Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Thermomechanical and chemical properties of porous W/liquid Li hybrid systems as plasma-facing self-healing surfaces[1] AVEEK KAPAT, ERIC LANG, ANTON NEFF, JEAN PAUL ALLAIN, Department of Nuclear, Plasma and Radiological Engineering, University of Illinois, Urbana, IL — The environmental conditions at the plasma-material interface of a future nuclear fusion reactor interacting will be extreme. The incident plasma will carry heat fluxes of the order of 100's of MWm^{-2} and particle fluxes that can average 10^{24} $m^{-2}s^{-1}$. The fusion reactor wall would need to operate at high temperatures near 800 C and the incident energy of particles will vary from a few eV ions to MeV neutrons. A hybrid system, inspired by self-healing solid-state concepts, combines the ductile phase of liquid Li within a solid phase porous W. The liquid Li serves to control hydrogen retention and provide vapor shielding, within the framework of a tunable porosity to optimize edge plasma conditions [2]. Additionally, the porous interface can also provide for effective defect sinks for high duty cycle neutron damage. The surface chemistry of liquid Li on a porous surface varied with D irradiation is studied and its effect on retention. Prior results with refractory alloys have demonstrated effective wetting properties [3]. These hybrid systems, as well as traditional W samples, are bombarded with 500eV D_2^+ and Ar^+ at 230°C and 300°C. The Li, O, and C XPS peaks were examined and compared to controls. Additionally, the porous W is characterized for thermo-mechanical properties.

[1]Work supported by USDOE Contract DE- DE-SC0014267

Aveek Kapat
University of Illinois

Date submitted: 18 Jul 2017 Electronic form version 1.4