

(AISI 304)

(2013 / 3/ 18 2012/ 11 /27)

(AISI304)

1000 °C

(AISI 304)

— — :
2 / (0.01 - 0.3 - 5.81) 225

Al₂O₃

Study of Austenitic Alloy AISI304 Oxidation after Coating by Aluminum and Chromium at High Temperature

Yahya A. AL-Salman

*Department of Physics
College of Science
University of Mosul*

Mahmood A. Hmood

Ahmad N. Mahmood
*Department of Environmental
College of Environmental
Science and Technology
University of Mosul*

ABSTRACT

The present research study the effect of metallic coating namely aluminizing and chromizing on the oxidation resistance of stainless steel alloy (AISI 304). The oxidation kinetics of a single stage coating such as Aluminized and Chromized alloy have been studied under atmospheric pressure at 1000 °C using a thermal cyclic oxidation then compared with uncoated alloy. The results show, the two samples of coatings such as aluminized and chromized which have a two different resistances of cyclic oxidation, two results show of three samples stainless steel alloy AISI 304 and aluminum, chromium coatings, the reduction in the weight after 225 (hr) is about (5.81-0.3-0.01)gm/cm² successively. aluminized coating exhibited the greatest resistance to oxidation. The superiority protection of aluminized coating can be due to the formation of Al₂O₃ and improving scale via pegs formation.

(-)

(-)

(CVD)

" "

.....

(Seal and Roy, 2000)

(304 ,321 ,316)

(321)

CeO₂

(304,316)

(321)

TiO FeTiO₃

.Ti

NiAl

.(Hounginon *et al.*, 2004)

TiAl

.(Katsman *et al.*, 2000)

(Picard *et al.*, 2001)

(AISI 304)

(AISI 304)

"

(AISI 304)

.(9×30)mm

(Pelitti,1960) (1)

(AISI 304)

(AISI 304)

: 1

Component	C	Mn	Si	S	P	Cr	Mo	Ni	N
Wt%	0.08	2	0.75	0.030	0.045	20.0	-	10.5	0.10

Coating processes

pack cementation

71% 25% 4% (NH₄Cl)

(Callister, 2005)

(1000°C)

Oxidation processes

(1000°C)

(225)

Thermal Cyclic)

(Oxidation

Microstructure

(220-400-1200)

(Grinding)

(Etching)

(Al₂O₃)

