Contribution ID: **3240** Type: **not specified**

P2.1033 The key role of ExB drifts in W impurity transport and redeposition in the DIII-D divertor

Tuesday, 9 July 2019 14:00 (2 hours)

See full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1033.pdf

Mixed-material DIVIMP-WallDYN modelling, now incorporating ExB drifts, is presented that simultaneously reproduces tungsten (W) erosion and deposition patterns observed during the DIII-D Metal Rings Campaign, in which toroidally symmetric W-coated tiles were installed in the carbon (C) DIII-D divertor. It is demonstrated that ExB drifts are required to reproduce the experimental observations, and that the spatial structure of modelled divertor poloidal ExB drifts correlates with boundaries of the observed deposition/erosion regions. With attached L-mode conditions and unfavourable ion grad-B drift direction, W and C coaccumulation is observed over a band ~5-8 cm outboard of the outer-strike-point (OSP) W source, but little W is observed closer to the OSP. In the mixed-material environment of DIIID, sputtering of W is suppressed in regions with strong target-directed drifts due to the formation of C codeposits. Time-dependent simulations with modified ExB impurity drifts (60% of the OEDGE-calculated drift velocity) quantitatively reproduce these features, including depth-resolved W/C ratios, within a factor of 2 over ~110 seconds of plasma exposure. These simulations suggest that ExB transport effects dominate over parallel force balance effects for high-Z impurities such as W in the divertor region. Including re-erosion of W changes the simulated redeposition by over an order of magnitude, leading to a better match with observed deposition patterns. The simulations also show that ExB drifts change the poloidal patterns of upstream W transport, but in a manner that remains qualitatively consistent with patterns measured on midplane SOL collector probes. This work represents the first self-consistent representation of global redeposition in a C divertor with W targets.

* Supported by US DOE via DE-FC02-04ER54698, DE-AC05-00OR22725, DE-SC0016318, DE-SC0019256, DE-FG02-07ER54917, DE-NA0003525, and the FES Postdoctoral Research Program.

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Session Classification: Poster P2

Track Classification: MCF