

Quantum dot excitons in carbon nanotubes

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A wealth of exciting results in mesoscopic quantum physics has been obtained with transport measurements using individual suspended nanotubes. In contrast, most optical experiments have so far not been in the quantum regime partly due to material limitations. Recently we identified zero-dimensional excitons in freely suspended narrow-diameter carbon nanotubes as a manifestation of the quantum regime in nanotube optics. Among key signatures of exciton localization we will present ultra-narrow emission lines, strongly suppressed spectral wandering and photoluminescence lifetimes in the range of nanoseconds. We will also discuss implications of quantum dot exciton localization for nanotube photoluminescence in the presence of static electric field.