Contribution ID: **486** Type: **Oral**

Advancement of LiMIT and Associated Technologies

Wednesday 7 June 2017 12:20 (20 minutes)

Liquid metal plasma facing components (PFCs) provide several advantages over standard solid PFCs, as the constantly refreshing, self-healing surface reduces erosion and thermal stress, decreases edge recycling, reduces impurities, and enhances plasma performance. The Liquid Metal Infused Trench (LiMIT) system, pioneered at UIUC and tested in HT-7 and Magnum PSI, has demonstrated the feasibility of thermoelectric magnetohydrodynamic (TEMHD) driven flow of liquid lithium through a series of solid trenches. As the system moves closer to full-scale implementation in fusion devices, the team at UIUC is focusing on addressing issues of flow control and heat flux handling, as well as the potential for the use of novel materials in a LiMIT system. We present advances in the use of dictating wetting temperature and therefore flow regimes using a novel surface micro/nanostructuring process, and the potential improvements to system behavior these techniques can yield under high heat loads. We also investigate the potential of a tin-lithium (SnLi) eutectic as a viable alternative in the LiMIT system. Since the advent of liquid lithium PFC concepts, SnLi has been discussed as a possible perfect compromise between the stability of tin and the plasma performance benefits of lithium. With an effective process for creating bulk SnLi eutectic at UIUC, we have been able to test several fusion relevant characteristics of SnLi, and investigate its potential as an improved liquid metal PFC material.

Eligible for student paper award?

No

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Session Classification: W.OA2: Divertors and PFCs: Liquid Metals

Track Classification: Plasma facing components