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The deuterium retention behavior in helium irradiated tungsten after plasma exposures in EAST

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Tungsten (W) is considered as the most attractive plasma facing material for future fusion devices attributed to its outstanding properties. During the operation of plasma, helium ions produced by deuterium and tritium fusion reaction will impinge on W, which will raise more complicated tritium retention behavior in W. In the present work, the deuterium retention behavior in helium irradiated W is studied.

Helium ion irradiation experiments with the fluencies of 3×1015, 3×1016 and 3×1017 ions/cm2 have been performed on recrystallized W, respectively. Transmission electron microscope (TEM) observation suggests that large numbers of dislocation loops are generated in W and the size of the dislocation loop increases with irradiation fluence. To understand the deuterium retention behavior in helium irradiated W formed in tokamak environment, the samples are exposed to the EAST tokamak plasma by Material and Plasma Evaluation System (MAPES). The results of thermal desorption spectroscopy (TDS) indicate that the total deuterium retention increase with the irradiation fluence which can be attributed to the defects induced by helium irradiation. The release peak for deuterium at around 403 K and 994 K are observed in all of the samples. Finally, the deuterium behavior in helium irradiated W is discussed in combination with the TEM results.

Eligible for student paper award?

No

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