

Synthesis, Electrochemical and Theoretical Study of Corrosion Inhibition on Carbon Steel in 1M HCl Medium by 2,2'-(piperazine-1,4-diyl)bis(N-(4-bromophenyl)acetamide)

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Abstract : In the present study, a distinct organic inhibitor, namely 2,2'-(piperazine-1,4-diyl)bis(N-(4-bromophenyl)acetamide) (PBRA), was synthesized and characterized using ^1H , ^{13}C NMR, and IR spectroscopy. Subsequently, the inhibition effect of PBRA on the corrosion of carbon steel in 1 M HCl was studied using electrochemical measurements such as potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS). The results showed that the inhibition efficiency increased with concentration, reaching 87% at 10^{-3}M . Furthermore, PBRA remained effective at temperatures ranging from 298 to 328 K. The adsorption of the inhibitor onto carbon steel was well described by the Langmuir adsorption isotherm. Additionally, a correlation between the molecular structure and quantum chemistry indices was established using density functional theory (DFT).

Keywords : synthesis, corrosion, inhibition, piperazine, efficacy, isotherm, acetamide

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