

Book review

Handbook of Thermal Analysis and Calorimetry, Series editor: Patrick K. Gallagher, Volume 4, **From Macromolecules to Man**, Volume editor: R. B. Kemp; Elsevier, 1999, Amsterdam–Lausanne–New York–Oxford–Shannon–Singapore–Tokyo
ISBN: 0-444-82088-4, 1060 pages, Price: USD 521

The excellently chosen, striking title of the volume and the elegant appearance of the book immediately catch the reader's attention and he or she opens the book with great expectation.

My first impression related to the large amount of work that must have been involved, both by the volume editor and by the 27 contributors. Very quickly, I was totally convinced as to the high quality and importance of this book.

The 17 chapters cover many aspects of biological thermal analysis and calorimetry. Each chapter was written by distinguished contributors, acknowledged worldwide as specialists in the given topics. In accordance with the promise of the title, the volume editor does indeed conduct the reader from macromolecules to man by means of the consecutive chapters:

- 1 Energetics that control the stability and dynamics of secondary and tertiary structure of nucleic acids
- 2 Theory and practice of DSC measurements on proteins
- 3 Lipid model membranes and biomembranes
- 4 Combustion calorimetry
- 5 The thermodynamics of microbial growth
- 6 Quantitative calorimetry and biochemical engineering
- 7 Calorimetry of microbial processes
- 8 Calorimetry of small animals
- 9 Calorimetric approaches to animal physiology and bioenergetics
- 10 Whole body calorimetry
- 11 Microcalorimetric studies of animal tissues and their isolated cells
- 12 Calorimetric studies in medicine
- 13 Calorimetric methods for analysis of plant metabolism
- 14 Wood
- 15 Dynamic mechanical analysis of elastomers
- 16 Thermal analyses in foods and food processes
- 17 Thermal analysis and calorimetry of pharmaceuticals

Chapter 1, written by H. H. Klump, deals with current advances in the studies of DNA and RNA structures and describes some of the recent applications of calorimetry for exploration of the origins of nucleic acid stability, the mechanisms of secondary and tertiary structure folding and unfolding, as studied through the use of model compounds, and the prospect of nanostructures based on nucleic acids.

Chapter 2, by J. Rösgen and H.-J. Hinz, introduces the investigation of protein energetics by means of DSC, as a direct and powerful approach to the question. The reader can learn how to perform the DSC experiments and the thermodynamic analysis of the heat capacity curves obtained.

Chapter 3, by A. Blume and P. Garidel, describes the principal type of calorimetric experiments which can be performed to elucidate the behavior of lipid model membranes. The goal is to present the principles of the method. The applications of DSC and isothermal titration calorimetry are discussed.

In *Chapter 4*, by I. Lamprecht, possible applications of bomb calorimetry in different biological fields are presented, sometimes in competition with other methods such as analysis of elemental or chemical composition (carbohydrates, protein and lipids).

E. H. Battley, the author of *Chapter 5*, discusses the reasons for studying the thermodynamics of microbial growth and introduces the principle of growth process systems and the thermodynamics of the process.

Chapter 6 is by P. Duboc, I. Marison and U. von Stockar. The aim of this contribution is to illustrate the application of the fundamentals of thermodynamics to biochemical engineering.

Chapter 7, by C. Larsson and L. Gustafsson, demonstrates that the microbial processes can be monitored and quantified by means of calorimetric measurements. The chapter contains several examples from the authors' own work, often with yeasts as model organisms.

Chapter 8, by I. Lamprecht and E. Schmolz, concentrates on calorimetric (direct and indirect) investigations of small animals (aquatic invertebrates, larger reptiles and insects). All calorimetric data cited in this chapter deal with intact, living animals which are not sacrificed for or during the experiments.

Chapter 9, by S. C. Hand, also deals with animals. Calorimetry is applied to bioenergetic and physiological studies of both aquatic and terrestrial animals.

Chapter 10, by U. Frenz, presents the principles and applications of the calorimetric method and equipment. The applications of whole body calorimetry include characterizing the requirements of food energy and food components for individual and different population groups, investigating metabolic pathways and regulation mechanisms in physiology, monitoring the metabolism of critically ill patients, and exploring the reasons for and progression of obesity, hypertension and diabetes in nutrition research.

Chapter 11, by R. B. Kemp and Y. H. Guan, guides the reader through microcalorimetric studies of animal tissues and their isolated cells, pointing out the reasons for systematic errors in calorimetry and providing several examples: different kinds, of muscles, nerves, diseased and damaged human tissues and cells.

Chapter 12, by M. Monti, illustrates the usefulness of calorimetric investigations in medicine. There are numerous examples from this field: hematology, malignancy, immunology, endocrinology, the cardiovascular system, nutritional and metabolic disorders, and the kidney.

Chapter 13, by R. S. Criddle and L. D. Hansen, provides a discussion focusing on methods for the measurement and interpretation of rates of heat production from plant metabolic processes.

Chapter 14, by H. G. Wiedemann and I. Lamprecht, deals with some of the thermoanalytical aspects of wood application in daily life. Wood plays an important role in numerous areas of

our daily lives. The field of application of thermoanalytical methods in wood research is correspondingly broad. The reader is presented with many examples.

Chapter 15, by C. M. Roland, illustrates the application of the dynamic mechanical analysis (DMA) of elastomers: viscoelasticity, and the time and temperature dependence of relaxation.

In *Chapter 16*, A. Schiraldi, L. Piazza, D. Fessas and M. Riva discuss the use of different thermal analysis techniques: DSC, TGA, TMA and DMA in food science and technology. We can see the curves obtained during the thermal analysis and we can learn how to evaluate the information.

Chapter 17 is by J. L. Ford and R. Willson. Thermal analysis and calorimetry have many applications within the pharmaceutical disciplines. This chapter reviews the current applications of these techniques to the development of pharmaceutical products.

All chapters can be regarded as reviews of the given domains. It is a pity that there are no running titles. Of course, this is only a minor fault, but a good running title can help in the use of a handbook. The chapters of this handbook do not intend to show the very latest research results in the discussed fields, though the reader can obtain a survey as concerns the methods, results and applications. The main approach is rather: 'how and what to do and when to do it'.

It is also worth mentioning the references given in the chapters. Each chapter furnishes a large number of literature citations relating to the discussed research field. These guide the reader interested in the details to the many articles available in the literature.

The well-structured index makes use of this handbook quick and effective.

Besides my overall appreciation of this valuable work, let me mention some technical editorial problems, though these do not decrease the scientific value of this publication. The layout of the different chapters is not unified. There are some Figures with too large numbers and others with too small numbers, in Chapter 14, 'thermogram' should be changed to 'curve'.

Overall, this is a well-edited, valuable book, which affords much useful information for everyone interested in the various aspects of biological thermal analysis and calorimetry.

Credit and recognition should be given to the volume editor of this book, Prof. Richard B. Kemp not only because of his commitment to biological thermal analysis and calorimetry, but also his persistence and patience, and above all his extremely hard work.

B. Androsits