

Local Electrochemical Response of Pure Iron Corrosion in Dynamic Electrolyte Film Process

Lulu Ji, Xiao Tang

(China University of Petroleum (East China), Qingdao, Shandong, 266580,

E-mail: tangxiao@upc.edu.cn)

Abstract: In the actual atmospheric environment, the liquid film on the metal surface has been constantly evaporating and condensing as the climate and meteorological conditions change, showing the characteristics of dynamic liquid film, so the dynamic liquid film corrosion is closer to the atmospheric environment. A concentric three-electrode array local electrochemical test method was used to study the effects of parameters such as dynamic liquid film change rate, initial liquid film thickness, and number of liquid film change cycles on the electrochemical behavior of pure iron corrosion. The electrochemical response of the dynamic liquid film change rate, the initial liquid film thickness, and the number of cycles to the pure iron interface is studied. Results show that with the gradual increase of the dynamic liquid film change rate, the corrosion process of the electrode varies with the external environment. As well as the unbalanced response speed between the electrodes inside the electrode, the local cathode and anode differentiation of the corroded electrode is serious, and the local corrosion tendency increases; when the initial liquid film thickness is thin, the corrosion potential and coupling current are unevenly distributed, and the cathode and anode differentiation is serious. The corrosion rate is large; with the increase of the number of dynamic liquid film cycles, the position of the cathode and anode is fixed, and the local corrosion tendency of the initial state, half cycle and final state first increases slightly, and then the volatility gradually decreases. In the evaporation process of the thin NaCl liquid film on the surface of the pure iron electrode, as the liquid film continues to thin, its corrosion tendency first increases, then decreases, and then increases; the liquid film changes from a uniform liquid film to discontinuous and dispersed Liquid film: In the middle and late stages of liquid film thinning, due to the influence of corrosion products and crystalline salts, the diffusion path of oxygen changes, resulting in the edge position being controlled by oxygen diffusion resistance.

Keywords: pure iron; three concentric electrodes; dynamic liquid film; local electrochemical response