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BOOK REVIEWS

Progress in Colloid and Polymer Science, Volume 133, 2006: Smart Colloidal Materials. Edited by Walter Richtering (RWTH Aachen University, Germany). Series edited by F. Kremer and W. Richtering. Springer: Berlin, Heidelberg, New York. 2006. viii + 184 pp. $199.00. ISBN 3-540-32701-0.

This book features selected papers presented at the 42nd Biennial Meeting of the Kolloid-Gesellschaft held at the RWTH Aachen University, Germany in September, 2005. The 27 chapters are organized into the following sections: Polymer Particles and Capsules; Polyelectrolytes, Colloidal Interactions; Surfactants; and Particles and Characterization. An author/title index and a key word index complete the book.

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Greene's Protective Groups in Organic Synthesis, 4th ed. By Peter G. M. Wuts (Pfizer) and Theodora W. Greene (The Rowland Institute for Science). John Wiley & Sons, Inc.: Hoboken, NJ. 2006. xxviii + 1082 pp. $94.95. ISBN 0-471-68754-0.

This fourth edition of *Green's Protective Groups in Organic Synthesis* continues to be a comprehensive guide to the techniques for the formation and cleavage of protective groups. The more than 1200 protective groups presented here are organized according to the functional group to be protected, ranging from the simplest to the most complex. Some of the new features of the fourth edition include the addition of more than 3100 new references, the inclusion of fluorous protective groups, a new chart covering selectivity in silyl group deprotection, and an expansion of the chapters on alcohol and amine protection. An extensive subject index completes the book.

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Supramolecular Polymers, Polymeric Betains, Oligomers. Advances in Polymer Science, 201. Springer: Berlin, Heidelberg, New York. 2006. x + 302 pp. $259.00. ISBN 3-540-31923-9.

The *Advances in Polymer Science* series remains an important venue for reviewing the latest and most interesting topics related to the field of polymers. This current volume is no exception. Although supramolecular chemistry, hybrid polymers, and polyelectrolytes have been popular topics in chemistry and materials research, this volume focuses on four main subtopics: cyclodextrin-based supramolecular polymers, liquid crystalline dendrimers and polypedes, polymeric betaines, and polyhedral oligomeric silsesquioxanes. These topics have been the subject of other shorter review articles, of course, but they have been given a much more detailed treatment in this book.

To begin with, cyclodextrin chemistry is a well-known and -studied area in supramolecular chemistry. Complexation is a key word in which a host−guest relationship is synonymous to higher levels of self-assembly. Interesting assembly and disassembly motifs are outlined based on the "stringing" together of these complexes in a variety of ways, e.g., direct, peripheral, head-to-tail, head-to-head, etc. This assembly and disassembly can also be triggered by thermal and photochemical gradients in solution. Both polyrotaxanes and polycatenanes are mentioned. Inclusion polymerization may yet become an important aspect of this field. The focus on solid-state crystalline structures at the beginning may be a little discouraging for people who are not familiar with this field, although it is essential.

The chapter on liquid crystalline (LC) dendrimers is timely and is also quite comprehensive for a review. The research group in Strasbourg on liquid crystalline materials are pioneers in this field. The authors have structured the review well by focusing on a variety of architectures and new phenomena observed in these materials, which mostly include the incorporation of mesogenic groups on different parts and generations of dendrimers. This functionalization evidently leads to the discovery or rediscovery of new LC phases. The collective assembly in a covalent manner differentiates this LC behavior from single molecule aggregates. More interestingly, the path toward hierarchical assembles is achieved by taking advantage of short- and long-range ordering in these materials. The inclusion of polypedes as a subclass is very appropriate since it emphasizes the importance of oligomeric units in ordering. The discussion of types of material architectures and compositions, as well as chirality, organometallics, and fullerenes, is not only helpful but also insightful. There is less emphasis on shape-persistent dendrimers, however, which may be because of a lack of study in this field or simply because of page limitations—this is already the longest chapter in the book! Nevertheless, it was my favorite.

