Spectroscopy in superfluid helium nanodroplets

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Helium droplets serve as cryogenic host system for atoms, molecules and clusters to study structures of molecules and van der Waals clusters and also low temperature chemistry. Unique properties of helium droplets are based on the superfluid phase and have been revealed by high resolution spectroscopy in the micro wave, the infra red, and the UVvis spectral range. [1]

Our initial approach to utilizing helium droplets as cryogenic reactor for the study of photochemical processes revealed surprising perturbations induced by the superfluid helium environment. [2] It drew our attention to the helium environment. Molecular spectra recorded in helium droplets always carry information on both the dopant species and the helium droplet. [3] In order to interpret the molecular contribution it is important to understand the helium induced part of spectra. We feed this enterprise entirely from the experimental side. Systematic studies as well as detailed study mostly by means of electronic spectroscopy reveal information on the dopant to helium interaction and, thus, provide insight into microsolvation of molecules in superfluid helium droplet [4]. We will critically discuss experimental details which have been interpreted according to the empirical model of microsolvation in helium droplets. It assumes a complex consisting of the dopant species surrounded by a non-superfluid helium solvation layer which rotates freely inside the superfluid helium droplet.

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