Implantation of D^+ and He^+ in Candidate Fusion First Wall Materials

R.F. Radel, B.B. Cipiti, G.L. Kulcinski, R.P. Ashley, and J.F. Santarius

Fusion Technology Institute
Madison, WI
rfradel@wisc.edu

The effects of high temperature (700-1200 ºC) implantation of deuterium and helium in candidate fusion first wall materials were studied in the University of Wisconsin Inertial Electrostatic Confinement (IEC) device. Tungsten "foam", single crystal tungsten, and a W-25%Re alloy were compared to previous tungsten powder metallurgy samples studied in the IEC device for the High Average Power Laser (HAPL) program. Scanning electron microscopy was performed to evaluate changes in surface morphology for various ion fluences at temperature ranges comparable to first wall temperatures. Preliminary results show that no deformations occur with deuterium implantation up to $2x10^{18}$ D^+/cm^2 at 1200 ºC polycrystalline tungsten samples. However, helium fluences in excess of $4x10^{17}$ He^+/cm^2 show extensive pore formation at 800 ºC. These changes will have an impact on the lifetime of thin tungsten coatings on the first walls of inertial and magnetic confinement fusion reactors.