Abstract Submitted for the MAR08 Meeting of The American Physical Society

Fröhlich phonon modes in PbSe and PbS colloidal quantum dots¹ JONATHAN WRUBEL, Harvard University, BYUNG-RYOOL HYUN, NIKOLAY AGLADZE, ALBERT SIEVERS, FRANK WISE, Cornell University — The measured infrared absorption of colloidal PbSe and PbS quantum dots in hexane is shown to be dominated by absorption near the Fröhlich mode frequency position. However, in both sets of quantum dots the mode is at a higher frequency than calculated from the bulk dielectric constant, and shifts to still higher frequency with decreasing diameter of dot. This behavior is shown to be consistent with a decreasing contribution of the near-infrared and visible exciton absorption to the dielectric constant at far infrared frequencies as the particle size decreases and the band gap increases. The unique presence of Fröhlich mode absorption in a wide range of dot sizes suggests that the mechanical boundary condition of the quantum dot is a "soft" one in which vibrational amplitudes do not go to zero at the boundary.

¹Supported by NSF-DMR

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Date submitted: 12 Dec 2007

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