

## Production of Np isotopes from 238U beam at BigRIPS in RIKEN/理研 BigRIPS での 238U ビームからの Np 同位体の生成

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A variety of unstable nuclear beams with atomic numbers (Z) up to 92 can be produced by the projectile fragmentation and in-flight fission from high intensity U beams at RIBF. Recently, it was found that  $^{234-238}\text{Np}$  can be created by a proton pickup reaction on 1 GeV/nucleon  $^{238}\text{U}$  beam. Owing to the recent developments of the high-Z beams at BigRIPS, energy dependence of the proton pickup reaction on  $^{238}\text{U}$  can be obtained at RIBF. Thus, we conducted an experiment to determine the energy dependence of the production cross section of  $^{237}\text{Np}$ . A test of the production of Np isotopes was performed by using the BigRIPS spectrometer at RIBF in March 2022.

Secondary beams around  $Z = 90$  were produced by a  $^{238}\text{U}$  beam with energies of 345 and 250 MeV/nucleon impinging on a 1-mm-thick  $^9\text{Be}$  production target at F0 in BigRIPS.

The particle identification (PID) of the secondary beam was performed using the TOF-Bp- $\Delta E$  method.

To validate the production of the  $^{237}\text{Np}^{91+}$ , a two dimensional (2D) Gaussian fitting approach was conducted in accordance with the distribution patterns of neighboring ions of  $^{234}\text{U}^{90+}$ ,  $^{235}\text{U}^{90+}$ , and  $^{232}\text{Pa}^{89+}$ . It is found that Np isotope can be counted up with contaminated U/Pa isotopes using the 2D Gaussian fitting technique. The production cross sections of  $^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{236}\text{U}$ ,  $^{232}\text{Pa}$ , and  $^{233}\text{Pa}$  as well as Np isotopes were derived.

In this presentation, we will report the analysis status of 345 MeV/nucleon.

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