THESIS ABSTRACT

TRANSIENT L.P. TECHNIQUE TO MEASURE LOW CORROSION CURRENTS OF M.S. IN INHIBITOR SOLUTIONS

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(Abstract of a thesis prepared under the supervision of Prof. T.P. Sastry, for which the author was awarded the M. Phil. degree of the South Gujarat University)

Mild steel (M.S.) exposed to oxygenated solutions of Tungstate, Acetate and Silicate demonstrates different types of behaviour in each of these aqueous media. In Tungstate solutions the metal appears to be passivated. The anodic Constant is infinity as found by experimentation. The corrosion potentials tend to become noble with time and the corresponding values of Linear Polarization Resistance show a significant increase in magnitude. A semilogarithmic plot of corrosion potential against L.P.R. on the log axis gives a straight line with a positive slope equal in magnitude, to the Cathodic Tafel constant. Such behaviour is also characteristic in passivating system. The passivity of M.S. by Tungstate in presence of Oxygen could be due to the oxidising action of Tungstate as well as the easy access of oxygen to the surface for the effective formation of a passive oxide film. These are the reasons consistent with the similar one made by other authors. We investigated the behaviour of M.S. in Tungstate solutions.

The Acetate solutions saturated with oxygen was distinctly alkaline (pH = 9.70). The steel specimen did not exhibit any tendency for passivation. The cathodic and Anodic Tafel Constants are finite and are close to each other, suggesting that corrosion of M.S. in this environment is under mixed control. However the conversion rates observed were significantly low. It is, hence, presumed that the acetate oxygen combination tends to inhibit corrosion through a passive film found on the surface.

In solutions of Sodium Silicate saturated with Oxygen the M.S. specimen exhibited a similar phenomenon as observed in the Acetate solution. However the Anodic Tafel Constant is significantly higher than conventional, while the cathodic Tafel Constant has the normal value expected of it. The corrosion is evidently under anodic control possibly due to the formation of a protective jet like layer of colloidal silicic ions of complex structure. The protective action might have been reinforced by inclusions of corrosion products in this protective layer.

The cathodic polarisation of electrodes with passive film appears to show the anomalous behaviour. When a cathodic current is applied to the electrode, the initial tendency of the electrode is to assume more noble potential contrary to the expectation that it should become active. This departure from theoretical convention is observed until the cathodic current applied reaches a certain critical value beyond which the electrode exhibits a normal cathodic polarization behaviour. These observations have been made during investigation of the polarization behaviour of a M.M. in Oxygen-Saturated solutions of Sodium Tungstate.