**Molecular Dynamics Simulations of Mixed Hydrogen-Helium Implantation in Tungsten**

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**Abstract**

Tungsten is a prime candidate material for the divertor in future fusion reactors such as ITER. However, the tungsten divertor will need to be able to withstand high fluxes, on the order of 10^24 m-2s-1, of low energy hydrogen and helium. It is crucial to understand both the tungsten surface response as well as the hydrogen retention and recycling for the divertor region. Since the plasma will be roughly 90% H and 10% He, it is also important to know how the presence of He will affect these properties as well. Molecular dynamics (MD) is a useful tool to study these effects. One issue with MD is that implantation fluxes tend to be very high, on the order of 10^27 m-2s-1, due to time and computational limitations. By performing large scale MD on supercomputers, it is possible to reach more realistic fluxes of 10^25 m-2s-1.

Results will be presented from MD simulations from a 50 nm x 50 nm x 25 nm tungsten box at 1200 K and 2000 K with a flux of 4 x 10^25 m-2s-1. Preliminary results show an initially high retention of hydrogen that accumulates near the surface. Similarly, a helium pre-implanted simulation will be used to perform subsequent hydrogen irradiation. This will produce information on H implantation for a more realistic microstructure that would be expected from a mixed plasma. These simulations provide insight into the early stages of surface deformation, hydrogen retention, and the effects of a He damaged sample on H irradiation for the tungsten divertor.