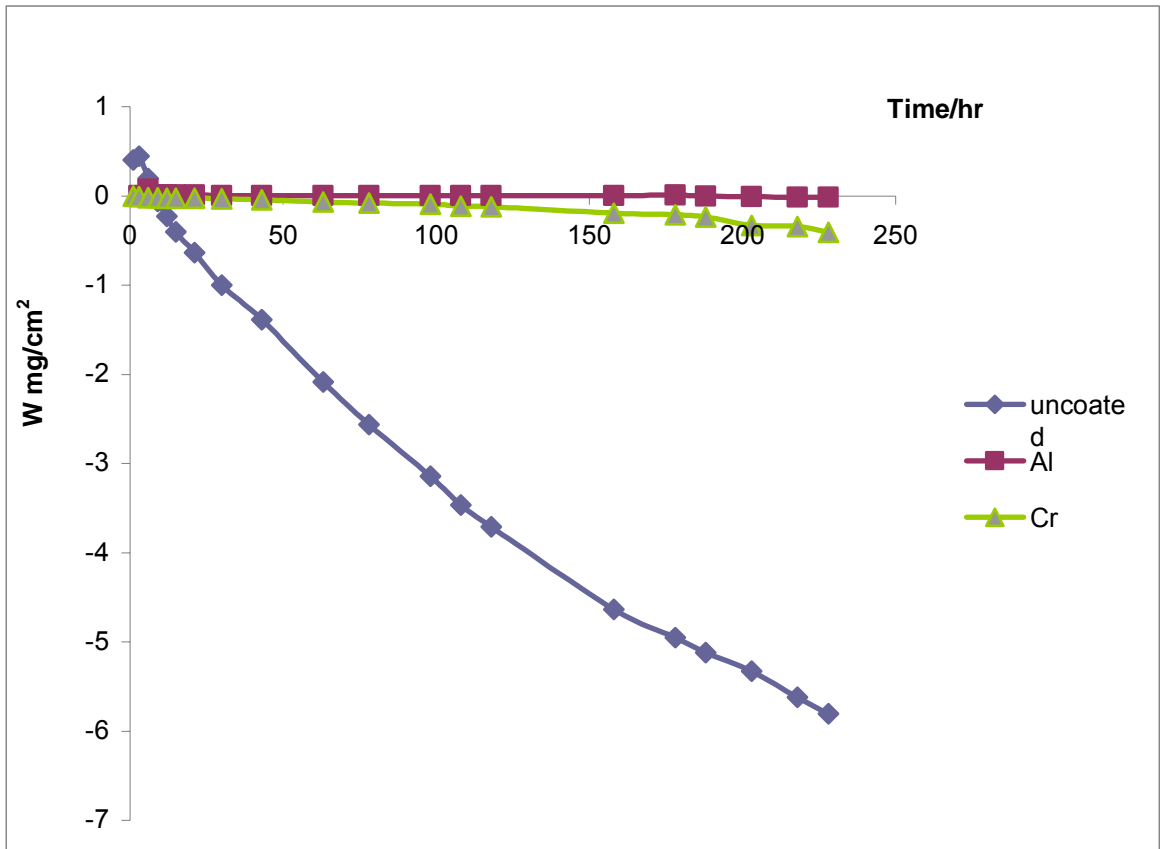
.98%

2%(HNO₃)

(Nital)

(1)

(AISI 304)



(hr)

:1

(1)

(Y-Al₂O₃)

Cr₂O₃

20%

900

FeO-Fe₃O₄

Fe₂O₃

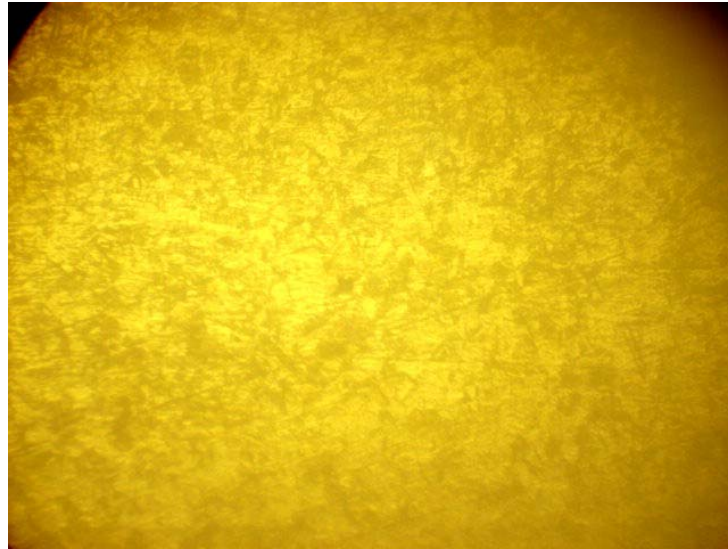
225

(2)

"

(.5.81mg/cm²)

2wt%



AISI 304

: 2

(1)

225 (0.3 mg/cm²)

0.01)

225 (mg/cm²)

(1)

(3)

FeAl₃

) (Cr₃Al₂ , FeAl₃ , FeAl,FeNi)

.(2009

(α-Al₂O₃)

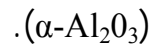
Y-)

(α-Al₂O₃)

(Procago, 1999)

(Al₂O₃)

.....

