Stereocontrolled polymers – how far are we from the structural precision of biomacromolecules?

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Natural macromolecules, such as proteins and nucleic acids, display various complex functionalities in biological systems. These functionalities depend on the macromolecular structure, which is determined by the sequence of monomers as well as stereochemical factors. Over the past decade, synthetic methods have evolved to enable complete control over sequential monomer assembly.[1] The precise control over the primary structure of abiotic macromolecules holds the promise to realize complex functionality, similar to natural biopolymers. One of the key features in biological processes involves chirality. Therefore, stereochemical considerations are a prerequisite for mimicking biological systems using synthetic polymers.[2] Here, I will discuss the possibilities of using sequence and stereochemistry as tools to tune the functionalities of abiotic polymers.[3] I will present how structural properties of polymers and folding can be examined and tuned by the sequence of monomers and stereocenters. I will also talk about the recent advancements in the synthesis methods towards high-molar mas polyurethanes that could display features of “artificial proteins”.[4]

References:

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