MS 6: Poster

Time: Wednesday 14:00–14:00 Location: DO24 Foyer

MS 6.1 Wed 14:00 DO24 Foyer

Search for Supernova debris on the Moon — •Leticia Fimiani[1], Thomas Faestermann[1], Jose Manuel Gomez Guzman[1], Karin Hain[1], Gregory Herzog[2], Gunther Korschinek[1], Bret Ligon[2], Peter Ludwig[1], Jisun Park[2], and Georg Rugel[3] — [1]Physics Department, Technische Universität München, Garching, Germany — [2]Department of Chemistry and Chemical Biology, Rutgers University, Piscataway, NJ, United States — [3]Forschungszentrum Dresden Rossendorf, Dresden, Germany

The enhanced deposition of ^{60}Fe in a deep ocean ferro-manganese crust about (2.1±0.4) Myr ago (Knie *et al.*, PRL 93, 171103 (2004), Fitoussi *et al.*, PRL 101, 121101 (2008)) indicate that one or more supernova (SN) explosions occurred in the vicinity of the Solar System. That observation was only possible with the ultrasensitive Accelerator Mass Spectrometry (AMS) technique at the Maier-Leibnitz-Laboratory, which is able to measure concentrations of ^{60}Fe/Fe down to a level of 10^{-16} and even below. Due to its lack of atmosphere and its negligible sedimentation rate, the Lunar surface is an excellent quantitative reservoir for SN debris. We searched for live ^{60}Fe ($T_{1/2} = 2.62 \times 10^6$ yr) and ^{53}Mn ($T_{1/2} = 3.7 \times 10^6$ yr) in different samples from 3 Apollo missions. ^{53}Mn is, similar as ^{26}Al and ^{60}Fe, a tool to trace nucleosynthesis activities. It is formed primarily during the explosive silicon-burning of the inner shells of SNe via ^{53}Fe which β-decays to ^{53}Mn. Samples where we found an enhanced ^{60}Fe concentration showed also an enhancement of ^{53}Mn. This could be the first detection of live ^{53}Mn originating from recent nucleosynthesis.

MS 6.2 Wed 14:00 DO24 Foyer

AMS of actinides in groundwater: development of a new procedure for trace analysis of Np, Pu, Am and Cm isotopes — •Francesca Quinto[1], Markus Lagos[1], Markus Plaschke[1], Thorsten Schäfer[1], Peter Steier[2], and Horst Geckeis[1] — [1]Karlsruhe Institute of Technology, Institute for Nuclear Waste Disposal (KIT-INE), Hermann-von Helmholtz-Platz 1, D-76344 Eggenstein-Leopoldshafen, Germany — [2]VERA Laboratory, Faculty of Physics, University of Vienna, Währinger Straße 17, A-1090 Vienna, Austria

In order to assess the actinides contamination in groudwater, their geochemistry is intensely studied in field and laboratory experiments focusing on speciation and ways of transport through the aquifers. A challenge lies in the analysis of actinides below ppq levels. We present a new analytical protocol suited to the measurement by accelerator mass spectrometry of Np, Pu, Am and Cm isotopes without previous chemical separation from each other. The actinides are quantitatively co-precipitated with Fe-hydroxide from the groundwater specimens. This procedure allows the pre-concentration of the actinides from the bulk elements and their incorporation into a sample matrix suited to the AMS measurements. The chemical yield of the co-precipitation is estimated measuring samples with suitable spikes by HR ICP-MS. At the AMS sytem: a) the ionization yield of Np, Pu, Am and Cm in the given sample matrix, b) the maximum number of nuclides per sample allowing detection limits below 0.01 ppq, and c) the influence of the laboratory background on the results, are determined.

MS 6.3 Wed 14:00 DO24 Foyer

Large-area detector for position and energy resolving detection of molecular fragments — •L. Gamer[1], S. Allgeier[1], D. Hengstler[1], S. Kempf[1], C. Krantz[2], O. Novotny[3], A. Pabinger[1], C. Pies[1], A. Wolf[2], L. Gastaldo[1], A. Fleischmann[1], and C. Enss[1] — [1]KIP Heidelberg University. — [2]MPI-K Heidelberg. — [3]Columbia Astrophysics Laboratory, New York, USA.

