



Fluorine in Medicinal Chemistry and Chemical Biology

In this volume of 19 chapters divided into four parts, the editor has provided a fresh perspective on the role of fluorine in medicinal chemistry and chemical biology, with a focused and novel approach. The introductory chapter, entitled “Basic Aspects of Fluorine in Chemistry and Biology”, is followed by contributions grouped in three sections: “Medicinal Chemistry”, “Synthetic Methods for Medicinal Chemistry and Chemical Biology”, and “Applications of Fluorinated Amino acids and Peptides to Chemical Biology and Pharmacology”. The individual chapters have been written by a very well-qualified group of contributors, who have provided timely and unique material. Lastly, the book contains a comprehensive Appendix listing “Fluorine-Containing Drugs for Human Use” and “Fluorine-Containing Drugs for Veterinary Use”.

The introductory chapter, an original treatment presenting the insights gained by the authors from their extensive research and study in this area, is an excellent example of the novel viewpoints found in this book. This first chapter is a modern, up-to-date description of the properties of fluorinated compounds that are most important to medicinal chemistry. The aspects of fluorination that have a profound impact on biological activity, such as the roles of fluorine in hydrogen bonding, in polar protein interactions, and in isosteric replacements, are discussed in detail.

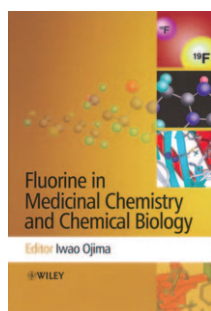
In the first major subsection, “Medicinal Chemistry”, the development of fluorinated drugs and drug candidates is presented in an approach based on case studies that is illustrative rather than comprehensive. Of necessity, some major and clinically important classes of fluorinated compounds, e.g., the quinolone antibiotics and the selective serotonin re-uptake inhibitors, are not discussed. In Chapter 2, a concise review of fluorinated prostanoids is followed by a discussion of the effects of fluorination on increased lipophilicity and metabolic stability. An application to the synthesis of the anti-glaucoma compound tafluprost is described in detail. In the subsequent discussion of glutamate analogues, a subject of research at Taisho Pharmaceuticals, the effect of fluorination is rationalized as the capacity to modulate the acidity and basicity of neighboring carboxylic acids and amines. This report is followed by three chapters describing the use of a trifluoromethyl group in three distinct applications: metalloproteinase inhibitors, taxoid anticancer agents, and antimalarial compounds. While the synthesis and biological activity are described for each of

these materials, the second generation taxoid anticancer agents are discussed in greater detail, as is consistent with the advanced state of development of these compounds. The final chapter of this section, on fluorinated nucleosides, focuses on syntheses rather than biological activity, in an appropriate link to the next section of this volume devoted to synthetic methods.

The discussion of “Synthetic Methods for Medicinal Chemistry and Chemical Biology” is based on selected building-block strategies for the construction of fluorinated molecules. Two of the chapters focus on difluoromethylene-containing molecules. Qing provides a brief synopsis of work in his laboratory on difluoromethylenated nucleosides. Itoh summarizes the value of the difluorocyclopropyl group in a variety of applications, with a greater emphasis on medicinal chemistry. Uneyama and Taguchi, respectively, contribute thorough discussions of the preparation of fluorinated amino acids and of peptide isosteres. As might be anticipated, these experienced investigators provide a wealth of experimental detail. Two of the contributions in this section, “Perfluorinated Heteroaromatic Systems as Scaffolds for Drug Discovery” and “Fluorous Mixture Synthesis (FMS) of Drug-like Molecules and Enantiomers, Stereoisomers and Analogues of Natural Products”, describe work that is a significant departure from earlier research, as the compounds used were highly fluorinated, not just selectively fluorinated. These chapters offer perspectives on the use of fluorination that are seldom seen in books reviewing organofluorine chemistry.

The final section of this work is devoted exclusively to the chemical biology and pharmacology of fluorinated amino acids and peptides. The chapters by Koksche and Kumar offer complementary descriptions of the effect of fluorination on peptides and amino acids. Koksche focuses on the influence of fluorination on the thermodynamics of coiled-coil interactions, while Kumar offers broader strategic insights on the applications of fluorinated amino acids. Honek, in an approach that contrasts appropriately with the preceding contributions, focuses narrowly on a single amino acid, fluorinated methionine. The final two chapters of this volume are devoted to topics rarely found in books on fluorine in medicinal chemistry: solid-state NMR and in vivo magnetic resonance. While most researchers are quite familiar with conventional fluorine-19 solution NMR studies, solid-state and in vivo methods are much less commonly encountered. These sections will suggest, both to newcomers and to veterans in fluorine chemistry, new applications and targets.

The editor's selection of topics illustrates the value of fluorination in a manner that shows its general utility apart from biological applications. In



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view of this breadth, *Fluorine in Medicinal Chemistry and Chemical Biology* would be an excellent addition to readers' personal libraries, and should definitely find a home in libraries of lending institutions.

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Silica-Based Materials for Advanced Chemical Applications

This really well written book gives a complete overview of sol-gel silica-based materials that are used in industrial applications. Overview is probably not the most appropriate term, since particular attention is paid to providing an understanding of the principles that are behind the applications. This style of presentation makes the book even more attractive. These materials have interested different research communities, including chemistry, physics, material science, and biology. The multidisciplinary aspect is illustrated well by the described areas of applications.

In a first chapter, sol-gel silica-based materials are presented in a succinct but very complete manner. This chapter is concerned mainly with basic synthesis and (multi)functionalization concepts, the main physicochemical characteristics related to their potential applications, as well as ways to modify them at the molecular and macroscopic level. It gives not only a foretaste of the

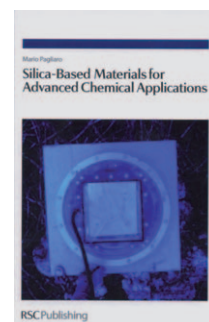
following chapters, but also generates the desire to continue reading.

These multifunctional materials have evolved in terms of applications in controlled release, purification and synthesis, coatings, catalysis, sensing, and hybrid silica-polymer nanocomposites. These fields of application are well presented in the different chapters, which are rich in information. Twenty five years after the first report of the preparation of a hybrid material by embedding an organic dye in a silica sol-gel glass (D. Avnir, 1984) and 20 years after the introduction of organically modified sol-gel silica matrices (H. Schmidt, 1988), they have now reached the level of industrial application. Although this is only the beginning, the record is impressive and their potential suggests numerous other applications. Moreover, the book emphasizes the role of chemists, physicists, and biologists in the fast evolution of these materials and their industrial development.

The last chapter gives a nice conclusion to the book. Further advantages of these hybrid sol-gel silica-based materials are discussed, outlining future research trends, applications, and markets for these multifunctional materials.

As this book gives both commercial and scientific viewpoints, it should be of great interest for researchers from different scientific communities in academia and industry. Moreover, taking into account the content and the style of writing, this book could also be very useful reading for undergraduate students.

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