

(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

FGM

XRD

EDS

- MCrAlY TBC -

واژه های کلیدی:

FGM

مقدمه

α -Al₂O₃

[]

TGO

[]

(TBC)

(TBC)

Co = M) MCrAlY

(Ni

(TGO -)

[]

Y₂O₃

NiCrAlY

(YSZ)

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[]

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 |

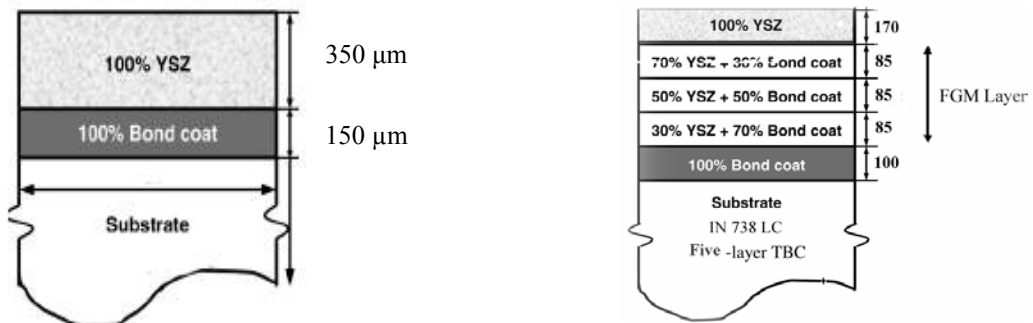
APS :

| 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 |

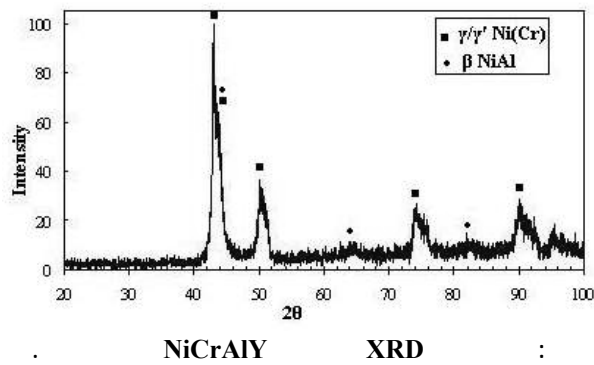
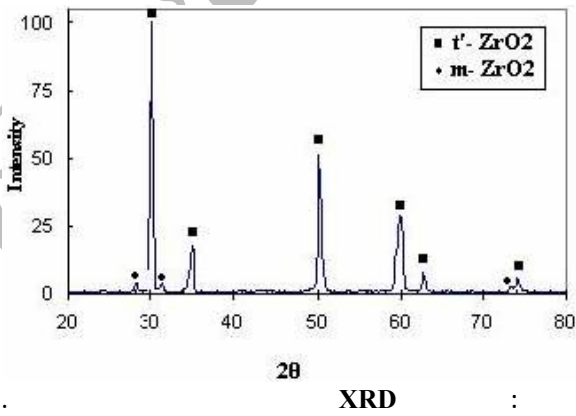
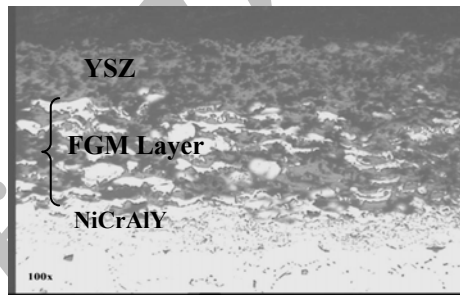
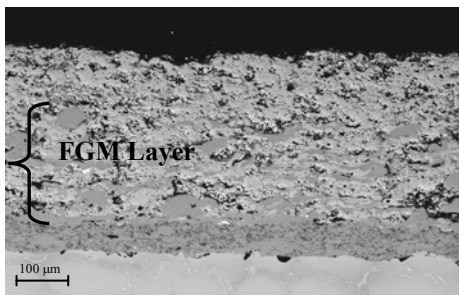
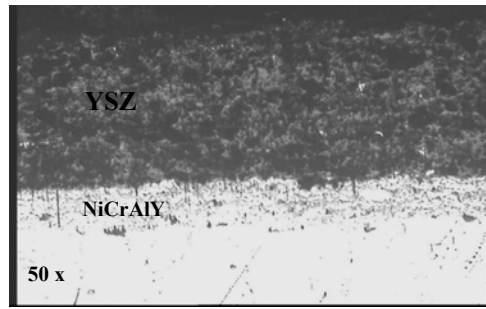
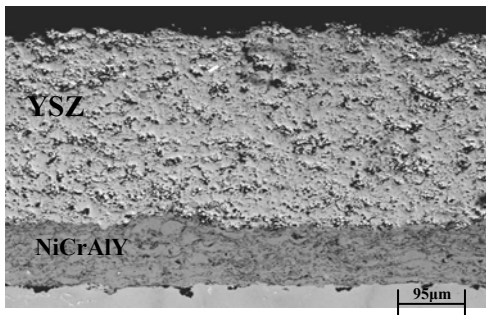
FGM YSZ/NiCrAlY :

