This is especially valuable for students or younger researchers developing an interest in these topics. The often critical but always very fair assessments, the personal outlooks and comments, as well as the numerous examples given are surely a positive quality of the book and should also appeal to experienced academic and industrial scientists.

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Metallochemistry of Neurodegeneration: Biological, Chemical and Genetic Aspects

By *Henryk Kozlowski*, *David R. Brown*, and *Gianni Valensin*.

RSC, Cambridge 2006. xii + 281 pp., hardcover £89.95.—ISBN 978-0-85404-360-6

The World Health Organization estimates that neurological disorders currently afflict over 1 billion people, with an estimated 24 million of those suffering from Alzheimer's disease (AD), which occurs almost exclusively in people over the age of 65. These disorders place a significant burden on the patients, their families, and the health care infrastructure. Addressing neurological disorders represents a significant emerging challenge as the world population increases in both size and age. For example, Alzheimer's Disease International projects that the number of AD cases will double every 20 years, which means that over 80 million people will suffer from the disease by 2040. Both the prevalence and severity of neurological disorders have motivated researchers to study disease pathologies and to search for therapeutic strategies. A growing body of evidence from these studies suggests a connection exists between the incidence of neurological diseases and either an imbalance in metal ion concentrations or a malfunction of a metalloenzyme.

In their new book, Kozlowski, Brown, and Valensin provide an overview of metalloneurochemistry and review some of the significant research from the field reported in the last 10–15 years. A growing number of bioinorganic chemists have recently joined the efforts of neuroscientists to study the chemistry of metals in the central nervous system (CNS) and the possible role of metals in neurological disorders. This book presents the relationship between metals and brain function from two different perspectives. First, several chapters are dedicated to four of the most prominent neurodegenerative disorders: AD, Parkinson's disease, amyotrophic lateral sclerosis, and prion diseases, and the proposed roles of various metals in these diseases. The second approach involves a survey of specific metals implicated in multiple disorders. Both the natural functions of these metals and detrimental consequences of exposure or overexposure to these metals are evaluated. Included in this overview are the clinical applications of lithium and the neurotoxicity of aluminum, which are both metals without functions in normal mammalian biology.

The most extensive discussion in the book is dedicated to copper. Mechanisms of copper homeostasis and entry into the CNS are presented in the context of widespread diseases, like AD, and also with respect to rarer disorders such as Wilson's and Menkes' diseases, which have been highlighted in recent studies of metallochaperones. The links between prion diseases such as bovine spongiform encephalopathy (mad-cow disease) and copper are analyzed with examples from genetic, biochemical, and coordination chemistry studies, providing a balanced presentation for readers with different scientific backgrounds. Although this is an instructive approach, the emphasis on copper may lead the uninitiated reader to erroneously conclude that metals such as iron, zinc, and calcium are of lesser importance in understanding neurological disorders. While it would have been impossible to provide a comprehensive picture of all the metal chemistry implicated in neurodegeneration in this book, it does provide an excellent springboard for initiating a study of the these subjects when used in conjunction with the primary literature and other books that review research at the interface of inorganic chemistry and neuroscience.

Studying the chemistry of aging and age-related diseases at the molecular level provides a promising avenue to address these issues, and the final chapter of the book examines the application of lanthanide-based MRI agents in the diagnosis and study of brain-related diseases. An increasing number of young scientists, including chemists, are choosing to focus on metalloneurochemistry because of the global health crisis associated with neurological disorders; however, finding effective therapeutics for existing neurological disorders and practicing preventative medicine remains challenging, as disease pathogenesis is not fully understood. Even with the abundance of data acquired by various methods to date, new investigators in the field can find numerous unanswered questions that cannot be studied with existing technologies. Solving many of the problems described in this book will require today's scientists to make innovations in MRI reagents, fluorescent sensors, caged complexes, pro-chelators as well as chemically modified biomolecules and new model systems to study disorders. Subsequent treatment of diseases will require similar advances in synthetic, biological, and coordination chemistry. This book conveys the urgent need for such research and development, and should motivate researchers in the field to continue to push the boundaries of metalloneurochemistry.

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Thermal Analysis of Pharmaceuticals

Edited by *Duncan Q. M. Craig* and *Mike Reading*.

CRC Press, Boca Raton 2007. 416 pp., hardcover £79.99.—ISBN 978-0-8247-5814-1

Working in the field of solid-state analysis of pharmaceuticals for many years, I accepted the invitation to review this book, not only with great curiosity and expectancy, but also with a preliminary question to answer: Is this the book I have been waiting for? A number of excellent books are available covering the general principles, fundamental theories, and diverse applications of thermal analysis and calorimetry. What can this book differentiate from the contenders? Can the authors give a unique insight into thermal analysis by focusing on pharmaceuticals, and/or into the analysis of pharmaceuticals by the versatile thermal methods? Can something novel be added to the relatively well established arsenal of thermal techniques?

