Sequence-defined polymers – Polymers that can mimic functions displayed by natural macromolecules

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In nature, DNA and proteins with well-ordered structural skeletons can be recognized as sequence-defined macromolecules. DNA, composed of A, T, C, G nucleotides, is a natural polymer of two chains that coil around each other to form a double helix carrying genetic instructions. All essential information to generate sequential protein chains from amino acids by transcription and translation process are encoded in DNA sequence. Subsequently, the amino acid sequence determine three-dimensional protein structure and decide about their functions.

The synthesis of uniform macromolecules with defined monomer sequence, as displayed by natural polymers, is a challenge of modern polymer chemistry.[1] In order to achieve full control over polymer structure new synthesis strategies, based on iterative chemistry has been recently developed.[2] The accessibility of sequence-defined, uniform macromolecular structures enabled the design of polymeric materials with an extended range of applications, beyond classical approaches. Furthermore, the monomer sequence regulation became an important parameter for the modulation of properties and functions of synthetic materials.

Examples of synthesis yielding sequence-defined macromolecules and the influence of sequence on the properties of resulting materials will be presented.[3] The application`s potential of sequence-ordered polymers for data storage will be illustrated[4] and future prospects for use of sequence-defined macromolecules will be deliberated.

References

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