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Title:	Multichromophoric-Catalyst Systems based on Perylene and Naphthalimide Towards Artificial Photosynthesis
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Abstract:	<p>The aim of this work is to synthesize light harvesting antenna and incorporate them in a molecular design of artificial photosynthetic systems where multiple chromophores capture light energy and transfer the excitation energy into a central chromophore (mimic of a reaction centre) by Förster resonance energy transfer (FRET). The selection of energy donor chromophore and energy acceptor chromophore will highly depend on the efficiency of light harvesting antennae. For this work, two multichromophore catalyst systems were designed and partly synthesized based on covalent attachment of a surface anchoring (SA) group to naphthalimide (N) and perylene (P) chromophores: (a) SA-N-P-N system and (b) SA-N-P-N-catalyst system where a Iridium based water oxidation catalyst will be covalently attached to the SA-N-P-N system. The two molecular design of multichromophore catalyst systems are based on the strategies of: (a) Multichromophore co-loading system (SA-N-P-N), where the chromophore and water oxidation catalyst are separately functionalized by anchoring groups to bind to photoanode and perform through surface electron transfer, and (b) Covalently linked multichromophore-catalyst system (SA-N-P-N-catalyst), where the chromophores and water oxidation catalyst are covalently linked and they are functionalized with anchoring groups to bind to the photoanode. In both systems, perylene was chosen as the central energy acceptor and naphthalimides as energy donor as the near quantitative spectral overlap of emission of naphthalimide donor and absorption of perylene acceptor indicate them to form a efficient Förster resonance energy transfer (FRET) Pair. Perylene was chosen as energy acceptor because these chromophores are highly fluorescent, synthetically versatile with good photochemical and structural stability. Naphthalimide was chosen as energy donor because of their ease for synthesis and tunability of their chemical structure in order to tune the (opto) electronic properties. These dyes are highly fluorescent, and their HOMO- LUMO energy levels and absorption profiles are complementary to those of the PDI. The advantage of designing such FRET based multichromophoric systems is that the efficient FRET leads to rapid migration of excitation energy to the central chromophore from the peripheral chromophores and as a result leads to rapid charge separation and prevents back electron transfer (BET). The prevention of BET is a very important parameter in improving the overall efficiency of such artificial photosynthetic systems.</p>
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