Book Reviews

Food Proteins. Properties and Characterization. Edited by Shuryo Nakai (University of British Columbia) and H. Wayne Modler (Food Research Center, Agriculture, Canada). VCH: New York. 1996. xii + 544 pp. $160.00. ISBN 1-56081-691-0.

As intended by the editors, this book will be an important reference book for persons who work with food proteins and a useful textbook for graduate students studying food proteins. This book covers the physical and chemical properties of amino acids and proteins (Chapters 1 and 2), denaturation (Chapter 3), functional properties (Chapter 4), nutritional quality (Chapter 6), modification by chemical or enzymatic methods (Chapter 5) or by biotechnology (Chapter 10), thermal analysis (Chapter 8), and methods to quantitate and characterize (Chapter 7) and separate and purify proteins (Chapter 9). The authors have met their goal of providing a firm foundation in modern protein chemistry, with examples relevant to foods. Their goal of relating these to food proteins during processing of foods was met in part, but will be built upon in a planned subsequent volume to cover applications to food processing and all commodity food proteins. The second volume should nicely complement this first volume, and together provide the basis for comprehensive coverage of food proteins in an advanced level course.

The chapters in this first volume generally are very well done, but the book could have benefited in several areas from more careful coordination of the various chapters. Beyond the first section of Chapter 1, An Overview, the detailed coverage of hydrophobicity, density, and QSAR computation would have been better placed with discussions on physical characterization. Uniform handling of equations in chapters, and checking equations for accuracy (see eqs 3.5, 3.15, and 3.16) would have been helpful to the reader. Chapters 7 and 9 on methods to quantitate, characterize, separate, and purify proteins each are well done, but are duplicative on most chromatography and some electrophoresis techniques. While the treatment of topics generally is of appropriate length and depth, several topics are noticed by perhaps undue brevity (e.g., methods to assess denaturation, glass transition, and the nitrogen combustion method for protein analysis), or by omission [e.g., rapid *in vitro* methods to assess protein quality, the new PDCAAS (protein digestibility corrected amino acid score) method for protein quality, and viscosity of protein solutions]. Granted that some of the chapters are classical in nature and rely heavily on older literature, several chapters have few references cited since 1990.

The potential problems of the book mentioned above are more than offset by the quality of the individual chapters and some unique aspects. The chapter on functional properties clearly relates functional properties to the structure and conformation of proteins, rather than just reporting experimental data on various functional properties. The chapter on denaturation includes detailed characterization of soy, milk, and egg proteins and then the effect of heat denaturation on each. The nutrition chapter includes a comprehensive section on the nutritional value of various food protein sources. The chapter on food protein modification through biotechnology relates modification to nutritional and functional properties.

Overall, the book is very good and is highly recommended to scientists and students of food proteins. The editors are to be commended for undertaking this useful project. The first volume brings together topics relevant to the basic theory and technology for understanding food protein chemistry. The planned second volume promises to bring further relevance to the topics by focusing on specific commodity proteins and the effects of food processing.

S. Suzanne Nielsen, *Purdue University*

JA965650A

S0002-7863(96)05650-8

Quality Assurance in Environmental Monitoring: Sampling and Simple Pretreatment. Edited by Philippe Quevauviller (European Commercial Measurement and Testing Programme). VCH: New York. 1995. xv + 306 pp. $115.00. ISBN 3-527-28725-8.

This book places special emphasis on sampling and sample pretreatment in the broader context of quality assurance (QA) and quality control (QC) with respect to environmental monitoring. QA and QC have assumed major roles in the past 10 years as evidenced by the large number of guidelines, governmental regulations, and various accreditation systems that have come into existence. QA is necessary in the process of performing accurate chemical analyses. With regard to environmental monitoring, given standardized methods of analysis, the major source of error is more likely to occur outside of the laboratory during the course of sampling in the field and/or operations such as pretreatment or storage. The book addresses QA as related to sample collection, storage, and pretreatment of various environmental matrices which will be analyzed for organics, nutrients, and trace elements.

