Effect of CO₂ and H₂S on the Corrosion Resistance of FV520B Steel in Salinity Water

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The corrosion behavior of FV520B stainless steel in different salinity water was studied by electrochemical measurements such as potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV) and X-ray photoelectron spectroscopy (XPS). The results showed that the open circuit potential (OCP) shifts negatively and the thermodynamic stability of FV520B steel decreases when CO₂ and H₂S were introduced into the salinity water (SW). The polarization curves of FV520B steel show typical passive characteristics in the salinity solutions. When CO₂ and H₂S are introduced into the SW, the corrosion current density of FV520B steel increases, the polarization resistance decreases, and the corrosion resistance decreases, and the corrosion resistance is the poorest in H₂S salinity water. XPS analysis shows that the passive film of FV520B steel are mainly consist of oxides and hydroxides of Fe, Cr, Mo, Ni and Cu. With the introducing of CO₂ and H₂S, the content of Fe²⁺ and Cr³⁺ in passive film decreases, the content of Fe³⁺ and Cr⁶⁺ increases, and the corrosion resistance of passive film decreases. The corrosion resistance of FV520B steel in SW is significantly reduced by corrosive gas CO₂ and H₂S, and the corrosion resistance in H₂S shows the worst.

Keywords: FV520B; corrosion; hydrogen sulfide; cyclic voltammetry; XPS

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