use may be important in determining satisfactory performance and that these considerations are further complicated when cost questions are brought into the problem.

The second part of the book, "Mechanical Properties of Metals in Design," consists of almost 40 articles on subjects such as thermal stresses, brittle fracture design, residual stresses, vibration, fatigue, wear, and shock and impact. Each of these articles is an excellent review of its subject and is particularly valuable to a designer in making him aware of the importance of processing or environmental factors, a point which probably was not mentioned when he studied the general subject in college. An attempt is made to arrange the articles under principal topics, but in some cases, the individual subjects are developed so broadly that the connection with the principal topic is almost incidental. Nevertheless, each of the discussions is authoritative and will be useful and interesting to one looking for information on such highly specialized subjects as shot peening, metallic coatings, riveted joints, and shrink-fitted assemblies which all appear under the topic, "Fatigue Considerations Resulting from Processing." Usually there are many references to additional sources of information, often to books authored by the writer of the article.

The first portions of Part III, "Other Physical Properties Affecting Design," review the effects of stress corrosion and irradiation on the behavior of metals and alloys and again caution the designer on unusual sources of trouble. The section on electrical and magnetic properties comprises a straightforward discussion and listing of data that probably can be found in an electrical engineering handbook, but it is notable in that it covers the newest materials.

Six excellent articles on nondestructive testing comprise Part IV. Each of these first explains the theory of the method and then describes the equipment used, specific applications, and limitations of the procedure. With this information, the reader can decide which technique to explore further for solving his own problems and can better understand the use of testing equipment that he already has in operation. Again there are many references. This portion of the book serves to make the modern engineer aware of the importance of quality control in manufacturing and of the need for routine inspection for incipient failure during use.