Effects of Tritiated Water on Corrosion Behavior of SUS304

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It is important for the safety of fusion reactors to understand the corrosion behavior of the structural materials which confine tritiated water. The exotic corrosion behavior of the materials which have contact with tritiated water could be expected, since the physical and chemical behavior of tritiated water would different from natural water in such points as generation of radiolysis products, change of pH [1], and so on. Therefore, anodic polarization measurements, one of the electrochemical techniques, for SUS304 stainless steel were performed to understand the effects of tritium on corrosion behavior.

In the experiments, the parameters of the present study to understand the effects of tritium on corrosion behavior were tritium concentration up to 0.23 GBq cm^{-3}, dissolved oxygen concentration up to 8.6wppm and pH from 1 to 13. The pH of electrolytes were changed using aqueous solutions of 0.05 mol dm^{-3} sulfuric acid, 0.05 mol dm^{-3} sodium sulfate, and 0.1 mol dm^{-3} sodium hydroxide.

In acid circumstance, any significant effects of tritium could not been observed in any tritium concentration of the electrolytes used in the present study when the dissolved oxygen was removed. However, it was observed that the passivation due to dissolved oxygen could be inhibited in tritiated water, although when the dissolved oxygen concentration increased, the passivation inhibitory effects suddenly become unobservable. However, as the tritium concentration increased, the passivation inhibitory effects became significant in higher dissolved oxygen concentration. Therefore, it was suggested that the passivation inhibitory reaction which would depend on the tritium concentration would compete with the passivation reaction due to dissolved oxygen.

In the presentation, the effects of tritium on the corrosion behavior, especially focused on the inhibitory effects of passivation which would be affected by dissolved oxygen concentration and pH will be discussed in detail.

[1] T. Hayashi et al., *Fusion Eng. Des.*, **81**, 1365-1369 (2006).