Heat transport in graphene and three-dimensional nanostructured carbon

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Carbon presents a wealth of allotropic forms with a wide range of thermo-mechanical properties. For example diamond is the bulk material with the highest lattice thermal conductivity, which is exceeded only by the thermal condcutivity of carbon nanostructures, such as graphene and nanotubes.

Combining atomistic molecular dynamics simulations and lattice dynamics calculations we investigate the phonon processes that make carbon nanostructures so versatile in either efficiently conducting or blocking heat. To this aim we compare phonon transport properties of carbon nanotubes, suspended graphene, negatively curved three-dimensional graphene and diamond at different conditions.