Production cross sections of neutron-rich nuclei in the region around $Z = 33$ using the in-flight fission of a ^{238}U beam at the 345 MeV/nucleon

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A new isotope search experiment in the neutron-rich region around $Z = 33$ was performed in November 2014, aiming to expand the frontier of accessible neutron-rich exotic nuclei.[1] Here, we report on the production cross sections of neutron-rich nuclei measured in this experiment.

Figure 1 shows the measured production cross sections as a function of mass number. The measured production cross sections were derived from the measured production rates and transmission efficiency in the BigRIPS separator, which was based on the LISE^{++} simulations.[2] The determination of the beam intensity was expected to cause a systematic error of 30%. An additional uncertainty of 40% was estimated to be caused by the evaluation of the transmission efficiency. The total systematic error was thus estimated to be 50%. Because the evaluation of transmission efficiency was not reliable, we did not derive the cross sections for the isotopes whose mean positions at the F2 focus were located outside the slit opening. The natural decrease of the measured cross sections with mass number seems to show a reasonable behavior.

The blue solid lines in Fig. 1 show the predictions from the LISE^{++} simulations, in which the LISE^{++} abrasion fission model is employed to calculated the cross sections of fission fragments from the ^{238}U+Be reaction. The simulations were carried out in the Monte Carlo mode. We used LISE^{++} version 8.4.1 and the standard abrasion fission model parameters.[3] The production cross sections are reproduced fairly well by the LISE^{++} predictions.

The black squares in Fig. 1 show the production cross sections obtained from previous measurement.[4] We can see that the present results are in good agreement with previous data. These results strongly support the validity and consistency of our measurement.

In this experiment, some candidates for new isotopes were found.[1] Their production cross sections will be derived using the same analysis. Detailed analysis is currently in progress.

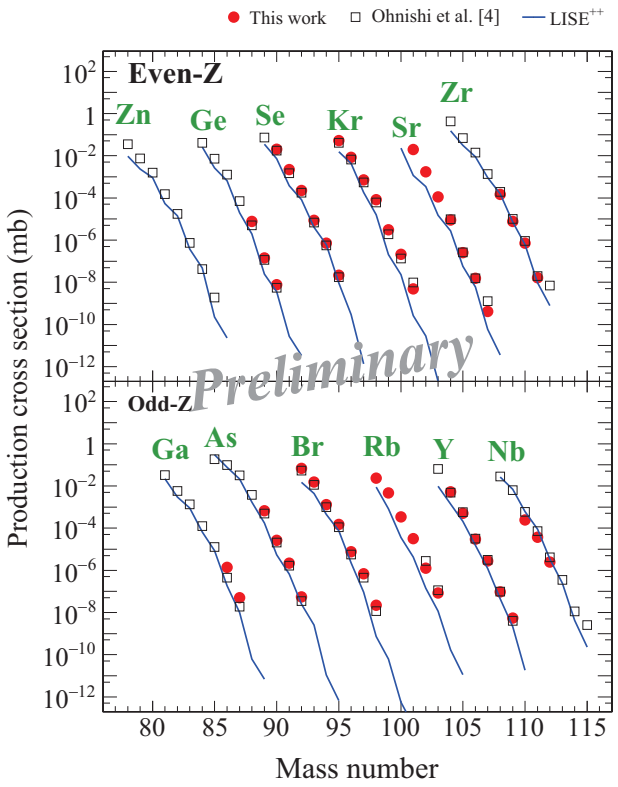

Fig. 1. Production cross section. The red circles and black squares represent those measured in this and previous work, respectively. The errors shown are statistical only. The blue solid lines show the LISE^{++} predictions.

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