To study reactions like the dissociative recombination in laboratory environment, the MPI-K Heidelberg is building a cryogenic storage ring to prepare molecular ions in their rotational groundstate. The kinematics of these processes can be resolved by a position and energy sensitive detection of the produced molecule fragments. Previously, we described a magnetic calorimeter for position and energy sensitive detection of massive particles. The detector encompasses 16 large-area absorbers, the temperature of each is monitored by a paramagnetic sensor located at a short edge of the absorber. Due to the finite thermal diffusivity in the absorber material, the rise-time of the detector depends on the impact location of the particle. Now, we compare the expected energy resolution and position sensitivity of this detector to experimental results where energy was deposited at different positions. We investigate the impact of backscattering, sputtering and lattice damage effects on the instrumental linewidth by means of Monte Carlo simulations and measurements performed with a similar detector that was irradiated with ions and small molecules. We find that the degradation of energy resolution is less than predicted and show that molecular fragments differing by only 1 mass unit can clearly be resolved.

MS 6.4 Wed 14:00 DO24 Foyer

Einsatz eines Allisonscanners zur Untersuchung der Strahlemittanz einer Sputter - (Caesium)- Ionenquelle — •Alexander Stuhl, Wolfgang Kretschmer, Andreas Scharf, Matthias Schindler und Karin Kritzler — Universität Erlangen-Nürnberg, Physikalisches Institut Abt. IV, Erwin-Rommel-Str.1, 91058 Erlangen

Am Tandembeschleuniger der Universität Erlangen werden routinemäßig Altersbestimmungen kohlenstoffhaltiger Proben mittels Radiokarbondatierung durchgeführt. Ein Teil der Forschung besteht darin, die Messexaktheit zu verbessern und die Messzeit zu verkürzen. Zur Optimierung des Quellenstroms und der Emittanz der Erlanger AMS-Anlage werden derzeit Computersimulationen der Ionenquelle mittels der Programme CPO und Lorentz 2d durchgeführt. Im Mittelpunkt der Untersuchung steht die Variation der Elektrodengeometrie und der Betriebsparameter, wie Beschleunigungsspannungen oder Heizleistung des Ionisierers bzw. des Caesiumreservoirs. Dadurch soll eine Maximierung des Sputtervorgangs erreicht, sowie die Wechselwirkung des Primär- mit dem Sekundärstrahls und der Teilchentransport aus der Quelle optimiert werden. Zur Überprüfung der Simulationsergebnisse ist die exakte Bestimmung der Strahlemittanz von zentraler Bedeutung. Zu diesem Zweck wurde ein Allisonscanner entwickelt. Dies ist ein Präzisionsmessgerät, bestehend aus planparallelen Ein- und Austrittsspalten, welches durch die Ablenkung des Teilchenstrahls mittels eines Plattenkondensators die Geometrie des Strahls vermisst. In diesem Beitrag wird die Funktionsweise, sowie der mechanische und elektrische Aufbau des Scanners und erste Testmessungen präsentiert.

MS 6.5 Wed 14:00 DO24 Foyer

Klassische Berechnung relativistischer Frequenzverschiebungen in einer idealen Penningfalle — •Jochen Ketter, Tommi Eronen, Martin Höcker, Marc Schuh, Sebastian Streubel und Klaus Blaum — Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg

Die ideale Penningfalle besteht aus einem homogenen Magnetfeld und einem elektrostatischen Quadrupolpotential. Klassisch betrachtet hängen die charakteristischen Frequenzen der drei Eigenmoden eines geladenen Teilchens nicht von seinen Bewegungsamplituden ab. Die spezielle Relativitätstheorie hebt diese Unabhängigkeit auf. Für eine erste Abschätzung wird die Amplitudenabhängigkeit der Frequenzen meist als relativistische Massenzunahme verstanden, was allerdings drei der neun Abhängigkeiten nicht korrekt erklärt. Bislang erfolgte die vollständige störungstheoretische Behandlung relativistischer Effekte in einer Penningfalle über einen quantenmechanischen Operatorformalismus [1]. Ausgehend von der Methode zur klassischen Berechnung der Frequenzverschiebung durch rotationssymmetrische Feldfehler [2] bestätigen wir durch eine entsprechende Näherung der relativistischen Bewegungsgleichungen [3] das klassische Limit der quantenmechanischen Vorhersage. Das Verständnis solcher Systematiken spielt eine wichtige Rolle für das Penningfallenexperiment THe-Trap [4].

