

Our experiments revealed that the quartz was attacked very slightly during the dissolution of Ag metal in the warm trifluoroacetic acid-hydrogen peroxide mixture. After making suitable corrections for the loss in weight of the quartz vessel, the calculated ratio AgCl:Ag was low by 0.6 to 1.2 parts per thousand. The attack on the quartz vessel and the low AgCl:Ag ratio make it fairly certain that, under the conditions of the experiment, the trifluoroacetic acid breaks down to a slight extent to yield hydrogen fluoride.

The trifluoroacetic acid-hydrogen peroxide reaction has been tested also with a number of other metals in addition to those mentioned above with these results (asterisk indicates clear solution was obtained):

Metal dissolves rapidly: Mg*, Mn, In*, Fe, Pb*
Metal dissolves moderately rapidly: Be*, Al*, Ni*, Sn, W, Sb*

Metal inert to reagent: Cr, Ta, Nb, Au

Elements tested but results indecisive: Si, Zr, Ti, Ga, P, Os, Ir, Pt.

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BOOK REVIEWS

The Infra-red Spectra of Complex Molecules. By L. J. BELLAMY, B.Sc., Ph.D., Senior Principal Scientific Officer, Ministry of Supply. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. xvii + 425 pp. 14.5 × 22 cm. Price, \$8.00.

Today's explosive growth of infra-red spectra makes this volume a welcome book. The absorption bands with which it deals constitute a kind of molecular language, telling us of the manifold events in the world of atomic partnerships; and the number of recognizable "words" in this language has now grown so large that a "dictionary" containing them all would be almost as large as the unabridged Webster's. Bellamy's book does not strive to be even an abridged dictionary, but is rather a lexicon of usage; and with respect to the language of the infra-red, one may fairly say that it is a kind of Fowler's "Modern English Usage," a uniquely valuable guide.

In the words of the introduction this book is an attempt to present a critical review of the data on which infra-red spectral correlations are based. There are twenty-three chapters; and with the exception of the first introductory and the final concluding chapters, each covers a class of compounds in which the factors influencing the frequencies and intensities of characteristic bands are discussed. These chapters are assembled together in four sets concerned, respectively, with C-C and C-H linkages, with C-O and O-H linkages, with C-N and N-H linkages and with the vibrations involving other elements and groups of inorganic origin. Each set of chapters is followed by half-a-dozen graphs to illustrate typical characteristic absorption bands; and in the introductory chapters there are five correlation charts, a total of thirty-three full-page illustrations. The final chapter (added in this second edition) is a comprehensive discussion of the origin and significance of group frequency shifts. With regard to this chapter, the author says in the preface that the reader would do well to treat small portions of it with the reserve accorded to an author's account of his own activities. This is an unmerited apology; the conclusions of this chapter are especially valuable in pointing the way in a field where guidance is particularly needed, today.

At the end of the book there is the usual subject index, a compound index and a table of reciprocals to use in converting wave-numbers. An author-index would have been helpful as there are 1681 references in the bibliographies placed at the end of each chapter.

Readers from many fields will be interested in this book. As a guide in the use of infra-red spectra for identifying compounds, it is invaluable. Those, who need help in employing infra-red spectra to interpret molecular structure, might welcome illustrations to show the exact types of

motion associated with different bands; but these usually can be found by consulting references. The relations of infra-red spectra to thermodynamic properties are largely omitted, perhaps because such relationships are outside the scope of the book; but the thermodynamic evidence for spectral interpretation is frequently important. However in sum, this volume assembles a compact and clear body of facts and conclusions which will be most helpful to workers in many fields all the way from the theoretical to the applied aspects of the subject.

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Anleitungen für die Chemische Laboratoriumspraxis. Band VIII. Tabellen zur Röntgenstrukturanalyse. By DR. KONRAD SAGEL, Wissenschaftl. Mitarbeiter im Metall-Laboratorium der Metallgesellschaft A. G. Frankfurt (Main). Springer-Verlag, Reichpietschauer 20, Berlin W 35, Germany. 1958. viii + 204 pp. 15.5 × 23 cm. Price, DM 28.—.

