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Measurements of 236U by Accelerator Mass Spectrometry

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236U is used as a signature in nuclear forensic, environmental and oceanographic studies. Its atomic ratio with the most abundant uranium isotope (238U) in environmental and bioassay samples can vary widely from 10-8 to 10-12. Therefore, its full-range measurement is a challenge by conventional radiometric or mass spectrometric methods. Accelerator Mass Spectrometry (AMS) offers interference-free measurement with ultra-high abundance sensitivity for several long-lived radioactive isotopes, including 236U. This is mainly due to the molecular destruction process involved in AMS. For 236U, however, AMS suffers from poor ionization and transmission efficiencies compared to other mass spectrometric methods such as ICP-MS and TIMS, due to the low formation probability of negatively charged uranium-containing ions. The main objective of this work is to enhance a negative ion current of the analyte, in this case UO- ion, from the cesium-sputter ion source used in AMS. We tested various diluents including Al, Ag, Nb, SiC, Ta, Si and Ta+Si with Fe-UOx for the UO- anion beam using the AMS system at A.E. Lalonde AMS Laboratory, University of Ottawa. The addition of Ta and Si to the Fe-UOx target matrix increases the production of UO- ion beam current by three fold to about 9nA from 2.5nA when using Al powder. Preliminary results from these tests will be presented and possible mechanism for the UO- anion beam increase will be discussed.

Primary author: Dr KAZI, Zakir (University of Ottawa)

Co-authors: Dr CHARLES, Christopher (University of Ottawa); Prof. CORNETT, Jack (University of Ottawa); Prof. KIESER, Liam (University of Ottawa); Dr ZHAO, Xiaolei (University of Ottawa)

Presenter: Dr KAZI, Zakir (University of Ottawa)

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