

NEW BOOKS

PHYSICAL METHODS FOR DETERMINING MOLECULAR GEOMETRY by W. S. Brey (Rheinhold Publishing Corp., New York, viii + 117 p., 1965, \$1.95).

This small paperback volume is another in the series "Selected Topics in Modern Chemistry." Its primary purpose is to acquaint students with the scope, methods and problems of a specialized area of physical chemical research. In addition, the book is intended to appeal to the mature chemist who utilizes information on molecular geometry and wishes to improve his general understanding in this field.

Subjects covered by this book include molecular geometry; nature of electromagnetic radiation; diffraction methods; electrical polarization in molecules; quantum theory, wave mechanics and the Boltzmann distribution; rotational spectra of molecules; and molecular vibrations. A summary with examples, a list of references and readings, and an index are also provided. Despite the formidable sound of some of the subjects discussed, the book is not difficult, nor is any unusual knowledge of mathematics presumed. In general, the level of experience required to comprehend most of the book is that of a college freshman in the second semester of general chemistry.

The book measures approximately 5 in. × 7.5 in. The binding, although paper, appears to be very durable. Printing and execution and reproduction of figures are excellent. No typographical errors were noted.

Many AOCs members undoubtedly will find the book useful. Others may have students or younger colleagues who would profit from its study. Its low price makes it a real bargain and insures that cost will not be a barrier to wide distribution and use.

H. M. TEETER
Assistant Director
Northern Utilization Research
& Development Division
Peoria, Illinois

CHEMICAL ASPECTS OF POLYPEPTIDE CHAIN STRUCTURES AND THE CYCLOL THEORY, by Dorothy Wrinch (Plenum Press, New York, 195 p., 1965, \$9.50).

If a reviewer had been asked to consider a book on the "phlogiston" theory years after Lavoisier had shown that it was incorrect, he might have felt the same way as I have with this one. Dorothy Wrinch seems to have left the main stream of thinking about protein structure about 30 years ago. Her "cyclol" theory of polypeptide structure extends the simple amide linkage to include combinations of two carboxyl groups with one amino group, two amino groups with one carboxyl group, esters, thioesters, thioamides, lactams, piperazines and combinations of all of these that result in formulations which, when and if they do occur, are considered by most authorities to play only minor or esoteric structural roles in polypeptides and proteins. The recent gains in knowledge of the detailed structure of myoglobin, lysozyme, and ribonuclease are not mentioned. Hydrogen and other bond forces are dismissed in a footnote.

The author believes that the cyclol hypotheses will eventually explain many curious and unsolved observations in peptide chemistry; for example, the nature of substrate binding sites in enzymes and the rapid replacement of amino acids in intact proteins. To quote: "As we explore the picture of chemical modifications of which polypeptide chains are capable according to the cyclol hypotheses, it will be of great interest to see that certain anomalous findings reported in the present day attack on enzyme reaction mechanisms can be effortlessly subsumed." It would be unfair not to admit that there may be important and useful hints for future work in this compendium, but they were not evident to this reviewer.

H. S. OLCOTT
Department of Nutritional Sciences
University of California
Berkeley, California

HIGH MOLECULAR COMPOUNDS IN PETROLEUM, by S. R. Sergienko translated from the Russian second, revised and augmented edition by J. Schmorak (Israel Program for Scientific Translations, Jerusalem. Published in the US by Daniel Davey and Co., Inc., 257 Park Avenue South, New York, New York, xv + 44 p., 1965, \$17).

The extensive investigations of the chemistry and technology of hydrocarbons of low and moderate molecular weight (compounds composed of less than about 12 carbon atoms) have led to a fairly large number of important industrial processes and products. While the studies were carried out chiefly with the objective of producing more and better gasoline, they have had marked effects on the entire chemical industry. However, except for problems connected with the use of higher molecular weight fractions as lubricating oils or as charging stock for the production of gasoline and gases, the chemistry of such fractions has received relatively little chemical attention. In "High Molecular Compounds in Petroleum," S. R. Sergieko points out that further developments in the petroleum and petrochemical industries will involve the processing of middle and high molecular weight components of petroleum and that their rational utilization will require a more thorough study of their constitution and properties. His book provides a fairly comprehensive survey of what is known at present about the subject.

The book is divided into two parts of approximately equal length, the first dealing with high molecular hydrocarbons (molecular weight above 400) and the second with high molecular hetero-organic compounds. Composition, properties, and reactions are discussed.

