Supporting information

Enhanced thermal shock resistance of ultra-high temperature ceramic by biomimetic surface modification

Baoxi Zhang,[a] *Xinghong Zhang*,[a] *Yunfeng Qiu*,[a] *Jiecai Han*, *[a], *PingAn Hu*, *[b] *Changqing Hong*,*[a] *Zujun Peng*,[a] *Wenbo Han*,[a] *Guiqing Chen*,[a] *Ping Hu*[a]

[a] Science and Technology on Advanced Composites in Special Environments Laboratory, Harbin Institute of Technology, Harbin, Heilongjiang, 150080, P. R. China

[b] Key Lab of Microsystem and Microstructure, Harbin Institute of Technology, Ministry of Education, No. 2 YiKuang Street, Harbin, 150080, P. R. China

*Corresponding author e-mail: hanjc@hit.edu.cn (J. C. Han), hupa@hit.edu.cn (P. A. Hu) and hongcq@hit.edu.cn (C. H. Hong)

Table of Contents

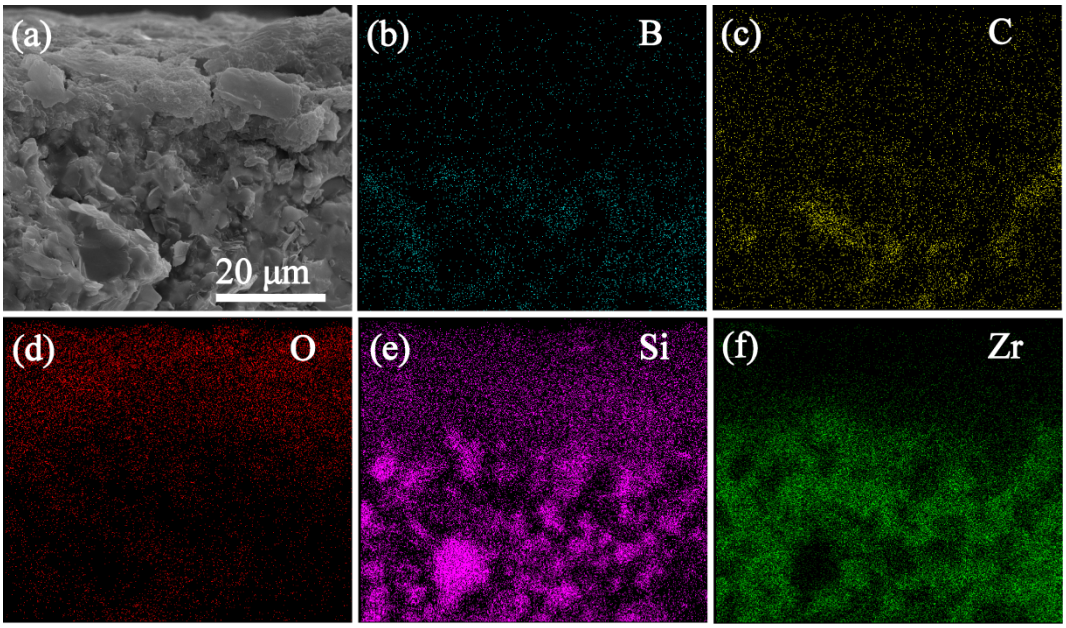

Fig. S1 Mapping images of elements distribution. (a) A cross-sectional SEM image of specimen with coating. (b-f) The mapping images of B, C, O, Si and Zr elements for specimen with YSZ coating, respectively.

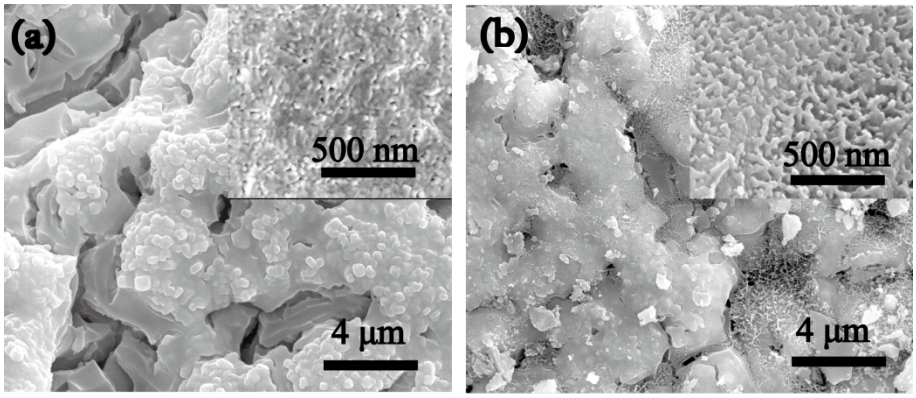

Fig. S2 Typical top SEM images of the first (a) and second (b) round dip-coating and calcination at 600 ˚C, respectively.

