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RADIOCHEMICAL METHOD OF INCREASING THE ACCURACY OF MEASURING THE RADIUM CONTENT IN URANIUM ORE

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Gamma-spectrometric methods for measuring the content of radium-226 using a photopeak with an energy of 186 keV are well known. However, according to the complete decay scheme of radium-226, this gamma-ray photopeak accompanies the alpha decay of radium to radon with a low quantum yield for decay of 5.4%. An increase in the measurement error on a semiconductor gamma spectrometer is also due to the low detector efficiency of 30%. A method is proposed for increasing the accuracy of measuring radium-226 in ore weighed portions by the radiochemical method. A sample of ore with a known mass is infused in a sealed vessel with water. In 12 days, the secular equilibrium between radium and radon-222 is practically achieved, when their activities coincide. Also, according to the decay scheme of radium, radon undergoes 3 alpha decays and 2 beta decays into daughter products to polonium-210 with a half-life of 22.5 years. Water with radon dissolved in it and its five decay products is drained, the solution is mixed with a scintillator according to a standard technique and measured on a Hidex SL-300 liquid scintillation spectrometer. The measurement efficiency here is 100%, every alpha and beta decay is recorded. Measurements are repeated every day. For 4 days, activity is halved, since the half-life of radon is 3.8 days. After 30 days, the activity of polonium-210, a decay product of radon with a half-life of 22.5 years, remains. The total initial alpha-beta activity of the solution is divided by five and the true activity of radon is obtained, equal to the activity of the weighed portion of radium in an aqueous solution, and subsequent calculations are used to calculate the specific activity of radium in the ore. Thus, by taking into account the total alpha-beta activity of short-lived daughter decay products of radon-222, the threshold value for detecting radon activity in an aqueous solution decreases 5 times and the sensitivity of the method increases 5 times compared to traditional measurement methods (1), when only one alpha decay of radon.

Literature

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