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ANALYSIS OF RADIATION INDICATORS OF NATURAL WOD IN THE AREA OF INFLUENCE OF URANIUM PRODUCTIONS

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Abstract
This article presents the results of a study to determine the magnitude of the effects of radiation factors of uranium production on the environment, namely, to determine the values - the exposure dose rate of gamma radiation - DER, equivalent to the equilibrium volumetric activity of radon - EEVA in the processing and storage of uranium products , the specific activity of long-lived alpha-nuclides - DAN in the atmospheric air, the volumetric activity of radon in the air of the working area and the density of radon molasses from soils in the areas of underground leaching - uranium SP.

Keyword: uranium object, equivalent equilibrium volumetric activity of radon, radiation factors, specific activity of radionuclides, exposure dose, long-lived

Relevance

In the field of uranium production, the situation of radiation factors and control methods depend on the magnitude of radiation factors.
The main methods for analyzing radiation factors are radiometric methods of analysis, X-ray spectral method, X-ray fluorescent energy-dispersive method, radioisotope method.
Insofar as radiation factors and technogenically polluted objects uranium production are radioactive a at analysis their composition often have to have case With very not big weights, for solutions radioecological tasks. For these goals most suitable and methods for applications are radiometric, x-ray fluorescent, alpha a, beta and gamma spectrometry, dosimetric and radioisotope methods of analysis.

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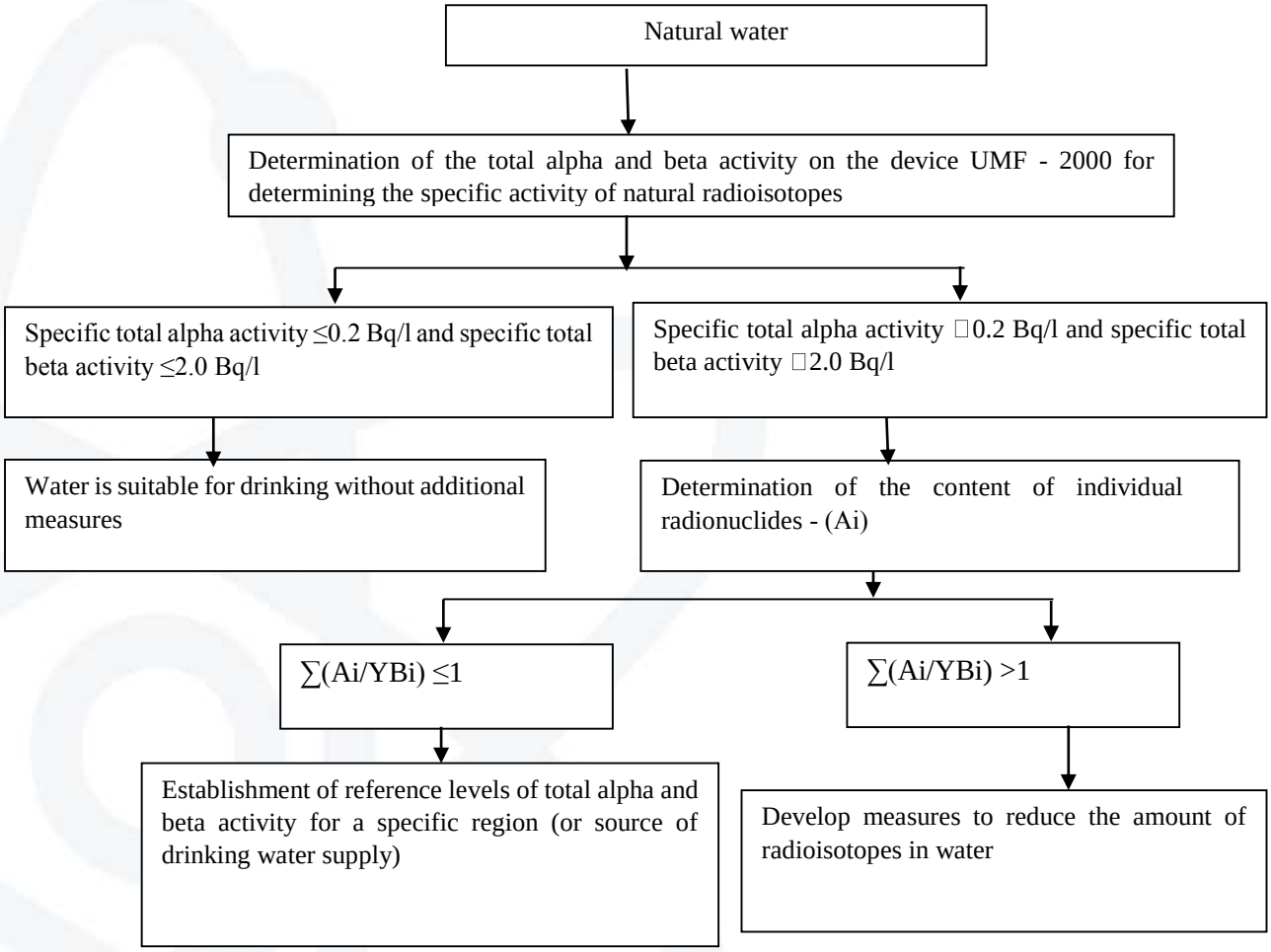
Goals and Objectives of the Study

