

NEW BOOKS

edited by F. W. Quackenbush

METAL CATALYZED LIPID OXIDATION edited by Reinhard Marcuse (Published in English by Svenska Institutet för Konserveringsforskning, Kallebäck, Göteborg 16, Sweden as SIK Report No. 240, 292 p., 1968, \$8).

Catalyzed changes in food and food products, including those of biocatalysts (enzymes), can have a desirable or an undesirable effect on practically all foods and food components. A specific example is lipid oxidation, which is largely dependent on the presence of metal catalysts. This fact and others led to the idea of a symposium on metal-catalyzed lipid oxidation which was organized by SIK and held in Gothenburg October 9-10, 1967 with the participation of some 50 research workers from 15 countries. The symposium included reviews and reports on original research, as well as discussion to suggest means and ways for new research projects. It was divided into three main sections: analytical methods, research in model systems and food problems. An introductory review was presented by K. U. Ingold.

The analytical section of the book includes discussion of atomic absorption, activation analysis and electron spin resonance and their applications to research on fat oxidation. Other, more common techniques also are discussed, such as oxygen consumption measured with a modified automatic Warburg apparatus and with the oxygen electrode.

In model systems certain metals were found to inhibit fat oxidation at low oxygen pressures. The relationship of metals to antioxidants such as tocopherol is discussed as well as the physical state of the metals in relation to catalytic effect. The importance of metal chelates on lipid oxidation especially in biological systems is covered in some detail. Chlorophyll and heme compounds and their relationships to photooxidative reactions and stability of food products is discussed. Close relationships between lipid oxidation, spin state of iron (in porphyrins), ligand and pigment changes in animal tissues are indicated.

In the food sector (third section) lipid oxidation in food products, especially of animal origin, is discussed in detail. Milk and other dairy products, sea foods, vegetable oils and margarines are relatively stable or unstable, depending upon types and amounts of metal catalysts present. Other subjects include demetalization procedures for fats and oils and packaging in relation to oxidative stability of various food products.

The book is well illustrated and the articles are clearly written by authorities in the field. It should find broad usage as a reference book by laboratory people in the food processing industry, although lack of an index (except for a list of the 29 papers) may hamper those who wish to consult the book on specific points.

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LABORATORY HANDBOOK FOR OIL AND FAT ANALYSTS by L. V. Cocks and C. van Rede (Academic Press, Inc., New York, 419 p., \$15.00).

Seventeen contributors, including the above-named authors, have collaborated in preparing this volume. At least 12 of them are or have been associated with the Unilever Laboratories and much of the handbook represents procedures which have been used by those laboratories. Some others are published methods of the AOCS and the AOAC. Emphasis is placed on quality control procedures useful in the processing of oil seeds and in the products of fat technology.

Section 1 concerns chiefly the sampling of oil seeds and nuts, their analysis and oil extraction, and analysis of the

meal for nitrogen, urease activity, soluble protein and crude fiber. Section 2 covers sampling of vegetable oils, analysis for moisture, impurities, ash, color, odor, iodine value, unsaponifiable matter, and many other procedures of long standing. Included are methods for polybromides, thiocyanogen value and some others which are of historical interest, as well as more modern lipid techniques such as a TLC method for fuel oil in whale oil and some paper chromatographic tests.

Section 3 covers glycerol analysis, and Section 4 analyses which are useful in refining, bleaching and hydrogenation. Section 5 covers water, free fatty acids, salt, milk solids, pH, vitamin A, carotene, coloring matter, peroxides and benzoates in finished fat products.

Section 6 is a special compilation of short papers on specific subjects, such as GLC, TLC, automated amino acid analysis, stability, trace metals by spectrophotometry, polarography, mass spectrometry, *trans* fatty acids by infrared analysis, and NMR spectroscopy.

