Properties and dynamics of molecules and molecular aggregates at low temperatures

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Abstract:

Charge and excitation transfer and corresponding decay and loss mechanism are the key aspects to be understood in connection with the function of light harvesting, organic photovoltaics and optoelectronic devices. Here we probe aggregates of organic molecules formed and isolated on rare gas clusters in order to understand collective processes of electronically excited systems. The cluster isolation technique is introduced and compared to other spectroscopic techniques at low temperatures. Results on the lifetime reduction of electronically excited systems are discussed in the context of the spectroscopy of the complexes and different decay mechanism.

In a second part, experiments using femtosecond lasers will be introduced to study ultra-short time dynamics of cold atoms and molecules. Here we will focus on wave packet interferometry in order to study quantum dynamics of small molecular complexes. In particular, quantum interference structures will be employed to study the formation of alkali-helium exciplexes. Experiments are extended using a new phase modulation technique which allows us to probe cold, dilute samples and to isolate multiple quantum coherences.