Effect of polyacrylic acid on the corrosion behavior of Alloy 690 in pressurized water reactor secondary water

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Abstract The effect of polyacrylic acid (PAA) on the corrosion behavior of Alloy 690 in simulated pressurized water reactor secondary water was investigated. The duplex oxide film structure, consisting of a Ni-rich outer layer and a Cr-rich inner layer, was maintained regardless of PAA presence. PAA inhibited the growth of outer Ni-rich particles while promoting Cr enrichment in the inner layer and inducing its amorphization, both enhancing oxidation resistance. However, excess PAA (≥ 500 ppb) suppressed protective oxide formation during initial oxidation, leading to oxygen penetration into the matrix. A PAA concentration of around 250 ppb is considered optimal for steam generators, as it provides the benefits of PAA without adverse effects on the alloy.

Keywords polyacrylic acid; Alloy 690; pressurized water reactor; secondary water; oxide film

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