

Communication

Galactomannan as a green inhibitor to protect the carbon steel against corrosion

Said ABBOUT ^{1*}, Malak REHIOUI¹, Rachid HSISSOU¹, Meryem ZOUARHI¹, Driss CHEBABE², Hamid ERRAMLI¹, Najat HAJJAJI¹

1. Team of Materials, Electrochemistry and Environment (LCOCE). Department of Chemistry, Faculty of Sciences, Ibn Tofail University, BP 133, 14000 Kenitra, Morocco.
2. Laboratory of Materials Engineering for the Environment and Natural Resources, Faculty of Sciences and Techniques, University Moulay Ismail of Meknes, BP 509 Boutalamine 52000 Errachidia, Morocco

* Correspondence: said.abbout@uit.ac.ma; Tel.: +212 673 011 458

Abstract: Carbon steel suffers from high degradation in an acidic medium like acidic stripping. For this reason, the protection of the carbon steel from the aggressive acidic attacks is required. One of the most common methods of protection is the use of corrosion inhibitors. For environmental reasons, researchers have investigated a new generation of inhibitors, called green inhibitors that cause less damage to the environment while providing high protection efficiency against corrosion.

This study aims to evaluate the impact of a bio-sourced polymer as a corrosion inhibitor against carbon steel corrosion in a 1 M HCl solution. Galactomannan was obtained from the *Ceratonia Siliqua* L. seeds, and its structure was characterized by using Fourier transformation infrared spectroscopy (FTIR). Effects of the inhibitor concentration and immersion time on the corrosion resistance of carbon steel was evaluated using different electrochemical methods (Tafel curves, impedance diagrams). Ability of the Galactomannan molecules to form links with iron atoms was characterized using UV-visible analysis. Surfaces of the corroded specimens was evaluated by using scanning electron microscopy (SEM) and EDS.

The results show that the Galactomannan acts as a mixed type inhibitor by physisorption and chemisorption on the metal surface. Besides, the efficiency of this compound increases with the concentration of the inhibitor and reaches a value of 86.7% at a concentration of 1 g/L.

Keywords: Galactomannan; corrosion inhibitor; electrochemical methods; SEM/EDS Method; plants; carbon steel
