Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information for: Temperature dependence of acoustic vibrations of CdSe and CdSe-CdS core-shell nanocrystals measured by low-frequency Raman spectroscopy

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Nanocrystal Characterization:

QD size was measured by transmission electron microscopy (TEM) and confirmed with small-angle x-ray scattering (SAXS). A sizing curve relating the first absorption feature energy with nanocrystal size was constructed based on TEM measurements (JEOL 2011, 200 kV) of 40 samples, which were analyzed according to the method described in Reference 1 (Figure S1). Sizes measured using SAXS were generally found to agree with TEM measurements to within ≤ 0.2 nm.

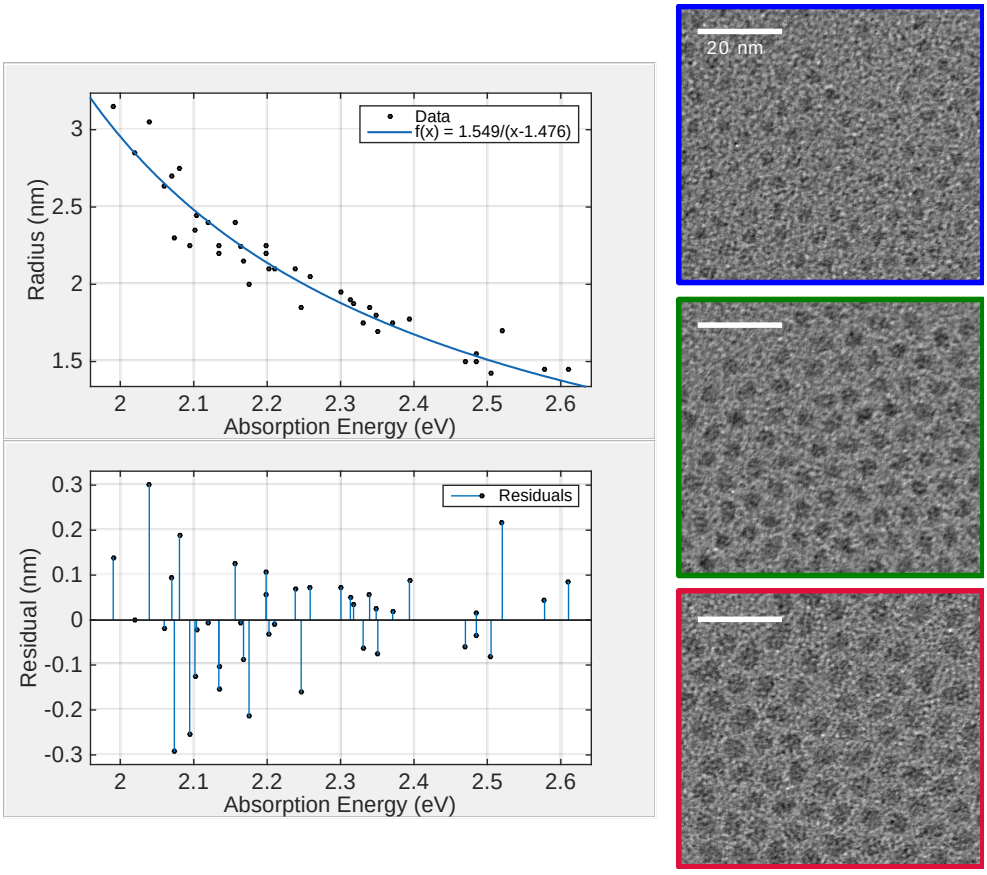

FIG. S1. Plot of QD radii measured by TEM against the first absorption peak energy for

40 QD samples with a fit line corresponding to the equation R = 1.549/(AbsPeak - 1.476) as a solid blue line. Below are residuals of the fit, with root-mean-square error 0.12 nm. This sizing curve and error were used throughout the manuscript for QD sizes. Representative QD TEM images are shown for R = 1.8 nm, 2.2 nm, and 2.6 nm QDs.

