# Tritium Retention by Tungsten with Nano-Morphology

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Tungsten is a candidate of plasma-facing materials, and ad/absorption of tritium on/in tungsten is an important issue to understand tritium inventory in vacuum vessels of fusion reactors. It is known that fiber-like nanostructure is developed on tungsten surface by exposing to He plasma at high temperatures. Development of such nanostructure may result in enlarged specific surface area, and consequent increase in tritium retention. From these viewpoints, the ad/absorption of tritium on/in nano-structured tungsten was examined in the present study.

Specimens of pure tungsten with nano-morphology were prepared by exposing tungsten sheets to He ions in the divertor plasma simulator NAGDIS-II. For comparison, specimens having smooth surface were also prepared by polishing tungsten disk with diamond powder and colloidal silica. These specimens were exposed to tritium gas diluted with deuterium at room temperature for 10 hours or at 673 K for 5 hours, and the concentration of tritium on/near surface was measured with an imaging plate (BAS-TR).

The amount of hydrogen isotopes retained at 300 $^{o}$C was higher than that at room temperature by a factor of about 30. Tritium retained at room temperature gradually desorbed from the specimen in a time scale of days. On the other hand, no significant desorption was observed for tritium retained at 300 $^{o}$C by keeping the specimen in air for several months and dipping in water at room temperature. These observations indicated that majority of tritium retained at room temperature was just adsorbed on the surface, while that at 300 $^{o}$C penetrated into the bulk. In either case (exposure at room temperature or 300 $^{o}$C), the amount of tritium retained on/in the specimen with nano-morphology was higher than that with smooth surface by a factor of 20 or less. In other words, the development of nano-morphology did increase specific surface area and tritium retention, but the extent of increase in tritium retention was not more than 20 times under the present conditions.

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