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Investigating fluorescent single-walled carbon nanotube quantum defects using Single Particle Fluorescent Microscope SHAGHAYEGH AGAH, Rice University, MIJIN KIM, University of Maryland, ROBBY HEADRICK, Rice University, YUHUANG WANG, University of Maryland, ANATOLY B. KOLOMEISKY, MATTEO PASQUALI, Rice University — It has been shown previously that functionalizing carbon nanotubes under controlled procedure strengthens their photoluminescence (PL) properties significantly due to the formation of defect states. However, the effect of this functionalization on the molecular level has not been shown yet. In this work, we skip the ensemble averaging method and probe individual SWCNT PL characteristic alteration due to presence of one to few fluorescent defects to understand physics behind this phenomenon better. Long SWCNTs are functionalized covalently with 4-nitrobenzenediazonium tetrafluoroborate to form different densities of defect quantum states, and increase their photon-conversion efficiency. Near-infrared fluorescence microscopy between 950 and 1600 nm, and emission spectroscopy between 800-1600 are used to image and characterize the brightened individuated SWCNTs that are excited by a diode laser. We show that the effect of new quantum states on emission properties of the individual SWCNTs depends on the chirality of the tube and its defect density. Also, the efficiency of functionalization in different concentration of nitrobenzenediazonium tetrafluoroborate is reported.

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