

# Zr及びAl<sub>2</sub>O<sub>3</sub>を用いた高温ガス炉装荷用模擬リチウムロッドのトリチウム閉じ込め性能の評価

## Evaluation of tritium confinement performance of the assembly composed of Zr and Al<sub>2</sub>O<sub>3</sub> simulating Li rod

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### 1. BACKGROUND and PURPOSE

A high temperature gas-cooled reactor is considered as a promising device to produce fuel tritium for a fusion reactor. However, it is necessary to develop a method to confine the tritium produced in the Li rod. In this study, the assembly simulating Li rod which was composed of Inner Zr tube - Outer Zr tube - Al<sub>2</sub>O<sub>3</sub> tube was built up, and tritium confinement ability was evaluated.

### 2. EXPERIMENT

Fig.1 shows a schematic diagram of the tritium confinement equipment. The test Li rod was heated to 700 °C and tritium gas was supplied from Port 2 between the inner Zr tube and the outer Zr tube. The tritium that has permeated the Zr and Al<sub>2</sub>O<sub>3</sub> was transported to the tritium recovery system by Ar gas purging. In the recovery system consisting of water bubblers and CuO bed, a liquid scintillation counter was used to measure the tritium concentration in the water bubblers. In the experiment 1, Tritium gas, which is mainly composed of HTO, was supplied for 87 hours. In the experiment 2, Tritium gas, which is mainly composed of HT, was supplied for 56 hours.

### 3. RESULTS AND DISCUSSION

Fig.2 and 3 show the accumulated tritium concentration in the water bubblers. In the experiment 1 (Fig.2), tritium permeation through Li rod was not observed for 87 hours. It is considered that the oxide layer formed on the surface of Zr suppressed the permeation of HTO. HT was trapped by defects in the Zr and such defects were not saturated due to the low concentration of tritium. In Experiment 2 (Fig.3), the permeation of HT to the outside of the Li rod was observed. HT permeation occurred within a few hours after the start of the experiment. This suggested that the defects in the Zr were saturated due to high concentration of HT and the diffusion of tritium in Zr is relatively fast.

### 4. SUMMARY

The Li rod successfully confined tritium gas mainly composed of HTO for 87 hours at 700 °C. On the other hand, the tritium gas mainly composed of HT was observed to permeate the Li rod. It was indicated that the tritium permeation rate from test assembly of Li rod depends on the chemical form of tritium. The permeation rate of HT was considerably faster than that of HTO.

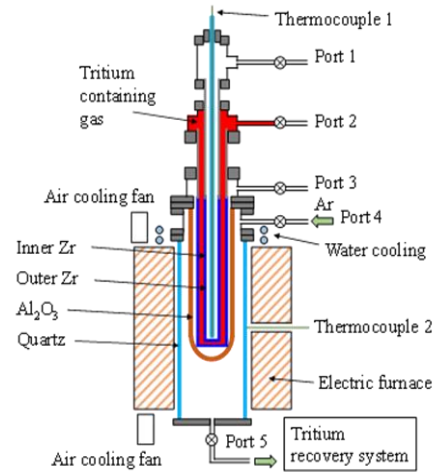


Fig.1 Schematic of test assembly of Li rod.

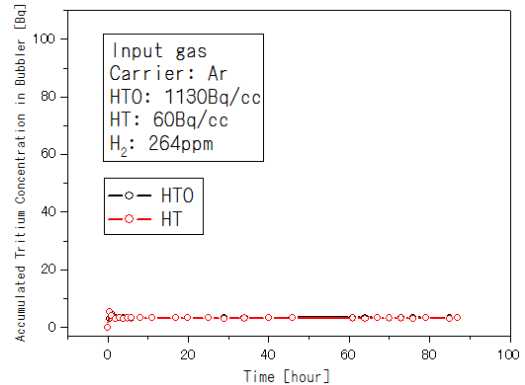


Fig.2 Tritium concentration of Experiment 1.

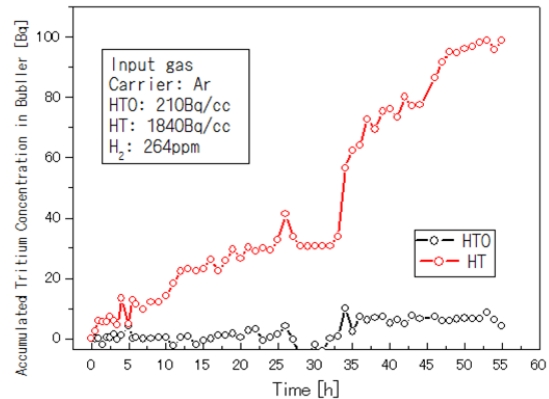


Fig.3 Tritium concentration of Experiment 2.