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Decay γ-spectroscopy of neutron-rich Ge - Br isotopes around A ~ 90 - 100

Nuclear data calculated by theoretical models play a large role in our understanding of the r-process due to the experimental difficulties in producing these very neutron-rich nuclei directly. In turn, experimental data are crucial in validating and constraining these models with the focus often on nuclear masses, half-lives and neutron emission probabilities. Nuclear structure also plays a key role and cutting-edge nuclear models have shown decay properties such as half-lives and P_n values to exhibit significant sensitivity to both nuclear shape and the competition between allowed Gamow-Teller (GT) and first-forbidden (FF) β-transitions. This sensitivity is particularly evident around shell closures and the mid-shell region. However, little to no γ-spectroscopy data exist for neutron-rich isotopes in the N ~ 60, A ~ 90 - 100 region.

Installed at RIKEN Nishina Center's RIBF facility since 2016, the BRIKEN
collaboration has significantly extended the envelope of known decay data for β-delayed neutron emitters between A = 70 and 170, contributing hundreds of new and more precise β-decay half-lives and neutron emission probabilities. In addition to the silicon implantation detector AIDA and the array of ^{3}He neutron counters, the BRIKEN array also includes two HPGe clovers to allow coincident γ-ray spectroscopy.

Presented here is the first look at γ-spectroscopy data obtained using the BRIKEN detector in neutron-rich Ge, As, Se and Br isotopes around N ~ 60 and A ~ 100. This region shows a mini-peak in observed r-process abundance distribution, most likely originating from nuclear structure effects like strong deformation. However, despite a similar potential production mechanism, this area has so far received much less attention from the r-process community than the rare-earth peak at A ~ 160. This analysis offers a first look into the decay patterns of the most neutron-rich Ge, As, Se and Br isotopes.

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