Contribution ID: **524** Type: **Poster**

An Equation of State and Compendium of Thermophysical Properties of Liquid Tin, a Prospective Plasma-Facing Material

Wednesday 7 June 2017 13:40 (2 hours)

One of the engineering challenges of magnetic confinement fusion is handling the high particle and heat fluxes incident on the divertor. Solid plasma facing materials must withstand these difficult conditions with a minimum of erosion, melting, and cracking. Liquid metals as plasma facing materials potentially alleviate all of these concerns, and are therefore being actively investigated for that purpose.

With an eye toward assessing the impacts of different liquid metal PFCs beyond the plasma-material interface (i.e. on the tokamak and ancillary systems as a whole), some additions must be made to codes such as RELAP5 and MELCOR for Fusion that are used to perform thermal hydraulic and safety analyses of such systems. These include an equation of state and other thermophysical properties of the candidate liquid metals.

Lithium is a primary candidate liquid metal PFC, and past interest in lithium as a tritium breeding material has resulted in comprehensive physical property summaries, including development of an equation of state subsequently implemented in both RELAP5 an MELCOR for Fusion. Tin is an interesting alternative; though it has a higher atomic number (Z = 50), it has a suitably low melting temperature (232 deg;C), low vapor pressure, and lacks the high chemical reactivity and high tritium solubility of lithium.

We collect and summarize here the available measured thermophysical property data on liquid tin, including density, specific heat, sound speed, vapor pressure, thermal and electrical conductivity, viscosity, surface tension, and tritium solubility. We use the thermodynamic property data (density, specific heat, sound speed, and vapor pressure) to develop an equation of state for liquid tin that accurately predicts these measured properties, and discuss its implementation in MELCOR for Fusion.

Eligible for student paper award?

No

Author: Dr HUMRICKHOUSE, Paul W. (Idaho National Laboratory)

Presenter: Dr HUMRICKHOUSE, Paul W. (Idaho National Laboratory)

Session Classification: W.POS: Poster Session W

Track Classification: Plasma facing components