[1] L. S. Brown and G. Gabrielse, Rev. Mod. Phys. 58, 233–311 (1986)
[2] J. Ketter *et al.*, IJMS, doi:10.1016/j.ijms.2013.10.005
[3] J. Ketter *et al.*, arXiv:1310.4463
[4] S. Streubel *et al.*, Appl. Phys. B, doi:10.1007/s00340-013-5669-x

MS 6.6 Wed 14:00 DO24 Foyer

Ion bunch stacking in a Penning trap after purification in an electrostatic ion-beam trap — •M. Rosenbusch[1], D. Atanasov[2], K. Blaum[3], Ch. Borgmann[3], S. Kreim[2,3], D. Lunney[4], V. Manea[4], L. Schweikhard[1], F. Wienholtz[1], and R. Wolf[1] — [1]Uni Greifswald — [2]CERN, CH-1211 Geneva, Switzerland — [3]Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg — [4]CSNSM-IN2P3-CNRS, Université Paris-Sud, 91406 Orsay, France

Measurements in analytical mass spectrometry as well as in precision mass determinations for atomic and nuclear physics are often handicapped when the ion sources deliver contaminations, i.e., unwanted ions of masses similar to those of the ions of interest. In particular, in ion-trapping devices, large amounts of contaminant ions result in significant systematic errors. At the Penning-trap mass spectrometer ISOLTRAP (ISOLDE/CERN), ions are purified in a multi-reflection time-of-flight mass separator (MR-ToF MS), which reaches a mass resolving power in excess of 10^5 in only tens of milliseconds [1,2]. However, the subsequent Penning-trap mass measurements require durations in order of a second. If only a certain maximum amount of ions can be processed simultaneously and the major parts are contaminants, the number of purified ions per mass-measurement cycle is limited. An improvement for such situations has been developed and realized recently [3]. The fast separation procedure of the MR-ToF MS is repeated several times while the purified ions are accumulated in a preparation Penning trap. In this contribution the method is described and proof-of-principle measurements are presented.

[1] R. N. Wolf *et al.*, Nucl. Instrum. Meth. A 686, 82 (2012)
[2] R. N. Wolf *et al.*, Int. J. Mass Spectrom. 349-350, 123 (2013)
[3] M. Rosenbusch *et al.*, Appl. Phys. B, accepted (2013), http://dx.doi.org/10.1007/s00340-013-5702-0

MS 6.7 Wed 14:00 DO24 Foyer

Probing the shell closure at $N = 32$ by mass measurements of neutron-rich potassium isotopes — •M. Rosenbusch[1], D. Beck[2], K. Blaum[3], Ch. Borgmann[3], M. Breitenfeldt[4], R. B. Cakirli[3,5], S. George[1], F. Herfurth[2], M. Kowalska[6], S. Kreim[3,6], D. Lunney[7], V. Manea[7], D. Neidherr[2,3], L. Schweikhard[1], J. Stanja[8], F. Wienholtz[1], R. Wolf[1], and K. Zuber[8] — [1]Ernst-Moritz-Arndt-Universität, Institut für Physik, 17487 Greifswald — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt — [3]Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, 69117 Heidelberg — [4]Katholieke Universiteit, 3000 Leuven, Belgium — [5]University of Istanbul, 334452 Istanbul, Turkey — [6]CERN, CH-1211 Geneva, Switzerland — [7]CSNSM-IN2P3-CNRS, Université Paris-Sud, 91406 Orsay, France — [8]Technische Universität Dresden, 01069 Dresden

The Penning-trap mass spectrometer ISOLTRAP at the on-line isotope separator ISOLDE/CERN has been set up for precision mass measurements of short-lived nuclides and has been continuously improved for accessing more exotic nuclides. A crucial step forward has been made with the installation of a multi-reflection time-of-flight mass separator (MR-ToF MS), which enables high-resolution mass separation of contaminated ions, resulting, e.g., in the measurement of the nuclide ^{82}Zn [1]. More recently, nuclear mass measurements have been performed directly in the MR-ToF MS instead of using a Penning trap. This paved the way for the determination of the masses of ^{53,54}Ca [2], which would not have succeeded in ISOLTRAP's Penning traps. The obtained two-neutron separation energies (S_{2n}) unambiguously confirm a shell closure at $N = 32$, which has been indicated earlier by measurements of the excitation energies of the first 2^+ state in ^{52}Ca [3]. In addition, with the MR-ToF MS at ISOLTRAP the masses of ^{52}K and ^{53}K have been determined for the first time. With a half-life of only 30 ms, ^{53}K is the shortest-lived nuclide ever investigated at ISOLTRAP. The data are currently under evaluation. In this contribution, the new S_{2n} values will be presented and the crossing of the neutron shell closure at $N = 32$ for potassium will be discussed.