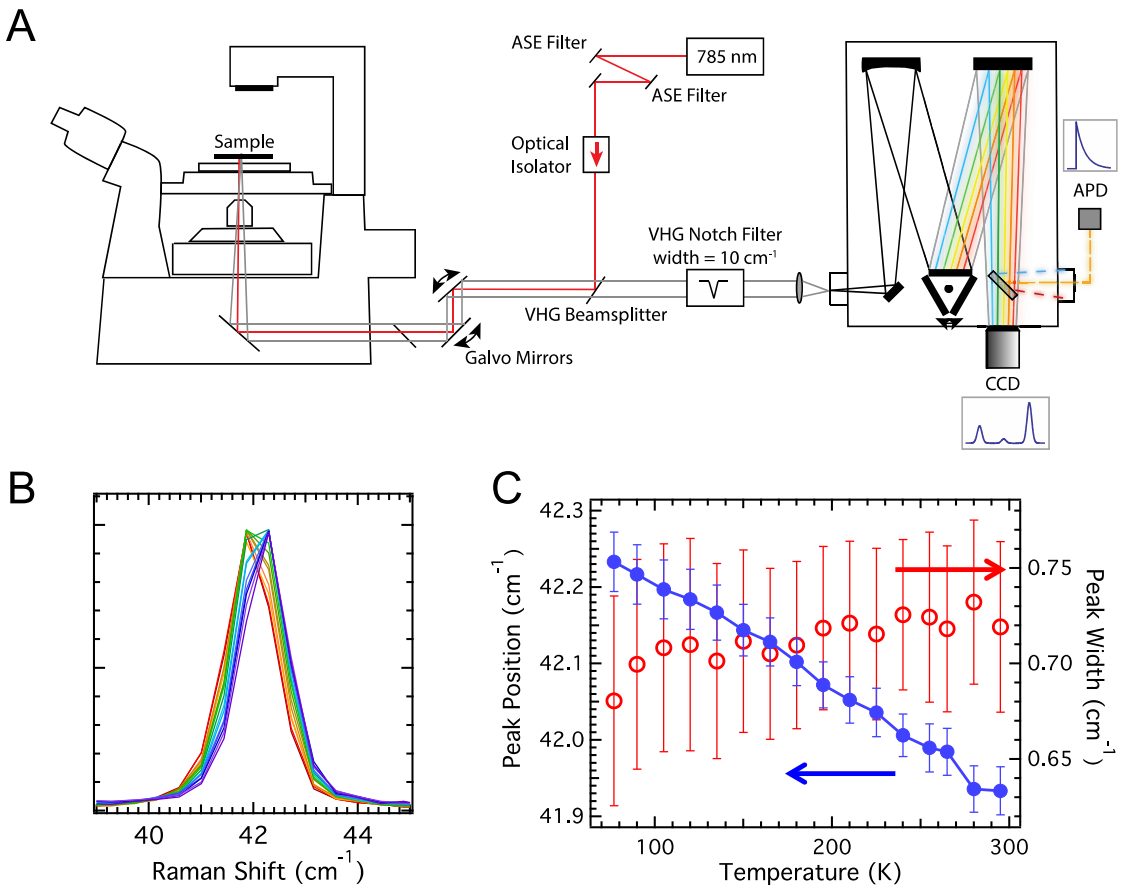

FIG S2. (A) Schematic of low-frequency Raman microscopy setup used in this work. (B) Temperature dependent Raman spectra of the E2 mode of bulk CdS. (C) The resolution of the instrument is sufficient to measure a linewidth of 0.7 cm^{-1} for this peak, as well as a temperature-dependent spectral shift after fitting the peak to a Gaussian. All QD Raman features in the main text have linewidth greater than this spectral feature.

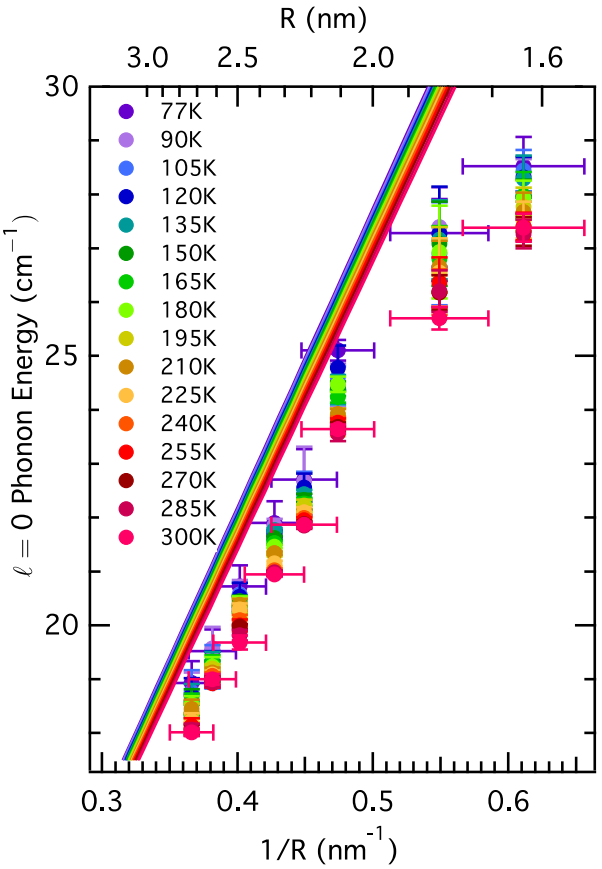

FIG S3. Reprint of Figure 3 from the main text, with x-error bars based on the RMS error from the QD sizing curve indicated.

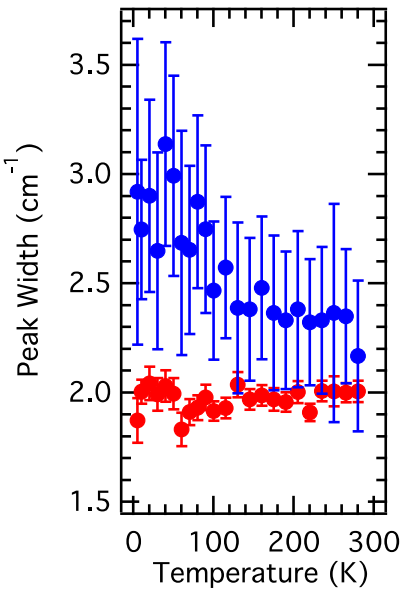

FIG S4. Raman linewidth for core-shell CdSe/CdS particles used for main text Figure 4 for the ω_1 (red) and ω_2 (blue) features. The linewidth is nearly independent of temperature, as was also observed and shown in main text Figure 2.

References:

[1] M. C. Weidman, M. E. Beck, R. S. Hoffman, F. Prins, and W. A. Tisdale, ACS Nano 8, 6363 (2014).