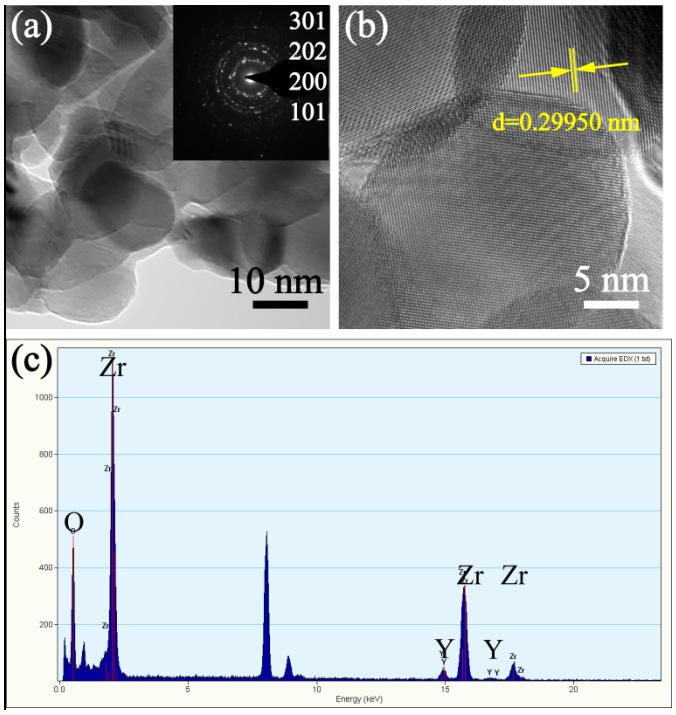

Fig. S3 TEM images of YSZ powders. (a) The typical conventional TEM bright fields of the YSZ powders and the SAED pattern (the inset). (b) A HR-TEM image taken from the same area. (c) Energy-dispersive analysis microscope (EDAM) of YSZ coating.

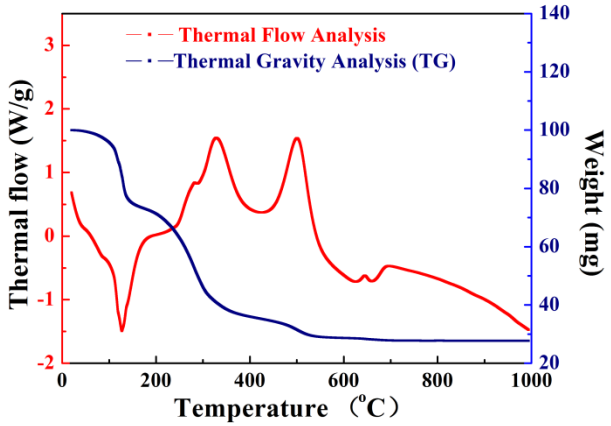

Fig. S4 TG and DSC curves of YSZ gel.

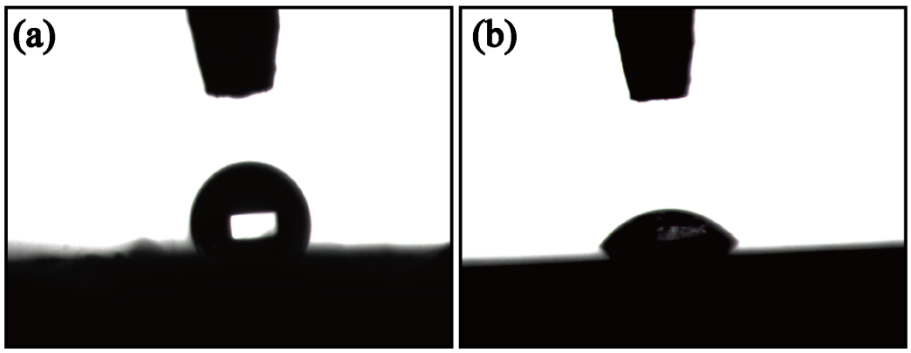

Fig. S5 The digital camera images of deionized water drops on the samples with (a) and without nanostructures (b), respectively.

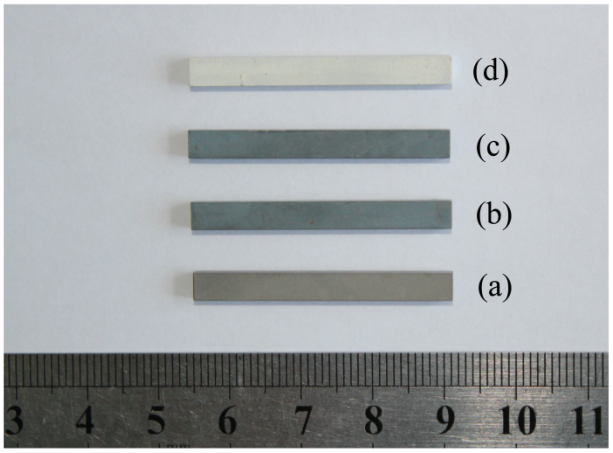

Fig. S6 The typical optical images of ZrB_2 ceramic matrix composite (a), oxidation at 900 ˚C for 1 h (b), alkali treatment with concentrated $NH_3 \cdot H_2O$ and H_2O_2 at 90 ˚C for 1 h (c), the third dip-coating and calcination at 600 ˚C (d).