ENGLISH SUMMARY

The corrosion is agreat problem,which faced the world, we can not hide this problem from our live but we can reduce it by several methods as the environment need. The aim of the present work is to study the reactivity of six polymer compounds as corrosion inhibitors for carbon steel in hydrochloric acid solutions.

This work contains three main chapter:

Chapter (1)

This chapter discusses definition of corrosion ,Types corrosion inhibitors, Electrochemical theory of corrosion ,corroision moinotoring techniques, Types of inhibitors and literature survey for_corrosion of carbon steel in aqueous solution and its inhibition.

Chapter(2)

This chapter deals with the experimental part. It includes the chemical composition ,chemical additives and solution ,chemical structure of polymer,classified as chemical techniques such as wight loss and electrochemical techniques such as potentiodynamic polarization and impedance spectroscopy.

Chapter(3)

It deals with the results obtained and their discussion and is divided into five sections.

part (A): contains the results of wight loss measurements for carbon steel in 1.0 M hydrochloric acid solutions containing different concentrations of polymer compounds. The results revealed that these compounds behave similary and the wight loss is generally decreases with increasing the

concentration of these compounds. It also depend upon the nature of the polymer compound used. The inhibition efficiency of these compounds is in the following order:

Comp.VI > Comp. V > Comp. IV > Comp. III > Comp. II > Comp.

The effect of temperature on corrosion inhibition of carbon steel in 1.0 M HCl solution was determined over a temperature range 25-55^0 C using weight loss measurements. The rate of corrosion increases with increasing the temperature and hence the inhibition efficiency decreases . This indicates that the adsorption of the polymer compounds onto the carbon steel surface is physical. Some activation thermodynamic in presence of 500ppm of the investigated compounds were calculated and interpreted.

part (B) :contain the results of Galvanostatic polarization the data reveals that, all polymer compound slightly shifted $E_{corr}$to more negative potential and also the values of I_{corr} decrease .both anodic and cathodic tafel slopes β_a,β_c in the presence of polymer compound increasing .The inhibition efficiency increased with concentration of inhibitor increase.

part(C) :involves the results of potentiodynamic anodic polarization measurements for carbon steel in 1.0 M HCl in absence and presence of different concentrations of NaCl as pitting corrosion agents. As the concentration of Chloride ions increases the pitting potential is shifted to more negative direction indicating the destruction of passive film and initiation of pitting corrosion.

The addition of different concentration of polymer compounds to 0.1M NaCl solution shifted the pitting potential towards more positive values, This indicates that increased resistance to pitting attack.

part (D) : contains the results of electrochemical impedance spectroscopy .Nyquist plots of carbon steel in 1.0 M HCl solution containing different concentrations of polymer compounds are plotted. Impedance parameters ,such as,charge transfer resistance R_{ct} ,and the double layer capacitance C_{dI} are derived from the Nyquist plots are determined for carbon steel in 1.0M HCl solution.The values of R_{ct} increase with increasing the concentration of the inhibitors and this in turn leads to adecrease in corrosion rate of carbon steel.

Part (E) : The inhibition mechanism of the general and pitting corrosion of carbon steel 1.0 M HCl solution by six polymer compounds is demonstrated by its adsorption on the surface of carbon steel. The adsorption is spontaneous and obeys Freundlich adsorption isotherm. The presence of many active centers of the polymer compounds facilitates the adsorption process, , and therefore increases the values of inhibition efficiency. It has also been shown that polymer compounds of large molecular weight give a high inhibition effect.

In conclusion, chemical and electrochemical measurements support the assumption that corrosion inhibition is primarily caused by adsorption of polymer compounds onto the carbon steel surface. The agreement between these different independent techniques indicates the validity of the obtained results.