BOOK REVIEWS

Metallurgy of the Rarer Metals. No. 6. Tantalum and Niobium. By G. L. MILLER, Ph.D., B.Sc., A.R.I.C., M.I. Chem. E. M.I.M.M. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1959. xxii + 767 pp. 15 × 22 cm. Price $21.00.

This is the first full size comprehensive book to be devoted entirely to tantalum and niobium and because of the important positions of these metals in the field of high temperature technology its publication is indeed timely.

Dr. Miller's treatment of the subject is thorough and the book is written with the authority which is justified by the author's intimate experience with these and the other refractory metals. The text is well organized in twelve chapters and embraces a 14 page table of contents which is carefully indexed to simplify the location of specific subjects. Innumerable reviews or condensations of original articles are found throughout the text and the bibliographies are in themselves an important contribution to the subject. The volume presents a blend of historical, theoretical and practical material and brings the reader up to date on the properties, production methods, uses, etc., of tantalum and niobium.

The first eight chapters, 345 pages, cover the early history of these elements, the sources of their minerals, the metallurgical extraction and reduction of the metals and their fabrication into useful shapes. Methods of extraction, of reduction, consolidation and fabrication are very thoroughly explored and include classical as well as current processes.

Almost two hundred pages are devoted to the properties of the metals and include a great many tables, charts and condensations of articles which have contributed to this knowledge. The corrosion resistance of the metals and particularly their reactions with gases are very thoroughly reported in this section.

The beginning of the space age started a soaring interest by metallurgists in metals with good high temperature strength. It is not surprising then to find that Dr. Miller used more than one hundred pages to discuss the binary alloys of tantalum and niobium. He cites 154 references on this subject.

The final chapter of the book is a study of certain compounds of tantalum and niobium, particularly the nitrides, carbides, borides and silicides. All of these compounds are hard metallic materials but only the carbides are of current commercial importance.

Appendices include information on the analytical chemistry and the metallography of the metals.

FANSTEEL METALLURGICAL CORP.
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Gmelins Handbuch der Anorganischen Chemie. Achte Völlig Neu Bearbeitete Auflage. Silicium. Teil B. System-Nummer 15. E. H. ERICH PIETSCH, Editor. Verlag Chemie, G.m.b.H., (17a) Weinheim/Bergstr., Pappelallee 3, Germany. 1959. lix + 923 pp. 17.5 × 25.5 cm. Price, Kart. DM. 570.--; Geb. DM. 575.--.

This companion volume to Teil C on organosilicon compounds (THIS JOURNAL, **82**, 2405 (1960)) represents a monumental effort on the part of the unique Gmelin Institute in Frankfurt. Eighteen co-workers labored with Editor Pietsch for ten years to collect and organize *all* of the information in the chemical literature on silicon, which is by no means a recent or rare or poorly-understood element. The result is a magnificently organized book of about a thousand pages, with a 59-page Table of Contents (in both German and English) listing 3068 items. It covers all of the chemical and physical properties of elementary silicon and its inorganic compounds except the silicate minerals.

One reason why Teil B is so large is that this ancient element has itself come in for a great deal of study. It requires 23 pages just to summarize the electrical properties of silicon, and of course many more to cover the preparation and purification, the nuclear and magnetic properties, the ionic radii and crystallographic constants, the mechanical, thermal and optical properties, and of course the chemical behavior and methods of analysis.

As for the sections on compounds, your reviewer believes that here is to be found the best review of the hydrides of silicon (30 pages long) available today, and this subject has come a long way since Stock's book of 1933. It is no surprise that SiO_2 comes in for 139 pages of description, there being so much known about the electrical, mechanical, petrographic and chemical properties of all its variations. The silicic acids and the hydrosols and gels of silica come in for even more treatment, however, 174 pages of it. Properties of the carbide take up 95 pages, and the halides 132. While the silicate glasses themselves are not covered, being relegated to the ceramic chemistry of silicon, 56 pages are devoted to the construction and behavior of the glass electrode, and this, too, is a review unobtainable elsewhere.

Just to note a few oddities that come to light as one goes through the book, anyone who wants to determine silicon in cosmetics or apples, or wants to analyze for silicon by activation with fast neutrons, or seeks to know the ionic radius of Si^{+4} under all conditions (it varies to an astonishing degree, from 0.22 Å. in highly polarized compounds to 1.82 Å. in Mg_2Si), or wants to know the action of $SiCl_4$ on Be or the Raman spectrum of $Si_4O_3Cl_{10}$, will find his answer here. The Gmelin Handbuch tells not just where to find facts, but lists, relates, and appraises the facts. This is why it is invaluable, and always will be so as long as chemists have limited lives and patience.

Some will object that the Gmelin volumes are always out of date. This, of course, is inevitable, since the series is not a mechanical listing of facts but a sober appraisal and reorganization of the information. In the present case the objection is met in part by a supplementary listing of the pertinent literature from 1950 to 1959, covering the period of preparation of the volume. Others may remark that the whole business is a fantastic rear-guard action, that the Gmelin Institute cannot hope to keep up with a chemical literature that doubles every 14 or 15 years. Well, if anyone can, the Gmelin people will, and they certainly act as though they intend to keep right on doing it.

DEPARTMENT OF CHEMISTRY
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Oxidation-Reduction Potentials of Organic Systems. By W. MANSFIELD CLARK, Ph.D., Sc.D., DeLamar Professor Emeritus of Physiological Chemistry and Research Professor of Chemistry, The Johns Hopkins University. The Williams and Wilkins Company, Baltimore 2, Maryland. 1960. xi + 584 pp. 16 × 23.5 cm. Price, $13.50.

Into this highly readable book Professor Clark has distilled the essence of nearly a half-century's pioneering research experience on potential measurements of electric cells. He has very successfully met his stated goal of providing in one volume both a theoretical and experimental introduction to this rather specialized technique for interested research workers and students in all fields of Chemistry and Biology. The work is restricted, as not indicated in the title, to a consideration of oxidation–reduction potentials of organic systems which are or can be made electromotively active and measured under equilibrium conditions in an electric cell. The technique is thus, presently at least, of somewhat limited value to organic chemistry, but gives more promise of increasing application to biochemical systems.

An introductory historical chapter is followed by one which reviews those elements of thermodynamics which are essential to an understanding of reversible electrode processes. Chapter III discusses "Conventions and Definitions of Some Special Terms." These are in accord with the modern trend toward the "European" sign convention. Particularly notable are the economy of formality and the phenomenological approach. Subsequent chapters explain the effects of such factors as *p*H and the formation of dimers, intermediate free radicals or coördination compounds on the