Contribution ID: **675** Type: **not specified**

P2.103 Synergistic effects of nitrogen seeding impurities and transient heat loads on tungsten

Tuesday, 18 September 2018 11:00 (2 hours)

The synergistic effects of transient heat loads in conjunction with stationary plasma were investigated. All tests were executed in the linear plasma device PSI-2 at a base temperature of around 800 ℃, which was achieved by the plasma exposure and an ohmic heater attached to the sample holder. Moreover, to simulate the ELM-like transient thermal events, a Nd:YAG laser with a wavelength of 1064 nm was used. The impact of up to 1000 transient thermal events with an absorbed power density of 0.38 GW/m², a pulse duration of 1 ms, and a repetition frequency of 0.5 Hz was analysed. A mixed D/He/N plasma with a flux of around 8 × 10^21 m^−2s^−1 was used to realize the stationary plasma background.
The obtained results of the D/He/N seeding impurity experiments are compared with D/He results and indicate that N, during low pulse number tests (≤ 1000 pulses), seems to have no significant influence on the thermal shock performance of tungsten in terms of damage formation such as roughening due to plastic deformation or cracking. However, particle induced nano-structures on the laser/plasma and, less pronounced, on the only plasma exposed surface show that N leads to the formation of lamella like structures. These structures could originate from glide planes, which become visible on the surface. Furthermore, the particle induced bubble formation below the exposed surface disappears or is significantly reduced if N is present in the plasma. A possible explanation for both effects could be the higher erosion rate compared to the H/He exposure. Especially the reduction or even absence of bubbles below the exposed surface could have a significant influence on the lifetime of the plasma facing material since a zone with a high bubble density below the surface could lead to a reduced thermal conductivity and therefore to overheating/melting.

Presenter: WIRTZ, Marius (Institut für Energie- und Klimaforschung Forschungszentrum Jülich GmbH)

Session Classification: P2