Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Helium and hydrogen interactions with tungsten surfaces as a plasma-facing material[1] CHUN-SHANG WONG, ROBERT KOLASINSKI, JOSH WHALEY, Sandia National Laboratories — Tungsten is a leading plasma-facing-material candidate for divertors in fusion tokamaks due to its favorable properties, such as a high melting temperature and a low sputter yield. However, plasma-W interactions can complicate matters. Undesirable hydrogen-W interactions include tritium retention and H embrittlement. Helium-W interactions can drive W fuzz growth, leading to material degradation. To investigate these interactions, we performed two experiments for H and He interactions with W surfaces. First, we characterized the W(111)+H(ads) system with multi-angle scattering and recoil maps. Backscattering maps provided crystallographic information of the W(111) substrate, including surface relaxation. Forward-scattering and recoil maps were used with MD simulations to determine H-adsorption positions. Second, we investigated the effect of high-temperature annealing on the surface morphology of He-induced W fuzz. W samples were exposed to a high-flux He plasma under identical conditions to grow fuzz layers. Samples were then annealed for different durations at different temperatures. He ion microscopy and spectroscopic ellipsometry revealed that the W fuzz morphology changed dramatically at temperatures as low as 1273 K.

[1]Sandia National Laboratories is a multimission laboratory managed and operated by National Technology Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energys National Nuclear Security Administration under contract DE-NA0003525. Sand No. SAND2019-7597 A

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Date submitted: 02 Jul 2019 Electronic form version 1.4