Chemistry Department
Faculty of Science

Thesis Entitled

Novel Synthesis and Reactions of Some Schiff Bases Containing Heterocyclic Ring Systems and Their Utility as Corrosion Inhibitors

Presented By
Mohamed Mahmoud Abd El-aal
(B.Sc. Applied Chemistry, 2010)

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APPROVAL SHEET FOR SUBMISSION
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Mohamed M. Abdelaal

Dedication

To

The soul of my

Mother

Abstract

In this study, Novel Schiff Bases derivative from N-aminophthalimide are prepared and using as corrosion inhibitors for steel in 0.5 M H_2SO_4 solution. Their chemical structures were determined using IR, Mass spectrometry and ^{1}H NMR spectroscopic analyses. Tafel polarization and electrochemical impedance spectroscopy (EIS) measurements techniques were used to examine the effect of these compounds. Schiff Bases inhibition effect depends on their concentrations, presence of different function groups and the temperature of the electrolyte. Thermodynamic adsorption parameters (K_{ads} and ΔG^{o}_{ads}) of the studied inhibitors were calculated using the Langmuir adsorption isotherm. The inhibition efficiency enhanced by the presence of synergism ion in the solution.

Carbonitriding, carburizing and oxidation processes were carried out in alkaline solution for mild steel by by Electrolytic plasma processing (EPP). The surfaces modified by EPP was characterized by X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and energy dispersive X-ray spectrometer (EDS). Cyclic voltammogram (CV) showed that the coating layers have a good corrosion behavior. Electrochemical Impedance Spectroscopy (EIS) used to check the strength of passive layers compared to base metal. Tafel plots showed that the general corrosion rate of coating layers are less than base metal. The microhardness of coating layers are greater than base metal. The coating layers produced by EPP did not break after attacking by chloride ions. Finally, the best inhibitor and the best plasma sample were used together to give better protection of mild steel.

Keywords: Schiff Base, synergism ion, corrosion, N-aminophthalimide, carbonitriding, carburizing, oxidation, Electrolytic plasma processing, mild steel, coating, cyclic voltammogram, electrochemical impedance spectroscopy, hardness.

Aim of this work

The aim of this work is preparation of novel Schiff base compounds derivative from N-aminophthalimide to protect mild steel from corrosion and developing a method to create electrolytic plasma processing (EPP) in lab scale to coat and treat the surface of mild steel and enhance the corrosion behaviour of it. The combination between the best inhibitor and the best treated plasma sample increases corrosion resistance of mild steel. Efficient strategies had to be evaluated for the preparation of Schiff base compounds that had to contain C, N, O atoms and benzene ring for the adsorption reaction. In EPP, introducing nitrogen and carbon from the solution into the surface of steel decreases the corrosion current.

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