Complementary Conjugated Polyelectrolye Complexes As Electronic Energy Relays

Tech ID: 33167 / UC Case 2016-381-0

BACKGROUND

Photosynthetic organisms use “soft” macromolecular assemblies for light absorption and concentration of electronic excitation energy. These generally work via an optically inactive protein-based backbone that acts as a host matrix for an array of light-harvesting pigment molecules. The pigments are organized in space such that excited states can migrate between molecules, ultimately delivering the energy to the reaction center.

TECHNOLOGY DESCRIPTION

UCSC researchers have developed an artificial light-harvesting energy transfer antenna based on complexes of oppositely charged conjugated polyelectrolytes (CPEs). A CPE is an amphiphilic polymer with a conjugated backbone and ionized (or ionizable) side chains. Excitons generated in the pigments within the light harvesting antennae (LHA) are funneled to a reaction center where the exciton is energetically trapped. The conjugated backbone and the charged side chains of the CPE lead to an architecture that simultaneously functions as a structural scaffold and an electronic energy “highway” that can transfer the energy by generation of electron/hole pairs via electron transfer.

Oppositely charged CPE's such as PTAK or derivatives thereof can be used as light harvesting antennae with complementary electronic absorption and emission spectra, resulting in thermodynamically allowed EET between the complexed CPEs. PTAK derivatives include regiorandom PTAK, regioregular PTAK, benzodithiophene PTAK, or any combination of these.

APPLICATIONS

Semiconductors

Artificial Photosynthesis

Conversion of sunlight into chemical potential energy (fuel)

ADVANTAGES

This is the first time that a multi-conjugated polyelectrolyte commplex has been assembled in solution and shown to form ionic complexes that undergo inter-conjugated polyelectrolyte electronic energy transfer

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INVENTORS

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OTHER INFORMATION

KEYWORDS

artificial photosynthesis, light harvesting antenna, conjugated polyelectrolyte, electronic energy transfer, PTAK

CATEGORIZED AS

- **Energy**
  - Bioenergy
  - Solar

RELATED CASES

2016-381-0

and modulates the nautre of the emitting excitonic wave function relative to isolated CPE's and a major step towards the production of clean fuels directly from solar energy.

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,682,742	06/20/2023	2016-381
United States Of America	Issued Patent	11,101,396	08/24/2021	2016-381

RELATED MATERIALS

- Exciton Transfer and Emergent Excitonic States in Oppositely-Charged Conjugated Polyelectrolyte Complexes - 07/18/2016

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Liquid Conductive Self-Coacervates Via Associative Phase Separation In Water

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