

Structure of neutron-rich nuclei around the N=126 closed shell

Zs. Podolyák¹, P.H. Regan¹, S. Steer¹, G. Farelly¹, N. Al-Dahan¹, A. Denis², N. Alkhomashi¹,
M. Górska³, S. Pietri³, J. Gerl³, H-J. Wollersheim³, J. Benlliure⁴ for the RISING collaboration

¹University of Surrey, UK

²University of Brighton, UK

³GSI, Darmstadt, Germany

⁴University of Santiago de Compostella, Spain

A series of experiments devoted to the study of the neutron-rich N~126 region have been performed at GSI, Darmstadt, within the Rare Isotopes Investigations at GSI (RISING) project. Exotic nuclei were synthesised using relativistic projectile fragmentation of ²⁰⁸Pb and ²³⁸U provided by the SIS synchrotron at GSI. The fragments produced were separated and identified event-by-event using the GSI FRagment Separator (FRS). The final reaction products were stopped in layers of plastic, copper, or double-sided-silicon-strip detectors at the final focal point of the FRS and viewed by the high-efficiency, high granularity Stopped RISING gamma-ray spectrometer, consisting of 15 Euroball cluster Ge-detectors. Time-correlated gamma decays from individually identified nuclear species have been measured, allowing the clean identification of isomeric decays (passive stopper), and beta and conversion electron decays (active Si stopper).

Selected highlights of the experimental results from these highly successful experiments will be presented:

- (i) the first observation of excited states in the N=126 closed-shell nucleus, ²⁰⁴Pt, following the internal decay of I=(5⁻), (7) and (10⁺) isomeric states;
- (ii) first observation of excited states in the N=126 ²⁰⁵Au nucleus, following the internal decay of an isomer built on the $\Pi h_{11/2}^{-1}$ state, as well the conversion electron decay of the $\Pi h_{11/2}^{-1}$ seconds lived isomeric state into the $\Pi d_{3/2}^{-1}$ ground-state.
- (iii) new experimental information on a range of nuclei in the region: ²⁰⁸Hg, ²⁰³Pt, ¹⁹⁸Os.
- (iv) beta-decay of heavy neutron-rich nuclei

Experiments, results, comparison with theoretical calculations will be discussed.