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^{243}Es, ^{249}Md: from production cross-sections measurement to spectroscopy – Perspectives at GANIL-SPIRAL2/S3

Detailed spectroscopy of heavy nuclei (HN) and super heavy nuclei (SHN) is of paramount importance to provide information on the nuclear landscape at the upper limit of the nuclear chart and on the nature of the predicted island of stability. However, these studies are made difficult by the involved low production cross-sections. In this context, measurement of production cross-sections, as well as half-lives and decay channels, constitute the first step towards more detailed spectroscopies of HN and SHN.

The odd-Z, even-N ^{243}Es and ^{249}Md have been produced at the University of Jyväskylä using the fusion-evaporation reactions ^{197}Au(^{48}Ca,2n)^{243}Es and ^{203}Tl(^{48}Ca,2n)^{249}Md, respectively. Fusion-evaporation residues were selected using the Recoil Ion Transport Unit (RITU) gas-filled separator and detected using the Gamma Recoil Electron Alpha-Tagging (GREAT) experimental setup. The Recoil Decay Tagging (RDT) analysis allowed to extract the half-lives, branching ratios and, for the first time, the production cross-sections of ^{243}Es and ^{249}Md [1]. Experimental results will be presented and compared to calculations made using the KEWPIE2 code [2]. Following this feasibility experiment, a second one dedicated to the prompt and delayed spectroscopy of ^{249}Md has been performed. Promising preliminary results will be presented.

Finally, in the near future, the Super Separator Spectrometer S3 [3] at GANIL-SPIRAL2 will be coupled with i) the Spectroscopy and Identification of Rare Ions Using S3 (SIRIUS) detector and ii) the Low Energy Branch (LEB) [4]. These two devices, which will offer new opportunities for spectroscopic studies of HN/SHN, will be presented. In particular, the LEB will allow to probe the structure of the HN/SHN independently of the nuclear models using laser ionization spectroscopy. In this context, the future detector SEASON, which will allow coupling delayed spectroscopy (alpha, conversion-electron and gamma) to laser ionization spectroscopy, will also be presented.

References

[1] R. Briselet, Ch. Theisen, M. Vandebrouck, A. Marchix et al. Phys. Rev. C 99, 024614 (2019).
[2] H. Lü, A. Marchix, Y. Abe and D. Boilley. Comput. Phys. Comm. 200, 381 (2016).
[3] F. Déchery et al. EPJA 51, 66 (2015).
[4] R. Ferrer et al. NIM B 317, 570 (2013).