

## **SUMMARY AND CONCLUSIONS**

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(1) A literature survey of the different theories of corrosion and passivation of metals and alloys is given with particular emphasis on the electrochemical behaviour of nickel in aqueous media with particular emphasis on the effect of aggressive and inhibitive organic or inorganic compound.

(2) Under open-circuit conditions, the potential of the nickel electrode was followed in oxygenated aqueous solutions of different concentration of  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{CrO}_4$ ,  $\text{NaCl}$ ,  $\text{NaBr}$ ,  $\text{NaI}$ ,  $\text{Na}_2\text{WO}_4$ ,  $\text{Na}_2\text{B}_4\text{O}_7$ ,  $\text{NaOH}$ ,  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  untill steady-state values were reached. The steady-state potential ( $E_{\text{st}}$ ) varies with the anions concentration according to :

$$E_{\text{st}} = a - b \log C_{\text{anion}}.$$

This group of anions promote the corrosion of Nickel and the extent of corrosion depends upon both the type and concentration of each anion in solution.

(3) In all solutions, the steady-state potential developed by nickel electrode move in the -ve

direction as the concentration is increased showing the occurrence of corrosion.

(4) When the aggressive ions  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$  were added to each of  $\text{H}_2\text{SO}_4$  and  $\text{NaOH}$  solutions in which the nickel electrode was previously equilibrated the steady-state varies with the aggressive ion concentration according to sigmoidal-shaped curve. The points of inflexion of these curves occurs at higher additions of the aggressive ions the higher the concentration of  $\text{H}_2\text{SO}_4$  and  $\text{NaOH}$  in solutions. The two parameters are related as.

$$\text{Log } \frac{\text{CH}_2\text{SO}_4}{\text{NaOH}} = a_1 + b_1 \text{ Log } C_{\text{agg.}}$$

This relation is explained on the basis of the alteration of the structure of electrical double layer at the metal/solution interface by competitive adsorption of the two counteracting anions.

(5) Galvanostatic variation of anode potential with time at constant current densities measurements of nickel were performed in aqueous solutions of various concentrations of  $\text{Na}_2\text{SO}_4$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{NaOH}$  and  $\text{NaCl}$  at different current densities. It was found that the quantity of electricity required for the

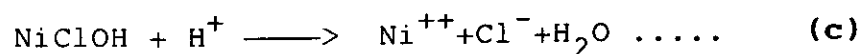
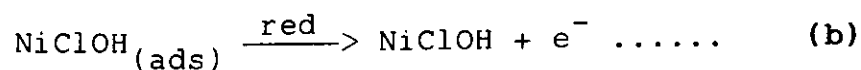
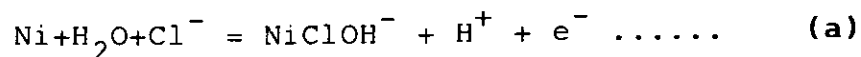
passivation of nickel electrodes in all solutions decreases with increasing the electrolyte. Concentration and/or the current density. The presence of chloride ions causes destruction of passivity on Ni with the initiation of visible pitting.

(6) Addition of increasing concentrations of mono-methyl-, monoethyl-, monobutyl-, dimethyl-, diethyl-, amines sod. Benzoate, causes inhibition of pitting corrosion on the nickel electrode in NaCl solutions, as revealed from the marked decrease in the quantity of electricity required to cause passivation similar results were found when some inorganic additives such as  $\text{Na}_2\text{WO}_4$ ,  $\text{Na}_2\text{HPO}_4$  and  $\text{Na}_2\text{CrO}_4$ , were introduced in sodium chloride solutions.

(7) Cyclic voltammograms and potentiodynamic polarization curves of the nickel electrode in constructed in NaCl solutions were constructed as function of electrolyte bulk concentration, precathodization potential and scanning rate.

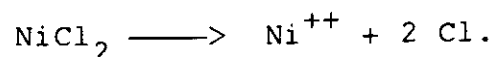
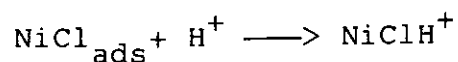
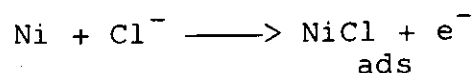
(8) Present results support remarks and mechanism suggested by previous works. The mode of influence of  $\text{Cl}^-$  ions on the dissolution of nickel consists of two pathway.

(a) At low  $\text{Cl}^-$  ion concentration, the following pathway is assumed:



It is assumed that step (b) is rate controlling step.

(b) At high chloride ion concentration the following mechanism as,



(9) Increasing the  $\text{Cl}^-$  ions concentration in the polarizing solutions causes the attack on the specimen surface, which is initially along the grain boundaries, to spread out into the grain interiors with stand the corroding action of a certain concentration of  $\text{Cl}^-$  ion can be deduced from the equation.

$$\text{Log } C_{\text{anion}} = K + n \text{ Log } C_{\text{Cl}^-}$$

Where K and n are constant.