Regular users of the AOCS Official and Tentative Methods of Analysis are likely to find a limited amount of help from this volume. While the procedures are stated to have been tested carefully, they lack the rigorous testing by collaborative study which is required of all AOAC and AOCS procedures. Perhaps the most useful section to many oil chemists will be Section 6. It seems unfortunate that this section constitutes only about one fourth of the total volume.

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FATTY ACIDS: THEIR CHEMISTRY, PROPERTIES, PRODUCTION AND USES, 2nd Edition, Part 4, K. S. Markley, Editor (Interscience Publishers, John Wiley and Sons, Inc., New York, 1967, pp. 2481-3118).

In the preface, Dr. Markley comments that this second edition of *Fatty Acids* follows the general outline and format of his first edition which was published in 1947, but the subject matter is covered in greater depth. As for example, the first edition discusses the identification of fatty acids in 20 pages whereas in this second edition it spans a total of 100 pages.

Although the second edition will be subdivided into five parts, this particular volume contains the cumulative author and subject indices of the first four parts plus the table of contents for the first three parts. The arrangement of the cumulative index in this volume is superior to the indices of the preceding three volumes.

Chapter 21 by Dr. K. S. Markley on the "Identification of Fatty Acids" is very thorough and is primarily concerned with the identification of fatty acids by reference to the melting points of their characteristic derivatives. As noted by the author, there is considerable skepticism regarding the accuracy of melting points reported some 25-40 years ago since modern instrumentation has shown a number of these derivatives contain trace contaminants. The chemistry and data presented in this chapter should prove quite useful for those chemists involved in basic fatty acid chemistry.

Chapter 22 by Dr. E. S. Lutton titled "Thermal Properties and Crystal State" is well written and organized. References on this subject are as recent as 1965 and from the number of publications listed for the author, he is certainly an expert on this subject. As is true with so many multiauthored books, it is difficult to present up-to-date information because of time requirements for assembling and publishing the material. Because of this factor the author has devoted the last

seven pages to an addendum. This chapter is well suited for the individual who wants to become acquainted with melting points, specific heats, heats of fusion and transition, heats of sublimation, heats of combustion and phase behaviors of binary and ternary systems of fatty acids.

Chapter 23 by Bernard Ackerman titled "Phosphorus Derivatives" pertains to the natural occurring phosphorus derivatives of fatty acids as they relate to the structure, biosynthesis and synthesis in vitro of the phospholipids. The phospholipids discussed include lecithins, cephalins, sphingomyelins, inositol phosphatides, plasmalogens and cardiolipins. The last portion of this chapter concerns the synthesis and characterization of certain new phosphorus derivatives of fatty acids not found in nature. Mr. Ackerman's chapter is a welcomed addition to this five volume treatise on fatty acids since the first edition contained very little information on phosphorus compounds.

Chapter 24 written by Mr. V. J. Muckerheide describes the "Industrial Production of Fatty Acids." The processes discussed include hydrolysis of fats, distillation of fatty acids and fractionation of fatty acids. The first portion of the chapter deals with the classification of raw materials used in the production of fatty acids. A goodly portion of the chapter is devoted to the commercial solvent fractionation of fatty acids with illustrative pictures and diagrams. For those not acquainted with the manufacture of fatty acid it provides a good beginning reference.

Chapter 25 is authored by Dr. Norman O. V. Sonntag and titled the "Utilization of Fatty Acids and Derivatives." The author has done an excellent job in condensing into 71 pages a subject which when covered in detail could consume all the pages in the four volumes of this second edition. He mentions in the introduction that there are over 2,500 U.S. patents dealing with applications of fatty acids. What the author has done is to give general kinds of information relating to the use of fatty acid chemicals and the same 229 references give a good point to begin for any chemist interested in the utilization of fatty acids.

As with the preceding three parts, this volume is a worth-while contribution to the field of fatty acid chemistry and should find its way to every technical library shelf.

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GAS EFFLUENT ANALYSIS, William Lodding, Editor (Marcel Dekker, Inc., New York, p. xi + 220, 1967, \$10.75).