Part I contains four chapters. The first chapter (11 pages) discusses the types of hydrocarbons present in the heavy petroleum fractions (boiling above 350°C): paraffins, cycloparaffins, aromatics, and hydrid hydrocarbons (molecules containing at least two of the first three types). Chapter II, "Paraffinic Hydrocarbons," (73 pages) discusses such subjects as the dependence of the melting points and crystalline form of paraffins on their structure, and the chemical properties and reactions of paraffins, the last being a very brief discussion based chiefly on the reactions of low molecular weight hydrocarbons. Chapter III, "Mixed (Hybrid) Hydrocarbons," (124 pages) includes discussions of the occurrence of these hydrocarbons in petroleum and the applications of selective catalytic hydrogenation, dehydrogenation and infrared spectroscopy to the study of their composition. Chapter IV, "High-Molecular Aromatic Petroleum Hydrocarbons" (32 pages), deals chiefly with condensed ring aromatic hydrocarbons. All the chapters discuss the effect of the structure of the hydrocarbons on their physical properties.

Part II consists of Chapter V, "Carboxylic Acids in Crude Petroleum (Naphthenic Acids)," (20 pages), Chapter VI, "Organic Sulfur and Nitrogen Compounds in Petroleum," (89 pages), Chapter VII, "Tars in Petroleum," (49 pages), and Chapter VIII, "Asphaltenes in Petroleum," (37 pages). Besides a discussion of the chemical structure, chemical reactions and properties, and the distribution of carboxylic acids in petroleum, the chapter on the acids includes a brief consideration of the sources of formation of the acids. The chapter on organic sulfur and nitrogen compounds is devoted largely to the former, apparently because very little, besides some American work, has been done on the composition of the high-molecular weight organic nitrogen compounds in petroleum. A detailed discussion of the selective catalytic hydrogenation of the organic sulfur compounds is presented because sulfur compounds are usually considered deleterious in gasoline and because identification of the sulfur-free hydrocarbon products aid in the identification of the original sulfur compounds. The author states, "The time is not far off when sulfur, oxygen, and nitrogen compounds in petroleum will cease to be 'undesirable non-hydrocarbon components' of crudes, i.e., to be mere waste products of petroleum processing, and will become a valuable chemical raw material."

The chapters on the tars and on their still higher mo-

lecular weight analogs, the asphaltenes, are devoted largely to the physical and chemical natures of the substances, methods of isolation and separation, and their investigation by means of infrared and fluorescence spectra. The technological applications of the materials are very briefly mentioned.

As may well be expected, the book is concerned more with the composition of petroleum deposits of the Soviet Union than with other crudes. This does not detract from its usefulness to American chemists; indeed, it serves as a very convenient summary of the many papers by Sergienko and other Russian workers. It does contain many references to studies sponsored by the American Petroleum Institute.

The chapters contain many excellent, lengthy tables describing the physical properties of many pertinent compounds. The tables would be improved by including references even if these may occasionally be found in the text. The same applies to the figures.

The usefulness of the book is diminished by the fact that it contains neither a subject nor an author index; it does have a fairly detailed table of contents. It also suffers from the fact that no running chapter or other titles are used at the top of the pages, an omission which invites error in locating the correct list of references at the chapter end.

Ready access to this volume is recommended to all who are interested in the composition and/or the utilization of the heavier petroleum fractions. Such utilization, as the author points out, may include paraffin wax, synthetic fibers and plastics, insulation materials, anticorrosion coatings, insecticides, herbicides, motor fuels, lubricating oils, carboxylic acids and many others.

Sergienko's final paragraph summarizes the situation. "The future progress in petroleum processing industry, its far-going adaptation to the needs of chemical industry and efficient utilization of raw materials will undoubtedly depend to a large extent on the degree of efficiency of petroleum processing and the utilization of the high-molecular petroleum products."

LOUIS SCHMERLING
Research Associate
Universal Oil Products Company
Des Plaines, Illinois

CHEMISTRY OF LAC, by P. K. Bose, Y. Sankaranarayanan and S. C. Sen Gupta (Indian Lac Research Institute, Ranchi, Bihar, India, 1963, 225 p.).

In this relatively slender volume the authors have attempted to bring attention to all of the information that has been reported on the subject of composition and chemical characteristics of this unique resinous material which is described as the only commercial resin of animal origin. As stated in the Foreword, their purpose is to bring together all the available knowledge of the chemistry of lac which may be useful to research workers and will encourage further research in this area.

Methods of obtaining and refining sticklac, both primitive and modern, are discussed briefly but principal emphasis is given to the chemical and physical nature of the known constituents of the material. Separate chapters are devoted to aleuritic acid, shelloic acid, the structure of the lac molecule as well as minor constituents. An additional chapter is related to the identification of shellac but little attention is given to the applications of the product in modern technology.

