The Influence of O₂ on the Corrosion Behavior of the X80 Steel in CO₂ Environment

Xiao Wang¹, Xinyue Wang¹, Jun Wang^{1,*}, Guowei Wang², Yi Pan¹, Shuangchun Yan¹

¹ Liaoning Shihua University, Fushun, China;

² Northeast Petroleum of Pipeline Co.1st, Shenyang, China

*E-mail: mikewangjun@163.com

doi: 10.20964/2020.01.81

Received: 28 September 2019 / Accepted: 7 November 2019 / Published: 30 November 2019

The present paper investigates the influence of O₂ on X80 steel under the CO₂ environment through polarization curves, EIS, and employing characterization by corrosion images and mechanisms, using the test data of the environmental content of CO₂ and O₂ in an oil field, while the pressure of O₂ is 0.082bar~0.15bar. The results show that O₂ mainly have influence on the polarization process of X80 steel cathode, and in the low O₂ pressure of 0~0.12bar, corrosion potential and corrosion current density of X80 steel essentially remains the same, and with the increase of O₂ pressure to 0.17bar~0.22bar, comprehensive corrosion rate and the electric double layer capacitance all increase, and also the polarization resistance, diffusion resistance, and charge transfer resistance is reduced. This behavior can be attributed due to the fact that O₂ destroyed the surface of X80 steel by the corrosion film resulting in local corrosion caused by the presence of CO₂.

Keywords: X80 steel; Carbon dioxide; Oxygen; Corrosion behavior; Film damage mechanism

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).