

Phononics: manipulating and controlling phonon (heat) transport

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Heat due to lattice vibration (phonons) is regarded as harmful for information processing of electronic devices. In this talk, I will show different stories of phonons. In the first part, I will discuss the anomalous phonon (heat) transport in nanostructures such as nanotube and nanowires. In the second part, I will demonstrate via numerical simulation, theoretical analysis and experiments that, phonons, can be manipulated like electrons. They can be used to carry and process information. Basic phononic devices such as thermal diode, thermal transistor, thermal logic gate and thermal memory will be discussed via nonlinear lattice model and nanostructures. Finally, I will discuss a new phenomenon a geometric phase induced heat transport and the heat flux fluctuation theorem.