Adaptive Self-Assembled Nanostructures: From Dynamic Chemistry to Function

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Abstract: The self-assembly of molecular building blocks through non-covalent interactions offers a powerful strategy for creating functional materials. Moving beyond purely synthetic or natural systems, current research focuses on hybrid platforms that combine rational design with biologically inspired motifs. Amino acid-based components are particularly attractive, as they enable the formation of precisely organized nanostructures that exhibit adaptive behavior reminiscent of biological systems. Inspired by the dynamic and responsive nature of biopolymers, we explore how amino acid-derived and other organic and inorganic building blocks can generate self-assembled nanostructures functioning as adaptive systems.[1-8] Through reversible interactions and structural programmability, these architectures can respond to environmental stimuli and modulate their properties at the nanoscale. This presentation will highlight selected examples illustrating the design of adaptive self-assembled nanostructures with potential applications in biotechnology, medicine, and advanced materials engineering (more information at www.arsgroup.amu.edu.pl).

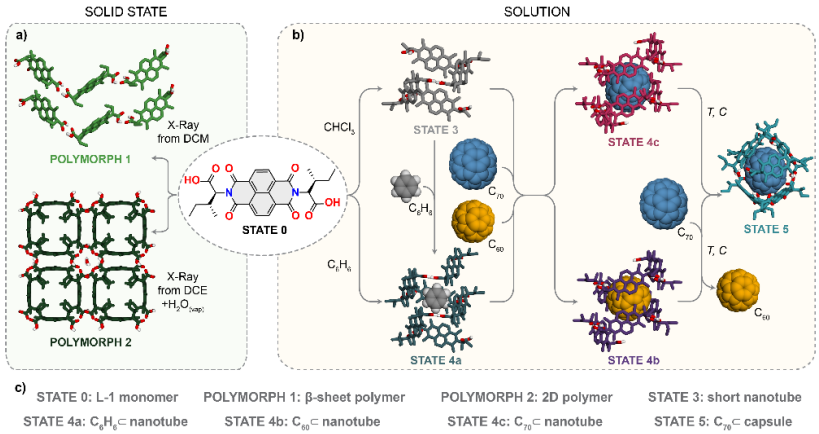

Figure 1. A structural reorganization of this artificial system into five distinct supramolecular states was accomplished, through modulation of solvent, temperature, concentration, and guest molecules.

Selected References:

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