A discussion of polymeric betaines is also a timely addition to this volume, as this class of polymer (polyelectrolyte) has not received a comprehensive review for some time. Although, these polymers are not as well utilized and synthesized as the anionic or cationic polyelectrolytes, they have been given new light here in terms of succinct classification schemes, various synthetic routes, and an overview of some of the more interesting applications for a linear polymer. The classification of polymeric carbo-, sulfo-, phosphobetaines puts them together with some of the most well-studied zwitterionic groups, making it easy to identify their synthetic routes and limitations. The main difference, of course, is the lack of small counter ions present in these betaines, making them uniquely hydrophilic and ionically neutral. The synthetic routes are also classified based mainly on addition-type polymerizations and analogous reactions that involve chemical derivatization on a preformed polymer. Step condensation-type polymerizations have also been cited as a route, although this approach is not covered as com-

Unsigned book reviews are by the Book Review Editor.

prehensively as others. Their properties in solutions and in condensed and gel states are of great interest since their network structure provides mechanical integrity to most membrane structures without the need to account for ion-exchange properties.

Last, the chapter on polyhedral oligomeric silsesquioxanes or POSS hybrid polymer materials appropriately outlines what is known about these materials and what is new. The chemistry of the POSS cages is the unique characteristic of these hybrid materials. In essence, this imparts a particulate nature to them and also serves as a central core to which various arms and dendrimeric-to-star type of architectures can be constructed. The chapter also gives some focus to POSS as substituents or side groups. A review of the physical, mechanical, and morphological properties is deemed essential since the incorporation of the "hard" and "soft" domains in these materials makes them useful not only for observing improved properties but also, more fundamentally, for developing a strong understanding of structure−property relationships in hybrid materials.

Overall, this book strives to give a comprehensive and timely review of these four major topics in the field of polymer chemistry and materials. Some of the chapters are truly outstanding. The references are timely, but because these are rapidly developing fields, another review will be needed in a few years.

Rigoberto C. Advincula, *University of Houston*

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Electrokinetic Chromatography: Theory, Instrumentation and Applications. Edited by Ute Pyell (University of Marburg, Germany). John Wiley & Sons, Ltd: Chichester. 2006. xii + 540 pp. $235.00. ISBN 0-470-87102-4.

Electrokinetic chromatography (EKC), which combines the separation principles of electrophoresis and pseudochromatography, has arguably been one of the most popular modes of capillary electrophoresis (CE) in the past two decades. To provide a comprehensive review of the topic, Pyell has invited several well-known international experts in the field to highlight all of the exciting and innovative developments for scientists interested in analytical-scale separations in open tubes. This topic is particularly timely, as a wide range of achiral and chiral compounds with different charged states and hydrophobicity require different EKC modes for separations. The book is well suited for those involved in fundamental research using EKC. In addition, it also dedicates some space to getting the novice caught up in the field. Detailed references at the end of each chapter not only augment the reader's knowledge but also may help instructors develop a specialized course in CE. Although this book for the most part is beyond the scope of readers interested in separation and detection of large molecules, it is an excellent reference that will certainly be of use to any scientist interested in developing approaches to separation and detection of small charged and uncharged molecules.

The 21 chapters are grouped into three major parts. Part I, entitled "Separation Principles" begins with a chapter by the editor in which she introduces the principles of separation of EKC and its various methodologies in a manner that is easily understandable and that nicely orients the reader to reveal how the various separation carriers (conventional micelles, molecular micelles, microemulsions, linear polymers, dendrimers) in the charged form are utilized in EKC. Therefore, this chapter not only will be very helpful to researchers who lack a background in EKC but also sets the stage for the following chapters covering its fundamentals.

In two chapters of Part I, micellar electrokinetic chromatography (MEKC) is reviewed from the perspective of selectivity and resolution. Optimizing the selectivity in MEKC by characterizing the various pseudostationary phases, ranging from micelles to microemulsions, vesicles, and polymeric surfactants, using the solvation parameter model may contribute significantly to the future development of pseudophases with enhanced selectivity. In a chapter by Jia and Terabe, the latter of whom is considered one of the inventors of MEKC, a very useful flowchart is presented illustrating resolution optimization in MEKC. Optimization of parameters for separation via experimental design is discussed in the next chapter and is the key for finding the best conditions for EKC separation with fewer experiments, and the chemometric techniques offer excellent possibilities to accomplish this task. However, the existing statistical methods still need to be refined, and thus the authors recommend at least second-order polynomials when using empirical equations as a starting point in EKC optimization.

The chapter on microemulsion electrokinetic chromatography (MEEKC) is easy to read and well laid out. It is a definitive reference on this mode of EKC. However, surprisingly, some of the recently published work using chiral microemulsions derived from either conventional surfactants or polymeric surfactants in MEEKC was not cited. In addition, the clear advantage of MEEKC over MEKC for certain sample types was not demonstrated.

