

THE DEVELOPMENT AND VERIFICATION OF A FAST COMBINATION METHOD FOR <sup>241</sup>AM, SR- AND PU-ISOTOPES IN AIR FILTERS

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In a case of emergency, usually samples are taken and measured by gamma spectroscopy for a first assessment. For an entire characterization of the potential fallout pure alpha and beta emitting radionuclides need to be determined as well. Thus, it is important to have radiochemical fast methods ready. As aerosols are one of the most important and the first indicators for a radiological contamination, the constant monitoring of air is crucial especially in such situations. Thus, it was the aim of this project to develop a fast method for the determination of <sup>241</sup>Am, Sr- and Pu-isotopes for aerosols in air filters. Thinking of fast methods, many different approaches come into mind (e.g. plastic scintillation<sup>1</sup>, ion exchange<sup>2</sup>). At present most of them are based on extraction chromatography. Thus, we took an approach based on the combined use of different extraction chromatographic resins by Eichrom®.

In our laboratory primarily environmental samples (e.g. soil, vegetation) and foodstuffs (milk, vegetables, cereals) are analysed radiochemically in a case of emergency. As we already know from previous emergency exercises that our fast method works for these kind of samples, we had to confirm that it is also suitable for air filters. In contrast to usual environmental samples, air filters are special regarding ashing and digestion. Depending on the air filters' material (e.g. borosilicate fibre) ashing is no option. Hence, the right digestion is the more important. So we focused on a total digestion using a mixture of hydrofluoric acid and reverse aqua regia. The presented analytical method is based on the selective separation and purification using consecutively Sr and DGA resin filled cartridges and the Vacuum Box System (all by Eichrom®). Especially when time is a crucial factor, using a vacuum assisted system helps to reduce the duration of the analytical method considerably. The presented fast method was verified during an emergency exercise. The analysed, spiked samples (Am-241 and Pu-239) showed a high correlation with the added activities. Furthermore, high chemical yields of the tracers above 59% were obtained. Additionally, the activity concentration of Pu-239 was determined by alpha spectroscopy and verified via ICP-MS.

This method, its development and the associated challenges will be presented at the 65<sup>th</sup> RRMCM.

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<sup>1</sup>Saez-Muno, et al, Rapid methods for radiostrontium determination in aerosol filters and vegetation in emergency situations using PS resin, Journal of Radioanalytical and Nuclear Chemistry, 2019, 322, 1397-1408

<sup>2</sup>Landstetter, et al, Development of a rapid method to determine plutonium in foodstuffs, Journal of Radioanalytical and Nuclear Chemistry, 2015, 304, 343-347