INFLUENCE OF HE/ D₂ PLASMA FLUXES ON TUNGSTEN COATINGS MORPHOLOGY AND CRYSTALLINITY

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Tungsten coatings play a growing role in different appliances because of their thermal characteristics. Future fusion reactor walls in their most critical areas in divertor, where they suffer high plasma fluxes, will be made of tungsten. It makes important to study changes in tungsten surface morphology when exposed to high-flux He/D₂ plasmas.

Our previous study [1] showed that when samples with tungsten-containing coatings were exposed to hydrogen plasmas with moderate fluxes of low enough energy ions, the erosion of the coating was hardly detectable. In the present study, samples with pure tungsten coatings were tested using He-containing plasmas and higher surface temperatures. The main task of the study was to find the dependence of the surface morphology and its crystallinity on the plasma composition and the temperature of the sample coating.

Samples produced by DIARC-Technology Inc with 2 µm W-coatings on Mo were exposed to controlled plasma discharges in Pilot-PSI at DIFFER. Samples were exposed to pure He and D₂ and mixed He/D₂ plasmas. The maximum surface temperature of the samples was kept at 900°C or 1200°C and the ion energy in terms of the bias voltage was set to -40 V or -70 V.

SEM, EPMA and XRD as post mortem methods [1] were used to characterize the samples. SEM showed that the action of plasma beam caused at the sample surface formation of quasi-periodic structures of < 0.1 µm periodicity. According to XRD, plasma fluxes caused both a shift of XRD peaks and a decrease of the peak width.

References