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Modeling of surface temperature effects on mixed material migration in NSTX-U[1] J.H. NICHOLS, M.A. JAWORSKI, PPPL, K. SCHMID, IPP Garching — NSTX-U will initially operate with graphite walls, periodically coated with thin lithium films to improve plasma performance. However, the spatial and temporal evolution of these films during and after plasma exposure is poorly understood. The WallDYN global mixed-material surface evolution model [K. Schmid et al., J. Nucl. Mater. 415, S284-S288 (2011)] has recently been applied to the NSTX-U geometry to simulate the evolution of poloidally inhomogenous mixed C/Li/O plasma-facing surfaces. The WallDYN model couples local erosion and deposition processes with plasma impurity transport in a non-iterative, self-consistent manner that maintains overall material balance. Temperature-dependent sputtering of lithium has been added to WallDYN, utilizing an adatom sputtering model developed from test stand experimental data. Additionally, a simplified temperature-dependent diffusion model has been added to WallDYN so as to capture the intercalation of lithium into a graphite bulk matrix. The sensitivity of global lithium migration patterns to changes in surface temperature magnitude and distribution will be examined. The effect of intra-discharge increases in surface temperature due to plasma heating, such as those observed during NSTX Liquid Lithium Divertor experiments, will also be examined.

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