| 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) |

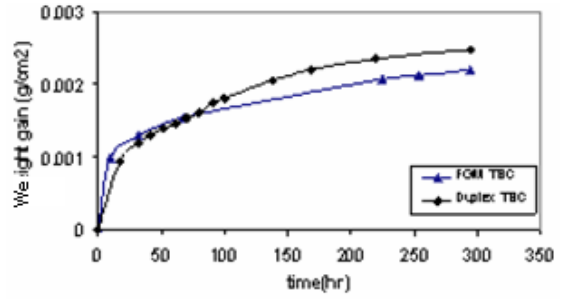
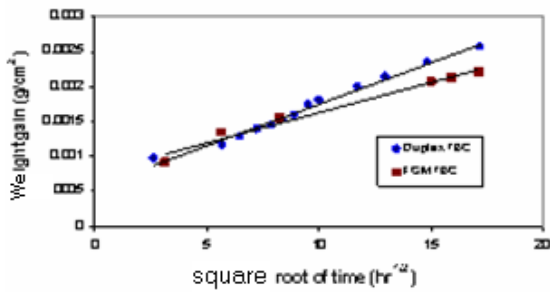
Z: ZrO₂-8wt% Y₂O₃; N: NiCrAlY



(μm) (FGM TBC) :

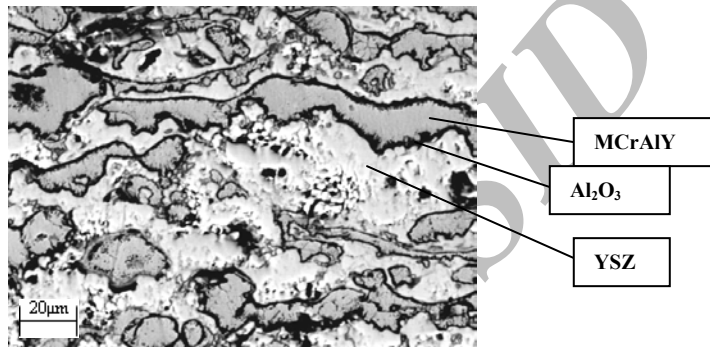


| NiCrAlY | | EDS | | یافته ها و بحث ریزساختار |
|-------------------------------|--------------------------------|-------|---------|-----------------------------|
| YSZ | | | | |
| NiCrAlY | : | | | |
| | | YSZ | | (-) |
| NiCrAlY | YSZ | | | |
| () | YSZ | [] | XRD | YSZ NiCrAlY (-) YSZ |
| (m-ZrO ₂) | | | YSZ | YSZ NiCrAlY |
| | (t'-ZrO ₂) | | | HVOF |
| t'-ZrO ₂ | | | | NiCrAlY |
| ZrO ₂ | | | | |
| t' | | | | FGM (-) |
| Y ₂ O ₃ | | | | |
| ZrO ₂ | YSZ | () | | |
| | | (+) | | |
| | | [] | | |
| | | YSZ | | |
| | | [] | NiCrAlY | () |
| β γ/γ | | | | FGM |
| β γ/γ | () | | XRD | |
| | Al ₂ O ₃ | | | |
| | | | NiCrAlY | FGM |
| | | | | NiCrAlY+YSZ |
| | | | NiCrAlY | YSZ |

