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Tungsten migration in Alcator C-Mod: sputtering and melting

G.M. WRIGHT, H. BARNARD, B. LIPSCHULTZ, D.G. WHYTE, MIT Plasma Science and Fusion Center — A row of bulk tungsten (W) tiles were installed near the typical outer strike-point location in the Alcator C-Mod divertor in 2007. In the 2009/2010 campaign, one of the W tiles mechanically failed resulting in significant W melting at that location. Post-campaign PIXE surface analysis has been used to observe tungsten (W) deposition and migration patterns in the divertor for the typical operations (sputtering only) and operation with melted components. For sputtering conditions, W deposition of up to 20 nm equivalent thickness is observed at various divertor surfaces indicating prompt re-deposition at the outer divertor, neutral and ion transport through the private-flux region and ion transport in the scrape off layer. For melting conditions, W deposition of up to 400 nm equivalent thickness is observed at some locations at the outer divertor. However, the toroidal distribution of W on the outer divertor is strongly non-uniform. There is no W deposition measured on the inner wall limiter. These results indicate that impurity migration is affected by the erosion mechanism and source, with the migration from melting being less predictable and uniform than from the sputtering case. Supported by USDoE award DE-SC00-02060.

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