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Title: Ultrafast spectroscopy in condensed phase: study of polar solvation and exciton fission

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**Abstract:** In condensed phase, the system under study does not only show its own property but also evolves as a function of its interaction with the surroundings. In first part, the interaction of system (solute) with its environment (solvent) is studied. We have studied how the interaction of a chromophore with a polar solvent relaxes the excited state of the chromophore. The sub 1ps dynamics of relaxation are studied for two solvents (ethanol and ethylene glycol) using the technique of TAS and 2DES. In second part, the interaction of a chromophore molecule with the neighboring chromophore of same type is studied. In polyacene molecules (such as tetracene and pentacene); one of the outcomes of such interaction is the formation of pair of triplets from a singlet exciton called as singlet fission. Using the technique of TAS, we have studied that while pentacene shows very robust singlet fission, the singlet fission in case of tetracene is not very robust. Also, the role of vibrational states in the singlet fission of pentacene have been studied.


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