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# Effect of laser sealing on hot corrosion resistance of ceria-yttria stabilized zirconia thermal barrier coating exposed to eutectic vanadium pentoxide-sodium sulfate

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Yttria partially stabilized zirconia (YPSZ) systems which are worldwide acceptable TBC for many advanced turbine engines, since developed before more than 30 years till now are widely investigated for high temperature corrosion resistance and for laser sealing. New system based on ceria-yttria stabilized zirconia ceramic thermal barrier coating sprayed above Ni24.5Cr6Al0.4Y bond coat deposited using semiautomatic air plasma spray on Inconel 738 LC superalloy substrate was investigated. The upper surfaces of thermal barrier coating system were sealed using high power $Yb^{+3}$-YAG laser. The as-sprayed and as-sealed coatings were tested for hot corrosion resistance at different temperatures and exposure times in a mixture of eutectic $V_2O_5$-$Na_2SO_4$. The upper surface plan views and transverse sections of the exposed samples were analysis using SEM, EDS, EPMA, XRD, FT-IR, atomic force microscopy and Raman spectroscopy. The laser sealed samples showed higher hot corrosion resistance under all tested conditions compared with its counterpart plasma sprayed coating. The presence of ceria in the thermal barrier coating reduced considerably the corrosion rate of as-sprayed and as-sealed thermal barrier coatings. The most dominant phase formed was $YVO_4$ rather than $CeVO_4$. The most detrimental defects accelerate the hot corrosion rate were porosity and voids. The presence of depression in the sealed coatings encouraged the reaction between the harmful species and the constituent of the zirconia based coating. The formation of harmful products of $YVO_4$ and $CeVO_4$ encourage the transformation of non-transformable tetragonal phase to monoclinic phase.

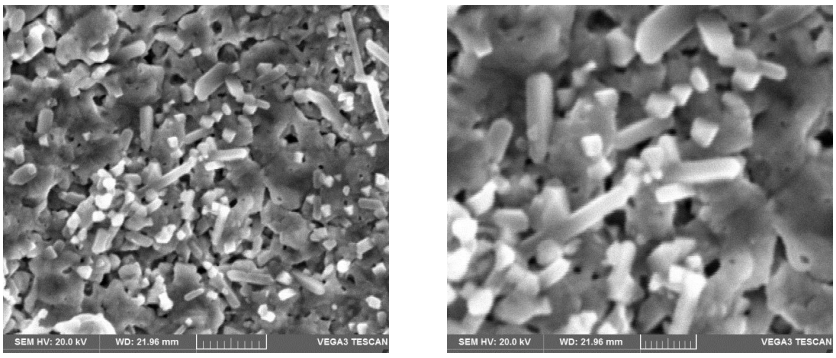


**Figure 1:** Sever attacks of salts at depressions of laser sealed plasma sprayed coating at 900oC for 8 hr showing the harmful nature of depressions.

## Biography

Maryam Ali Bash has BSc and MSc degrees in Metallurgical Engineering and is currently a PhD student at the Department of Production Engineering and Metallurgy, University of Technology, Baghdad, Iraq. She attend many worldwide conferences in Europe to presents her work. She has exceptional expertise in design and analysis the relationship between the microstructure and behavior of alloys and advanced ceramics. The most scientific 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 trained very well to improve her currier during the last 12 years in the area of design, materials selection, microstructural analysis, hot corrosion, oxidation and processing analysis. She has excellent record in lecturing on the materials science and engineering, non-distractive testing such as FT-IR, AFM, Raman spectroscopy, EPMA, EDS and XRD.

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