[1] R. N. Wolf *et al.*, Phys. Rev. Lett. 110, 041101 (2013)
[2] F. Wienholtz *et al.*, Nature 498, 346-349 (2013)
[3] A. Huck *et al.*, Phys. Rev. C 31, 2226 (1985)

MS 6.8 Wed 14:00 DO24 Foyer

FRS Ion Catcher: Ion Survival Efficiency of Radioactive Ions — •Timo Dickel[1,2], Emma Haettner[1], Fabian Heisse[3], Sivaij Purushothaman[1], Moritz Pascal Reiter[2], and The FRS Ion Catcher Collaboration[1] — [1]GSI Darmstadt — [2]Justus-Liebig-Universität — [3]TU Dresden

At the MATS and LaSpec experiments of the LEB of the Super-FRS, high precision experiments will be done with low-energy exotic nuclei. To reach out to the most exotic nuclei, high efficiencies in the thermalization and beam preparation (e.g., separation and identification) are of upmost importance. Therefore, these parameters are optimized and tested online with the of the FRS Ion Catcher facility and in a separate off-line experiment. An in depth study of ion survival efficiencies has been performed to characterize the cryogenic stopping cell, to understand the slowing down process and to optimize the overall efficiency of the FRS Ion Catcher. Alpha-decay recoil ions from a ^{223}Ra source are used to determine the ion survival and transport efficiencies, which reflect the charge-exchange and stripping cross-sections during the slowing down process of the ions. These investigations as well as other efficiency optimizations of the FRS Ion Catcher will be presented.

MS 6.9 Wed 14:00 DO24 Foyer

Poly-Anion Production in Penning and RFQ Ion Traps — •Steffi Bandelow, Franklin Martinez, Gerrit Marx, and Lutz Schweikhard — Institute for Physics, Ernst-Moritz-Arndt University, 17487 Greifswald, Germany

The poly-anion production is being investigated in Penning and linear radio-frequency quadrupole (RFQ) traps at the ClusterTrap setup. The range of anionic charge states produced with the electron-bath technique in a Penning trap is restricted by the upper mass limit of this trap. By installation of a cylindrical Penning trap with a 12-Tesla superconducting magnet, the mass and thus cluster-size range is enhanced by a factor of 20 compared to the previously used hyperbolic 5-Tesla Penning trap. For first experimental tests with the 12-Tesla cylindrical Penning trap, gold cluster mono-anions Aun-, n = 330 - 350, have been exposed to an electron bath. As a result, higher negative charge states up to hexa-anionic clusters have been observed for the first time [1]. In a parallel effort, di- and tri-anionic gold clusters have been produced in an RFQ-trap [2]. To this end, an electron beam is guided through the RFQ-trap, which is operated by 2- or 3-state digital driving voltages [3,4]. In addition, both polyanion-production techniques have been combined by pre-charging clusters in the RFQ-trap, transferring the resulting dianions into the Penning trap and applying the electron-bath technique to produce higher charge states.

[1] Martinez et al., subm. to IJMS (2013). [2] Martinez et al., AIP Conf. Proc. 1521 (2013) 230. [3] Bandelow et al., IJMS 336 (2013) 47. [4] Bandelow et al., IJMS 353 (2013) 49.

MS 6.10 Wed 14:00 DO24 Foyer

Analysing Destruction Channels of interstellar Hydrocarbon Anions with a 22pol Ion-Trap — •Eric Endres, Olga Lakhmanskaya, Thorsten Best, Daniel Hauser, Sunil Kumar, and Roland Wester — Universität Innsbruck, Institut für Ionenphysik und Angewandte Physik, Österreich

In the interstellar medium (ISM), ion-molecule reactions are considered to play a key role in the formation of complex molecules. The detection of the first interstellar anions [1,2], which happen to be carbon chain anions, has raised new interest in the quantitative composition of the ISM and the underlying reaction network. To understand the observed abundance of these carbon chain anions, a detailed analysis of the possible destruction channels is indispensable.

