

Effects of Phonon Confinement in Ultra-Thin Silicon Membranes

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Understanding the behaviour of phonons in structures with reduced dimensions and, consequently, the effects on thermal properties of nanostructures is becoming more and more important due to miniaturization of devices. In the literature there is an increasing collection of theoretical papers on various aspects of nanophononics 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 early experiments [1, 2] there has been increasing activity in the field. In this presentation we describe the recent advances in fabrication of ultra-thin, sub-10 nm thick, free-standing silicon membranes [3], development of new characterization techniques for heat propagation based on Raman spectroscopy [4], and the consequences of acoustic phonon confinement on phonon dispersion and phonon lifetimes [5, 6].

References

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