

RADIOCHEMICAL METHODOLOGY APPLIED TO DETERMINATION OF GAMMA EMITTING RADIONUCLIDES IN WASTE SAMPLES FROM IEA-R1 REACTOR

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INTRODUCTION

The Brazilian reactor IEA-R1 has been in operation since 1957. It is an open pool-type nuclear research reactor, operating at 2 to 5 MW that uses water as coolant, moderator and biological shield.

Polypropylene filter cartridges are part of the water treatment system of the reactor and become radioactive as they remove suspended solid material from the cooling water during the operation of the reactor. Annually, the replacement of the filters from the reactor's water treatment system generates about 36 units.

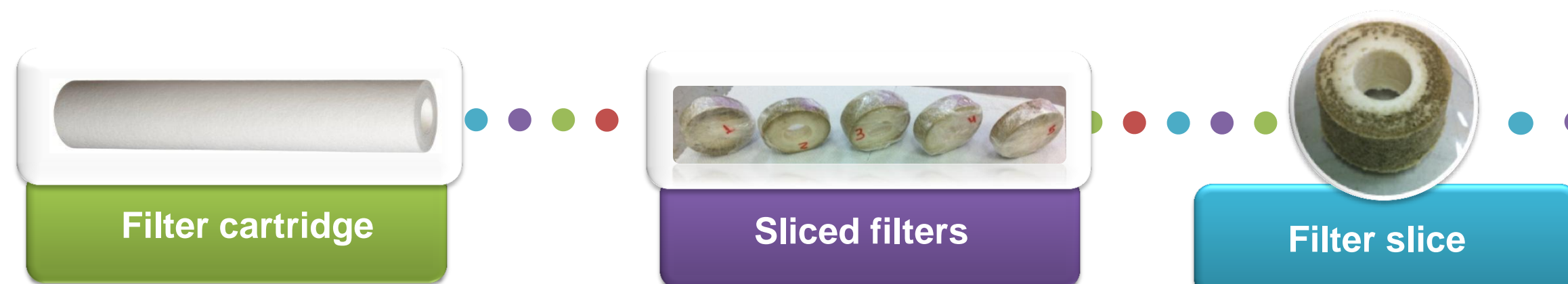
The development of a method for the characterization of the radionuclides present in the filters is required for routine operation in the Radioactive Waste Management Facility (RWMF) in order to determine the radioisotopic inventory of the waste packages.

Wastes from nuclear reactors contain transuranic elements, activation and fission products, only few of them emitting gamma radiation measurable by simple gamma scanning methods.

