Nonadiabatic alignment and photoelectron spectroscopy of molecules in helium droplets

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We show that the alignment methods, based on moderately intense nonresonant laser pulses, can be transferred from isolated molecules in the gas phase to molecules embedded in superfluid Helium droplets. We show that nonadiabatic alignment inside helium droplets depends on the molecule studied, and the alignment dynamics are very different from the dynamics of isolated molecules.[1] It is shown that multiple short pulses, synchronized appropriately, can enhance the degree of alignment and provide information about the alignment dynamics. Our studies uses 1,4-diiodobenzene and I_2 as examples, but other molecules were studied as well.

In a second project, photoelectrons generated from 2-photon ionization of naphthalene molecules inside helium droplets were recorded and compared to studies on isolated molecules. The kinetic energy distributions of photoelectrons from molecules inside helium droplets deviate from the gas phase results. The motivation for the studies is to explore if photoelectron kinetic energy distributions from molecules in He droplets is an experimental observable that can provide useful information for femtosecond time-resolved studies of chemical reaction dynamics

References:
[1] Dominik Pentlehner, Jens H. Nielsen, Alkwin Slenczka, Klaus Mølmer, Henrik Stapelfeldt, Phys. Rev. Lett. **110**, 093002 (2013).