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Excitons in Single-Walled Carbon Nanotubes in Different Local Environments: Effects of Strain and Disorder on Magnetic Brightening[1]
T.A. SEARLES, ECE Dept, Rice University, D.J. HILTON, J. SHAVER, W.D. RICE, Rice Univ., Y.-D. JHO, GIST, Korea, S.A. MCGILL, NHMFL, J.A. FAGAN, E.K. HOBBIE, NIST, J. KONO, ECE Dept, Rice University — Recent experiments on single-walled carbon nanotubes (SWNTs) have shown that in the presence of a high magnetic field the two lowest-energy spin-singlet exciton states become bright [1]. Furthermore, this "magnetic brightening", or increase in photoluminescence (PL) intensity as a function of magnetic flux through each SWNT, increases as the temperature decreases. Here, we report results of temperature-dependent magneto-PL from 2 to 200 K and up to 45 T on SWNTs of the same stock solution suspended in four different local environments. We compared both the brightening and temperature dependence of tubes stretch aligned and unaligned in poly-acrylic acid matrices. As expected, the tubes aligned at high magnetic field exhibited more brightening than those unaligned. We also investigated the behavior of SWNTs in two other matrices, iota-Carrageenan and gelatin. Along with the expected peak shifting and broadening from the effects of strain, we found that the temperature dependence changes with local environment. [1] S. Zaric *et al.*, PRL **96**, 016406 (2006); J. Shaver *et al.*, Nano Lett. **7**, 1851 (2007); I. B. Mortimer and R. J. Nicholas, PRL **98**, 027404 (2007).

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