The Effects of Trace PbO on the Oxide Behavior of 304L Stainless Steel in High Temperature Water

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304L stainless steel was corroded in a simulated PWR primary circuit at 315°C with ppb level PbO treatment. Corrosion properties and semiconductor behaviors of the oxide layers on SS304L exposed to high temperature and high pressure water corrosion were investigated by electrochemical potentiodynamic curves and Mott-Schottky tests. The FE-SEM images suggested some unprotective spinel crystals formed on the surface of oxide film with trace level PbO treatment. And XPS results indicated not only 2⁺ valance but also 4⁺ and 0 of Pb, cooperated with Iron, Chromium, Nickel and their oxides, in the oxide layer.

Keywords: High temperature and high pressure water; 304L stainless steels; PbO; Potentiodynamic curves; Mott-Schottky analysis

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