

Structure of ^{110}Zr - first spectroscopy and its implications for shell evolution and the r-process

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A predicted $Z=40$ subshell closure in ^{110}Zr has long been considered a potential explanation for the excess of elemental abundances before the $A=130$ r-process peak. We performed the first spectroscopy of this nucleus at the RIKEN-RIBF facility, populating the low-lying levels via $(p,2p)$ knockout and measuring the energies with the MINOS tracker and DALI2 NaI array. We will present first spectroscopy results, $^{111}\text{Nb}(p,2p)^{110}\text{Zr}$ and $^{112}\text{Mo}(p,3p)^{110}\text{Zr}$ cross sections, complementary analysis of neighboring nuclei, implications for structural evolution in the $50 < N < 82$ region, and the impact on our understanding of the formation of the $A=130$ r-process peak. Additionally, we report on a broader, ongoing study of $(p,2p)$ and $(p,3p)$ quasi-free scattering cross sections as measured during the SEASTAR (Shell Evolution And Search for Two-plus energies At RIBF) campaigns.

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