

STATEMENT OF THE PROBLEM

The work described in this thesis deals with the hot corrosion studies on some industrially important steels (S-110, 18:8 Cr:Ni austenitic and AISI 303) and some nickel base superalloys (Nimonic series: N-75, N-80A, N-90 and N-105) in presence of N_2SO_4 films and ash residues (from Indian coal), in the temperature range 650 - 1000°C under atmospheric conditions.

The break up of the work in various chapters is as follows:

Chapter 1: General Introduction: Part I - It covers some important aspects of the chemistry of hot corrosion and deals with the descriptions of various parameters e.g., alloy composition, temperature, salt composition affecting hot corrosion rates. Detailed discussions pertaining to electrochemical aspects of hot corrosion and recent developments in mechanisms of hot corrosion have also been incorporated in this chapter.

Chapter 2: General Introduction: Part II - It covers fossil fuel corrosion with special reference to coal

ash deposit corrosion. It describes importance of coal ash deposit corrosion with special reference to coal of Indian origin. A brief literature survey has been given covering the recent studies conducted on corrosive action of coal directly or indirectly concerning with coalfired gas turbines (fluid bed combustion) and coal gasifiers.

Chapter 3: 'Analysis of Coal' - It describes the experimental part of the work dealing with the analysis of coal and coal ash residues.

Chapter 4: 'Ash Deposit Corrosion of Stainless Steels' - This chapter describes the oxidation behaviour of stainless steels in presence of ash residues obtained from Indian coal samples collected from various sources. Studies have been carried out to examine the kinetic and morphological aspects of the problem.

Chapter 5: 'Ash Deposit Corrosion of Superalloys' - It deals with the hot corrosion studies on some Nimonic alloys (N-75, N-80A, N-90 and N-105) coated with various coal ash residues in the temperature range 800 - 1000°C in air. Kinetic studies have been carried out by weight gain/time measurements.

Morphology of the scales have been established on the basis of X-ray diffraction, optical metallography, SEM and EPMA.

Chapter 6: 'Hot Corrosion of Superalloys in Presence of Sodium Sulfate and Transition Metal Sulfates' - This chapter includes studies on the hot corrosion behaviour of Nimonic 75, 80A, 90 and 105 in presence of Na_2SO_4 and mixtures of Na_2SO_4 with transition metal sulfates (CoSO_4 , NiSO_4 and $\text{Cr}_2(\text{SO}_4)_3$). Kinetic and morphological studies have been conducted to investigate the behaviour.

Chapter 7: Summary - The Chapter summarizes the results arrived at from the studies described in chapters 4 to 6 and the conclusions drawn thereof. Suggestions for the future work which is likely to be carried out are also given.