World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:12, No:11, 2018

# The Effect of a Saturated Kink on the Dynamics of Tungsten Impurities in the Plasma Core

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**Abstract :** Tungsten (W) will be used in ITER as one of the plasma facing components (PFCs). The W could migrate to the plasma center. This could have a potentially deleterious effect on plasma confinement. Electron cyclotron resonance heating (ECRH) can be used to prevent W accumulation. We simulated a series of H mode discharges in ASDEX U with PFC containing W, where central ECRH was used to prevent W accumulation in the plasma center. The experiments showed that the W density profiles were flat after a sawtooth crash, and become hollow in between sawtooth crashes when ECRH has been applied. It was also observed that a saturated kink mode was active in these conditions. We studied the effect of saturated kink like instabilities on the redistribution of W impurities. The kink was modeled as the sum of a simple analytical equilibrium (large aspect ratio, circular cross section) plus the perturbation produced by the kink. A numerical code that follows the exact trajectories of the impurity ions in the total fields and includes collisions was employed. The code is written in Cuda C and runs in Graphical Processing Units (GPUs), allowing simulations with a large number of particles with modest resources. Our simulations show that when the W ions have a thermal velocity distribution, the kink has no effect on the W density. When we consider the plasma rotation, the kink can affect the W density. When the average passing frequency of the W particles is similar to the frequency of the kink mode, the expulsion of W ions from the plasma core is maximum, and the W density shows a hollow structure. This could have implications for the mitigation of W accumulation.

**Keywords :** impurity transport, kink instability, tungsten accumulation, tungsten dynamics
**Conference Title :** ICPP 2018 : International Conference on Plasma Physics
**Conference Location :** Kyoto, Japan
**Conference Dates :** November 15-16, 2018