The book consists of ten chapters which cover the QA associated with various aspects of environmental monitoring. The first chapter is a general overview of QA and QC. This is an excellent chapter for individuals not familiar with QA and QC, and it is an excellent review for the expert. The second chapter presents sampling strategies that can be used for the environmental monitoring of biological specimens. The third chapter presents aspects of quality assurance and quality control of surface water sampling. The fourth chapter discusses the quality assurance of predetermination steps for dissolved nutrients in marine samples. The fifth chapter discusses quality assurance of sediment sampling. The sixth chapter presents quality assurance for the analysis of organic compounds in marine samples. This chapter is specifically directed toward applications to the analysis of chlorobiphenyls (PCBs) and polycyclic aromatic compounds (PAHs). Chapter seven deals with quality assurance of sampling and sample pretreatment for trace metal determinations in soils. Chapter eight presents aspects of quality assurance for sampling and sample handling for trace metal analysis in aquatic biota. Chapter nine is concerned with the quality assurance of plant sampling and storage. Chapter ten presents a holistic structure for quality management which contains a model for marine environmental monitoring.

This book provides an excellent source of detailed, highly useful QA information for sampling and sample pretreatment to be considered for environmental monitoring. The presentations of general principles followed by specific examples in the chapters were excellent. It is refreshing to note that chapter six which presented QA and PCBs and PAHs in marine matrices also presented an excellent but brief discussion of the analyses of these compounds which also included troubleshooting tips. The editor, P. Quevauviller, has done an outstanding job of combining chapters written by different authors into a very cohesive and a very readable text. This book is recommended both to the beginner as well as to those versed in various aspects of QA and QC. This book is also recommended as a reference source and as a worthy addition to libraries.

James M. O'Neal, *The University of Mississippi*

JA965646Z

S0002-7863(96)05646-6

New Trends in Kramers' Reaction Rate Theory. Edited by Peter Talkner (Paul Scherrer Institute, Switzerland) and Peter Hanggi (University of Augsburg, FRG). Kluwer: Dordrecht, The Netherlands. 1995. ix + 251 pp. $125.00. ISBN 0-7923-2940-6.

Escapes from metastable states by surmounting simple, multiple, or even fluctuating barriers are part of our common experiences in life. They also occur in many phenomena of interest in physics, chemistry, and biology such as diffusion, nucleation, and chemical reaction as well as material and charge transfer processes. With the publication of this very timely book, the editors have enlisted a number of authors, including themselves, to describe more recent developments in rate theory since the appearance of the classic review "Reaction Rate Theory; Fifty years after Kramers" by the editors of this volume and Michal Borkovec (*Rev. Mod. Phys.* **1990**, *52*, 251).

After an introductory chapter there are ten others on theoretical advances in this field which the editors hope may "potentially guide future developments". This begins with an excellent discussion of variational transition state theory (VTST) in condensed phases by Susan Tucker who provides an introduction to Kramers' theory and its extension to include memory friction and nonlinearities of the reaction coordinate. Anharmonic barrier corrections to Kramers' theory are next discussed by Peter Talkner followed by a chapter on multiple barrier crossings in periodic potentials by P. Jung and Bruce Berne. The task of surmounting fluctuating barriers in the presence of thermal white noise is addressed by Peter Hanggi, and noise-induced transitions and chemical rate laws are taken up by Raymond Kapral. Brownian particles kicked by position dependent pulses are discussed by Reimann and Talkner in relation to escape from metastable states followed by two chapters on the transport properties of random walkers on a set of discrete lattice points. In the first, C. Van Den Broeck and J. M. Parrando discuss escape from a region embedded in a self-similar structure containing a trap which is treated by decimation and renomalization techniques, and in the second, J. Bendler and M. Schlesinger discuss the ubiquitous stretched exponential kinetic decay occurring in glasses and disordered systems. The last two chapters deal with quantum mechanical treatments of reaction rates. Gregory Voth discusses a quantum mechanical transition state rate theory by exploiting the relation between the Feynman path integral centroid densities and the rate of activated events, and W. Miller describes recent developments in formulating an exact quantum rate theory.

The material presented in this book is at the cutting edge of research in this field, and the editors have succeeded in providing a comprehensive account of recent developments within the covers of a slim book of only 250 pages. The chapters are well organized, the writing is clear, and the index is comprehensive. The level is high, and a wide range of subjects including correlated hopping, fluctuating barriers, random walks in self-similar structures, nonexponential decay in disordered systems, Feynman path integral formulations, and an exact quantum reaction dynamics are discussed. The book assumes a good knowledge of classical rate theory and is strongly recommended as an introduction to and summary of current work. The price however is steep, and a cheaper paperback edition would be appreciated by students and workers in this field.

