P42

Comparative modeling of neon and tungsten impurity transport in the boundary plasma of EAST with normal and extended grid to the first wall

Hui Wang[1], Guoliang Xu[1], Rui Ding[1], Hang Si[1], Guozhang Jia[1], Hai Xie[1], Junling Chen[1]

1 Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei 230031, China

The impurity leakage mechanisms of seeded neon and eroded W in the boundary plasma of EAST are revealed by modeling using the coupled SOLPS-DIVIMP codes with full drift effects included. The Ne distribution derived from the impurity tracing Monte Carlo DIVIMP simulation using the background plasma from the SOLPS-ITER simulation agrees well with the Ne transport by fluid SOLPS-ITER simulations, which validates the implemented drift effects. Then the leakage processes of both Ne and W under various dissipative divertor conditions are investigated by the DIVIMP code. An increase of both Ne and W concentration in the core plasma is observed before the onset of divertor detachment when increasing the Ne injection rate. Meanwhile, Ne shows a larger leakage ability than that of W under both attached and detached divertor conditions due to the more pronounced impact of drifts on Ne transport. Modeling results reveal that under the favorable Bt direction, E×B drifts can drive impurities from the outer divertor region to the inner divertor region, and increase the impurity leakage from the inner divertor region where the poloidal E×B drift points upstream. To study W source and transport from the first wall, the simulation grid is extended to the first wall based on a low single null divertor configuration. The OSM-EIRENE is used to generate the background plasma and the W erosion and transport is then calculated using the DIVIMP code with a full W wall condition. Comparative analysis between results from the normal and extended grids shows significant changes in the W source and leakage paths. Under the favorable Bt direction, the E×B drifts lead to an enrichment of Ne in the inner divertor region and facilitate the onset of detachment. However, a notable W source comes from the first wall of the high-field side (HFS) adjacent to the divertor due to the high Ne impinging flux, even if the divertor is detached. Since the poloidal E×B drift facilitates the W leakage from the HFS, the W core concentration of the extended grid is much higher than that of the standard grid. Consequently, the inclusion of an extended grid for modeling is important to for understanding W source and leakage with full W wall tokamaks.