METHOD OF RADIOACTIVITY LEAKAGE DETERMINATION OF THE CLOSED IONIZING SOURCES

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Closed ionizing radioactive sources (Co-60, Cs-137, Ir-192, Am-241, Tm-170, others) are widely used in various areas of science, medicine and industry. The sources consist of internal capsule with radioactive matter and leak-proof external capsule made from stainless steel. All the sources have operation and storage warranty period. For example, operation and storage warranty period of ionization radiation source of type Cesium-137 makes 3,5 years. After expiration of guaranteed exploitation and storage term, it is necessary to check leak of Cesium-137 source for prolongation of its service life and further use. Unchecked sources represent radiation danger to environment and to personnel working with sources and should be utilized in special points on burial place of radioactive waste.

In the given work new method of checking of radioactivity leakage (leak-proof) of closed ionization sources [1] is offered. Essence of method consists in immersing of radiation ionization source in ortho-phosphoric acid, keeping of source during 1 hour, and measurement of radio-activity of acid on gamma spectrometer. Advantage of given method is that at use ortho-phosphoric acid weld seam of source does not collapse which is forming anticorrosive surface slick on surface of capsule of source.

For checking of efficiency of given method, source of type of Cesium-137 has been immersed in glass with 10 % water solution of ortho-phosphoric acid during 1 hour. After, source have been washed in water and placed in protective container. Acid solution have been measured on gamma spectrometer «Canberra» type of DCA-1000 with Ge-Li detector and with software «Genie».

Efficiency of registration of gamma radiation of Cesium-137 by spectrometer have defined by calibration of gamma spectrometer by using of exemplary standard sources Cs-137 with gamma energy 663 кеV from set Exemplary Standard Gamma Sources #3-1r.

Suggested method of checking of leakproof of closed ionization source has been tested at determination of leakproof of Cesium-137 sources of Cs 7.021.1 type with radioactivity of radionuclide Cs-137 from $4{,}13 \cdot 10^9$ Bq to $2{,}6 \cdot 10^{11}$ Bq.

The table shows results of spectrometric measurements of radio-activity of solutions received at determination of leakproofness of closed ionization radiation sources of type Cesium-137 with radioactivity of radionuclide of Cs-137 - $4{,}13 \cdot 10^9$ Bq.

Number, #	Radionuclide	Source number	Passport number	Solution radio-activity, Bq	Note
1	Cs-137	8Г4	29635	≤0,3	leakproof
2	Cs-137	7X8	29634	≤0,3	leakproof
3	Cs-137	32T	29589	≤0,3	leakproof
4	Cs-137	7T5	29643	≤0,3	leakproof
5	Cs-137	7K6	29618	≤0,3	leakproof
6	Cs-137	9K9	29656	≤0,3	leakproof
7	Cs-137	13T	29666	≤0,3	leakproof
8	Cs-137	37A	29593	≤0,3	leakproof

From the table it is seen, that at checking of leak-proof of Cesium-137 sources, that all sources are leak-proof and solutions radio-activity of radionuclide of Cs-137 is essential less in comparison with the admissible radio-activity.

Reference

1. Kh.A.Ergashev, Sh.Makhkamov, U.T. Ashrapov. Method of tightness definition of an ionization radiation source. Preliminary patent of Republic of Uzbekistan, #4943, 1997.