

(FGM)

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بهناز سعیدی^۱، علیرضا صبور روح اقدم^{۲*} و علی محمد خدای^۳

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چکیده

FGM

YSZ
YSZ/NiCrAlY
°C

HVOF
YSZ + NiCrAlY

NiCrAlY

FGM
APS

XRD

EDS

FGM

- MCrAlY TBC -

واژه های کلیدی:

FGM

مقدمه

α -Al₂O₃

[] TGO

[]

(TBC)

(TBC)

Co = M) MCrAlY

(Ni

(TGO -)

[]

Y₂O₃

NiCrAlY

(YSZ)

()

[]

FGM

TBC

NiCrAlY

FGM

TBC

NiCrAlY

HVOF

HVOF

VPS

(TGO)

HVOF

TBC

YSZ/NiCrAlY

(FGM)

APS

[]

FGM

(FGM)

/

APS

YSZ

()

APS

HVOF

NiCrAlY

()

% YSZ

%

()

[-]

FGM

()

TBC

()

°C

مواد و روش تحقیق

mm

/ g

Inconel LC

mm

wire cut

| Particle Size | Production | Composition | Powders |
|-----------------|-------------------------|--|---------------------|
| - μm | Agglomerated & Sintered | ZrO ₂ -8wt% Y ₂ O ₃ | YSZ (AI-1075) |
| - μm | Spheroidal gas atomized | Ni-22Cr-10Al-1Y | NiCrAlY (AMDDRY962) |

NiCrAlY % HVOF :

| Parameters | Value |
|--|-------|
| Oxygen flow rate (l/min) | 350 |
| Propane flow rate (l/min) | 35 |
| Powder carrier gas (N ₂) flow rate (l/min) | 5 |
| Spray distance (mm) | 250 |
| X-Y Traverse speed (rpm) | 420 |

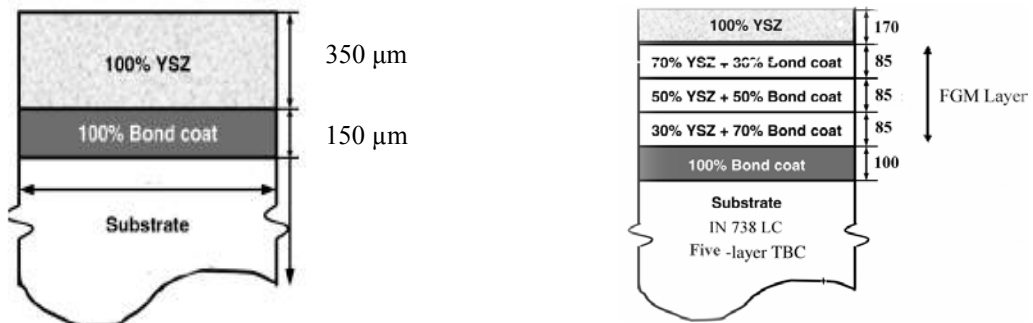
APS :

| Parameters | Value | |
|--|--------------|-----------|
| | Graded layer | Top layer |
| Argon flow rate(l /min) | 50 | 40 |
| Hydrogen flow rate(l /min) | 13 | 12 |
| Spray distance (mm) | 130 | 120 |
| Powder NiCrAlY feed rate(g/min) | 6 | - |
| Carrier gas (Ar) flow rate of Powder YSZ (l/min) | 2.6 | 2.6 |
| Traverse speed (rpm) | 420 | 420 |
| Gun power supply level (A) | 600 | 600 |

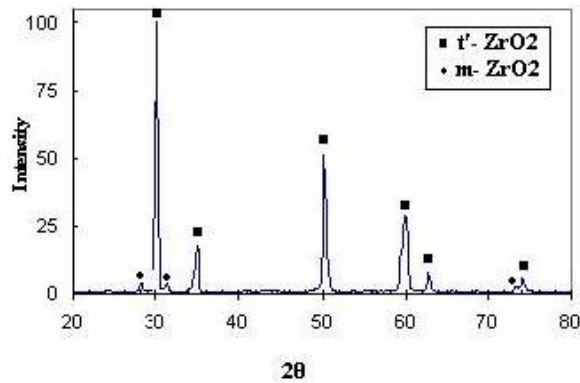
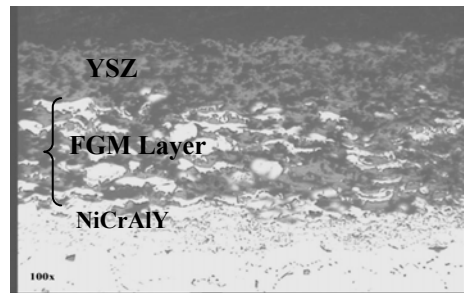
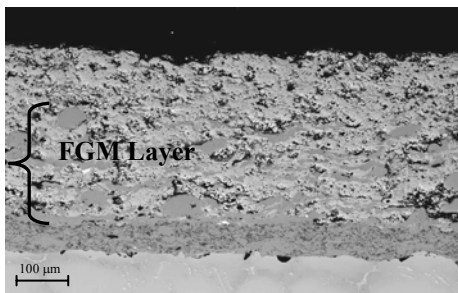
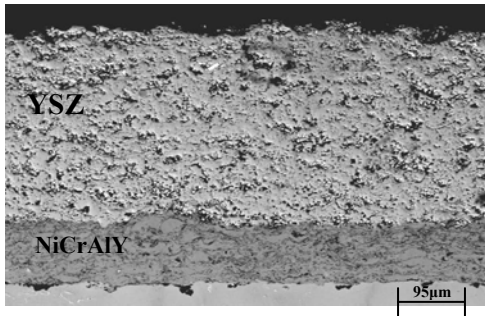
FGM YSZ/NiCrAlY :