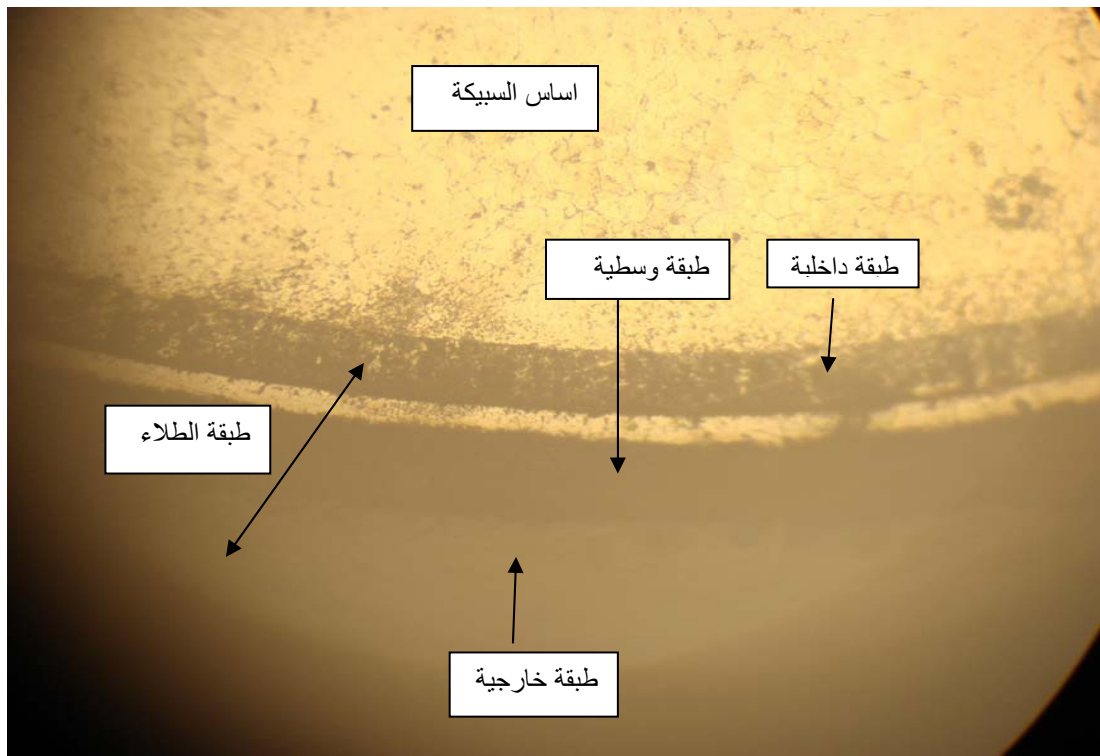
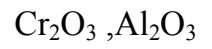
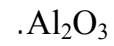
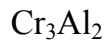


(Isothermal)

(Thermal cyclic)

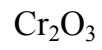
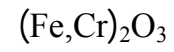
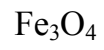
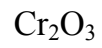
(Thermal cyclic)

"

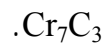


(600X) 1000 °C

(1)

.(2009) (FeCr, FeNi, CrNi, Cr_7C_3 Fe_7C_3)

(4)



(Feritte stablser)

.....



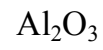
(600X) 1000 °C

: 4

:

"

-1



"

-2

.

-3

.

(Pack Cementation)

-4

304

.(2009)

- Callister, W.D. (2005). " Materials Science and Engineering ". 5th ed. John Wiley and Sons, New York.
- Hounginon, C.; Chevalier, S.; Larpin, J. (2004). High temperature oxidation behavior of aluminide coating obtained by Pack Cementation. *Ann. Chem. Sci. Mat.*
- Katsman, A.; Ginzburg, A.; Werber, T.; Cohen, I.; Levin, L. (2000). Nickel-aluminide coating of TiAl by two-stage process. *Surface and Coatings Techno.*, **127**, 220-223.
- Pelitti, E.(1960). "Orosion, Materials of Conston for Fertilizer Plants and Phosphoric Aced Servie ", chemistry and Technology of fertilizer. A merican chemical society Monograph Series, Reinhold publishing Crop. pp. 576-632.
- Picard, S.; Memet, J.B.; Sabot, R.; Grosse, J.L.; Riviere, J.P. (2001). Microhardness and surface characterization of low energy, high current ion implanted austenitic stainless steel. *Materials Sci. Engine.*, **A303**, 163 – 172 .
- Procayo, J. (1999). Oxidation behavior of Fe-Si thermal spray coating. *Material Letters*, **38** (1), 45.
- Seal, S.; Roy, K. (2000). Ceria-based high-temperature coatings for oxidation prevention. *Metals and Society* .**52**(1), 1-7.