



Impact of oxygen level on the corrosion behavior of carbon steels used in oil and gas industry

Shaban, Ghada; Bartawi, Emad Hasan; Rizzo, Riccardo; Rogowska, Magdalena; Ambat, Rajan

Publication date:
2020

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Shaban, G., Bartawi, E. H., Rizzo, R., Rogowska, M., & Ambat, R. (2020). *Impact of oxygen level on the corrosion behavior of carbon steels used in oil and gas industry*. Abstract from EUROCORR 2020, Brussels, Belgium.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Impact of oxygen level on the corrosion behavior of carbon steels used in oil and gas industry

Ghada Shaban¹, Emad Bartawi¹, Riccardo Rizzo¹, Magdalena Rogowska¹, Rajan Ambat¹

Section of Material and Surface Engineering, Department of Mechanical Engineering, Technical University of Denmark, 2800 Lyngby, Denmark

Abstract

The presence of oxygen in the wellbore is a serious issue and influences the corrosion behavior of the material by changing the morphology and properties of the formed corrosion layers. In this study, the effect of the dissolved oxygen concentrations on the corrosion behavior of 1Cr carbon steel and 13Cr stainless steel was investigated.

Tests were conducted at atmospheric pressure in 3.5 wt.% NaCl solution saturated with CO₂ at two different temperatures, 40 °C and 80 °C for aerated and deaerated systems. Three different concentrations of dissolved oxygen (230 ppb, 650 ppb, and 2000 ppb) at 40 °C were studied. Linear Polarization Resistance (LPR), Electrochemical Impedance Spectroscopy (EIS), and Potentiodynamic Polarization were used to study the electrochemical behavior. X-Ray Powder Diffraction (XRD), Scanning Electron Microscopy (SEM), and Energy Dispersive X-Ray Spectroscopy (EDS) were employed to analyze the morphology, the chemical composition and the different phases of the corrosion products. Results showed that the corrosion rate of 1Cr carbon steel decreased with increasing the concentration of dissolved oxygen from (230 ppb to 2000 ppb) in the system. On the contrary, the polarization resistance of 13Cr stainless steel decreased with increasing the concentration of dissolved oxygen in the system, which implies a higher corrosion rate.

Keywords

Carbon steel; CO₂ corrosion; Iron carbonate; EIS; LPR