Fission Probability of Actinide Nuclei Obtained Using ^{18}O-induced Multi-Nucleon Transfer Channels

*Kun Ratha Kean[1], Satoshi Chiba[1], Katsuhisa Nishio[2], Kentaro Hirose[2], Mark Vermeulen[2], Hiroyuki Makii[2], Riccardo Orlandi[2], Kazuaki Tsukada[2]

[1] Tokyo Institute of Technology, [2]Japan Atomic Energy Agency

Measurement of fission probabilities of several actinide nuclides was carried out at the JAEA tandem accelerator facility using the multi-nucleon transfer channels of ^{18}O+^{238}U, which can be used to determine the fission cross sections as a surrogate of neutron-induced reactions. Results of fission barrier height will be also presented.

Keywords: multi-nucleon transfer reaction, fission probability, fission barrier height

Measurement of neutron-induced fission cross sections for short-lived nuclei is practically impossible due to the lack of available target material. Instead a surrogate reaction technique using transfer or multi-nucleon transfer reactions have been applied to indirectly determine the fission cross sections. Compared to the several attempts using lighter ions such as ^{3,4}He beams, we choose heavy-projectile ^{18}O, which can populate a wide range of compound nuclides in one reaction due to opening many transfer channels [1]. In this work, we have carried out an experiment of the ^{18}O+^{238}U reaction to determine fission probabilities of several nuclides, which is the basis to determine the fission cross sections. Another goal of this measurement is to determine the fission barrier heights systematically.

The experiment was carried out using a 157.5-MeV ^{18}O beam (0.5pnA) from the JAEA tandem accelerator. The beam bombarded the ^{238}U target having thickness of 80μg/cm^2. The ejectile nuclides were identified by a ΔE-E silicon telescope to assign the transfer channel and corresponding compound nuclide. Fission fragments were detected by four multi-wire proportional counters (MWPCs). The obtained spectra showed population of twelve compound nuclides $^{237\text{-}240}$U, $^{239\text{-}242}$Np and $^{241\text{-}244}$Pu. Data analysis of the fission probabilities and fission barrier height analysis is ongoing, and the obtained results will be presented in the meeting.

The work is partially supported by the Comprehensive study of delayed-neutron yields for accurate evaluation of kinetics of high burn-up reactors, by the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) and by MEXT scholarship program for Cambodian students.

References

[1] R. Lèguillon et al., Phys. Lett. B, **761**, 15 (2016).