One chapter stands apart from the rest, because novel approaches on the use of polymeric chiral and achiral surfactants, dendrimers, and polymeric nanoparticles are described. The use of polymeric surfactants for the hyphenation of EKC with mass spectrometric (MS) detection is also discussed briefly. Several notable features of polymeric surfactants, such as the absence of free surfactant monomers, low surface activity, and, more importantly, the lack of signal in the mass region of interest, seem to solve the long-standing problems associated with the coupling of EKC to MS.

Additional subjects covered in Part I are pseudostationary ion-exchange phases, enantiomeric separations, and on-line sample enrichment in EKC. The chapter on pseudo-stationary ion-exchange phases covers the significant advantages of this mode of chromatography for the separation of charged compounds with similar mobilities. However, a clear advantage of this mode over capillary zone electrophoresis (CZE) for the separation of ionic compounds is not demonstrated. In the chapter on enantiomeric separations, the authors outline the separation principles of this technique but mainly describe the use of various cyclodextrins. One could argue that there are other charged chiral pseudophases, e.g., amino acid based molecular micelles, crown ethers, macrocyclic antibiotics, that should have been included in this chapter. A major drawback of CE and EKC is poor detection sensitivity; thus, the well-written discussion of on-line sample enrichment techniques in the last chapter of Part I should be of great interest to those interested in developing trace-level detection in pharmaceutical, toxicological, and environmental analysis.

Part II, "Instrumentation", contains six chapters, beginning with a basic introduction to EKC instrumentation—including power supply, injector, and different designs for UV detector cells—with special attention to the preparation and use of coated capillaries. However, there is no clear focus on the utilization of coated capillaries for EKC in this chapter. The next four chapters deal with different methods of detection, which include laser-induced fluorescence and amperometric, photothermal, and MS detection. The discussion of the coupling of EKC to MS as a method of detection is particularly timely, as the presence of low-molecular-weight separation carriers used in EKC may cause problems with MS detection. I particularly thought that the last chapter in Part II, which contains significant information on several interesting examples of EKC and MEKC on microchips, complemented the other chapters of Part II very nicely, and I was impressed with the discussion of two-dimensional MEKC on a microchip.

The applications of EKC are the subject of Part III, which contains five chapters dedicated to the analysis of pharmaceuticals, body fluids, and food and beverages, as well as chiral and environmental compounds. Although most of the chapters in this section are well organized and will serve as a definitive reference on an array of applications, I am not as confident about the outlook of the chapters on pharmaceutical and chiral analysis. For example, it was disappointing to see that instead of showing applications of EKC-MS using various separation carriers for the analysis of pharmaceutical compounds, the authors elected to discuss applications of CZE-MS for pharmaceutical analysis, which seemed to be a bit out of focus because no extensive information on the conditions for this type of analysis by EKC was provided from the available literature. Similarly, the chapter on chiral analysis should have also tabulated some important representative applications of EKC methods using the various separation carriers discussed in Part I.

Overall, this book is not of sufficient general interest to appeal to the entire community of chemists, but it should be an excellent reference for those chemists who follow developments in the area of small molecule separations or who seek to develop difficult and challenging separations in EKC. They will find here some very interesting and exotic applications of this valuable mode of CE.

Shahab A. Shamsi, *Georgia State University*

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Inorganic Chemistry in Focus III. Edited by Gerd Meyer, Dieter Naumann (Universität Köln, Germany), and Lars Wesemann (Universität Tübingen, Germany). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2006. xlvi + 330 pp. $125. ISBN 3-527-31510-1.

This book commemorates the 80th birthday of Prof. John D. Corbett of Iowa State University and thus contains 21 articles on inorganic solid-state chemistry written exclusively by his former graduate students and postdoctoral associates. An unusual feature of this book is the one-page biographical sketches of all of the senior authors. These indicate the variety of interesting careers and major academic and research positions throughout the world of Corbett's former co-workers.

The range of topics in the individual articles reflects the wide diversity of areas in solid-state chemistry that have been developed in Corbett's group for approximately a half-century. Most of the articles relate in some way to cluster chemistry in inorganic solid-state materials, although a few are discussions of other types of inorganic solid-state materials, such as thiospinels, layered perrhenate and vanadate hybrid solids, metal halides, titanium nitride nanoparticles, and alkaline earth borophosphates. The inorganic clusters included contain either the early transition metals, including the lanthanides, or post-transition elements, i.e., Zintl ion clusters. A short five-page subject index concludes the book.

In general, the articles are highly stimulating to both theoretical and experimental chemists and suggest potential areas for future research on chemical structure and bonding. In addition, the chemistry discussed in this book is relevant to understanding the properties of inorganic solids. This book is recommended both to inorganic chemists and solid-state physicists.

