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## Liquid Metal Corrosion of conventional and thermomechanically improved ferritic-martensitic steel

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Lead-cooled Fast Reactor (LFR) is considered one of the most promising designs for the future Gen-IV, next generation of nuclear energy systems. This reactor, cooled by lead or lead bismuth eutectic (LBE), will operate at high temperatures ( $T > 500^{\circ}\text{C}$ ). The efficiency and temperature increases will impact the materials behaviour regarding to its mechanical properties, irradiation conditions and specially the corrosion resistance. The compatibility of steels with liquid metal at extreme operational conditions is a remaining issue and needs further investigation; especially that focused on the use of structural materials with better oxidation behaviour and high-temperature strength.

Liquid Metal Corrosion (LMC) can be mitigated by the formation of protective oxide layer over material surface depending on the steel composition, oxygen concentration, mechanism of oxide layer formation and the microchemistry and microstructure in the near surface layer.

On the other hand, the improvement of creep properties of conventional 9-12% Cr ferritic-martensitic steels merges as an alternative for large components materials by a microstructural optimization through nano-precipitation stable at  $700^{\circ}\text{C}$  with a combination of composition adjustments, guided by computational thermodynamics and/or thermomechanical control process (TMCP) optimization. The thermomechanical treatment (TMT) has been optimized in order to produce a dispersion of nano-sized particles which improves the creep resistance of conventional T91 steel.

This paper focuses on the study of the corrosion behaviour, of conventional (T91-AR) and thermomechanical improved (T91-TMT) ferritic-martensitic steels. Long term immersion corrosion tests have been performed to determine the behaviour differences of both materials depending on the environment, Pb and LBE liquid metals, high temperatures and oxygen controlled concentrations. The type and extension of structural material degradation has been evaluated by means of metallographic post-test examination and chemical characterization of deposits and oxide layers.