

Production of medically interesting ^{97}Ru via $^{nat}\text{Mo}(\alpha, x)$ above 40 MeV at ARRONAX

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Aim

Recently there has been growing interest in the medical application of ^{97}Ru isotope. It is intended to be useful for both diagnostic and therapeutic purposes due to its convenient physical properties ($T_{1/2} = 2.9$ d, gamma lines 215.7 keV, 85.8% and 324.5 keV, 10.2%, decay 100% EC with no β^+ to contribute to the dose). Its chemical properties are also favourable, as it has several degrees of oxidation (II, III, IV, VIII) and forms more stable compounds compared to the conventional ^{99m}Tc [Zaitseva, 1996]. Therefore, there are already many ^{97}Ru -labeled radiopharmaceuticals successfully used for different prolonged examinations [Mukhopadhyay, 2011].

Materials and methods

Presently, there are different identified routes to produce ^{97}Ru , with the use of neutron and charge particle induced reactions [Lahiri, 2016]. In this work, we focus on the α -induced nuclear reactions on ^{nat}Mo target in order to extend the available data above 40 MeV, in coherence with α beam available at our facility. The irradiation of ^{nat}Mo stack foils was performed at ARRONAX, with the α -beam of 67.4 MeV. The energy straggling in the last foil was calculated to be 0.75 MeV. The irradiated foils were measured via γ -ray spectroscopy techniques.

Results and discussion

We have measured the cross-section for the α -induced reactions on ^{nat}Mo in the energy range 67 – 42 MeV. Our results indicate that for example the irradiation of 250 μm ^{nat}Mo with 65 MeV α -beam will yield around 10 MBq/ μAh (0.27 mCi/ μAh) of ^{97}Ru . Most importantly, the use of such high energy prevents the formation of long-lived contaminant ^{103}Ru ($T_{1/2} = 39.35$ d). Although the yield of 0.27 mCi/ μAh is lower compared to the $^{103}\text{Rh}(p, x)^{97}\text{Ru}$ reaction with around 1.3 mCi/ μAh [Lagunas-Solar, 1982], it allows to use the cheaper target with better thermal properties. Therefore the method to produce ^{97}Ru via $^{nat}\text{Mo}(\alpha, x)$ might be considered in certain cases.

References

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