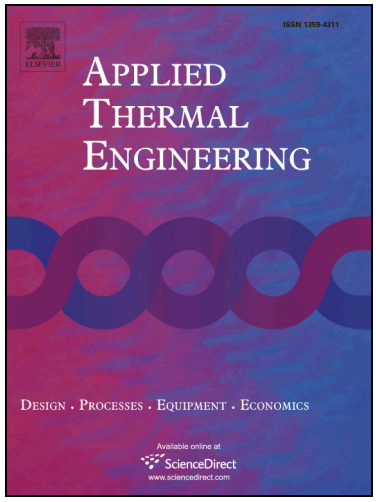

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Yuzhang Wang, Hongzhao Liu, Xixiang Ling, Yiwu Weng

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Effects of pore microstructure on the effective thermal conductivity of thermal barrier coatings

Yuzhang Wang *, Hongzhao Liu, Xixiang Ling, Yiwu Weng

School of Mechanical Engineering, Gas Turbine Research Institute, Shanghai Jiao Tong Univ., 800 Dong Chuan Rd. Shanghai 200240, P.R. China

Abstract:

The pore microstructure of thermal barrier coatings (TBCs) has great effect on its heat transfer performance. However, it is difficult to establish structure-property relationships of TBCs due to inhomogeneous geometry microstructures. In this work, various anisotropic microstructures of TBCs were reconstructed using the developed software based on four parameter stochastic growth method. Heat transfer performance of these coatings was numerically investigated using the developed numerical calculation software based on the thermal resistance network method. The effective thermal conductivity and the temperature field at the steady state were obtained. The results show the effect of size and shape of pores on the effective thermal conductivity of columnar and layered TBCs is different, and these effects increase with the porosity. At the same porosity, the effective thermal conductivity of the layered structure TBCs increases with the decrease of pores size and logarithmically decreases with the elongated pores. In contrast, the effective thermal conductivity of columnar structure TBCs decreases with the decrease of pores size

* Corresponding author. Tel.: +86 21 3420 6031; fax: +86 21 3420 6342.
E-mail address: yuzhang_wang@yahoo.com (Y. Wang).