

Title: Comparative study about Sr-90 determination in environmental samples by using liquid and plastic scintillators.

Student: Jordi Rotger Pons

Date: January 2020

Supervisor/s: Dr. Àlex Tarancón Sanz
Departament d'Enginyeria Química i Química Analítica
Dra. Anna Rigol Parera
Departament d'Enginyeria Química i Química Analítica

Strontium-90 is a radionuclide generated as fission product in nuclear facilities. It is a high energy beta particle emitter that can be easily introduced in food chain because of its chemical similarity with calcium. Therefore, strontium-90 must be monitored in different environmental samples. In the case of water samples, the most settled methods are based on liquid scintillation, which includes different steps of pre-treatment, strontium-90 separation from interferences and measurement. Nevertheless, these methods have some drawbacks as its long-time duration or the generation of mixed wastes. This is where new methods based on plastic scintillation can be a monitoring alternative using selective plastic scintillation resins for strontium-90. These new methods can unify strontium-90 separation and measurement steps with a considerable reduction of time and avoiding the generation of mixed wastes. In view of this, the main goal of the project is to establish a comparison between validated methods based on liquid scintillation with those based in plastic scintillation.

Both techniques, liquid and plastic scintillation, were applied to two types of water samples. First, a sample with medium strontium-90 activity and several interferences in which results obtained by plastic scintillation were comparable with those obtained by liquid scintillation. Secondly, a sample with extremely low strontium-90 activity that, despite providing very reproducible results, plastic scintillation did not give results as accurate as liquid scintillation.

Plastic scintillation methods also were carried out in less time and reached lower detection limits than liquid scintillation methods.

Keywords: strontium-90, water samples, liquid scintillation, plastic scintillation, plastic scintillation resins.