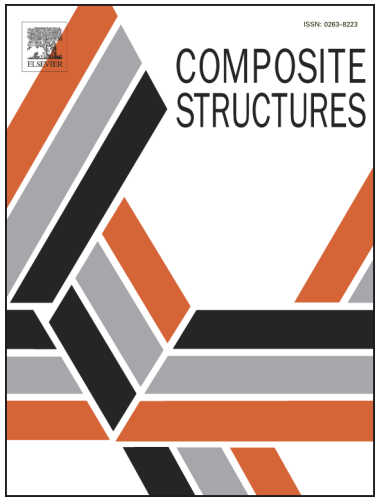

Effective thermoelectric conversion properties of thermoelectric composites containing a crack/hole

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Effective thermoelectric conversion properties of thermoelectric composites containing a crack/hole

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ABSTRACT: Despite the wide applications in engineering of thermoelectric materials, effective thermoelectric conversion behavior of cracked thermoelectric composites has never been investigated so far. To establish the effective properties of a thermoelectric composite, we revisit the general model of a bi-layered thermoelectric composite system with an interfacial crack and study the effect of interfacial cracking on the thermoelectric properties. Through an equivalent principle, the effective thermoelectric properties are given and the influence of applied temperature, crack boundary, crack size, and crack shape are discussed in detail. Generally, a higher effective figure of merit (thermoelectric conversion efficiency) can be obtained in a cracked thermoelectric composite. A significant increase of the effective figure of merit can be observed as the crack size getting larger. In practical engineering, the results in this paper will have a good approximation for cracked thermoelectric composites and can be directly used for design and optimization of thermoelectric devices.

Keywords: thermoelectric materials; effective thermoelectric properties; interfacial crack.

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