

Hybrid complexes from biological and synthetic materials for light-harvesting and charge separation applications

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Organic, inorganic, and biological components are combined to form synthetic hybrid structures: extremely stable organic dyes of the rylene tetracarboxydiimide series, the absorption and emission of which can be optically tuned over the entire visible and near-infrared spectrum, inorganic semiconductor nanocrystals or quantum dots that can likewise be tuned and some of which are capable of charge separation, and recombinant versions of a natural light-harvesting complex from plants consisting of a scaffold protein that binds numerous different chromophores at an exceptionally high density. Dyads and triads as well as more complex combinations of these building blocks will be made such that they undergo efficient energy and/or charge transfer. An in-depth understanding of how their optical properties and electronic coupling depend on the chemical coupling between components will help to optimise the hybrid nanosystems as efficient light-harvesters and for potential photovoltaic applications.

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