Jayendran C. Rasaiah, *University of Maine*

JA9554017

S0002-7863(95)05401-1

Advances in Polymer Science. Volume 125. Statistical Mechanics; Deformation; Ultrasonic Spectroscopy. Edited by Akihiro Abe (Tokyo Institute of Polytechnics) *et al*. Springer: New York. 1996. 194 pp. ISBN 3-540-60483-9.

This volume comprises three chapters with a focus on the viscoelastic properties of polymeric materials: (1) Statistical mechanics of transport phenomena: Polymeric liquid mixtures, by C. F. Curtiss and R. Byron Bird, pp 1−101; (2) Kinetics of deformation and relaxation in highly oriented polymers, by S. V. Bronnikov, V. I. Vettegren, and S. Y. Frenkel, pp 103−146; and (3) Ultrasonic spectroscopy for polymeric materials, by K. Matsushige, N. Hiramatsu, and H. Okabe, pp 147−186.

In the first chapter, Curtiss and Bird expand on a statistical mechanical model developed in prior work by the authors and co-workers. They explore transport phenomena in polymeric liquids in the framework of the phase-space kinetic theory, using a bead-spring model without constant bond lengths or bond angles, or specification of the nature of the connectivity (linear, branched, etc.), and with possible chemical composition and structural and chain length heterogeneity. Their main physical result is a "general equation of change", which is then utilized to discuss the stress tensor, heat and mass flux, and the coupling of these in special applications. Examples are limited to solutions without hydrodynamic interaction among chains (e.g., several examples involve the Rouse chain or its limit for two beads, the Hookean dumbbell). These include the isothermal stress tensor and the diffusivity tensor for the flowing Rouse model, and the nonisothermal stress tensor and the thermal conductivity tensor for the flowing dumbbell model. The authors are careful to identify assumptions at each stage, and to point out possible improvements. They suggest that the more "rigorous" of the expressions for the mass and heat flux vectors and the stress tensor may find use in Brownian or molecular dynamics simulations, suggesting that analytical advances may be unlikely in the near term. They further recommend systematic experimental studies of the effects of velocity fields on the diffusivity and thermal conductivity tensors probed in their work. The well-written review offers only a few (37) citations, perhaps reflecting its focus on a narrow, if difficult, problem. Students of the subject will find it very useful.

The chapter by Bronnikov *et al*. shares the attribute of focus, being principally a review of work by the authors and co-workers on a representation of the creep of oriented polymers in the range between the main (β and α) relaxation transitions. Many of the (113) citations are to work of this group published in the Russian literature. The authors present support for their contention that, for many materials, in this range, the initial (decelerating) and subsequent steady creep rate may be represented by an Arrhenius-like expression, with an activation energy that depends linearly on the applied stress, and a proportionality factor that is on the order of the periodicity of atomic vibrations. They further note that the same form may be used for the time constant for the creation of excited states deduced from IR or Raman spectra for samples under stress, with activation energies and proportionality factors on the same order of magnitude. They conclude that the mechanical response is intimately related to the states monitored spectroscopically, and further suggest that the temperature dependence of these states at equilibrium may be reflected in the dependence of the mechanical behavior on temperature. Although the conclusions may be subject to debate, the chapter may be useful as a review of concepts and a data analysis, not all of which may be readily available otherwise.

In the final chapter Matsushige *et al*. present the case that technical advances in wide-band ultrasonic transducers and the availability of computerized data acquisition and analysis methods have made it timely to develop and make wider use of ultrasonic spectroscopy for nondestructive characterization of polymeric materials. The authors discuss the detection and analysis of the response of a material to a single pulse using fast Fourier transformation methods to determine the complex velocity for the propagation of longitudinal plane waves as a function of frequency and temperature. Reference citations to earlier, more complete monographs on the use of pulse methods and the relation of the observables to material properties such as the complex adiabatic compression modulus and the shear modulus would have been useful; overall, the reference list is meager (24 citations), much of it being to work of the authors. They present results for several samples in terms of the power spectrum and attenuation over a relatively narrow range of frequencies (typically 1−10 MHz), to illustrate the characterization of phase transitions, and heterogeneities in a uniform matrix. They also discuss the two-dimensional method for nondestructive characterization of composite materials, making use of the information on the frequency response, with an example for a multilayered carbon fiber reinforced plastic material. Overall, the chapter provides a useful introduction to an important topic, but the interested reader will want to do supplementary reading to gain a reasonable perspective of the subject.

Guy C. Berry, *Carnegie Mellon University*

JA965795H

S0002-7863(96)05795-2