1-INTRODUCTION

CHAPTER I

I - Introduction

A sound knowledge of the process of corrosion, its kinetic and mechanistic aspects can help control the problem effectively.

Most metals are thermodynamically unstable under normal atmospheric conditions and have a tendency to revert back to their oxidized state (stable state i.e., ore).

Literature shows that corrosion of metals has been reported as early as 1800 's [1]. Significant contribution by Evans [2], Uhling and Pourbaix [3] too laid a solid foundation for understanding corrosion process and research and development too.

Trends in corrosion research changed rapidly over the years. It started with simple galvanic measurements and has now come to use of computer controlled potentiostatic / galvanostatic measurements. Sophisticated instrumentation and the revolution in computer technology make online monitoring of corrosion possible.

1.1 General aspects of corrosion

1.1.1 Definition and importance of corrosion

Corrosion may be defined as an unintentional attack on a material through reaction by the surrounding environment, the term refers to a process or to the damage caused by such a process, corrosion is also defined as the destruction or deterioration of materials under chemical action of the surrounding environment [4]. Shreir [5] describes corrosion as the reaction of solid with 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 attacks.

1.1.2 Cost of corrosion

It is justifiable that several crores of rupees are spent on research for controlling corrosion [3]. 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 of toxic products).
6. Appearance (Unpleasant look of corroded materials).

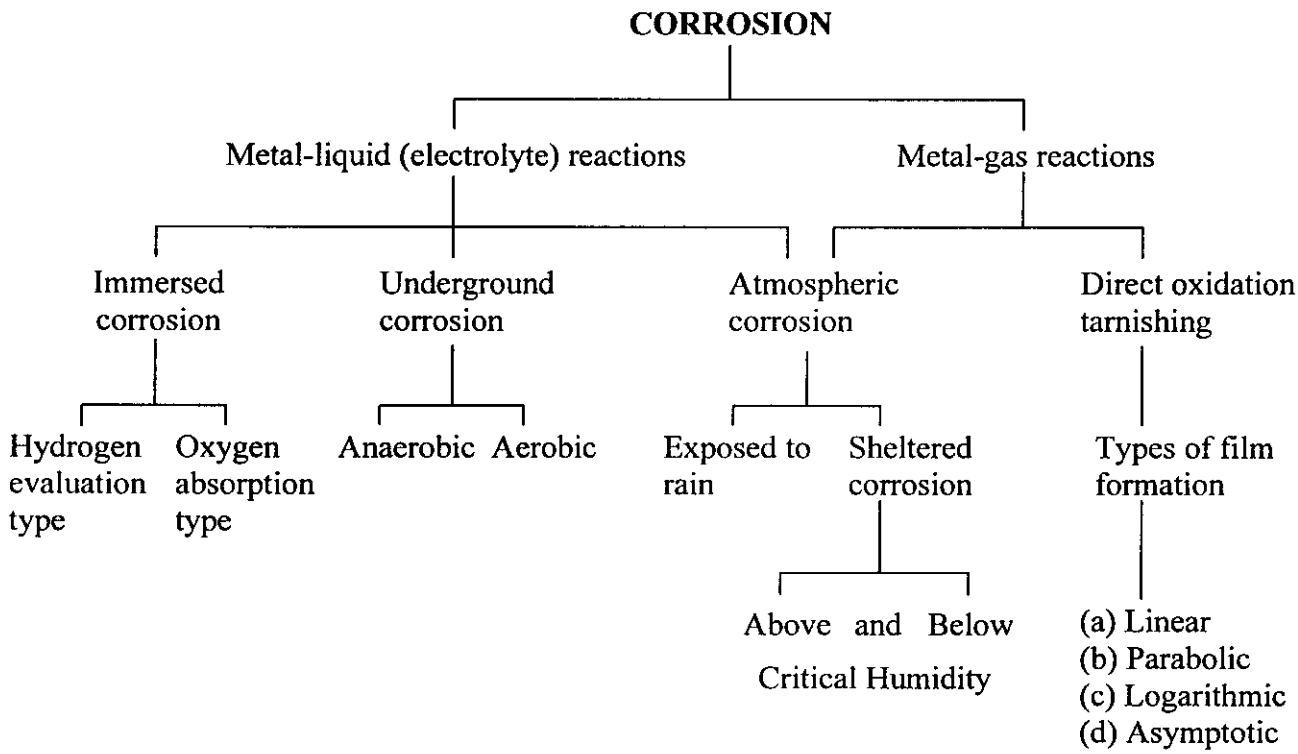
1.1.3 Classification of corrosion

Corrosion has been classified in different ways. One way of classification is high temperature and low temperature corrosion, another way is wet and dry corrosion. The more preferred classification is based on mechanisms, which falls into two types:

1. Electrochemical corrosion involving an interface in which anodic and cathodic areas can be distinctly identified or such identification is not possible.
2. Chemical corrosion which involves direct chemical reaction of the metal with the environment.

A general scheme [6] for the classification is presented below:

CLASSIFICATION OF CORROSION PROCESS



1.1.4 Factors influencing corrosion

The extent of corrosion and its nature largely depend upon the metal and the environment surrounding it. The important factors that influence the corrosion phenomenon are as follows:

a) Nature of the metal
b) Environment
c) Temperature
d) Concentration of electrolyte
e) Nature of the corrosion product
f) Electrode potential
g) Aeration
h) Agitation
i) Hydrogen overvoltage
j) pH of the electrolyte

1.1.5 Theories of corrosion

The corrosion of metals in aqueous solutions is an electrochemical process as established in the first half of the 19th century. Whitney [7] gave the most acceptable electrochemical theory. The other theories such as acid theory [8] chemical attack theory,