Short Communication

Corrosion Behaviour of 316L Stainless Steel in Boric Acid Solutions

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The corrosion behaviour of stainless steel 316L in boric acid solutions to simulate the environment in the primary circuit of a pressurized water reactor was investigated by electrochemistry, the weight loss method, scanning electron microscopy, and X-ray diffraction. The results indicated that during a 7 day corrosion process at temperatures ranging from 50 to 185°C, the stainless steel 316L had very low corrosion rates. The corrosion of a passive protection layer on the surface were investigated. The electrochemistry results showed that the open circuit potential of the samples increased as the corrosion process developed, and at high concentrations of boric acid, a more positive open circuit potential was observed. The Nyquist plots displayed a shrinking semi-circle as the corrosion time increased. Bode diagrams indicated the time constant during the corrosion process. The morphology results suggested that the metal oxides changed from large deposits to small scaly deposits as the boric acid concentration increased. X-ray diffraction analysis suggested that the oxide layer on stainless steel 316L after corrosion had the same composition even when different concentrations of boric acid were used. These results grant insight into the corrosion behaviour of 316L stainless steel in boric acid solutions during the operation of pressurized water reactors.

Keywords: Stainless steel 316L; Boric acid; Corrosion; Electrochemical behaviour

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