| Top layer | Forth layer | Third layer | Second layer | Bond layer | Composition (vol%) |
|-----------|---------------|--------------|---------------|------------|-----------------------------|
| %100 Z | %70 Z + %30 N | %50 Z + N%50 | %30 Z + %70 N | %100 N | |
| 180 | 100 | 80 | 80 | 80 | Thickness (μm) |

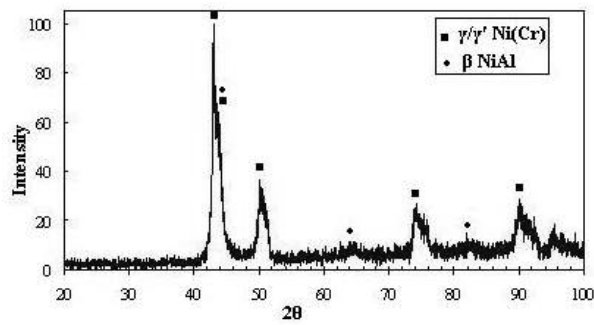
Z: ZrO₂-8wt% Y₂O₃; N: NiCrAlY



(μm) (FGM TBC (:



XRD :



NiCrAlY XRD :

NiCrAlY

EDS

YSZ

NiCrAlY :

یافته ها و بحث
ریزساختار

(-)

NiCrAlY YSZ

. []

() YSZ XRD YSZ NiCrAlY (-)

YSZ

(m-ZrO₂) YSZ NiCrAlY

(t'-ZrO₂)

HVOF

t'-ZrO₂ NiCrAlY

ZrO₂

t' FGM (-)

Y₂O₃

ZrO₂ YSZ ()

(+)

. []

YSZ

[] NiCrAlY ()

β γ/γ FGM

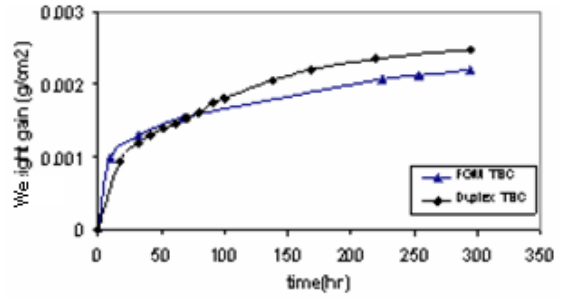
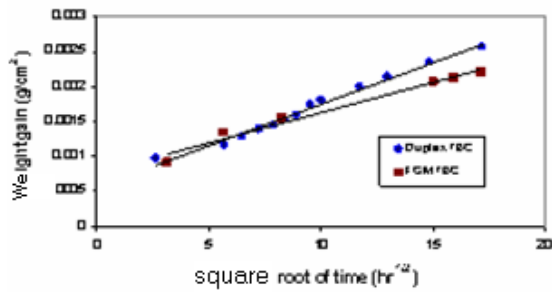
β γ/γ () XRD

