Corrosion Inhibition of Carbon Steel in HCl and H₂SO₄ Acids by Novel 1,3,4-Thiadiazolium-2-Phenylamine Salts

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doi: 10.20964/2018.07.64

Received: 27 March 2018 / Accepted: 7 May 2018 / Published: 5 June 2018

The inhibition ability of four 1,3,4-thiadiazolium-2-phenylamine chlorides (MI 1-4) towards carbon steel corrosion in 1.0 M HCl and 0.5 M H₂SO₄ was evaluated by potentiodynamic polarization (PP), the linear resistance to polarization (LRP) and electrochemical impedance spectroscopy (EIS) at different inhibitor concentrations. Polarization curves showed that all the evaluated compounds act as mixed inhibitors with a tendency to become anodic in both acids. EIS plots indicated that the presence of all compounds increases the charge transfer resistance of the corrosion process, thus increasing the corrosion inhibition efficiency in both acids. These derivatives exhibit good inhibition properties in both acidic solutions, and the adsorption on the carbon steel surface follows the Langmuir isotherm model in both acidic media. Theoretical calculations were also performed, and the calculated quantum parameters correlated with the experimental results, thus supporting the conclusions reached from the electrochemical data.

Keywords: Mesoionic Salts; Polarization; EIS; Molecular Modeling; Acid Corrosion.

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