



SIMULTANEOUS DETERMINATION OF U AND Pu ISOTOPES BY ALPHA SPECTROMETRY

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Determination of actinides by alpha spectrometry is usually carried out after full separation of each of the components of the sample. The procedure presented in this paper permits U and Pu isotopes to be measured together allowing faster sample processing and measurement. The method consists in the extraction with tributyl phosphate of U and Pu isotopes from the rest of the matrix, followed by a cathodic electrodeposition to obtain suitable pieces for alpha spectrometry. It can be applied to various environmental samples, such as water, filters and soil (about 0.5 g of solid sample for the described conditions). High-quality electroplated discs are essential for simultaneous processing.

POTENTIAL INTERFERENCES

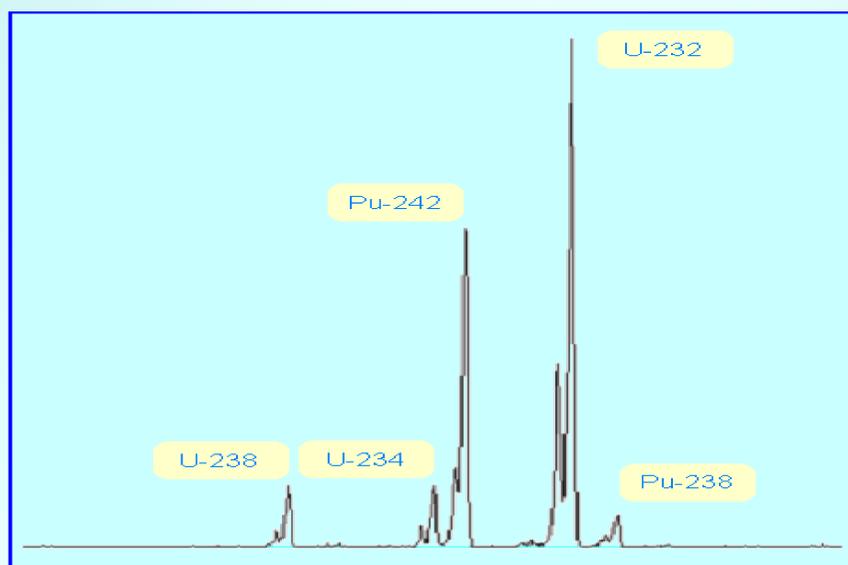
Main energies and their intensities of most common alpha emitters. Those which may cause interference in the measurement of U + Pu are highlighted.

Isotope	Energy (keV)	Intensity (%)	Energy (keV)	Intensity (%)
Th-232	4011,2	78,9	3948,5	21
U-238	4198	77,54	4151	22,33
Th-230	4687	76,3	4620,5	23,4
Th-229	4845,3	56,2	4901	10,2
U-234	4774,6	71,37	4722,4	28,42
Np-237	4788	47,64	4771,4	13
Pu-242	4902,3	76,53	4858,2	23,44
Pu-239	5156,59	70,79	5143,82	17,14
Pu-240	5168,13	72,74	5123,6	27,16
Am-243	5275,3	86,74	5233,3	11,46
Po-210	5304,33	99,999		
U-232	5320,24	69,1	5263,48	30,6
Th-228	5423,28	73,2	5340,38	26,2
Am-241	5485,56	84,45	5442,86	13,23
Pu-238	5499,03	71,04	5456,3	28,85
Ra-224	5685,48	94,73	5448,8	5,25
Cm-243	5786,4	73,4	5742,5	11,3
Cm-244	5804,77	76,7	5762,65	23,3

