CHAPTER (I)

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Investigation of the mechanisms involved in corrosion process and the development on the basis of these mechanisms of new effective methods for protection of metal against corrosion is of paramount importance to the national economy of any country. The study of corrosion can be considered as an independent branch of science, within the scope of physical chemistry, which deals with the deterioration of structure of solid bodies through physicochemical reactions that takes place with the surrounding environmental media [1].

Aqueous corrosion can take many forms. Apart from general corrosion, which results in a relatively uniform removal of a surface, specific feature in a metal surface may be preferentially or selectively attacked. Such feature includes grain boundaries, precipitate and metal/inclusion interface. The presence of film on a metal surface may give rise to highly localized region of corrosion attack, resulting, perhaps, in pitting [2].

The thermodynamically possible process of metal transition into oxide or ionic state by reacting with surrounding medium, i.e., the corrosion process, can proceed by a chemical or electrochemical route, or by both taking place simultaneously. However, it can be assumed that with electrical-conducting media (electrolytes), the electrochemical mechanism prevails to such an extent that the purely chemical mechanism can be eliminated. The basic difference

between the electrochemical and chemical mechanism is that the overall reaction of the metal with the surrounding environment, in the former, it takes place through the independent processes namely, anodic and cathodic.

Modern corrosion science stems from the local cell model was proposed by Evans [3] and the concept of mixed corrosion potential was proved by Wagner [4]. These two magnificent achievements have combined into what is called the electrochemical theory of corrosion. This theory describes metallic corrosion as a combination of an anodic oxidation such as metal dissolution producing metal ions and a cathodic reduction such as oxygen ionization or discharge of hydrogen ions.

Recently [5], the corrosion process, however, consists not only of oxidation reduction reactions but also of acid-base reactions. The anodic dissolution of metal is an oxidation process producing metal ions. The metal ions thus produced are transferred into aqueous solution to form hydrated aquo-metal ions or anino-complexes of metal ions. Therefore, the acid-base character involved, that makes the corrosion process diversified, depending not only on the oxidizing agent and the electrode potential but also on the acid-base species such as basic anions present in the environment.

The most important factors that control the dissolution of metals in aqueous environment are the type and concentration of the present anions. There are, however, many cases where the dissolution rate of metal in acid solutions depends not only on the concentration of hydrogen ions participating in the