SUMMARY

The corrosion problem is of a great problem, which faced the world from the last years until now, we can't hide this problem from our live but we can reduce "inhibit" it in the metals by several methods as the environment need. This work discuss the corrosion of 316 L SS in 3M HCl.

This work contains three basic chapters

Chapter one: " INTRODUCTION "

This chapter discusses: corrosion theory, causes of corrosion, forms of corrosion, corrosion migration, types of inhibitors, Literature survey of corrosion of stainless steel and aim of this study

Chapter two: " EXPERIMENTAL AND TECHNIQUES "

It includes the chemical composition of the investigated material, preparation of the used hydrochloric acid solution, the used p-aminoazobenzene compounds, solutions and procedures used for the corrosion measurements such as a weight loss and electrochemical techniques.

Chapter three: " RESULTS AND DISCUSSION "

It deals with the results obtained and their discussion and this chapter is divided into three sections:

First Section:

Evaluation of the inhibitor efficiency by weight loss method for all the four compounds in 3M HCl at 30 ± 1^0 C reveled that the inhibitor efficiency increases with the concentration. From these studies the order of inhibition efficiency of compounds I-IV in 3M HCl is found to be :

III > II > I > IV

These p-aminoazobenzene derivatives obey Temkin's adsorption isotherm showing that the inhibition is by adsorption. The degree of surface coverage (θ) for the inhibitors on the metal surface increases with increasing the concentration in the corrosive medium. The action of the inhibitors in the aggressive acid was assumed to be due to their adsorption at the metal /solution interface. The effect of temperature on the corrosion inhibition of 316L SS in 3M HCl was determined over the temperature range 30-50^0 C using weight loss measurements. The rate of corrosion increases with increasing the temperature together with decrease in inhibition efficiency indicating that the inhibition occurs through physical adsorption of the additives. Thermodynamic functions of activation were calculated in presence of $9x10^{-6}$ M of p-aminoazobenzene compounds.

Second Section:

The effect of p-aminoazobenzene compounds on the cathodic and anodic polarization of 316L SS in 3M HCl was investigated. Corrosion rate decreased with increasing of concentration of the p-aminoazobenzene compounds together with increase in both cathodic and anodic polarization, but the corrosion inhibition has a great effect on the cathodic polarization. Variation of inhibition efficiency with the structure of p-aminoazobenzene compounds was interpreted in terms of the number of adsorption sites in the molecule and their electron charge density, molecular size, mode of adsorption and the polar effect of the substitutent groups. The order of increased inhibition efficiency for 316L SS corrosion in 3M HCl at all concentrations in the range

$3x10^{-6} - 1.8x10^{-5}$ M by polarization technique is

III > II > I >IV

Third Section:

In this section potentiodynamic anodic polarization curves of 316L SS 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 p-aminoazobenzene compounds. 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 p-aminoazobenzene compounds on their inhibition efficiencies was discussed, the order of these inhibition efficiencies depends 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 316L SS surface. Agreement among these different independent techniques indicates the validity of the obtained results.

This thesis contains also references, Arabic and English summaries.