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Enhanced tungsten prompt re-deposition during ELMs in the DIII-D divertor[1] TYLER ABRAMS, A.W. LEONARD, GA, E.A. UNTERBERG, R.S. WILCOX, ORNL, D.L. RUDAKOV, UCSD, W.R. WAMPLER, SNL, C. JOHNSON, D. ENNIS, Auburn U., J. GUTERL, G. SINCLAIR, ORAU — Recent measurements conducted in the DIII-D divertor indicate a substantially higher tungsten prompt re-deposition fraction, f_{redep}, occurs in H-mode discharges with edge localized modes (ELMs) relative to L-mode discharges. A value of f_{redep} of ˜0.72 was inferred on a 15 mm diameter W-coated DiMES sample exposed to 3 repeat L-mode discharges, whereas an f_{redep} value of ˜0.88 was calculated on an identical sample exposed to one H-mode discharge and 2 repeat L-mode shots. This result is interpreted using the recently developed free-streaming plus recycling model (FSRM), extended to include the effect of W prompt re-deposition using analytic geometric approximations. The FSRM predicts that f_{redep} should increase from ˜0.4 in the inter-ELM phase to 0.9 during the peak of the intra-ELM phase for strongly attached DIII-D discharges, and from ˜0.7 to ˜0.95 for a typical detached divertor case. This increase in f_{redep} is due to the strong increase in divertor electron density, and correspondingly shorter W ionization mean free path during the ELM. This work represents the first experimental evidence of enhanced prompt re-deposition during ELMs and is a promising result for ITER where nearly all the W sputtered near the strike-point will be during ELMs. Additional ELM-resolved W re-deposition measurements using spectroscopic interpretation of WI/WII line ratios will also be presented.

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