Book reviews

Oxidases and Related Redox Systems, Progress in Clinical and Biological Research, Vol. 274, edited by Tsoo E. King, Howard S. Mason and Martin Morrison (Alan R. Liss Inc., 41 East 11th St., New York, NY 10003, 1988, 789 pp., $140)

This volume contains the collected papers of the 4th International Symposium on Oxidases and Related Redox Systems, held in Portland, Oregon, Oct. 4–8, 1987. Proceedings of previous symposia are well known, having been published under the same title by different publishers (Wiley, 1965; University Park Press, 1973; Pergamon Press, 1982). Unlike previous volumes which were typeset and nicely presented, this book is photo-offset and inconsistent in the spacing and fonts used by individual contributors. In some cases, the print is so crowded that the papers are difficult to read. However, instead of being forced to condense their ideas into a few pages as is all too common in contemporary compendia, authors were allowed sufficient latitude to present their data in extended and cohesive pictures when appropriate, so superficial flaws in text appearance can be forgiven.

The stated goal of this symposium was "to attempt a synthesis of the biochemistry of oxygen from its various component aspects, chemistry, enzymology, molecular biology, molecular physiology, historical geology and evolution...from a broad comparative point of view." This intended synthesis of information never occurred, and the reader is left to organize and integrate individually what, on first reading, seems to be an almost overwhelming amount of interesting but sometimes disconnected material.

Forty-six papers covering nine topics (some in two sections) are included. The first section is composed of personal perspectives and reminiscences about Professor David Keilin who made major discoveries that formed the basis of the modern fields of respiratory biology and bioenergetics. These papers, presented by former associates, are nostalgic in tone but nevertheless contain some interesting history and insight into the development of the two fields. They are followed by a general session on the thermodynamics of oxygen, the evolution of atmospheric oxygen and molecular pathogenesis arising from hypoxia.

Subsequent sections cover flavo-protein oxidases and oxygenases (general structure/function relationships, phenolic hydroxylase mechanisms, $0_2^{\cdot}$ production by NADPH oxidase); iron- and copper-oxidases, oxygenases and 0_2 transporters (oxo-bridged binuclear iron centers, phthalate oxygenase, dopamine β-hydroxylase); copper proteins (galactose oxidase, blue copper proteins, ascorbate oxidase, hemocyanins, tyrosinase, laccase); transfer of reducing equivalents in heme proteins (hydride vs. electron transfer in NADH oxidation, electron transfer rates in the cytochrome c: cytochrome c peroxidase system, intramolecular electron transfer and electrochemical probes in redox proteins); peroxidases (cytochrome c peroxidase: coordination and spin states, radical intermediates; ferryl-and oxy- forms of horseradish peroxidases; vanadium-containing bromoperoxidases); cytochrome P-450 and related proteins, including steroid hydroxylase and prostaglandin F synthetase; and cytochrome c oxidase (ten papers on various aspects of the enzyme).

Because the range of enzymes and proteins considered is broad, there is considerable food for thought and extrapolation for nearly any researcher interested in biological oxidations, particularly heme and metal catalyses. Papers are particularly strong on presentation of structure and mechanisms in terms of metal binding and proton and electron transfer. State-of-the-art techniques such as X-ray crystallography, EXAFS (extended x-ray absorption fine structure), EPR (electron paramagnetic resonance), ENDOR (electron nuclear double resonance), magnetic susceptibility, resonance Raman spectroscopy and cyclic voltammetry of proteins using gold and pyrolytic graphite electrodes have been applied to develop quite sophisticated and detailed understandings of three-dimensional structures and their relationships to (a) binding specificities of metals, oxygen and substrates, as well as (b) intramolecular and intracomplex electron transfer pathways. Sections on flavoproteins, copper proteins and cytochrome c oxidase are solid and stimu-

lating; treatment of cytochrome P-450 is rather limited.

Because this field has progressed beyond the point where current symposia proceedings can serve as introductions to the field, this volume is primarily for informed readers. However, much valuable information is presented which builds on the data bases established in previous symposia, and thus this book, used in conjunction with the previous volumes, will be the best available general reference to the field. Although the price is likely to discourage purchase by individuals other than specialists, the full series of the **Oxidases and Related Redox Systems** should be requisite reference material in all chemistry and biochemistry libraries.

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Durum Wheat: Chemistry and Technology, edited by Giuseppe Fabriani and Claudia Lintas (American Association of Cereal Chemists, 3340 Pilot Knob Rd., St. Paul, MN 55121, 1988, 332 pp., $118 US, $129 elsewhere).

This hardcover book, one of the AACC monograph series, contains 18 chapters by 26 contributors (14 from Italy, 10 from the U.S. and 1 each from Canada and France). The lengths of chapters range from 7 to 29 pages, with up to 166 references per chapter. A total of 77 tables, 65 figures and 859 references are included in this monograph, which comprehensively covers durum wheats.

