Comparative Analysis of Corrosion Resistance of 20# and L245NS Steels in the CO₂-saturated Simulated Oilfield Solution with Trace Amounts of H₂S

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The study of the electrochemical corrosion behavior on both 20# and L245NS steels were conducted in CO₂-saturated simulated oilfield solution with trace amounts of H₂S at 25°C and 45°C by potentiodynamic polarization curve, EIS and SEM methods. The corrosion parameters of measured Nyquist plots fitted by ZView software were theoretically analyzed and discussed. The results indicated that the corrosion potential (E_{corr}) became more negative and that the corrosion current density (i_{corr}) decreased with the addition of 0.1 wt.% Na₂S·9H₂O. At 45°C, the Warburg impedance characteristics of diffusion process appeared whereas a depressed capacitive semi-circle at 25°C in a low frequency region was observed for 20# and L245NS steels in the low sulfur-containing condition. Trace amounts of H₂S can lead to the degradation effect on carbon steel, and L245NS steel has relatively better resistance performance than 20# steel to sulfur-containing corrosive solution.

Keywords: 20# steel; L245NS steel; H₂S/CO₂ corrosion; polarization curve; EIS

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