Effect of Ambient Atmosphere and Temperature on The Corrosion Resistance of X80 High-deformation Pipeline Steel in Bicarbonate Solution

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doi: 10.20964/2017.01.90

Received: 19 September 2016 / *Accepted:* 14 November 2016 / *Published:* 12 December 2016

In this study, the electrochemical corrosion behavior of X80 high-deformation pipeline steel in bicarbonate solutions was evaluated. Effects of atmosphere and temperature on the corrosion resistance were studied by electrochemical tests. Results showed that the main characteristics of the potentiodynamic polarization curves are mainly determined by the atmosphere. The solution concentration and temperature can only affect the specific values. The presence of O₂ can accelerate the corrosion reactions, resulting in “double-anodic-peak-phenomenon”. CO₂ weakens the stability of passivity, even eliminates the passivity phenomenon in dilute solution. Results of the potentiodynamic polarization, electrochemical impedance spectroscopy, potentiostatic anodic polarization, and Mott–Schottky analysis indicated that the corrosion rate increases and the passivity stability weakens, with the increase in temperature.

Keywords: X80 high deformation pipeline steel; corrosion resistance; atmosphere; temperature; passivity

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