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Effects of hydrogen surface processes on hydrogen retention in plasma facing components[1] JEROME GUTERL, ROMAN SMIRNOV, SERGEI KRASHENINNIKOV, Univ of California - San Diego — Hydrogen retention and recycling on metallic plasma-facing components (PFCs) are among the key-issues for future fusion devices due to both safety and operational reasons. For tungsten, which has been chosen as divertor material in ITER, parameters of hydrogen desorption from Wsurfaces, experimentally measured for fusion-related conditions, show a large discrepancy [1]. Indeed, various complex phenomena may affect hydrogen desorption (e.g atomic islands, roughness, surface reconstruction, impurities, ect). In this work, we investigate effects of hydrogen desorption from W surfaces on hydrogen retention in W material. Two regimes of hydrogen surface desorption (readsorption-limited and recombination-limited) can be identified and may affect the kinetic order of desorption. Within these desorption regimes, it is shown that release of hydrogen from W material in fusion-related conditions may be surface-limited at low temperature and diffusion-limited at high temperature. Analyses of hydrogen release regimes for thermodesorption experiments and plasma operations in fusion reactors show that surface processes may strongly affect retention and release of hydrogen from W material. In this context, effects of W surface coverage with oxygen on hydrogen desorption are discussed since high concentrations of oxygen on PFCs surfaces are expected in future fusion devices.

[1] R. Causey, Journal of Nuclear Materials 300 91–117 (2002)

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