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CFEL-Building 99, seminar room I, ground floor

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Laser induced alignment of molecules in helium droplets

Aligning molecules in the laboratory frame is desirable for the study of directionality in physical and chemical processes. Examples are the direction of transition dipole moments or the stereoselectivity of chemical reactions such as SN_2 reactions. Laser induced alignment can be achieved adiabatically using long (ns) or nonadiabatically using short (fs) laser pulses with respect to the rotational period of the molecule.

So far, all studies of laser induced alignment involved isolated molecules in a cold molecular beam or in a gas cell. Here, we report the first experimental results on laser induced alignment of molecules embedded in superfluid helium droplets and thus make a step from isolated molecules in the gas phase to solvated molecules in a condensed phase.

Our studies show that adiabatic alignment of molecules in helium droplets appears similar as for the isolated molecules, whereas nonadiabatic alignment shows striking differences. (s. fig. below) Recent data on adiabatic and nonadiabatic laser induced alignment of Iodobenzene ($\text{C}_6\text{H}_5\text{I}$), Methyl iodide (CH_3I) and Carbondisulfide (CS_2) in the gas phase and inside helium droplets will be presented and discussed.

