

### Fluorinated Heterocyclic Compounds

The presence of one or more fluorine atoms in an organic molecule can have a dramatic effect on its physical and chemical properties. In some cases reactivity can increase, in others it may decrease, and some fluorinated compounds are extremely stable and find applications in materials science. Fluorine can alter the properties of drug compounds increasing their metabolic stability and enhancing their activity, while the presence of fluorine can alter the mechanistic course of many reactions leading to unexpected and intriguing behavior.

Organofluorine chemistry has become an important discipline since the first major developments of the subject in the 1960s, and the recent increased availability of organofluorine compounds has led to rapid advances in synthetic and materials applications. There are a number of recent good books available on organofluorine chemistry, but this work, edited by Viacheslav Petrov, is the first major contribution devoted specifically to fluorinated heterocycles. The already diverse properties and reactivity of heterocyclic compounds are increased even more by the presence of fluorine atoms, and gives rise to a fascinating field of synthetic and mechanistic chemistry. This book brings together contributions from seventeen leading researchers in heterocyclic fluorine chemistry, and covers in detail the chemistry of small, medium, and large ring compounds in ten chapters. A second part of the book, chapters 11–13, cover applications of fluorinated heterocycles, specifically agrochemicals, pharmaceuticals, and materials chemistry.

The first two chapters of Part I cover the chemistry of three- and four-membered heterocycles, including the key oxiranes, aziridines, oxetanes, thietanes, and some of their unsaturated counterparts. Their synthesis from fluoroalkenes precursors is discussed. Chapter 3 describes the synthesis, properties and reactions of the important group of nitrogen containing five-membered ring compounds, namely pyrrolidines and pyrroles, as well as poly-aza, and fused-nitrogen-ring compounds. Interesting aspects of oxygen, sulfur, selenium, and phosphorus containing rings bearing fluorine are discussed in chapter 4 while carbohydrate compounds are covered in chapter 5.

Six-membered fluorinated ring compounds are of major significance with pyridines being the most studied, and are assigned three chapters of the book. Chapter 6 discusses the introduction of fluorine atoms selectively into pyridine derivatives, by among others, the Balz–Schiemann reaction and arene lithiation methods. Reactions of perfluoro-

pyridine including the important  $S_NAr$  reactions which can lead to useful multifunctionalised pyridines (and other azaarenes) is covered largely in chapter 8, while chapter 7 discusses six-membered heterocycles with fluoroalkyl side chains. Methods and reagents for the introduction of fluoroalkyl groups are covered, as well as ring synthesis from fluoroalkyl containing building blocks.

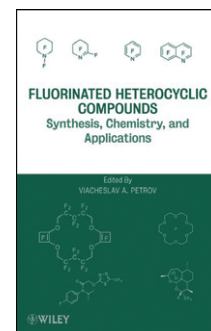
The “mirror image” nature of non-aromatic or “saturated” perfluoroheterocycles is described in chapter 9 and larger rings including and azepines, diazepines, oxazepines as well as fused rings, and macrocycles are reviewed in chapter 10. Each chapter is well written and clearly illustrated with good reaction schemes that illustrate the diverse, intriguing, and often difficult to predict, reactions that fluorinated compounds undergo. There is a wealth of fascinating chemistry presented.

Part II of the book consists of three chapters on important applications of fluorinated heterocycles. Chapter 11 describes recent advances in fungicides and insecticides, while chapter 12 discusses fluorine-containing pharmaceuticals. The fact that 10 % of all current drug compounds sold contain fluorine shows the important effect this element has on pharmacological properties. Discussion of the synthesis of key fluorine-containing antiviral and antibacterial drugs is presented as well as examples of compounds which act against cancers, parasites, and neurological disorders. The final chapter discusses materials applications with an emphasis on polymers and oligomers derived from fluorinated epoxides. These three chapters give a nice perspective of the many important uses of fluorinated heterocycles. The separation of the applications from the detailed chemistry of the various ring systems emphasizes their growing importance.

The book is well referenced and indexed and covers the literature from pioneering work in the 1960s to recent developments up to 2009. It provides an excellent source of information on fluorinated heterocycles as well as something to dip into if you are looking for some unexpected and stimulating chemistry. The book is suitable for advanced undergraduates and research students and represents a valuable addition to the literature that should be on the shelves of libraries in both academic and industrial institutions. I would recommend this book to all scientists who consider working with fluorinated compounds—be they synthetic chemists, life-science chemists, or materials scientists.

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