Modification of the tungsten surface under the beam plasma discharge plasmas

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At present moment tungsten is considered one of the most promising candidate for plasma-facing applications due to its unique physical properties [1]. However, intensive helium plasma irradiation combined with high surface temperature of the tungsten can create conditions for the formation of highly porous structures on the tungsten surface known as fuzz [2].

The present contribution studies the dynamics of formation of tungsten fuzz under the He, He/Ar, He/D, He/H plasma expose in a beam-plasma discharge (BPD). BPD allows to create plasma with a wide range of operational parameters: electron density $n_e = 1\times10^{17} - 1\times10^{19}$ m^{-3} and electron temperature T_e up to 30 eV with the presence of highly energetic electron fraction (with energies up to the applied accelerating voltage value or higher). During the experiment optimal conditions for fuzz formation under the beam plasma discharge plasmas was found, SEM analysis of fuzz structures grown under direct beam impact and side plasma conditions was performed. Figure 1 shows temporal evolution of the surface temperature profile during the He plasma exposure, the bombarding helium ion flux was $\Gamma_{He} \sim 8\times10^{20}$ m^{-2}s^{-1}, total ion fluence was $\Phi_{He} \sim 4\times10^{24}$ m^{-2}.

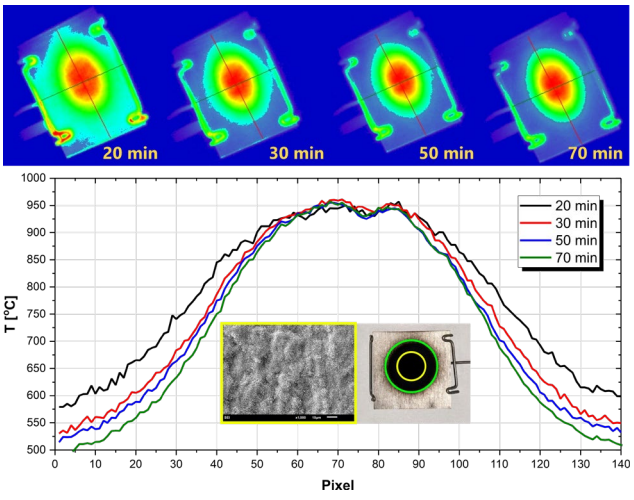

Fig 1 *Temporal evolution of the surface temperature profile of the sample*

References

[1] Buzi L *et al* 2017 Nucl. Fusion **57** 126009

[2] Takamura S *et al* 2006 Plasma Fusion Res.1 051