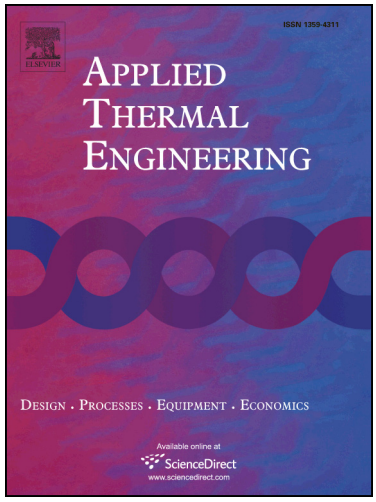

Research Paper

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Transient interlaminar thermal stress in multi-layered thermoelectric materials

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Abstract: This paper studies the transient interlaminar stress in a multilayered thermoelectric material (TEM), which consists of a N-type and a P-type thermocouple, separated by an insulating layer. Analytical solution for one-dimensional temperature and the associated interlaminar stresses at the steady-state and the transient state are obtained. The influence of insulating layer's thickness and material properties on the peeling stress, which is the key reason for delamination, has also been investigated. Distribution of the temperature and interlaminar stress are presented graphically. The interlaminar stress at the free ends of the TEM shows significant stress concentration. A thinner insulating layer results in a smaller interlaminar stress. The interlaminar stress also reduces if the insulting layer has a smaller Young's modulus. The value of the transient interlaminar stress is found to be very different from that of the steady-state. Overall, the interlaminar stress level at the transient-state is higher than that at the steady-state.

Keywords: Thermoelectric material, Multilayered material, Interlaminar stress, Transient heat conduction

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