

Plenary Talk PV XVII Fri 9:00 U Audimax
Controlling and imaging molecules inside helium nanodroplets with laser pulses — ●HENRIK STAPELFELDT — Department of Chemistry, Aarhus University, Denmark

Controlling and imaging molecules inside helium nanodroplets with laser pulses

I will show how laser pulses can align molecules embedded in helium nanodroplets and how the ability to place molecules in advantageous spatial orientations allows structural determination of molecular complexes. The talk will focus on the following topics:

1) Impulsive alignment with pulses much shorter than the molecular rotational periods focusing on understanding how rotational quantum

coherence is influenced by the dissipative environment of the helium droplets.

2) Alignment induced by pulses that are turned-on on the time scale of molecular rotations. It will be shown how the 0.4 K temperature of the molecules inside the droplets enables unprecedented high degrees of alignment, in either one or three dimensions. The method applies to large, complex molecules and the alignment can be made field-free by rapidly switching off the alignment pulse.

3) Femtosecond-laser-induced Coulomb explosion imaging of the structure of molecular dimers and trimers created inside He droplets. Results for both small linear molecules, such as carbonylsulfide, and larger molecules, such as tetracene, are presented. Perspectives for time-resolved imaging of bimolecular reactions are discussed.