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HTPD 2018



Contribution ID : 109

Type : not specified

12.34 Lithium vapor flow measurements on a Lithium Vapor Box Divertor similarity experiment

Wednesday, 18 April 2018 20:31 (120)

The lithium vapor box divertor is a concept for handling the extreme divertor heat fluxes in magnetic fusion devices. In a baffled slot divertor, plasma interacts with a dense cloud of Li vapor which radiates and cools the plasma, leading to recombination and detachment. Before testing on a tokamak the concept should be validated: we plan to study detachment and heat redistribution by a Li vapor cloud in laboratory experiments. Mass changes and temperatures are measured to validate a Direct Simulation Monte Carlo model [1] of neutral Li. The initial apparatus and experiment is a 3 cm radius steel box containing 10g of Li held at 650°C as vapor flows out a wide nozzle into a similarly-sized box at a lower temperature. Diagnosis is made challenging by the required material compatibility with lithium vapor. Vapor pressure is exponential with temperature, so to validate mass flow models to within 10%, absolute temperature to within 3.6K is required. The apparatus and methods of temperature and mass flow measurements are presented.

This work supported by U.S. DOE Contract No. DE-AC02-09CH11466.

[1] M.A Gallis et al., AIP Conference Proceedings 1628, 27 (2014); doi:10.1063/1.4902571.

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Session Classification : Session #12, Wednesday Night Poster Session