§68. Investigation of Tritium Inventory and Removal on Deposition Layer in LHD

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An investigation of retained hydrogen isotopes in plasma facing material and deposition layer are important issues in fusion devices. Carbon-based materials (CBMs) are still one of the candidate and favorable for fusion applications because of a low atomic number, good thermo-mechanical properties, low coefficient of thermal expansion and the absence of melting.

On the other hand, graphite targets, IG-430U (Toyo Tanso Co. Ltd.,), are used for divertor targets in LHD and eroded carbon have been deposited on plasma facing walls widely. After the start of deuterium plasma experiments in LHD, a control of the tritium gross amount and removal methods for deposited hydrogen isotopes are required [1]. Tritium trappings have been studied using pure materials [2], but using samples exposed to plasmas in current devices is not sufficient yet. In this study, LHD deposition layers are exposed to tritium gases in Toyama University and amounts of trapped tritium and removal rate are analyzed.

Two kinds of different co-deposited carbon layers were produced during the 13th experimental campaign in LHD. Target samples made by SUS316 and Si were installed the section 6.5 at inner poloidal cross-section. These samples were set in the different facing holder and mainly two kinds of group can be separated facing samples. One is the sample targets facing graphite divertor and eroded carbons from nearby divertor targets by physical sputtering deposit on these targets, , namely S1 and S2. A thickness of deposition layer is about 100-400 nm. The other is the sample targets non-facing graphite divertor and thin carbon deposition layers of ~50 nm are observed and these samples are namely S3 and S4 [3-5].

Target samples of deposition layers were exposed to 7% tritium gasses and this exposure time is 3 hours. A temperature of target samples during tritium exposure are kept about 150 degrees.

After tritium exposure experiment, retained tritium was measured by imaging plate (IP). Temperatures of deposition layer were kept in the room air after tritium exposure. Day 1 shows just after an experiment and this time was pasted up to 1 year as shown in Fig.1. At two weeks after tritium exposure, amounts of detected tritium were reduced. Figure 2 shows retained tritium with and without backing treatment. For the case of baking treatments with 95 degrees, the total integrated time is 20h. After these baking with 95 degree, additionally baking treatments with 150degree were done. It is shown there temperature regions are not sufficient to remove trapped tritium from deposition layer. In previous data of deposition layer measured by TDS, hydrogen was not desorpted in these temperatures. For cleanings for tritium removal, additional wall conditioning methods, such as glow discharges are needed.

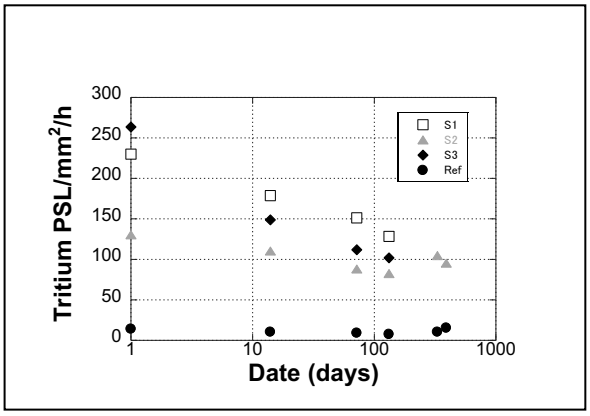

Fig. 1 Amount of retained tritium on deposition layers.

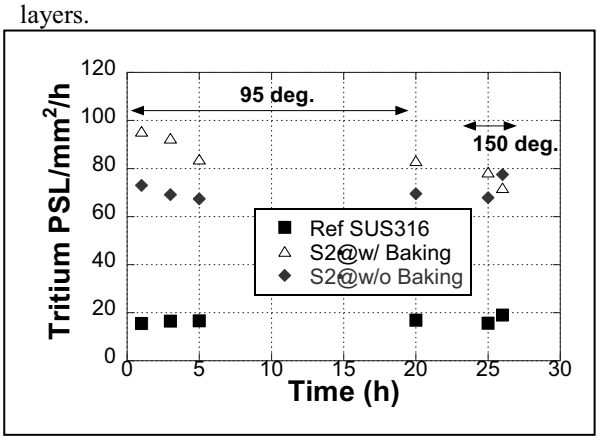

Fig. 2 Amount of retained tritium with and without backing treatments on deposition layers.

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