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Probing the Electronic and Vibronic Structure of Single and Ensemble CdS Nanowires using Resonant Raman Scattering. A. ABDI, L.V. TITOVA, L.M. SMITH, H.E. JACKSON, Dept. of Physics, Univ. of Cincinnati, Cincinnati, OH 45221, J.M. YARRISON-RICE, Dept. of Physics, Miami Univ., Oxford, OH 45056, J.L. LENSCH, L.J. LAUHON, Dept. of Materials Science and Engineering, Northwestern Univ., Evanston, IL 60208 — Semiconductor nanostructure electronic and vibrational states can be sensitively probed using resonant Raman scattering (RRS) even when such states are not accessible through photoluminescence or transport techniques. We present an investigation of the electronic and vibrational states in both a single CdS nanowire and in an ensemble of CdS nanowires using RRS at room temperature. The CdS nanowire samples were grown using a chemical vapor deposition and gold-catalyzed vapor liquid solid growth technique. We observe strong 1-LO and 2-LO Raman resonances within the broader photoluminescence emission. The energy separation between the peaks of the 1-LO and 2-LO resonance of an ensemble of CdS nanowires was found to be 34 meV. Raman scattering from a single nanowire exhibits similar behavior but with a narrower resonance. These results demonstrate that RRS is a powerful tool for probing the electronic and vibrational properties of semiconductor nanostructures. We acknowledge the support of ACS through PRF, and NSF through grants 0071797, 0216374, and a graduate fellowship (JLL).

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