A decade of 1MV accelerator mass spectrometry in Romania – expanding the range of measurable isotopes

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Abstract

In Romanian scientific research, there was already vast experience in the field of accelerator mass spectrometry [1]. In 2012, this research field received a strong development boost when a new Cockcroft Walton type 1 MV HVEE tandetron AMS system was installed at the National Institute for Physics and Nuclear Engineering (IFIN-HH), Bucharest. After the acceptance tests carried out by High Voltage Engineering Europa (HVEE), AMS system was commissioned only for isotopes ^{14}C, ^{10}Be, ^{26}Al, and ^{129}I [2, 3].

In parallel with the routine isotope measurements, in the last 10 years we have expanded the range of measurable isotopes at our AMS machine. Thus, new procedures have been developed that allow high-sensitivity measurements of boron, tritium and plutonium (239, 240, 242). These developments will enable new applications using these isotopes at our AMS facility.

Tritium is the primary fuel in nuclear fusion and its behavior inside the tokamak, as well as its contamination of its walls, are intensively studied in the Euratom program. Tritium has applications in medicine as a marker, as well as in environmental science. By determining the concentration of tritium in tree rings near nuclear facilities, the history of nuclear pollution can be established [4].

Determining very low concentrations of boron in graphite is useful in classifying graphite used as a moderator in nuclear fission reactors, particularly during decommissioning procedures of such installations and for the preparation of new neutron moderators[5].

Plutonium is an important tracer in monitoring nuclear pollution in the environment and in determining the origin of radioactive materials based on the isotopic ratio of plutonium, particularly when discerning the illicit nature of certain materials. Additionally, other applications of plutonium are found in fields such as astrophysics, archaeology, geology, medicine, and others [6, 7].

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