DETERMINATION OF $^{90}$Sr AND $^{89}$Sr IN ENVIRONMENTAL SAMPLES AND IN RADIOACTIVE WASTE

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Strontium 90 is a significant radionuclide with anthropogenic origin and a relatively long half-life of 28.6 years. Strontium is a homologue of calcium and has similar metabolic pathways. Considering the importance of this radionuclide the determination of this radionuclide is frequently performed in varied types of samples. In the case of radioactive waste or environmental samples from nuclear facilities vicinity, appearance of $^{89}$Sr, with the half-life of 50.6 days, is also possible. Considerable amounts of other radionuclides, potentially interfering and surpassing radiostrontium activities, are likely to be present in such samples.

The purpose of our experiments was to verify the method of $^{90}$Sr and $^{89}$Sr determination, which can indicate possible interference with other radionuclides in measured samples and to prove the process of chemistry preparation by feedback control. This method with reinforced robustness was subsequently applied to measurement of radioactive waste with various matrix and complicated radionuclide composition and environmental samples, possibly containing radionuclides of the natural decay series. In most cases, this method allows quick measurement of $^{90}$Sr and $^{89}$Sr, without relatively time-consuming measurement of decay curve of $^{90}$Y.

The first part of the method consists of a chemistry treatment of the samples including pre-concentration part and several-step strontium isolation. In order to isolate strontium, routines with a relatively higher selectivity have been chosen. The yield of strontium preparation, depending on sample matrix and number of isolation steps, was determined by gamma spectrometry measurement of spiked $^{85}$Sr.

Liquid scintillation counting (LSC) of the samples was arranged to relatively greater robustness only in higher-energy part of spectra and with possibility to indicate residuum of other radionuclides in the measured spectrum.

The choice of basic counting windows was accomplished on the base of maximal energies of these beta emitters: $^{90}$Y (daughter radionuclide of $^{90}$Sr), $^{89}$Sr, and $^{210}$Bi (uranium natural decay series, daughter radionuclide of $^{210}$Pb, which could be present in the measured sample). Several auxiliary windows were also chosen to identify incidence of alpha and beta emitting radionuclide impurities in the measured sample. Edges of measuring windows were moved in the dependence on quenching parameters, TSIE or SQP(E).

Sample measurement by LSC was performed with instruments TriCarb 1050 and Wallac Guardian 1414. Spectra were evaluated and possible interference of other radionuclides was guarded. The activities, uncertainties and detection limits were then calculated.