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Innsbruck Physics Colloquium

Resonant Photoelectron Spectroscopy of Cryogenically-Cooled Anions via Dipole-Bound Excited States

Lai-Sheng Wang

Dep. of Chemistry, Brown University, US



Research in our lab focuses on the investigation of the electronic structure and chemical bonding of nanoclusters and anions from solution. We developed an experimental apparatus integrating electrospray ionization with photoelectron spectroscopy (PES), which allowed negative ions from solution samples to be studied in the gas phase, including multiply-charged anions, solvated anions, and biological molecules. In this talk, I will start by reviewing our early effort in the study of multiply-charged anions, followed by our development of a cryogenic ion-trap to create vibrationally-cold anions, which are important for high-resolution PES. The main topic will be on our recent development of resonant PES using high-resolution photoelectron imaging. Negative ions do not possess Rydberg states. However, polar anions may have diffuse dipole-bound states just below the detachment threshold, analogous to Rydberg states. Excitation to vibrational levels of the dipole-bound state can induce autodetachment via vibronic coupling. The resulting resonant photoelectron spectrum is highly non-Franck-Condon and yields much richer vibrational information than conventional PES. I will show how we use this technique to obtain vibrational information of polycyclic aromatic hydrocarbon (PAH) radical species. Finally, I will discuss our recent observation of p-type dipole-bound states due to anisotropic polarization in PAH systems.

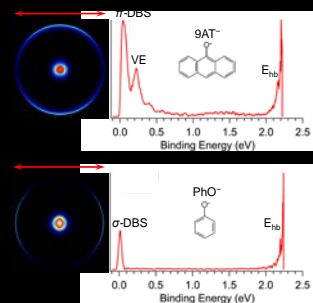
Colloquium: Tuesday, 27.04.2021

17:15 h

DK-ALM Pre-Talk: 16:30 h

Franziska Dahlmann

Hyperfine effects in the vibrational spectroscopy of Cl-H₂ and Cl-D₂ complexes



Resonant two-photon imaging of 9AT⁻ and PhO⁻ via their dipole-bound states. D. F. Yuan et al. *Phys. Rev. Lett.* **125**, 073003 (2020)

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Innsbruck Physics Colloquium, Organisation: M. Beyer, H.-C. Nägerl, A. Reimer