This book contains a compilation of formulas, numerical tables and other information (such as a collection of crystallographic data for a large number of compounds) which will be of use to practically any person working in the field of X-ray diffraction. The information is given in four sections: (A) Tables for Indexing Diffraction Maxima; (B) Tables for Intensity Determination; (C) Tables for Analysis of Diffuse Background; and (D) Several Physical and Mathematical Tables. In each section (except D) the tables are preceded by a compilation of formulas and explanatory material.

The only other compilation comparable to this book is Vol. II of Internationale Tabellen zur Bestimmung von Kristallstrukturen (published in 1935 by Gebrüder Bornträger, lithoprinted in 1944 by Edwards Brothers, Ann Arbor, Mich.), which, of course, is very much out of date (a new edition is to be published soon by the Kynoch Press, Birmingham, England). X-Ray crystallographers, and other people working in the field of X-ray diffraction, will certainly want to have both books. Dr. Sagel's book often contains more information on topics covered by both books. For example, Dr. Sagel gives tables of absorption corrections for plate-like and spherical crystals as well as for cylinders; and his treatment of polarization factors also includes the case of crystal-monochromatized radiation. In those cases where the literature offers a rather wide selection of data, Dr. Sagel has clearly attempted to list information obtained by the best and most modern techniques. His compilation of

atomic form factors, for example, is taken from seven different sources, most of which represent the latest work in this field. An advantage of Dr. Sagel's book is that wave lengths and crystallographic data are given in angströms, rather than in X units.

One rather serious criticism of this book is that it does not present information relative to the Weissenberg and precession photographic techniques. For example, the Lorentz and polarization (PLG in the nomenclature of the book) factor is not tabulated for either the equi-inclination Weissenberg or precession methods. Furthermore, the trigonometric formulas are not given for these important methods.

The usefulness of tables and charts which are intended as aids in indexing powder and single-crystal photographs depends a great deal on personal preferences as well as the nature of the particular problem. Since the selection of material given by Dr. Sagel is somewhat different from that given in *Internationale Tabellen*, the advantage of having both books is apparent.

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An Introduction to the Chemistry of Fats and Fatty Acids.

By F. D. GUNSTONE, PH.D., A.R.I.C., Lecturer in Chemistry, The University of St. Andrews. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. x + 161 pp. 16 × 25 cm. Price, \$6.00.

In his foreword Professor Hilditch states the need for a good textbook on fat chemistry for the use of Honours students in organic or biochemistry and commends the present volume for this purpose. In his opinion the treatment is logical, concise and clear and in this the reviewer agrees.

In the United States there is perhaps less need for this book, since we already have in Deuel's Vol. I a very complete monograph on this subject, but perhaps it may be too detailed for the beginner. In this respect Gunstone's book seems suitable and may serve as an introduction to the more comprehensive monographs.

There are six chapters in the book with a good index making in all 161 pages. The first chapter is given to a discussion of the more important structural units of the fats—nomenclature, classification, saturated and unsaturated and branched chain fatty acids, with determination of structure and finally synthesis.

The second chapter is devoted to the chemical nature of the fats and other lipids with examination of the component fatty acids and the distribution of the various acids in the triglyceride molecule.

The third chapter deals with the physical properties of the fats and fatty acids while the fourth takes up the chemical properties such as hydrolysis, hydrogenation, oxidation and other properties.

Chapter five has to do with the synthesis and utilization of fats in living organisms—biosynthesis in plants and metabolism in animals.

Chapter six is concerned with the technical applications of fats—edible fats, soap and detergents, glycerol, paints, varnishes, etc., with other uses of fats.

Certain tables of composition, as for example on pages 32, 34, 36, in the reviewer's opinion would have been improved by titles or headings, but these are small matters and do not affect the general usefulness of the book.

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Metals and Enzyme Activity. Biochemical Society Symposium No. 15 held at the University of Leeds on 13 July, 1956. Organised and Edited by E. M. CROOK. Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 1958. 102 pp. 16 × 25 cm. Price, \$3.75.

