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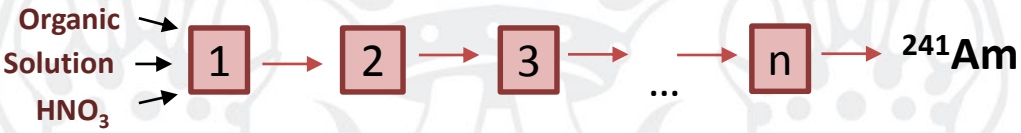
APPLICATION OF NUCLEAR SPECTROSCOPY METHODS FOR ANALYTICAL SUPPORT AND CORRECTION OF THE EXPERIMENT ON LIQUID EXTRACTION OF TPE AND REE

The results

№	Sample	Intensity Imp/Te	Square [imp.]	Amplitude [imp.]	Average [channels]	ПШПВ [channels]	Activity «Calcul.»	Activity «Gauss»
1	Standart 1747Bq		45465	6498	41.8	6,52	1750	—
2	Sample -1		88616	12539	41.8	6,58	3500	3405
3	Sample -2	1403	105393	14892	41.9	6,59	4190	4050
4	Sample -3	203	14296	2008	41.7	6,63	553	549
5	Sample -4	647	49241	6994	41.8	6,56	1920	1892
6	Sample -5	640	48636	6859	41.8	6,61	1900	1869
7	Sample -6	635	47044	6690	41.8	6,55	1870	1807
8	Sample -7	658	49700	6995	41.9	6,62	1940	1910
9	Sample -8	680	49970	7246	41.9	6,42	2010	1920
10	Sample -9	692	50810	7182	41.9	6,59	2030	1952
11	Sample -10	672	49026	7007	41.9	6,52	1950	1884
12	Sample -11	795	54333	7930	41.9	6,38	2210	2088
13	Sample -12	373	22744	3433	42.0	6,17	959	873
14	Sample -13	192	10776	1601	41.9	6,27	444	403
15	Sample -14	88	3987	575	41.9	6,45	164	153

Diagram of the radio-chemical experiment for he obtained samples

Extraction and re-extraction

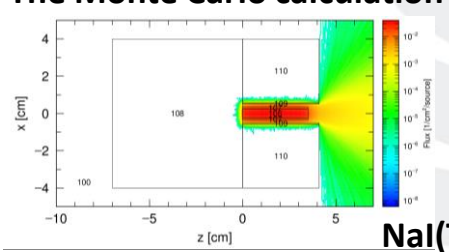


1,2,3…n – extraction stages; → - outgoing lines

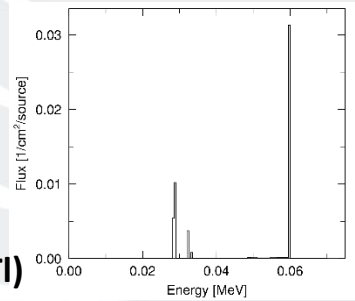
$$n = \left|\frac{dN}{dt}\right| * \frac{1}{V} * \frac{T_{\frac{1}{2}}}{\ln 2} * \frac{M}{N_A}$$ — conversation of activity into concentration

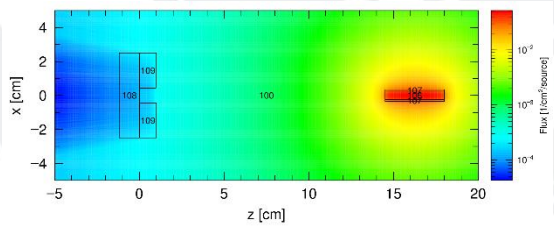
where n is the concentration of TPE in the solution, dN/dt is the activity of the sample, V is its volume, $T_{1/2}$ is the half-life of TPE, M is its molar mass, N_A is Avogadro's number.

The Monte Carlo calculation

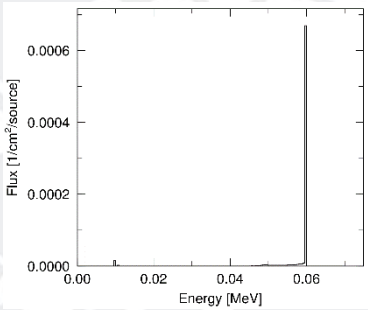


NaI(Tl)





HPGE



Conclusions

1) When measuring the concentration of radioactive substances in solution, with simple spectra, the advantage of a scintillation detector with a well, because its detection efficiency is 100 times higher than that of the HPGE detector available in the laboratory, and, consequently, the exposure time is 100 times shorter, which is especially important when conducting an experiment with short-lived elements.

2) Monte Carlo calculations of the experiment in the PHiTs package do not contradict the obtained experimental data and the well-known properties of the detectors.

3)However, the assumption of significant self-absorption of soft gamma radiation in a nitric acid solution is not confirmed by either the calculations or the experiment. According to the estimates of the calculation (which coincides with the experimental data), the self-absorption of radiation in the solution does not exceed 3-4%.