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## EROSION PROPERTIES OF TUNGSTEN AND WTa5 ALLOY EXPOSED TO REPETITIVE QSPA PLASMA LOADS BELOW MELTING THRESHOLD

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Lifetime of Plasma Facing Materials (PFM) is critical issue for successful implementation of fusion reactor project. Tungsten is chosen as main plasma facing material for ITER and DEMO divertor design due to advantageous properties: high thermal conductivity, high temperature strength and stability, high recrystallization temperature and high spattering threshold for hydrogen. The one of the most important issues for simulation experiments at the fusion-reactor relevant conditions are studies of properties of different tungsten grades under a large number of plasma exposures.

Surface pattern, damage and structure of pure tungsten and tungsten-tantalum alloy WTa5 targets have been analyzed in condition of preheating to 200 °C, 300 °C and at room temperature (RT). Plasma loads up to 400 hydrogen pulses below the melting threshold (0.6 MJ/m$^2$) have been performed with a quasi-stationary plasma accelerator QSPA Kh-50. The plasma pulse shape is triangular, pulse duration 0.25 ms. The ion impact energy is about 0.4 keV. Maximum plasma pressure is 0.32 MPa, and the stream diameter 18 cm.

Surface analysis of exposed samples was carried out with an optical microscope MMR-4 equipped with a CCD camera and Scanning Electron Microscope (SEM) JEOL JSM-6390. Pprecise measurements of the surface roughness with the Hommelwerke tester T500 were also performed. X-ray diffraction (XRD) has been used to study structure, sub-structure and stress state of targets.

Large number of repetitive plasma loads below the melting threshold led to the clear degradation of thermo-mechanical properties of the affected surface layers on tungsten. Network of cracks appeared on exposed surfaces. Cracks propagate to the bulk mainly transversely and parallel to the irradiated surface. The melting onset of edge of cracks is observed whereas other surface remains non-melted. Melted edges eject the nm particles. Such small particles are able to be melted even for rather small heat loads below the surface melting threshold.