The Influences of Chloride Anions on Corrosion Electrochemical Characteristics of 904L Stainless Steel in Blast Furnace Gas/Water system

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In this work, the influences of chloride anion (Cl^-) concentrations on the corrosion electrochemical characteristics for a super austenitic stainless steel (ASS), 904L ASS, in a simulated environmental solution that was acquired with the introduction of blast furnace gas (BFG) into water were investigated with the methods of electrochemical techniques including potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), current transient and Mott-Schottky plot. From the electrochemical measurement and investigation, the results showed that 904L ASS presented the electrochemical behavior of self-passivation in the BFG/water solutions with different concentrations of Cl^- , and the influences of Cl^- concentrations on the main corrosion electrochemical parameters, including pitting potential (E_{pit}), passivation current density (i_{pass}), repassivation potential (E_{rep}), passive film capacitance (CEP_f), passive film resistance (R_f), flat bond potential (U_{fb}) and donor density (N_D), were very prominent and showed a certain rule. Further, the 904L steel presented the good self-passivation characteristic in the BFG/water solution when the Cl^- concentration was lower than 78.50 g/L. However, when the Cl^- concentration was higher than 78.50 g/L, the self-passivation characteristic of 904L ASS decreased gradually with the increase of Cl^- concentration. Further, the relation between corrosion and passivation characteristics was also discussed in this paper.

Key words: 904L ASS; corrosion and passivation; blast furnace gas; chloride anion; polarization; EIS; Mott-Schottky

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