SUMMARY

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As known that the economic power of a country is determined by its output of steel. So, studies of steel properties in general and electrochemical, especially, have been received a great attention. In such respect, the corrosion and corrosion inhibition of steel in the different media become very interesting and important owing to its wide applicability in industry and domestic life. The purpose of the present investigation is to study the corrosion and corrosion inhibition of steel in acid chloride solutions in absence and presence of some selected indole series of compounds.

The thesis comprises three main chapters, the first one is concerned with an introduction reviewing concisely the relevant literature related to the project of investigation.

Chapter II deals with the experimental part. It includes composition of C-steel used, the preparation of the test specimens for the different techniques of measurements and method of preparation of materials of various solutions used. Also, the procedures followed for corrosion measurements, using weight loss, and polarization techniques are including in this chapter.

Chapter III deals with the corrosion inhibition of C-steel in acid chloride solution by some indole derivatives, under four subdivision parts. The first one involving the effect of the parent indole compound concentration, i.e.unsubstituted, on the corrosion inhibition of C-steel in acid chloride solution, 1 M HCl, using weight loss and polarization measurements .It was found that the increase of inhibitor concentration decreases both the corrosion rate and corrosion current, $i_{corr.}$

The surface coverage, θ and θ_i , calculated from weight loss and polarization measurements, respectively increase with increasing the inhibitor concentration, and the adsorption isotherm obtained is of S-shape nature. The adsorption of inhibitor molecules on the metal surface was discussed on the light of the Frumkin adsorption isotherm. Spectrophotometric analysis of the acid solutions containing the inhibitor before and after reduction, i.e., after corrosion process, and the possible fragment derivatives which likely to occur if affected by reduction, indicate that the azo group of the inhibitor is reduced to the hydrazine. Also, the reduced form of the inhibitor gives corrosion inhibition action. In other words, the non and reduced inhibitor forms affect the corrosion process.

Parts two and three show the effect of each of substituents group whether electron donating, CH_3- or CH_3O- or withdrawing, NO_2- , and its position in ortho- , meta- , and para- with respect to the azo group of indole derivatives, on the corrosion inhibition of C-steel in acid chloride solution, 1 M HCl. The inhibition actions of such substituted derivatives were compared with that of the parent indole compound.

For all derivatives used, the inhibition efficiency follows the following order: nitro- < methyl- < methoxy- derivatives. Such order is consistence with the results of surface coverage, θ and θ_i , calculated from weight loss and polarization measurements. The substituents position does not affect the above order.

In a similar manner to Hammett equation, the corrosion potential, $E_{corr.}$, Surface coverage, θ and inhibition efficiency, I, were found to correlate linearly with the substituents of Hammett constants, σ , thus:

$E_{corr.}, \theta$ or $\%I = \rho\,\sigma$

where ρ is the proportionality constant, which depends on the nature of both metal and electrolyte, It is a measure of the sensitivity of a given series of inhibitor compounds of constant concentration to impart inhibition action.

On the other hand, for each substituted group, the effect of substituent position on the inhibition efficiency increases on the following order: para- < meta- < ortho-. The results obtained were discussed on the light of the effect of electronic densities on the inhibitor active centers.

The final part of chapter III shows the effect of the temperature on the corrosion and corrosion inhibition of C-steel in 1M HCl solutions without and with 10^{-4},10^{-5} and 10^{-6} M indole derivative compounds. Arrhenius plots of log K versus reciprocal of absolute temperature for acid solutions without and with inhibitor, are linear one which obeys the following equation:

$$LnK = B - \frac{Ea}{RT}$$

where B is a constant depends on the metal type and electrolyte. The activation energies in absence and presence of inhibitor are equal to 21 KJ mol^{-1} and 25- 46 KJ mol^{-1}, respectively. Such increase in activation energies indicates that the indole derivatives bring about a change in the rate of the corrosion and these indole derivative compounds bring an inhibition of corrosion of C-steel.