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Light-harvesting chlorophyll protein (LHCII) drives electron transfer in semiconductor nanocrystals

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Abstract

Type-II quantum dots (QDs) are capable of light-driven charge separation between their core and the shell structures; however, their light absorption is limited in the longer-wavelength range. Biological light-harvesting complex II (LHCII)[1] efficiently absorbs in the blue and red spectral domains.

[1] Abbreviations. Chl, chlorophylls; DAS, decay-associated spectra; DHLA, dihydrolipoic acid; e-h, electron hole; ESA, excited state absorption; ET, electron transfer; FRET, Förster resonance energy transfer; GSB, ground state bleach; h-ΔN11 wild type (wt) Lhcb1 from *Pisum sativum* lacking the N-terminal 11 amino acids but carrying an extra hexahistidyl (His_6) tag instead; IRF, instrument response function; LHCII, light-harvesting complex II; ML, monolayer; MV, methyl viologen; MV_{red}, reduced MV; NOPA, non-collinear optical parametric amplifier; ODE, octadecene; QDs, quantum dots; RC, reaction center; PSII, photosystem II; TA, transient absorption; TCEP, tris-(2-carboxyethyl) phosphine; TDPA, tetradecylphosphonic acid; TOP, trioctylphosphine; ZDC, zinc diethyldithiocarbamate