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Effects of erosion/redeposition of mixed-material on deuterium recycling during L- and H-mode plasmas in DIII-D.[1] TATYANA SIZYUK, AHMED HASSANEIN, JEFFREY BROOKS, Purdue, TYLER ABRAMS, HOUYANG GUO, GA, PURDUE/GA COLLABORATION — The effects of plasma parameters on material mixing and deuterium recycling were studied using self-consistent integrated models implemented in ITMC-DYN and REDEP/WBC computer packages benchmarked with results of RBS and TDS sample analyses. We simulated W erosion and redeposition and calibrated our results with RBS data for two types of discharges in DIII-D using the DiMES probe. The probe surface was initially covered by C with several W spots on the surface. Using the reconstructed edge plasma characteristics from OEDGE/DIVIMP, our simulations successfully explained the factor of 10 difference in W net erosion between high-temperature, low-density and low-temperature, high-density divertor plasma conditions and showed significant W redeposition on 15 mm spots, up to 75%, while only 15% of W was redeposited on 1 mm spots. This analysis was further extended to time-dependent simulations of the D, C, and W ion interactions (i.e., erosion/redeposition) on the evolving surfaces. Our simulations calculated the C/D relative concentrations in plasma near the divertor surface and in co-deposited layers. Small amount of C impurities in plasma (3%) can significantly increase D retention (2 times) due to the formation of C/W surface layer compared to pure W.

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Tatyana Sizyuk
Purdue University

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