Contribution ID: **5** Type: **Talk**

Development of analytical techniques for tritium accountancy around the fusion fuel cycle

Thursday 5 February 2026 14:50 (30 minutes)

The Tritium Fuel Cycle (TFC) division at UKAEA is working in collaboration with the LIBRTI project to develop analytical techniques for tritium accountancy. For a fusion power plant to be fully operational, tritium will need to be analysed throughout the entire fuel cycle whether it is in gas stream or in materials such as breeder materials. Two projects are currently on-going and will develop a wide range of analytical methods and instruments to answer the challenges around tritium analytics.
HERA is looking at testing analytical methods for real-time analysis of tritium in gas streams. The project is a glovebox experiment installed in the Active Gas Handling System (AGHS) building on the Culham campus. The glovebox has been entirely designed by UKAEA engineers and is currently being built in the facility, once the build phase comes to an end, the glovebox will enter commissioning where the instruments installed inside will be tested and calibrated. HERA will be testing 2 analytical instruments: a mass spectrometer (MS) and a Raman spectrometer. The HERA glovebox will be capable of generating its own gas calibration standards thanks to calibrated vessels and PVTc calculations. The instruments will be able to quantify H2, D2 and T2 from limit of detection up to 100% gas streams. A Palladium catalyst will also be installed in the glovebox to allow for isotopic exchange and semi- quantification of HD, HT and DT.
THALIA's goal is to develop and validate a method for tritium accountancy when trapped in liquid breeder materials such as liquid lithium, LiPb and FLiBe, the first phase of the project will focus on FLiBe. The project consists of 2 sub-projects, ERATO and CLIO, each looking at an analytical technique. ERATO will focus on developing a sample preparation technique suitable for analysis of tritiated lithium-based salts for Liquid Scintillation Counting (LSC). Meanwhile, CLIO will develop a hydrogen analysis technique using ICP-MS, commonly used for a wide range of analysis but currently not developed for analysing small atoms such as hydrogen and its isotopologues. Both techniques are considered to be low technology readiness level (TRL) due to the difficult of getting the tritiated lithium matrix into a suitable state for analysis.
THALIA and its sub-projects are facing quite a few challenges such as difficulty of working with lithium-based materials, unknown tritium speciation in the materials, very low concentrations, storage of samples.
The presentation will go through:
- The need for real-time analysis of tritium and its challenges.
- What is the HERA project
- Analytical instruments integrated in HERA
- The challenges of tritium accountancy in breeder materials
- What are the THALIA project and its sub-projects CLIO and ERATO

Speaker affiliation

UKAEA

Author: MONT, Clemence

Presenter: MONT, Clemence

Session Classification: Session 3-11

Track Classification: LIBRTI Conference