Simulation of the tungsten impurities transport at radiative divertor regime with neon seeding from upper target in EAST

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The maximum tolerated heat flux to the EAST upper tungsten (W) target is \(~10\text{MW/m}^2\) \textsuperscript{[1]}. To maintain the lifetime of the divertor, the radiative divertor operation regime should be adopted. Neon, as one of the most effective radiative impurity, has been proposed as the external impurity for the heat control in ITER and EAST \textsuperscript{[2,3]}. However, the introduced Ne impurity may enhance tungsten sputtering, even the plasma temperature is significantly reduced. Thus, W concentration at core region may exceed acceptable range. This study aims to figure out the production and transport of the W impurity in the divertor and scrape-off layer (SOL) during the neon impurity seeding, under the radiative divertor operation region. The EAST upper single null equilibrium has been chosen for the study. SOLPS code package is employed to simulate the edge plasma with different Ne seeding rate, to provide the plasma background \textsuperscript{[4]}, and the DIVIMP code is applied to simulate the production and transport of the W impurities. The results show that the Ne seeding rate has a significant impact on the W concentration in core regime, mainly due to the changes of the W sputtering and impurity transport. The insufficient neon seeding rate would cause the W impurity fraction exceeds the core toleration. The comparison between the EAST experiment measurement and DIVIMP simulation about the W impurity spectrum will also be presented in this conference.

Reference