Book Reviews *

Macromolecular Engineering: Recent Advances. Edited by Munmaya K. Mishra (Texaco Inc.), Oskar Nuyken (Technical University of Munich), Shiro Kobayashi (Tohoku University), Yusuf Yagci (Istanbul Technical University), and Bidulata Sar (PFI, Inc.). Plenum Press: New York. 1995. ix + 332 pp. $105.00. ISBN 0-306-45112-3.

This volume was developed from the 1st International Conference on Advanced Polymers Via Macromolecular Engineering (APME '95), June 24−29, 1995, at the Vassar College campus, Poughkeepsie, NY. There are 24 comprehensive chapters that reflect the belief that macromolecular engineering is the key to developing new polymeric materials. Some of the titles are Group Transfer Polymerization and Its Relationship to Other Living Systems, Fundamentals and Practical Aspects of "Living" Radical Polymerization, and The Constant Copolymer Composition Technique (III).

JA9656208

S0002-7863(96)05620-X

CIBA Foundation Symposium 191: Non-Reproductive Actions of Sex Steroids. Wiley: New York. 1995. ix + 307 pp. $79.95. ISBN 0-471-95513-2.

This book brings together clinicians and basic researchers from a number of disciplines to discuss the non-reproductive actions of sex steroids. Sex steroids have numerous effects on the brain, and although many of these are directed to neural functions underlying reproduction, others are more broadly related to brain function. Among these are effects on cognitive function, motor coordination (high levels of estrogen exacerbate symptoms of Parkinson's disease), depressive illness, and dementia (estrogen has been shown to improve cognitive function in Alzheimer's disease patients). Neurosteroids also have an important role in nerve repair. The protective role of estrogen against cardiovascular disease in women is widely documented; the mechanism behind this cardioprotective effect is discussed. The incidence of autoimmune disease is higher in women than in men, and estradiol appears to exacerbate the symptoms of many of these diseases, with the exception of rheumatoid arthritis, where estrogen suppresses symptoms. Sex steroids have been implicated in the pathogenesis of several types of cancers. Synthetic steroid antagonists, such as tamoxifen, have been widely studied as therapeutic agents for hormone-dependent cancers. The advantages and disadvantages of hormone replacement therapy (HRT) form a major topic of discussion in this book. HRT has been shown to reduce postmenopausal demineralization of bone, thus slowing the advance of osteoporosis. Protective effects of HRT on cardiovascular disease are also discussed.

JA965554+

S0002-7863(96)05554-0

Chemical Thermodynamics Series, Vol. 2: Chemical Thermodynamics of Americium. By R. J. Silva (Lawrence Livermore National Lab), Giovanni Bidoglio (Environment Institute, Italy), Malcolm H. Rand (Winters-Hill Consultancy), Piotr B. Robouch (Institute of Reference Materials and Measurements, Belgium), Hans Wanner (MBT Environmental Engineering, Ltd.), and Ignasi Puigdomenech (OECD Nuclear Energy Agency). Elsevier: Amsterdam. 1995. xvii + 374 pp. $234.50. ISBN 0-444-82281-X.

This is the second volume in a series of critical reviews of the chemical thermodynamic data of those elements of particular importance in the safety assessment modeling of high-level radioactive waste storage and disposal facilities. The present volume is a review of experimental data reported in the literature for americium. Where no data existed, comparisons and estimates were made on the basis of experimental data on analog lanthanide elements. This book contains a reference list, authors list, and formula list.

JA965551X

S0002-7863(96)05551-5

Stereoselective Reactions of Metal-Activated Molecules, Second Symposium. Edited by Helmut Werner and Jorg Sundermeyer (Bayerische Julius-Maximilians University). Verlag Vieweg: Branschweig. 1995. x + 236 pp. $91.00. ISBN 3-528-06664-4.

The key topics of the Second International Symposium of the Sonderforschungsbereich 347 on Stereoselective Reactions of Metal-Activated Molecules held in Wurzburg, September 21−23, 1994, are contained in this book. The search for metal selective reactions is currently one of the most important challenges in chemistry. Both organometallic chemistry and enzymatic chemistry have contributed numerous valuable applications, and the importance of these interdisciplinary fields of research continues to expand dramatically. The use of metal complexes or metalloenzymes for stoichiometric catalytic transformations may help to control chemo-, regio-, and stereoselectivity. The enormous progress achieved during the past few years is reflected in the contributions to this volume which focus on stereoselective coupling or cleavage of C−O, C−C, C−H, C−F, C−S, and C−P bonds as well as on spectroscopical and theoretical studies on metal−ligand interactions. A selection of eleven plenary lectures and twenty poster abstracts covering a broad spectrum of inorganic, organic, physicochemical, and theoretical aspects of ligand activation by metal centers are presented in this volume.

