

Technical Meeting on Nuclear Fusion Fuel Permeation in Reactor First Wall Components

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The effect of He pre-irradiation on D permeation through wall materials

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The effect of helium (He) pre-irradiation on deuterium (D) permeation in wall materials has been investigated. A reduced activation ferritic/martensitic (RAFM) steel CLF-1 and tungsten (W) were first exposed to low energy He plasmas. After He irradiation, D permeation tests were performed for the samples and retention was measured by high-resolution thermal desorption spectroscopy (TDS). He pre-irradiation resulted in a significant reduction of D permeation and retention in both wall materials. Microstructure observation by indicated that the surfaces of samples after He irradiation turned rough and He nanobubbles were formed near the surface. He nano-bubbles may act as a diffusion barrier to D atoms and consequently reduce the amount of uptake in the materials.

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