The nuclear-physical properties of bromine and radioisotopes of other elements with close half-lives, the influence of competitive nuclear reactions and interference lines have been studied. The optimization of temporary parameters of analysis has been carried out. Thus, the method for determination of Br, Au, Sm, La and Na in hydromineral raw materials by instrumental neutron activation analysis has been developed.

The dry residue (after evaporation of 1 ml sample) is irradiated in vertical channel of nuclear reactor (neutron flux is $1x10^{14}$ n/cm^2 s) for 15 hours. The samples were measured (t_{meas}=400 sec) with Ge detector after 10-15 days of "cooling".

The determination limits of elements are Br-0.8 mg/l; Au-0.7 μg/l; Sm-0.1μg/l; La-15 μg/l; Na-2mg/l at this regime of analysis.

The analysis for a number of industrial samples to determine these elements is carried out. The samples with enhanced industrial –valuable concentration of elements have been found.

The correlation dependence between bromine and sodium contents is determined.

The comparison of results for neutron activation analysis and chemical analysis methods has been carried out. It shows the satisfactory agreement between them.

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NEUTRON ACTIVATION ANALYSIS OF PURE URANIUM USING PRECONCENTRATION

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Uranium and its compounds are used as nuclear fuel, and requirements for purity of initial uranium are very high. Therefore highly sensitive and multielemental analysis of uranium is required. One of such methods is neutron activation analysis (NAA).

During irradiation of uranium by nuclear reactor neutrons the induced radioactivity of a sample is formed by uranium radionuclide ^{239}U ($T_{1/2}$ = 23,4 min.) and its daughter radionuclide ^{239}Np ($T_{1/2}$ = 2,39 d). Short-lived ^{239}U almost completely decays in 24 hours after irradiation and the radioactivity of the sample is mainly due to ^{239}Np and is more than 10^9 Bq for 0.1 g of uranium sample (F = $1\cdot10^{14}$ cm^{-2}s^{-1}, $t_{irr.}$ = 5h). That is why nondestructive determination of the impurities is impossible and they should be separated from ^{239}Np.

When irradiated uranium yields fission products – radionuclides of some elements with mass numbers 91-104 and 131-144. The main problem in NAA of uranium is to take into account correctly the influence of fission products on the analysis results.

We have developed a radiochemical separation procedure for RNAA of uranium [1]. Comparing the results of analysis carried out by radiochemical NAA and instrumental NAA with preconcentration of trace elements can be used for evaluating the interference of fission products on uranium analysis results. Preconcentration of trace elements have been carried out by extraction chromatography in "TBP – 6M HNO_3" system [1]. Experiments have shown that if 0.1 g uranium sample is taken for analysis (F = $1\cdot10^{14}$ cm^{-2}s^{-1}, $t_{irr.}$ =5h) the apparent concentration of Y, Zr, Mo, Cs, La, Ce, Pr, Nd exceeds the true concentration by 2500-3000 times and so determination of these elements is not possible by radiochemical NAA.

Reference:

1. Sadikov I.I., Salimov M.I., Rakhimov A.V., Zinov'ev V.G/ Radiochemical separation of neptunium for radiochemical activation analysis of pure uranium.// The fifth Intern.Conf. "Modern problems of Nuclear Physics" 12-15 August, 2003, Samarkand. Book of abstract, p. 325

ON THE POSSIBILITY OF USING SMALL AMOUNTS OF RADIONUCLIDES IN MEDICINE

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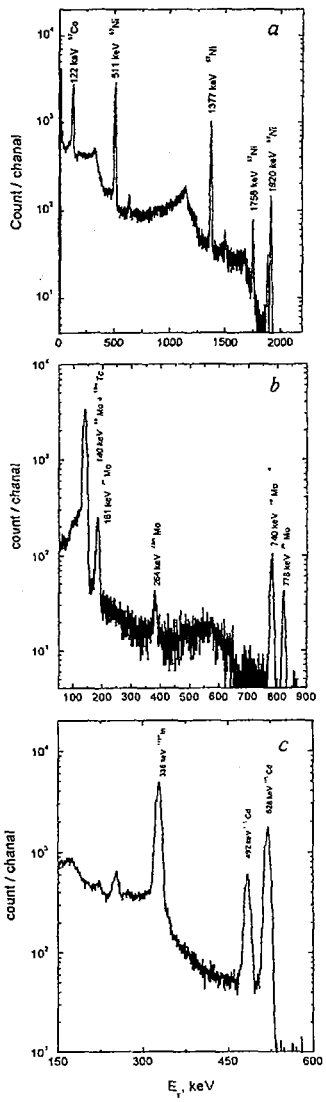
It is known that the use of nuclear radiation for diagnoses and treatment of human diseases represents the modern method. High radioactivities are shipped to countries and regions and are distributed into certain doses for preparation of vaccines. However, it is often the case when the region does not require high radioactivities. For example, consultation with doctors showed that not more than 10 patients arrive to hospitals for treatment in the city of Samarkand and the province per day. For the region, it is sufficient to obtain several radionuclides.

The radionuclides ^{57}Co, ^{99m}Tc and ^{115m}In obtained by us posses nuclear-physics properties which meet the requirements of beam medicine. On fig. a, b, c, γ-spectra of mentioned radionuclides obtained by nuclear reaction schemes on microtron bremsstrahlung are shown:



a) $^{58}Ni\ (\gamma, n)\ ^{57}Ni \xrightarrow{\beta^-} {}^{57}Co(E_\gamma 122\ keV, T_{1/2}\ 271\ d)$

b) $^{100}Mo\ (\gamma, n)\ ^{99}Mo \xrightarrow{\beta^-} {}^{99m}Tc(E_\gamma 140\ keV, T_{1/2}\ 66\ h)$

c) $^{116}Cd\ (\gamma, n)\ ^{115}Cd \xrightarrow{\beta^-} {}^{115m}In(E_\gamma 366\ keV, T_{1/2}\ 4{,}5\ h)$

Production and radiochemical techniques for considered radionuclides were developed.

In the presentation, the issues of wide application of generated radionuclides obtained at microtron will be discussed.