HK 42 Kernphysik/Spektroskopie

Zeit: Donnerstag 14:00–15:30 Raum: C

Gruppenbericht

HK 42.1 Do 14:00 C

Identification of Superheavy Elements by the Atomic Properties of their Decay Products — •M. Sewtz[1], A. Yakushev[2], W. Lauth[3], S. Fritzsche[4], D. Habs[1], A. Türler[2], and H. Backe[3] — [1]LMU München — [2]TU München — [3]Universität Mainz — [4]Universität Kassel

The discovery of relatively long-lived isotopes of superheavy elements with nuclear charge numbers Z=114, 116 and 118 is the most fascinating aspect of superheavy element research in the last decades which confirms -if true- an over 30 year old theoretical prediction of a so-called "island of stability" located around Z=114, 120 or 126 and N=184. However, the coexistence of α-decays from different isomeric states, electron capture and spontaneous fission may hamper any attempt to identify the endpoints of the decay chains by considering only the nuclear properties.

The development of resonance ionization spectroscopy and ion mobility spectrometry at the first trans-actinide elements Rf and Db may open up the way for Z-selective detection of the endpoint isotopes ^{267,268}Rf and ^{267,268}Db. These techniques can be combined with mass analysis and thus allow for Z- and mass number A- selective detection which would represent a direct connection of the decay chains of the reported super-heavy elements to the well established part of the chart of nuclei.

The combination of these ultra sensitive experimental methods with state of the art atomic level calculations has already proven successful at the first optical spectroscopy at element 100 [1,2]. *Supported by BMBF under contract no. 06 MZ 169I [1] M. Sewtz et al., Phys. Rev. Lett. **90(16)**, 163002-1 (2003) [2] H. Backe et al., Hyp. Int. (2005), submitted

Gruppenbericht

HK 42.2 Do 14:30 C

Mass measurements of rare earth radionuclides around 147Ho at SHIPTRAP — •Michael Block for the SHIPTRAP collaboration — GSI, Planckstrasse 1, 64291 Darmstadt

The Penning trap mass spectrometer SHIPTRAP at GSI Darmstadt was set up for precision mass measurements of heavy radionuclides produced in fusion evaporation reactions and separated by the velocity filter SHIP. Two interesting regions in the chart of nuclides that can be accessed by this production method are the region around the doubly magic 100Sn and the region of elements heavier than uranium. The perspectives based on the present status will be outlined.

Recently, first mass measurements of proton-rich radionuclides around 147Ho, produced in the reaction 92Mo(58Ni,xpyn), were performed with the SHIPTRAP Penning trap mass spectrometer. In this region near the proton drip-line systematic studies of the proton separation energies are an important tool to map the drip-line and to identify ground state proton-emitter. The proton separation energies can be derived from precise mass measurements. Therefore, systematic measurements along isotopic or isotonic chains are foreseen. First results from SHIPTRAP will be presented.

HK 42.3 Do 15:00 C

Transition probabilities in the common odd neighbor nucleus of the X(5) like nuclei ^{176,178}Os — •O. Möller[1], A. Dewald[1], B. Melon[1], Th. Pissulla[1], J. Jolie[1], K.O. Zell[1], P. Petkov[2], D.R. Napoli[3], M. Axiotis[3], C. Rusu[3], D. Bazzacco[4], C.A. Ur[4], and R. Menegazzo[4] — [1]Institut für Kernphysik, Universität zu Köln, Köln, Deutschland — [2]Bulg. Acad. of Sciences, Inst. for Nucl. Res. and Nucl. Ener., Sofia, Bulgaria — [3]INFN, Laboratori Nazionali di Legnaro, Italy — [4]Dipartimento di Fisica dell'Universita' and INFN Sezione Padova,Padova, Italy

Lifetimes of states in the $\nu 1/2[511]$ and $\nu 7/2[633]$ bands of ^{177}Os have been measured using the Köln coincidence plunger device and the GASP spectrometer at the LN Legnaro. Excited states were populated via the ^{154}Sm(^{29}Si,4n)^{177}Os reaction at E(^{29}Si) = 145 MeV. Calculations in the framework of the triaxial rotor plus particle model give a good agreement, both for the energy spectrum and the absolute transition probabilities. In order to fit the measured B(E2) values of the positive and negative parity bands, different deformations had to be assumed which points to specific polarization effects on the core due to the occupation of the different single particle levels by the odd neutron. Since ^{177}Os lies just in-between ^{176}Os and ^{178}Os, which were recently found to show the features of the critical point symmetry X(5), it is interesting to check whether X(5) like features can also be observed in the common odd neighbor nucleus ^{177}Os.

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HK 42.4 Do 15:15 C

Test of the critical point symmetry X(5) in case of ^{176}Os with absolute transition probabilities — •B. Melon[1], A. Dewald[1], O. Möller[1], Th. Pissulla[1], C. Fransen[1], A. Linnemann[1], J. Jolie[1], K.O. Zell[1], P. Petkov[2], D.R. Napoli[3], C. Rusu[3], D. Bazzacco[4], C.A. Ur[4], and R. Menegazzo[4] — [1]Institut für Kernphysik, Universität zu Köln, Köln, Germany — [2]Bulg. Acad. of Sciences, Inst. for Nucl. Res. and Nucl. Ener., Sofia, Bulgaria — [3]INFN, Laboratori Nazionali di Legnaro, Italy — [4]Dipartimento di Fisica dell'Universita' and INFN Sezione Padova, Padova, Italy

It has been shown that the energy spectrum and the experimental transition probabilities of ^{178}Os can be very well described in the framework of the critical point symmetry X(5)[1]. ^{178}Os is the first example of an X(5) like nucleus in a mass region different to A = 150 where the first X(5) like nuclei were identified. Based on the energy spectrum, also ^{176}Os was found to be a good X(5) candidate. Therefore we performed a lifetime measurement with the Köln coincidence plunger device and the GASP spectrometer at the Laboratori Nazionali di Legnaro using the ^{152}Sm(^{29}Si,5n)^{176}Os reaction at E(^{29}Si) = 145 MeV to allow for a more a stringent test of the X(5) predictions including absolute transition probabilities. The obtained results will be presented and will be compared to the calculated values in the framework of the X(5) model, the Interacting Boson Model (IBM) and the General Collective Model (GCM).

[1] A. Dewald et al., J.Phys.(London) G31, S1427 (2005)