Cryogenic spectroscopy of sp^3 defect states in carbon nanotubes

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Photoactive defect states in semiconducting single-walled carbon nanotubes (CNTs) have the potential to enable novel applications in quantum photonic technologies. While early experiments have established cryogenic CNTs as quantum light emitters [1], more recent work has identified luminescent defect states as sources of single photons up to room temperature [2,3]. For chemically-engineered CNTs, sp^3 functionalization offers means to deterministically influence the corresponding trap state properties *via* the characteristics of the covalent side chains. Recent findings show that the incorporation of sp^3 alkyl defects into the sp^2 lattice of narrow-diameter CNTs promotes the formation of both neutral and charged localized excitons [4] with unexpectedly high quantum efficiency. Here, we report the results of our cryogenic photoluminescence studies carried out on individual nanotubes functionalized with sp^3 side-wall chemistry.

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