Most accessible method definitions isotopic composition uranium and others α-emitting radionuclides is an method α-spectrometry. In this case basic task becomes receiving quality source, suitable for measurements. Quality source v given case will determined his thick and necessary for receiving quality spectrum content alpha emitter. For exceptions self-takeovers α-radiation sources must be thin and active substance must be evenly distributed on surfaces substrates. For definitions isotopes alpha emitter thickness source should not exceed 50 μg/cm², a general content. For example, uranium for holding routine measurements-not less 50 mcgv sample.

Findings and Discussions

Preparations usually cook electrolytic through for receiving thin homogeneous films hydro oxides and oxides element on the metallic substrate, when practically all α-emitting radionuclides besieged on the substrate.

Below is a general view of radiological water control:



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However, the optimal requirements (high concentration alpha emitter and low salt content) answers small number natural water. Hence, stage preliminary concentration, reset saline background and cleaning from impurities is an not inalienable part methods definitions isotopic composition uranium v natural waters not depending from Togo, what method v further will cooked a source for α-spectrometric measurements. For holding isotopic analysis drinking waters conduct preliminary radiochemical training water samples, which includes v yourself concentration isotopes uranium from water samples, extraction department distracting radionuclides and gland, cooking electric way counting sample. Electrolytic precipitation uranium perform on a substrate from corrosion resistant stainless become.

Concentration uranium from water trials were carried out With help hydroxyl gland. Interfering alpha emitters at implementation alpha spectrometric measurements isotopes uranium may be main way Po -210(E=5.305MeV), Ra -226(E=4.777MeV) and Th (E=4.685MeV).[1]

All uranium nuclides (^{234}U, ^{235}U, ^{238}U) in the process of radiochemical training lead myself equally and stand out simultaneously. Researched water sample volume 1 liter acidified hydrochloric acid before pH=1 and withstood not less 6 hours. Then sample boiled under sentry glass v flow twenty minutes before removal carbon dioxide (if water painted, additionally front boiling injected 1cm ^{3} H2O2 _ _ _ for destruction Uranus organic connections), after what added solution chloride gland from calculation 50mg gland on the 1 liter samples water, and besieged hydroxides ammonia (pH=8). draft gave settle down v flow 1-2hours and decanted transparent solution above sediment. Then sediment filtered out across filter "white ribbon" diameter 11cm. Sediment which got together on the filter dissolved 50cm ^{3} hot-boiling 7M nitric acid, tide her small in portions So, to seize the whole sediment, after what filter washed more two times 10cm ^{3} hot nitric acids. [2].

Obtained nitrogenous sour solution containing isotopes uranium translated v dividing funnel, tide 15cm ^{3} fresh purified 30% TBF v toluene and carried out extraction v flow 5 minutes. Uterine solution after separation phases leaked back v glass, a organic extract washed two times equal volume 7M nitric acids and one once equal volume solution 0.25M HNO3 _ v 0.04M HF v flow one minutes.Further carried out back-extraction uranium for what washed organic phase three times on one minute portions distilled water 15cm ^{3}.

United water solution re-extract evaporated dry, added 5cm ^{3} concentrated HNO3 _ for removal traces organic substances and again evaporate dry. Dry the remainder

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containing isotopes uranium dissolved v 10cm ^{3} 2% solution soda at heating, filter out across filter "blue ribbon" and endure v electrolytic cell. Electro precipitation isotopes uranium carried out on a substrate from stainless become v flow thirty minutes at permanent current 2A. countable sample measured on the alpha spectrometer CANBERRA.[3].

