Electrochemical Corrosion Behavior of API X120 Steel at Different Temperatures in CO₂ saturated NaCl solution in presence of 2-[2-(dimethylamino)ethoxy]ethanol as inhibitor

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The objectives of this research were to see how the concentration of 2-[2-(dimethylamino)ethoxy] ethanol (DMEE) as an inhibitor, as well as temperature, affected the corrosion rate of API X120 steel in a 3.5wt% NaCl solution saturated with CO₂. The electrochemical analyses by the potentiodynamic polarization technique showed that the presence of DMEE decreased corrosion current density, and the positive shift of corrosion potential was attributed to the sensible effect of DMEE on the corrosion process due to the creation of a protective layer on the steel surface and it hinders the hydrogen evolution reaction and retards the dissolution reaction. The results demonstrated that DMEE as a mixed inhibitor remarkably decreased the corrosion rate of steel and 87.75% corrosion inhibition efficiency was obtained for the addition of 100μM DMEE in corrosive media at 25°C. Moreover, EIS analyses revealed that the increase in temperature decreased the time lag between the adsorption and desorption of DMEE molecules on the steel surface and led to an increase in corrosion rate and a decrease in inhibition efficiency values with increased temperature. SEM analyses of corroded surface of API X120 steel in presence of DMEE revealed that corrosion was reduced due to the formation of a DMEE protection layer on the metal surface and the capture of CO₂ by DMEE molecules.

Keywords: Corrosion; Inhibitor; Temperature; 2-[2-(dimethylamino) ethoxy] ethanol; Electrochemical impedance spectroscopy

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