Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 39 2024

Colloquium on Applied Sciences 2024
19-21 January 2024, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Anti-Corrosion Evaluation of Organic and Pharmaceutical Compounds for Mild Steel in 3.5 wt% NaCl Solution

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Structured Abstract

Background: Corrosion on mild steel is a significant concern as it is widely used in various industries for construction, machinery parts, pipelines, and other metal-based engineering applications. Corrosion can occur spontaneously and is inevitable. However, one of the most effective ways to combat it is with corrosion inhibitors. An azomethine compound can be identified by the presence of an imine functional group specifically the carbon-nitrogen double bond (C=N). The azomethine compound's structure with its electron-rich C-N bond has shown promising potential for chemical interactions including complexation with metals. In addition, the molecular structure of paracetamol contains heteroatoms and aromatic rings, which can impact their inhibitory properties. For this investigation, the selection was made to focus on organic compounds Benzylidene aniline and pharmaceutical compounds Paracetamol. These compounds were selected due to their unique properties that allow them to form a protective barrier on the surface of mild steel through adsorption. This barrier helps prevent corrosion when the steel is exposed to a corrosive environment.

Methods: Benzylidine aniline was first synthesized and then validated with paracetamol by Fourier Transform Infrared (FTIR), elemental analysis, and melting point. The weight loss method was used to investigate the inhibitory effects of this Benzylidine aniline and Paracetamol on mild steel corrosion in 3.5% NaCl solution, with inhibitor concentrations ranging from 1000ppm to 4000ppm after 24 hours of exposure.

Results: It was shown that the inhibition efficiency rises with increasing inhibitor concentration, with Benzylidine aniline having the highest corrosion inhibition property of 76.81% at 4000ppm, followed by Paracetamol with the second highest corrosion inhibition of 58.46 at 4000ppm. The mild steel surface was then analyzed to evaluate surface morphology using a field emission scanning electron microscope (FESEM), which revealed a better surface on both compounds compared to untreated mild steel in 3.5% NaCl. Characterization of the synthesis through FTIR confirmed the presence of organic compounds such as C=N and C=O groups in Benzylidine aniline and Paracetamol. Results obtained from elemental analysis are closely matched the theoretical and literature values.

Conclusion: In conclusion, this study offers valuable insights into the current state of knowledge in various fields, through a comprehensive assessment of available literature on the antimicrobial properties of neem against pathogenic microbes. The results from numerous research underscore the promise of neem as a natural treatment and its efficacy as an antimicrobial agents.

Keywords: Anti-corrosion, mild steel, NaCl, benzylidine aniline.

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