Using the alpha spectrometric method analysis can define the following isotopes chemical elements, v volume including chain decay uranium ^{234} U ^{235} U ^{238} U ^{234Pa} _ ^{230Th} _ ^{226} Ra, ^{222Rn} , ^{218po} , ^{214Pb} , ^{214} Bi, ^{214po} , ^{210po} _ and others v objects environmental environment. Sensitivity methods is from 10 $^{-9}$ % before 10 $^{-11}$ %.

Results radiochemical analysis samples superficial and underground waters, selected from points zones influence radioactively contaminated productions:

No. samples	Volumetric activity, Bq/l				Total volumetric activity, Bq/l	
	U- 238	Ra -226	Th -232	Po -210	Σα radiation	Σ β- radiation
surface water						
one	0.76 _ _	0.0 16 _	0.18	0.01 3	0.1 7 ± 0.0 7	0.5 0± 0.11
2	0.81 _	0.01 9	0.26	0.0 16	0.1 8± 0.09	0.57 ± 0.14
3	0.73	0.0 14	0.16	0.00 8	0.18 ± 0.08	0.5 4 ± 0.12 _
4	0.78 _	0.024 _	0.23	0.017	0.19 ± 0.07 _	0.53 ± 0.12
5	0.53	0.020	0.28	0.024	0.19 ± 0.10	0.47 ± 0.10
6	0.58	0.032	0.37	0.052	0.20 ± 0.10	0.32 ± 0.10
underground water						
7	0.91 _	0.024 _	0.22	0.010	0.32 ± 0.12 _ _ _	2.61 ± 0.4 7 _ _
eight	0.98	0.0 14	0.18	0.00 8	0.42 ± 0.15 _ _	3.68 ± 0.53 _ _

The obtained results show that the total α- and β-activity in 1, 2, 3, 4, 5, 6 for surface waters is at the level of the established norm - ≤0.2 Bq/l for α-activity and ≤2.0 Bq /l for β-activity. Slightly high total α-activity was found in 7 and 8 groundwater samples. This forced us to conduct an isotope analysis of underground water samples from the considerations that, probably, there is a violation of the radioactive equilibrium - K_{pp} between uranium isotopes ^{234} U / ^{238} U .

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The specific activity of the isotope ^{234}U which is - 2.3 * 10 ^{8} Bq / g. Slight violations of the radioactive balance - K_{pp} towards the ^{234}U isotope significantly affects the increase in the total α-activity. In nature, there are three isotopes of natural uranium - ^{234}U , ^{235}U and ^{238}U , which differ in nuclear chemical characteristics, which are determined by mass spectrometric or alpha spectrometric methods. For alpha spectrometry, an alpha spectrometer of the ALPHA ANALYST type (CANBERRA, USA) was used.

Figure 4 and Figure 5 show the dependences of the total α -activity on the concentration of the isotope ^{234}U d for surface and ground waters.

To determine the isotope analysis of natural waters, preliminary radiochemical preparation of water samples was carried out, which includes the concentration of uranium isotopes - (^{234}U, ^{235}U, ^{238}U) from water samples, extraction separation from interfering radionuclides and iron, and preparation of a counting sample by electrical means. Electrolytic deposition of uranium is performed on a corrosion-resistant stainless steel substrate. The concentration of uranium from aqueous samples was carried out using iron hydroxide. All uranium radionuclides (^{234}U , ^{235}U , ^{238}U) behave in the same way during radiochemical preparation and are released simultaneously.

