

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Eigenmodes and Vibration Spectra of Ag₂Ga Nanoneedles Measured Using Laser Doppler Vibrometry R. REIFENBERGER, L. BIEDERMANN, R. TUNG, A. RAMAN, Birck Nanotechnology Center, Purdue University, M. YAZDANPANA, ElectroOptics Research Institute and Nanotechnology Center, U. of Louisville and NaugaNeedles LLC, R. COHN, ElectroOptics Research Institute and Nanotechnology Center, U. of Louisville — Applications for selectively grown Ag₂Ga nanoneedles include high-aspect ratio conductive AFM tips, mass sensors, force sensors, and high resonant frequency nano-cantilevers. To help enable these applications, reliable estimates for the elastic modulus of these nanoneedles and the quality factors of their oscillations are of interest. We have used Laser Doppler Vibrometry (LDV) to measure the vibration spectra and eigenmodes of individual Ag₂Ga nanoneedles. An advantage of this technique is that the vibration spectra between 0 and 20 MHz can be measured with high frequency resolution, allowing the eigenfrequencies and quality factors of each resonance to be accurately determined. Using Euler-Bernoulli beam theory, the elastic modulus and spring constant can be calculated from the nanoneedles' eigenfrequencies and the dimensions of the nanoneedles. The techniques developed can be used to measure the vibrational spectra of any suspended nanowire with high frequency resolution.

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Date submitted: 07 Dec 2008

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