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Our present research program is concerned with a comparative study of the preparation—structure-property relationships of identical stereoregular (3-substituted PHAs, which are either prepared by lactone polymerization reactions or produced by bacteria. By either route these polymers can be obtained in a highly isotactic, high molecular weight form.

Poly(isocyanides) (2) also called poly(iminomethylenes) or poly(carbonimidoyls) can be prepared from isocyanides (1) by the catalytic action of nickel(II) salts. The monomers are easily accessible from amines and amino acids.

\[
\begin{align*}
R - N E & \xrightarrow{+} R - N C W \\
\text{Poly(isocyanides)} & \xrightarrow{\text{Ni(II) salts}} (R - N = C <) (R - N = C <) \text{, (2)}
\end{align*}
\]

Poly(isocyanides) have a tightly coiled, rigid rod structure. They occur either as right-handed or left-handed helices and, therefore, are chiral. The helical chains contain approximately 4 repeating units \(R - N = C <\) per turn.

In the lecture the synthesis and structure of polymers of isocyanides will be discussed. In addition, some applications of these polymers will be given in the field of biomimetic chemistry.

Chemical methods of polymer synthesis are inherently limited by the statistical nature of polymerization processes. As a result, the polymers currently in use are not pure materials, but instead are mixtures characterized by distributions of the important structural variables (molecular weight, composition, sequence and stereochemistry). The preparation of pure polymeric materials, and the use of polymers in applications that require precise structural control, can be realized only through the introduction of new synthetic methods. With this in mind, we have begun to develop molecular biological approaches to the preparation of new polymeric materials. The fidelity of protein biosynthesis, coupled with recent advances in the synthesis, cloning and expression of genes, offers the prospect of a new synthetic technique of unprecedented precision and remarkable scope. This lecture will describe the design, synthesis and expression of several new families of genes that encode amino acid copolymers of some potential interest in materials science.

This lecture will discuss the design, synthesis, cloning and expression of several classes of genes that encode polypeptides of potential interest in polymer materials science.

Our group has recently adopted a synthetic approach to understanding the structural basis for protein function. In order to test some of the rules and concepts which are believed to be important for protein folding and stability, we are attempting to design...