Ultrafast Energy Transfer Dynamics within Quantum Dots: From Ensemble Measurements to Single Particle Probing

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Abstract:

We are interested in probing ultrafast energy transfer dynamics within (natural and) artificial light harvesters both at the bulk level and at the single molecule (or single molecular complex or single particle) level. Our present research interest is to investigate exciton dynamics within ensemble of quantum dots using femtosecond coherent spectroscopy (pump-probe spectroscopy and two-dimensional electronic spectroscopy) and extending it to a single quantum dot using femtosecond optical tweezer as a handle to efficiently trap individual nanoparticles in solution.

To this end, we synthesized Cd-Se quantum dots of varying sizes and, quite recently, quantum dot dimmers. We characterized them by UV-Vis spectroscopy and steady-state & time-resolved fluorescence spectroscopy (using time-correlated single photon counting technique).

On the other hand, we theoretically investigated stable trapping of dielectric particles of various sizes under femtosecond pulsed excitation at high repetition rate [1-4]. At present, we are designing and constructing a completely bench-top optical tweezer system. Our goal is to perform spectroscopy of such trapped particles in solution to explore dynamical information that is often not observed when the particles are immobilized on a surface and to explore dynamical inter-particle correlation.

References and Notes:

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