Design and construction of RFIGISOL2 at CYRIC

II. 1. Design and construction of RFIGISOL2 at CYRIC

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The study of neutron rich unstable nuclei far from the valley of beta-stability is an important step toward the understanding of nuclear structure. The Radio Frequency Ion Guide Isotope Separator On-Line (RFIGISOL) system provides us neutron rich unstable nuclei produced by proton induced fission reactions with Uranium target. The RFIGISOL1 using large volume thermalization gascell equipped with DC and RF electric field was installed and developed in 2001[1)]. The mass separated fission yield was increased in comparison with the yield from a classical type IGISOL system[2)]. However, the mass separated fission yields from RFIGISOL1 was insufficient for the purpose of nuclear physics experiment such as perturbed angular correlation measurement at the region of more neutron rich unstable nuclei[3)].

The RFIGISOL2 has been developed to increase mass separated fission yields[4)]. Figure 1 shows schematic view of RFIGISOL2. The newly installed functions of RFIGISOL2 are as follows;

- modified electrode configuration at thermalization gascell
- cooling system of thermalization gascell
- driving mechanism of skimmer electrode

In themalization gascell, DC electric field of RFIGISOL1 was produced by 80 ring electrodes which are arranged to form a parabolic structure. Although the DC voltages were applied well, the sophisticated structure and heavy weight of the ring electrodes need to optimize of DC field. In RFIGISOL2, all electrodes have been printed on the 50 μm Kapton film. It is formed into a cylindrical shape. This realizes a flexible design of electrode structure and lighter weight.

A cooling system of thermalization gascell has been installed to reduce the impurity molecules in buffer gas. It has been operated at temperatures between -20°C and 80°C using Fluorinert^{TM} liquid indirect cooling brine. In thermalization gascell, the fission product ions collide with impurity molecules. This process leads to neutralization of fission product ions. This works as an effective method for avoiding ion loses by neutralization[5].

The driving mechanism of the skimmer electrode has been installed. This system enabled to optimize the distance between ion guide orifice and skimmer electrode in on-line experiments. A better optimized electrical field condition for ion optics and the adequate buffer gas pressure at the orifice skimmer region have been obtained. This optimization also enables us to improve velocity dispersion, ion transport, etc.

These new characteristics of RFIGISOL2 lead higher yields of mass separated fission fragments.

References

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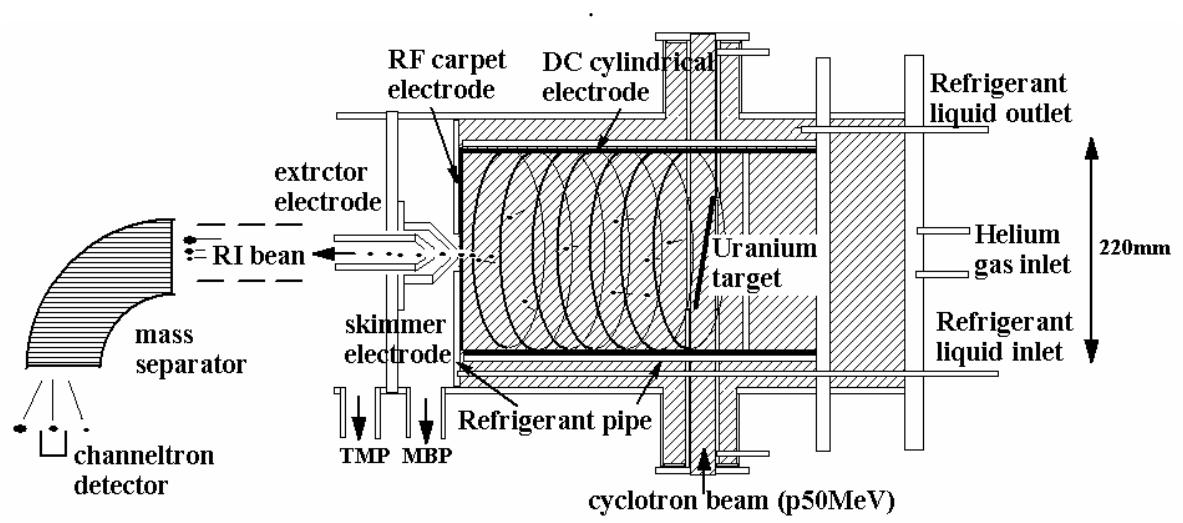

Figure 1. Schematic view of RFIGISOL2.