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P3.115 Tungsten sources and transport during Metal Rings Campaign in DIII-D*

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The Metal Rings Campaign in DIII-D allowed for studies of tungsten sourcing and transport from poloidally localized, isotopically distinct surfaces in a low-Z background. Two 5 cm wide toroidal rings of W-coated tile inserts were installed in the lower divertor of DIII-D. The outboard (shelf) ring was coated with isotopically enriched W-182; the inboard (floor) ring used a natural W coating. Two types of collector probes were used in the divertor and near outboard mid-plane to study short- and long-range transport of W. The divertor probe installed on DiMES manipulator was located 1 cm radially outboard of the shelf ring. The mid-plane collector probe was inserted in the scrape-off layer (SOL) plasmas. In reproducible L-mode plasma discharges with Outer Strike Point (OSP) on the shelf ring, a low near-surface steady-state W coverage formed on the part of the divertor probe undergoing net erosion, while in the region of net C deposition W kept accumulating with time in the deposits. In the same experiment, measured deposition of W on the mid-plane collector probes showed more W collected on the side facing away from the lower divertor, which was explained by OEDGE modelling suggesting W accumulation at the plasma crown, driven by ion temperature parallel gradient force. In another experiment with ELMy H-mode discharges, the OSP was positioned on the floor ring while the shelf ring was in SOL. Isotopic analysis of W collected by mid-plane probes showed that for discharges with smaller frequent ELMs the floor W source was dominant, while with larger, less frequent ELMs the floor and shelf sources were comparable. Arcing observed on the shelf ring via fast filtered imaging may be also a significant contributor to the SOL W source during large ELMs.

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