

COPPER CORROSION INHIBITION IN HCL 1 M MEDIUM BY A NEW ORGANIC SYNTHETIZED MOLECULE: EXPERIMENTAL AND THEORITECAL APPROACHES.

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Introduction & Objectives:

Nowadays, metallic corrosion which is a constant and continuous process becomes a severe problem of worldwide significance that affects many sectors, especially in numerous industrial applications due to their enormous economic losses [1]. According to research guided by the NACE, the current economic loss of corrosion has been increased up to \$ 2.5 trillion per year that equates to around 3.4% of the gross domestic product (GDP) [2]. Copper is an extensively material utilized for numerous industrial applications, due to their remarkable physical and mechanical properties [3]. Over the years, the Utilization of chemical inhibitors especially organic compounds possessing aromaticity, multiple bonds and polar groups including N, S, and/or O atoms is one of the most strategies to avoid deterioration of copper [4,5]. So, in view a new synthetized organic compound have been tested as corrosion inhibitor.

Methodology (Material and methods):

The investigation of corrosion inhibition efficiency and mechanism of inhibition has been studied using potentiodynamic polarization and electrochemical impedance spectroscopy (EIS). The morphology of the steel surface was studied using scanning electron microscopy (SEM) measurement. Besides that, the experimental results were completed using theoretical studies such as density functional theory (DFT), and molecular dynamics (MD) in order to understanding of the inhibition mechanisms.

Results and Discussion:

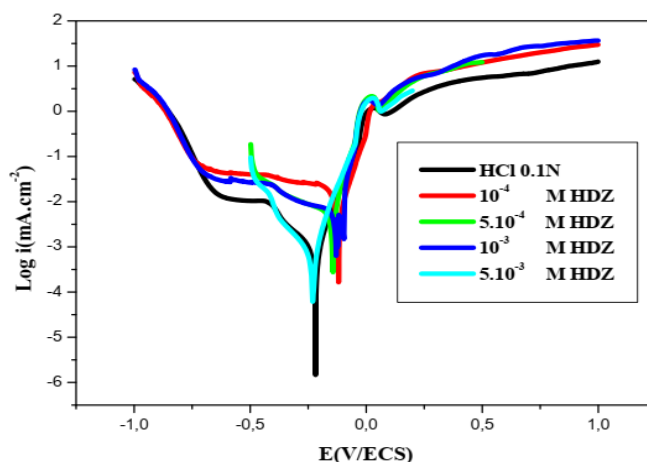


Fig. 1. Copper polarization curves in 0.1 N HCl without and with different concentrations of tested inhibitor at 298 K.



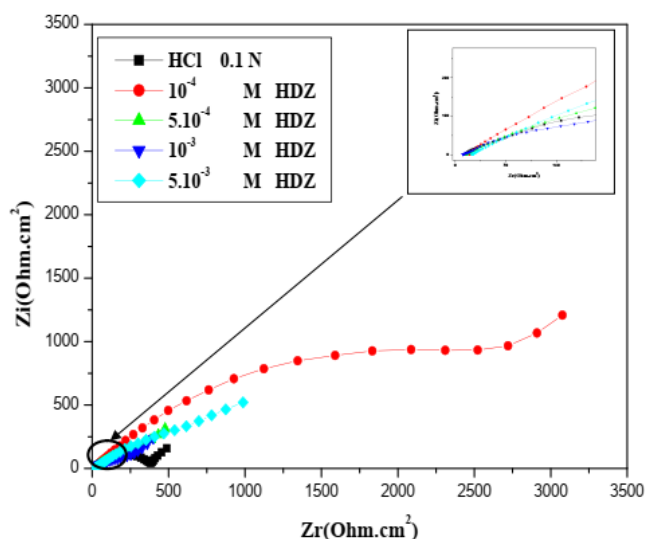


Fig. 2. Nyquist diagrams of copper in 0.1 N HCl without and with inhibitor concentrations at 298K.

Conclusion :

- The tested inhibitor act as an excellent inhibitor for the corrosion of copper in 0.1 N HCl.
- The inhibition efficiency increased with increasing in inhibitor concentration and the adsorption manner follow Langmuir adsorption isotherm.
- The potentiodynamic polarization results revealed that the Inhibitor compound act as mixed type inhibitor in HCl solution.
- The SEM micrographs showed that the corrosion of copper in 0.1 N HCl solution was described by corrosion attack, and the addition of the inhibitor to the aggressive solutions diminished the corrosion rate of copper.
- The calculated quantum chemical confirms the results obtained from experimental results.

Keywords: Corrosion inhibitor, Copper, HCl, DFT.

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