

the countries of Australia, Austria, Canada, England, France, Germany, Holland, Hungary, India, Japan, Northern Ireland, Russia and the United States of America.

The papers are classified into five chapters entitled: I, Chemistry and Physics of Solid Catalysts; II, Homogeneous Catalysis and Related Effects; III, Surface Chemistry and Its Relation to Catalysis; IV, Techniques and Technology of Catalysis; and V, Special Topics in Catalysis.

Most of the modern techniques of catalytic chemistry are represented, including infrared spectroscopy as applied to the adsorbed complex, catalytic reactions confined to single crystallographic faces, surface area measurement, differential thermal data on solid state reactions, magnetic measurements to determine the duration of electron transfer during chemisorption, tracer techniques in mechanism determination, and X-ray and electron diffraction methods for catalyst structure determination.

Systems described include the chromia-alumina cyclization catalysts, silica-alumina cracking catalysts, platinum reforming catalysts, ruthenium, rhodium, palladium and platinum hydrogenation catalysts, alumina and silica-alumina catalysts for the dehydrogenation of alcohols, cobalt carbonyl catalysts for oxonation, molybdena reforming catalysts, and metal chelate hydrogenation catalysts.

Fifty-seven pages of critical discussion from the original conference meetings are included. Well organized author and subject indices (16 pages and 4 pages, respectively) provide a reference system to the contents.

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The Relativistic Gas. By J. L. SYNGE, School of Theoretical Physics, Dublin Institute for Advanced Studies. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. xi + 108 pp. 15.5 × 23 cm. Price, \$4.50.

"This little book may be regarded as a supplement to a recent book (by the same author, "Relativity: The Special Theory" (1956)) with the same notation and the same emphasis on Minkowskian geometry. . . . The purpose of this book is to develop in a simple way some formulae for a relativistic gas. . . . It is written for the relativist who wants to know about the behavior of a relativistic gas, rather than for the expert in statistical mechanics" (who wants to know about relativity).

This quotation from the preface fairly states this book's prerequisites, intended audience and aim. Syngé limits himself to consideration of classical gases of point particles interacting with zero mean free path (physically contradictory as he notes). The formulae which are derived are not new, but they are derived in a direct and relativistically covariant way. In addition to the distribution function of the ideal relativistic gas, the book treats shock waves with proofs of their causality and irreversibility. In an appendix, Syngé shows how his methods can be applied to a more physical system, namely, radiation plus moving matter. An idealized model is used (2 level "atoms," which have no relative motion) and the formulae for the stress tensor which are derived are equated to those of L. H. Thomas.

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Fortschritte der Physikalischen Chemie. Band 1. Diffusion. Methoden der Messung und Auswertung. By Prof. DR. W. JOST, Direktor des Institutes für Physikalische Chemie der Universität Göttingen. Verlag Dr. Dietrich Steinkopff, Holzhofallee 35, Darmstadt, Germany. 1957. x + 177 pp. 15.5 × 23 cm. Price, DM 25, —.

This volume considers both theoretical and experimental aspects of the measurement of diffusion. In his selection of topics, the author has achieved a compact presentation of basic material. The contents of this volume parallel closely the corresponding parts of the author's earlier and more comprehensive treatise ("Diffusion in Solids, Liquids, Gases," by W. Jost, Academic Press, Inc., New York,

1952). However some new material is included to describe recent developments, and the bibliographies at the ends of the chapters include a large number of recent publications which have appeared since the previous volume went to press.

The first chapter, occupying slightly more than half of the book, deals with the differential equations of diffusion and their solutions subject to various initial and boundary conditions. This chapter omits a few topics considered in the corresponding chapter of the author's 1952 book and introduces some new material; examples of the latter include further consideration of concentration-dependent diffusion coefficients and a brief discussion of diffusion in systems containing more than two components. The remaining four chapters are shorter, and deal with the specific cases of diffusion in solids, diffusion in gases, diffusion in liquids, and thermal diffusion. Brief descriptions of experimental procedures for studying these cases of diffusion are given, and tables containing some representative data are included which illustrate the results.

Even a reader who may prefer reading the author's 1952 treatise in English to obtain a survey of the subject of diffusion will find the list of references in the present volume very helpful as a guide to recent literature.