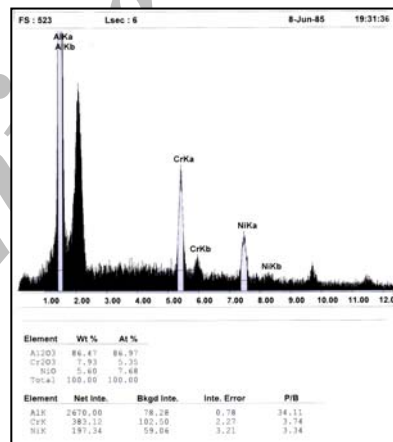


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FGM NiCrAlY



NiCrAlY

EDS

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FGM

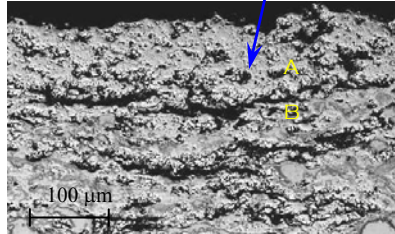
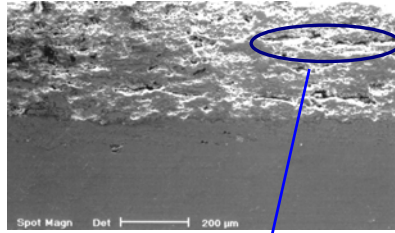
(-)

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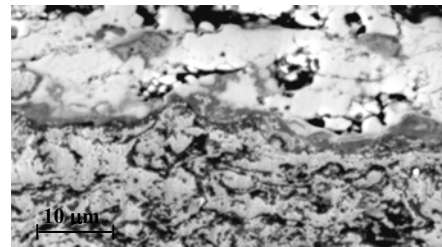
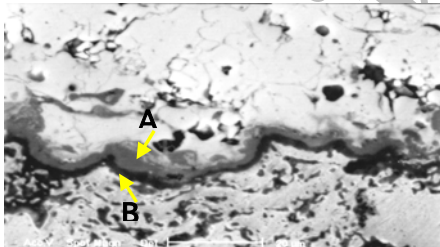
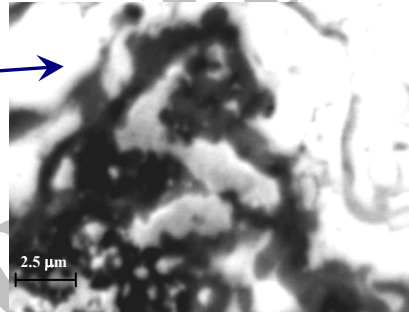
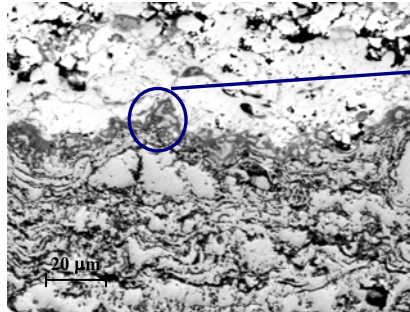
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YSZ

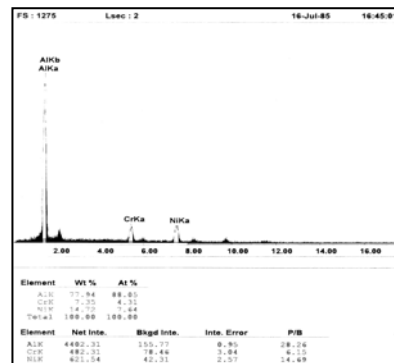
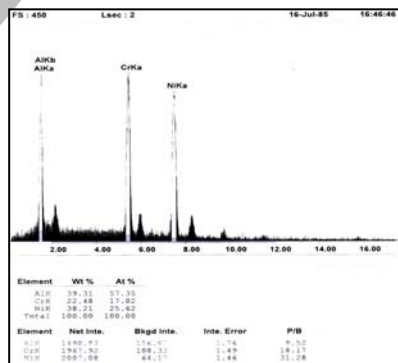
FGM



