Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Plasma-surface interactions on extreme grain-refined tungsten tested under multi-scale fusion reactor conditions[1] JEAN PAUL ALLAIN, OSMAN EL-ATWANI, Purdue University, JONATHAN HINKS, University of Huddersfield, SEAN GONDERMAN, Purdue University, ANTON NEFF, University of Illinois, THOMAS MORGAN, KIRILL BYSTROV, GREG DE TEMMERMAN, FOM-Dutch Institute for Fundamental Energy Research — Tungsten is being considered as one of the top material candidates for divertor and first-wall components of future plasma-burning magnetic fusion reactors. Future operation demands reliable performance under extreme environmental conditions including: multi-scale variables including: particle flux (e.g. 10^{17}-10^{24} /m^2/sec), fluence (e.g. 10^{19}-10^{28} m^{-2}), temperature (200-1500 C), incident particle energies (5-1000 eV/amu) and heat fluxes (10-50 MWm^{-2}). Recent studies have observed complex surface morphology evolved when exposed to He and D/He plasmas. Extreme grain-refined tungsten is investigated as a plasma-facing component material with possible radiation-resistant properties. A systematic study ranging from early-stage He irradiation conditions to fusion reactor-level plasmas has been conducted. Early-stage studies include *in-situ* TEM analysis of He-irradiated nanostructured tungsten. Simulated conditions in future fusion plasma-burning devices are replicated using Pilot-PSI plasmas at DIFFER. Results shed light on critical gaps in our understanding of the surface response and nano-to-microstructural deformation behavior motivating pathways for improved theoretical and computational modeling strategies.

[1]Work supported by USDOE Contract DE-SC0004032.

Jean Paul Allain
Purdue University

Date submitted: 12 Jul 2013 Electronic form version 1.4