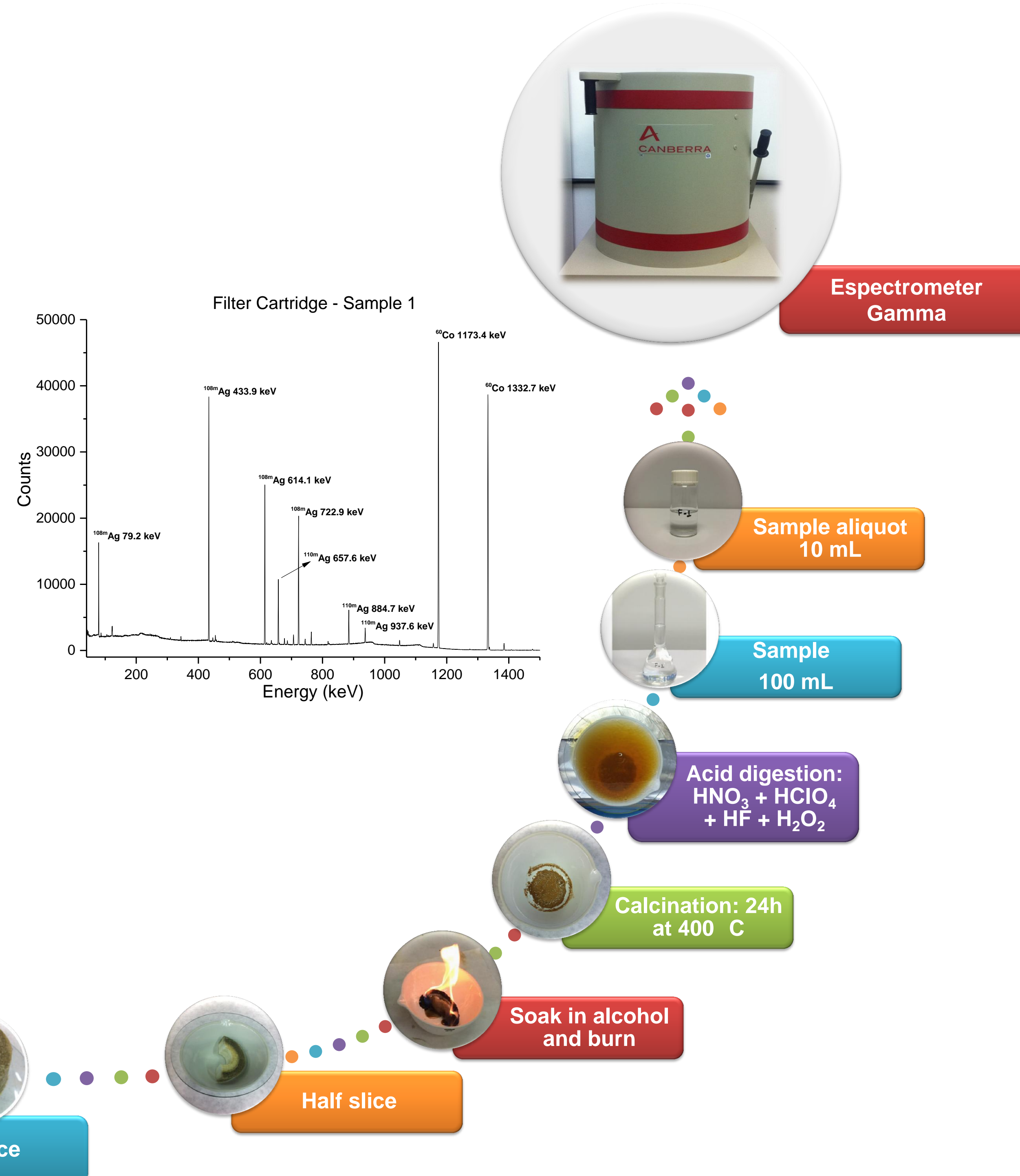
The method of the Scaling Factors (SF) uses empirically determined proportions between the concentrations of Difficult to Measure (DTM) radionuclides and that of easily measurable gamma emitters called Key Nuclide (KN), to calculate DTM concentrations.

OBJECTIVE

The objective of this study is to describe a method of the dissolution of the filter cartridges for determination of gamma emitting radionuclides.



METHOD AND RESULTS



DISCUSSION

To determine the activity of a sample by means of gamma spectrometry, it is necessary previous knowledge of the efficiency curve for a given geometry, which can be obtained by calibrating the efficiency and energy of the detector.

The need to dissolve the filter cartridges has arisen given the difficulty in obtaining a standard source with the same filter geometry. Therefore, for this work, the calibration curve was constructed using a mixed gamma-ray standard with known activities, same geometry, density, physical state and chemical composition of the source to be analyzed.

A sample with background count (BG) was prepared and analyzed under the same conditions as the samples and the result was subtracted from the results obtained for each filter sample.

CONCLUSIONS

- ❖ After many tests, it was possible to establish a method for the dissolution of filter cartridges for the determination of gamma-emitting radionuclides.
- ❖ A mixed gamma-ray standard was produced in liquid form, containing the following radionuclides: ²⁴¹Am, ¹³⁷Cs and ⁶⁰Co, which have photopeaks at the following energies: 59.54, 661.66 and 1332.49 keV, respectively.

ACKNOWLEDGEMENTS