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Interfacial proximity effects on nanostructure thermal transport

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Thermal transport across interfaces is a key consideration in the development of advanced nanostructured materials for thermal management and thermoelectric energy conversion. Presented here is recent work from molecular dynamics simulation that illustrates how interfacial spacing can be tailored to modify thermal transport in such materials. Specifically, two examples are discussed: thermal transport between single wall carbon nanotubes and thermal conduction in superlattices. A four order of magnitude decrease in nanotube-nanotube thermal resistance is observed as nanotube spacing decreases, and a clear thermal conductivity minimum is observed in lattice matched superlattices. Mechanical phenomena emerging from the simulations include length dependence of nanotube Young's modulus and the importance of interfacial strain in maintaining coherent lattice waves in superlattices.