

The Effect of Surface Treatment on Reducing Metal Release from Alloy 690 SG Tubing in PWR Primary Water

Yasuyoshi Hidaka¹, Manabu Kanzaki¹, Yumi Momozono¹, Yasuhiro Masaki¹,
Akihiro Uehira² and Osamu Miyahara²

1 NIPPON STEEL & SUMITOMO METAL CORPORATION, R & D Laboratories,

2 NIPPON STEEL & SUMITOMO METAL CORPORATION, Amagasaki Works,

Email: hidaka.y53.yasuyoshi@jp.nssmc.com

In primary side of PWR, nickel released from Ni-base alloy such as Alloy 690 for SG tubes is one of main exposure resources during scheduled inspections. In order to reduce radiation exposure in PWR plant during the inspections, reduction of Ni release from SG tubes is important.

In this study, the effect of surface treatment, the Pre-filming technology giving Cr-oxide on the surface of Ni-based alloy, was investigated in term of reduction of nickel release from Alloy690 in PWR primary water.

Physical analysis showed that the Pre-film composed of mainly Cr₂O₃ layer, and the oxide layer had uniform thickness throughout 20 m long SG tubes.

The new test system which enabled to reproduce PWR primary water environment, especially focused on high flow velocity was introduced for estimating Ni release behavior in this study. It was clarified that the amount of released Ni from Alloy 690 coated with Pre-film was much less than that from non-coated Alloy 690.

Pre-film on Alloy 690 was recognized to be stable even under such a severe test condition at high flow velocity from the cross-sectional TEM observation of test pieces after the tests.