Acoustic Phonons in Ultra-Thin Silicon Membranes

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Understanding of thermal properties and behaviour of phonons in nanoscale structures is becoming more and more important due to the continuous miniaturization of devices and the consequent need to control the heat dissipation. In the literature there is an increasing collection of theoretical papers on various aspects of phononics but experimental verification of the models has proven to be challenging. Ultra-thin membranes provide one way to probe the effects of acoustic phonon confinement on thermal properties and since the earlier experiments [1, 2] there has been increasing activity in the field. In this talk we will describe the recent advances in fabrication of ultra-thin, sub-10 nm thick, silicon membranes [3], development of new characterization techniques for heat propagation based on Raman spectroscopy [4], and the consequences of confinement on acoustic phonon dispersion and phonon lifetimes [5, 6].

References

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