Effect of HCO_3^- Concentration on the Corrosion Behaviour of X80 Pipeline Steel in Simulated Soil Solution

Fei Xie, Dan Wang^{*}, Chengxiang Yu, Yue Zong, Ming Wu

Key Laboratory of Oil & Gas Storage and Transportation, College of Petroleum Engineering, Liaoning Shihua University, Fushun Liaoning, 113001, China.

^{*}E-mail: wd841015@163.com

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In buried pipeline steel, soil environmental factors cause corrosion, which greatly affects the safe operation of pipe networks. The effects of HCO_3^- on the corrosion behaviour of X80 pipeline steel in Liaohe Oilfield simulated soil solution was investigated through potentiodynamic polarization and electrochemical impedance spectroscopy. The corrosion morphologies were observed by a metalloscope under different HCO_3^- concentrations. Accordingly, the polarization curves of the X80 pipeline steel exhibited the typical characteristics of activated passivation in the solution. With increasing HCO_3^- concentration, the corrosion rate of X80 steel increased and then decreased. The different anodic-current peaks obtained were caused by the property changes of the surface corrosion products of the electrode. When the HCO_3^- concentration was 0.2 mol/L, the metal corrosion reaction was disrupted. The surface corrosion phenomenon was not obvious and produced only few minor corrosion pits. In this case, the X80 pipeline steel showed the highest corrosion resistance, which was due to the widest passivation interval at this time, and the passivation film was complete and the densest. Thus, the best film protection was attained for the metal electrodes.

Keywords: X80 pipeline steel, bicarbonate ion, corrosion behaviour, Liaohe oilfield soil

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