A cryogenic 22-pol radio frequency ion trap is an ideal tool to observe reactions that take place slowly, such as carbon chain anions with molecular hydrogen [3]. Furthermore, measurements over a large temperature scale are feasible. Longitudinal optical access to the trap also provides the possibility to make precise photodetachment measurements.[4]

Temperature dependent measurements of the reaction rates for the reaction between hydrocarbon chain anions and H_2 will be presented.

[1] McCarthy et al. Ap.J. 652:L141 (2006); [2] Cernicharo et al. A&A 467, p. L37-L40; [3] Eichelberger et al. Ap.J. 667:1283 (2007); [4] Best et al. Ap.J. 742:63 (2011)

MS 6.11 Wed 14:00 DO24 Foyer

New setup for studying correlation effects in poly-anionic metal clusters by photoelectron spectroscopy — •Madlen Müller[1], Gerrit Marx[1], Patrice Oelssner[2], Josef Tiggesbäumker[2], Robert Wolf[3], Karl-Heinz Meiwes-Broer[2], and Lutz Schweikhard[2] — [1]Ernst-Moritz-Arndt-Universität, Greifswald, Deutschland — [2]Universität Rostock, Deutschland — [3]Max-Planck-Institut für Kernphysik, Heidelberg, Deutschland

Photoelectron spectroscopy (PES) experiments open insight into the electronic structure of atomic clusters. In the case of multiply negatively charged clusters, electron affinities and Coulomb barriers of these species can be probed by varying the wavelength of the photodetachment laser[1]. In addition, poly-anionic metal clusters serve as model systems for electron-correlation phenomena[2]. A setup is presented, which combines a Paul trap, used for cluster-size selection and poly-anion production by sequential electron attachment[3], with a magnetic-bottle time-of-flight electron spectrometer[1]. As a first

test PES on mono- and di-anion fullerenes with ultraviolet nanosecond laser pulses has been performed. In the future the measurements will be extended to poly-anionic metal clusters in order to explore their electronic properties. The project is part of the Collaborative Research Center (SFB) 652.

[1] L.-S.Wang et al., J. Phys. Chem. A 104, 1978 (2000).
[2] A. Herlert et al., New J. Phys. 14, 055015 (2012).
[3] F. Martinez et al., Eur. Phys. J. D 67, 39 (2013); AIP Conf. Proc. 1521, 230 (2013).

MS 6.12 Wed 14:00 DO24 Foyer

Status and Perspective of a New Time-Of-Flight Detector for the Isochronous Mass Spectrometry in the Collector Ring at FAIR — •Marcel Diwisch[1], Natalia Kuzminchuk-Feuerstein[1,2], Hans Geissel[1,2], Ronja Knöbel[1,2], Timo Dickel[1,2], Wolfgang Plass[1,2], Christoph Scheidenberger[1,2], and Helmut Weick[2] — [1]Justus-Liebig-University Gießen — [2]GSI, Darmstadt

The masses of exotic nuclei can be measured directly in ion storage rings by measuring their revolution time in the ring. In the presently used FRS-ESR facility one method to do this is the so called Isochronous Mass Spectrometry (IMS). With the IMS method mass values of exotic nuclei with lifetimes as short as a few 10μs are accessible. To determine the masses the revolution time of the ions in the ring is measured by a Time-Of-Flight (TOF) detector.

The future Collector Ring (CR) will be different compared to the current ESR not only in circumference but also in terms of beam dimensions and intensities. In order to use an advanced version of the IMS in the CR a new double detector system, which improves the mass resolution of the IMS method and fulfills the requirements of the new beam dimensions will be shown.
Improvements of almost a factor 2 for the timing accuracy with at least 95% detection efficiency is expected compared to the current design, even though the detector dimensions had to be increased by a factor of 2 to adapt to the new beam dimensions.

MS 6.13 Wed 14:00 DO24 Foyer

Spatially resolved ultra-trace analysis of plutonium and technetium with resonant Laser-SNMS — •Michael Franzmann[1,2], Sven Kayser[3], Klaus Wendt[2], and Clemens Walther[1] — [1]Institut für Radioökologie und Strahlenschutz, Leibniz Universität Hannover — [2]Institut für Physik, Universität Mainz — [3]ION-TOF GmbH, Münster

