

Public Abstract

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Title: CORROSION PERFORMANCE OF NICKEL BASED ALLOY IN HYDROGEN IODINE SOLUTION

In this thesis, the corrosion performance of some Ni-based super alloys including Inconel 625, Hastelloy X and Nickel 200 were investigated in HI solution at 70°C and 100°C at intervals of 24h, 48h, 96h and 192h respectively. Morphology and microstructure of corroded samples were analyzed using scanning electron microscopy (SEM), X-ray energy dispersive spectroscopy (EDS), and optical profilometry. Corroded samples were also examined for their electrochemical corrosion properties by a cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS).

The corrosion rates of all tested alloys increase with temperature. For Inconel 625 and Hastelloy X, the corrosion rate initially increased and then remained constant over time. This phenomenon is most probably attributable to their inherent anti-corrosion oxide layer. However, the corrosion rate for Nickel 200 does not fluctuate remarkably, since the protective layer is weaker than the other two alloys. In Inconel 625 samples, the constituent iron is lost in a stable ratio of rates with respect to nickel. While in Hastelloy X samples, the iron, Chromium, and Molybdenum are corroded in a stable ratio of rates with respect to nickel, respectively. With temperature increase, the corrosion rates of these elements increase.

The protective oxide layer of Hastelloy X is more anti-corrosive than Inconel 625, according to EIS results. And Hastelloy X has a smoother surface after several days' corrosion as observed by optical profilometry.