Measurement of Thermal Conductance of Microcrack Interfaces in Composite Materials

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Application of stress on ceramic-matrix composites can lead to formation of microcracks in the matrix and debonding between the fiber and the matrix. The additional interfaces created by such processes can reduce the effective thermal conductivity of these materials. In applications involving high heat fluxes and thermal stresses such as in combustor linings, reduction of thermal conductivity by microcracks can lead to higher temperature gradients, higher thermal stresses, more matrix cracking, and eventually catastrophic failure. For the purpose of design, therefore, it is important to quantify the reduction of thermal conductivity due to microcracks. This paper will present some of the first quantitative measurements of the conductance of microcracks as a function of crack opening displacement. The data will be used to understand the role of fibers in thermal bridging across the cracks.