studies on the corrosion of 316l stain less steel in aqueous media

a.m.abdelfattah ibrahim

The corrosion problem is ofa great problem, which faced the worldfrom the last years until now, we can't hide this problem from our livebut: we can reduce "inhibit" it in the metals by several methods as theenvironment need. This work discuss the corrosion of 316 L SS in 3MHCI.This work contains three basic chaptersChapter one: " INTRODUCTION"This chapter discusses: corrosion theory, causes of corrosion, forms ofcorrosion, corrosion migration, types of inhibitors, Literature survey of corrosion ofstainless steel and aim of this studyChapter two: " EXPERIMENTAL AND TECHNIQUES"It includes the chemical composition of the investigated -material,preparation of the used hydrochloric acid solution, the usedp aminoazobenzene compounds, solutions and procedures used for thecorrosion measurements such as a weight loss and electrochemicaltechniques.Chapter three: " RESULTS AND DISCUSSION"It deals with the results obtained and their discussion and this chapteris divided into three sections:First Section:Evaluation of the inhibitor efficiency by weight loss method for allthe four compounds in 3M HCI at 30 ± 10 C reveled that the inhibitorefficiency increases with the concentration. from these studies the orderof inhibition efficiency of compounds I-IV in 3M HCI is found to be :Ill>II>I>IV167These p_aminoazobenzene derivatives obey Temkin's adsorptionisotherm showing that the inhibition is by adsorption. The degree ofsurface coverage (9) for the inhibitors on the metal surface increaseswith increasing the concentration in the corrosive medium. The action ofthe inhibitors in the aggressive acid was assumed to be due to theiradsorption at the metal Isolution interface. The effect of temperature onthe corrosion inhibition of 3l6L SS in 3M RCI was determined over thetemperature range 30-500 C using weightloss measurements. The rate ofcorrosion increases with increasing the temperature together withdecrease in inhibition efficiency indicating that the inhibition occursthrough physical adsorption of the additives. Thermodynamic functionsof activation were calculated in presence of 9xl0-6 M ofp-aminoazobenzene compounds.Second Section:The effect of p-aminoazobenzene compounds on the cathodicand anodic polarization of 3l6L SS in 3M RCI was investigated.Corrosion rate decreased with increasing of concentration of thep-aminoazobenzene compounds together with increase in bothcathodic and anodic polarization, but the corrosion inhibition has agreat effect on the cathodic polarization. Variation of inhibitionefficiency with the structure ofp-aminoazobenzene compounds wasinterpreted in terms of the number of adsorption sites in themolecule and their

electron charge density, molecular size, mode ofadsorption and the polar effect of the substitutent groups. The orderof increased inhibition efficiency for 316L SS corrosion in 3M RCIat all concentrations in the range3xl0-6_ 1.8xlO-5M by polarization technique isIII> IT> I>IVThird Section:In this section potentiodynamic anodic polarization curves of 3l6LSS in different concentrations ofNaCI solution was studied. It was foundthat the cr ions cause the destruction of the passivating oxide film andinitiate pitting corrosion. The pitting corrosion potential is shifted tomore negative values with increasing chloride ion concentrations.Trials were made to inhibit pitting corrosion using organiccompounds such as p-aminoazobenzene compounds. These compoundsshifted the pitting potential to more positive values, indicating theinhibiting effect of these compounds.168The influence of the chemical structure of the usedp-aminoazobenzene compounds on their inhibition efficiencies wasdiscussed, the order of these inhibition efficiencies depends mainly uponthe number of adsorption active centers, skeletal representation of themolecules supported this explanation.In conclusion the polarization and weight loss measurements supportthe assumption that corrosion inhibition primarily takes place throughadsorption of the inhibitors on the 316L SS surface. Agreement amongthese different independent techniques indicates the validity of theobtained results.