BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

SOVIET METALLURGICAL PROGRESS

Title High-Purity Metals and Alloys, Fabrication, Properties and Testing

Editors V. S. Emel'yanov and A. I. Evstyukhin

Publisher Consultants Bureau, 1967

Pages viii + 175

Price $22.50

Reviewer O. Norman Carlson

This paper-covered book is a collection of articles on metallurgy and metallography that were contributed to scientific conferences for institute teachers in Russia during 1963 and 1964. It consists of 26 short articles describing current Russian work on a wide variety of metallurgical problems. Its format is that of a technical journal or symposium publication, consisting of a collection of research papers.

The implied emphasis on high-purity metals is somewhat misleading. Only seven articles could be identified as pertaining to high-purity metals. Two of these are on the properties of iodide-refined vanadium and hafnium, two on the principles of zone refining, two describe effects of impurities on electrical properties of metals and alloys, and one summarizes analytical methods for determining the impurities in high-purity niobium. While these are interesting and informative, they are largely review in nature and contain relatively little original data.

While the diversity of subjects detracts from the general utility of the book, it has reference value on a few specialized topics. For example, there is a group of high quality papers concerned with diffusion in metals and alloys. One article relating changes in the diffusion coefficient and activation energy during diffusion was of particular interest. The empirical relationship $D_0 = A \exp(Q/B)$ was demonstrated to be universally applicable not only to self-diffusion in metals but also to interstitial and substitutional diffusion. An explanation of this relationship is offered on the basis of the Wert-Zener-LeClaire theory with certain necessary corrections or modifications.

There are also three outstanding papers on the thermodynamic principles and mechanisms underlying the interaction of molten lithium with steels and other alloys containing carbon. This is a valuable contribution to the increasingly important subject of liquid metal corrosion and especially to the technology of molten lithium.

Another group of articles describes a variety of experimental techniques developed by members of the faculty. These include apparatus for extrusion of metals in liquid form under pressure, static hot hardness testing, zone melting, an adaptation for an x-ray camera, and a technique for determining diffusion coefficients of alpha-radioactive elements. In most cases sufficient detail is presented to enable one to construct a similar piece of equipment with a minimum of effort.

Interspersed throughout the book are the results of a number of phase-diagram investigations of both metallic and fused-salt systems. The proposed diagrams are based primarily upon thermal analyses, microstructural evidence, and a limited amount of x-ray data. The work on the Zr-C and UC-W systems in particular are worthwhile contributions to the literature.

In conclusion, the book has value as an overview of the progress of metallurgical research in the Soviet Union. This is hardly the kind of book most metallurgists will want to include in their personal library, but it will undoubtedly find use as a reference source. It is amply illustrated with diagrams, graphs, and photographs of uniformly high quality. With the exception of an incorrect distinction between a liquidus and solidus curve in one paper, the book has been carefully edited, and the translators are to be commended for the readable, smooth-flowing style of the English version.

O. Norman Carlson is Professor of Metallurgy at Iowa State University and Senior Metallurgist with the Ames Laboratory of the USAEC. He has been a member of the staff of that institution since it conferred his PhD (chemistry, 1950). His research interests are primarily in the areas of the preparation and purification of metals of nuclear interest and in the study of phase equilibria in metallic systems.