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Optical properties of single solution based semiconductor nanowires MASARU KUNO, VLADIMIR PROTASENKO, University of Notre Dame — The optical properties of solution based nanowires are studied using single molecule microscopy. Particular emphasis is placed on CdSe nanowires with diameters at or below 10 nm and lengths exceeding 1-10 microns. For comparison the bulk exciton Bohr radius is 5.6 nm. These wires therefore exhibit confinement effects as seen by blueshifts, both in the ensemble linear absorption and band edge emission. No deep trap emission is seen. Furthermore, branched nanowires with tripod, v-shape and y-shape morphologies can be made using the same solution based chemistry. In all cases, unusual intrawire spectral heterogeneity is observed in both the spectral position and linewidth. Fluorescence intermittency within the wire is also observed and has been shown to exhibit power law on-time and off-time probability densities. Possible explanations for this intrawire heterogeneity include dielectric contrast effects as well as more intrinsic causes due to zincblende/wurtzite phase admixtures present in the wires. However, such explanations do not explain any of the observed fluorescence dynamics. Complicating these (and other) possible explanations are recent experiments we have conducted, which show that external electric fields can modulate both the spatial position and intensity of the nanowire emission.

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