The references cited in the extensive bibliography number well over 400, most of which were published in Journals outside the US. Some of these date back a considerable number of years. This is not to be interpreted to mean that the subject matter covered is archaic but simply demonstrates that an effort has been made to be as thorough as possible.

The literary style employed is excellent in the opinion of this reviewer. The volume is well indexed from the standpoint of both subject and author. Unfortunately, some typographical errors are apparent but an errata sheet is included.

The book should be a welcome addition to the libraries of those with interest in this area.

S. G. WILSON
Cargill, Inc.
Minneapolis, Minnesota

COATINGS OF HIGH-TEMPERATURE MATERIALS, edited by H. H. Hausner (Plenum Press, New York, 296 p., 1966, \$15).

This volume deals with recent progress made in the United States and the USSR in the field of high temperature coatings. The book treats coating problems, the properties of coated materials, and coating characteristics on high temperature metals and alloys, particularly the refractory metals.

The book is divided into three parts in which coatings are discussed from different aspects. The table of contents lists three parts: Part 1, Coatings of High Temperature Materials, by G. V. Samsonov and A. P. Epik; Part 2, Properties of Coated Refractory Metals, by W. A. Gibeaut and E. S. Bartlett; Part 3, Coatings on Refractory Metals, by D. H. Leeds.

The first part is the largest and represents a translation and updating of an earlier 1964 Russian edition. The Russian authors have organized their work according to types of coatings (borides, carbides, nitrides, silicides, etc.). They consider coatings produced by diffusion and by deposition from the vapor phase. Plasma, flame-spraying, and detonation methods are not treated. Approximately 100 references to the Russian literature are given, many of which are to Professor Samsonov's own research.

The second part is arranged according to the materials to be protected—primarily columbium, molybdenum, tantalum, tungsten, and their alloys. The work summarizes research since 1961 at the Battelle Memorial Institute. The primary emphasis is on silicides, aluminides, and the liquid tin-aluminum system; thin oxide coatings are not considered. Coating processes are described only briefly, but test data are abundant.

The last part is the briefest and is mainly concerned with refractory metal coatings as applied to aerospace technology. Although the text is brief (14 pages) the references, appendix, and figures comprise 73 pages. The main thrust of the text deals with improving the oxidation resistance of refractory metals. The conclusions are general, and the author attempts to identify certain of them with specific test data.

The presentation of the three parts is heterogeneous—in size, subject matter, and even format. The fault lies not with the editing, but with the basic construction of the independent sections of the text. Nonetheless, the book is an important contribution to the literature on coatings. It is both a primer for those unfamiliar with the field and a much-needed reference for English speaking researchers to cross check their general knowledge against the USSR.

The book is primarily of interest to metallurgists, ceramists, and other scientists and engineers working in the aerospace industries, particularly in the high-temperature materials field.

R. E. GRACE
Purdue University
Lafayette, Indiana

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MANUAL ON RECOMMENDED PRACTICES IN SPECTROPHOTOMETRY, sponsored by ASTM Committee E-13 on Absorption Spectroscopy (American Society for Testing and Materials, 113 p., 1966, \$3.50).

The objective of this publication, as stated in the Foreword, is to provide a "source of authentic practices and other useful information . . . for ready reference in the spectroscopic laboratory." The book contains all practices proposed or recommended to date by the ASTM Committee in the formulation of practical test methods based on spectrophotometry. The volume is divided into sections covering the following subjects: Nomenclature, Adequacy of Available Equipment, General Qualitative Analysis and Infrared, Ultraviolet and Photometric Methods. The index includes, in addition to the contents of the book itself, references to applications of the spectrophotometric methods to specific situations as found in the 1965 Book of ASTM Standards.

The first section, which is concerned with nomenclature, is a useful glossary of tentative definitions of terms and symbols relating to molecular spectroscopy.

The second section covers the recommended practice for describing and measuring the performance of spectrophotometers. It is important that a spectrophotometric method include sufficient description of the instrumentation and its performance to enable the method to be of use to others. This practice provides a systematic means of describing the factors which control the analytical results. The parameters covered include selection of the setting of analytical wavelength, selection of slit width, photometric measurements, and characteristics of absorption cells. The significance of the practice as noted in this section is to permit "an analyst to compare the general performance of his instrument . . . with the performance of instruments used in developing the method." It would be well for all spectroscopists to make use of these practices and to recognize the necessity for such checks of instrument performance.

