

Carbohydrate Drug Design. Edited by Anatole A. Klyosov (Pro-Pharmaceuticals, Inc., Newton, MA), Zbigniew J. Witczak (Wilkes University, Wilkes-Barre, PA), and David Platt (Pro-Pharmaceuticals, Inc.). American Chemical Society: Washington, DC (distributed by Oxford University Press). 2006. xii + 324 pp. \$189.50. ISBN 0-8412-3946-0.

This book was developed from a symposium of the same name sponsored by the American Chemical Society held in Anaheim, CA in March/April, 2004. It also includes additional chapters on carbohydrate-based vaccines and treatment of certain infections and new information about the synthesis of carbohydrates and the computation of its structures. The 11 chapters are organized under the following headings: Overview; Cancer; Human Immunodeficiency Virus; Pathogen Management; and New Approaches in Synthesis and Computational Studies. An author index and a subject index complete the book.

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Combinatorial Chemistry: From Theory to Application, Second Revised Edition, Volume 26. Edited by Willi Bannwarth (Universität Freiburg, Germany) and Berthold Hinzen (Bayer AG, Wuppertal, Germany). Series Edited by R. Mannhold, H. Kubinyi, and G. Folkers. Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2006. xxii + 672 pp. \$205. ISBN 3-527-30693-5.

There are 10 chapters in this latest edition of Combinatorial Chemistry, with special focus on “solid-phase organic synthesis, linkers and their cleavage, C–C bond formation, syntheses of heterocycles, polymer-supported reagents, encoding strategies, purification in high-speed solution phase synthesis, automation and devices, and computer-assisted library design” to quote from the preface. The appendix “Cheminformatics and Web Resources for Combinatorial Chemistry” and a subject index complete the book.

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Progress in Colloid and Polymer Science: Characterization of Polymer Surfaces and Thin Films, Volume 132, 2006. Edited by Karina Grundke, Manfred Stamm (Leibniz Institute of Polymer Research, Dresden, Germany), and Hans-Jürgen P. Adler (Technische Universität). Series Edited by K. Kremer and W. Richtering. Springer: Berlin, Heidelberg. 2006. viii + 172 pp. \$189. ISBN 3-540-31241-2.

This book is based on a symposium of the same name held in Meissen, Germany in April, 2005. It covers “a representative

spectrum of surface sensitive techniques and their application to polymer surface and thin film characterization as well as recent examples of technologically relevant materials and process development”, to quote from the preface. There are 21 chapters, a sampling of which includes “Molecular Imaging of Microstructured Polymer Surfaces” by Salzer et al., “Adsorption of Polyelectrolytes with Hydrophobic Parts” by Schwarz et al., and “Physicochemical Changes on Wool Surface after an Enzymatic Treatment” by Walawska et al. An author/title index and a keyword index complete the book, which is also available to subscribers online.

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Chemical Genomics: Small Molecule Probes to Study Cellular Function. Ernst Schering Research Foundation Workshop 58. Edited by Stefan Jaroch and Hilmar Weinmann (Schering AG, Berlin). Springer: Berlin, Heidelberg, New York. 2006. xiv + 180 pp. \$79.95. ISBN 3-540-27865-6.

This book was developed from the 58th Ernst Schering Research Foundation Workshop on “progress in chemogenomics, chemical genomics, and chemical biology.” The first three chapters cover topics in chemogenomics, followed by a chapter on diversity-oriented synthesis and one on the use of small molecules to study cell biology and proteins. The remaining three chapters cover a range of topics in chemical genomics from research in molecular endocrinology to protein structure similarity clustering and natural product structure to novel screening technologies. There is no subject index, although there is a list of previous volumes published in this series.

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Microwave Assisted Organic Synthesis. Edited by Jason P. Tierney (GlaxoSmithKline, Harlow, UK) and Pelle Lidström (Biotage AB, Uppsala, Sweden). Blackwell Publishing and CRC Press: Oxford, UK and Boca Raton, FL, USA. 2005. xii + 280 pp. \$149.95. ISBN 0-8493-2371-1.

