The Effects of Chloride Anions on Corrosion and Passivation Behavior of 254SMO Stainless Steel in Water Absorbed of Blast Furnace Gas (BFG)

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The effects of chloride anions (Cl⁻) on the corrosion and passivation behavior of 254SMO stainless steel in an electrolyte that was obtained by water absorption of blast furnace gas (BFG) were studied by the electrochemical measurements of potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), potential step and Mott-Schottky plot. The 254SMO steel showed the electrochemical characteristic of spontaneous passivation in the studied electrolyte with different concentrations of Cl⁻, and the effects of Cl⁻ concentration on the values of passivation current density (i_{pass}), pitting potential (E_{pit}), repassivation potential (E_{rep}), passive film resistance (R_f), passive film capacitance (CEP), donor density (N_D) and flat bond potential (U_{fb}) presented a certain law but was not very prominent. Further, in the studied Cl⁻ concentration range from 20 g/L to 120 g/L, the 254SMO steel showed good passivation capability in the studied electrolyte, and the passivation capability for the surface of 254SMO stainless steel at the low Cl⁻ concentration was greater than that at the high Cl⁻ concentration.

Keywords: 254SMO stainless steel; blast furnace gas (BFG); corrosion; passivation; chloride anion