Corrosion Behaviour of 304 stainles steel in aqueous solution

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The aim of the present work is to study the corrosion behavior ofstainless steel 304 using 0.1M NaOH using natural oils namely (lettuceoil, sweet almond oil, sesame oil, rocket oil and parsley oil).The thesis comprises three main chapters:-Chapter 1:This chapter deals with the introduction, which includesdefinitions, classification of corrosion, corrosion inhibitors, and literaturesurvey on corrosion behavior of stainless steel 304 in aqueous solutions.Chapter 2:This chapter deals with the experimental part which includescomplete description of the working procedures, preparation of solutions,electrode treatment, electrolytic cell, and electrochemical measurements.Chapter 3:Part (A)Potentiodynamic anodic polarization curves of stainless steel 304in 0.1M NaOH solution containing different concentrations of NaClsolution were studied. It was found that the addition of Cl- ions cause thedestruction of the passivation oxide film and initiate pitting corrosion.The pitting corrosion potential for these additives is shifted to morenegative values with increasing chloride ion concentrations. Trials weremade to inhibit the pitting corrosion of stainless steel 304 using naturaloils in NaOH solution. These compounds shifted the pitting potential tomore positive values, indicating the inhibition effect of these compounds.English Summary98Part (B)This part study the effect of concentrations of oils on thegalvanostatic polarization curves of stainless steel 304 in 0.1M NaOH,respectively . Some corrosion parameters were calculated such asaddition of different corrosion current density (Icorr), anodic (ba) andcathodic (bc) using Tafel lines slopes. By increasing the concentrations ofnatural oils the corrosion current density decrease and consequently theinhibition efficiency is increased.The adsorption isotherm for natural oils on the stainless steelsurface follows Langmuir adsorption isotherm at constant temperature.Part (C)This part study the Electrochemical Impedance Spectroscopy usingNyquist diagrams and Bode curves and it was concluded that the value ofRp increases with the increase in the concentration of the investigatedcompounds and this indicates the formation of a protective film on thealloy surface by the adsorption and an increase in the corrosion inhibitionefficiency in basic solution. While the value of Cdl decreases withincreasing the concentrations of inhibitors in comparison with that ofblank solution (uninhibited), as a result from the replacement of watermolecules by inhibitor molecules which lead to decrease in localdielectric constant and/or an increase in the thickness of the electricdouble layer formed on 304 stainless steel.