



Contribution ID: 243

Type: **not specified**

Development of Pb-16Li technologies for DEMO Reactor

Tuesday, 18 September 2018 17:00 (20 minutes)

Three of the four breeder blanket concepts for a DEMO Reactor use the eutectic Pb-16Li enriched at 90% in ^6Li as breeder material: Helium Cooled Lithium Lead (HCLL), Water Cooled Lithium Lead (WCLL) and Dual Coolant Lithium Lead (DCLL). Moreover the WCLL is one of the blanket concepts that will be qualified in the ITER reactor, therefore the development and design of lead lithium loops and auxiliary systems is essential. The main functional requirements that Pb-16Li systems have to fulfill are:

- To circulate the liquid Pb-16Li through the blanket;
- To extract the Tritium produced inside the breeder modules from Pb-16Li (this function is shared with the Tritium Extraction System);
- To control Pb-16Li chemistry and to remove accumulated impurities;
- To avoid tritium permeation into primary coolant.

In the framework of EUROfusion Consortium, the design of the Pb-16Li loops for the breeding blankets and R&D activities are planned. The present work aims to describe the activities performed in order to achieve the following objectives: i) design and integration of the Pb-16Li loops inside tokamak building, ii) development and characterization of antipermeation and anticorrosion coatings in Pb-16Li, iii) development and design of tritium extraction system, iv) design chemistry control system for Pb-16Li loops, v) perform MHD analyses taking into account also the impact on tritium transport in breeding blankets and perform safety analysis of water/Pb-16Li interaction due to LOCA inside the WCLL blanket.

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Session Classification: O2.C