English summary

The aim of the present work is to study the corrosion behaviour of copper in 1M HCl using rice bran oil extracted components namely, e.g (fatty acid (oleic acid), dewaxed oil (methyl oleate) and wax (lignoceryl alcohol)) and synthetic amide series prepared from rice bran oil as inhibitors.

The thesis comprises three main chapters:

Chapter I:

This chapter deals with the introduction, which includes definition, classification of corrosion, corrosion inhibitors and literature survey on corrosion behaviour of copper in aqueous solutions.

Chapter II:

This chapter deals with experimental part, which includes the chemical composition of investigated material, extraction and preparation methods for the investigated compounds and preparation of the used solutions.

Also, experimental part contains the instruments and the procedures used for the corrosion measurements such as gravimetric and potentiodynamic polarization techniques.

Chapter III:

This chapter deals with the results obtained and their discussion under two separated parts; (A) and (B).

Part A:

Weight loss measurements were carried out for copper in 1M HCl in the absence and presence of different concentrations of rice bran oil extracted components (fatty acid, dewaxed oil and wax) and synthetic amides series at 25°C. The obtained results show that, the corrosion rate of copper decreased with increasing the concentration of investigated

inhibitors. The order of decreasing inhibition efficiency for the used additives is:

Wax > dewaxed oil > fatty acid,

Amide IV > amide III > amide II > amide I.

Part B:

– Potentiodynamic polarization measurements were carried out for copper in 1M HCl in the absence and presence of different concentrations of rice bran oil extracted components (fatty acid, dewaxed oil and wax) and synthetic amides series at 25°C. The polarization curves indicated that these compounds influence both anodic and cathodic processes without change in the corrosion potential. This means that these compounds act as mixed type inhibitors. The order of decreasing inhibition efficiency for the used additives is:

Wax > dewaxed oil > fatty acid,

Amide IV > amide III > amide II > amide I.

The obtained results show that the adsorption of the investigated inhibitors on the copper surface follows Langmuir adsorption isotherm.

– The effect of temperature on the corrosion rate of copper in 1M HCl over the temperature range 40 – 60°C in the absence and presence of specific concentrations of rice bran oil extracted components (60 ppm fatty acid, 50 ppm for dewaxed oil and wax, respectively) and amide series (50 ppm for amide I, amide II, amide III, respectively, and 40 ppm for Amide IV) has been studied. The inhibition efficiency decreased with increasing the temperature. This recommended that usage of these inhibitors is preferred in the room temperature. Arrhenius plots of logarithm corrosion rate (log I_{corr}) against reciprocal of absolute temperature (1/T) were found to be linear and obeyed the following equation:

$$I_{corr} = k \exp (-E_a^*/ RT)$$

The calculated values of the activation energy in the absence and presence of specific concentrations of the investigated compounds were found to decrease with increasing temperature.

Plots of logarithm corrosion rate divided by a absolute temperature ($\log I_{corr}/ T$) against reciprocal of absolute temperature (1/T) were found to be linear and obeyed the following transition state:

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

Thermodynamic activation parameters (ΔH^* and ΔS^*) are also computed and discussed. The values of the activation energy, E_a^*, and the activation enthalpy, ΔH^*, are increased with increased inhibition concentration while the value of the activation entropy, ΔS^*, is decreased.