Electrochemical and Optical Behavior of Microalloyed Steel in Near-Neutral Aqueous Solution

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A comparative study is presented using optical absorbance and potentiodynamic tests for monitoring corrosion rate. Physical degradation of X-70 microalloyed steel samples over various exposure intervals is measured by optical absorbance in solutions contaminated with corrosion oxides. A laser diode at 635 nm was used for monitoring the accumulation of corrosion oxides dissolved for 30 h in NS-4 aqueous solutions of the metallic samples. The optical power of transmittance and corrosion current (I_{corr}) from potentiodynamic polarization tests show good agreement, with the slopes of the two curves coinciding. This agreement indicates a continuous dissolution process, confirming that the material continues to show no formation of protective metallic oxides.

Keywords: X-70 steel; Electrochemical measurement; Oxide film; NS-4 solution; Optical monitoring

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