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In-beam γ-ray spectroscopy of neutron-rich actinides at the JAEA Tandem accelerator

R. Orlandi [1], H. Makii[1], K. Nishio[1], E. Ideguchi[2], T.T. Pham[2], M. Asai[1], K. Tsukada[1], K. Hirose[1], T.K. Sato[1], Y. Ito[1], F. Suzaki[1], A.N. Andreyev[1,3], N. Aoi[2], T. Shizuma[4], Y. Fang[5], M. Kumar Raju[5], J-G.Wang[5], B. Gao[5], S. Yan[6], K.P. Rykaczewski[7]

[1] *Advanced Science Research Center, Japan Atomic Energy Agency, Tokai, Japan*
[2] *Research Center for Nuclear Physics (RCNP), Osaka University, Japan*
[3] *Department of Physics, University of York, Heslington, United Kingdom*
[4] *National Institutes for Quantum and Radioalogical Science and Technology (QST), Tokai, Japan*
[5] *Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China*
[6] *China Institute of Atomic Energy, Beijing, China*
[7] *Oak Ridge National Laboratory, Oak Ridge TN, USA*

In the search for the Island of Stability (IoS), indirect information can be obtained by studying actinide isotopes in the region neighbouring the deformed doubly magic nucleus ^{252}Fm (Z=100, N=152). The valence proton and neutron orbitals of nuclei in this region, in fact, include also some substates, lowered by deformation, of those orbits that give rise to the spherical shells of the IoS. The properties of actinides near the deformed shell gaps can thus provide benchmarks for theoretical models that predict the location of the IoS and the properties of Super Heavy Elements [1]. The nuclear structure of neutron-rich actinides, however, is poorly known due to the difficulty of producing and studying these heavy isotopes. At the JAEA Tandem accelerator laboratory in Tokai, Japan, in-beam γ-ray spectroscopy experiments were recently carried out to study the structure of actinides such as ^{248}Cf (Z=98, N=150), ^{249}Cf(Z=98, N=151), ^{254}Es(Z=99, N=155) and ^{252}Fm. The JAEA Tandem is one of the few facilities in the world where radioactive actinide targets can be irradiated using beam of heavy ions. The nuclei of interest were either Coulomb excited (^{249}Cf, ^{254}Es), or produced using transfer reactions induced by heavy-ion beams (^{248}Cf, ^{252}Fm). A brief overview of some recent results and their implications for the deformed shell gaps at Z=100 and N=152 will be presented.

Reference

[1] Ch. Theisen *et al.*, Nuclear Physics A **944**, 333–375 (2015).