It is now twenty years since Gedye and co-workers reported their pioneering observations in microwave-promoted organic synthesis, which prompted Giguere and myself to publish our independent results using this new technique. Since then there have been more than 2000 publications and three books in the field of microwave-accelerated organic synthesis, including this latest effort edited by Tierney and Lidström. Now some academic departments are hiring faculty solely to investigate microwave chemistry. Thanks to the development of commercial units capable of controlling the reaction temperatures and pressures, the use of microwaves to promote chemical reactions is now a practical technique for organic synthesis.

Unsigned book reviews are by the Book Review Editor.

This book has been organized into nine chapters, the style and length of which vary. The first chapter by Mingos, an early convert to the speed and efficiency offered by microwave-promoted reactions, is entitled "Theoretical aspects of microwave dielectric heating". Mingos begins with an explanation of how microwave heating works, then explains why different common solvents superheat to different extents, and compares microwave heating with conventional heating both in solution and in solid-state reactions. In the second chapter, "Microwave-accelerated metal catalysis: organic transformations at warp speed", Olofsson and Larhed thoroughly summarize the documented advantage of using microwave heating to achieve Stille, Suzuki, Negishi, Heck, Sonogashira, and Buchwald–Hartwig couplings. This chapter also includes allylation reactions and carbonylative couplings. The third chapter, by Besson and Brain, is a comprehensive survey of microwave-assisted heterocyclic chemical transformations, starting with five-membered ring systems containing one heteroatom and ending with seven-membered heterocycles having at least two heteroatoms. Carbon–carbon multiple bonds, carbonyl groups, and nitrogen-bearing functional groups have been reduced under microwave-assisted conditions, and Danks and Wagner have included all of them in their chapter "Microwave-assisted Reductions", including hydrodehalogenation reactions. I particularly enjoyed reading Westman's contribution entitled "Speed and efficiency in the production of diverse structures: microwave-assisted multi-component reactions", which focuses on multi-component processes, including cascade reactions and one-pot syntheses. Anyone needing to carry out Hantzsch, Biginelli, Ugi, Kindler, Mannich, Pauson–Khand, Wittig, or even aza Diels–Alder reactions will relish this review. It also includes the high yield preparation of heterocyclic systems, such as imidazoles, triazines, quinolines, pyrroles, indoles, and spiroindoles using such reagents as (triphenylphosphoranylidene)ethanone and *N,N*-dimethylformamide diethyl acetal. The desire of the editors to include contemporary applications of microwave chemistry is reflected by the inclusion of the following chapters: "Integrating microwave-assisted synthesis and solid-supported reagents" by Baxendale, Lee, and Levy, "Microwave-assisted solid-phase synthesis" by Stadler and Kappe, and "Timesavings associated with microwave-assisted synthesis: a quantitative approach" by Sarko. The first review includes many industrial applications. In the next chapter, Stadler and Kappe summarize the application of microwave heating for solid-phase synthesis, whereas, in the third, Sarko discusses new developments in the hardware of microwave technology to facilitate the rapid production of libraries. Roberts and Stauss advocate the use of continuous flow microwave reactions in the last chapter, "Scale-up of microwave-assisted organic synthesis".

This book was written for the benefit of synthetic organic chemists. It is rich in references and will stimulate many researchers to test whether their chemistry might benefit from microwave irradiation.

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Radicals in Synthesis II: Complex Molecules. Topics in Current Chemistry, 264. Edited by Andreas Gansäuer (Universität Bonn, Germany). Springer: Berlin, Heidelberg, New York. 2006. xii + 250 pp. \$249.00. ISBN 3-540-31325-7.

The use of organic free radicals in organic synthesis has matured to become a diverse and sophisticated endeavor. This volume of *Topics in Current Chemistry* is the successor to *Radicals in Synthesis I* and addresses the application of radical methodologies toward the efficient assembly of complex molecules. Many of these processes highlight the exquisite chemoselective, regioselective, and diastereoselective reactions achievable by employing free-radical intermediates, often under conditions that are experimentally mild and environmentally benign. The material is aimed toward an intermediate and advanced audience of organic chemists having some basic knowledge of synthesis and free-radical reactions. Thus this book is a very valuable resource for those wishing to update their knowledge with a compendium of work by leading practitioners in the field. The selection of topics is to some extent idiosyncratic, but it leaves many fields available for future volumes.

