**Arcing, erosion effects and nanostructured “fuzz” growth on tungsten components under powerful plasma load in tokamak**

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Powerful plasma load on the plasma facing material in tokamaks during transients (disruption, ELMs, VDE etc.) produces several multiscale effects including surface erosion, redeposition of eroded materials, melting and melt motion over the surface, inhomogeneous solidification leading to specific surface clustering conditions and forming a corrugated roughen surface [1]. Conditions in plasma sheath over the roughen surface are favourable for arcs and sparks ignition affecting the material surface overheating. Such process is governed dominantly by universal mechanisms of surface growth and seems weakly dependent on the specific physical and chemical properties of the virgin materials [2,3]. This report summarizes recent experimental observations of tungsten materials exposed to extreme thermal plasma loads in the T-10 tokamak. Post-mortem analysis of tungsten has revealed unipolar arcs and sparking effects on tungsten targets exposed in the T-10 tokamak. These tungsten samples with corrugated surface were then used to irradiate with stationary plasma in the PLM plasma device [4] which is a divertor simulator facility. The growth of nanostructured “fuzz” was detected on the corrugated tungsten surface after the test during ~200 minutes with the PLM plasma of density ~ $(2-5) \times 10^{12} \text{ cm}^{-3}$ and electron temperature ~2-10 eV, such conditions are modelling the SOL plasma in a tokamak. Such “fuzz” surface can enhance the ignition of unipolar arcs and sparking on plasma-facing surface; arcing leads to an enhanced heat transfer from plasma to a surface. These arcs effects and “fuzz” growth on the corrugated surface should be analysed to evaluate the erosion of the tungsten divertor tiles in the ITER.

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