CFEL SCIENCE

SEMINAR

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Building 49 - Seminar Room 108

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Spectroscopic investigations of quantum solvation

Microwave and infrared spectroscopy, in combination with molecular beam methods, has allowed us to study small to intermediate-sized doped HeN and $(H_2)N$ clusters with atom-by-atom resolution. N, the number of helium atoms or hydrogen molecules, reaches up to 70 for the case of HeN – carbonyl sulfide (HeN-OCS). These experiments have given detailed insights into how superfluidity, a bulk phase property, evolves from the microscopic scale.

Our microwave spectroscopic investigations of ammonia and OCS in helium nanodroplets have revealed interesting line-shapes and fine-structures of the measured transitions. These observations are explained in terms of droplet size distribution and the development of sublevel structures of molecular energy levels in helium nanodroplets.

Molecular hydrogen, specifically $paraH_2$, is the only substance other than helium which is suspected to have a superfluid phase. Its superfluid transition temperature, however, is predicted to be at about 6 K, well below the freezing point of $paraH_2$ at 13 K. Spectroscopic studies of $(paraH_2)N$-molecule clusters may be an alternative approach to detect indicators of superfluid $paraH_2$ in terms of a turnaround in B constant, similar to the case of HeN-CO clusters.

Host: Jochen Küpper, Coherent Imaging Division - Controlled Molecule Imaging Group