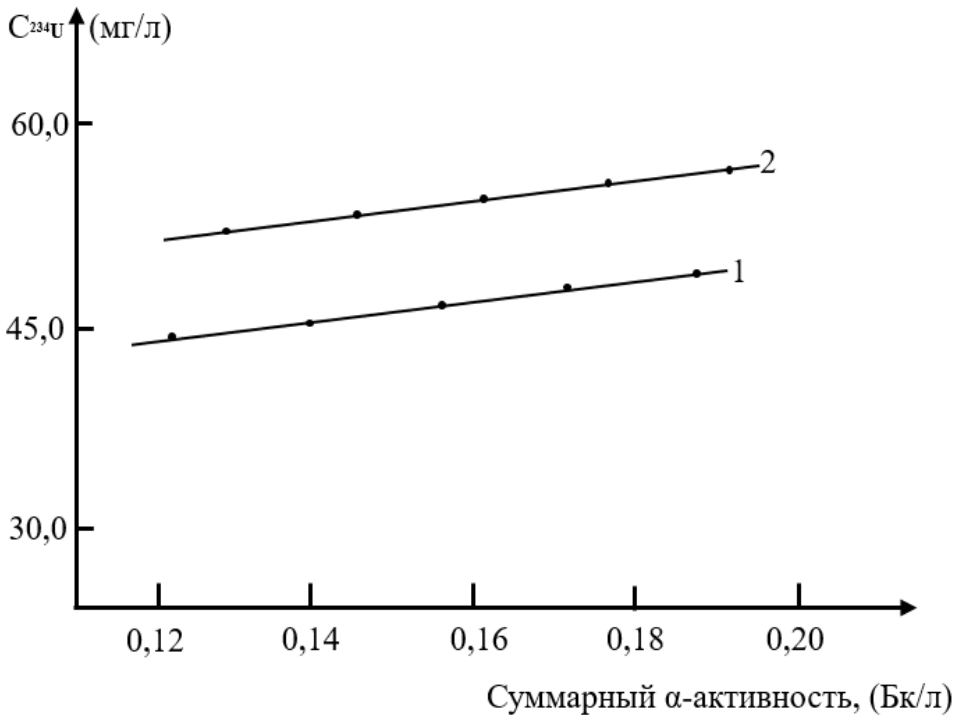

Fig. 4. Dependence of the total α -activity on the concentration of the isotope ^{234}U for surface and ground waters

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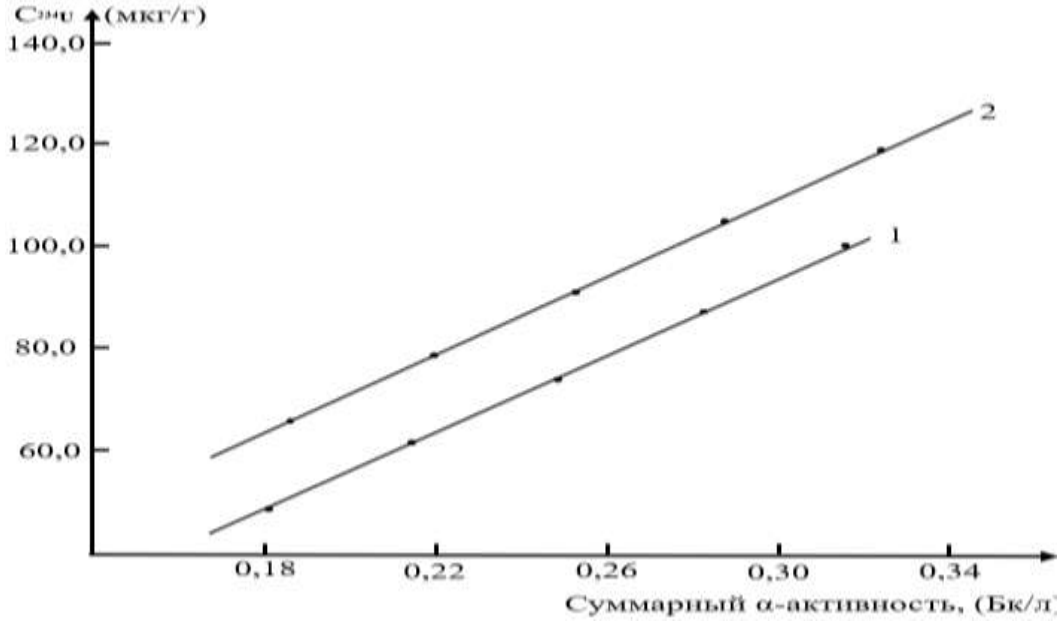

Fig. 5. Dependence of the total α -activity on the concentration of the isotope ^{234}U for groundwater

It can be seen from Fig. 4 and Fig. 5 that there are dependences of the total α -activity on the concentration of the ^{234}U isotope for surface and ground waters . In addition, Fig. 4 and Fig. 5 show that the radioactive equilibrium between uranium isotopes ^{234}U / ^{238}U in water samples is indeed disturbed. That is, the higher the concentration of the isotope ^{234}U in the sample, the higher the total α - activity of this sample.

Conclusion

Therefore, based on the results obtained installed

The data obtained show that the radiation situation in this man-made uranium facility and around it is in a satisfactory state and does not have a clear negative adverse effect on the health of the population, a limited part of the population, personnel and the environment.

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