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Surface morphology changes and damage in hot tungsten by impact of 80 eV - 12 keV He-ions and keV-energy self-atoms[1] HUSSEIN HIJAZI, MARK E. BANNISTER, Oak Ridge National Laboratory, PREDRAG S. KRSTIC, University of Tennessee, CHAD M. PARISH, HARRY M. MEYER III, FRED M. MEYER, Oak Ridge National Laboratory — We report on measurements of interactions of 50 – 12,000 eV He ions with heated tungsten surfaces performed at the ORNL MIRF. Surface morphology changes, as well as nano-fuzz formation were investigated as function of flux and total fluence, for both virgin and pre-damaged W-targets. At low fluences, ordered surface structures are observed, with great grain-to-grain variability, together with blisters and pinholes, whose density and size increase with increasing fluence. At larger fluences, individual grain characteristics disappear, and the entire surface assumes a frothy appearance in FIB/SEM, with a multitude of near-surface bubbles with a broad range of sizes, and disordered whisker growth, while in SEM imaging the surface is indistinguishable from nano-fuzz produced on linear plasma devices. These features are evident at progressively lower fluences as the He-ion energy is increased, particularly above 1 keV, where the He beam serves not only to load the near-surface region with He to saturation, but to produce significant near-surface damage sites that can trap He. We also report on observations of the effects on surface morphology changes and nano-fuzz formation of pre-damage created by self-ion impact, and on MD simulations of near-surface damage using self-atoms.

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