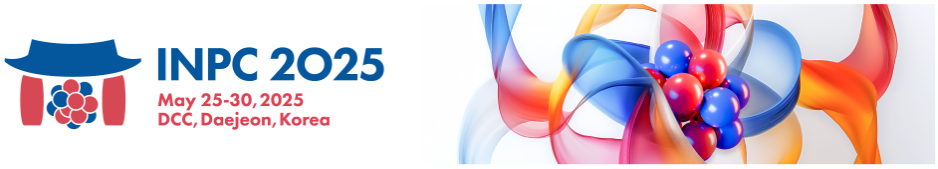

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Production of neutron-rich nuclei in the vicinity of 78Ni: Fragmentation reactions of unstable 81Ga and 82Ge beams

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Neutron-rich nuclei in the vicinity of doubly-magic nucleus ^{78}Ni ($Z = 28, N = 50$) is important for both nuclear physics and astrophysics. To explore these very neutron-rich isotopes, the question of how to produce them effectively in a laboratory arises. So far, two methods are widely used for production of neutron-rich nuclei: fragmentation of relevant stable nuclei and induced fission of ^{238}U. However, for the production of most neutron-rich nuclei in the ^{78}Ni region, both projectile fragmentation and the fission of ^{238}U encounter difficulties. For projectile fragmentation, no suitable relevant stable nuclei are available as projectiles. In the case of in-flight fission, the production cross sections dramatically decrease towards the very neutron-rich side.

Recently, a new method of the two-step scheme by combing ISOL and in-flight fragmentation has been proposed to produce very neutron-rich nuclei in "next-generation"facilities, such as EURISOL, BISOL and RAON. In order to evaluate the potential of the two-step scheme in producing exotic isotopes in the vicinity of ^{78}Ni, the fragmentation reactions of unstable nuclei ^{81}Ga ($Z = 31, N = 50$) and ^{82}Ge ($Z = 32, N = 50$) at 250 MeV/nucleon have been measured at RIKEN RIBF. The ^{81}Ga and ^{82}Ge beams were produced by in-flight fission of ^{238}U primary beam in BigRIPS separator. A 1.89-g/cm^2 ^{9}Be target was used to induce the fragmentation reactions. The reaction products were analyzed by the ZeroDegree spectrometer. For the first time, the fragmentation cross sections for very neutron-rich nuclei around ^{78}Ni were obtained. The newly measured cross sections were compared with various calculations. These data enable to make a comparison between the two-step and one-step methods for the production of extremely neutron-rich nuclei in the $N = 50$ region. In the presentation, the cross section results as well as the potential of two-step scheme in the production of very neutron-rich nuclei near ^{78}Ni will be discussed.

Consent

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