Contribution ID: **111** Type: **Oral**

First β-decay spectroscopy of 135In and new β-decay branches of 134In

Thursday, 16 June 2022 16:30 (20 minutes)

The β decay of the neutron-rich ^{134}In and ^{135}In was investigated experimentally with the aim of providing new insights into the nuclear structure of the tin isotopes above $N = 82$. Better understanding of exotic nuclides from the ^{132}Sn region is required for accurate modeling of the rapid neutron capture nucleosynthesis process (r process), due to the $A \approx 130$ peak in the r-process abundance pattern being linked to the $N = 82$ shell closure [1, 2]. Because a vast number of nuclei involved in the r process are β-delayed neutron (βn) emitters, new experimental data that can verify and guide theoretical models describing βn emission are of particular interest. Neutron-rich isotopes ^{134}In and ^{135}In –being rare instances of experimentally accessible nuclides for which the $\beta 3n$ decay is energetically allowed [3] –constitute representative nuclei to investigate the competition between βn and multiple-neutron emission as well as the γ-ray contribution to the decay of neutron-unbound states.

The β-delayed γ-ray spectroscopy measurement was performed at the ISOLDE Decay Station. Three β-decay branches of ^{134}In were established, two of which were observed for the first time [4]. Population of neutron-unbound states decaying via γ rays was identified in the two daughter nuclei of ^{134}In, ^{134}Sn and ^{133}Sn, at excitation energies exceeding the neutron separation energy by 1 MeV. The βn- and $\beta 2n$-emission branching ratios of ^{134}In were determined and compared with theoretical calculations. The βn decay was observed to be dominant β-decay branch of ^{134}In even though the Gamow-Teller resonance is located substantially above the two-neutron separation energy of ^{134}Sn. Transitions following the β decay of ^{135}In are reported for the first time, including γ rays tentatively attributed to ^{135}Sn [4]. A transition that might be a candidate for deexciting the missing neutron single-particle $\nu 1i_{13/2}$ state in ^{133}Sn was observed in both β decays and its assignment is discussed. Experimental level schemes of ^{134}Sn and ^{135}Sn are compared with shell-model predictions, including calculations considering particle-hole excitations across the $N = 82$ shell gap [5].

[1] B. Pfeiffer, K. L. Kratz, F. K. Thielemann, and W. B. Walters, Nucl. Phys. A 693, 282 (2001).
[2] M.R. Mumpower, R. Surman, G.C. McLaughlin, and A. Aprahamian, Prog. Part. Nucl. Phys. 86, 86 (2016).
[3] M. Wang, W. J. Huang, F. G. Kondev, G. Audi, and S. Naimi, Chin. Phys. C 45, 030003 (2021).
[4] M. Piersa-Siłkowska et al. (IDS Collaboration), Phys. Rev. C 104, 044328 (2021).
[5] H. Jin, M. Hasegawa, S. Tazaki, K. Kaneko, and Y. Sun, Phys. Rev. C 84, 044324 (2011).

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Session Classification: NS2022 Plenary

Track Classification: Oral Presentations