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Corrosion studies through open circuit potential determination of Zinc-Aluminium alloy in 1M NaCl solution by using Schiff base

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ABSTRACT

The corrosion behavior of ZINC-ALUMINIUM alloy in the presence of Schiffs Base derivative has been investigated in 1M NaCl solution using Open Circuit Potential techniques. Inhibition efficiency of this compound has been found to vary with concentration of the inhibitor derivative and temperature. The results obtained from OCP measurements were in good agreement.

KEYWORDS

ZINC-ALUMINIUM alloy
corrosion;
OCP;
NaCl;
Schiffs base.

INTRODUCTION

ZINC-ALUMINIUM alloy is widely used in various industrial operations and the study of its corrosion and its inhibition is a subject of practical significance. The use of organic compounds containing nitrogen as corrosion inhibitors is widely spread for many metals and alloys, little is known of their functions because of the complexity of the process. ZINC-ALUMINIUM alloy is used in microelectronics, fabrication of heat exchanger tubes and cooling water systems, due to its high thermal and electrical conductivities, low cost and malleability. Corrosion inhibition of ZINC-ALUMINIUM alloy can be achieved through the modification of its interface by forming self assembled ordered ultrathin layers of organic inhibitors. Commonly used inhibitors for ZINC-ALUMINIUM alloy corrosion are toxic compounds that should be replaced with the new eco-friendly inhibitors. The purpose of the present paper is to determine the effect of Schiffs Base derivatives towards the corrosion of ZINC-ALUMINIUM alloy in NaCl. As Schiffs Base derivatives have rarely been studied as inhibitors for ZINC-ALUMINIUM alloy in NaCl.

METHODS

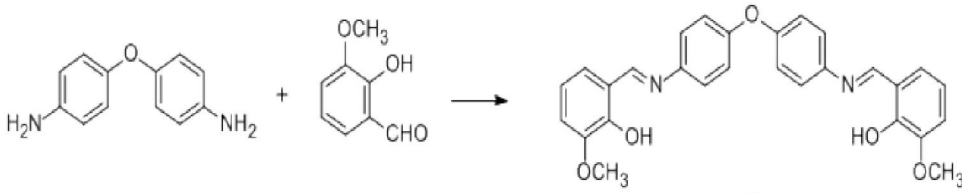
Materials

Tests were performed on ZINC-ALUMINIUM alloy of the following composition

Aluminum	Copper	Magnesium	Zinc
26-28%	2-2.5%	0.01-0.02%	Balance

Inhibitors

The Schiffs Base derivatives used in this study are non-toxic, with high molecular size, contain a large number of donating atoms (N- atoms) and easily available as pharmaceutical drugs manufactured by many pharmaceuticals and their structure are listed below:



1 2 3

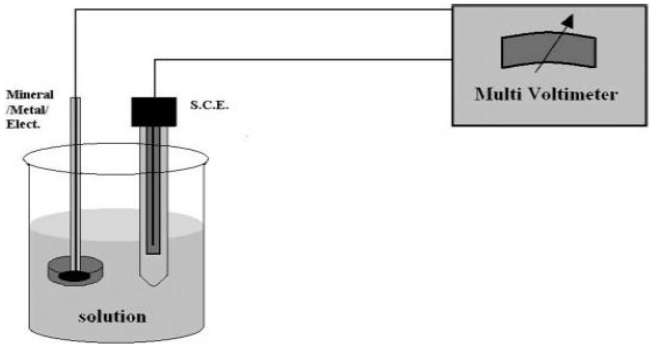
A Mixture 0f, 4'-diaminodiphenyl ether (1) and o-vanillin(2) in methanol is stirred at room temperature for one hour to give an orange ppt and after filtration and washing with methanol to give the pure Schiff base(3)

Solutions

The aggressive solutions, 1 M NaCl were prepared by using dilution with demineralized water. The concentration range of the inhibitors used was 2ppm to 6ppm.

Procedures used for corrosion measurements

Open circuit potential test



The equipment contains a multimeter where resistance, alternate current and direct current can be measured with two out let wires given and it runs with a cell of 9 volts capacity. An aluminum wire is used to hold the specimen. Specimen is connected to the wire and suitable covered by Teflon tape so that aluminum is not exposed to electrolyte medium. The specimen is made as anode and the cathode will be the reference electrode that is standard calomel electrode. Before testing each specimen was cleaned in acetone for five minutes and air-dried. Both electrodes are connected to multimeter and the same is switched on to measure the DC voltage developed after dipping them in NaCl, which is used as electrolyte solution. The voltage developed and displayed by the multimeter is noted for every hour for a period of seven days. The procedure is repeated for all the four specimens. Then the results are computerized and simulation graphs are produced by taking time of immerse versus the potential developed.

Rectangular specimen of 2cm length and 1cm breadth is prepared by adopting standard metallographic procedure and connected in a circuit containing a aluminium wire, calomel electrode, multimeter and immersed in a test cell containing 1M NaCl solution.

RESULTS AND DISCUSSIONS

Corrosion behavior

Figure 1 shows the simulation curves for the ZINC-ALUMINIUM/inhibitor that are typical for both matrix alloy & with inhibitor. In the beginning the potential decreases up to 48 hrs of exposure then the potential remains constant due to passivation. That is there is a possibility of development of non-porous layer of aluminum oxide can be predicted which may prevent corrosion and there will decrease in corrosion behaviour. Increase in percentage of Inhibitor in the corrodunt medium results in a marked decrease in potential development. Which is clear indication in the in the increase of corrosion resistance from matrix to with 6ppm inhibitor.

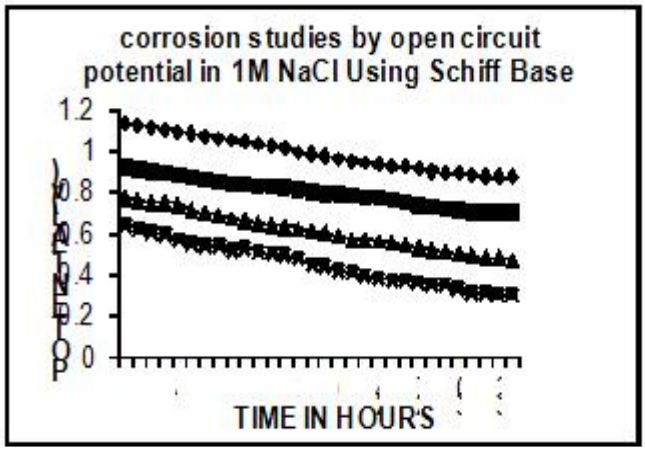


Figure 1 : Corrosion studies by open circuit potential in 1m nacl solution using organic inhibitors

CONCLUSIONS

Corrosion behavior of ZINC-ALUMINIUM alloy & with inhibitor were tested by Open Circuit Potential Method seems to decrease for 48 hrs of exposure and remains constant afterwards till 96 hrs of exposure for matrix as well as ZINC-ALUMINIUM with inhibitor. Potential developed for each hour decrease with increase in inhibitor Concentration from 2ppm to 6ppm. The extent of corrosion damage was decreased with increase in concentration of inhibitors.

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