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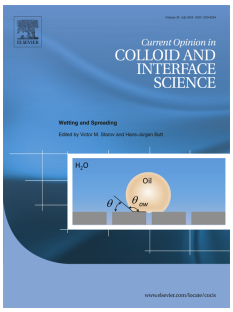

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DNA Assembled Photoactive Systems

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Highlights

- Versatility of DNA nanostructure facilitates assembly of photoactive nanomaterials.
- DNA photosystems are excellent tools for biosensing, bioimaging and therapeutics.
- Solar energy harvesting and fuel production are benefiting from DNA photosystems.
- Application-based developments with DNA assembled photoactive systems are expected.

Abstract

Advances in the utilization of DNA to fabricate a wide array of rigid and flexible multi-dimensional nanostructures has inspired scientists to build photoactive and responsive materials. Because many of these hybrid systems have shown improved and controllable optical and electronic properties as compared to single components, there has been significant effort in exploring their use for biomedical and energy applications in the past decade. Here, we introduce the chemistry used to conjugate DNA oligonucleotides to photoactive nanomaterials and the use of DNA assembly to fabricate hybrid photoactive nanomaterial systems and their utilization for in vitro and in vivo biosensing, bioimaging as well as solar energy harvesting and conversion. As DNA structures become more robust and scalable, and our understanding of energy and charge transfer in DNA assembled systems progresses, we expect increasing efforts to use DNA as a structure directing agent to build highly functional photoactive systems that function in both biological and non-biological systems.

Graphical Abstract