# THERMOPHYSICAL, MICROSTRUCTURAL CHARACTERISATION AND NON-DESTRUCTIVE CONTROL OF TBCS BY PHOTOTHERMAL AND THERMOGRAPHIC TECHNIQUES: SOME LESSONS LEARNED

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Key Words: Photothermal techniques, NDE&T, thermography, thermal diffusivity, microstructure.

Since several years, photothermal and thermographic techniques have been used to perform the thermo-physical characterisation of TBCs and the non-destructive assessment of TBC integrity. Furthermore, in the last decade some attempts to use these techniques for carrying out a non-destructive microstructural characterization have been done, as well. In this talk the description of a thermographic technique able to simultaneously measure the through-the-thickness and the in-plane thermal diffusivity of free standing TBCs samples and thus giving evidence of the typical microstructural anisotropy of APS TBCs will be provided [1]. Furthermore, some effects of the laser radiation used in a laser flash experiment on the TBC thermal diffusivity and a new model for fitting the experimental data will be presented [2,3].

The main results of an activity focused to identify potentialities and limitations of using Laser flash experiments on multilayered samples for estimating thermal diffusivity of TBCs samples will be provided.
A theoretical and experimental analysis of the real capabilities of infrared techniques to estimate the porosity content and the microstructure of porous ceramic materials such as thermal barrier coatings (TBCs) by studying thermal diffusivity variations when pores are filled with air or vacuum will be provided [4,5].

The method [6] for the semi-quantitative estimation of the interface cracked fraction between the bondcoat and TBC, within coupons subjected to thermal cycling, will be proposed. It consists on the evaluation of the TBC thermal diffusivity evolution during ageing compared to the as sprayed value. A critical analysis, starting from the contradictory results obtained applying this method on several sets of APS TBC samples, complements the topic. A successful case of integrating the aforementioned approach with the apparent thermal effusivity method [7] to monitor damage progression of Bondcoat-TBC interface over thermal cyclic oxidation tests will be presented together with the comparison with computed tomography images of the same samples.

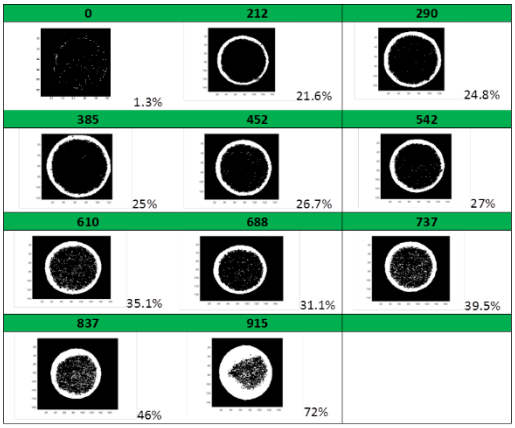


*Figure 1 - Delamination evolution as a function of aging cycles (on top of each image) at high temperature estimated by the apparent effusivity method. Delaminations are represented as white pixels. The quantitative estimation of delaminated area is provided close to each image.*

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