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Investigation of a new approach for 36Cl determination using plastic scintillators

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36Cl is one of the important radionuclides to be controlled in view of radioactive waste disposal from nuclear infrastructures. Determination of 36Cl is challenging due to its volatility, low activity concentration in decommissioning samples and the lack of solid reference materials for method validation.
In this paper, a new approach to determine 36Cl in solid samples by using plastic scintillator microspheres (PSm)/resin (PSresin) was examined. The main advantages of using PSm/PSresin are the decrease of the turnaround time (TAT) of the analysis procedure since the PSm/PSresin with the radionuclide adsorbed can be directly measured by liquid scintillation counting (LSC) and avoiding mixed wastes.
Samples were pyrolysed to release 36Cl with the Trio-Furnace Pyrolyser from RADDEC. Different set-ups were investigated for trapping and/or separating this 36Cl. Two different approaches were investigated using respectively plastic scintillation microspheres (PSm) and plastic scintillating resins (PSresin). With the PSm, two different set-ups for trapping 36Cl from the pyrolyser were tested: 1) using the PSm directly as a trapping material and 2) mixing the PSm with the trapping solutions (H2SO4 and Na2CO3) after applying the combustion procedure. With the PSresin (TK-TcScint), a selective scintillating resin normally used for 99Tc determination, was tested using a set-up where the trapping solutions (H2SO4 and Na2CO3) were loaded into the cartridge containing the PSresin, which was placed into a LS vial and directly measured by LSC. This paper will present and discuss a comparison of the chemical recoveries of 36Cl obtained using the various approaches and set ups.

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