

## Fission studies using multi-nucleon transfer reactions at the JAEA tandem

Tuesday, June 12, 2018 11:30 AM (30 minutes)

In this talk we will discuss the use of multi-nucleon transfer (MNT) reactions to study fission properties of a series of exotic nuclei in the neutron-rich actinide region. Most of these nuclei cannot be accessed by the traditional method of complete-fusion reactions. The MNT transfer channels of the  $^{18}\text{O}+^{232}\text{Th}$  reaction were used to study fission of fourteen nuclei:  $^{231,232,233,234}\text{Th}$ ,  $^{232,233,234,235,236}\text{Pa}$ , and  $^{234,235,236,237,238}\text{U}$  [1]. Identification of fissioning nuclei and of their excitation energy is performed on an event-by-event basis, through the measurement of outgoing ejectile particle in coincidence with fission fragments. Fission fragment mass distributions (FFMDs) are measured for each transfer channel. In particular, the FFMDs of  $^{234}\text{Th}$  and  $^{234,235,236}\text{Pa}$  were measured for the first time. Predominantly asymmetric fission is observed at low excitation energies for all studied cases, with a gradual increase of the symmetric mode towards higher excitation energy. By using the same method, the measurements with  $^{238}\text{U}$  [2],  $^{237}\text{Np}$ ,  $^{248}\text{Cm}$ , and  $^{249}\text{Cf}$  targets were recently performed.

The obtained FFMDs are compared with a calculation based on the fluctuation-dissipation model [2,3], where effect of multi-chance fission (neutron evaporation prior to fission) was considered. It was found that multi-chance fission has significant role on the shape of FFMD, particularly at the high-excitation energies.

### Reference

- [1] R. Leguillon et al., Phys. Lett. B 761, 125 (2016)
- [2] K.Hirose et al., Phys. Rev. Letters, 119, 222501 (2017)
- [3] Y. Aritomo and S. Chiba, Phys. Rev. C 88, 044614 (2013)

**Primary author:** Prof. ANDREYEV, Andrei (University of York (UK), JAEA (Tokai, Japan))

**Presenter:** Prof. ANDREYEV, Andrei (University of York (UK), JAEA (Tokai, Japan))

**Session Classification:** Fission

**Track Classification:** Fission