MS 3: New Developments and Techniques

Time: Monday 15:15–16:00 Location: f128

MS 3.1 Mon 15:15 f128

Generation and detection of mass-selected neutral polypeptide beams — Jonas Schätti[2], Moritz Kriegleder[1], Maxime Debiossac[1], Michael Kerschbaum[1], •Marcel Strauss[1], Philipp Geyer[1], Marcel Mayor[2,3], Valentin Köhler[2], and Markus Arndt[1] — [1]Faculty of Physics, University Vienna — [2]Department of Chemistry, University Basel — [3]Institute of Nanotechnology, Karlsruhe Institute of Technology

Studies of biomolecules in the gas phase have attracted increasing interest because they allow elucidating the relative influence of the solvent shell or the determination of molecular polarizabilities, which are challenging to measure on ionic species. Here we report on novel concepts for the generation and detection of neutral polypeptide beams. For the preparation of neutral biomolecular beams we have designed and synthesized photocleavable subunits that can be generically labelled to peptides and proteins and allow us to gain control over the molecular charge state in high vacuum, using intense laser light. We demonstrate site-specific photo-activated cleavage neutralization in the gas phase, with high spatial control and precise timing for polypeptides even up to insulin [1]. While neutral biomolecules may be detected by a second photocleavage stage for post-ionization, we discuss new realizations of superconducting nanowire devices (SNWD) as detectors for slow ions and even neutral particles.

[1] Schätti et al., Chem. Commun. 55, 12507(2019)

MS 3.2 Mon 15:30 f128

Towards Ion Mobility Measurements of Actinides — •Elisabeth Rickert[1,2], Hartmut Backe[2], Michael Block[1,2,3], Christoph E. Düllmann[1,2,3], Mustapha Laatiaoui[1,2], Werner Lauth[2], Sebastian Raeder[1,3], Fabian Schneider[1,2], and Jonas Schneider[1,2] — [1]Helmholtz-Institut Mainz — [2]Johannes Gutenberg-Universität Mainz — [3]GSI Helmholtzzentrum für Schwerionenforschung GmbH

Relativistic effects strongly influence the chemical and physical properties of the heaviest elements, which can significantly differ from the periodicity displayed by the periodic table of elements. Previous systematic mobility measurements on monoatomic lanthanide ions revealed the dependence of ion-atom interactions on the underlying electronic configuration and helped to investigate the aforementioned effects. Presently, the measurements are being extended to the actinides, where larger deviations from periodicity are expected. In this contribution, experimental approach, first results, and future plans are presented.

MS 3.3 Mon 15:45 f128

A cryogenic drift cell setup for ion mobility measurements in the actinides — •Jonas Schneider[1,2], Hartmut Backe[1], Michael Block[1,2,3], Christoph E. Düllmann[1,2,3], Mustapha Laatiaoui[1,2], Werner Lauth[1], Steffen Lohse[2], Sebastian Raeder[2,3], Elisabeth Rickert[2,3], and Fabian Schneider[1,2] — [1]Johannes Gutenberg-Universität, Mainz — [2]Helmholtz-Institut, Mainz — [3]GSI Helmholtzzentrum für Schwerionenforschung mbH, Darmstadt

Ion mobility spectrometry is a powerful tool to get insights on the ion-atom interaction potential by measuring the drift time of ions through a gas atmosphere. The potential is highly influenced by the atom's electronic configuration and subject to increasingly stronger relativistic effects with increasing atomic number Z. A cryogenic drift cell is currently under development to improve the capabilities of the existing ion mobility spectrometer [Laatiaoui et al. EPJD 66 (2012) 232] and to enable measurements over a large temperature and pressure range of the buffer gas in the region of the transuranium elements ($Z > 92$). To achieve optimal transmission rates for the design, extensive ion trajectory simulations for the cell and surrounding radiofrequency quadrupole structures were carried out using the SIMION software package. Results from these simulations as well as the current status will be discussed.