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Photoluminescence Dynamics of Covalent Dopant-Induced Trap States in Single Wall Carbon Nanotubes STEPHEN DOORN, NICOLAI HARTMANN, SIBEL YALCIN, XUEDAN MA, HAN HTOON, Los Alamos National Laboratory — Recent advances in low level covalent functionalization of carbon nanotubes is receiving significant attention due to new emitting states being introduced by chemically stable oxygen [1,2] and aryl diazonium dopants [3] that increase photoluminescence quantum yields. Recent low-temperature studies have furthermore elucidated the associated chemical and electronic structure.[4] We report here photoluminescence studies of dynamic behaviors of the dopant sites. Relevant to their potential uses in imaging and as novel photon sources, we demonstrate blinking behaviors and discuss a range of response as a function of dopant species. We also report photoluminescence decay dynamics obtained at the ensemble and single tube levels. We find that localization of excitons at dopant sites dramatically increases photoluminescence lifetimes, indicating the importance of exciton trapping as a route to limiting non-radiative decay pathways arising from exciton mobility. [1] S. Ghosh, et al., Science, 330, 1656 (2010). [2] Y. Piao, et al., Nature Chem., 5, 840 (2013). [3] Y. Miyauchi, et al., Nature Photon., 7, 715 (2013). [4] X. Ma, et al., ACS Nano, 8, 10782 (2014).

Stephen Doorn
Los Alamos National Laboratory

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