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Editorial

Editorial Note on Bioactive Polymers

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EDITORIAL

Biopolymers play critical roles in the growth and development of all living things. The term biopolymer describes natural polymers such as proteins, DNA and RNA, and polysaccharides. Specific recognition of these biopolymers coordinates fundamental physiological interactions. The generation of synthetic bi-polymers, which we refer to as neo biopolymers, that mimic natural biopolymers could have profound applications in disease prevention and treatment, as well as in the elucidation of biological mechanisms. These applications are predicated on the development of new methods for the controlled synthesis of these materials. There are several important features of natural biopolymers that must be con-side red in the design of synthetic biopolymer mimics. First the backbone must display the necessary functional groups in orientations that are similar to those found in natural displays. In addition, the final products of these syntheses should be compatible with all the relevant environments in which the natural bi-molecules occur. Finally, many biopolymers are homogeneous, an important feature in eliciting and elucidating specific responses. The generation of linear displays, or linear polymers, which share the structural features of natural bi-polymers, is a rapidly expanding area. Many interesting efforts to create molecules with conformational or functional properties of natural biopolymers have assembled the target materials using multistep reaction processes.

Bioactive Polymers 201 alternative synthetic approach, polymerization reactions offer one critical ad-vantage: a complex material can be assembled in one process. While the efficiency of polymerization processes makes them extremely at-tractive for neo biopolymer synthesis, the biological functions of the resulting materials will be difficult to dissect if the materials are highly heterogeneous. Consequently, developments in polymer chemistry that will enable the synthesis of homogeneous, highly functionalized materials are needed. Living polymerization processes offer opportunities to generate materials with these desirable attributes. A living polymerization is defined as a reaction in which the termination and chain transfer processes are slow relative to elongation.

For reactions in which the rate of initiation exceeds that of propagation, materials of controlled molecular masses can be generated by varying the monomer-to-initiator ratios. Although many living polymerizations are known, the reaction conditions foremost of these processes do not tolerate the dense display of polar functionality essential for the function of biological molecules. A number of research groups, therefore, have set out to discover and exploit polymerization methods that are compatible with the diversity of functional groups that characterizes biological systems. Neo biopolymers have been generated by a number of different polymerization strategies. These include radical polymerization, cationic polymerization, ring-opening polymerization (ROP), and ring-opening metathesis polymerization (ROMP).

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