This book begins with the origin, world distribution and production of durum wheat. This is followed by chapters on the genetics and breeding of durum wheat in Europe and the U.S. Durum variety introduction in the U.S. (1853–1918) and durum cultivars grown in the U.S. and Canada since 1925 are presented in tables which may be of historical interest to durum wheat researchers in North America. Chapter 4, on diseases of durum wheats, describes leaf spots, rusts, *Fusarium* head blight (scab), black point and root and crown rots.

The second part of the book includes the chemistry of durum wheat components, presented in four chapters. The first deals with protein and enzyme composition. This chapter has 166 references devoted mainly to durum wheat proteins, from protein content and amino acid composition to changes in protein composition during pasta-making and cooking. The enzyme section includes α-amylases, lipoxygenases, peroxidases, polyphenoloxidases and proteases. The next chapter, on carbohydrates, describes sugars, starch, pentosans and changes in carbohydrate composition during wheat maturation and pasta processing. It is followed by a chapter on durum lipids. This describes total, free and bound lipids, lipid components in various lipid classes, including pigments, and changes in lipids during seed maturation and pasta processing. Another chapter provides nutrient distribution in the durum wheat kernel, vitamin and mineral contents, effects of processing and storage on both vitamin and mineral contents and nutrient availability.

The third part of this book consists of two chapters on processing and covers milling and manufacturing of pasta products. Both chapters, written by Italian authors, are nicely illustrated. The chapter on milling provides schematic diagrams, flow charts and photographs of equipment. The pasta-manufacturing process also is illustrated with diagrams and photographs of equipment, including automatic packaging machines and various pasta products. Both processing chapters are so descriptive that readers may feel as if they had toured the plants.

The fourth part consists of four chapters on the evaluation of durum wheat, semolina and pasta in Europe, the U.S. and Canada, and on specific aspects of durum wheat and pasta cooking-quality evaluation in Europe. This is the first published reference providing comprehensive reviews evaluating parameters and methods employed in Europe and two North American countries.

The last part of this book includes four chapters on several subjects. The first focuses on other durum wheat products, including bread, couscous, extruded products and bulgar, and their manufacture. This is followed by a critical review on the nutritive value of pasta and its role in healthful diets. The next chapter describes the marketing of durum wheat in the U.S., trends in supply and demand, factors affecting marketing and price formulation for U.S. durum, and international markets. This books ends with a short chapter giving a perspective on durum wheat products, including the romance of pasta and the art of pasta cooking.

Because this book consists of many multiauthored chapters, each subject is dealt with by an expert in the field, but portions overlap to some extent. Most meritorious is that this is the only published material to include all aspects of durum wheat, from genetics to the art of pasta cooking. It is highly recommended for those who are engaged in durum wheat research at universities and government institutions, for quality assurance and R&D professionals in the pasta processing industry and, also, for faculty and students in food science and cereal technology curricula. It is an excellent reference book and a unique textbook.

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Near-Infrared Technology in the Agricultural and Food Industries, edited by Phil Williams and Karl Norris (American Association of Cereal Chemists, 3340 Pilot Knob Rd., St. Paul, MN 55121, 1987, 330 pp., $169 US, $175.90 elsewhere).

Near-infrared (NIR) technology means analysis to agricultural and food industries. Rapid analysis of moisture in soil, of protein in flour and of cookies and other cereal grain products are all NIR applications that have "grown up" over the past two decades.

This book is a timely review, a reference source and a digest of practice today. Other applications (to plastics, textiles, pharmaceuticals, petrochemicals) on the periphery of foods share common theory, statistics, instrumentation and often principle references. This monograph, therefore, is a "cabinet filled with tools" and a catalog for many others. Most any NIR "carpenter" would find it a valuable resource.

The content matches the book's higher-than-average price. Its 15 chapters (17 authors and 246 double-column pages) are divided between technology and NIR applications. Five chapters accent regional uses, seen from five different continents. The last 25% of the book contains a trove of pure reference materials: NIR reflectance spectra of 328 substances, bibliography with 986 citations including titles and abstracts, index to the bibliography and text index.

Chapter 1, on The Physics of Near-Infrared Reflectance, by Gerald S. Birth and Harry G. Hecht, contains discussion of theory and photographs of experiments with reflected light. It is quite helpful in understanding optical experiences and in learning the more abstract areas of physics. Examples include diffuse reflectance, specular (here called "regular"), index matching, light scattering and particle size effects on reflected light. Some "ah-hah's" may slip out, while reading this chapter.

Chapter 2, on Chemical Principles of Near-Infrared Technology, describes origins of analysis by "color" in near infrared. This chapter is about correlating NIR bands, observed in absorption and reflectance, with molecules (sucrose, fatty acids, etc.) and their functional groups. Two flaws—in Figure 4 and Figure 21—are the only detractions from this chapter.

Chapters 3 and 4 both pertain to NIR calibration and some of the mathematical treatments used to improve accuracy of analysis. The former chapter is the more basic of the two and contains an overview of linear regression and other statistical tools used also in the latter chapter. Both are systematic in their coverage and have good reference sections.

