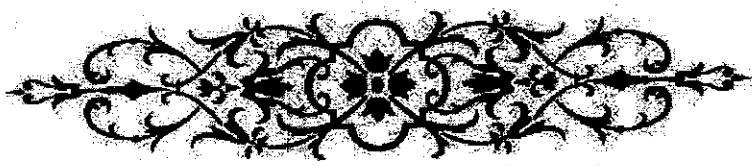
CHAPTER (1)

Introduction



INTRODUCTION

1.1-GENERAL ASPECTS OF CORROSION

1.1.1- Definition of corrosion

The most important electrodic process of vast practical significance is that resulting in the dissolution of a metal in a solution or in the formation of a film of conducting moisture adhering to a metal surface. The process is termed " Corrosion ". It is the rate of corrosion which determines the significance of corrosion. It is now generally accepted that corrosion is a reversion or a partial reversion from the met stable condition of the metal to a stable condition of the mineral accompanied by a reduction in the free energy of the system. Common examples of materials corrosion are rusting of iron and the tarnishing of silver, copper etc. The rate of the metal dissolution is governed by materials characteristics and the environment.
More attention is to be given to metallic due to:
a-An increased use of metals in many fields of technology-rare and expensive metals used in atomic energy field.
b-A more corrosive environment due to air and water pollution.
c-Slender dimension used in metallic construction which do not tolerate corrosive attack.

1.1.2- Cost of corrosion

In recent years corrosion by chemical and electrochemical reactions has assumed great economic importance throughout the world. The estimated annual loss due to corrosion is enormously large. Studies worldwide have shown that the overall cost of corrosion amount to at least 2-3% of the Gross National product and that 20-25% of the cost could be avoided by using appropriate corrosion control technology[1]. In USA the cost of corrosion per year has been estimated to be over 126B(billion) dollars in 1982. The problem of preventing of metallic corrosion is extremely complex but it is of great technological and economical importance. Corrosion of metals can be controlled by taking suitable preventive measures such as painting, plating, use of expensive alloys, use of inhibitors etc. Corrosion of engineering components many times leads to the loss of production and sometimes it may be hazardous too.

It is justifiable that several corers of rupees are spent on research for controlling corrosion[2]. Losses caused by corrosion could be direct or indirect.

1.1.2.1 Direct losses

1-Inability to use otherwise desirable materials.
2-Over design.
3- replacement of corroded component or repair cost.
4- Cost of anticorrosive paints and other protective methods.

1.1.2.2 Indirect losses

1-Contamination of the product.
2-Valuable part of the container getting corroded.
3-Adjacent equipment getting corroded.
4-Loss of production.
5-Safety(fire and explosion o toxic products).
6-Appearance (Unpleasant look of corroded materials).

1.2-Classification of corrosion

All the metallic materials consist of atoms having valiancy electrons which can be donated or shared. In a corrosive environment the components of the alloy get ionized and the movement of the electrons sets up a galvanic or electrochemical cell which causes oxidation, reduction, dissolution or simple diffusion of elements.

The metallurgical approach of corrosion of metals is in terms of the nature of the alloying characteristics, the phases existing and their inter-diffusion under different environmental conditions. In fact, the process of corrosion is a complex phenomenon and it is difficult to predict the exclusive effect or the individual role involved by any one of the above mentioned processes.

Based on the above processes, corrosion can be classified in many ways as low temperature and high temperature corrosion, direct oxidation and electrochemical corrosion, etc. The preferred classification is:

(i)dry or chemical corrosion
(ii)wet or electrochemical corrosion.

Dry corrosion occurs in the absence of a liquid phase or above the dew point of the environment. Vapors and gases are usually coordinates, it is often associated with high temperature. An example is the attack of steel by furnace gases.