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Biomolecular Chemistry Focuses On Environmental

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Introduction

Biomolecular Chemistry focuses on environmental factors that govern the processes that determine the fate of organic chemicals in natural and engineered systems. The information discovered is then applied to quantitatively assessing the environmental behavior of organic chemicals. Now in its 2nd edition, this book takes a more holistic view on physical-chemical properties of organic compounds. It includes new topics that address aspects of gas/solid partitioning, bioaccumulation, and transformations within the atmosphere. Biomolecular Chemistry is that the scientific study of the chemical and biochemical phenomena that occur in natural places. It shouldn't be confused with green chemistry, which seeks to scale back potential pollution at its source. It can be defined as the study of the sources, reactions, transport, effects, and fates of chemical species in the air, soil, and water environments; and the effect of human activity and biological activity on these. Biomolecular Chemistry is an interdisciplinary science that has atmospheric, aquatic and soil chemistry, also as heavily counting on analytical chemistry and being associated with environmental and other areas of science. Biomolecular Chemistry deals with the above topic. Biomolecular chemistry, which concerns the study of chemical processes at the interface of chemistry and biology, is a relatively new and largely unexplored area. Materials of controlled structure are needed for biomaterial, electronic, photonic, and medical applications. Nature makes materials of precisely controlled architectures that perform various functions, including, for instance , catalysis, structural support, and knowledge processing and storage. The study of such materials has the potential to supply fundamental knowledge which will be wont to advantage within the design and preparation of latest systems. A better understanding of chemical reactions underlying biological systems is in turn expected to lead to a better ability to design novel materials with properties that equal or exceed those of the present materials upon which they're based. The ability to regulate surface functional groups, chain length, topology, and structure is critical to the planning of novel materials which will be beneficial for naval applications. Recent advances in molecular genetics, combinatorial chemistry, and the design of semisynthetic enzymes and catalytic antibodies provide unique opportunities for new applications. An attractive possibility is to use DNA templates to organize polymers having controlled molecular dimensions and judiciously placed functional groups and chain folding patterns. Such materials are difficult if not impossible to organize by current synthetic polymerization methods. This potential capability to control the folding of macromolecular chains will lead to materials with improved strength and elasticity, as well as other desired properties. Application of the technology to the incorporation of “unnatural” amino acids and carbohydrates will significantly expand the scope of obtainable materials. For example, it'll be possible to exactly vary intentionally the hydrophilic and hydrophobic surface characteristics of materials. Another area of research where biological chemistry is poised to have a significant impact is in the development of high-strength materials. For example, some sorts of silk, like spider dragline, are synthesized within the laboratory using DNA templates and are found to be stronger than steel, as strong as Kevlar®, but much more elastic. Thus, it may be possible to develop materials based on naturally occurring biopolymers to use as lightweight reinforcement for superior composites. However, the molecular-level understanding of the parameters that control the properties of such materials is lacking. Hence, an active research program within the area is very desirable. An added benefit lies within the design of latest synthetic routes to producing protective clothing, composites, and materials that have a far better potential for being compatible with substances in living systems. An intriguing prospect during this area is that the possibility of mixing present segments with synthetic polymer segments to offer hybrid materials which will synergistically incorporate the useful properties of both systems. Opportunities exist here for property-directed synthesis of novel materials which will be tailored to naval applications. Research at the interface of biology and chemistry will cause a far better understanding of the factors that control bioadhesion and ultimately biocorrosion, two areas of major concern to the Navy. Adhesion of marine organisms to naval structures leads to fouling, and known Methods of combating the problem are increasingly limited by environmental concerns. Biogenetic synthesis are often wont to incorporate appropriate functional groups, which can be designed to migrate to the surface of a protective coating, thereby controlling marine biofilm formation. Mechanistic understanding of bioadhesion is critically needed for control of fouling and biocorrosion and represents the critical input for this material design effort. Continued research into the mechanisms of bioadhesion is an area of opportunity. Another area during which research at the interface of chemistry and biology is predicted to possess an impression is within the design of physical methods for fast genetic analysis. Combinatorial synthesis is making available arrays of materials for varied applications, including coatings and films. However, the planning of appropriate processes for synthesizing molecular arrays and physical methods for measurement and analysis of surface properties are lagging. Hence, a concerted effort in both synthetic methods research and research designed to take advantage of the atomiclevel characterization offered by the new sorts of microscopy—scanning tunneling microscopy, atomic force microscopy, and near-field optical microscopy—is timely. These techniques will cause new, robust, and fast analytical methods. New biomaterials are needed in applications such as wound healing, bone replacement, and controlled delivery of biologically active species. Biomolecular chemistry is poised to have a significant impact on the availability of biocompatible materials. It is important to understand that current biomaterials haven't been designed for such uses but are chosen empirically from materials developed for nonbiological uses. In some cases this empirical approach has led to serious immunogenic complications. Understanding the basics of biological performance at the molecular level will facilitate incorporation of biocompatible segments into synthetic systems to be used in medical applications.