

Accelerator Mass Spectrometry of Plutonium Isotopes at IFIN-HH

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The Accelerator Mass Spectrometry is the most sensitive measurement method that allows us to determine $^{239, 240, 244}\text{Pu}$ radioisotopes from environmental samples with extremely low isotope concentrations. By measuring Plutonium isotopes we focus our research activity on two main directions, monitorization of environmental nuclear pollution and nuclear astrophysics.

This presentation gives a compressive overview about the progress that was made in the determination of Plutonium isotopes at IFIN-HH, and it starts with the ion optic simulations of the whole system using the calculation code Simion@ 8.1 [1, 2], to determine the optimum operating parameters of the electrical and magnetic elements for ion (Plutonium and Uranium) beam filtration and guidance.

In the second part are presented the studies performed for the transport and measurement of actinides on the 1MV Tandetron Accelerator. The ^{238}U and ^{232}Th isotopes were used as pilot beams for the determination of ion transport parameters, after which the isotopic ratios of the $^{239}\text{Pu}/^{242}\text{Pu}$ and $^{240}\text{Pu}/^{242}\text{Pu}$ were measured using a reference material received from the CNA-Seville laboratory [3], in addition the isotopic ratio of $^{244}\text{Pu}/^{242}\text{Pu}$ was determined for the new Plutonium Standard ColPuS [4]. The results obtained for the isotopic ratios agree with the consensus values of both standards.

Finally, is given a short overview of the molecular interferences challenges that are encountered when measuring Plutonium isotopes [4].

References

1. A. Solima, Simulation of ion beam extraction and focusing system, Chinese Physics C, vol. Vol. 35, 2011.
2. D. Păceșilă et al., Ion beam optic simulations at the 1 MV tandetronTM from IFIN-HH Bucharest, Romanian Reports in Physics, vol. 70, no. 3, 2018.
3. D. Păceșilă et al., Preliminary results on the measurement of plutonium isotopic ratios at the 1MV AMS facility in IFIN-HH, U.P.B. Sci. Bull, Series A, Vol. 82, no. 2, 2020.
4. Status report on AMS Measurements of Plutonium Isotopes using 1MV Tandetron Accelerator. Performance and Limits, *In preparation*