

2<sup>nd</sup> International Conference and Exhibition on  
**Materials Science and Chemistry**  
July 13-14, 2017 Berlin, Germany

### State of the art on laser sealing of zirconia-based plasma sprayed thermal barrier coatings

Maryam Ali Bash<sup>1</sup>, Mohammed Jasim Kadhim<sup>1</sup> and Mohammed Hilyil Hafiz<sup>2</sup>

<sup>1</sup>University of Technology, Iraq

<sup>2</sup>Al-Iraqi University, Iraq

The backbone for thermal barrier coatings has been well recognized as zirconia based ceramics which are mostly produced using plasma spraying techniques. Defects which have been usually present in plasma sprayed coatings may lead to easily penetrate the harmful species in the fuel and then diffused into the coating which leading to accelerate degradation. The work summarizes the important highlight points relative to the gas and solid state lasers processing of advanced plasma sprayed coatings used in advanced thermal barrier coatings turbine engines. The reduction or even elimination of these problems during servicing using CO<sub>2</sub>, Nd<sup>3+</sup>-YAG and Yb<sup>3+</sup>-YAG lasers can highly improve the lifetime of the TBCs systems. The paper reports and analyzed all the relevant works of laser sealing of plasma sprayed coatings. The recent work by the authors has been investigated the effect of processing and laser parameters of continuous wave high power solid state Yb<sup>3+</sup>-YAG fiber laser on sealing thermal plasma sprayed zirconia-ceria-yttria thermal barrier coating. It was found that the sealed coatings having shinny appearance, dense microstructure with nearly nil depressions and very low thickness evaporation. They also postulated that the sealed coatings characterized with very fine cell size, very low roughness and having network crack spacing. These network crack spacing were formed due to sever laser thermal shock associated with high temperature gradient. The network crack spacing improves considerably the strain tolerance of the thermal barrier coating system and finally enhances the durability. Many different mathematical relationships were deriving between the output performances and the dependent laser variables of power density, interaction time and specific energy.

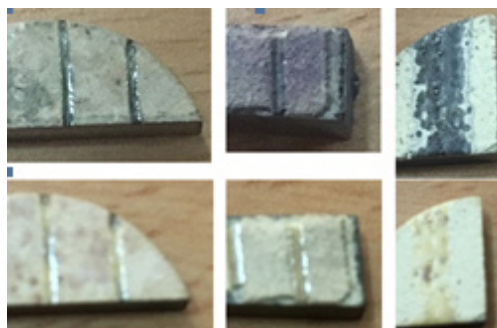


Figure 1: Showing yellow color after restoring of oxygen,

#### Biography

Maryam Ali Bash has done her BSc and MSc in Metallurgical Engineering and is currently a PhD student in the Department of Production Engineering and Metallurgy, University of Technology, Baghdad, Iraq. She has exceptional expertise in design and analysis of the relationship between the microstructure and behavior of alloys and advanced ceramics. The fields of her interest are thermal barrier coatings, hot corrosion and laser processing of advanced plasma sprayed ceramic coatings. She developed many new approaches for mixing of advanced powders and performance of advanced ceramic coatings. She has excellent record in lecturing on the materials science and engineering, non-destructive testing such as FT-IR, AFM, Raman spectroscopy, EPMA, EDS and XRD.

mayam\_uot@yahoo.com

#### Notes: