Preliminary results of the MARIOS experiment on Minor Actinide Bearing Blanket concept.

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Abstract:

Americium is a strong contributor to the long term radiotoxicity of high activity nuclear waste. Transmutation by irradiation in nuclear reactors of long-lived nuclides like 241Am is, therefore, an option for the reduction of radiotoxicity, residual power packages as well as the repository area. One of the most attractive possibilities to burn MA, is represented by the Minor Actinides Bearing Blanket (MABB) concept. In this option, MA are diluted in a UO2 matrix and irradiated for a long time (4,100 EFPD) into radial blankets at the periphery of the outer core of a sodium fast reactor. The MARIOS irradiation experiment is the latest of a series of experiments on americium transmutation (e.g. EFTTRA-T4, EFTTRA-T4bis, HELIOS). Moreover, the MARIOS experiment, together with the DIAMINO experiment, which is under preparation in the OSIRIS reactor in France, is dealing with the study of the in-pile behaviour of UO2 containing Minor Actinides (MAs) in order to gain knowledge on the role of the microstructure and of the temperature on the gas release and on fuel swelling for the MABB concept. The MARIOS experiment is carried out in the framework of the 4-year project FAIRFUELS of the EURATOM 7th Framework Programme (FP7).

The MARIOS experiment is conducted in the HFR (High Flux Reactor) in Petten (The Netherlands) and started in March 2011. It has been planned that the experiment will last 11 cycles, corresponding approximately to 11 months.

This paper covers the description and the objectives of the experiment, as well as the preliminary result in term of first assessment and temperature recording.