LIGHT-HARVESTING ANTENNAE: FROM PRINCIPLES TO APPLICATIONS

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An antenna for light harvesting is an organized multicomponent system in which many chromophoric molecular units absorb the incident light and then channel the excitation energy to a common acceptor component [1]. In the first part, a discussion of the parameters which influence light-harvesting process will be discussed and then examples will be discussed with particular emphasis on two cases: (i) a multiterpyridine system coupled to a hexathiobenzene benzene core exhibiting aggregation induced phosphorescence and (ii) a family of Silicon nanocrystals (SiNCs) functionalised by organic chromophores.

In the multiterpyridine system [2], Mg2+ complexation turns on phosphorescence of the hexathiobenzene core. Metal ion coordination yields the formation of a supramolecular polymer which hinders intramolecular rotations and motions of the core chromophore, thus favoring radiative deactivation of the luminescent excited state. Upon excitation of the \([\text{Mg(tpy)2}]^{2+}\) units of the polymeric structure, sensitization of the core phosphorescence takes place with >90% efficiency.

The second approach is based on Silicon nanocrystals (2-12 nm) can be made as viable light emitters with emission wavelength that can be tuned from the near-infrared (NIR) into the visible by decreasing their size. Covalent Si-to-carbon bonding offers the possibility of integrating inorganic and organic components into robust structures. For example, we functionalised two families of SiNC of average diameter of 2.5 and 5 nm with pyrene chromophores: pyrene excitation results in a very efficient (>95%) energy transfer to the nanocrystal core [3]. The investigated hybrid material exhibits high quantum yield (40%) also in the NIR spectral region with lifetime in the \(\mu\)s range [4].

References: