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TITLE:

BIOMASS OF CHLORELLA SP. AS GREEN CORROSION INHIBITOR FOR MILD STEEL

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ABSTRACT

Corrosion is a huge and ongoing issue that causes substantial problems for the environment, our assets, and our lives, as well as economic losses especially in the industries. As a result, corrosion prevention requires additional focus. Metal corrosion inhibitors, both inorganic and synthetic, are used to prevent and slow corrosion, but they are dangerous. Green corrosion inhibitors, which are both environmentally and economically friendly, are so likely to provide the solution to this problem. In this paper, the biomass of the unicellular green algae *Chlorella sp.*, which synthesises a high quantity of protein, was investigated as a natural inhibitor of mild steel corrosion in 0.2 mol L^{-1} H_2SO_4 by Fourier-transform infrared spectroscopy (FTIR) analysis and gravimetric analysis to determine Inhibition Efficiency (IE%), Corrosion Rate (CR), and Surface Coverage (Ø). Furthermore, the thermodynamic characteristics of the adsorption process, such as Activation Energy (Ea), Enthalpy (H°), and Entropy (S°), were determined, and the results demonstrated a favourable interaction.

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BACKGROUND

1.1 Introduction

Mild steel is the most often utilised metal in almost all industrial and home applications. Mild steel is generally inexpensive and has metal qualities that make it suitable for a wide range of applications, particularly in the food, petroleum, chemical and electrochemical industries, and power generation. However, when exposed to acidic environments, these materials suffer extensive corrosion damage.

Corrosion issues emerge as a result of the interaction of aqueous solutions and mild steel in industrial operations such as pickling, in which the metal alloy comes into contact with strong acids to remove incrustations in the system. Corrosion has become a worldwide issue as industrial technology has advanced at a rapid pace. Corrosion damages around 25% of property, including industrial machines, automobiles, pipeline systems, homes, buildings, and railway bridges. Corrosion of metals or alloys is typically caused by electrochemical interactions with their surroundings. Surface impurities, pressure, temperature, and solution concentration all have an impact on the corrosion process. Corrosion occurs when metals and alloys strive to revert to their more stable thermodynamic state (oxides, hydroxides, and sulphides) after being corroded or attacked by chemicals.

An inhibitor is a substance that is added in small amounts to a corrosive environment to slow the corrosion reaction by forming a protective film. Although numerous synthetic chemicals are efficient in protecting metals from corrosion, the majority of them are harmful to the environment and humans, not to mention expensive to produce. Toxicity may arise during the compound's production and application. Concerns about the environment have heightened interest in developing more sustainable solutions, such as the investigation of corrosion inhibitors that have a lower environmental impact. Natural corrosion inhibitors are less expensive to manufacture, include more nutrients, are widely available, and are made from renewable materials. Furthermore, plant extracts are typically inexpensive and can be obtained using simple extraction techniques. The inhibitors have a wide range of applications. These are