

Abstract Submitted
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Thermal properties of semiconductor nanowires using electromechanics JOHN MATHEW, MANDAR DESHMUKH, Department of Condensed Matter Physics and Materials Science, Tata Institute of Fundamental Research, Mumbai, India — We present low temperature measurements of thermal expansion and diffusivity of InAs nanowires using electromechanical response of the nanowire. To realize this, we fabricate InAs nanowire devices in doubly clamped, suspended field effect transistor geometry, and use direct radio frequency detection of the nanowire electromechanics. The resonant frequency of the nanowire is studied at different temperatures as a function of applied source-drain bias voltage. Due to joule heating and the non-monotonic thermal expansion of InAs we observe positive and negative dispersion of the nanowire resonant frequency with applied bias. We also study dynamical response to heating to understand the thermal diffusivity in these sub-micron structures. We show that the resonant frequency of NEMS devices acts as a good indicator of thermal properties of semiconducting materials providing information on thermal conductivity, expansion and diffusivity.

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