The geochemical behaviour of plutonium is of major concern for the safety analysis of contaminated sites. It is necessary to analyze the sorption on minerals and nanoparticles to elucidate the interactions in the environment and predict future migration and transport mechanisms. Therefore a system for resonant Laser-SNMS is currently being developed at the IRS Hannover. This system combines a commercial TOF-SIMS (IONTOF) with a Ti:sapphire laser system, which will be set up and tested by the Institute of Physics at University of Mainz. Identical laser systems are used there for resonance ionization of stable and radioisotopes for many years. Due to the high spatial resolution of the TOF-SIMS ion gun, the good mass resolution of the time-of-flight mass spectrometer and the excellent element selectivity of resonant ionization this laser mass spectrometric approach is seen as most promising system for ultra-trace analysis on actinides and fission products. For definition and design of the analytical system precise simulations on ion optics and mass spectrometer lay out are programmed to ensure highest efficiency together with suitable mass resolution. This simulation program optimizes the path of the ionized particle cloud through the ion optical structure of the mass spectrometer.

MS 6.14 Wed 14:00 DO24 Foyer

A Laser Ablation Carbon Cluster Ion Source for the FRS Ion Catcher — •Ann-Kathrin Rink[1], Christine Hornung[1], Timo Dickel[1,2], Jens Ebert[1], Hans Geissel[1,2], Wolfgang R. Plass[1,2], and Christoph Scheidenberger[1,2] — [1]Jusuts-Liebig Universität Gießen — [2]GSI Helmholtzzentrum für Schwerionenforschung

The FRS Ion Catcher, a test branch for the Super-FRS at FAIR, is comissioned and successfully tested. Consisting of a Cryogenic Stopping Cell (CSC), a diagnostic unit (DU) and a Multi-Reflection Time-of-Flight Mass-Spectrometer (MR-TOF-MS) to stop, identify and measure projectile and fission fragments produced by the FRS.

To do systematic studies of the MR-TOF-MS calibrants over a broad mass range are essential. To fulfil this task a laser ablation carbon cluster ion source has been designed, commissioned and tested in an external setup. Advantages of this source is a broadband mass range of calibrants (clusters), generation calibrants at every mass unit (C-13 enriched fullerenes), a high repetition rate (100Hz) and long term stable operation (x-y-table). Due to that it is a perfect tool to complete the current setup of the MR-TOF-MS. First tests and results will be presented.

MS 6.15 Wed 14:00 DO24 Foyer

Nd:YAG-Laserpuls-induzierte Ionenerzeugung an hochreinen Festkörperproben zur massenspektrometrischen Spurenelementanalyse — •Bernhard Wiedemann[1], Michael Deveaux[1], Michael Petri[1] und Karl-Heinz Wiedemann[2] — [1]Institut für Kernphysik, Max-von-Laue-Str. 1, D-60438 Frankfurt am Main — [2]Heraeus, D-63450 Hanau, Heraeusstr. 12-14

Es wird eine Ultrahochvakuum-kompatible, laserinduzierte Ionenquelle für die Erzeugung eines matrixreinen Ionenstroms für die massenspektrometrische Spurenelementanalyse an elektrisch leitenden und nichtleitenden Festkörpermaterialien beschrieben. Um Praxistauglichkeit zu erreichen wurden entscheidende technische Verbesserungen vorgenommen: (1) Die Leistung des Lasers wurde erhöht und seine Betriebsparameter auf die Aufgabenstellung angepasst (Wellenlänge 532nm, Pulswiederholfrequenz 30Hz, Pulsdauer 4ns, Strahldivergenz <0,5mrad, Pulsenergie von 3 bis 5mJ für Siliciumdioxid im Fokus einer Plankonvexlinse mit der Brennweite 200mm und dem Durchmesser 24,4mm). (2) Es wurde eine nahezu optisch dichte, vakuumtechnisch offene Abschirmung der Ionenquelle entwickelt, die auf hohem elektrischen Potential Ionen beinahe vollständig zum Sensor lenkt und gleichzeitig durch Raumwinkelbegrenzung das Eintrittsfenster des Lasers vor neutralisierter Teilchenbelegung schützt, und dadurch die Konstanz der Laserinduktion in die Probe für die Dauer der Spurenelementanalyse gewährleistet. (3) Ein automatischer Manipulator erlaubt Probenwechsel und -bewegung relativ zum Laserstrahl. Hierdurch können Proben (insbesondere auch in Schichten) ortsaufgelöst analysiert werden.

