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TITLE:

THE EFFECT OF SPIRULINA SP. AS GREEN CORROSION INHIBITOR ON MILD STEEL IN O.5M HYDROCHLORIC ACID SOLUTION

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ABSTRACT

Large-scale and persistent corrosion harms the environment, our possessions, and our lives significantly while also costing money. Therefore, corrosion prevention needs more attention. Inorganic and synthetic metal corrosion inhibitors are used to stop and slow corrosion; however, they are hazardous. Green corrosion inhibitors, which are affordable and environmentally friendly, are quite likely to offer a solution to this issue. In this study, the potentiality of green microalgae (*Spirulina* sp.) to inhibit corrosion of mild steel was studied in acidic media, hydrochloric acid (HCl). Gravimetric method and thermodynamics analysis were used to study the performance of this green microalgae as corrosion inhibitor. Results revealed that used of 0.2 g/L of the *Spirulina* sp. reached maximum inhibition efficiency (IE%) and decreased in corrosion rate (CR). Interestingly, the rise in temperature has increased the value of IE% along with the corrosion rate. Furthermore, thermodynamic parameters of the adsorption process, such as activation energy (Ea), enthalpy ($\Delta H°$), and entropy ($\Delta S°$), were calculated, and these values showed a good interaction. The positive values of $\Delta H°$ and $\Delta S°$ proved that the reaction was endothermic and spontaneous. Thus, results from this study showed that these green microalgae were an attractive alternative to prevent corrosion as they showed great inhibition efficiency according to its optimum condition.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

Mild steel is the most abundant type of metal, and it is used for almost every purpose imaginable, both in industry and in the home. Because of its low cost and the metal qualities it possesses, mild steel is suitable for a wide variety of applications, particularly in the food, petroleum, chemical, and electrochemical sectors, as well as the generation of electricity (Miralrio and Vázquez, 2020). This metal, on the other hand, degrades when it is subjected to acidic mediums such as sulphuric acid and hydrochloric acid, which are typically utilised in industrial settings for the pickling and descaling of metals.

Corrosion happens when aqueous solutions and carbon steel come into contact. This happens in industrial processes like pickling, where the metal alloy encounters concentrated acids to get rid of rust. Several synthetic compounds are good at keeping metals from rusting, but most of them are harmful to people and the environment and are expensive to make. The toxicity may show up during the making of the compound or when it is used.

Today, environmental concern has raised interest in creating more sustainable solutions, such as the development of corrosion inhibitors that have a smaller environmental effect. Natural corrosion inhibitors (such as plants and algae) are less expensive to produce, nutrient-dense, abundant, and made from renewable resources. Moreover, plant extracts are often cheap and may be produced using straightforward and simple extraction processes. Some of which are dedicated to the use of algae as corrosion inhibitors for mild steel (de Oliveira et al., 2021; Kamal and Sethuraman, 2012; Rodrigues et al., 2018).

Microalgae are prokaryotic or eukaryotic microorganisms that perform aerobic photosynthesis. They have a wide range of natural compounds like pigments, lipids and fatty acids, proteins, polysaccharides, phenolic compounds, vitamins and others. They