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AG Dynamics of Molecular Systems

The Effect of Intermolecular Coupling on Ultrafast Dynamics of Organic Nanoparticles

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Understanding the transport mechanisms of electronic excitations in molecular systems is the basis for their application in light harvesting and opto-electronic devices. The exciton transfer properties depend pivotally on the intermolecular coupling, whereas the intermolecular coupling depends on the supramolecular structure. In this work, we prepare organic nanoparticles of Perylene Red with flash-precipitation under different conditions. We correlate their intermolecular coupling, optical spectra, quantum yields, emission lifetimes and their size and characterize their exciton dynamics upon excitation with ultrashort laser pulses by transient absorption spectroscopy. We find that we can vary the intermolecular coupling by changing the preparation conditions and thus the supramolecular structure. In contrast to the monomeric system, there is an ultrafast generation of charge-transfer states in the nanoparticles. This generation depends on the intermolecular coupling. Exciton density depending measurements are used to determine the mobility of the excitons. We model exciton-exciton interaction with a three dimensional incoherent diffusion model. The exciton diffusion constant is about ten times higher for stronger molecular coupling and thus depends on the intermolecular coupling significantly.

Talk: English

Slides: English

Location: Via zoom, please see the corresponding email.