

Accepted Manuscript

Title: Improved Properties of Scandia and Yttria Co-doped Zirconia as a Potential Thermal Barrier Material for High Temperature Applications

Authors: W. Fan, Z.Z. Wang, Y. Bai, J.W. Che, R.J. Wang, F. Ma, W.Z. Tao, G.Y. Liang



PII: S0955-2219(18)30364-9
DOI: <https://doi.org/10.1016/j.jeurceramsoc.2018.06.002>
Reference: JECS 11923

To appear in: *Journal of the European Ceramic Society*

Received date: 27-12-2017
Revised date: 5-5-2018
Accepted date: 1-6-2018

Please cite this article as: Fan W, Wang ZZ, Bai Y, Che JW, Wang RJ, Ma F, Tao WZ, Liang GY, Improved Properties of Scandia and Yttria Co-doped Zirconia as a Potential Thermal Barrier Material for High Temperature Applications, *Journal of the European Ceramic Society* (2018), <https://doi.org/10.1016/j.jeurceramsoc.2018.06.002>

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Improved Properties of Scandia and Yttria Co-doped Zirconia as a Potential Thermal Barrier Material for High Temperature Applications

W. Fan ^a, Z.Z. Wang ^a, Y. Bai ^{a,*} byxjtu@mail.xjtu.edu.cn, J.W. Che ^b, R.J. Wang ^c, F. Ma
^a, W.Z. Tao ^d, G.Y. Liang ^b

^a State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an,
710049, PR China

^b MOE Key Laboratory for Non-equilibrium Synthesis and Modulation of Condensed Matter, Xi'an
Jiaotong University, Xi'an, 710049, PR China

^c Beijing Jinlunkuntian Special Machine Co., Ltd, Beijing, 100083, PR China

^d Jiangsu Lida Hi-Tech Special Material Co., Ltd, Changshu, 215500, PR China.

*Corresponding author.: Tel.: +86-29-82668614; fax: +86-29-82663453.

Abstract:

Due to the limited temperature capability of current YSZ thermal barrier coating (TBC) material, considerable effort has been expended world-wide to research new candidates for TBC applications above 1200 °C. Our study suggested that Sc₂O₃ and Y₂O₃ co-doped ZrO₂ (ScYSZ) had excellent *t'* phase stability even after annealed at 1500 °C for 336 h. The thermal expansion coefficient of ScYSZ was comparable to the value of YSZ. The thermal conductivity of fully dense ScYSZ was in the range of 2.13-1.91 W·m⁻¹·K⁻¹ (25-1300 °C), approximately 25 % lower than that of YSZ. Although the fracture toughness of dense ScYSZ was slightly lower than YSZ, an evident decline in elastic modulus was found. Additionally, thermal cycling lifetime

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