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Volumetric Analysis. Volume III. Titration Methods: Oxidation-Reduction Reactions. I. M. KOLTHOFF, Professor and Head, Division of Analytical Chemistry, University of Minnesota, Minneapolis, Minn., and R. BELCHER, Reader in Analytical Chemistry, the University of Birmingham, Birmingham, England, with the cooperation of V. A. STENGER, Analytical Research Chemist, The Dow Chemical Co., Midland, Mich., and G. MATSUYAMA, Senior Research Chemist, Research Department, Union Oil Co. of California, Brea, Calif. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. ix + 714 pp. 15.5 × 23.5 cm. Price, \$15.00.

Because thirty years have elapsed since the last edition of this book, and since no equivalent monograph has appeared in the interim, we can heartily agree with the opening sentence in the Preface, "This third and last volume of "Volumetric Analysis," dealing with oxidation-reduction titrations, is long overdue." The long wait is rewarded because the present volume perpetuates the high standard set by its progenitor, *Massanalyse*.

Following an introductory chapter on general techniques in redox titrations, separate chapters are devoted to applications of the important titrants permanganate ion, ceric ion and dichromate ion. Next follow three chapters on iodometric methods, and separate chapters *seriatim* on the Karl Fischer water titration, potassium iodate titrations, determination of organic compounds with periodate, potassium bromate titrations and titrimetry with hypohalites. Reductometric titrations are then discussed in a separate chapter, and the text concludes with a chapter on miscellaneous titrants.

This arrangement emphasizes the applications of various titrants, rather than the various methods that are available for the determination of a particular element or substance. The latter must be located *via* the Subject Index.

The coverage is not restricted to inorganic analyses, and includes the determination of organic substances and functional groups.

The treatment is comprehensive and critical, and, in general, sufficient procedural detail is given so that the methods can be applied without recourse to the original literature. Not the least of this book's virtues is that the literature has been made a real, living part of the text, as it should be, by placing the citations as footnotes on the pages, where they can be most effectively used. The comprehensiveness of the literature coverage is reflected by the Author Index of more than 2700 names. However the essence of the book's excellence stems not from mere comprehensiveness, but rather from the authoritative manner in which this huge literature has been critically assessed and correlated. Every page reflects the high order of analytical sagacity which characterized the previous editions of this work.

Has the book no faults? The answer depends mainly on opinion. The practising analytical chemist might regard the arrangement by titrants as less convenient than arrangement by elements or substances would be. Some may feel that the discussion only of methods employing visual end-point indication has resulted in the omission of some better methods based on physico-chemical techniques of e.p. detection. However, if these really are short-comings they do not loom very large in comparison to the wealth of information presented.

Titrimetric methods constitute a very large fraction of analytical methodology, and I do not know of any other monograph which treats the subject as thoroughly as this one does. No prescience is needed to appreciate the important role that this book will play in guiding the quality control operations of innumerable industrial laboratories during quite a few years to come. Yet its price is no more than that of a rather cheap stirring motor, or a replacement glass electrode for a *p*H meter. Scholarship is indeed its own reward!

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Phenazines. G. A. SWAN, King's College, Newcastle upon Tyne, England, and D. G. I. FELTON, British-American Tobacco Company, Ltd., Millbrook, Southampton, England. *The Chemistry of Heterocyclic Compounds. A Series of Monographs.* Arnold Weissberger, Consulting Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. xix + 693 pp. 16 × 23.5 cm. Price, \$21.00 (subscription price); \$22.50 (single copy price).

This volume is an exceptionally fine and complete member of a series which already includes a number of outstanding monographs. The material is presented with clarity and extraordinary attention to detail, often with the completeness one would expect of an original publication. As a result, the reader finds that the book contains sufficient data to enable him to derive numerous ideas for further research in phenazine chemistry.

Much of the chemistry of phenazine was described many years ago. In general, the authors have ably reinterpreted the findings in modern terms and discussed inconsistencies, discrepancies and invalid conclusions which exist in the old literature. Occasionally, however, unsatisfactory interpretations appear to be tacitly accepted, as in the case of the structures of rosindonic acid and isorosindonic acid, and in the use of a vigorous reaction to distinguish between tautomeric forms of hydroxyisorosindone.

The book covers the literature up to approximately September, 1956. It is divided into two parts. The first deals with phenazines and their quaternary derivatives which do not carry any condensed rings. The second part deals with derivatives that have other carbocyclic or heterocyclic rings fused to the phenazine nucleus.

