Mechanism and evaluation method of stress corrosion susceptibility of 904L stainless steel with optimized structure in seawater

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Abstract The stress corrosion cracking (SCC) and the electrochemical behavior of 904L stainless steel in a simulated seawater environment were investigated using slow strain rate testing (SSRT), electrochemical polarization, electrochemical impedance spectroscopy (EIS) and Mott-Schottky (M-S) curves. The sensitive potential range of 904L stainless steel was determined by the fast and slow scan potential polarization curve, is -950 mVSCE ~ 270 mVSCE. Moreover, with the negative shift of applied potential, the toughness fracture characteristic of the three kinds of steel is reduced, and the sensitization state steel is the most obvious reduction. Finally, a practical formula for evaluating the SCC susceptibility of 904L stainless steel was developed by integrating data from SSRT and fast and slow scan polarization curves.

Keywords 904L stainless steel; Stress corrosion cracking; Electrochemical character, SCC susceptibility evaluation method.

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