Al₂O₃

NiCrAlY FGM

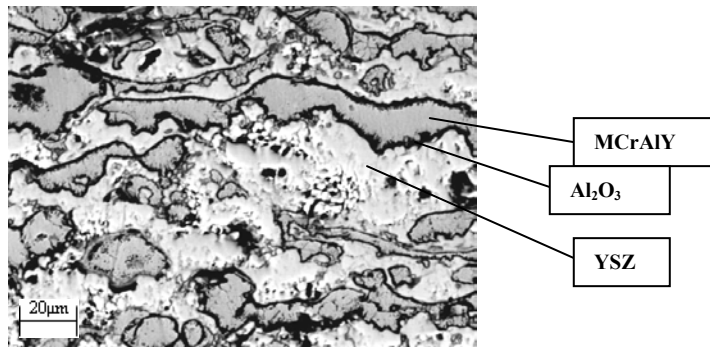
NiCrAlY+YSZ

NiCrAlY YSZ



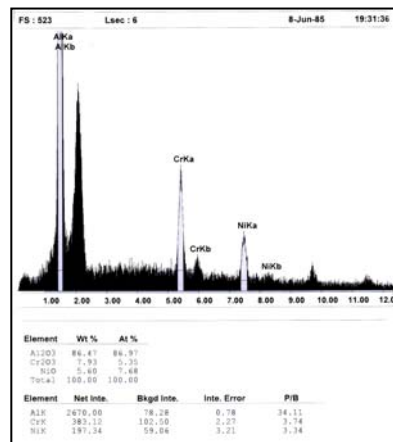
(FGM

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FGM NiCrAlY

:



NiCrAlY

EDS

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FGM

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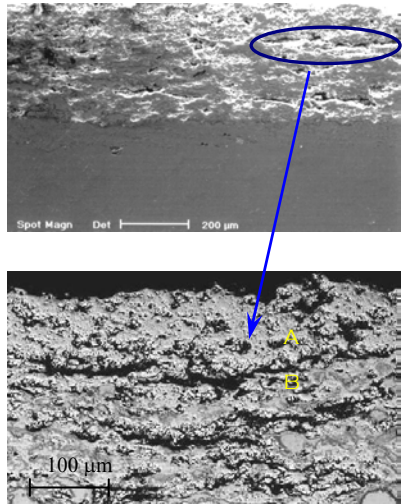
()

°C

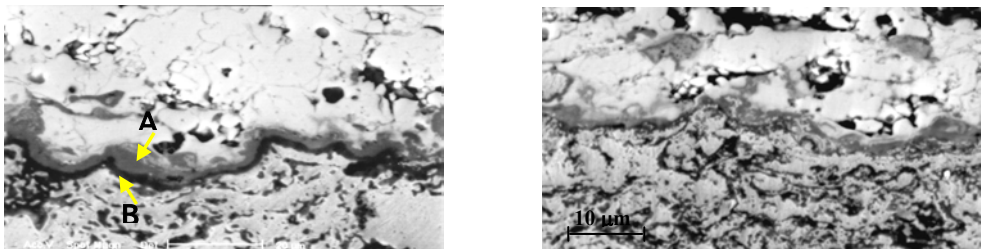
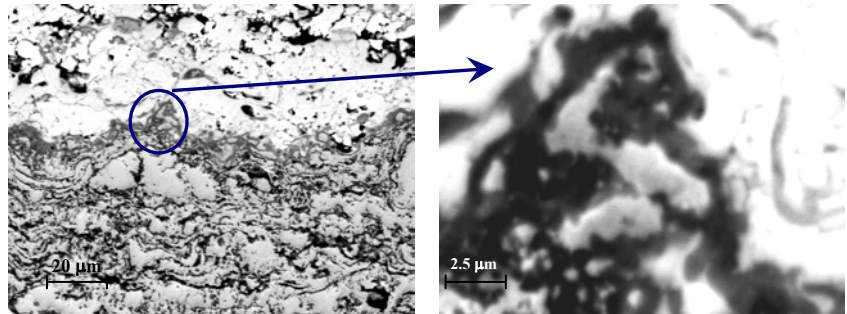
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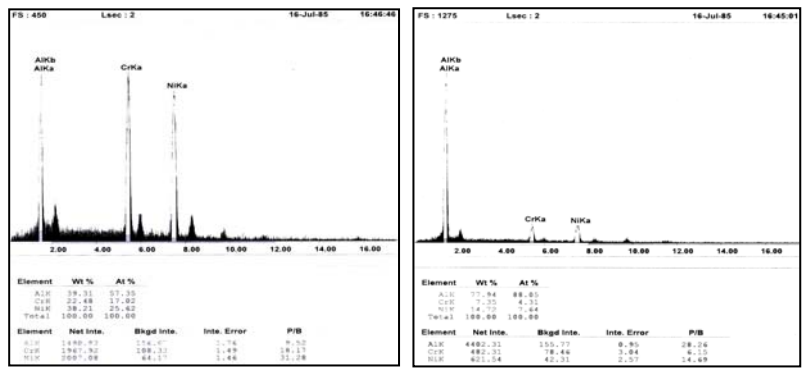
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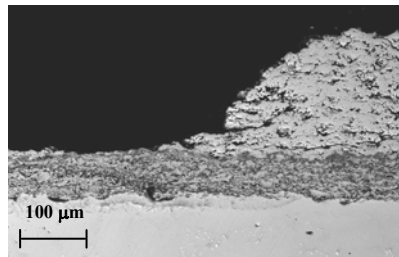
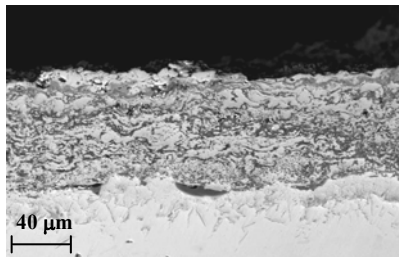
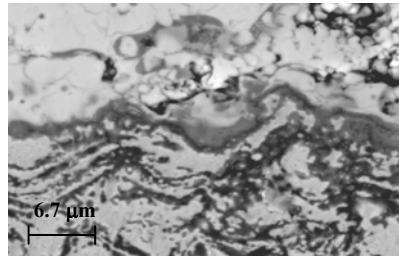
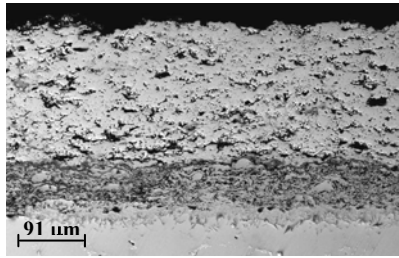
YSZ FGM :



