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Optical phonon modes of PbSe nanoparticles - a Raman and infrared study FRANCISCO CARRETO, Physics Department, FELICIA MANCIU, Physics Department, University of Texas at El Paso, El Paso TX 79968, YUDHISTHIRA SAHOO, Institute for Lasers, Photonics and Biophotonics, PARAS PRASAD, Institute for Lasers, Photonics and Biophotonics and Department of Chemistry, The State University of New York at Buffalo, Buffalo, NY 14260 — We here demonstrate the use of micro-probe Raman and far-infrared absorption spectroscopy in probing the existence of optical phonon modes of PbSe nanoparticles. The samples were prepared by colloidal chemistry and preliminary characterized by Transmission Electron Microscopy. The Raman results show evidence of the surface phonon (SP) mode. The frequency of this vibration is consistent with its prediction by a dielectric continuum model. While for different PbSe nanoparticle sizes the observed SP mode does not show any obvious change in its position, there is a clear shift by approximately 4 cm^{-1} toward higher frequency in the appearance of the longitudinal optical mode in the Raman spectra from the 3 nm to the 7 nm PbSe nanoparticles. Far-infrared measurements demonstrate the presence of the transverse optical and of the coupled phonon modes.

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