The importance of solid-state analysis of pharmaceuticals has significantly increased over the last decade due to the stringent regulatory and quality assurance requirements, and as a result of a screaming race among pharmaceutical players to develop novel solid forms (polymorphs and solvatomorphs, co-crystals) or complex formulations (advanced drug delivery and biomedical systems) to hit the market with exclusivity. In this industrial setting, thermal methods play a vital role in the research and development of such forms, which gives a timely basis for releasing this book.

The editors (D. Q. M. Craig and M. Readings) did a really good job in creating a fine balance between topics of commonly used, well-established methods, and of techniques that are the focus of recent research efforts. Most of the topics follow a three-fold division throughout the book; first giving the essential theoretical and instrumental background of the method, followed by the parameters that should be optimized and controlled, and those which are important to understand the strength as well as the pitfalls and limitations of the methods. Carefully selected, real-life examples reflecting problems generally faced by pharmaceutical scientists during solid-state analysis of pharmaceuticals are given at the end of each topic. The theoretical background is provided in a very rational and compact way without overflowing mathematics, which is very helpful for newcomers to the field; nonetheless it provides an excellent summary for those having a deeper knowledge. I personally found the optimization parts very useful, reflecting the endeavor of the authors to give a realistic picture of the methodological capabilities, and to show the critical points that can lead to misuse of the instrument or misinterpretation of the results. Authors of the respective chapters are recognized representatives of industry and academia, which assure industrial relevance and scientific value throughout the book. The contents are easily accessible through the table of contents and the keyword index.

The first three chapters are devoted to the principles, optimization and applications of differential scanning calorimetry (DSC) as it is still the most frequently used thermal technique. Besides the examples showing characterization of pharmaceutical hydrates, solvates, and glasses, the application section addresses thermodynamic relationships of enantiotropic and monotropic polymorphs, and shows respective manifestation of the phenomenon on the DSC thermogram. This is followed by modulated temperature DSC (Chapter 4), which provides a highly useful supplementary tool to conventional DSC. Widespread use of MTDSC can be expected especially in analysis of the relaxation of glassy drugs, in characterization of drug delivery systems based particularly on polymeric materials. The following two chapters (Chapter 5–6) cover principles and applications of thermogravimetric analysis (TGA). In this part, the strengths and weaknesses of thermogravimetry in investigating solid-state reaction kinetics and mechanisms are emphasized, and an excellent introduction to the theory of solid-state reaction kinetics is also given. This becomes particularly useful in characterizing pharmaceutical hydrates and solvates (stoichiometry and binding characteristics) and analyzing the kinetics of the dehydration process, as well as decomposition, as illustrated beautifully by the examples. The authors also give account of how TGA can be utilized to analyze conventional and controlled-release dosage forms. Although thermal microscopy is a matured technique, which has been used for decades, the book would not be complete without this chapter (Chapter 7). Visualizing the events seen on TGA and DSC thermograms is necessary to be able to understand melting and recrystallization, as well as solid-state transformations; this point clearly hits the reader through the use of didactic examples. This chapter also includes vendor contact details relevant to thermal microscopy (Tables 7.1–7.6), which I personally feel inappropriate in the context of a scientific textbook. The remaining chapters describe techniques of less widespread use, but which are in the forefront of pharmaceutical research: isothermal microcalorimetry (Chapter 8), high sensitivity DSC (Chapter 9), thermoreological characterization (Chapter 10), and thermally stimulated current spectroscopy (Chapter 11). The importance of these techniques is continuously growing, and the techniques find specific applications in versatile pharmaceutical problems (e.g. stability and drug-excipient compatibility testing, characterization of biological molecules, polymeric and heterogeneous systems of pharmaceutical and biomedical importance).

The discipline of thermal analysis is enormous and even focusing on pharmaceuticals leaves the authors and the readers on a giant ground. This conceptual art, however, brilliantly filters the subject of thermal analysis to finally provide not only the essence of the most relevant techniques, but also giving unique insight into how these methods can be effectively combined to solve complex problems faced by pharmaceutical scientists. Due to the high scientific value, timely industrial relevance, and didactic approach, this book is an invaluable information resource for readers both in academia and industry, be they beginners or experts. I warmly recommend this book to everybody involved in solid-state analysis of pharmaceuticals, because it is the "must have" that I have long been waiting for.

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