The third section describes the use of the Wyandotte-ASTM punched card index in the identification of material by absorption spectroscopy. The remainder of the book is concerned with practices for infrared, ultraviolet, and photometric analysis.

This volume is a useful reference for all who are engaged in the use of spectroscopic methods of identification and analysis and should be available in all spectroscopic laboratories.

ELIZABETH R. MCCALL
Chemist, Spectroscopy
Investigations
Cotton Physical Properties
Lab.
Southern Utilization &
Research Development
Laboratories
New Orleans, Louisiana

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MATERIALS DATA NOMOGRAPHS, by R. L. Peters (Reinhold Publishing Corporation, 224 p., 1965, \$16.50).

The 156 nomographs comprising this book present a varied and unique collection of data. The data are grouped into sections on strength of materials; modulus of materials; hardness of materials; density of materials; electric and magnetic properties of materials; heat parameters (thermal properties) of materials; atomic, nuclear, and radiation properties; and miscellaneous properties such as viscosity, acoustic velocity, coefficient of friction, mold shrinkage of plastics, and others. The nomographs are clearly drawn and easy to read.

The title of each nomograph is listed in each section of the table of contents. However, the titles generally describe only the property to be found in a particular nomograph, while the class of materials covered is rarely mentioned. Many titles, such as "Thermal Conductivity," appear several times. Similarly, the index lists only properties and no materials or classes of materials. On most of the nomographs, the materials are coded by number, chemical symbol, or abbrevia-

tion. One set of code symbols, located near the front of the book, identifies the corresponding materials but this set is not used exclusively throughout the book. Consequently, it is rather inconvenient to locate all available properties of a particular material.

This book has been organized in such a manner that it is valuable to people or groups who are making exploratory investigations to select a structural material which has a specific combination of desired properties. The majority of the nomographs presents information on metals and alloys. Plastic materials and glass are somewhat less thoroughly covered. Information on chemical compounds and natural materials, such as wood, is very meager.

Some of the sources used to compile the data are listed but specific references are not given for any of the nomograph data. This can be very frustrating if, for example, reference temperature is needed. A spot check on various properties against other sources indicates general agreement within engineering accuracy. However, more precise values are often available for more exacting work. Furthermore, caution should be employed when

using the information in this book since it is not free of error. One such error is in Figure VII-5 "Nuclear Cross Section" where the slow neutron cross section of lithium is shown both as .003 barns and also as 910 barns.

Since the book contains such a wide variety of information, it is doubtful that it would be of great utility to any specialist who would normally have a more complete and/or accurate collection of data pertaining to his own field. It loses some of its value as a general reference book because of the inconvenience of finding information on a specific material. A greatly expanded index would increase its usefulness considerably.

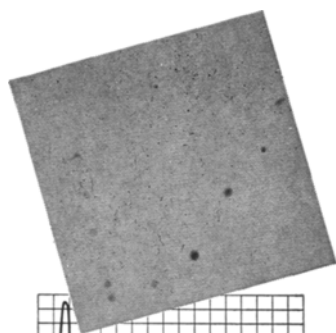
STANLEY KASPER, Principal
Process Engineer
J. C. KULI, Materials
Engineer
Blaw-Knox Company
Chemical Plants Division
Pittsburgh, Pennsylvania

SOLID STATE CHEMISTRY, by Z. U. Borisova (translated from the Russian by Consultant's Bureau Enterprises, Inc., 1966, 256 p. \$25).

This volume is, in part, composed of a series of papers originally published (in 1965) as *Khimiya Tverdogo Tela* by the Leningrad State University. In addition, there are included 13 papers which were published in 1962 as part of *Vestnik Leningradskogo Universiteta* (Bulletin of the Leningrad University). All are dedicated to the memory of Prof. R. L. Myuller of the Leningrad University.

Technically there isn't much for which one can criticize the book since the type, graphs and photographs are all quite clear. True the English seems somewhat stilted but of course this is common, to some extent, to all translations. What is more important are the contents. Professor Borisova pointed out that "this book should be of value to graduate students, scientists, and engineers working in the field of special glasses and semiconductor materials." To this she should have added "and to few other people." There is certainly little in this volume to interest the nonspecialist or for that matter most specialists in solid state chemistry. The contents deal exclusively with the electrical properties of various glasses and semiconductors and, with the kinetics involved in their etching. There would appear to be a real need for a good text on solid state chemistry, but unfortunately this isn't the book.

M. E. LIPSCHUTZ
Assistant Professor
Department of Chemistry
Purdue University
Lafayette, Indiana



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