

Investigation of pelletized and sphere-packed oxide fuels for Minor Actinide transmutation in Sodium Fast Reactors, within the FP-7 European project PELGRIMM

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Abstract

The FP-7 European project PELGRIMM, which stands for “PELlets versus GRanulates: Irradiation, Manufacturing, Modelling” is a 4 year and 7.2M€ project, addressing Minor-Actinide (MA) bearing oxide fuel developments for Generation IV – Sodium Fast Reactor Systems. Both options, MA homogeneous recycle in driver fuels with MA content at a few percent and heterogeneous recycle on UO₂ fuels bearing high MA contents located in the radial core blanket, are considered. Two fuel forms: pellet and spherepac, are under investigation.

A total of 12 partners from research laboratories, universities and industries, collaborate to share and leverage their skills, progress and achievements, covering a comprehensive set of investigations:

- perform the Post-Irradiation Examinations of MARIOS and SPHERE irradiated pins within the European project FAIRFUELS, providing the very first results respectively on the helium behaviour in (Am,U)O₂ fuels and a comparison between sphere-packed and pelletized (U,Pu,Am)O₂ fuel performances;
- take the next step in the (Am,U)O₂ fuel qualification rationale by performing the semi-analytical test MARINE in HFR;
- extend Minor Actinide bearing fuel fabrication processes to alternative routes in order to limit secondary waste streams;
- extend the capabilities of existing calculation codes devoted to fuel behaviour under irradiation
- accomplish a preliminary design of a sodium cooled fast reactor core with spherepacked (U,Pu,Am)O₂ fuels and perform a preliminary safety assessment.

PELGRIMM promotes the implication of European students and young researchers too, through:

- placements of trainees in organisations involved in the project
- the development and delivery of training courses and workshops
- contributions to research actions of the project by researchers preparing a doctoral thesis or employed at a post-doctoral position.

The paper gives an overview of the PELGRIMM programme to be completed by December 2015.