Preface

A large number of biologically relevant species are negatively charged, therefore it is not surprising that nature has developed sophisticated receptors to recognise, detect and transform anions. For example, complex receptors such as phosphate- and sulphate-binding proteins are employed by living cells to selectively recognise these two geometrically analogous anions. In addition to their roles in biological systems, some anions also have important environmental impacts. For example, cyanide, pertechnetate and chromates pose serious health problems if present in water supplies.

Because of their important biological roles and potential environmental impact there is great current interest in developing molecular receptors to selectively recognise anions and in doing so be able to sequester, transform or sense them. The six chapters presented in this volume provide an overview of anion recognition and the most recent advances in this fast-growing area of supramolecular chemistry are highlighted.

The first chapter by Bates and Gale provides an overview of the coordination of anions by synthetic organic hosts. The different organic functional groups used to bind anions are presented and this provides an introduction to the structural and electronic properties that hosts must have to recognise anionic guests. On the other hand, Bayly and Beer give a detailed account of the use of metal complexes as anion receptors. Besides the important structural features that metals can confer to receptors, their optical and redox properties make them attractive for the development of anion sensors.

Metal-based receptors have found particularly interesting applications in the recognition of phosphorylated species of biological interest (e.g. phosphorylated amino acids and peptides). This area is reviewed in depth by Tamaru and Hamachi with particular emphasis on a series of receptors based on zinc(II) centres which have been shown to bind phosphates with very high binding constants in aqueous media. The applications of this type of receptor for the detection of samples of biological interest are also presented.

Ballester provides an interesting account of anion $\cdots\pi$ interactions and their impact in host design. Over the past few years there has been mounting evidence that this type of interaction plays an important role in anion recognition. The chapter starts with a detailed overview of the theoretical aspects of anion $\cdots\pi$ interactions which is followed by a discussion of the existing

experimental evidence for this type of interaction. Both, solution and crystallographic studies are analysed showing the potential impact that this type of interaction could have in the design of new anion receptors.

The use of anions as templating agents is discussed by Vilar. The chapter starts with a general overview of the area and a discussion of the applications of anion templates in organic and coordination chemistry. The second part of the chapter deals with examples where anions are employed as templates in dynamic combinatorial libraries. This approach promises to provide an efficient route for the synthesis of better and more selective anion receptors. The last chapter by Ewen and Steinke also deals with the use of anions as templates but in this case in the context of molecular imprinted polymers. The first half of the chapter provides an introduction into molecularly imprinted polymers and this is followed by a detailed discussion of examples where anionic species have been used to imprint this class of polymeric materials.

The topics discussed in this volume provide an exciting and stimulating overview of the most recent studies within anion recognition and templation. Although the supramolecular chemistry of anions took a long time to develop, it is now a mature area that provides solutions to challenging problems. There is no doubt that its growth will continue yielding more sophisticated and efficient receptors for the recognition of a wide range of negatively charged species.

London, February 2008 Ramón Vilar