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ISOL technique for the production of 225Ac at CERN-MEDICIS

Over the last few years, several studies have proven the effect of targeted alpha therapy using 225Ac and 213Bi[1,2,3]. One of the crucial bottlenecks in upscaling current studies and moving to clinical trials is the availability of these isotopes. The current production methods cannot provide sufficient quantities of 225Ac or its daughter 213Bi. Furthermore, some of these production techniques result in batches of 225Ac with a lot of impurities which require advanced radiochemical separation techiques to be purified. Therefore, a new technique for the production of 225Ac and other radioisotopes is proposed. The new CERN-MEDICIS facility, which is under development, uses the Isotope Separation On-Line (ISOL) technique to produce a range of medical radioisotopes, e.g. 225Ac, 149Tb, etc[4]. This techique uses a combination of element selective and mass selective processes which result in a very pure, carrier-free batch of the isotope of interest. First a target material, e.g. UCx or Ta, is irradiated with high energy protons of 1.4 GeV. Afterwards, the target it heated to extract the produced isotopes. These isotopes are selectively ionized using a resonant ionisation laser ion source[5]. This allows to selectively ionize Ac isotopes. This ion beam passes through a mass separating magnetic field to result in an ion beam which is very pure in mass. As a final step this ion beam will be collected in a metallic foil or a salt. Afterwards, the radioisotopes can be separated from the collection material using dissolution and simple radiochemical purifications. Resonant laser ionisation of actinium has recently been achieved during a proof-of-concept experiment at CERN while the upscaling towards routine production is under investigation.

In this contribution, we shall introduce the ISOL technique and its possible application in the production of alpha-emitting radioisotopes for medical applications. The CERN-MEDICIS facility will be introduced and the recent results on the production of 225Ac at CERN will be presented.

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[4] R. dos Santos Augusto et al. CERN-MEDICIS (Medical Isotopes Collected from ISOLDE): A New Facility. Applied Sciences, 4(2):265-281, may 2014.

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Email Address

dockx.kristof@kuleuven.be

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Primary author: Mr DOCKX, Kristof (Institute for Nuclear and Radiation Physics, KU Leuven)

Co-authors: Dr STORA, Thierry (CERN); Dr COCOLIOS, Thomas Elias (Institute for Nuclear and Radiation Physics, KU Leuven)

Presenter: Mr DOCKX, Kristof (Institute for Nuclear and Radiation Physics, KU Leuven)