Research and development of a new gas-filled recoil separator GARIS-II


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We developed a new gas-filled recoil ion separator GARIS-II to study on asymmetric actinide-based reactions (hot fusion) [1, 2]. It will be used as a powerful tool for nuclear decay spectroscopy of superheavy element (SHE) nuclides and SHE chemistry. The separator consists of five magnets arranged in a Q_v-D-Q_h-Q_v-D configuration (D: dipole magnet, Q: quadrupole magnet). Ion optical characteristics are summarized in Fig. 1. The solid angle is increased from 12.2 to 18.5 msr, approximately 1.5 times higher than GARIS. The total path length 5.06 m of GARIS-II is shorter than 5.76 m of GARIS. It is possible to use various filled gas, such as He and He/H_2 mixture. The recoil ion with magnetic rigidity $B \rho < 2.43 \ T \cdot m$ will be able to collect to the focal plane.

This new separator was just starting to calibrate by using a standard $\alpha$-source of $^{241}$Am, 0 degree target recoils, and products via $^{40}$Ar-induced fusion reactions. We will give the status of GARIS-II including apparatus, such as a gas-cooled rotating target system and a focal plane detection system, around the separator.