FUSION FUEL GAS RECOVERY AND DELIVERY CHARACTERISTICS ON A TRAY-TYPE ZRCO BED

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The roles of the ZrCo hydride bed in the ITER tritium storage and delivery system (SDS) are to store and supply the D-T fuel during DT plasma operation. The hydride bed for the SDS requires the performance of fast recovery and delivery of D-T [1]. The storage material of tritium has been used to store and deliver tritium from the storage vessel. The ZrCo powder, which is the storage material of tritium, has an excellent hydriding/dehydriding property. It has a slow chemical reaction property in case of contact with air. It is a non-nuclear material [2]. Our experimental apparatus to test the experimental ZrCo bed consists of a high pressure tank which stores and measures hydrogen, a ZrCo bed which is used for hydriding/dehydriding of hydrogen, a rotary pump and a turbo molecular pump, and a scroll pump which delivers hydrogen from the ZrCo bed to the tank. Our ZrCo bed is a tray type and has a metal mesh filter. The bed is composed of the primary vessel and the secondary vessel. There are three trays in the primary vessel. Each tray of the primary vessel contains the metal hydride, and a vacuum layer is formed between the primary and secondary vessels. In this study, we present nuclear fusion fuel recovery and delivery characteristics of the tray type ZrCoHx SDS bed with different stoichiometries (x = 1.0, 1.5, 1.8, 2.0) for a nuclear fusion application. The ZrCo powder of 1241g from SAES Getters was loaded into our ZrCo bed. The activation (vacuum annealing) of ZrCo was carried out at 500℃ for 5 hours. And the powderization of ZrCo was repeated 4 times for $ZrCoH_{1.0}$. It was found that the powderization of ZrCo was almost complete by four times of the hydriding/dehydriding operation. After powderization, the storage and delivery operation on ZrCoHx (x=1.0, 1.5, 1.8, 2.0) were performed. The hydriding and dehydriding rates were enhanced with the increase of stoichiometry.

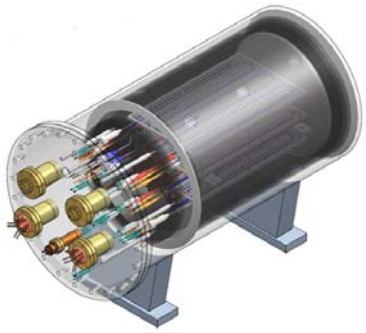

Figure 1: Metal hydride bed

Figure 2: Experimental rig

[1] ITER DDD, WBS 3.2.C, Storage and Delivery System *FDR2001*, 2001.
[2] Hongsuk Chung et al., Fusion Engineering and Design, Vol.84, 2009, p. 599