

Chapter I is an introduction wherein pertinent aspects of kinetics are discussed and the basic organization of the work is explained. In Chapter II the various experimental methods for generating free radicals and measuring their activities are critically reviewed. Chapter III is an excellent addition wherein kinetic and thermodynamic methods for evaluating bond-dissociation energies are discussed. Chapters IV and V cover the role of free radicals in thermal and photochemical reactions, respectively. Chapter VI is a discussion of the various types of elementary processes, well illustrated with examples from the literature. Chapters VII-XV cover individual elementary reactions, classified as in the first edition, according to the elements participating in the reaction.

Workers in the field of free radical reactions owe a real debt of gratitude to Dr. Steacie for this superb critical evaluation of the field. This work should be in the hands of every chemist interested in free radical chemistry. It is unfortunate that the publishers have deemed it necessary to price the book for the industrial market rather than for the university professor and his graduate students.

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Gmelins Handbuch der Anorganischen Chemie. Schwefel, Teil A, System-Nummer 9. Edited by E. H. ERICH PRIETSCHE. Verlag Chemie, G.m.b.H., Weinheim/Bergstr., West Germany. Available in the U.S.A. through any American book importer such as Walter J. Johnson, Inc., 125 East 23rd Street, New York 10, N. Y., and Stechert-Hafner, Inc., 31 East 10th Street, New York 3, N. Y. 1953. xvi + 252 pp. 17.5 × 25 cm. Price, \$34.00.

The publication of this Part A completes System Number 9 on the chemistry of the important element sulfur and its compounds for the Eighth Edition of the Gmelin Handbuch. It also provides an index for the entire volume. In line with the general plan of the Handbuch, System Number 9 covers elementary sulfur and its compounds with hydrogen, oxygen, nitrogen and the halogens. Compounds of sulfur with elements treated later in the Gmelin series are discussed in the later volumes.

The new Part A, dealing only with elementary sulfur, affords an exhaustive and excellent coverage of the formation and production of the many different polymorphic forms, their phase equilibria, physical properties and electrochemical characteristics. The chemical behavior of sulfur in general toward other materials and classes of substances, such as water, alkalies, acids, non-metals, metals, hydrides, oxides, halides and salts is summarized. The solution characteristics of sulfur in non-aqueous solvents are treated in detail. References to patents are included.

The literature of sulfur is covered completely up through December, 1949, and all of the references carried over from earlier editions of the Handbuch have been re-evaluated in the light of modern theory. This comprehensive, critical and very usable treatment is particularly welcome because of the great confusion of reports in the literature concerning the various modifications of sulfur. Chemists, both academic and industrial, will find it most helpful.

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Rare Metals Handbook. Edited by CLIFFORD A. HAMPPEL, Chemical Engineer, Homewood, Ill. Formerly Supervisor, Extraction Metallurgy, Armour Research Foundation, Chicago, Illinois. Reinhold Publishing Corporation, 330 West 42nd Street, New York 36, N. Y. 1954. xiii + 657 pp. 16.5 × 23.5 cm. Price, \$12.00.

This is a very useful reference book of data on more than 35 of the less familiar elements . . . an undertaking in which 34 contributors participated in the preparation of its 29 chapters. The book will probably be of greatest use to process metallurgists and mining geologists, although chemists, physical metallurgists, physicists and mechanical engineers will also find it a source of useful information. The style and chapter organization are remarkably uniform, when one considers the plurality of authorship. The text

which accompanies its numerous tables is very well written . . . far from dry and uninteresting. In many respects it performs the same functions as does Van Arkel's "Reine Metalle."

A brief historical introduction is given for each of the elements, followed by sections which discuss such topics as occurrence, production and economic statistics, derivation, physical properties, chemical properties, toxicity, alloys, fabrication techniques and applications. Abundant references to recent technical and scientific publications appear at the end of each chapter.

Care seems to have been exercised in the tabulation of data, although a few errors appear even to the browsing eye of the reviewer. Thus, the latent heat of fusion of lithium is given as 32.81 calories per gram (Table 2, Chapter 12). This value, which appears in practically all handbooks (including Lange's Handbook of Chemistry, Landolt-Börnstein, and the American Society of Metals Handbook, to mention a few) is clearly much too low and falls far short of Richards' rule ($\Delta S = 2$ e.u./g. atom). An unfortunate repetition of about one page of text occurs on pages 46 and 47.

On the whole, this is a reliable helpful ready reference which deserves a place on the limited bookshelf. The paper, illustrations, and general format are good.

