

β -decay of very neutron-rich Rh, Pd, Ag nuclei

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The astrophysical origin of about half of the elements heavier than iron have been attributed to the rapid neutron capture process (r-process). Reliable nuclear physics is needed to link theoretical models with astronomical observations. The region around the $N = 82$ shell closure is of particular interest as it is responsible for the $A = 130$ peak in the solar abundance pattern. The peak is the result of the longer β -decay timescale compared to the neutron capture timescale when the r-process path reaches the shell closure [1] [2] [3].

An experiment to investigate half-lives and β -delayed neutron emission branching ratios of neutron-rich nuclei was performed at the GSI projectile FRagment Separator (FRS) [4]. A 900 MeV/u, ^{238}U beam delivered by the SIS-18 synchrotron impinged upon a 2480 mg/cm² thick beryllium target placed at the FRS entrance. Produced fission fragments were selected in flight via the $B\rho - \Delta E - B\rho$ method. The ions were then implanted at the final focal plane of the FRS into the Silicon Implantation detector and Beta Absorber (SIMBA) [5]. SIMBA detected implants as well as subsequent β -decays which can be correlated in time and position to its respective implant. The silicon arrays were surrounded with the BEta deLayEd Neutron detector (BELEN-30) [6]. BELEN-30 consisting of 30 ^3He tubes embedded in a polyethylene matrix which thermalized and detected β -delayed neutrons emission with an efficiency of about 40%.

Several $B\rho$ settings of the FRS were used during the experiment to yield optimum secondary beam intensities of the ions of interest. Preliminary analysis has identified neutron-rich Rh, Pd, Ag, and Cd isotopes in the region close to the $N = 82$ shell closure. The identification of the ions implanted into SIMBA has been completed. Figure 1 shows the separation between different species in the particle identification. Some species identified have no previous

measurement of half-life and/or β -delayed neutron emission branching ratio. The determination of the implanted ion's half-lives and branching ratios is currently underway.

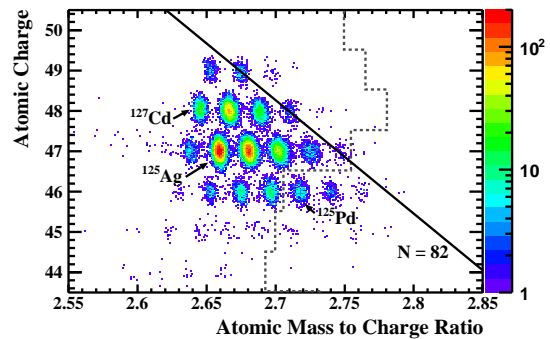


Figure 1: Cumulative Implanted Particle Identification (PID). Isotopes left of the dashed jagged line have known half-lives. Isotopes along the solid line have $N = 82$.

References

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