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(Al_2O_3

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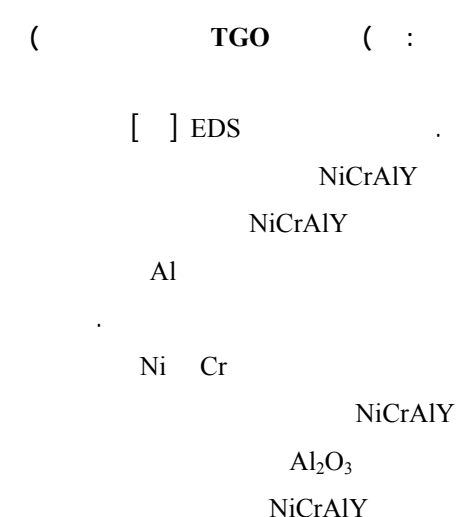
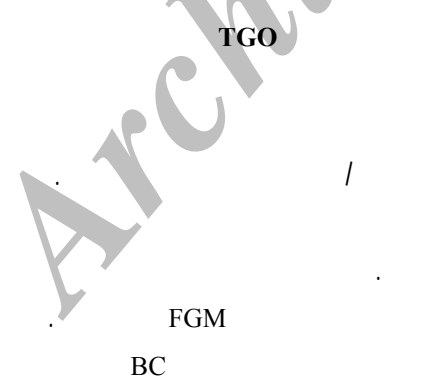
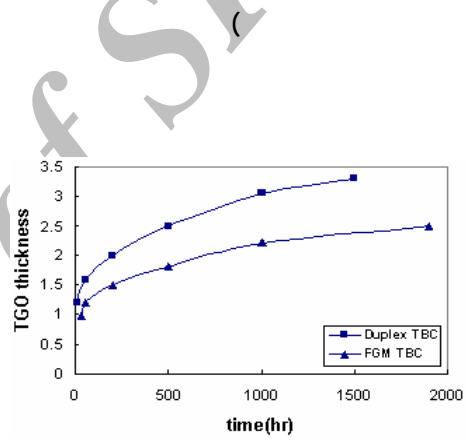
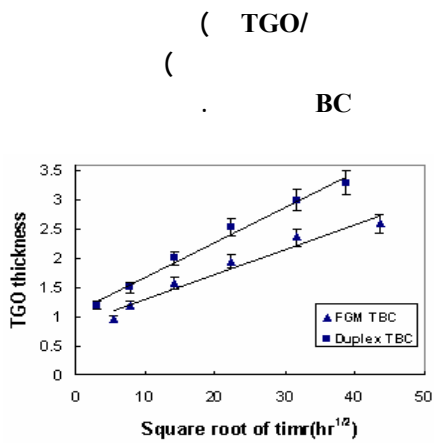
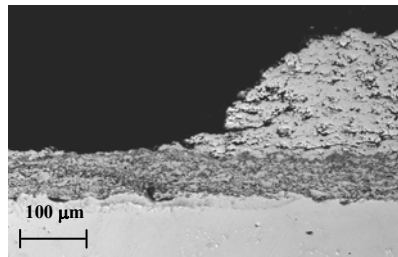
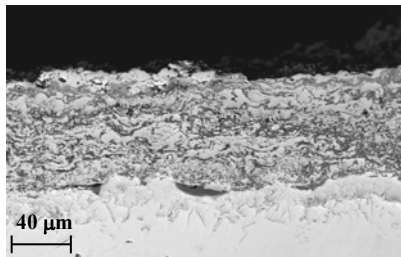
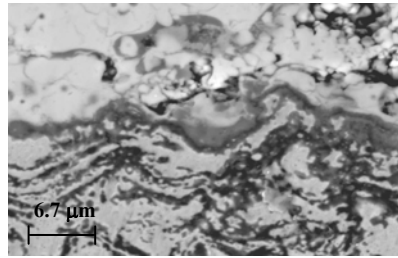
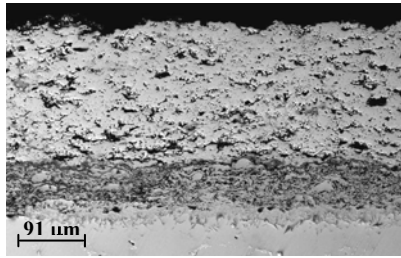


(A)

(B)

(EDS

:



BC ()
EDS ()

[]
- Ni - Al - NiCrAlY - α-Al₂O₃

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