The phenazines include many dyestuffs of commercial importance, and the authors have dealt in detail with the chemistry of these substances. In order to avoid unwarranted duplication of discussion, compounds related to the important dyes, but not of importance or particular chemical interest themselves, are tabulated with their chief properties.

One chapter deals with the chemistry of naturally occurring phenazines. It includes data presented in historical fashion which, while interesting, might have been more concisely and appropriately described elsewhere. Thus, phenazinediols synthesized as a result of erroneous assumptions during the iodinin work could have been described in a previous chapter subsection dealing specifically with phenazinediols.

An interesting chapter is devoted to the biological properties of phenazines.

The system of cross-reference used in the book is unreasonably cumbersome. The reader is not directed to a page in another part of the book, but to a chapter, section, subsection, etc. This requires constant reference to the table of contents, followed by a leafing through the sections for the desired information.

With very few exceptions, the proof-reading job was well done. The printing is maintained at the high standards set for the previous members of the series.

This book can be recommended most heartily to chemists interested in heterocyclic compounds. The authors are to be congratulated for having produced a work of such excellence.

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The Analytical Uses of Ethylenediaminetetraacetic Acid. By FRANK J. WELCHER, Professor of Chemistry, Indiana University, Indianapolis, Indiana. D. Van Nostrand Company, Inc., 1206 Alexander Street, Princeton, New Jersey. 1958. xvii + 366 pp. 16 × 23.5 cm. Price \$8.50.

Ethylenediaminetetraacetic acid (EDTA) is an interesting and remarkable compound. Although its possible use as a metal-complexing reagent was recognized only a few years ago, the analytical uses of EDTA and its salts have grown rapidly, especially during the past four or five years, so that now more than 1000 papers have appeared in the literature in the United States and in many foreign countries. Indeed, the preliminary studies on certain aminopolycarboxylic acids [such as ammoniatetraacetic acid and ethylenediaminetetraacetic acid as complexing reagents for calcium and magnesium (in basic solution)] were made in Europe some twenty-five years ago and fundamental studies were made in the early 1940's by Brintzinger, Pfeiffer and Schwartzbach, respectively, and their co-workers.

The author of this volume recognized the many applications of EDTA in analytical chemistry and the growing interest in the use of it and its salts. He realized, too, the difficult and time-consuming task required to make a thorough search of the literature, even with the aid of abstract journals, and in the present volume he has "endeavored to collect information from all papers describing the use of ethylenediaminetetraacetic acid in inorganic analysis, and to present this material in a form which would simplify any future study of it." The book is not intended to be a manual of recommended methods for specific types of analysis, though many detailed procedures are given. However, all types of procedures and variations of them are given, along with reports on interference, optimum conditions, and claims as to accuracy, but no attempt was made to give a critical evaluation of each method, obviously an impossible task to do in the time available.

There are eighteen chapters covering a wide range of analytical applications of EDTA and its salts. Chapter I deals with EDTA substances, their properties and preparation; formation and structure of EDTA complexes, their properties, formation constants and effect of *p*H; analytical uses such as the titration of metallic ions (about 35), and a number of anions, including micro-titrations, colorimetric determinations, as a masking agent to prevent interference in the determination of various metals using other reagents, and disodium EDTA as a primary standard for the titration of several common metals. Chapters II to XVI are devoted to the following topics: end-point detection in EDTA titrations, metal indicators, and a long list of determinations, including laboratory procedures and claims of accuracy: cations in mixtures, water hardness, calcium, magnesium, strontium, barium, zinc, cadmium, mercury, aluminum, scandium, gallium, indium, rare-earths, thallium, titanium, zirconium, lead, thorium, vanadium, bismuth, manganese, iron, cobalt, nickel, copper, chromium, gold, palladium, silver, potassium, sodium, uranium, plutonium, europium, germanium, niobium, iridium, the halides, arsenate, chromate, cyanide, ferrocyanide, molybdate, phosphate, sulfate, sulfide and tungstate. Uses of EDTA in qualitative analysis is the subject of Chapter XVII and Chapter XVIII deals with elimination of interference and separations. An extensive bibliography (963 references) follows, listing more than 900 references since 1950 and over 150 since 1956! The author (private communication) estimates that at least 100 papers on EDTA appeared too late to be included in the book, an indication of the current interest in this remarkably versatile compound.

The book is well indexed; printing and binding are good. It will make a useful and timesaving reference book for analysts interested in using EDTA and its salts.

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