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Flux threshold determination for tungsten nano-fuzz formation using an 80 eV He-ion beam[1] FRED W. MEYER, MARK E. BANNISTER, CHAD M. PARISH, Oak Ridge National Laboratory — At the ORNL Multicharged Ion Research Facility (MIRF), we have extended our investigation of flux thresholds for He-ion induced nano-fuzz formation on hot tungsten surfaces down to plasma-edge-relevant energies of 80 eV. We measured the size of the incident ion beam by accurate flux-profile measurements, and the size of the region where tungsten nano-fuzz was formed by post-exposure SEM surface analysis and real-time monitoring of the hot W surface-emissivity change throughout the beam exposure. If tungsten nano-fuzz formation had a fluence threshold, the size of the observed nano-fuzz region would be expected to increase with exposure time, eventually filling the entire ion beam spot. Instead, we found that the region of nano-fuzz formation (1) was always smaller than the beam spot itself and (2) did not increase in size with time, i.e. with accumulated He ion fluence. By comparison of the flux profile and the spatial extent of the fuzz region we determined a flux threshold of $9.5\text{+-}3\text{x}10^{19}/\text{m}^2\text{s}$ at 80 eV He ion impact energy. We show that the observed flux-threshold energy dependence for nano-fuzz formation, which we have now mapped out from 80 eV to 8.5 keV, is well reproduced by the combined energy dependences of He-ion reflection, He-ion range and target-damage creation, determined using SRIM.

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