Comparison of corrosion behavior of EUROFER and CLAM steels in flowing Pb-15.7Li

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Ferritic martensitic steels are envisaged to be applied as structural material in HCLL blanket systems. Their compatibility with the liquid breeder, which is in direct contact with the structural alloy, will be essential for a reliable and safe operation of the designed blankets. Formerly performed corrosion tests of RAFM steels in PICOLO loop of KIT were mainly done at high flow velocities, e.g. 0.22 m/s and delivered severe attack with values above 400 µm material loss per year at 550°C operational temperature. Meanwhile, flow velocities for corrosion testing have been reduced into the "cm range" to be near fusion relevant conditions under actual and planned campaigns.

Among the international ITER-partners, many varieties of RAFM steels have been developed and manufactured within the last decade, e.g. the so-called **C**hinese **L**ow **A**ctivation **M**artensitic steel (CLAM). For the use of these steels for building of TBMs in ITER, an extended qualification program has to be performed which includes corrosion tests in the flowing PbLi alloy, too.

In this paper, the long term corrosion behavior of EUROFER and CLAM steel in flowing Pb-15.7Li will be presented at a flow velocity of about 0.10 m/s and compared with earlier obtained results of RAFM steels exposed at other operation parameters of PICOLO loop. The Chinese CLAM steel was characterized concerning corrosion attack in PbLi in direct comparison with EUROFER steel in the same test campaign for exposure times up to more than 12,000 h for the first time. The observed corrosion attack is near 250 µm/year and fits well to predictions made by MATLIM-modeling for low flow velocities in the turbulent flow regime.

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