This is volume one of the Thermal Analysis Series. It consists of seven chapters, each covering a different subject. They are: Principles and General Instrumentation (William Lodding); Thermal Conductivity Detectors and Their Application to Some Thermodynamic and Kinetic Measurements (T. R. Ingraham); Mass Spectrometric Identification of Gaseous Products From Thermal Analysis (H. G. Langer and R. S. Gohlke); Pyrolysis—Gas Chromatography Effluent Analysis (B. Groten); Selective Sorption and Condensation of Effluent Gases (William Lodding); Thermoparticulate Analysis (C. B. Murphy).

This is the first book dealing exclusively with this subject and provides a very useful service in bringing together information which has been scattered through the literature. According to the publisher this book "is valuable to analytical chemists, physical chemists, polymer and organic chemists, mineralogists and graduate students in related fields." This volume will be very useful to the researcher who is beginning to work in gas effluent analysis, but the treatment is generally not comprehensive enough for the experienced worker in the field. Most of the examples cited are inorganic, and most of the organic examples deal with synthetic polymers. However, there is still a great deal that will interest readers of the JAOCs. This is especially true for the chapters dealing with the applications of mass spectrometry, infrared

analysis and pyrolysis gas chromatography. The chapter on thermoparticulate analysis should be of interest to workers studying the smoking of oils.

Unfortunately, the definition given for pyrolysis differs from the one accepted by most workers. Also, the editor seems to draw a distinction between gas effluent analysis and gas evolution analysis, a term which has been in use for several years. However, there seems to be no operational basis for a distinction. In some instances older types of laboratory-made or commercial equipment is described in detail while the more modern equipment and techniques are only mentioned briefly or not at all.

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RECOMMENDED METHODS FOR THE ANALYSIS OF DRYING OILS, by H. W. Talen (Butterworths, 47 p., 1965, \$10.)

This is a paper-back reprint from Pure and Appl. Chem. 10(3), 1965. Ten subcommittee members from eight western European countries reviewed the existing methods of analysis for drying oils and published a collection of methods considered most suitable as internationally accepted standard methods for drying oils. It is published in English with a complete French translation on opposite pages.

Nine methods are presented: Acid Value, Saponification Value, Unsaponifiable Matter, Iodine Value, Diene and Pandiene Value, Diene and Triene Conjugation, Polymeric Fatty Acids in Stand Oils, Detection of Fish Oil in Linseed Oil, and Linseed Oil in Linseed Stand Oil.

This book is of value to people throughout the world who wish to standardize their methods in the analysis of drying oils to obtain uniformity between laboratories.

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FATTY ACIDS AND THEIR INDUSTRIAL APPLICATIONS, edited by E. Scott Pattison (Marcel Dekker, Inc., New York, N.Y., 368 pp., authors index and subject index, 1968, \$8.00).

This book is divided into 17 chapters, authored by chemists well known in the field of Fatty Acids, and edited by E. Scott Pattison, who has long been associated with the Fatty Acid Producers Council, a division of the Soap and Detergent Association of New York. All of the authors have had industrial experience and as a result this book is primarily concerned with the application of fatty acids in industry and in industrial chemicals.

Essentially the book describes the sources of fatty acid; their methods of production, their general, physical and chemical properties; applicable analytical methods; and their chemical reactions. This information is coupled with the use of fatty acids and their derivatives in industrial products such as soap and detergent protective coatings, metallic soaps and greases, cosmetics, rubber, textile products, foods, pharmaceuticals, plasticizers and so forth. One short chapter deals with synthetic fatty acids and their uses.

This is an excellent book for anyone who is interested in practical information on fatty acids in general and their specific use in modern industrial products. The availability of fatty acids and their chemical and physical characteristics are presented in a most usable form.

The chapters are well written, the authors are excellent. The book should be very useful to any industrial user of fatty acids and derivatives, or by anyone interested in the present status of fatty acids in general.

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