Chapter 3
Relationship Between the Chemical Structure and the Corrosion Inhibition Properties of Some Organic Molecules:
Challenges and Industrial Applications

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ABSTRACT

Corrosion experts work experimentally in laboratories with long-term procedures and high costs by modifying the structures of new corrosion inhibitors or existing inhibitors. Corrosion is defined as the chemical corrosion of metals and their alloys after ion transport with the effect of the environment they are in, and thus the deterioration of their physical properties. Many scientists continue to work at full speed to develop new and more effective corrosion inhibitors. In many studies, corrosion inhibitor molecules have been found. When the results of the studies are examined in detail, it is seen that very effective molecules have been discovered. In this study, 3,4-dichloro-aceto-phenone-O-1' -(1' .3' .4' -triazolyl)-metheneoxime (DATM), Diglycidyl amino benzene (DGAB) epoxy prepolymer, xanthione (XION) and 2,2-dibenzamidodiphenyl disulfide (DPD) which are known as very good corrosion inhibitors that have been studied by different scientists before, will be compared among themselves.

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1. INTRODUCTION

Corrosion experts work experimentally in laboratories with long-term procedures and high costs by modifying the structures of new corrosion inhibitors or existing inhibitors. Corrosion is defined as the chemical corrosion of metals and their alloys after ion transport with the effect of the environment they are in, and thus the deterioration of their physical properties. Since non-metallic materials are also affected by environmental conditions, we can define "Corrosion" as the deterioration of all products, which are industrial and construction materials, due to environmental effects and their structures. Impurities in the metal structure, local differences in alloys, metal production conditions, temperature and humidity differences, local concentration differences of dissolved gases or salts in the environment where the metal comes into contact are some of the factors that increase corrosion. According to the intended use of qualified industrial production, the design and manufacture of very different materials in many different fields, from our daily life needs to advanced spacecraft, requires a much higher level of protection of these products. Organic surface coatings are the easiest and cheapest way to protect all kinds of machinery against rust and corrosion. Many scientists have emphasized the idea that organic compounds are the best, most competent and most powerful method for controlling corrosion. Organic compounds extend the benefits by implementing electron-dense centers, known as bonding centers, that form complexes at the metal-media interface. Anti-corrosion organic compounds are concentrated water-based chemical products used to protect metal from short-term corrosion. Corrosion inhibitors are the most important chemicals used on the metal surface by preventing the formation of corrosion by preventing the metal from contacting with gases such as carbon and oxygen in the air. It is known that the anti-corrosion chemical is generally used in surface treatments in the metal industry. In addition, we can say that it is used in sealing tests in the metal industry. In addition, anti-corrosion chemicals are used to prevent corrosion that may occur in closed, open, heating and cooling circuit systems. Anti-corrosion chemicals are an indispensable product for the metalworking industry. The product, which provides a protective layer on the metal, prevents the metal from contacting with gases in the air and prevents corrosion that may occur in metals. This measure provides very good protection against oxidation of metals. All kinds of materials made of metal corrode more or less depending on the period of use. As a result, as corrosion progresses, all the mechanical properties of the corroded metal change and its strength decreases. Steam boilers, oil and natural gas pipelines, nuclear reactors, bridges, deep well pipes, ships and fixed and working metal parts of all kinds of motor vehicles are the structures where corrosion is the most and pose a great danger. Thus, corrosion becomes a big problem. The production of corrosion-resistant materials, surface coatings, additions to the environment to reduce the effectiveness of corrosive environments, replacement of parts that are too corroded to do their job are considered as economic losses directly caused by corrosion. In this study, 3,4-dichloro-aceto-phenone-O-1'-(1' .3' .4'-triazolyl)-metheneoxime (DATM), Diglycidyl, which are known as very good corrosion inhibitors that have been studied by different scientists before. amino benzene (DGAB) epoxy prepolymer, xanthione (XION) and 2,2-dibenzamidodiphenyl disulfide (DPD) will be compared among themselves. Separate studies have been carried out for each of these compounds, and they have come to the fore as the molecules with the best corrosion prevention ability compared to the molecules they encountered in previous studies (Guo et al, 2014; Hsissou et al., 2020; Obot et al., 2015; Tan et al., 2020). Our aim here is to compare these anti-corrosion organic substances among themselves and to discuss their results. How the structure of the molecule influences its tendency to be an anti-corrosion chemical will also be discussed. For example, the nature of the structure containing polar functional groups allows the monomers to be strongly adsorbed on the metal surface and provides