Light-induced charge accumulation in a sensitizer-acceptor dyad

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Artificial photosynthesis for solar fuel production requires several rounds of light-induced charge separation to accumulate enough redox equivalents at the catalytic sites for the target chemistry to occur. To gain more insight into the multielectron redox process, it is necessary to study the elementary steps of charge accumulation. We used a nanosecond sequential excitation technique to follow step-by-step the multiple light-induced charge separation in a molecular dyad containing a naphthalene diimide (NDI) linked to a $[Ru(bipyridine)_3]^{2+}$ chromophore with reversible electron donor. A doubly reduced NDI^{2-} with an unprecedented long lifetime (200 μs) is evident from transient absorption spectra upon a second excitation. Possible reaction pathways and mechanism for the formation of NDI^{2-} will be discussed.