SUMMARY

The thesis comprises three main chapters; ***the first one*** deals with the following fields of interest:

Corrosion theory, corrosion protection types of corrosion and corrosion behavior of aluminum in aqueous environments. Finally, literature survey of corrosion behavior of aluminium and aim of the present work.

The second chapter deals with the experimental techniques, which include preparation of the sodium hydroxide solution , the investigated of (N – thiazolyl– 2 – cyanoacetamide derivatives and N – thiazolyl– 2 – cyano – 2–propeneamide derivatives) solutions and the procedures used for the corrosion measurements such as weight loss and polarization techniques.

Chapter three deals with the results and discussion, the results obtained and their interpretations are shown under three separated sections , (A) , (B) and (C).

Section (A) :

Contains the results of weight loss measurements for aluminum in 0.01M sodium hydroxide solution containing different concentrations of (N–thiazolyl–2–cyanoacetamide derivatives and N–thiazolyl–2–cyano–2–propeneamide derivatives) solutions.

These results revealed that these compounds behave similarly and the weight loss is generally decreases with increasing the concentration of these compounds and also depends upon the nature and type of investigated inhibitors.

The inhibition efficiency of these compounds decreases in the following order :

i) For first series compounds :

(c) > (b) > (a)

ii) For second series compounds :

(f) > (e) > (d)

The synergistic effect of barium chloride , strontium chloride , calcium chloride and magnesium chloride was examined by addition of $BaCl_2.6H_2O$, $SrCl_2.6H_2O$, $CaCl_2.6H_2O$ and $MgCl_2.6H_2O$ to enhance the inhibited effect of these (N–thiazolyl–2– cyanoacetamide derivatives and N–thiazolyl–2–cyano–2–propeneamide derivatives) compounds . This conducted by studying the effect of addition constant concentration of the selected salts with different concentrations of investigated inhibitors.

A number of mathematical relationships for the adsorption isotherms have been suggested to fit the experiment data of the present work .

The simplest equation that fits our results is that due to Frumkin's adsorption isotherm and is given by the general equation :

$$KC = \Theta / 1- \Theta \exp (-2a \Theta)$$

The effect of temperatures on the corrosion rates of aluminium in 0.01M sodium hydroxide solutions containing different concentrations of (N–thiazolyl–2–cyanoacetamide derivatives and N–thiazolyl–2–cyano–2–propeneamide derivatives) compounds was studied . Arrhenius plots of logarithm corrosion rate (log k) against reciprocal of absolute temperature (1/T) were found to be linear and obeyed the following equation :

$$\text{Log } k = \log A - (E_a^*/2.303RT)$$

From the transition state equation , plots of logarithm corrosion rate divided by absolute temperature (log k/T) against reciprocal of absolute temperature (1/T) were found to be linear and obeyed the following equation :

$$\text{Rate} = RT/Nh \exp (\Delta S^*/R) \exp (-\Delta H^*/RT)$$

Thermodynamic parameters (ΔH^*_{ads} and ΔS^*_{ads}) are also computed and discussed. The percentage inhibition efficiency decreases with increasing temperature.This indicated that, these compounds are physically adsorbed on aluminium surface.

The values of activation energy and heat of adsorption (ΔH^*_{ads}) are increased with increasing inhibitor concentration while entropy of adsorption (ΔS^*_{ads}) is decreased at the same time , also the adsorption of the inhibitors on the aluminium surface is physically.

Section (B) :

Contains the results of galvanostatic polarization measurements for aluminium in 0.01M NaOH in absence and presence of different (N–thiazolyl–2–cyanoacetamide derivatives and N–thiazolyl–2–cyano–2–propeneamide derivatives) compounds. The polarization curves indicated that these compounds influence both cathodic and anodic processes(mixed type inhibitors), but the data suggested that the anode is more polarized when an external current was applied. The order of decreased inhibition efficiency for the additives :

i) For first series compounds :

(c) > (b) > (a)

ii) For second series compounds :

(f) > (e) > (d)

This is in a good agreement with the observed order of corrosion inhibition determined by the weight loss method. This indicates the validity of the results obtained by two different methods.

Section (C) :

The influence of the chemical structure of the used inhibitors on their inhibition efficiencies was discussed on the basis of the substituent groups in the p-position and the molecular size of these compounds.