A 44: 100 Years of Mass Spectrometry 1

Time: Friday 11:00–13:00 Location: E 415

Invited Talk A 44.1 Fri 11:00 E 415

MS for environmental and radiochemical applications — •Clemens Walther — Institut für Radioökologie und Strahlenschutz, Leibniz Universität Hannover Herrenhäuser Str. 2, 30419 Hannover

MS is applied frequently for investigating environmental questions, making use of the techniques' superior sensitivity and selectivity. A particular interesting field is the detection and speciation of radionuclides. The talk will revisit historical developments and will give an overview of recent applications for both, chemical speciation of radionuclides and trace detection in the environment.

Invited Talk A 44.2 Fri 11:30 E 415

Modern nuclear mass models — •Stephane Goriely — Institut d'Astronomie et d'Astrophysique, Université Libre de Bruxelles, CP226, 1050 Brussels, Belgium

The nuclear mass remains a property of fundamental importance not only for various aspects of nuclear physics, but also for some physics applications, such as nuclear astrophysics. We review the various mass models that have been developed in recent years and critically compare their predictions of experimentally known nuclear structure properties as well as their extrapolation towards the exotic neutron-rich nuclei. Special attention is devoted to recent microscopic mass models based on the mean-field Hartree-Fock-Bogolyuobov method with effective nucleon-nucleon interactions.

Invited Talk A 44.3 Fri 12:00 E 415

High-accuracy mass measurements for nuclear astrophysics — •Susanne Kreim — CERN, Genf, Schweiz — Max-Planck- Institut für Kernphysik, Heidelberg, Deutschland

The mass of a nucleus delivers the binding energy giving insight into structural effects throughout the nuclear chart from the lightest to the heaviest element. Precision measurements of masses far away from the valley of stability are also important to understand nuclear stability. Both notions are crucial for a correct description of astrophysical processes.

The so-called rapid neutron-capture process (r-process) of stellar nucleosynthesis is held responsible for the production of the heavy elements. However, the astrophysical site for a successful r-process has not been identified yet. A possible theory, alternative to the supernova-induced r-process, is the decompression of neutron-star matter by its merger with another neutron star. In the neutron-star crust, exotic rare isotopes become so-called equilibrium nuclei and can contribute to the elemental abundance. Another mechanism of stellar nucleosynthesis is the rp-process, rapid proton-capture process, which takes place on the proton-rich side of the valley of stability and originates in x-ray bursts.

Precise mass values are input parameters that constrain the models for the stellar creation of elements. Whenever masses are not (yet) available, one has to rely on mass models for the nuclei participating in astrophysical processes. New masses offer the required test bench for the predictive power of models. In this contribution, recently performed mass measurements as well as still desired ones will be discussed.

Invited Talk A 44.4 Fri 12:30 E 415

Storage ring mass and lifetime measurements — •Fritz Bosch — GSI Helmholtzzentrum, Darmstadt, Germany

The Experimental Storage Ring ESR provided the first opportunity for addressing precision masurements of masses and beta-decay characteristics of stored and cooled unstable highly-charged ions. This talk will focus on the first observations of the orbital electron-capture decay of H-like and He-like ions in well-defined quantum states. The ESR is for this purpose a unique tool, since the only, but unambiguous signature for these two-body decays is a sudden tiny jump of the revolution frequency. If only a few parent ions are injected and subsequently cooled, this extremely small change of the revolution frequency can be observed and clearly resolved. The first results of this "single-ion decay spectroscopy" will be reported and discussed.