RESEARCH INSTITUTES 348
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Chemical Specificity in Biological Interactions. Edited by FRANK R. N. GURD. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1954. xv + 234 pp. 15.5 × 23.5 cm. Price, \$6.00.

This is the third volume of the Memoirs of the Harvard University Laboratory of Physical Chemistry Related to Medicine and Public Health. Like its predecessors in the series ("Enzymes and Enzyme Systems, Their State in Nature" and "Blood Cells and Plasma Proteins, Their State in Nature"), this volume is based on the contributions to a symposium organized annually by the Laboratory and reflects in many ways the scientific interests of the director, Professor E. J. Cohn, who died shortly before the volume went to press.

Being a key problem in biology, the theme of specificity merits the attention that a symposium can provide, and efforts to focus thinking on the question of specificity are to be applauded. It has become a truism nowadays that the particular properties of organisms and cells are to be accounted for in the precise structure and the restricted organization of their constituent parts. This precision in structure and restrictedness in organization is what is meant by *specificity* and what is believed to underlie such specific relations as exist between antigens and their antibodies, enzymes and their substrates, genes and the metabolic processes they exert a direct effect upon, inductors and the pathways of cell differentiation they induce. A major goal of modern biology is to discover the ways in which the structural features of molecules contribute to the specificity of biological processes. It is becoming increasingly clear that proteins and nucleic acids are involved in most of these processes, and for this reason the detailed structure of these substances needs to be understood. Progress is being made in this direction and in concomitant studies of the extrinsic conditions essential for the expression of the specific activities of these substances. Because of its vastness and complexity, a periodic comprehensive consideration of the subject should be both enlightening and stimulating.

Unfortunately, not all of the papers in the present volume bear with equal relevance on the subject of specificity, nor do they furnish as a whole a sufficiently broad picture of the present state of our knowledge. Recent experimental advances in chemical immunology have been neglected, for example, and one would have liked to see contributions on the X-ray and amino acid sequence analysis of proteins as well as a more expanded section devoted to nucleic acids, the sole contribution on this topic being W. E. Cohn's review of his highly interesting studies utilizing ion-exchange chromatography. This criticism does not detract from the fact that many of the papers are excellent reviews of the particular fields of which they treat. Of special value is a group of articles dealing with specificity in protein-metal

interaction, which together make informative reading and a very useful addition to any biochemical library. These articles include a general introduction by the late E. J. Cohn; a discussion of "Special Problems in the Formation of Metal Complexes" by C. D. Coryell, which includes recent physicochemical information on the specificity in complex formation of hemoglobin and ferrihemoglobin; thorough and valuable reviews by J. Schubert on "Interactions of Metals with Small Molecules and Ions"; and a paper by G. Schwarzenbach giving a theoretical foundation and pertinent experimental data for "The Specificity of Metal Complex Formation" with special reference to proteins. Other papers deal with radiation injury (by S. Warren), physicochemical properties of steroids (by R. B. Turner), clinical studies of steroid hormones (by T. F. Gallagher), purification and analysis of hormones of the posterior pituitary gland (by V. du Vigneaud), and are related to varying extents to the general theme of the symposium.

The book is well indexed both for subject and author, and is in other respects as well a technically handsome publication.

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Cellulose and Cellulose Derivatives. Part I. High Polymers, Volume V. Second completely revised and augmented edition. By EMIL OTT, HAROLD M. SPURLIN and MILDRED W. GRAFFLIN, Research Department, Hercules Powder Co., Wilmington, Delaware. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1954. xvi + 509 pp. 16 X 24 cm. Price, \$12.00.

Subsequent to the appearance of the first edition in 1943, "Cellulose and Cellulose Derivatives" has become the standard reference work in its field. The first of the three parts planned for the second edition appeared in 1954. The high quality of Part I indicates that the standards of the first edition will be maintained in the revision.

The new first part covers essentially the material of Chapters I-V of the first edition, and the emphasis is placed on the basic chemistry and properties of cellulose. The space devoted to this phase of the subject is slightly greater than in the first edition. Evidently the principal expansion of 500 pages planned for the entire work will be devoted subsequently to the more practical and technological aspects of cellulose.

Although not expanded significantly, the presentation of the basic aspects has been reorganized and definitely improved. The coverage of related subjects such as the hemicelluloses and lignin is brief but is adequately handled by competent specialists. Although sixteen specialists contributed to Part 1, the necessary integration has been successfully accomplished by the editors.

