

RESEARCH ARTICLE

Evaluation of Methanolic Extract of *Inula graveolens* L. as Antioxidant and Corrosion Inhibitor for Carbon Steel Alloy using MATLAB

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ABSTRACT

In recent years, Antioxidants have played a crucial role in various applications, and their potential has been evaluated through multiple assays Antioxidant utilizing 2, 2-diphenyl-1-picryl-hydrazyl-hydrate (DPPH), β -carotene assay and environmentally friendly corrosion resistance property for alloy carbon steel in 1M HCl was investigated in both in the absence and presence of methanolic extract of *Inula graveolens* L (MEIG). Using the Tafel Plot method, the impact of temperature and inhibitor concentration was studied MEIG gave good antioxidant activity, including β -carotene (83%) and DPPH (73.9%), and exhibited a maximal (99.5%) inhibitory efficiency at 323 k. Kinetic parameters (E_a , ΔG^* , ΔS^* and ΔH^* ,) were calculated. MEIG increased the energy barrier of the corrosion reaction, making it non-spontaneous through an endothermic mechanism. Furthermore, ΔH_{ads} , ΔG_{ads} , and ΔS_{ads} were also calculated, demonstrating that the inhibitor was physically adsorbed via a spontaneous. However, inhibition efficiency decreased with rising temperature due to weakened adsorption and desorption effect Simply blocking the reaction sites inhibited the corrosion. The absorption process sold the Langmuir equation for heat absorption. The study highlights MEIG's dual functionality as a potent antioxidant and an effective, environmentally friendly corrosion inhibitor models was processed using MATLAB computer programming.

Keywords: *Inula graveolens* L., antioxidants, corrosion inhibitors, acidic corrosive media, carbon steel alloy

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Introduction

Oxidation is a significant problem in various fields such as human health and food production. It also affects industrial areas, causing corrosion in metal containers and structures, leading to economic losses and reduced product quality. [1-3] Creating metal implants that are resistant to corrosion is a challenging endeavor, especially in the field of biomedical engineering. If corrosion were to occur after implantation in the human body, it could pose serious risks. [4] Researchers worldwide often cite this as a key reason for seeking effective corrosion inhibitors. These inhibitors can be natural, semi-synthetic, or synthetic, and are chosen based on specific requirements [5].

As a result, investigating corrosion mitigation strategies is necessary. As a sustainable and eco-friendly substitute, green corrosion inhibitors derived from organic materials such as plant extracts have been created. There is a constant push to discover potent, naturally derived corrosion inhibitors. [6,7] Corrosion-resistant materials are commonly found in industries that operate in corrosive environments, such as food processing and marine applications (e.g., ships). Creating