High resolution scanning transmission electron microscopy (HR STEM) analysis of redeposited layer on ASDEX Upgrade tile

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Erosion and redeposition of plasma-facing material is one of the most important issue in the fusion devices [1,2]. However, the structure and composition of redeposited layers as well as the mechanism and condition of their formation are not fully described and understood as of yet.

In the present study, structure and phase composition were examined of the deposit layer (~500 nm in thickness) grown during 2007 campaign on a tile from the inner strike point region from ASDEX Upgrade divertor. High resolution scanning transmission electron microscopy (HR STEM) combined with local nano-diffraction technique have been used to identify deposits phase composition. The results were compared with a model system for erosion and redeposition, i.e. thin tungsten-doped amorphous carbon films (a-C:W), produced by magnetron sputtering with additional post-annealing treatment, which contain different types of tungsten carbides with various sizes depending on W concentration and annealing temperature. Comparison with the deposit structure provided information on the conditions in the fusion device during the redeposition process.

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