Short Communication

Electrochemical Corrosion Behavior of API 5L X60 steel Exposed to Different Concentration of NaCl Solution

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doi: 10.20964/2021.05.21

Received: 5 December 2020 / Accepted: 7 January 2021 / Published: 31 March 2021

Here, the corrosion behavior of API 5L X60 pipeline steel immersed in different concentrations of NaCl solution as an offshore environment was studied using polarization and electrochemical impedance spectroscopy (EIS) tests. Different parameters were obtained from the fitting EIS data by an equivalent circuit model to indicate the corrosion resistance of carbon pipeline steels in the offshore environment. The polarization results indicate that the performance of corrosion resistant in API 5L X60 pipeline steels considerably improved with formation of a passive layer to restrain both the anodic and the cathodic corrosion reaction. The EIS results indicate that the NaCl concentration in electrochemical solution plays a significant role in the evolution of the charge-transfer processes and film resistance. Furthermore, the resistance of the passive layer is gradually reduced by increasing the chloride content which reveals that porous products and non-protective corrosion have been developed on the surface of the pipeline. Half-cell potential results indicate that the potential values in all NaCl concentrations tend to positive value by increasing immersion time, showing more resistance to corrosion in higher exposure time.

Keywords: API 5L X60 pipeline steels; Electrochemical corrosion; Offshore environment; polarization analysis; Electrochemical impedance spectroscopy

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