CORROSION-EROSION OF CLAM STEEL IN FLOWING LIPB IN DRAGON-RT

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Liquid Lithium-Lead (LiPb) Blanket concepts provide attractive options for high tritium breeding ratio, high efficiency and simplicity of the system [1]. Because of its low activation properties, radiation resistance and industrial maturity, RAFM (Reduced Activation Ferritic /Martensitic) steels are widely regarded as promising structural materials of the blanket system, CLAM (China low activation Martensitic) steel is the first candidate structural material for the series of FDS reacotrs developed in China [2].

The corrosion tests performed in DRAGON-RT built in ASIPP (Institute of Plasma Physics, Chinese Academy of Sciences) at 480°C and 550°C for thousands hours, which was aimed to investigate the corrosion-erosion behavior under the higher flowing LiPb condition at different temperature. The driving force of flowing LiPb with the rate 0.16m/s was induced by the electric motor. The results was also compared with that obtained in static corrosion tests to investigate the velocity effect on the corrosion behavior of CLAM steel in the LiPb flow.

After exposure, weight loss measurement, hardness tests, the Scanning Electron Microscope observations and Energy Dispersive X-ray Spectrometer tests were adopted to analyze the microstructure and compositional change for the specimens. The results showed that the boundary of grain suffered corrosion attack due to the dissolution of carbides in liquid LiPb and chromium and iron elements depleted layer was observed on the cross-section of CLAM steel after exposure.

[2] Q. Huang, et al., J.Nucl. Mater. 367-370, 2007, 142-146.