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Time-resolved photoluminescence of individual CdS nanowires L.V. TITOVA, THANG B. HOANG, H.E. JACKSON, L.M. SMITH, Dept. of Phys., Univ. of Cincinnati, Cincinnati, OH 45221, J.M. YARRISON-RICE, Dept. of Phys., Miami Univ., Oxford, OH 45056, J.L. LENSCH, L.J. LAUHON, Dept. of Mat. Sci. and Eng., Northwestern Univ., Evanston, IL 60208 — We study photoluminescence (PL) dynamics of single VLS-prepared CdS nanowires. AFM imaging reveals that while some nanowires are straight and uniform, the others show significant morphological irregularities. Low temperature PL of uniform nanowires displays a single near band edge (NBE) peak. Spectra of the irregular nanowires exhibit a broad PL band with a high energy shoulder in the same energy range as the NBE peak of the uniform nanowires, as well as an array of narrow peaks at the lower energy. Spatially-resolved PL images indicate that the narrow lines originate at specific locations along the nanowire. Time-resolved PL (TRPL) measurements show that NBE emission in all nanowires is short-lived (lifetime < 50 ps), indicating the presence of non-radiative recombination channels. On the other hand, TRPL of the localized states exhibit are significantly longer (400 ps to 1 ns) and vary from line to line. At room temperature, the PL spectra of all nanowires, regardless of the morphology, consist of the single short-lived NBE emission peak. We acknowledge the support of ACS through the PRF, and NSF through grants 0071797, 0216374, and a graduate fellowship (JLL).

Lyubov Titova
University of Cincinnati

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