Chapter 1
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Corrosion can be defined as the undesirable reactions between materials and the environment which lead to the loss of the functionality of the materials. Each year corrosion of materials and related loss cost us tremendously with the direct loss due to corrosion estimated to be 3-5% of the gross national product. Generation of scientists and engineers have dedicated themselves to the investigation of corrosion mechanism and the development of effective protection techniques.

Corrosion is a complex and it can take on various forms depending on the properties of the material and the corrosive environment. Uniform corrosion refers to homogenous dissolution of materials, such as the corrosion of carbon steels in acidic solutions. The corrosion rate is almost the same everywhere and the corrosion can be mentioned easily. Few accidents occur as a result of the uniform corrosion due to its predictability, although significant amount of materials is lost in the process. Non uniform corrosion, however, concerns the inhomogeneous deterioration due to the heterogeneities of the material or the environment. It consists of various forms of corrosion such as intergranular corrosion, selective corrosion and pitting corrosion.

Steel is produced from iron, the following elements are always present in steel; carbon, manganese, phosphorous, sulfur, silicon and traces of oxygen, nitrogen and aluminum. Various alloying ingredients are frequently added, such as nickel, chromium, copper, molybdenum and vanadium. The most important of these elements in steel is carbon, it forms a compound Fe_3C (iron carbide), which is extremely hard and brittle and known as cementite.

Commercially available steel comes in a wide variety of shapes, forms and chemical composition, depending on the intended use of the material. In the course

of its usage the product is subjected to unfavorable environments as is the case of chemical engineering. Under these conditions steel undergoes more or less severe corrosion attacks.

The majority of metal-corroding processes in electrolytes is electrochemical in nature. The rate of any given electrochemical process depends on the rates of two conjugate reaction proceeding at the metal surface: an anodic reaction consisting in the transfer of metal ions from the lattice to the solution, with liberation of electrons, and a cathodic reaction consisting in the assimilation by some depolarization of the electron librated during the anodic reaction.

Inhibitor can vary the rate of a corrosion process by affecting the kinetics of the electrochemical reactions responsible for that process. Thus, they can be used to the greatest advantage for the protection of metals in many different environments.

1.1- Types of Corrosion

1.1.1 General or Uniform Corrosion

Differences in electrical potential occur on the surface of a piece of metal due to small differences in chemical composition, amount of cold work, etc. These differences set up small corrosion cells each with an anode and cathode. Corrosion continues until the metal is consumed or the film of rust formed on the surface sets up a barrier to the electrolyte.

1.1.2 Pitting Corrosion

Pitting corrosion is a complex but an important problem that is at the root of many corrosion failures. In pitting corrosion the surface of the metal is attacked in small localized areas. Organisms in water or breaks in a passive film can initiate corrosion. In pitting corrosion very little metal is removed from the surface but the effect is marked.