

Development of high efficiency electrode for highly tritiated water processing

K. Isobe^{a,*} and T. Yamanishi^a

*^aTritium technology group, Japan Atomic Energy Agency, Shirakatashirane 2-4, Tokai-mura,
Ibaraki, 319-1195 Japan*

Tritiated water is easily produced in fusion reactor and the process of tritiated water is one of issues from the view points of safety and tritium cycle. Especially, the process of highly tritiated water, which is produced in vacuum vessel and blanket system, will be main problem. Ceramic electrolysis method that had been developed for tokamak exhaust processing can be applied for the process of highly tritiated water. In this method, water is decomposed of hydrogen and oxygen ion on Yttria stabilized Zirconia (YSZ) surface with electrochemically. Efficiency of water decomposition, however, is low for such process. Aiming to enhance the efficiency of ceramic electrolysis method, we developed new electrodes using cerium oxide (Cerium).

We prepared electrodes by two manufacturing methods. One is to mix cerium into Pt paste and then electrode was sintering on the YSZ. We called the electrode as Cerium adding electrode. The other is to use Cerium as intermediate layer between YSZ and Pt-YSZ electrode. We called the electrode as double layer electrode. In addition to this, different cerium concentrations of electrodes, 10%, 20% and 30%, were prepared for Cerium adding electrode. The water decomposition performance of such electrodes and usual electrode using Pt-YSZ was confirmed in different humidity at 1073K. Both electrodes using Cerium showed higher water decomposition performance than that of usual electrode. Especially, 30% cerium adding electrode showed highest performance and the decomposition efficiency was one order magnitude higher than that of usual electrode.