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MONITORING THE DISTRIBUTION OF RADON ISOTOPES AND THEIR DECAY PRODUCTS IN THE SURFACE GROUND ATMOSPHERIC AND EARTH LAYERS OF ALMATY

The UN, among its 17 Sustainable Development Goals, calls for healthy lives and the promotion of well-being for all at all ages. Radon measurements to assess the health effects of this radioactive gas support the Sustainable Development Goals and target 3.4 on noncommunicable diseases [1]. Radon is classified by WHO and IARC as a Group I carcinogen [2, 3]. The proportion of lung cancer cases caused by radon is estimated to range from 3% to 14% [3]. In Kazakhstan, lung cancer has occupied first place in the structure of mortality from cancer in recent years [4]. In Almaty, the problem of radon hazard in the territory, despite the presence of a large number of tectonic faults (the concentration of radon in the human eco-environment, residential buildings located above such zones can reach high values), has not been sufficiently studied. The decay of radon isotopes produces alpha, beta, and gamma radionuclides, which are easily sorbed by substances in various phase states. Radionuclides can be found in air, water, and soil as a result of natural and man-made pollution, which may increase short-term and/or long-term effects on human health. Therefore, the search and monitoring of local radon "flares"in Almaty is a relevant area of research.
In this work, radiometric measurements of the equivalent equilibrium volumetric activity of radon in the air were performed in residential and administrative premises located at various distances from tectonic faults; beta and gamma spectrometric measurements of soil samples. The measurements were carried out at different distances from tectonic faults using a radon radiometer "RAMON-02" in temporary and long-term buildings. Soil samples were taken near these buildings and measured using gamma and beta spectrometric installations SKS-99 SPUTNIK. The measurement exposure on the spectrometers was at least 10,000 events per sample.
The results of the study showed that the content of beta and gamma activity of natural radionuclides in the soil correlates with the equivalent equilibrium volumetric activity of radon in the air; this in turn reflects the increased concentration of radon decay products in the samples. The radon activity concentration averaged 73.85 Bq•m⁻³ and ranged from 4.93 to 405.21 Bq•m⁻³. Local foci have been identified in which the obtained values exceed by more than twice the established standards for the average annual equivalent equilibrium volumetric activity of the decay products of radon and thoron in the air of residential premises (200 Bq•m⁻³) [5]. These results will make it possible in the future to develop protective measures aimed at reducing the entry of radon into indoor air and improving indoor ventilation.
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Section

Applications of nuclear methods in science, technology, medicine and radioecology

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