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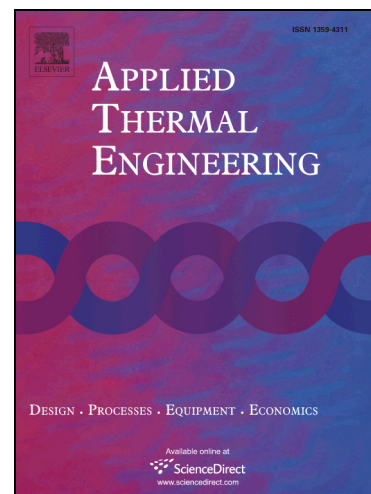
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Effects of pore microstructure on the effective thermal conductivity of thermal barrier coatings

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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

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