Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Surface morphology changes to tungsten under exposure to He ions from an electron cyclotron resonance plasma source[1] DAVID DONOVAN, University of Tennessee-Knoxville, DEAN BUCHENAUER, JOSH WHALEY, RAYMOND FRIDDLE, Sandia National Laboratory, GRAHAM WRIGHT, Massachusetts Institute of Technology — Exposure of tungsten to low energy (<100 eV) helium plasmas at temperatures between 900-1900 K in both laboratory experiments [1] and tokamaks [2] has been shown to cause severe nanoscale modification of the near surface resulting the growth of tungsten tendrils. We are exploring the potential for using a compact ECR plasma in situ with scanning tunneling microscopy (STM) to investigate the early stages of helium induced tungsten migration. Here we report on characterization of the plasma source for helium plasmas with a desired ion flux of $\sim$ 1x10^{19} ions m^{-2} s^{-1} and the surface morphology changes seen on the exposed tungsten surfaces. Exposures of polished tungsten discs have been performed and characterized using SEM, AFM, and FIB cross section imaging. Bubbles have been seen on the exposed tungsten surface and in sub-surface cross sections growing to up to 150 nm in diameter. Comparisons are made between exposures of warm rolled Plansee tungsten discs and ALMT ITER grade tungsten samples.

[1] M.J. Baldwin, R.P. Doerner, Nucl. Fusion 48 (2008) 035001; M.J. Baldwin, R.P. Doerner, J. Nucl. Mater. 404 (2010) 165.
[2] G.M. Wright, et al, Nucl. Fusion 52 (2012) 042003.

[1]Work supported by US DOE Contract DE-AC04-94AL85000 and the PSI Science Center.

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Date submitted: 02 Jul 2014 Electronic form version 1.4