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**Thermal and thermoelectric properties of individual single-walled carbon nanotubes, Bi-based and III-V nanowires**[1]

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Electronic and thermoelectric materials can be nanostructured to confine electrons and phonons in one or more dimensions so as to engineer the transport and interaction of charge and heat. Various classical and quantum size confinement effects on the thermal and thermoelectric properties have been suggested by theoretical calculations, but have not been experimentally verified due to the difficulty in nanoscale thermal transport measurements. We have developed MEMS (microelectromechanical systems) sensor devices for measuring the thermal and thermoelectric properties of individual one-dimensional nanostructures. Using the sensor devices, we have observed record-high thermal conductivity and ballistic phonon transport in single-walled carbon nanotubes, suppressed thermal conductivity in semiconductor nanowires, and enhanced thermoelectric figure of merit in bismuth telluride nanowires. These findings suggest an escalating self-heating problem in nanoelectronic devices and also novel uses of nanomaterials for thermal management and for efficient thermoelectric energy conversion.

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