Characterization of the ultrafast dynamics of Multilayer Quantum Dot nano-Materials: the effect of chiral linkers

Hadar MANIS LEVY - *University of Padova, Italy*

Two-dimensional electronic spectroscopy (2DES) has been often associated mostly with the investigation of energy and charge transfer dynamics in biological photosynthetic processes. The exclusive ability to probe ultrafast transitions allowed to detect quantum coherence in such biologic systems. This exciting discovery had shed some light on the mystery of the remarkably high efficiency of the process and led to many repeated attempts to imitate such a natural mechanism in artificial systems for the benefit of high efficiency energy transfer (ET) in nano-materials.

Semiconductor quantum dots (QDs) solids and arrays hold a great potential for novel applications which are aimed at exploiting quantum properties in room temperature nano-devices. ET between coupled QDs is essential for several applications, such as quantum information processing. The coupling can be manipulated through the modulation of their sizes, distances and inter-dot linkers. Recent study demonstrated charge separation, and a stronger coupling using helical chiral molecules as a linker that exhibit long spin-wave function delocalization.

Here we explore the ultrafast dynamics of such a chiral linker/QDs system using 2DES in order to characterize fast and large delocalization of the excitation between QDs in chiral potential as opposed to non-chiral linkers. Since chirality is a common motif in Nature, understanding the effect of chiral environments on the dynamics of the ET between QDs may also promote a better understanding of the fast energy transfer between exited levels in biological systems.