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β decay of neutron-rich ^{135}In, ^{134}In and ^{133}In nuclei: γ emission from neutron-unbound states in ^{134}Sn and ^{133}Sn

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Experimental studies of nuclei far from stability provide guidance for further development of nuclear models. Simple systems in the proximity of the doubly-magic shell closures are the best cases for testing the predictive power of shell-model calculations. In this context, understanding of the nuclear structure in the closest proximity of the doubly-magic ^{132}Sn is essential before making extrapolations of the nuclear properties towards more neutron-rich tin isotopes. In this work, the β decay of ^{135}In has been studied for the first time.

Excited states in ^{133}Sn, ^{134}Sn and ^{135}Sn were investigated via β decay of ^{133}In, ^{134}In and ^{135}In at ISOLDE Decay Station. Isomer-selective ionization using RILIS enabled the β decays of ^{133g}In (I$^{\pi}$=9/2^{+}) and ^{133m}In (I$^{\pi}$=1/2^{-}) to be studied independently for the first time. Thanks to the large spin difference of those two β-decaying states, it is possible to investigate separately the lower- and higher-spin states in the daughter ^{133}Sn and thus to probe single-particle transitions relevant in the neutron-rich ^{132}Sn region. Single-hole states in ^{133}Sn were identified at energies exceeding neutron-separation energy up to 3.7 MeV. Due to centrifugal barrier hindering the neutron from leaving the nucleus, the contribution of electromagnetic decay of those unbound states was found to be significant. The same phenomenon was observed for a new neutron-unbound state identified in ^{134}Sn. Preliminary results of the first β-decay studies of ^{135}In were obtained. Comprehensive description of excited states in ^{133}Sn and ^{134}Sn was deduced from both β and βn decay branches of indium isotopes.

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