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Using Laser Induced Shock Waves to Investigate The Nanoparticle Transition From Bulk Behavior to Discrete Atom/Finite Size Behavior[1] BERNARD GERSTMAN, Florida International University — As particle size becomes smaller, finite size effects become important and thermo-mechanical properties of nanoparticles, such as the bulk modulus, deviate from the values of larger size particles. The change in properties from the bulk values is important from an applied standpoint as nanoparticles are used in various applications and also important for testing fundamental models of atomic interactions in finite size systems. We develop a first principles model to predict all thermo-mechanical effects generated by any laser pulse incident on a nanoparticle. The use of short enough pulses produces shock fronts in the surrounding transparent medium that the nanoparticles are immersed in, such as water or a solid polymer. We show that, using particles of decreasing size, measurements of these shock fronts in the medium allow the determination of the size at which a nanoparticle is small enough to deviate from its bulk behavior and manifest finite size effects. Because the measurements can be made in the surrounding medium, they are easier to perform experimentally.

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Bernard Gerstman
Florida International University

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