Time resolved excited state dynamics of 1-Iodonapthalene molecules studied inside helium droplets

James D. Pickering[1]*, Lars Christiansen[*], Henrik Stapelfeldt[*]

[*] *Department of Chemistry, Aarhus University, 8000 Aarhus C, Denmark*

Synopsis Time-resolved measurements on the excited state of 1-iodonaphthalene have been measured for isolated molecules and molecules inside helium droplets.

The dynamics of electronically excited 1-iodonaphthalene (INaph) molecules inside helium droplets have been studied using time-resolved ion yield spectroscopy (TRIY). A 120fs 266nm pump pulse was used to excite the Inaph from the ground state to the excited state. The population in the excited state was monitored by measuring the ion yield of singly ionised molecules as a function of time delay between the pump pulse and a non-resonant 40fs 800nm probe pulse. By keeping the intensity of the probe pulse low enough not to ionise from the ground state, we are selective to only the excited state. The decay in ion yield from molecules excited outside and inside helium droplets reveal different timescales, thus the excited state decay inside helium droplets is modified by the environment. These experiments pave the way for better understanding the electronically excited states in the time domain where little is known compared to the frequency domain.

E-mail: pickering@chem.au.dk

The TRIY measurements performed here are a first step towards more elaborate time resolved excited state experiments. For isolated molecules time-resolved photoelectron spectroscopy has proven to be an extremely powerful technique to study the evolution of excited states of molecules [1]. By using the photoelectron as an observable more information can be extracted. In particular if the molecules are prealigned and the photoelectron angular distributions are measured [2].

References

[1] A. Stolow and J. G. Underwood, Advances in Chemical Physics 2008, **139**:497-584
[2] Katharine L. Reid, Annu. Rev. Phys. Chem. 2003. **54**:397–424