# Enhancing the isotropic thermal conductivity of composite materials

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## Abstract

The thermal conductivity of a perfect laminate composite is obviously as high as the Voigt limit in the laminate plane directions, and as low as the Reuss limit in the normal direction. We [1] recently found that the isotropic thermal conductivity of two-phase composites can be significantly enhanced by structural design. It has been generally recognized [2] that the range of the isotropic thermal conductivity of composite materials is limited by the Hashin and Shtrikman's theoretical upper and lower bounds [3]. Theoretical analysis [4], computational simulation [5], and experimental measurement [6] have shown that the isotropic conductivities of conventional particle composite materials are not only always within the Hashin and Shtrikman's upper and lower bounds, but usually much closer to their lower bound than their upper bound.

We recently designed type types of composite materials [1, 7, 8], which not only could have a Young's much larger than the Voigt limit and a Poisson's ratio at a desire value (e.g. positive, negative, or 0), but also have an isotropic conductivity either approximately the same as the Hashin and Shtrikman's theoretical upper bound or significantly larger than the conductivity of the conventional particle composites.

## References

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