# SUMMARY

The aim of the present work is to study the reactivity of some aminopyrimidine derivatives as corrosion inhibitors for C-steel ( 1018 grade ) in nitric acid solution. The thesis comprises three main chapters.

**The first chapter :** Deals with the following fields of interest

(i) Corrosion principles , forms and corrosion protection.

(ii) Literature survey of corrosion behaviour of carbon steel.

(iii) Aim of the present work .

**The second chapter**: Deals with the experiment part which includes, the chemical composition of the investigated material, preparation of nitric acid, sodium chloride and used aminopyrimidines solutions.

Also the experimental techniques contain the instruments and the procedures used for the corrosion measurements and calculations such as weight loss, galvanostatic polarization and potentiodynamic anodic polarization .

**The third chapter**: Deals with the results obtained and their discussion under three separated sections, (A) , (B), and (C) .

**Section A :**

Contains the results of weight loss measurements for carbon steel (1018 grade ) in 0.05 M $HNO_3$ solution containing different concentrations of used aminopyrimidine derivatives. The results revealed that these compounds behave similarly and the weight loss is generally decreases with increasing the concentrations of these compounds and also depends upon the number of amino groups involved in these compounds. The order of the inhibition efficiency of these compounds is :

IV > III > II > I

The effect of temperature on the corrosion rate of C- steel(1018) in 0.05 M nitric acid solution over the temperature range 30 - 60 °C in absence and presence of the selected aminopyrimidine compounds have been studied.

Arrhenius plot of logarithm corrosion rate ( log k ) against reciprocal of absolute temperature (1/T ) was found to be linear and obeyed the following Equation :

$\log K = \log A - Ea^{\circ}/2.303\ RT$

Where A is a constant depends on the metal type and electrolyte . the activation energies in absence and presence of inhibitors are equal to 8.6 K J $mol^{-1}$ and ( 9.5 -15.3 K J $mol^{-1}$ ) respectively. Such increase in activation energies indicates that the aminopyrimidine derivatives bring about a change in the rate of the corrosion and these compounds bring an inhibition for corrosion of C-steel. Thermodynamic activation parameters ($\Delta H^{\circ}$ and $\Delta S^{\circ}$ ) are also computed and discussed. The percentage inhibition is decreased with increasing temperature , this indicated that , these compounds are physically adsorbed on the C- steel surface . the results showed that the adsorption of these compounds obeyed Temkin's adsorption isotherm .

The synergistic effect of potassium iodide was examined by addition of 1 x $10^{-3}$ M of KI to enhance the inhibitive effect of the selected aminopyrimidine compounds. The values of synergism parameters $S_{\theta}$ was also calculated and discussed.

**Section B:**

Contains the results of galvanostatic polarization, the results obtained are presented in many Tables and Figures, the effect of inhibitors on the cathodic and anodic polarization of carbon steel in 0.05 M $HNO_3$ solution was investigated. Corrosion rate ($I_{corr.}$) was found to decrease with increase of the concentration in presence of the additives. The polarization curves indicated that these compounds influence both cathodic and anodic processes. The order of increased inhibition efficiency for C-steel in 0.05 M $HNO_3$ at all concentrations used ( $7x10^{-6}$ to $17x10^{-6}$ M ) by polarization is :

IV > III > II > I

**Section C:**

In this section potentiodynamic anodic polarization curves of carbon steel in different concentrations of NaCl solution was studied. It was found that the $Cl^-$ ions cause the destruction of the passivating oxide film and initiate pitting corrosion . The

pitting corrosion potential is shifted to more negative values with increasing chloride ion concentrations.

Trials were made to inhibit pitting corrosion using organic compounds such as aminopyrimidine derivatives. These compounds shifted the pitting potential to more positive values, indicating the inhibiting effect of these compounds.

The influence of the chemical structure of the used aminopyrimidine compounds on their inhibition efficiencies was discussed, the order of these inhibition efficiencies depend mainly upon the number of adsorption active centers, skeletal representation of the molecules supported this explanation.

In conclusion the polarization and weight loss measurements support the assumption that corrosion inhibition primarily takes place through adsorption of the inhibitors on the carbon steel surface. Agreement among these different independent techniques indicates the validity of the obtained results.

This thesis contains also references , Arabic and English summaries .