

CONCENTRATIONS OF NATURAL RADIONUCLIDES IN COMBUSTIBLE SLATES

A.N.AZIMOV¹, I.T. MUMINOV², A.K.MUHAMEDOV¹, A.A.SAFAROV¹, A.N.SAFAROV¹.

1 Samarkand State University.

2 Research Institute of Applied Physics, National University of Uzbekistan.

In current work decomposition technique [1] of scintillation γ -spectra of combustible slates samples is demonstrated. The measurements were done on γ -spectrometer with NaI(Tl) crystal, $\varnothing 63 \times 63$ mm, $\Delta E_{\gamma}/1332 \text{ keV} = 10\%$. Samples were hermetically packed into one liter Marinelli beakers (sample density $\rho = 925 \text{ g/l}$). Efficiency calibration of spectrometer and decomposition of spectra to its components were done using standard sources ^{226}Ra ($A = 8147(570) \text{ Bq}$), ^{232}Th ($A = 7349(514) \text{ Bq}$) and ^{40}K ($A = 13790(965) \text{ Bq}$) from OMACH set.

Spectra of samples are caused by radiations of natural radionuclides ^{40}K , ^{235}U , daughter RNs of ^{226}Ra sub row (^{214}Pb , ^{214}Bi) and row ^{232}Th (^{228}Ac , ^{212}Pb and ^{208}Tl). Spectrum of sample can be presented as following:

$$S = S_{\text{Ra}} + S_{\text{Th}} + S_{\text{K}} + S_{\text{U}} + F,$$

where S_i -components of corresponding RNs, F- background. The “reduced” inert spectrum was taken as background component of sample with density ρ [1].

Activities of ^{226}Ra , ^{232}Th and ^{40}K were determined using normalized spectra E_{Ra} , E_{Th} , E_{K} of standard sources, for ^{235}U – by intensity – I (area) of total absorption peak $185,7 \text{ keV}$ ^{235}U , registration efficiency $-\varepsilon_{\gamma}$, quantum yield $-a_{\gamma}$ and measurement time $-t$: $A_{\text{U}} = I_{\gamma} / \varepsilon_{\gamma} a_{\gamma} t$.

Spectra decomposition procedure is illustrated in Fig.1

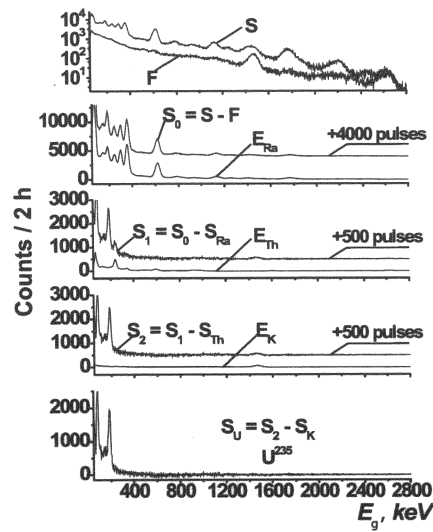


Fig. 1. Spectrum of sample – S and its components F, E_{Ra} (687(70) Bq/kg), E_{Th} (24(3) Bq/kg), E_K (268(30) Bq/kg), S_U (39(4) Bq/kg). $S_0 = S - F$, $S_1 = S_0 - E_{Ra}$, $S_2 = S_1 - E_{Th}$, $S_U = S_2 - E_K$.

Reference

1. A.N Azimov, Sh. Kh. Hushmuradov, I. T. Muminov, T. M. Muminov, B. S. Osmanov, A. N. Safarov, A. A. Safarov, Gamma spectrometric determination of natural radio nuclides and ^{137}Cs concentration in environmental samples. The improved Scintillation technique, Radiation measurements, 43 (2008), p 66-71.