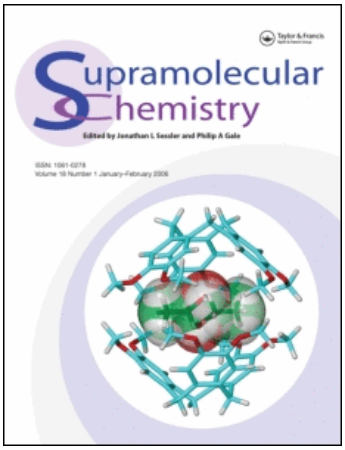

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Preface

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Special Issue on Supramolecular Biochemical Assemblies

Preface

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It is my great pleasure and privilege to introduce the excellent selection of articles published in this special issue of *Supramolecular Chemistry*. This special issue is devoted to the emerging field of supramolecular biochemistry, a research area that is concerned with the study of the molecular recognition and the self-association of biomolecules to form well-organized assemblies. The resulting assemblies are often in the nanometric scale. However, self-association of biomolecules can also lead to the formation of macroscopic objects, such as fibrils and hydrogels. This field of research has become very active in recent years, and many new insights into these processes are beginning to unfold. Beyond its key importance for the understanding of self-association in biology and its physiological roles, the study of biomolecular assemblies has also many technological and practical implications. The current issue contains articles that describe the study of diverse systems that range from natural biological assemblies to the nanotechnological uses of novel bio-inspired materials.

Self-organization of biomolecules is critical for any living organism and its study is seminal for the understanding of many aspects of structural and functional biology. Self-association and spontaneous organization occurs at many levels of biological systems. A few examples, out of the seeming limitless number, include the assembly of biological membranes by the self-organization of phospholipids, the construction of nano-machines, such as the ribosome, by the hierarchical self-organization of protein and RNA molecules, the organization of inorganic skeletal macroscopic elements by biomineralization processes, and the assembly of fibrillar structures of nano-scale order, such as silk or collagen fibrils. The formation of supramolecular biochemical assemblies may also have pathological implications. This is exemplified, for instance, by the formation of amyloid fibrils, which is associated with several key human disorders, including Alzheimer's disease and type II diabetes. Furthermore, an increased understanding of the mechanism of self-organization is already leading to very significant advances in the design and fabrication of bio-inspired self-assembled materials and the applications of such biological and bio-inspired assemblies in nanotechnology and material science. Thus, the study of supramolecular biochemical assemblies represents not only a very unique interface between biology, chemistry, material science, and nanotechnology, but also one of immediate and future importance.

The current issue brings together leaders in the field of supramolecular biochemical assemblies. The researchers in question represent institutions in various parts of the world and exemplify further diversity in that they study a variety of systems using a range of different experimental approaches. The featured articles includes the analysis of macroscopic objects, such as fibrils formed by the assembly of the natural spider silk (study by Scheibel and coworkers), hydrogels formed by the assembly of amphiphilic triblock copolymers (study by Deming and coworkers), arrays of ordered peptide molecules that are formed by self-organization at interfaces (study by Rapaport), and tapes formed by designed β-sheet peptides (study by Aggeli and coworkers). Other studies include the self-assembly of lipid-like peptides that mimic the properties of membrane forming phospholipids that were mentioned above (study by Zhang and coworker), the assembly of glycine-rich linear and cyclic hexapeptide into pre-fibrillar and spherulite-like nanostructures (study by Verma and Joshi), as well as the organization of extremely short tripeptides that contain γ-aminobutyric acid into ordered assemblies (study by Banerjee and coworkers).

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The interface between inorganic chemistry and supramolecular biochemistry is represented in studies that describe the controlled self-assembly of histidine-containing β-sheet peptides by metal binding (study by Mihara and coworkers), the peptide-induced formation of quantum dots and gold nanoparticles assemblies (study by Naik and coworkers), and finally the assembly peptide nano-rings that contain gold nano-particles (study by Matsui and coworkers).

Taken together, this collection of articles provide a very interesting, diverse, and intriguing exposure to various aspects of the current study of bio-nano-assemblies. I hope that this special issue will become an important source of reference for those interested in the recent developments in this exciting field.