

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Wide bandwidth nanowire electromechanics on insulating substrates at room temperature ABHILASH SEBASTIAN, JOHN MATHEW, SHAMASHIS SENGUPTA, MAHESHWAR GOKHALE, ARNAB BHATTACHARYA, MANDAR DESHMUKH, Tata Institute of Fundamental Research, Mumbai, India — We present a simple fabrication scheme for nano-scale devices on insulating substrates. Doubly clamped InAs nanowire resonators with local gate configuration are fabricated on sapphire substrates. Parasitic capacitance is reduced on insulating substrates thus enabling measurements at all temperatures and particularly above room temperature, an essential requirement for NEMS sensors. Mechanical motion of the nanowire is capacitively actuated and detected using a network analyser. This technique provides wide bandwidth radio frequency transduction and allows the nanowire oscillations to be probed at a much faster rate compared to mixing techniques. Both in-plane and out-of-plane vibrational modes of the nanowire are observed and the non-linear response of the resonators is studied. Quality factor of the resonator increases at low temperatures. We also study the relation between mechanical motion and thermal strains in the nanowire. This opens up a new approach in studying thermal properties of nanostructures. Our method of fabrication can be extended to NEMS devices on flexible substrates and other nanostructures.

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Date submitted: 08 Nov 2012

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