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DETERMINATION OF PO-210 IN DRINKING WATER WITH PLASTIC SCINTILLATION RESINS. DEVELOPMENT AND METHODS COMPARATIVE

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Po-210 is a natural occurring radionuclide produced in the decay chain of ²³⁸U. Spanish legislation RD 140/2003 establishes that all consumption waters which exceeds fixed parametric values requires the determination of ²¹⁰Po, among other specific radionuclides. In addition, due to its extremely high radiotoxicity the limit activity allowed for ²¹⁰Po, 0.1 Bq L⁻¹, is the lowest among the radionuclides considered. ²¹⁰Po is usually analyzed by alpha spectrometry after controlled volume reduction (UNE-EN ISO 13161) or by alpha spectrometry after preconcentration through coprecipitation with MnO₂ and separation from interferences with the SRresin®. Those methods provide good results with very low detection methods. However, both are slow since require from long sample process time and therefore faster methods could be an alternative to increase laboratory productivity. Considering this necessity, this work intends to develop a new method to analyze ²¹⁰Po in water samples using a selective plastic scintillation resin (PSresin). This resin is made of 50-60 μm polystyrene scintillating microspheres coated with Aliquat-336 as a selective extractant. The advantage of this method with regards alpha spectrometry and liquid scintillation is that unifies separation and measurement steps in the same material, reducing time of analysis and reagents (no elution is required) and avoiding the generation of mixed wastes.

The studies performed have allowed the isolation of ²¹⁰Po onto PSresin eluting ²¹⁰Pb and ²¹⁰Bi, as the main interferences, with hydrochloric acid rinses at 1 mol L⁻¹ and 6.25 mol L⁻¹, respectively. In addition, an optimization of rinse volumes was carried out. On the other hand, a research of several chemical analogues to polonium to be used in the whole procedure as chemical tracer was performed. Zinc and cadmium were found to be the most suitable metals reproducing polonium behavior both on the preconcentration step through MnO₂ precipitation and on the PSresin separation.

Finally drinking water samples were analyzed with the PSresins method and also through the reference methods UNE-EN ISO 13161 and IAEA/AQ/12. The comparison showed that PSresin method is faster and provided accurate results, but those based on alpha spectrometry achieved lower detection limits.

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