JA965552P

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Annual Review of Physical Chemistry, Vol. 46. Edited by Herbert L. Strauss (University of California−Berkeley), Gerald T. Babcock (Michigan State University), and Stephen R. Leone (University of Colorado). Annual Reviews, Inc.: Palo Alto, CA. 1995. x + 771 pp. $51.00. ISBN 0-8243-1046-2.

The field of physical chemistry continues to progress in many surprising directions. The applications reviewed in this volume involve systems that range from nanocrystals to the interstellar medium; they span time scales from the femtosecond to the often slow processes of nucleation and protein folding.

JA9655505

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Carbohydrate Building Blocks. By Mikael Bols (Aarhus University). Wiley: New York. 1996. ix + 182 pp. $39.95. ISBN 0-471-13339-6.

The goals of this book are to provide the reader with a library of carbohydrate building blocks, and a method for deciphering which building blocks can be most efficiently employed in synthesis, given a desired stereochemical outcome. These objectives are realized in a set of cross-referenced indices listing several sources of building blocks and their stereochemical features. A particularly appealing aspect of the book comes from the fact that most of the building blocks are available in four or fewer steps, from inexpensive starting materials. The book goes beyond its utility as a reference guide by describing

*Unsigned book reviews are by the Book Review Editor.

trends that are little known outside the carbohydrate field. For example, the relative reactivities of hydroxyl groups in several pyranoses and furanoses are provided. Equally important are the pyranose substitution rules and the results of thermodynamic versus kinetic equilibrations. Each of these concepts is presented in a simple format, making them easy to remember.

The book contains eleven chapters covering the raw materials, carbohydrate acetal derivatives, other selectivity protected sugars, oxidation products—including aldonic acids and lactones, reduction products—carbohydrate polyols, 1,6-anhydrosugars, unsaturated sugars, products of base treatment, products of acid treatment, disaccharides, and miscellaneous carbohydrate products. One-third of the book is dedicated to these chapters primarily describing synthetic transformations, including the ten most common pathways to prepare carbohydrate building blocks. Guidelines for ketal formation and reactions of cyclic ketals are covered in detail. The stereochemical consequences of conformational constraints are also presented where appropriate. The combined chapters are concisely written, which is a strength of the book. However, in describing useful trends and rules, a more extensive list of references is merited.

The remaining two-thirds of the book contain several indices, including a compendium of building blocks, a stereochemical index, an index of partially protected compounds, a carbocyclic index, an index of compounds with branched carbon chains, and a subject index. The compendium of building blocks presents commercially available starting materials followed by an extensive list of building blocks prepared from these starting materials in a few steps. The building block Chemical Abstract number, the synthetic scheme used to synthesize the compound, and examples of common building block derivatives are provided, along with appropriate references. The stereochemical index contains numerous stereochemical arrangements of extended carbon chains with cross-reference to the building block numbers that contain them. The partially protected compound index correlates partially protected acyclic carbohydrates with the building block compendium. Carbocyclic structures and branched carbon chains are similarly treated. These indices provide a powerful tool for synthetic design of complex molecules.

This book is sure to be useful to synthetic chemists targeting chiral molecules, whether or not they are familiar with the carbohydrate literature. It is written in a manner easily understood by beginning graduate students, yet it contains information worthy of reminding advanced researchers. The book is reasonably priced, making it a feasible acquisition for most personal libraries. Finally, an underlying premise of this book is that carbohydrate-based starting materials are an underexploited resource. Diligent referral to this book will help remedy this fact and greatly facilitate tapping this rich chiral pool in future synthetic endeavors.

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JA9553967

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Herbicides Inhibiting Branched-Chain Amino Acid Biosynthesis—Recent Developments. Chemistry of Plant Protection, #10. Edited by J. Stetter (Bayerwerk, FRG). Springer: New York. 1994. vii + 219 pp. $133.00. ISBN 0-387-58181-2.

In 1872 when the first synthesis of an organic herbicide, an s-triazine, was reported, no one dreamed of killing fields of weeds with synthetic chemicals. Though s-triazines are major herbicides today, in fact, it took 3/4 of a century for their herbicidal properties to be recognized! The ideas and directions of organic chemistry in 1872, in retrospect, were far afield from using synthetic organic compounds to control, to kill, or much less to protect plants. In sharp contrast barely a decade ago two separate classes of herbicides, sulfonylurea and imidazolinone, were discovered which inhibit the biosynthesis of the essential amino acids valine, leucine, and isoleucine. These discoveries practically caused a "landrush" of new industrial chemistry, and now numerous structurally related herbicides have been commercialized and others are being synthesized or developed by a dozen or more companies. This book has eight chapters on these potent enzyme-inhibiting herbicides and related compounds, likely with similar modes of biochemistry. The first chapter summarizes the current body of knowledge on acetolactate synthase (ALS) which is the primary herbicidal target enzyme. ALS, also commonly called acetohydroxy acid synthase, is a key enzyme in the biosynthesis of branched-chain amino acids in plants and in bacteria. The other seven chapters are written by a different group from an agriculture chemical company and focus on specific chemical synthesis pathways and structural comparisons. This useful little book is packed with information on structural modifications of these diverse sets of chemicals and on chemical pathways for their organic synthesis. A few examples are given about the application of these herbicides in various agricultural crops, particularly the Brown and Cotterman and the Gerwich et al. chapters which also deal with the problem of herbicide resistance in plants.

