P-10

고온의 염기성 용액에서 Silicate 첨가재에 의한 Alloy 600 산화막의 조성변화

Chemical Composition of Oxide Layer on Alloy 600 in Caustic Solution with Silicate

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1. Introduction

Silicate is a major constituent of sludge on the tubesheet region of PWR steam generators, where stress corrosion cracking (SCC) of the steam generator tubing generally occurs in nuclear power plants. There were controversy about the role of silicon compound in SCC, implying that it is very difficult to pin point the specific compound having an influence on SCC because the deposit on the top of tube sheet is rather complex in composition and structure. This work is aimed at clarifying variation of oxide layer on Alloy 600 with silicate in high temperature caustic solution

2. Experimental

In this work, the effects of silicate on oxide layer of Alloy 600 and Alloy 690 have been studied in 10 % NaOH and 40 % NaOH with and without 2 g/l SiO2 at 315℃. The experiments were performed using C-ring specimens at 200 mV above the corrosion potential. Polarization behaviors of Alloy 600 and Alloy 690 were also studied. High temperature mill annealed Alloy 600, sensitized Alloy 600, thermally treated Alloy 600 were used for polarization test. Composition profiles of the oxide layer on Alloy 600 was examined with an Auger electron microscope.

3. Summary

Presence of silica reduced the current density of the polarization curve above the corrosion potential in 10% NaOH while it has little effect the current density of the polarization curve above the corrosion potential in 40% NaOH. Presence of silica caused Cr enrichment in the outermost layer of the corrosion product on the free surface and crack initiation site. However, it had no effect on the composition profile of the corrosion product on the crack tip, indicating that migration of the

silicon compound to the crack tip is limited. Silicon was found to be incorporated into the outer layer of the corrosion product. Cr enrichment in the outermost layer of the corrosion product and/or incorporation of silicon into the outer layer of the corrosion product under the presence of silica in 10% NaOH seem to increase the stability of the corrosion product.