Effect of Tin on The Corrosion Resistance of 16 Cr Ferritic Stainless Steel in Acidic Solution and Chloride-Containing Media

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Newly developed 16 Cr ferritic stainless steel (FSS) containing tin, ranging from 0~0.5 wt.%, are resource-efficient, economic steels with good mechanical properties. In this paper, its corrosion behavior was investigated in acidic solution and chloride-containing media through weight loss measurements, potentiodynamic polarization curves and critical pitting corrosion temperature (CPT). The morphologies of the specimens were studied by scanning electron microscope-energy-dispersive X-ray spectroscopy (SEM-EDS) techniques. Based on the results, the effects of tin element on the corrosion resistance for 16 Cr FSS in different solutions were complex. It could be concluded that the corrosion behaviors of 16 Cr FSS was affected by a small addition of tin in two ways: 1) A SnO₂ layer could be formed over the surface of the specimens and protect them from corrosion, which was then verified by the X-ray photoelectron spectroscopy (XPS); 2) The hydrolysis reaction of Sn²⁺ and Sn⁴⁺ led to an increase of local concentration of hydrogen ions, which further aggravated the corrosion of the specimens. The whole corrosion resistance of 16 Cr FSS was depended on the two antagonism effects.

Keywords: Tin, 16 Cr Ferritic stainless steel, Corrosion resistance, Pitting corrosion

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