Now, in less than a decade a whole field of industrial chemistry can develop, as this book shows, because we do dream about specific chemical control mechanisms and protection for each organism. One powerful force that activated this intense industrial search for new herbicide chemistry was the recognition that plants and bacteria can conduct similar biosynthesis pathways which often are absent in animals. While this revolution is built on comparative biochemistry, it also is beginning to utilize the astonishing new developments appearing almost daily in structural biology, e.g., crystalline structures of enzymes and their active sites which allow us to learn about the binding of substrates, inhibitors, and cofactors. Furthermore, the revolution is poised to use the incipient explosion of new information that is upon us about plant biochemistry at the gene level. Modern work in plant biochemistry finally is allowing us to learn about critical plant processes, with low copy numbers, such as vitamin biosynthesis pathways, the biosynthesis of enzyme cofactors, or many other key features of plant biochemistry such as their natural protection and communication mechanisms. As a contrast, many established herbicides, i.e., s-triazines, substituted ureas, or the bipyridiliums, inhibit major biosynthesis reactions in photosynthesis with high copy numbers, but tomorrow's herbicides likely will inhibit the photoprotection reactions in photosynthesis such as the xanthophyll cycle or toxic O_2 scavenging processes. These and other plant biochemical processes that involve low copy numbers of enzymes and sites are specific lethal targets in plant cells that can be inhibited by low dosages of synthetic chemicals. Earlier herbicides often required large amounts of chemical to treat a field; i.e., this reviewer recalls using a 55 gallon drum of phenoxy type herbicides to spray several gallons of chemical on one acre brush plots in the early 1950s. Today the ALS inhibitors described in this book are applied in fractions of a quart per acre type volumes by using the high-pressure, but low-volume, sprayers that engineers have developed for the application of agricultural chemicals.

There's little in the book to quibble about. Mammals do not synthesize branched-chain amino acids; hence, potential mammalian toxicology problems are absent. It is an oversight though not to mention the use of sulfonylurea to treat diabetes in humans because sulfonylurea inhibits the K channel ATP-sensitive proteins involved in regulating blood glucose levels. The book is a wide-angle view of this rapidly growing and changing field of plant protection, and readers should be stimulated by incipient prospects for the discovery of new classes of herbicidal chemistry. For example, the field of herbicide chemistry is ripe for combinatorial chemistry aimed at plant proteins like ALS whose active sites and other structural features will be elucidated soon. In 1996 one can only speculate about new herbicide chemistry, but this field of chemical plant protection will be a major agricultural tool in the 21st century.

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JA955203F

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Surface Phases on Silicon: Preparation, Structure and Properties. By V. G. Lifshits, A. A. Saranin, and A. V. Zotov (Russian Academy of Sciences). Wiley: Chichester. 1995. xiv + 448 pp. $115.00. ISBN 0-471-94846-2.

The field of Si microelectronics science and technology dominates the modern world through all kinds of computer and computer-related hardware. Simply put Si is the most important semiconductor and electronic material that there is. The vast world of Si-dominated technology was born in the early 1960s when it was discovered that the Si surface could be rendered passive with respect to the surface electronic states. It is a goal of microelectronics to reduce both the intrinsic (Tamm states) and extrinsic surface electronic states. Often

this is accomplished via the growth of dielectric films such as SiO_2 on Si to reduce intrinsic states, and with careful attention to cleanliness so as to remove unwanted chemicals and phases from causing extrinsic states. Thus, the subject of this book is at the heart of Si science and technology. Yet despite the enormous scientific and technological literature on the subject of Si microelectronics, the Si-dielectric film interface, and the Si surface, there are very few collections of information on the surface and interface chemistry of Si. This subject book comprises such a collection and therefore is an important contribution to the Si literature.

