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Confined optical phonons in PbSe quantum dots BYUNG-RYOOL HYUN, School of Engineering and Applied Physics, Cornell University, JONATHAN WRUBEL, NICK AGLADZE, ALBERT SIEVERS, Laboratory of Atomic and Solid State Physics, Cornell University, KYUNG-SANG CHO, CHRIS MURRAY, IBM, T. J. Watson Research Center, Nanoscale Materials and Devices, FRANK WISE, School of Engineering and Applied Physics, Cornell University — We characterized the confined optical phonons of PbSe quantum dots (QDs) by Raman scattering and far-infrared (FIR) absorption spectroscopy. The size dependence of the Raman spectrum is consistent with theoretical calculations within a dielectric continuum model, considering the phonon dispersion in the bulk material. The electron-phonon coupling strengths inferred from overtones in the Raman spectra is three orders of magnitude larger than expected from the calculated electron wave functions. The FIR absorption spectra exhibit an asymmetric broad peak near the bulk LO phonon frequency. The measured spectra are inconsistent with the ?hard-boundary? condition that has been used successfully in prior work on lead-salt QDs. We will discuss the size-dependence of the confined optical phonon and the possible mechanism to explain the FIR absorption spectra of PbSe QDs.

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