

ON THE DIRECT DETERMINATION OF RADIOSTRONTIUM AND Pb-210 FROM WATER SAMPLES

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Crown-ether based extraction chromatographic resins are frequently used for the separation and determination of Pb-210 and radiostrontium in aqueous samples via liquid scintillation (LSC) or gas proportional counting (GPC). These resins only show significant Pb and Sr retention at moderate to high acid concentrations; thus they do not allow direct loading of the analytes from filtered raw or acidified water samples, making the use of additional pre-concentration steps such as ion exchange or co-precipitation necessary.

In order to simplify the radiostrontium and Pb-210 determination two extraction chromatographic resins (TK100 & TK101 Resin) allowing the direct load of the analytes from water samples and their subsequent purification on the same resin have been developed and characterized. Both resins are based on a crown-ether with high selectivity for Sr and Pb, however by including HDEHP (TK100) or a short chained ionic liquid (TK101) into its composition Pb and Sr can be extracted at a much wider range of pH conditions, i.e. $\text{pH} \leq 8$. Conditions allowing the removal of other beta emitters (e.g. Sr-90, Bi-210, Y-90) from the resins, and for the final elution of the analytes from the resins, have been identified. Elution studies have been performed with both resins in column form as well as in disc form, the latter having the advantage of allowing higher flow rates, with the aim of developing rapid methods for the determination of radiostrontium and Pb-210. It has been shown that the TK100 Resin allows for separating Sr from 250 mL (95.2% +/- 2.5%, N=3) – 500 mL (88.2% +/- 4.3%, N=3) water samples with high yields even at sample loading flow rates of 5 – 10 mL/min. TK101 Resin on the other hand shows near quantitative Pb uptake ($\geq 95\%$) from water samples of elevated volumes even at high flow rates (e.g. 10 mL/min for columns and 30 mL/min for discs). Samples of up to 5 L were directly loaded onto the resin in column or filter geometry; Pb was retained on the resin, purified and finally eluted with high chemical yield and purity. The direct measurement of Pb-210 loaded discs by liquid scintillation counting is being evaluated in order to further speed up the method.

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