Chapter 1, by Malacria and colleagues, is an insightful and sophisticated analysis of intra- and intermolecular tandem radical processes used in the preparation of polycyclic products. The tandem or cascade processes involve cyclization, radical translocation, fragmentation, and homolytic substitution reactions. Convergent cyclizations, e.g., [2 + 3], [4 + 2], and [4 + 1], are examined, as well as hydrogen or aryl migrations followed by cyclizations. Radical/polar crossover sequences are also discussed. The work in this chapter covers a wide range of free-radical methodologies. In contrast, Chapter 2 by Oltra and co-workers on the use of Cp₂TiCl focuses on the specific topic of the use of titanocene(III) both stoichiometrically and catalytically to effect homolytic epoxide opening as applied to the synthesis of natural products. This very specific methodology reflects the research interests of the editor, Gansäuer. Here the authors introduce basic principles of Cp₂TiCl-mediated homolysis of epoxides and then discuss synthetic applications. The efficacy in 6-*endo* and 7-*endo* cyclizations is particularly notable.

McGhee and Procter highlight the practical application of radical methodologies on solid and soluble polymer supports in Chapter 3. This thoughtful analysis covers the use of polymer-supported reagents for radical reactions and the more common use of polymer-supported substrates. Recent advances in the development of resins with optically active linkers as chiral auxiliaries are discussed, as well as the design of polymer linkers that are cleaved by free-radical methods. In Chapter 4, Hansen and Skrydstrup examine the use of free-radical reactions to carry out modifications of amino acids, peptides, and carbohydrates. Reactions involving both amino acid side chains and peptide backbones are discussed, including those involving captodative amino acid radical intermediates. Carbohydrate modifications are reviewed, encompassing both functional group conversions and cyclization reactions. The general tolerance of free-radical reactions to the presence of unprotected heteroatom functional groups, e.g., alcohols, amines, carboxylic acids, provides opportunities for exquisite selectivity not possible with conventional ionic reactions.

In Chapter 5 on "Unusual Radical Cyclizations" Walton focuses on cyclizations to form three-, four-, and seven-

membered rings and greater. This very nice analysis includes a discussion of the pertinent rate constants and clever methods to use free radicals to form small rings. Included are representative examples of β -lactam formation, medium-to-large-ring *endo* closures, and the formation of 7-, 8-, 11- and 12-membered lactams. In addition to conventional intramolecular radical additions, cyclizations involving dimerizations and radical nucleophilic substitution ($S_{RN}1$) steps are presented. Also highlighted are trimethylenemethane and other diradical cyclo-dimerizations and radical/anion cyclo-couplings.

The final chapter by Quiclet-Sire and Zard is a beautiful overview of the power of degenerative radical transfers of xanthates and related dithiocarbonyl derivatives to effect "slow" radical reactions. Additions of radicals to unactivated olefins can be achieved due to the absence of competitive side reactions, such as premature reduction, that plague most other radical-based methodologies. Also discussed are useful transformations of the resulting xanthate moieties to introduce a variety of functional groups. Radical cation crossover reactions with xanthates are demonstrated, including rearomatization reactions. The reversible and degenerate nature of xanthate radical

reactions leads to applications in cascade reactions that rapidly increase molecular complexity with small molecule substrates, as well as effecting "living" polymerization successfully with both activated and unactivated olefinic monomers.

In summary, this diverse collection of topics gives a sampling of the very sophisticated and powerful methodologies utilized in the construction of complex organic small molecules using radical intermediates. Consistently, the focus is on the newest advances in the field, highlighting very recent works while providing references to valuable reviews of previous work. In a few of the early chapters, the specifics are hard to follow in instances where details are discussed but no structures are provided. However this failing only occurs in a few cases; most of the work is clearly illustrated. This collection of thoughtfully written chapters serves to highlight the impressive efficiency and selectivity of free-radical chemistry as a powerful and rapidly developing field.

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