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Evolution of the N=82 Neutron-Deficient Shell Closure and Pushing Toward the Proton Drip-Line at TITAN

Monday 3 June 2019 12:00 (15 minutes)

In the region where the expected N=82 shell closure approaches the proton drip-line, we are confronted with our poor knowledge of the nuclear binding energies. Precision experimental data is critical if we are to gain an understanding of how this neutron shell evolves for the heaviest N=82 isotones. The binding energies of neutron deficient nuclei can also reveal the exact location of the proton drip-line. However, the current lack of precision mass measurements in this region makes these nuclei stand out as a clear target for mass spectrometry studies, which allow for the determination of these binding energies. Furthermore, masses in this region can provide an anchor for chains of alpha decays whose origins extend up to A≈170, and for which only relative masses are presently known.

The Isotope Separator and ACcelerator (ISAC) facility at TRIUMF produces intense beams of exotic isotopes for nuclear science. I will present the results of a series of atomic mass measurements of neutron-deficient Yb and Tm isotopes around the N=82 shell closure. Several of these masses were measured directly for the first time. These measurements were carried out using the recently commissioned Multiple Reflection Time-Of-Flight Mass Spectrometer (MR-TOF-MS) at TRIUMF's Ion Trap for Atomic and Nuclear science (TITAN). The results enable us to reduce the uncertainty in the nuclear binding energies, thus pushing towards the proton drip-line and providing new insight into the behaviour of the N=82 shell closure far from stability.

Author: KOOTTE, Brian

Co-authors: ANDREIOU, C. (Department of Physics, Simon Fraser University, Burnaby, British Columbia); Mr BECK, Soenke (University of Giessen/GSI); BRUNNER, Thomas (McGill University); DILLING, Jens (triumf/UBC); DILLMANN, Iris; DUNLING, ELEANOR (TRIUMF); FLOWERDEW, Jake (University of Calgary); Dr GRAHAM, Leigh (TRIUMF); GWINNER, Gerald (University of Manitoba); JACOBS, A. (TRIUMF); Mr KLAWITTER, Renee (Max--Planck-Institut fur Kernphysik, Heidelberg D-69117, Germany); LAN, Yang (TRIUMF); LEISTENSCHNEIDER, Erich (TRIUMF); LYKIARDOPOULOU, M. (TRIUMF); Mr MONIER, Victor (University of York); MUKUL, Ish (TRIUMF); PAUL, Stefan (TRIUMF); Dr REITER, Moritz Pascal (University of Giessen/TRIUMF); Prof. THOMPSON, Robert (University of Calgary, Canada); TRACY, JR., J.L. (TRIUMF); Mr VANSTEENKISTE, Mike (Waterloo/TRIUMF); WIESER, Michael (University of Calgary); Mr WILL, Christian (University of Giessen); KWIATKOWSKI, Anna (TRIUMF)

Presenter: KOOTTE, Brian

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