R. Bruce King, *University of Georgia*

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Peptide Hybrid Polymers. Advances in Polymer Science, 202. Edited by Harm-Anton Klok (Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland) and Helmut Schlaad (Max Planck Institute of Colloids and Interfaces, Potsdam-Golm, Germany). Springer: Berlin, Heidelberg, New York. 2006. xii + 160 pp. $179. ISBN 3-540-32567-0.

In this volume, one of the latest in the *Advances in Polymer Science* series, the editors and authors provide an overview of the state-of-the-art in a burgeoning area that merges the controlled structural and biological activity of one of Nature's main class of polymers—proteins and peptides—with the more traditional chemistry of synthetic polymers. It consists of five chapters written by experts in the field whose topics range from synthesis to self-assembly to potential uses in drug and gene delivery.

The first two chapters focus on the different synthetic methods used to access peptide hybrid polymers. In the first, Deming presents an overview of the polymerization of α-amino acid-*N*-carboxyanhydrides (NCAs), which spans from early work in the field where base or nucleophiles were used in the polymerization of NCAs to the recent developments of transition-metal initiators that have been pioneered in his lab and others. He goes on to elucidate how such polymerizations have been used to access polypeptide hybrid copolymers. In the next chapter, Löwik et al. describe and summarize the wide range of other techniques and processes that have been used to access such bioinspired hybrid polymers. This broad chapter outlines techniques that range from grafting of peptides to a premade polymer, to free-radical polymerizations of peptide-containing monomers, to polymer−protein conjugates (both covalent and noncovalent) and protein engineering. One nice aspect of this chapter is that it focuses on the synthesis of polymer hybrids in

which biorelevant peptide fragments have been incorporated. The nature of the peptide component ranges from cell adhesion peptides, such as RGD peptides, to peptides that form controlled secondary structures, and the reader is introduced to some of the reasons why these materials are so appealing. Chapters 3 and 4 nicely build on some of the aspects introduced in Chapter 2 and outline in more detail the self-assembly properties of polypeptide-based copolymers. Schlaad in Chapter 3 focuses on the self-assembly capabilities of these systems in solution. In particular, he focuses on peptide fragments that form controlled secondary structures, such as α-helices or β-sheets, and how these structures influence the self-assembly of the copolymers in solution. Chapter 4, by Klok and Lecommandoux, is an overview of the self-assembly capabilities of the peptide hybrid block copolymers in the solid state. This detailed chapter is divided into sections that primarily focus on AB and ABA block copolymers of which A is the poly(peptide)—primarily poly(γ-benzyl glutamate) or poly(ε-benzoyloxycarbonyl-lysine)—and B includes poly(butadiene), poly(isoprene), poly(styrene), poly(ethylene glycol), or poly(siloxane). In the final chapter, Osada and Kataoka turn their attention to the potential uses of hybrid polymers of peptides. They specifically focus on poly(ethylene glycol)—poly(peptide) hybrid block copolymers and their use in drug and gene delivery. The amphiphilic nature of such block copolymers, with the peptide being the hydrophobic component, results in the formation of micelles with core—shell architectures. This chapter outlines a number of ways, primarily from the labs of the authors, that such assemblies have been utilized and developed for their biocompatibility, targeted delivery, and stimuli-responsive properties.

In summary, this volume nicely introduces the researcher and student to the area of peptide polymer hybrids and outlines the areas of synthesis and self-assembly as well as potential medical applications. This is a fast developing area of interdisciplinary research, and this volume sets the scene well.

Stuart J Rowan, *Case Western Reserve University*

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Potential Health Benefits of Citrus. ACS Symposium Series 936. Edited by Bhimanagouda S. Patil (Texas A&M University), Nancy D. Turner (Texas A&M University), Edward G. Miller (Baylor University), and Jennifer S. Brodbelt (University of Texas at Austin). American Chemical Society: Washington, DC (Distributed by Oxford University Press). 2006. xiv + 282 pp. $174.50. ISBN 0-8412-3957-6.

This book was developed from a symposium on the titled subject held at the 228th National Meeting of the American Chemical Society in Philadelphia in August 2004. The first chapter, written by the editors, is an overview of the topic, and the remaining 18 are grouped into the following catagories: Isolation and Characterization of Citrus Bioactive Compounds; Bioavailability and Toxicity of Limonoids; Health Properties of Bioactive Compounds in Citrus; and Consumer Trends. An author and a subject index complete the book.

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