MS 6.16 Wed 14:00 DO24 Foyer

A time-of-flight mass spectrometer with laser ionization for sensitive product molecule detection for heterogeneous model reactions — •Martin Tschurl, Andreas Winbauer, Sebastian Kollmannsberger, Josef Kiermaier, Ulrich Boesl, and Ueli Heiz — Lehrstuhl für Physikalische Chemie & Catalysis Research Center, Chemistry Department, Technische Universität München, Lichtenbergstraße 4, 85748 Garching bei München, Germany

Investigations of model catalysts are very often performed in ultrahigh vacuum for ensuring very well-defined systems. Usually, product molecule detection is performed by electron impact (EI) ionization in a quadrupole mass spectrometer. While this method offers the possibilities of continuous measurements and high sensitivity, it features the drawback that a mass scan has to be performed to detect the masses of all reaction products. In addition, the discrimination between isobars is difficult to achieve because of the unselective properties of EI ionization. In this work we present a time-of-flight MS in combination with laser ionization. Due to the setup, this system allows for a very sensitive detection of isobaric species. In this poster the detection principle is illustrated and first proof-of-principle measurements are shown.

MS 6.17 Wed 14:00 DO24 Foyer

Status of the future SPIRAL2 Resonance Ionization Laser Ion Source GISELE — •Fabian Schneider[1], Jose Luis Henares[2], Tobias Kron[1], Nathalie Lecesne[2], Renan Leroy[2], Benoit Osmond[2], Marica Sjödin[2], and Klaus Wendt[1] — [1]Institut für Physik, Universität Mainz — [2]GANIL, Caen, France

Resonance Ionization Spectroscopy is a most powerful tool for efficient and selective production of ion beams in particular useful at on-line isotope breeders. For this purpose the future upgrade S^3 (Super Separator Spectrometer) of the SPIRAL2 accelerator at GANIL (Caen, France) includes a gas cell at its fission target. Therein high resolution RIS on short lived isotopes will be performed, addressing either the in-cell or in-jet technology. The corresponding Resonance Ionization Laser Ion Source project GISELE is furthermore designed to produce strong and pure radioisotope beams for experiments at the future hot cavitiy unit of SPIRAL2. Its laser system will combine sets of tunable high-repetition rate pulsed dye as well as titanium:sapphire lasers.

Currently, off-line preparation studies are performed with the titanium:sapphire lasers for the day 1 requested beams of Zinc and Tin. A suitable excitation scheme was developed for Zinc and the ionization efficiency was determined. For Tin three known ionization schemes, a 3-step and two widely identical 2-step schemes, were tested and compared with published results from other facilities.

MS 6.18 Wed 14:00 DO24 Foyer

Titan:Saphir-Laser mit Gitterresonator in Littman-Geometrie — •Pascal Naubereit, Tobias Kron, Fabian Schneider und Klaus Wendt — Institut für Physik, Johannes Gutenberg-Universität Mainz, Germany

Hochrepetierend gepulste Titan:Saphir-Laser mit weitem Abstimmbereich und geringer spektraler Breite sind wichtige Werkzeuge für moderne Spektroskopieansätze, z. B. beim hochauflösenden Studium von Ionisationsschemata und speziell Hyperfeinstruktur und Isotopieverschiebung an radioaktiven Isotopen. In der Mainzer Arbeitsgruppe LARISSA werden entsprechende Lasersysteme entwickelt und eingesetzt, wobei ein Reflexionsgitter in Littrow-Anordnung als frequenzselektives Element verwendet wird. Der existierende Aufbau bietet Verbesserungsansätze hinsichtlich Konversionseffizienz, Schmalbandigkeit, Strahlprofil und Benutzerfreundlichkeit. Aktuelle Ansätze tendieren zu einem Resonator in Littman-Geometrie, bei dem die Frequenzselektion über ein feststehendes Gitter stattfindet. Die 1. Beugungsordnung wird mit einem Drehspiegel an geeignet positioniertem Pivotpunkt zurückreflektiert. Die Laserstrahlung wird direkt über die 0. Beugungsordnung ausgekoppelt. Ein solcher Laseraufbau ohne Strahlaufweiter und Auskoppelspiegel und mit feststehendem Reflexionsgitter besticht durch seine Einfachheit. Zusätzlich soll eine Frequenzverdopplung etabliert werden, bei der die Phasenanpassung des Verdopplungskristalls automatisch in Abhängigkeit der Wellenlänge erfolgt. Somit wird der Abstimmbereich des Lasers um den Bereich der zweiten Harmonischen des Titan:Saphir-Lasers erweitert.