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V Congreso Hispano-Luso de Cerámica y Vidrio

Characterization of a Functionally Gradient Ceramic Based on $CaZrO_3$ – MgO

Débora Babo[1], J. Nunes Pereira[1], Pedro D. Silva[1], Pilar Pena[2], Carmen Baudin[2], Abílio P. Silva[1*]

[1]Centre for Mechanical and Aerospace Science and Technologies (C-MAST-UBI), Universidade da Beira Interior, Rua Marquês d'Ávila e Bolama, 6201-001, Covilhã, Portugal, [2]Instituto de Cerámica y Vidrio, CSIC, Kelsen 5, Madrid 28049, Spain

E-mail *abilio@ubi.pt*

In the case, where the structure is exposed to severe conditions of operation, such as high strength, wear and high-temperature gradients (e.g. engine components, insulation system, thermal barrier and thermal shield) must be applied.
In this work, it was developed and characterized a functional gradient ceramic coating. A ceramic composite based in $CaZrO_3$ – MgO was used in order to design a material with successive layers of molar composition 2:3, 1:1 and 1:3 of $CaZrO_3$:MgO, respectively. A dense material was obtained by sintering assisted reaction (Figure 1). Thermal conductivity at room temperature, hardness, fracture toughness, surface energy, and microstructure were characterized.

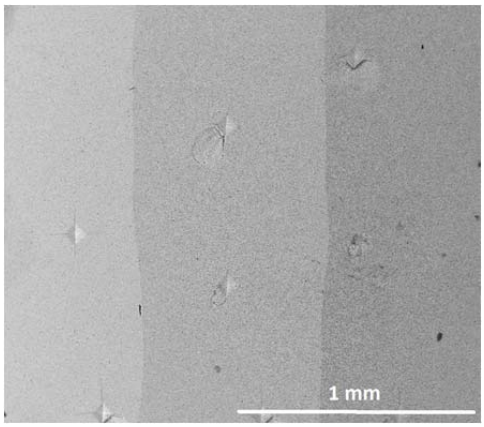

Figure 1: Three layer of $CaZrO_3$ – MgO with molar composition of 2:3, 1:1 and 1:3.

The results show for monolithic specimens of 2:3 CZ, 1:1 CZ and 1:3 CZ a *H* of 9,9 *GPa*, 9,8 *GPa* and 10,1*GPa*; a K_c of 1,6 $MPa.m^{1/2}$, 1,7 $MPa.m^{1/}$ and 2,1 $MPa.m^{1/2}$; a *k* of 0,59 *W/mK*; 0,76 *W/mK* and 0,79 *W/mK*; and a surface energy (*SE*) of 43,27 *mN/m*, 51,39 *mN/m* and 46,55 *mN/m*, respectively. The functional gradient ceramic shows a *H* of 10,7 *GPa*, a K_c of 1,97 $MPa.m^{1/2}$; a *k* of 0,82 *W/mK* and *SE* of 53,98 *mN/m*. The individual composition and the functional gradient ceramic show a similar relative density of 4,3 g/cm^3 and a porosity of 0,2%. This design methodology has the advantage of allowing the properties of the same material to suit different substrates.

ACKNOWLEDGMENTS

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