20、Corrosion of Stainless Steels

Inhibition of corrosion mechanism of Cl- in 304 stainless steel by different SO_4^{2-} concentrations at 30°C

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Abstract The chemical production process, often produces a high concentration of inorganic salt wastewater, causing serious pollution to the environment, but also a waste of valuable water resources. Through the low-temperature multi-effect distillation technology to deal with the high concentration of inorganic salts produced in the production process of mine water will find that the evaporation and concentration of heat exchanger is the first to face the trouble of equipment corrosion phenomenon. Heat exchanger tubes in the production of not only face the Cl- in the environment of pitting corrosion and stress corrosion, but also face other inorganic salt ions of the synergistic corrosion due to mineralization, scaling caused by crevice corrosion and other issues, and at higher temperatures and low-temperature multi-effect distillation process is in a low-pressure corrosive environment of the complexity of the equipment and pipeline is very easy to occur in localized corrosion, increase the cost of wastewater treatment and other issues. Study the use of scanning electron microscopy, X-ray photoelectron spectroscopy and other characterization methods technology and kinetic potential polarization, electrochemical impedance spectroscopy (EIS), Mott-Schottky test, and other electrochemical methods at 30 ℃, at a concentration of 0.38M NaCl with different concentrations of Na_2SO_4 in the corrosion phenomenon of 304 stainless steel tube. In the Cl-containing solution, in the local area, the higher concentration of chloride ions will destroy the oxide film on the surface of stainless steel, forming small etch pits. These etch pits continue to deepen and eventually penetrate the entire metal surface. With the addition of SO42-, the corrosion resistance of stainless steel gradually rises, the concentration of defects in the passivation film decreases, and the dissolution rate of Fe and Cr decreases, which suggests that the addition of SO_4^{2-} in the solution inhibits the eruption and growth of pitting. SO_4^{2-}addition at 0.38M NaCl concentration inhibited the growth of pitting pits, which promoted the corrosion resistance of 304 stainless steel, and heeled well to protect the production equipment and pipe fitting facilities.

Keywords mine water, low-temperature multi-effect distillation technology, stainless steel, pitting corrosion, passivation film