My first perusal of this book left me somewhat negative. In later reflections my opinion changed. Part I entitled Preliminary Comments prompted the negativism. Part I is an attempt to review all of surface science and suface analysis in less than 15 pages. Needless to say no author could accomplish this large task, and the question arises whether it should be attempted at all. In part II the situation changes dramatically for the better. Part II, Chapter 3, is a nice treatment of a clean Si surface which is essentially a discussion of the observed Si surface reconstructions with 276 references. I have never seen all this information in one place before. This chapter along with the supplements (which are appendices) comprise an enormous and valuable amount of structural information for clean and absorbate-covered Si. This is a must read for all people using Si surfaces for clean (UHV) experiments.

The authors call this book a handbook, and this is an apt description. Chapter 4 which is 360 pages is the heart of the data and information with absorbate information for 63 elements in alphabetical order with references. In some cases, namely, hydrogen (139 references), oxygen (72 references), and important metal silicide formers, much is published while for other elements, namely, dysprosium and zinc, little is known, but there is some information collected. Where available the absorbate structural information is presented for the three major Si orientations ((111), (110), and (100)). Often there is information about what phases form, how they are formed, and what properties are affected such as surface diffusion and work functions.

One cannot help but be disappointed with the level of critical analysis of the information. In all cases the findings in the literature are simply presented. There is much attention to oxygen in the literature because of the formation of the crucially important SiO_2 phase. No feeling for the importance of this is given, and even with the larger number of pages on hydrogen and oxygen, these sections are very short considering the literature and the importance of these subjects. However, as I mentioned above, I know of no other source for this breadth of information except scattered in the original literature and in specialized reviews. Also, it should be realized that this handbook is most useful to obtain starting information and not particularly useful for a specialist to review his field of absorbate expertise.

In summary I would recommend this book as a first stop to anyone entering the field of Si surface science. Also it is a must addition to the library of a Si surface scientist as a quick reference to a vast literature.

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JA955116N

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Hydrocarbon Chemistry. By George A. Olah (University of Southern California) and Árpád Molnár (József Attila University, Hungary). Wiley: New York. 1995. xviii + 632 pp. $69.95. ISBN 0-471-11359-X.

There is much rich soil in the field of hydrocarbon chemistry which remains largely unknown to practicing organic chemists. Who better to write a book on hydrocarbon chemistry than 1994 Nobel Laureate George Olah? Olah and Molnár have collaborated with the goal of presenting the fundamental and applied/industrial aspects of hydrocarbon chemistry in a single volume. For the most part the venture is successful and at a price which makes this book accessible to most chemists with an interest in the field.

While the material is clearly selective in order to fit into a volume of this size, there are very few points where one could seriously argue with the authors' choices for inclusion. Each of the twelve chapters is well referenced, with a high number of those references being less than five years old. The book has more than four thousand end-of-chapter references (with some redundancy) to primary literature sources.

The first chapter, dealing with a general introduction to the area, is followed by four chapters covering primarily the modification of the carbon framework with coverage of such topics as cracking, reforming, Fischer−Tropsch chemistry, methane coupling, various isomerization processes, and alkylation reactions. Chapters 6−9 cover reactions which involve the modification of hydrocarbons by the introduction of heteroatoms. Chapter 6 covers addition reactions to alkenes, dienes, and alkynes wherein oxygen, halogen, nitrogen, or metal atoms become part of the carbon framework. Chapter 7 focuses on carbonylation through hydroformylation and carboxylation reactions of alkenes. Chapter 8 on oxidation and oxygenation represents almost one-quarter of the book and has an admirable coverage of topics moving through a discussion of the oxidation reactions of alkanes, alkenes, alkynes, and aromatics to conclude with a number of practical applications. The past decade has seen a very high level of research activity in this area of hydrocarbon chemistry, and this is reflected by the number of recent publications referred to in this chapter. Chapter 9 covers various heteroatom substitutions of alkanes, arylalkanes, and aromatics. Chapter 10 deals primarily with the hydrogenation of alkenes, dienes, alkynes, and aromatics though a brief section covers chemical and electrochemical reductions. The book concludes with a short chapter on metathesis and a strong chapter on oligomerization and polymerization. The organizational structure of the book makes it appropriate as a reference book for a graduate course on hydrocarbon chemistry.

A number of features make this book well worth having on one's bookshelf: (i) the chemistry of hydrocarbons is covered thoroughly, (ii) the industrial aspects of the chemistry provide an important source for students and researchers, (iii) each chapter can stand largely on its own, and (iv) the price is right. However, the book would have been improved if greater attention had been made to final editing in order to make the book more readable and more useful. Errors (e.g., the misspelling of Noble Laureate J. W. Cornforth's name on page 13, and grammatical inconsistencies and spelling errors especially in the earlier chapters) and confusing sentence structure make reading the book less than pleasant at times, but the greatest need for this book is an author index which would make it more "browser-friendly" and useful as a reference text.

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