Contribution ID: **227** Type: **POSTER**

Towards a new approach for structural materials of Lead Fast Reactors

Tuesday, 27 June 2017 17:30 (1h 30m)

The development of Pb and LBE cooled fast reactors represents a unique challenge for the materials that are subject, at the same time, to degradation mechanisms related to neutron radiation damage, exposure to high temperatures and exposure to the HLM. The protection towards HLM corrosion, in the past, has been based on the control of the oxygen concentration in the HLM by keeping the oxygen concentration between 10-5 and 10-6wt.% in the liquid metal and prevent the onset of severe oxidation. This approach presents technical difficulties in its application and poses the risk that the accumulation of oxide particles can prevent the heat exchange of refrigerant in critical parts of the reactor. The new approach bases the protection of structural materials on oxides more stable than chromium oxide in HLM and namely alumina. Two paths are under study to perform stable oxides protections on LFR structures and are thoroughly discussed: 1) steel coating by anti-corrosion barriers, 2) advanced austenitics. The first approach is feasible in the short term since several coating techniques already qualified in other contexts exist to protect the steels. Alumina coatings are a promising option for the protection of the fuel claddings and the R&D to demonstrate the feasibility of this option is in progress. The second approach require a long path to tune and qualify self passivating alloys for core applications where the features for swelling resistance have to be associated with those for HLM corrosion.
The development of radiation resistant steels has been based on the optimization of composition and thermo-mechanical treatments, lasted several decades, to improve the resistance to irradiation swelling and maintain suitable mechanical properties. However the advanced austenitics for reactor internals which are less exposed than the core to fast neutrons require less R&D and could be produced in a short time.

Country/Int. Organization

Italy/ENEA (Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile)

Primary author: Dr ANGIOLINI, Massimo Emilio (ENEA)

Co-authors: Dr PILLONI, Luciano (enea); Dr UTILI, Marco (ENEA); Dr AGOSTINI, Pietro (ENEA)

Presenter: Dr AGOSTINI, Pietro (ENEA)

Session Classification: Poster Session 1

Track Classification: Track 5. Fast Reactor Materials (Fuels and Structures) and Technology