The individual contributions vary somewhat in the quality and extent of revision. The important section on End Groups was changed only in minor details from that of the first edition. The coverage of cellulases is inadequate, and a special section should have been included. A more adequate coverage of biochemical aspects might be expected of a book with such a general title. More references to the old work might have been given in some sections. This problem is difficult but cannot be solved simply by the elimination of old work.

The editors and publishers are to be commended for this revision and for maintaining the standards of the first edition. The format is good, the illustrations excellent (particularly the frontispiece in color), and the editorial work superb. Librarians and catalogers may be confused, however, by the listing of three editors on the title page and two on the cover. Confusion also might be avoided by the elimination of this work from its artificial classification as Volume V of the High Polymer Series.

The revised book is one that will be needed personally by all chemists and technologists in the field, even those with copies of the first edition, and is a required addition for all chemical and technological libraries with any coverage of the field.

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New Instrumental Methods in Electrochemistry. Theory Instrumentation and Applications to Analytical and Physical Chemistry. By PAUL DELAHAY, Louisiana State University. Interscience Publishers, Inc., 250 Fifth Avenue, New York, N. Y. 1954. xvii + 437 pp. 16 X 23.5 cm. Price, \$11.50.

Dr. Delahay deserves the gratitude of electrochemists and of chemists in general for his having been willing and able to provide them with such a clear and detailed survey of the new instrumental methods of electrochemistry in a period during which he has been so thoroughly busy making his own important contributions to the subject.

This is not just another book on electrochemical instrumental analysis but a complete theoretical and practical treatise on the various methods which have been developed since the pioneering electroanalytical contributions of Cruikshank, in 1801, and with particular intensity and richness during the years which have followed Heyrovsky's discovery of polarography in 1922.

After a flattering Foreword by I. M. Kolthoff, a brief Preface by the author and a very detailed Table of Contents occupying nine pages, the text begins with a historical sketch and a general review of electrochemical methods, 27 pages which clearly settle the confusing jargon which the subject requires (coulometry, potentiometry, voltammetry, polarography, amperometry, etc.). This constitutes Chapter 1 of Part One ("Voltammetric and Related Methods") and includes six sections divided themselves into a total of eighteen sub-sections. This four-stage systematization of the subject holds throughout most of the book, the numerous mathematical formulas being numbered in a separate sequence in each chapter. Chapter 2 gives a brief sketch of the theory of electrode potentials and a fairly detailed treatment of electrode kinetics (27 pages again, but a more fundamental approach to the still very fluid theory of electrode kinetics would have been desirable). The so-called European signs of electrode potentials are adopted, as is natural in a presentation of electrochemical phenomena, but Dr. Delahay has chosen the unusual convention of giving a negative sign to anodic currents and a positive sign to cathodic currents. If overvoltages are taken (as is done in this book) equal to the differences between European electrode potentials under current and at zero current, anodic overvoltages are positive and cathodic overvoltages negative. Currents and overvoltages should have the same signs, making their products positive in accordance with the requirement that these irreversible electrode processes must create entropy. Chapters 3, 4 and 5 (of, respectively, 25, 14 and 27 pages) have a common main title, "Voltammetry and Polarography at Constant Voltage" ("potential" replaces "voltage" in the title of Chapter 5), the sub-titles being "Reversible Processes," "Irreversible Processes" and "Kinetic and Catalytic Processes." On pages 52-55 the author gives a particularly satisfying derivation of the classical formula of polarography relating the potential to the logarithm of the $i_a - i/i$ ratio in place of the intuitive approximate proof of other books. Chapter 4 presents the very interesting advances of the last few years in the interpretation of irreversible waves. Here and elsewhere in the book one is struck by the continued vitality and high-level productivity of the Prague school founded by Heyrovsky. It also is remarkable to notice how frequently different groups of workers have made the same or similar contributions simultaneously, an obvious indication of the great activity which electrochemistry displays at present throughout the world. Dr. Delahay is to be congratulated for the care with which he has assembled his bibliography and for his complete fairness in giving full credit to his competitors in these pioneering investigations. Chapter 6 of 30 pages treats "Voltammetry and Polarography with Continuously Changing Potential," while Chapter 7 of 32 pages treats the same techniques with "Periodically Changing Potential" and contains a detailed presentation of recent developments on the faradaic impedance (a term coined by Grahame) of an electrochemical process and on the component parts of this impedance, the polarization resistance and the pseudocapacity. Here again the numerous contributions originating in different countries amount to an impressive total. Chapter 8 of 37 pages treats "Voltammetry at Controlled Current," a method whose theoretical literature dates back to 1879, and includes numerous contributions from the turn of the century. The use of its main feature, the transition