INWASCON
ISSN: 2710-5873 (Online)
CODEN: ITMNBH

i TECH MAG

DOI: http://doi.org/10.26480/itechmag.02.2020.25.27

RESEARCH ARTICLE

THE ASSESSMENT OF INHIBITIVE EFFECT OF CYMBOPOGON CITRATUS ON MARINE CORROSION OF MILD STEEL

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ARTICLE DETAILS

Article History:

Received 01 February 2020
Accepted 05 March 2020
Available online 25 March 2020

ABSTRACT

Numerous extensive efforts have been done to acquire the applicable green corrosion inhibitors in order to decrease the corrosion rate of the materials. The corrosion inhibition of mild steel is vital for technology due to the increased industrial applications of these materials. In this report, the inhibitive action of Cymbopogon Citratus on the marine corrosion of mild steel was evaluated. The inhibition efficiency was calculated using weight loss measurement method, electrochemical measurement and inhibitor mechanism analysis. It was found that, Cymbopogon Citratus exhibited a very good performance as a green corrosion inhibitor for mild steel corrosion in seawater. All the experimental methods used for this project show that the presence of Cymbopogon Citratus in the seawater significantly decreases the corrosion rates and further decreasing the corrosion rates as the concentration of Cymbopogon Citratus increases. To sum it up, the inhibition efficiency increases with an increase in Cymbopogon Citratus concentration

KEYWORDS

Cymbopogon Citratus, electrochemical, corrosion inhibition, mild steel, marine.

1. INTRODUCTION

Corrosion is the deprivation and breakdown of a metal and its alloy due to chemical and electrochemical reactions with its environment. The effect of corrosion is touched in three extents of concern - economics, safety, and environmental loss. Corrosion is a drawback that affects every industry (Conshohocken, 2010). The severe consequences of the corrosion process have become a problem of worldwide significance. Therefore, preventing corrosion is an essential part of industrial and critical cleaning processes.

There are several techniques used to control corrosion process. One such process is usage of corrosion inhibitors. Once, chromates were used as corrosion inhibitors. Nevertheless, environmental scientists do not encourage this since chromates are toxic in nature. Therefore, researchers are considering for green corrosion inhibitors such as extracts of plant resources.

Along the years, numerous extensive efforts have been done to acquire the applicable green corrosion inhibitors in order to decrease the corrosion rate of the materials (Cymbopogon and Stapf, 2008). Research has been made to discover appropriate natural source to be carried out as corrosion inhibitor in adaptation with many corrosion media. One of the efficient corrosion inhibitor is Cymbopogon Citratus (CC) based on its chemical properties that act as a corrosion inhibitor. CC will offer appealing potentials to be a corrosion inhibitor because it is renewable, cheap, safe use and mostly available in Southeast Asia especially Malaysia (Deyab, 2017). Shortage of research on the effect of this inhibitor on the corrosion of mild steel in seawater has encouraged the author to explore this research area as contribution to the present interest on environmental- friendly and green corrosion inhibitors.

The key purpose of this research is to study the assessment of the natural inhibitor affecting the corrosion of the mild steel in the marine environment (Fiori-bimbi et al., 2014). In this research, the green corrosion inhibitor used is powder of CC. There are two experiments is carried out to determine the effectiveness of inhibitor which are weight loss and electrochemical measurement. The electrochemical measurement is conducted using Potentiodynamic Polarization (PP). The experiments in this research assess the corrosion rates and other results such as corrosion current and polarization resistance from PP. Furthermore, the inhibition mechanisms experiment also are carried out in order to determine the chemical properties of the inhibitor solution such as conductivity, salinity, Total Dissolved Solids (TDS) and Dissolved Oxygen (DO) (Rosliza and Wan Nik, 2010).

2. MATERIAL AND METHODS

The mild steel specimen has been used as main element to determine the effectiveness of the CC powder for the research. The mild steel is used widely in marine applications (Garcia-arriaga et al., 2010). The size of the mild steel specimen is 30 × 24 × 2 mm. The samples are immersed in acetone for 2-3 minutes to remove corroded parts. The samples further immersed in sulphuric acid, H_2SO_4 for 5 minutes. The samples then washed with distilled water.

CC is the green corrosion inhibitor and can be considered as the head material of this research. CC was obtained from local market at Kijal, Terengganu. It has been cut into tiny sizes before grinded. The blender has been used as grinding medium to obtain the grinded specimen of CC (Rosliza et al., 2008). Then, the sample of CC has been dried for 1 day in an oven at 100. After that, the dried specimen has been sieved to obtain the size of 155 µm which is suitable as a solute for this experiment. The end product is the powder of CC with size of 155 µm. The seawater plays role as corrosion medium for the experiment. The seawater sample obtained from Pantai Telok Kalong, Kemaman.

The gravimetric analysis has been performed on the rectangular mild steel specimen with the dimension of 30 × 24 ×2 mm. The specimens of the mild steel in set of three corrosion inhibitor have been dipped in 6 beakers containing various solutions for 42 days. The observation of the specimen have been repeatedly done every 7 days to reweigh the mild steel for the weight loss verification by recording the data in the table for