

Efficacy of *Kyllinga Erecta* Plant in Preventing Corrosion of Copper Metal in Acidic Medium

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Extended Abstract

Introduction

Corrosion is a natural electrochemical process that leads to the deterioration of metals, particularly copper, in industrial and environmental settings. It highlights the significant financial and environmental impacts of copper corrosion and emphasizes the importance of developing strategies to prevent it. Corrosion inhibitors are presented as a practical solution, with plant extracts emerging as eco-friendly alternatives due to their bioactive compounds that effectively form protective layers on metals. Recent research has shown that plant extracts, containing bioactive compounds rich in elements such as sulphur, oxygen, nitrogen, and phosphorus, can serve as effective corrosion inhibitors. These elements are known to facilitate the adsorption of the extract's active molecules onto the metal surface, forming a thin protective film that shields the metal from aggressive agents in its environment. Plant-based inhibitors have also demonstrated a high inhibition efficiency comparable to synthetic counterparts, making them a viable alternative. The active components in these extracts, including alkaloids, flavonoids, terpenoids, and tannins, are believed to interact with the metal surface through complex mechanisms involving electron donation and adsorption, helping to mitigate corrosion. The study focuses on *Kyllinga erecta*, a plant known for its medicinal properties, aims to evaluate the corrosion inhibition capabilities of its extract for copper in acidic environments, aligning with global trends toward sustainable practices using gravimetry measurement.

Materials and Methods/Methodology

The methodology involved collecting, drying, and preparing ethanol extract of dried *Kyllinga erecta* plant (KEP) as a corrosion inhibitor for copper in different concentrations (0.5, 1.0, 1.5, 2.0, and 2.5M) at temperatures 298, 308, and 318K using the gravimetric method. The inhibitory effect of KEPE on copper corrosion in 0.5M H₂SO₄ was assessed, with evaluations spanning varying inhibitor concentrations and immersion times (1–5 hours). Weight loss was measured periodically to evaluate the corrosion rate, inhibition efficiency, and protective effect of the plant extract.

Results and Discussion

Results showed that the extract effectively inhibits copper corrosion in all tested concentrations. The extent of inhibition correlates with the concentration of KEPE in the acidic medium, achieving an efficiency of up to 85% for immersion durations of 1–5 hours. Inhibition efficiency and weight loss measurements revealed that both increased alongside rising inhibitor concentration in 0.5M H₂SO₄.

Conclusions

The findings confirm KEPE as an effective corrosion inhibitor in acidic environments, offering the potential for sustainable and eco-friendly industrial applications.

Keywords: Sustainable, Copper, *Kyllinga erecta*, Corrosion, Inhibitor, Eco-friendly