

TO STUDY THE HIGH TEMPERATURE CORROSION RESISTANCE OF CERIUM SUBSTITUTED SILICATE- ZIRCONIUM SOL-GEL PROTECTIVE COATING ON SS-304 BOILER STEEL

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Mode of Study : F. Time

ABSTRACT

High temperature corrosion is grave problem in incinerators, boilers, turbines and IC engines. Burning of different types of fuels produce salt like Na, S, and K which get deposited on boiler parts and deteriorate parts at elevated temperatures. However, total prevention of corrosion cannot be possible but it can be reduce to endurable levels. To prevent hot corrosion alloying of metals usually done. But it does not conserve mechanical properties like creep, toughness, ductility etc. Coating is generic way to enhance the materials life at elevated temperature in presence of salts. Sol-gel method of coating is easy and cheap as compared to thermal spray coatings. In the present work, Cerium substituted Silicon-Zirconium coating is prepared via Sol-Gel route. It is deposited on Chromium based super alloy SS-304. Sol-gel dip coating method is used for coating the materials. Cyclic oxidation tests are performed at 9000 C in the presence of Na₂SO₄ salt solution on coated and bare samples. The salt solution is applied after every 10 cycles. Weight gain analysis shows that coated samples (.695) have shown better resistance than bare specimen (1.835) cyclic oxidation in simulated environment. Scanning Electron Microscope, Energy Dispersive Spectroscopy and X-ray mapping techniques are also confirmed that organic precursors of Silicon and Zirconium useful in creating uniform coating. However, coating showed cracks after calcinations which may be due to higher rate of drying. But cracks become self-healed when specimen was subjected to simulated environment at 9000C due to grain growth of Zirconium particles. X-ray mapping showed that protective layer of cerium and Zirconium present at surface of SS-304 and coating was successful in providing resistance to substrate metal from penetration of salts.