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 Na_2CO_3, $NaHCO_3$, Na_2SO_4, Na_2CrO_4, NaCl, NaBr, NaI, Na_2WO_4, $Na_2B_4O_7$, NaOH, H_2SO_4 and HNO_3 untill steady-state values were reached. The steady-state potential (E_{st}) varies with the anions concentration according to :

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

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 occurrance of corrosion.

(4) When the aggressive ions Cl^-, Br^-, I^- were added to each of H_2SO_4 and 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 H_2SO_4 and NaOH in solutions. The two parameters are related as.

$$\text{Log } C_{\substack{H_2SO_4 \\ NaOH}} = a_1 + b_1 \text{ Log } C_{agg}.$$

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 Na_2SO_4, H_2SO_4, NaOH and 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 monomethyl-,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 Na_2WO_4, Na_2HPO_4 and Na_2CrO_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 Cl^- ions on the dissolution of nickel consists of two pathway.

(a) At low Cl^- ion concentration, the following pathway is assumed:

$$Ni+H_2O+Cl^- = NiClOH^- + H^+ + e^- \text{ ......} \qquad (a)$$

$$NiClOH_{(ads)} \xrightarrow{red} NiClOH + e^- \text{ ......} \qquad (b)$$

$$NiClOH + H^+ \longrightarrow Ni^{++}+Cl^-+H_2O \text{ .....} \qquad (c)$$

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

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

$$Ni + Cl^- \longrightarrow NiCl_{ads} + e^-$$

$$NiCl_{ads} + H^+ \longrightarrow NiClH^+$$

$$NiClH^+ + Cl^- \longrightarrow NiCl_2 + H^+ + e^-$$

$$NiCl_2 \longrightarrow Ni^{++} + 2\ Cl.$$

(9) Increasing the 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 Cl^- ion can be deduced from the equation.

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

Where K and n are constant.