MO 8: Spectroscopy in He-Droplets

Time: Monday 16:30–17:30 Location: F 107

MO 8.1 Mon 16:30 F 107

Imaging desorption dynamics of alkali doped helium nanodroplets — •Johannes von Vangerow, Amon Sieg, Harald Schmidt, Barbara Grüner, Frank Stienkemeier, and Marcel Mudrich — Physikalisches Institut, Universität Freiburg, Hermann-Herderstr. 3, 79108 Freiburg, Germany

Due to their low temperature (400 mK) and weak interaction, doped helium nanodroplets serve as excellent model systems to study solvation effects and desorption dynamics in the cold temperature regime. Recently, doping by alkali atoms has gained interest because, unlike other dopand species, they dwell in dimple like states at the surface of the droplet. Surprisingly, this many particle system can be desribed as a diatomic molecule. Here we report how far this conclusion applies for heavy alkali atoms and even dimers doping. This work was carried out via state selective multiphoton ionisation and velocity map imaging ion and electron detection. In addition, we recently extended our vmi setup by a femtosecond lasersystem enabeling us to study solvation and desorption dynamics by pump probe imaging spectroscopy.

MO 8.2 Mon 16:45 F 107

Photoelectron spectroscopy on Mg embedded in helium-droplets — •Lev Kazak, Sebastian Göde, Josef Tiggesbäumker, and Karl-Heinz Meiwes-Broer — Instiute of Physics, University of Rostock, Universitätsplatz 3, 18051 Rostock, D

Magnesium atoms embedded in superfluid helium nanodroplets have been identified to arrange themselves in a metastable network of isolated atoms [1], initially proposed by Gordon [2]. Excitation spectra in the vicinity of the atomic $3\ ^1P_1^0 \leftarrow 3\ ^1S_0$ transition, measured via resonant two-photon ionization (R2PI), reveal a narrow peak next to the atomic resonance, irrespective of the cluster size, which suggests, that before excitation single Mg atoms are dissolved within the droplet. From the peak shift with respect to the monomer signal, an interatomic Mg-Mg distance of 10 Å has been deduced. Here we use photoelectron spectroscopy (PES) in order to map the electronic structure. Interestingly, also in photoemission simple spectra arise when more then a single atom is present, whereas almost no pickup dependence is observed. Additionally peaks which corresponds to highly excited complexes has beend found, indicating a possible relaxation of the metastable structure [3].

[1] A. Przystawik, S. Göde et. al., Phys.Rev.A **78**, 021202 (2008)
[2] E.B. Gordon, J.Exp.Theor.Phys.Lett. **19**, 63 (1974)
[3] S. Göde et. al., submitted to New Jour. Phys.

MO 8.3 Mon 17:00 F 107

Studying Molecular Aggregation below 1 K — •Pablo Nieto, Torsten Endres, Daniel Habig, Gerhard Schwaab, and Martina Havenith — Department of Physical Chemistry II, Ruhr-Universität Bochum, Germany

Spectroscopy of doped molecules in superfluid helium droplets is a very promising and fast developing area for the study of molecular aggregation at temperatures below 1 K. These experiments can be seen as a part of the effort to understand molecular interactions at the microscopic level and low temperatures. In this presentation some examples carried out in our lab in Bochum will be explained to illustrate the great potential of this technique for the study of molecular aggregates in a controlled environment.

As a first example, pyridine dimers were investigated in the C-H asymmetric vibration region (2980-3100 cm^{-1}) by means of infrared depletion spectroscopy. The cluster sizes related to each resolved band were determined by means of pick-up pressure intensity dependence as well as with mass sensitive depletion spectra. Furthermore, the study of the different bands on applying a DC electric field provided a very valuable tool for obtaining conformational information. The assignment of the pyridine dimers structures present in helium droplets was carried out by combining the experimental results with ab initio calculations. Results for other systems such as the pyridine-water heterodimer will also be discussed.

MO 8.4 Mon 17:15 F 107

Catching biomolecular ions with liquid helium nanodroplets — •Ana Isabel Gonzalez Florez, Doo-Sik Ahn, Frank Filsinger, Gerard Meijer, and Gert von Helden — Fritz-Haber-Institut der MPG, Berlin, Germany

Liquid helium nanodroplets are an ideal matrix for the spectroscopic study of molecules. The droplets are isothermal at 0.38 K, superfluid, weakly interacting with the embedded molecule, and transparent over a wide spectral range [1]. We have built up an experimental setup [2, 3] that allows the doping of selected ions in helium droplets. In our experiment, biological molecules are brought into the gas phase via electrospray ionization. They are then mass-to-charge selected using a quadrupole mass spectrometer, and stored in a linear ion trap where they are picked up by helium droplets. Further downstream, the charged droplets are investigated and detected.

In this talk, we will present the electronic spectra of protonated tryptophan and of protonated tryptamine in liquid helium droplets. We will show that the broad electronic spectra of these protonated molecules becomes narrower and blue-shifted by hydration with one water molecule, or by adding the crown ether 18-crown-6. Currently, we are working with larger peptides. An update of those systems will be discussed as well.

[1] J. P. Toennies, A. F. Vilesov, Angew. Chem. Int. Ed. 43, 2622 (2004)
[2] F. Bierau *et al.*, Phys. Rev. Lett. 105, 133402 (2010)
[3] F. Filsinger *et al.*, PCCP, 1-8 (2012)