

ALTERNATIVE GENERATORS OF THE ^{99m}Tc

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^{99m}Tc is the most widely used radionuclide in nuclear medicine. ^{99m}Tc radionuclide is obtained from a generator, in which ^{99}Mo serves as the parent radionuclide. In the generator ^{99m}Tc and ^{99}Mo radionuclides are found in genetic balance and ^{99m}Tc radionuclide is chemically extracted from the system periodically.

Although there already exists many ways and variants of manufacturing ^{99m}Tc generators, search for new variants of the $^{99}\text{Mo} \rightarrow ^{99m}\text{Tc}$ generator systems continue. An example is the investigations carried out with the support of the IAEA [1,2]. In these research works, generators based on elution of polymolybdate gels have been developed and evaluated.

These generators will be serving as alternative technologies for production of ^{99m}Tc radionuclide, which use ^{99}Mo produced by non-fission means.

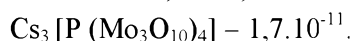
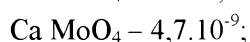
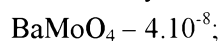
It is known that in Australia and China more than 30% of ^{99m}Tc generators are gel-generators [2]. The works of authors [3-5] are devoted to the problem of searching new perspective materials as a column material that will serve as adsorbent.

The main purpose of all the research on alternative technologies is the usage of parent radionuclide ^{99}Mo that is obtained from $^{98}\text{Mo}(n, \gamma)^{99}\text{Mo}$ reaction instead of as a fission product.

Our work examines the possibility of reception of generators $^{99}\text{Mo} \rightarrow ^{99m}\text{Tc}$ using non-fission ^{99}Mo that is based on insoluble salts of molybdate.

Experimental

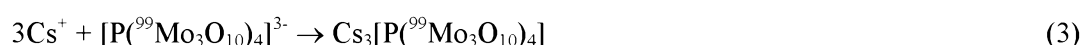
In our experiments insoluble salts, barium, calcium molybdates and phosphorous molybdate of cesium were used. Solubility of the specified salts are presented below:



Salts of barium and calcium were obtained by adding ^{99}Mo radionuclide into the chemical structure of the salts during their synthesis. Solutions containing Ba^{2+} , Ca^{2+} and $^{99}\text{MoO}_4^{2-}$ ions are mixed and the following resolvable salts of molybdate precipitate:



Phosphorous molybdate of cesium was obtained by mixing solutions containing ions of Cs^+ and phosphorous molybdate (^{99}Mo):



The generators consisted of glass columns with two layers: a lower layer of Al_2O_3 (0,5g.), and an upper layer of insoluble salt of ^{99}Mo . Weight of the salt varied from 1 to 2g. Pertechnetate ($^{99\text{m}}\text{Tc}$) sodium was extracted with 0,9% solution of NaCl at a speed of 0,5 to 1,5 ml/min.

Results

^{99}Mo is generally produced by direct (n, γ) nuclear reaction of irradiated natural Molybdenum or enriched ^{98}Mo .

Output of insoluble salts of molybdate (^{99}Mo) on its synthesis was more than 95% for all salts. This means that the loss of ^{99}Mo in the process of obtaining insoluble salts is minor.

Quantity of yield of $^{99\text{m}}\text{Tc}$ from salt generators on elution in 0,9% solution of NaCl are presented in Table 1.

Table 1. Yield of $^{99\text{m}}\text{Tc}$ from salt generators

Salt	Yield of $^{99\text{m}}\text{Tc}$, %	Content of ^{98}Mo , %	Radiochemical purity, %
BaMoO_4	70,8	less than 10^{-3}	99,7
Ca MoO_4	75,2	0,02	99,5
$\text{Cs}_3 [\text{P} (\text{Mo}_3\text{O}_{10})_4]$	77,6	less than 10^{-4}	99,8

Not so high yield of $^{99\text{m}}\text{Tc}$ radionuclide indicates that Technetium-99m is adsorbed in the molybdate salts. Table 1. Also shows radiochemical and radionuclide purity of pertechnetate ($^{99\text{m}}\text{Tc}$). Result obtained support the usability of salt generators in practice.

References

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