Study of neutron-deficient zinc isotopes - production, two proton radioactivity and other decay modes

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The most neutron-deficient isotopes of zinc known to date are ^{54}Zn, ^{55}Zn and ^{56}Zn. ^{54}Zn was first observed in 2005 [1] and it is one of a few nuclei that undergo two proton radioactivity. As the most recently discovered decay mode, 2p radioactivity is still not well understood. Exotic 2p emitters are difficult to produce in numbers sufficient for statistically significant analysis. The most thorough investigation of this decay mode was so far only achieved for ^{45}Fe [2], where the momentum distribution of protons strongly supported a three body model of the decay.

In April 2019, we made an attempt to produce and study ^{54}Zn at RIKEN facility in Japan. We produced $^{54,55\&56}$Zn in the projectile fragmentation of ^{78}Kr beam on a beryllium target and measured production cross section for those nuclei using the BigRIPS separator [3]. Furthermore, we registered several 2p decays of ^{54}Zn along with other decay modes for ^{55}Zn and ^{56}Zn using the Warsaw OTPC detector placed at the end of the BigRIPS beamline.

In this contribution, we present and discuss the results of the RIKEN experiment. We show the results of the cross section measurement and we compare them with models and other production methods in hope for finding the best solution for two-proton emitters production. We also show the results for ^{54}Zn 2p decays and ^{55}Zn beta-delayed decays.

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[2] K. Miernik *et al.*, Eur. Phys. J. A **42** (2009) 431-439.
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