SPECTRAL ANALYSIS

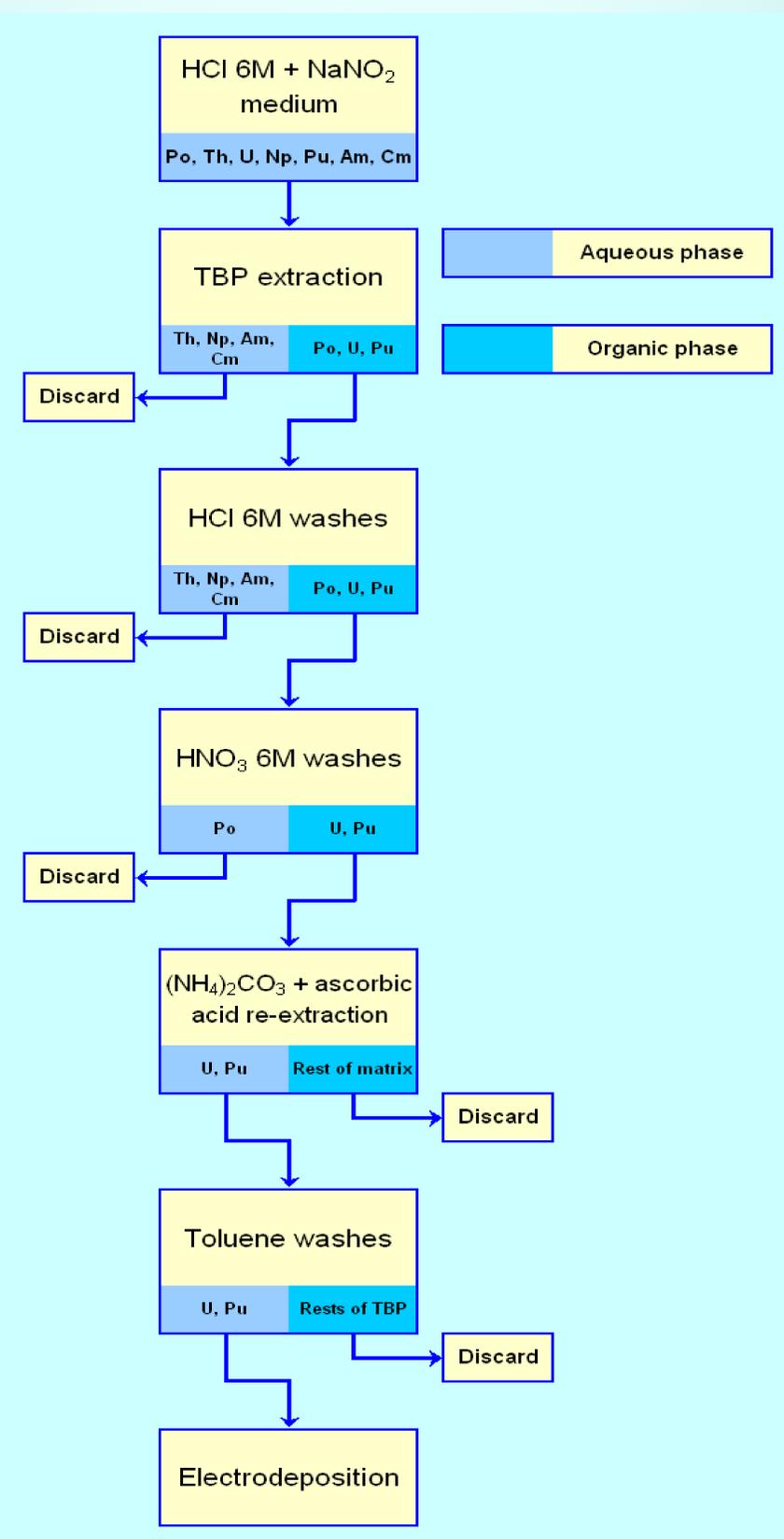
It can be observed the great resolution achieved with this technique by looking at Pu-242 and U-234 peaks, whose emission energies are very close and are clearly distinguished. Even different energies of one single nuclide can be noticed.

It can also be remarked the pretty small alpha peak characteristic tail, which is related with energy degradation processes.



Yields around 60-90 % can be achieved.

ANALYTICAL PROCEDURE



CONCLUSIONS

The technique presented here allows to achieve results for U and Pu isotopes carrying only one reading. It can be applied to several matrices such as water, filters and soils. It's not expensive as it uses very small amounts of reagents. Besides, it produces high-quality electroplated discs, which are essential for a correct spectral analysis. Moreover, it's a fast technique, that allows to process several samples in a few hours.