Chirality and photoswitching in DNA-templated supramolecular assemblies

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DNA-templated polymerization is an essential process of life itself. Inspired by the structure and the formidable information density of DNA, many researchers have attempted to utilize DNA as a template to synthesize well-defined molecules and sequence-controlled polymers, or to program supramolecular constructs with sub-nm resolution.[1,2,3] Besides the inherent beauty of these assemblies, potential applications are envisioned in sensing, delivery, and imaging.

In the context of DNA-templated supramolecular assembly, we exploit complementary interactions, such as ionic interactions, H-bonding, and π-type interactions to scaffold π-conjugated molecules along DNA structures.[4] We study the effects of chirality induction from the DNA to the supramolecular assembly of the binder molecules, and we establish relationships between the supramolecular organization and the chiroptical properties. Furthermore, we show that the use of a photoswitch molecule (based on an azobenzene moiety) that bind to DNA in the minor-groove can be used to modulate the supramolecular organization in multicomponent assemblies along the DNA template.[5] Finally, we assess the activity of several types of enzymes on the supramolecular DNA hybrids through (chir)optical signals.

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