(Al₂O₃ :

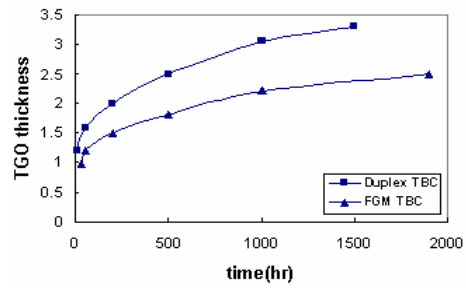
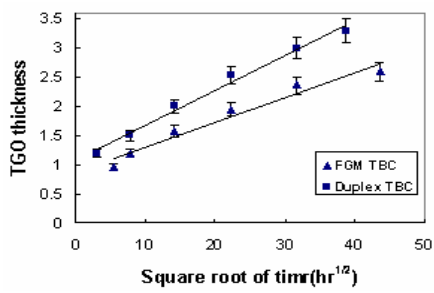


(A) (B) (EDS :



(TGO/
(BC

(BC/TC



TGO

(TGO (:

[] EDS

FGM
BC

NiCrAlY
NiCrAlY
Al
Ni Cr
NiCrAlY
Al₂O₃
NiCrAlY

BC ()
EDS ()

[] Al NiCrAlY
- Ni - Al α-Al₂O₃

| BC/TGO | | Al | Al ₂ O ₃ |
|--------------------------------|--|---|---|
| | | EDS | [-] |
| . | | | |
| ضخامت لایه TGO | | | |
| BC/TC | | Ni | Al ₂ O ₃ Cr ₂ O ₃ NiO |
| FGM | FGM | Ni | BC |
| | | Al ₂ O ₃ Cr ₂ O ₃ | |
| | | Ni(Cr,Al) ₂ O ₄ NiO | |
| | | Al ₂ O ₃ | [] |
| Al ₂ O ₃ | | Al ₂ O ₃ | () |
| | | Al ₂ O ₃ | |
| | | (-) | Al ₂ O ₃ |
| | | () | B |
| | | () | A |
| :K _p t | h) h ² = 2K _p .t | Al | (B) |
| Al ₂ O ₃ | [](| (A) | |
| | K _p ^{1/2} | | Cr Ni |
| | K _p | | Al |
| / μ m ² /s | FGM | | Al ₂ O ₃ Al |
| | | | Al |
| | FGM | Al ₂ O ₃ | |
| | | Ni(Cr,Al) ₂ O ₄ | |
| | FGM | Al | |
| | | [] | |
| | | (-) | /TGO |
| | °C | TBC | YSZ |
| FGM | | | |
| | TBC | | Al ₂ O ₃ |
| | FGM | | |
| | | TBC | [] |
| | | | / |
| . | | / : | Cr ₂ O ₃ NiO Al ₂ O ₃ |
| | | | / / |

نتیجه گیری

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واژه های انگلیسی به ترتیب استفاده در متن

- 1 - Thermally Grown Oxide
- 2 - Thermal Barrier Coating Systems
- 3 - Functionally Graded Materials
- 4 - Sandblasting
- 5 - Yittria Stabilized Zirconia
- 6 - High Velocity Oxy Fuel
- 7 - Air Plasma Spray