High Temperature Hot Corrosion Resistance of Coated Stainless Steel at NaCl/Na2So4 Mixtures Environments

Lect. Dr. Ayad A. Albadrani

College of Engineering / University of Anbar

https://www.iasj.net/iasj/download/3b6ad20cc504a3d7

In this study , Silicon and Aluminum with and without cerium were simultaneously co- deposited by diffusion into austenitic stainless steel (AISI 316L) substrates, by a single-step pack cementation process. Cyclic hot corrosion tests were conducted on coated and uncoated austenitic stainless steel alloy with 50wt.% NaCl+50wt.%Na2So4 deposits at 750C° for 120h at 10h cycle. The results show that the hot corrosion resistance of both coated stainless steels was significantly improved as compared with the uncoated steels. The scale formed on coated stainless steel after oxidation in mixture environment was consisted of NiAl2O4, NiFe2O4 and NiCr2O4. Optical metallographic (LOM) and X-ray diffraction (XRD) was used to characterize the resulting coating and cyclic hot corrosion structures.

Key words: Pack cementation, Hot corrosion, Oxidation, Coatings stainless steels.

1- The oxidation kinetics of both coated and uncoated systems follows parabolic rate law.
2- Both coated systems revealed good cyclic oxidation resistance compared with uncoated stainless steel 316L under the same identified condition.
3- The addition of 0.5 wt. % cerium to silicon modified aluminize diffusion coating, improved the hot corrosion resistance of coated stainless steel substrates.
4- The Na2So4/NaCl salt mixture are more corrosive than that of 100 wt.%Na2So4 environment.

REFERENCES.

- J.Balmain et al., "Grouth of Oxide Scales upon Isothermal Oxidtion of CVD-FBR Aluminide Coated Stainless steel", Surface and Coating Technology, Vol.153, 2002, pp.49-58.

- Rajab Mohammed "Improvement of stainless steel(316L) Hot Corrosion and Oxidation Resistance by Aluminizing-Siliconizing ",Ph.D, thesis, University of Technology, Iraq, 2007.
- S.seal,et al."Ceria-based High-Temperature Coatings for Oxidation Prevention "JOM-e 52(1) January,pp.163-177, 2000.
- C.J Wang,Y.C.Chang and Y.H.su "The Hot Corrosion of Fe-Mn-Al-C Alloy with NaCl/Na2So4 Coating Mixtures at 750C°",Oxidation of metals, Vol.59, Nos.1/2, pp.115-132, 2003.
- Nagarajon,R.D.Smith and I.G.Wright,"Corrosion of Nickel-Base and Iron-Base Alloys in Simulated Fluidized –Bed Cool-Combustion Environment", Oxidation of Metals,Vol31,Nos.1/2,pp.123-143,1989.
- F.Toscan,et al.,"Relations between Oxidation Kinetic and Chromium Diffusion Stainless ",Meterials Science Forum,Vols,461-464,pp.45-52,2004.
- Hung-Weng Hsu and Wen-Ta Tsai,"High-Temperature Behavior of Siliconized 310 Stainless steel,"Materials chemistry and Physics,Vol.64,Issue,14\April ,pp.147-155, 2000.
- Parm.valentin Rohr,"Development De Reventments Pourles Aciers D,Echangeurs Thermiques Et Amelioration Delerwr resistance Ala Corrosion En Environment stimulant less Fumees De combustion De charbon ",Thesis, Institute National Polytechnique De,Toulouse, (2005).
- R.A.Rapp and Min Hui Zheng,"Simultaneous Aluminizing and Chromizing of steels to from(FeCr)3Al coating", Oxidation of Metal,Vol.49,Nos.1/2,1989,pp.19- 31.
- R.Sivakumar and B.L.Mordite, "High Temperature Coatings For Gas Turbine Blades", Surface and Coatings Technology, 37,1989,pp.139-160.
- I.Gurrappa "Hot Corrosion Behavior of Cm247LC Alloy in Na2So4 and NaCl Environments "Oxidation of Metals, Vol.51,Nos,516,1999,pp.353-381.