This little collection of seven papers on the function of metals in enzymes is understandably not a comprehensive treatise. Furthermore, the reader who expects to peruse this book and learn something definite about what metals do in enzymic catalysis will be disappointed. Although many metal chelate compounds are known, we have relatively

little precise knowledge of factors governing chelate stability and reactivity. Thus, the fundamental background for understanding the role of metals in enzymes is incomplete. Furthermore, enzymes contain many groups capable of coordination with metal ions and these bear an unknown spacial relationship to each other. It is, consequently, difficult to discuss the role of metals in enzyme function except in a vague and speculative way. Perhaps a subject is most exciting at this stage, and we can be sure that today's speculation will lead to future understanding. Discussions like the one recorded in this book are a very good way of letting the average chemist in on some of the excitement of a developing new field. Unfortunately, this book has been slow in publication, and the reader may well wonder what has happened in the field in the past two years.

A clear and very condensed introduction on metal-ligand bond types and stereochemistry of complexes by R. S. Nyholm opened the symposium. This was followed by a rambling, but interesting, discussion by L. E. Orgel, covering the dependence of chelate stability on the nature of the metal ion and ligand groups and variation of chelate stability with pH. Other topics considered were the possible roles of metals in bringing reacting groups together at enzyme surfaces and in generalized acid catalysis, and oxidation reactions of copper complexes including copper-containing oxidases and oxygen carriers. The third paper by B. R. Rabin dealt with metal-peptide complexes and proteolytic activity. This is a fine example of the kind of careful work required to arrive at unambiguous answers about the structure of simple chelate complexes, and of the great difficulty in extrapolating from these results to probable mechanisms of metal function in enzymes. Several hypotheses about the role of metal ion activators in peptidase action were considered.

The afternoon session was introduced by Adrien Albert who discussed the significance of heavy metals in biological systems. F. C. Happold and R. B. Beechey provided a stimulating discussion on "univalent metals and other non-specific activations." Data on tryptophanase were presented and interpreted as indicating a role of K^+ and NH_4^+ ions in "organizing the protein" in some way. The activation of enzymes by univalent ions clearly deserves much future study. F. Bergel and R. C. Bray considered metallo-flavoproteins with special reference to the role of molybdenum in xanthine oxidase and in nitrate reductase. In the final paper of the day, E. C. Slater lucidly reviewed the chemistry of the cytochromes. Cytochrome nomenclature and the composition of the main cytochrome chain in the small particles of heart muscle preparations were discussed at length. Briefly considered were the cytochrome chain of intact mitochondria, the oxidation and reduction of cytochrome c, the properties of cytochrome oxidase and the kinetics of its action.

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The Terpenes. Volume V. The Triterpenes and their Derivatives. Hydroxy Acids, Hydroxy Lactones, Hydroxyaldehyde Acids, Hydroxy-keto Acids and the Stereochemistry of the Triterpenes. By the Late Sir JOHN SIMONSEN and W. C. J. ROSS, D.Sc., D.I.C., F.R.I.C., Reader in Chemistry, Institute of Cancer Research, University of London. Cambridge University Press, 32 East 57th Street, New York 22, N. Y. 1957. ix + 662 pp. 14.5 × 22 cm. Price, \$15.50.

This book represents the last volume of the late Sir John Simonsen's treatise on terpenes. It contains an extensive and very detailed discussion of the chemistry of the triterpene acids and their derivatives. The bulk of the original work on these complicated natural products was done in the laboratories of Barton, Halsall, Jeger, Jones, Ruzicka, Spring and Wieland. The authors were able to do justice to the excellent researches of these investigators. The topics in general are clearly presented and anybody who wishes to learn some good chemistry or refresh his memory should read at least a few of the chapters. Besides reviewing the contents of previously published papers the authors propose structures for some transformation products of bassic acid, ursolic acid and particularly quinovic acid. The book contains also a most welcome 100-page addendum