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CHEMICAL SEPARATION AND PURIFICATION OF STABLE 45SC FROM CERN-MEDICIS MASS-SEPARATOR COLLECTION FOILS

Radionuclides of chemical element Scandium can be used in radionuclide targeted therapy and positron emission tomography (PET/CT), where 44Sc or 43Sc would be used for diagnostic imaging purposes and monitoring therapy response and 47Sc for therapeutic purposes or SPECT diagnostics [1].
CERN MEDICIS (MEDical Isotopes Collected from ISolde) produces medical radionuclides by recovering the 1.4 and 1.7 GeV proton beam from CERN-PSB (Proton Synchrotron Booster) before it reaches the beam dump using thick targets placed behind the ISOLDE (The Isotope mass Separator On-Line facility) targets. These radionuclides are then extracted and separated according to their atomic mass via MEDICIS mass-separator and implanted in a Zinc or Aluminium covered gold or salt foils [2]. Mass-separation is the only way to separate medical 43,44,47Sc radionuclides from the long-lived ones, such as 46Sc. After collecting the radionuclides on the foil, radiochemical manipulations are necessary to get rid of isobaric (equal mass) impurities.
Ion exchange chromatography is one of the most powerful and widely used methods for radiochemical separations. With a proper choice of conditions, ion exchange is very useful for separating carrier-free radionuclides from a bulk target having a significantly lower affinity toward the resin [3].
Method for stable Scandium separation from Zinc and Aluminium standard solutions was developed using DGA resin. ICP-MS analyses were performed on each of the collected samples to determine the concentration of zinc, aluminium, and scandium ions. In this method DGA resin trapped more than 90% of the total scandium ions present in the stock solution. Afterward, this method was used to separate stable scandium from CERN MEDICIS mass –separator collection foils with Zinc coating (500nm). In total, more than 90% of Zinc ions were separated from the sample. Most of the Zinc ions were separated in feedthrough and waste fraction. Less than 1% of Zinc ions were in the product fraction. As it is planned to implant Scandium on Aluminium coated gold foils in the future, separation of scandium from Al/Au foil was performed. In total more than 90% of Aluminium ions were separated from the sample.

Keywords: ion exchange chromatography, scandium, mass-separator.

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