Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Helium and deuterium induced morphology on porous tungsten and effects on D retention[1] AVEEK KAPAT, JEAN PAUL ALLAIN, ERIC LANG, University of Illinois at Urbana Champaign, JONATHAN HINKS, STEPHEN DONNELLY, University of Huddersfield, UK — Tungsten is the material of choice for plasma facing components in the divertor region of future plasma-burning tokamak fusion reactors due to favorable thermo-mechanical properties. However, refractory metals are limited by possible detrimental ion-induced (He and D) surface morphologies that compromise confinement. Materials with increased defect sink domains could decrease vacancy trapping sites and decrease the probability for early-stage helium bubble formation intra-granularly. Previous work conjectured that an increase in defect sinks such as grain-boundary interfaces could provide increased resistance to helium-bubble formation. Thus higher grain boundary densities could potentially lead to an increased He fluence threshold. Based on the defect dynamics observed in the ultrafine grain tungsten, an internal free surface could also act as a defect sink and thus increases radiation tolerance, namely a material with a high surface-to-volume ratio such as porous tungsten. Moreover, very little is known about porous metals and their potential for increasing tolerance to radiation damage as a plasma-facing interface. Porous tungsten was irradiated in the MIAMI facility at the University of Huddersfield at room and˜1200C temperature with He then with D as well as just with deuterium; all cases were observed with in-situ TEM. The observed defect dynamics as well as deuterium retention are presented.

[1]This work is supported by US DOE Contract DE-SC0014267

Aveek Kapat
University of Illinois at Urbana Champaign

Date submitted: 20 Jul 2016 Electronic form version 1.4