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Present status and upgrade plan of RI production target in SCRIT electron scattering facility

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Electron-beam-driven RI separator for SCRIT (ERIS) [1] was constructed as an online isotope separator (ISOL) system that is dedicated to produce a radioactive isotope (RI) beam for the SCRIT (Self-Confinement RI Target) electron scattering facility [2] at RIKEN RI Beam Factory. Electron scattering is one of the best ways to accurately understand the internal structure of atomic nuclei. The aim of this facility is realization of electron scattering experiment with unstable nuclei, for which the target nuclei of 108 ions/s are required.

In ERIS, the photofission of uranium driven by the electron beam is used for the RI production. 43 self-made uranium-carbide disks are stacked to be the target. The disk is approximately 1 mm thick and 18 mm in diameter. The amount of uranium is approximately 0.65 g/disk. The uranium-carbide disks are irradiated by 150 MeV electron beam accelerated by a microtron. Recently, the yields of ^{132}Sn and ^{137}Cs beams extracted from ERIS were achieved to 2.6×10^5 ions/s and 6.3×10^6 ions/s with 15-g and 28-g uranium targets and a 10-W electron beam, respectively [3], and, in particular, the ^{137}Cs beams were used for the world's first electron scattering experiment with online-produced unstable nuclei.[4]

For further experiments, we plan to upgrade the power of electron beam by a factor of 100 to 2kW in order to increase the yield of RI beam. Therefore, a high-power resistant system for ERIS is required, such as a production target itself, a remote handling system for irradiated targets, radiation shields, and so on.

In this contribution, we will report the present status and an upgrade plan of ERIS.

References

- [1] T. Ohnishi et al., Nucl. Instrum. Methods Phys. Res. B 317, 357 (2013).
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- [3] T. Ohnishi et al., Nucl. Instrum. Methods Phys. Res. B 541, 380 (2023).
- [4] K. Tsukada et al., Phys. Rev. Letters, in press. (2023).

Themes for the contribution

8 Multipurpose use of targets and beam dumps:

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