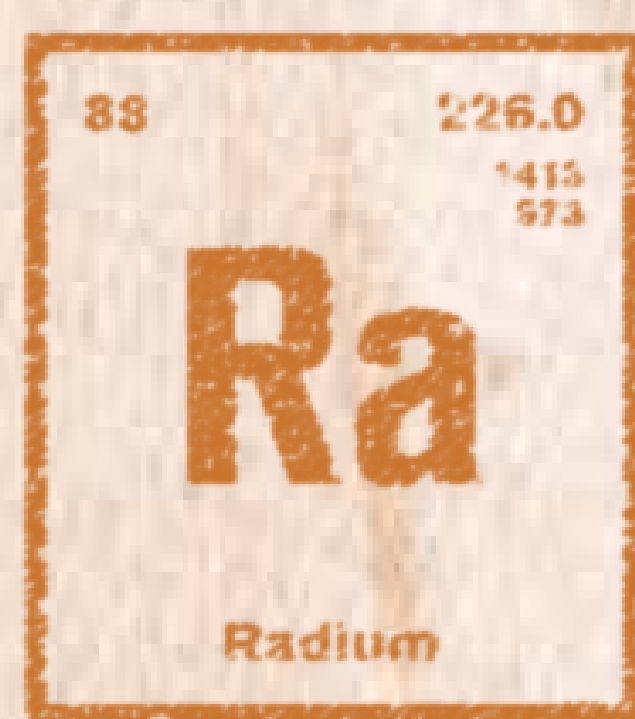


MINIATURIZED AUTOMATIC SYSTEM FOR ^{226}Ra ISOLATION AND PRE-CONCENTRATION FROM DRINKING WATER

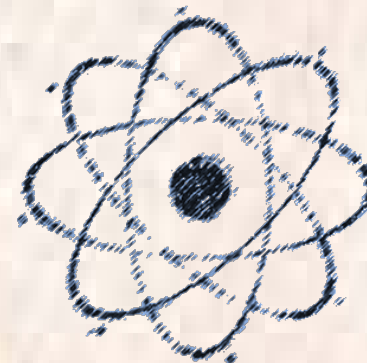


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An automatic system based on multisyringe flow injection analysis (MSFIA) and lab-on-valve (LOV) techniques for separation and pre-concentration of ^{226}Ra in drinking water samples has been developed. The analytical protocol combines two different procedures for radium separation and pre-concentration: the Ra adsorption on MnO_2 and the BaSO_4 co-precipitation, achieving more selectivity especially in water samples with low radium levels.

Radium is adsorbed on MnO_2 deposited on macroporous of bead cellulose. Then, it is eluted with hydroxylamine and subsequently co-precipitated with BaSO_4 . After that, the remaining liquid is discarded. The ^{226}Ra pre-concentrated in the solid can be detected in off-line mode by low background proportional counter or if the co-precipitate is dissolved using EDTA in ammonium solution. ^{226}Ra activity is determined using the Hidex 300SL liquid scintillation counter (LSC).

The MSFIA-LOV system allows reduction of reagent volumes, the minimization of sample handling, improving the precision (1.9% RSD), and extraction frequency (up to 3 h^{-1}), attaining a significant decrease of both time and cost per analysis. Besides, it has been satisfactorily applied to different types of spiked drinking water (tap, mineral and groundwater). The minimum detectable activity (AMD) of this system allows to reach the reference values proposed by international agencies responsible for providing technical support on public health issues (e.g. WHO, ATSDR, EPA).

Analytical procedure and features

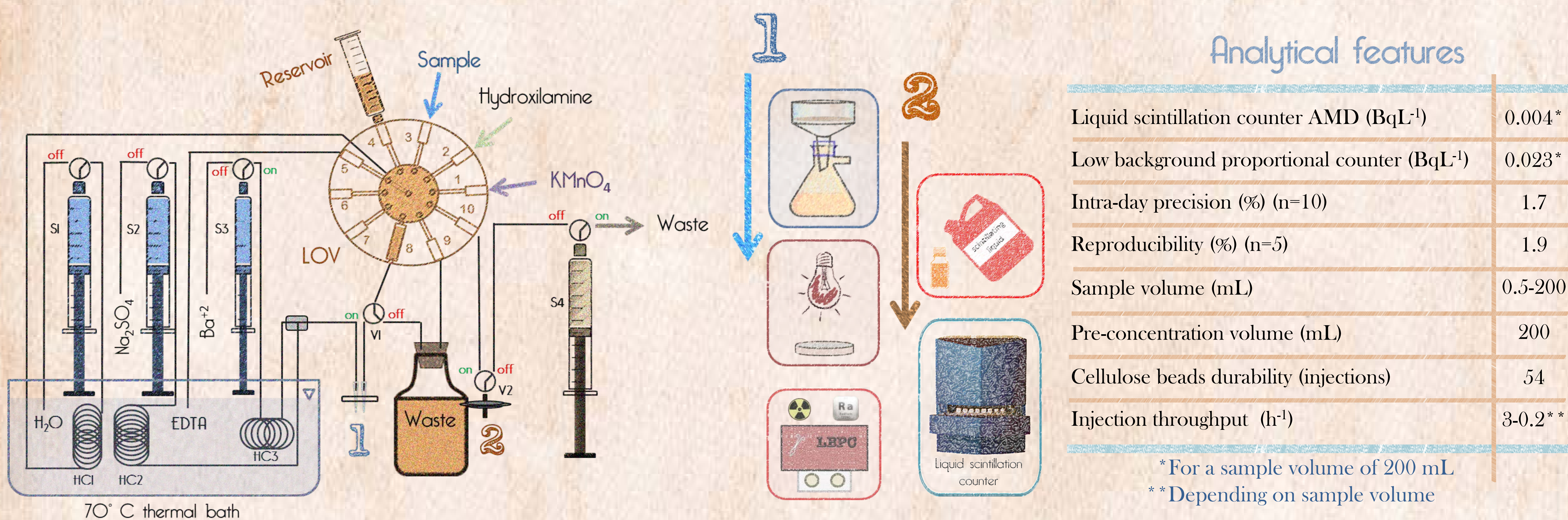


Figure 1. Schematic diagram of the MSFIA - LOV system, procedure diagram and analytical features

Conclusions

An automated LOV method for extraction and pre-concentration of ^{226}Ra prior radiometric detection has been developed.

Main features of the developed method are the fully automation of the isolation/preconcentration procedure, including the on-line replacement of the column; the low LOD; the drastic shortening of analysis time; and the reduced sample and reagents consumption.

Moreover, the proposed method offers accuracy, high precision and improvement of the analyst safety, what is of high relevance when manipulating radioactive isotopes.

Thus, this method has several advantages such as simplicity, selectivity, sensitivity, low operational and instrumentation costs and robustness. Besides, it minimizes considerably the use of sample and reagents, contributing to significantly reduce the environmental impact per analysis

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