

Development of U-236 AMS in MALT –Measuring the soil samples in Fukushima

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Natural ^{236}U ($T_{1/2}=2.342\times 10^7\text{y}$) is produced by capturing of thermal neutron, whereas anthropogenic ^{236}U is generated by nuclear activities: global fallout, spent fuel reprocessing, and nuclear power plant decommissioning. Isotopic ratio of contaminated soil and sea water, for instance, are estimated to be $^{236}\text{U}/^{238}\text{U}\sim 10^{-9}$, therefore ^{236}U in natural samples are applied as a tracer recently.

There are mainly two reasons for development of ^{236}U AMS in MALT. First, measuring natural samples: sea water, coral core, and soil. Natural background of ^{236}U in these samples might be $^{236}\text{U}/^{238}\text{U}\sim 10^{-12}$. Second, detecting the ^{236}U assumed to have leaked from Fukushima nuclear power plant.

Aiming at the background level of 10^{-12} , development of ^{236}U AMS system had started at MALT (Micro Analysis Laboratory, Tandem accelerator). ^{236}U is extracted as $^{236}\text{UO}^+$ from the ion source and exchanged to $^{236}\text{U}^{5+}$ at the terminal. The magnetic rigidity at the injection magnet is $5.07 [\text{MeV}^{1/2}\text{amu}^{1/2}]$. The terminal voltage is 2.4 MV and the magnetic rigidity at the analyzing magnet is $16.4 [\text{MeV}^{1/2}\text{amu}^{1/2}]$. Now ^{236}U can be measured at $^{236}\text{U}/^{238}\text{U}\sim 10^{-10}$ level, there are, however, strong interference from $^{235}\text{U}^{5+}$, which may experiences the abnormal charge exchange. So MALT are planning to attach TOF as a final detector.

In order to measure the soil samples in Fukushima, MALT is focusing on following three projects. (1) Establishing the chemical procedure for soil: eluting and purifying uranium from samples. (2) Measuring ^{238}U by using ICP-MS. (3) Analysing the beam orbit and understanding the interfering mechanism of $^{235}\text{U}^{5+}$.