Development of Pt/ASDBC Catalyst for Room Temperature Recombiner of Atmosphere Detritiation System

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Combined catalytic recombiner and water absorber system has been applied in the field of nuclear fusion to control the tritium release into the environment as low as reasonably achievable. The typical operating temperature of catalytic recombiner packed with Pt/ α Al_2O_3 catalysts for hydrogen oxidation was 473K. Efficient tritium oxidation performance at room temperature has been strongly required taking a severe accident in a facility into consideration. However, tritium oxidation performance of Pt/ α Al_2O_3 catalyst at room temperature was quite low. In addition, it has been known that the tritium oxidation performance is decreased in the case where the concentration of water vapor is very large. The decrease in tritium oxidation performance in the presence of water has been explained as the water layers formed on the noble metal plays the obstruction role of tritium transport onto noble metal.

We have developed the hydrophobic Pt catalysts applicable for tritium oxidation in the presence of saturated water vapor at room temperature. A new type of hydrophobic catalyst, Pt/ASDBC, has been prepared by dipositting platinum on alkyl-styrene diviyl-benzene copolymer (ASDBC). Pt/ASDBC is more hydrophobic than Pt/SDBC that is a promising catalyst for the water detritiation system [1]. The deposited platinum used to prepare Pt/ASDBC catalyst was 1.0 g/L. The value was approximately half of a commercial Japanese Pt/SDBC catalyst. Tritium oxidation tests of the catalysts using 3GBq/m^3 of tritium were performed in the absence/presence of saturated water vapor at room temperature. Tritium oxidation sufficient for room temperature recombiner was demonstrated using Pt/ASDBC catalyst.

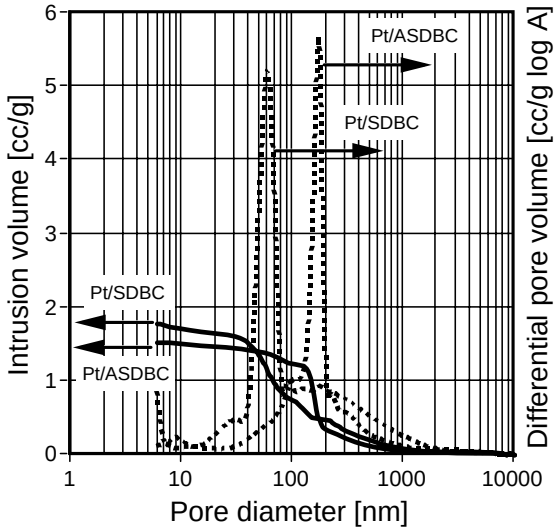

Figure 1: Pore size distribution of catalytic materials measured by mercury porosimeter.

[1] Y. Iwai et al., Fusion Sci. Technol., 41 , 2002, pp1126-1130