ENERGY TRANSFER IN A SYNTHETIC DENDRON-BASED LIGHT HARVESTING SYSTEM

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Single molecule experiments based on Förster resonance energy transfer (FRET) are now capable of detecting energy funneling in branched molecules. Here we present the synthesis, as well as the optical characterization of a dendron coupled to two donor dyes (Cy3) and one acceptor dye (Cy5). Characterization of the dendron by ensemble absorption and emission spectroscopy shows that the molecule is capable of light harvesting; yielding a FRET signal from the acceptor that is greater than expected for a single donor. Additionally, we investigated an energy transfer cascade upon UV excitation of the conjugated backbone, resulting in several competing energy transfer pathways with the same total energy transfer as direct FRET. The first pathway is FRET from the backbone to Cy3 and resulting FRET to Cy5, with the competing pathway that allows direct energy transfer to Cy5 from the backbone via superexchange. Structural simulations in solution, as well as direct imaging by scanning tunneling microscopy show that the dyes can fold over onto the dendron, creating a heterogeneous distribution of conformations suitable for imaging single molecule studies of light harvesting.