

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:

Development of a Np standard material for accelerator mass spectrometry

SPOKESPERSON:

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EXPERIMENTAL GROUP:

Full Name	Institution	Title or Position
Akihiko Yokoyama	Institute of Science and Engineering, Kanazawa University	(P)
Aya Sakaguchi	Department of Chemistry, Tsukuba University	(AP)

RUNNING TIME: Installation time without beam	1 days(for each beam time)
Development of device	0 days
Test running time for experiment	0 days
Data runs	2 days

BEAM LINE: AVF : K course

BEAM REQUIREMENTS: Type of particle	p
Beam energy	40 MeV
Beam intensity	1 μ A
Other requirements	energy resolution \leq 200 keV

BUDGET: Experimental expenses 0 yen

SAFETY CONTROLLED ITEMS:

Nuclear fuel material of depleted uranium is used.

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SUMMARY OF THE PROPOSAL

Summary.

In this study, neptunium material for a tracer in the mass spectroscopy measurement is produced in the irradiation of U-238 target with a proton beam. The produced atoms of neptunium isotopes are determined as a function of incident energies from 15 MeV to 40 MeV to obtain their production cross sections and find the best energy from the isotope ratios for production of Np-236 with the least contamination of Np-237. As a goal of the study, the standard material is prepared and applied to the analysis of environmental samples to discuss its feasibility.

1. Irradiation of uranium

- The $^{238}\text{U}(p,3n)^{236}\text{Np}$ reaction is performed in the K course of the AVF cyclotron in RCNP. Several targets of depleted uranium are prepared by electrodeposition on Al thin foils to make a stack target of them to obtain the yields at different energies simultaneously in one-time irradiation. The wanted nuclide is Np-236 in the ground state ($T_{1/2}=1.54 \times 10^6 \text{ y}$) although there is a nuclear isomer for the nuclide. Two days for irradiation are required for production of the nuclide. The irradiation for tracer production with a thick target is performed later.

2. Gamma measurement of the irradiated target

- Most of the radioactive products in the irradiations are expected to be nuclides much lighter than the target nuclide due to nuclear fission.
- The irradiated target is submitted to γ measurement to monitor the decay and reduction of the radioactivities.

3. Isolation of neptunium from target and mass spectrometry for neptunium

- Dissolution of the target and isolation of neptunium are performed to prepare samples for mass spectrometry.
- From the measurements, the yield of Np and the ratios of Np-236/Np-237 at the incident energies of study are determined.
- The best condition of irradiation is expected to be obtained.

4. Mass spectrometry for Np isotopes

- Standard material of Np is prepared from the irradiated thick target for the best condition obtained from the stack target experiment and applied to the environmental samples.