STUDY OF DEUTERIUM RETENTION IN D_2^+ IMPLANTED SiC COATED GRAPHITE FOR EAST

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The doped graphite tiles bolted to the active cooling heat sink, made of GBST1308 (1% B_4C, 2.5% Si, 7.5% Ti) coated with SiC, are now being used as the only plasma facing material (PFM) for the EAST device since the campaign of 2008. The gradient SiC coatings on the doped graphite have been developed by a technique of chemical vapor reaction (CVR) combined with chemical vapor infiltration (CVI) by infiltration of the reaction gases through the open pores in the graphite [1, 2]. From the plasma density and fueling point of view, it is important to study thoroughly the hydrogen isotope retention in this kind of SiC-coated doped graphite.

D_2^+ implantations into the SiC coated doped graphite were performed at Shizuoka University. The chemical states of Si and C were studied by means of X-ray photoelectron spectroscopy (XPS), and the thermal desorption behavior of deuterium was analyzed by thermal desorption spectroscopy (TDS). In the XPS spectra, the peak positions of C-1s and Si-2p were, respectively, shifted to higher and lower binding energy side after D_2^+ implantation, indicating that D was trapped by both C and Si in the SiC coatings. In the TDS spectra, two desorption peaks were observed at around 850K and 1050K, corresponding to desorption peaks of D bond to Si and C, respectively. At low implantation fluence of 0.1×10^{22} D^+m^{-2}, only D_2 desorption at higher temperature was observed, indicating that deuterium was preferentially trapped by C at the initial stage of implantation. With increasing the fluence, the amount of D_2 desorbed from both of peaks increased. At the fluence of 1.5×10^{22} D^+m^{-2}, the trapping of deuterium was almost saturated. In the previous studies [3, 4], Y. Oya et al. reported the deuterium retention behavior in polycrystalline β-SiC. In this presentation, difference of retention behavior in β-SiC and SiC coating, and the underlying mechanism will be discussed in detail.

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