

MS 5: Ionenfallen und Cluster

Zeit: Mittwoch 11:30–12:30

Raum: 5F

MS 5.1 Mi 11:30 5F

Simultaneous Monitoring of the Radial Modes of the Ion Motion and their Manipulation in Penning traps by FT-ICR MS— ●MARTIN BREITENFELDT¹, FALK ZIEGLER¹, ALEXANDER HERLERT², GERRIT MARX¹, and LUTZ SCHWEIKHARD¹ — ¹Institut für Physik, Ernst-Moritz-Arndt-Universität, Domstr. 10a, D-17487 Greifswald — ²Physics Department, CERN, CH-1211 Geneva 23

It is demonstrated how FT-ICR MS can be used to monitor both the coherent magnetron motion and the cyclotron motion of ions stored in a Penning trap. By repeated measurements of the ICR signal intensity at the magnetron frequency, ν_- , and the reduced cyclotron frequency, ν_+ , the manipulation of the ion motion by dipolar, quadrupolar, and octupolar excitation has been followed. In particular, the conversion between the magnetron and the cyclotron motion by quadrupolar and octupolar excitation at the corresponding resonance frequencies $\nu_c = \nu_+ + \nu_-$ and $2\nu_c$, respectively, after a preceding dipolar excitation of the magnetron motion, has been observed by detection of both the magnetron and the cyclotron signal. In the case of octupolar excitation this is the first experiment where the resonance is monitored via a signal directly related to the magnetron motion. Moreover, it is demonstrated that FT-ICR MS allows the simultaneous monitoring of the excitation effect on both the cyclotron and the magnetron motion.

MS 5.2 Mi 11:45 5F

Photoaktivierung mehrfach negativ geladener Aluminiumcluster — NOELLE WALSH, ●FRANKLIN MARTINEZ, FALK ZIEGLER, GERRIT MARX und LUTZ SCHWEIKHARD — Institut für Physik, Ernst-Moritz-Arndt Universität, 17487 Greifswald, Deutschland

Mehrfach negativ geladene Aluminiumclusterionen Al_n^{2-} und Al_n^{3-} werden in einer Penningfalle erzeugt und gespeichert. Nach Clustergrößenselektion werden sie mit einem gepulsten Laser angeregt. Als Zerfallskanäle kommen verschiedene Reaktionen in Betracht, wie zum Beispiel die Abgabe von Elektronen. Dabei bleiben die geladenen Zerfallsprodukte in der Penningfalle gespeichert und können mittels Flugzeitmassenspektrometrie nachgewiesen werden. Verzögerte Zerfälle können in einem Zeitfenster zwischen 10 Mikrosekunden und 100 Millisekunden untersucht werden.

MS 5.3 Mi 12:00 5F

Collision-induced fragmentation of free sulfur clusters —●TIBERIU ARION¹, ROMAN FLESCH¹, THOMAS SCHLATHÖLTER², FRESIA ALVARADO², RONNIE HOEKSTRA², REINHARD MORGENSTERN², and ECKART RÜHL¹ — ¹Institut für Chemie und Biochemie, Freie Universität Berlin, Takustr. 3, 14195 Berlin, Germany — ²Kernfysisch Versneller Instituut, Zernikelaan 25, 9747 AA Groningen, The Netherlands

Fragmentation of multiply charged sulfur clusters is investigated by multicoincidence spectroscopy. The experiments are carried out at the electron cyclotron resonance source at the KVI Groningen, where beams of Xe^{q+} ($q = 5, 10, 15, 20$) are produced. The Xe^{q+} - ions are accelerated to kinetic energies of 8-10 x q keV and collided with the free sulfur clusters. Variable size sulfur clusters are prepared in a two stage oven source, where the temperature of the oven is used to adjust the cluster size. Most experiments were performed using molecular sulfur (S_8). Ion-ion-coincidence as well as mass spectra were recorded. S^+/S^{n+} ($n = 1 - 6$) coincidences are observed as a result of collisions with highly charged projectiles. Moreover, coincidences between singly charged atoms or clusters, such as S^+/S_2^+ , or S_2^+/S_3^+ are found preferentially in collisions with ions of lower charge, such as Xe^{Z+} ($Z > 5$). Possible mechanisms of cluster fragmentation are discussed. The results are compared to earlier experiments on core excited sulfur clusters.

MS 5.4 Mi 12:15 5F

Capture and investigation of cluster ions in an open Paul trap — ●HAGEN RITTER, MARTIN ARNDT, GERRIT MARX, and LUTZ SCHWEIKHARD — Institut für Physik, Ernst-Moritz-Arndt-Universität, Domstr. 10a, 17489 Greifswald

An open Paul trap is used for the investigation of stored cluster ions. The trap consists of two pairs of electrodes arranged in two planes mounted opposite to each other. Simulations were performed to determine the best design for the realisation of a quadrupolar field between the two planes. As part of an ion-trap system, bunched cluster ions coming from a linear Paul trap are captured in the open Paul trap, stored and investigated. The mass spectra are obtained by time-of-flight mass spectrometry. The design allows 360° radial access to the trap volume and different options for manipulation of the stored cluster ions. The experimental setup is intended to serve as a device for research on metal-cluster ions as part of the collaborative research center SFB 652.