Chapter 5, authored by W.F. McClure, discusses the "nuts and bolts" of NIR instrumentation, and contains a laundry list of many details that need consideration for engineering design and performance considerations. It includes useful tables, working equations and drawings that add clarity to the text. Its discussion of photometric noise is straightforward. This reviewer noted only the omission of a summation

sign in one of the equations on RMS noise. This chapter emphasizes the hybrid-component nature of modern NIR analysis and the many unique skills needed for making one's own instrument.

Chapter 6, on Commercial Near-Infrared Reflectance Analyzers, looks at a bench-type analyzer and two more flexible, computerized spectrophotometers available today. Beginning with an historical perspective, this chapter covers second- and third-generation advances in hardware design. It also discusses major steps in operating the instruments. These include calibration and statistical monitoring of NIR precision and accuracy.

In Chapter 7, P.C. Williams describes parameters used to evaluate NIR calibrations and where to look for errors in NIR testing. He begins with statistics and discusses examples evaluating typical calibrations for wheat. This section is clear on definitions but is less so on their use. If two calibrations compete for the same constituent (protein in wheat), which one "bottom line" is better? Operationally, how/when does one adjust intercept (bias) or slope (skew)? Changes can be made following simple direction, and even software could be written to help direct those less experienced through the statistical quagmire. We are not there yet.

The last section of Chapter 7 discusses the various sources of error in NIR testing: instrumental, digital signal processing, sample handling and calibration options. There is considerable experience woven into this section and value discovered by reading it. Chapters 8—14 cover various commodities and geographic locations.

In Chapter 15, P.C. Williams and K.H. Norris treat four different uses of qualitative spectroscopy: general composition and particle-size; impurities such as water in dried flours; spectral areas of maximum sensitivity for detecting impurities; and classification of unknowns by discriminate analysis. The authors point out the potential importance of discriminate analysis. Introduced in 1985 by Mark and Tunnell, discriminate analysis has helped one pharmaceutical company identify drug ingredients for greater integrity of final product and bakers identify optimum wheat varieties that provide superior baking quality. The theory is not discussed, but references are listed.

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Handbook of Heats of Mixing: Supplementary Volume, by James J. Christensen, Richard L. Rowley and Reed M. Izatt (John Wiley & Sons Inc., 1 Wiley Dr., Somerset, NJ 08875-1272, 1988, 1,145 pp, $150.)

The initial **Handbook of Heats of Mixing,** published by John Wiley and Sons in 1982, summarized the published literature values through 1980. This volume updates heat-of-mixing data from 1981 to 1986. Only data reported in the literature are included.

This handbook is divided into two sections. Section 1 features information concerning the prediction and use of heat-of-mixing data. It documents methods that can be used with success, points out possible failures and shortcomings, critiques and evaluates methods and provides detailed sample calculations. Enclosed with this volume is a diskette formatted with DOS 3.1 for IBM and IBM-compatible computers. The source code is BASIC. The programs include algorithms for seven different excess enthalpy prediction techniques plus a menu program for directing flow to the programs. The programs were written by one of the authors and are intended to be used to test prediction techniques. The programs do not include a sophisticated user-program interface. Seven prediction techniques are available on the diskette. Use of each of the methods is briefly described in the handbook.

In Section 2, heat-of-mixing data from 1981-1986 are summarized under the headings of the various substances. δH Values, temperature, pressure, error, literature references, methods and conditions of measurement of δH, purity of materials used and classification of systems are noted.

This handbook contains five separate indexes that feature the empirical formula for each substance, references, synonyms, the system classification, and all ternary and quaternary systems. Each index, except the reference index, includes all material from both the original handbook and the supplement. This volume is an extensive compilation of enthalpy changes for the mixing of liquids. It will be an indispensable reference for researchers and scientists in chemistry, engineering and related fields.

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New books

Flavors and Fragrances: A World Perspective, Proceedings of the 10th International Congress of Essential Oils, Fragrances and Flavors, Washington, DC, USA, Nov. 16-20, 1986 (Developments in Food Science, 18), edited by B.M. Lawrence, B.D. Mookherjee and B.J. Willis, Elsevier Science Publishing Co. Inc., PO Box 1663, Grand Central Station, New York, NY 10163, 1988, 1108 pp., $302.75.

Chemical Reactors: Design, Engineering, Operation, by Pierre Tranbouze, Hugo Van Landeghem and Jean-Pierre Wauquier, Editions Technip, 27 Rue Ginoux, 75737 Paris, France, 1988, 640 pp., 830 French francs (published in English).

Oil World 1958-2007, published by ISTA Mielke GmbH, PO Box 90 08 03, 2100 Hamburg, West Germany, available in December 1988. Complete version, 248 deutsche marks (surface mail) for *Oil World* subscribers; nonsubscribers, 268 deutsche marks. Condensed version, *Oil World* subscribers, 178 deutsche marks; nonsubscribers, 198 deutsche marks.