CFEL SCIENCE

Colloquium

24th October 2014 – 14:00

CFEL bldg. 99 , seminar rooms I-III

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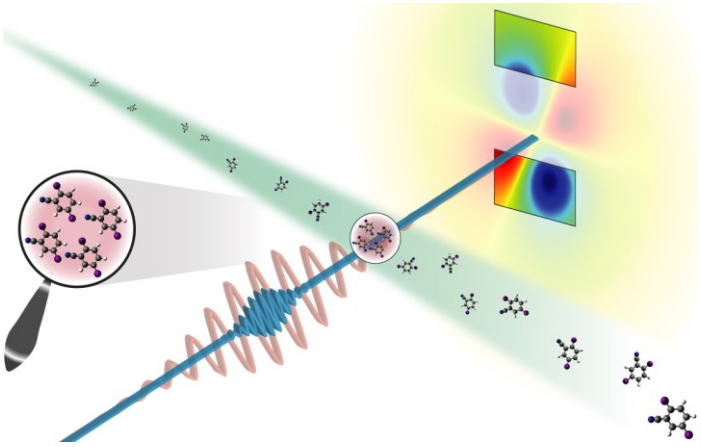
Dynamics and reactivities of controlled molecules

The structure function relationship is still a largely open area of molecular sciences. On the one hand there is vast evidence for structural influence in chemistry and biology, with highly successful abstractions even at the textbook level. On the other hand, there is very little direct experimental evidence for the details of this structure-function relationship. We have demonstrated a new approach toward the investigation of the influence of conformational details in the molecular structure on the reactivity of gas-phase reactions. The next challenge is the disentangling of the chemical dynamics of individual molecular species with temporal and spatial atomic resolution. The recording of these so-called “molecular movies” is within reach. Corresponding modern experiments in the molecular sciences range from ultrafast attosecond electron dynamics investigations of small molecules to the coherent diffractive imaging of nanocrystals or viruses of biological samples. The successful filming will often rely on strongly controlled molecular samples. This includes the separation of individual structural isomers or even single quantum states of complex molecules, but also the ability to strongly fix complex molecules in space, and to deliver them to the interaction point of the probe experiment, such as modern table-top laser systems, free-electron lasers, or electron beams.

In this presentation I will discuss our endeavors to get complex molecules under control, including the spatial separation of different species and the one- and three-dimensional alignment and orientation. I will discuss the chemical reactivities of conformers and discuss future possibilities to study the structure-function relationship in bimolecular reactions. Moreover, the controlled samples of such many-body quantum systems have been successfully employed in various benchmark experiments toward the recording of molecular movies and I will discuss the current status and future possibilities.



Host: Robin Santra - CFEL Theory Division