CHAPTER I
INTRODUCTION

High Temperature Hydrogen Attack (HTHA) has been one of the major problems in the petroleum and petrochemical industry. HTHA has been observed in equipment used in the environment with high hydrogen pressure at elevated temperature. Hydrogen attack can lead to failure of pipeline, tubular, and pressure vessels. It can reduce the service life of steel.

Hydrogen can be introduced into industrial pipe and vessel walls through general corrosion process (e.g. flow assisted corrosion, uniform corrosion etc.). At elevated temperatures, molecular hydrogen dissociates into the atomic form at the steel surface and the hydrogen atoms enter into steel substrate. Accumulation of hydrogen atoms can combine with impurities in steels or with other hydrogen atoms and become trapped in the steel wall. This trapping can cause serious damage in the form of hydrogen blistering, hydrogen embrittlement or hydrogen induced cracking.

According to the risk of diffusible hydrogen damage to steel, rapid and efficient removal of hydrogen from the pipe or vessel wall is desirable. The benefits of removal are to reduce the likelihood and/or severity of hydrogen related corrosion resulting in reducing downtime of units.

The purpose of this work is to study the transport of hydrogen through industrially relevant steels under normal operating conditions and to remove the hydrogen flux from the steel as rapidly as possible. The conditions which affect the diffusion of hydrogen through various steels will be determined. The effect of oxide films and the coating of outside surfaces with a catalyst will be investigated. The minimum temperature limit (The temperature at which hydrogen can permeate through the steel wall) will also be determined.