

Analysis of Some Produced Inhibitors for Corrosion of J55 Steel in NaCl Solution Saturated with CO₂

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Abstract : The corrosion inhibition performance of pyran (AP) and benzimidazole (BI) derivatives on J55 steel in 3.5% NaCl solution saturated with CO₂ was investigated by electrochemical, weight loss, surface characterization, and theoretical studies. The electrochemical studies included electrochemical impedance spectroscopy (EIS), potentiodynamic polarization (PDP), electrochemical frequency modulation (EFM), and electrochemical frequency modulation trend (EFMT). Surface characterization was done using contact angle, scanning electron microscopy (SEM), and atomic force microscopy (AFM) techniques. DFT and molecular dynamics (MD) studies were done using Gaussian and Materials Studio softwares. All the studies suggested the good inhibition by the synthesized inhibitors on J55 steel in 3.5% NaCl solution saturated with CO₂ due to the formation of a protective film on the surface. Molecular dynamic simulation was applied to search for the most stable configuration and adsorption energies for the interaction of the inhibitors with Fe (110) surface.

Keywords : corrosion, inhibitor, EFM, AFM, DFT, MD

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