Title: A novel theoretical model to predict the temperature-dependent fracture strength of ceramic materials

Authors: Yong Deng, Weiguo Li, Jiaxing Shao, Xianhe Zhang, Haibo Kou, Peiji Geng, Xuyao Zhang, Ying Li, Jianzuo Ma

PII: S0955-2219(17)30467-3
DOI: http://dx.doi.org/doi:10.1016/j.jeurceramsoc.2017.06.044
Reference: JECS 11348

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

Received date: 28-4-2017
Revised date: 19-6-2017
Accepted date: 24-6-2017

Please cite this article as: Deng Yong, Li Weiguo, Shao Jiaxing, Zhang Xianhe, Kou Haibo, Geng Peiji, Zhang Xuyao, Li Ying, Ma Jianzuo.A novel theoretical model to predict the temperature-dependent fracture strength of ceramic materials.*Journal of The European Ceramic Society* http://dx.doi.org/10.1016/j.jeurceramsoc.2017.06.044

A novel theoretical model to predict the temperature-dependent fracture strength of ceramic materials

Yong Deng, Weiguo Li*, Jiaxing Shao, Xianhe Zhang, Haibo Kou, Peiji Geng, Xuyao Zhang, Ying Li and Jianzuo Ma

State Key Laboratory of Coal Mine Disaster Dynamics and Control, College of Aerospace Engineering, Chongqing University, Chongqing 400030, China

*Corresponding author's address: College of Aerospace Engineering, Chongqing University, Chongqing 400030, China.
Phone number: +86 13452029896 (mobile phone)
Fax: +86 023 65102421.

E-mail address: wgli@cqu.edu.cn

Abstract

A novel temperature-dependent fracture strength model for ceramic materials is developed, based on a critical fracture energy density associated with material fracture comprising strain energy, the corresponding equivalent potential energy, and kinetic energy of atoms per unit volume. It relates the fracture strength at high temperatures to that at the reference temperature, the temperature-dependent Young's modulus, the temperature, and the melting point. The model is verified by comparison with experimental data of ceramic materials. The model predictions and the experimental data are in excellent agreement with each other. As the Young's modulus can easily be obtained by experiments and the melting point can easily be obtained by materials