

Vibrational Quantization in Semiconductor Nanocomposites

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Semiconductor nanoparticles embedded in borosilicate glass matrix have generated considerable attention in last few years due to their wide range of applications and an important model system in the study of 3-D quantum confinements. As size is reduced in a nanoparticle; the electronic structure is modified as compared to the bulk with the oscillator strength concentrated into a few discrete transitions. Aside from modifying the electronic structure, confinement also affects coupling to optical and acoustical phonons.

In the present presentation we present a low frequency Raman scattering of $\text{CdS}_x\text{Se}_{1-x}$ and $\text{CdTe}_x\text{Se}_{1-x}$ nanocrystals embedded in borosilicate glass for various compositions and sizes. The peaks obtained in the experimental low frequency Raman spectra have been analysed by three different theoretical models. We have been able to observe the overtone of phonon mode and torsional mode against the selection rule. We attribute the presence of torsional mode to the nonspherical shape of particle confirmed by the HRTEM result.