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Efficient Electron Transfer in CdSe-py-SWNTs FETs

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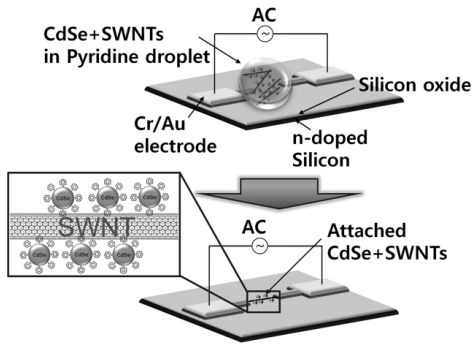
Ability to transport extracted carriers from NQDs is essential for the development of most NQD based applications. Strategies to facilitate carrier transport while preserving NQDs' optical characteristics include: 1) Fabricating neat films of NQDs with modified surfaces either by adapting series of ligands with certain limitations or by applying physical processes such as heat annealing 2) Coupling of NQDs to one-dimensional nanostructures such as single walled carbon nanotubes (SWNTs) or various types of nanowires. NQD-nanowire hybrid nanostructures are expected to facilitate selective wavelength absorption, charge transfer to 1-D nanostructures, and efficient carrier transport.

Even with the vast interests in using NQD-SWNT hybrid materials in optoelectric applications, still, no reports so far have clearly elucidated the optoelectric behavior when they were assembled on the FET mainly because the complexity involving in both components in their preparation and characterization. We have monitored the optical properties of both components (NQDs, SWNTs) from the synthesis, to the assembly, and to the device. More importantly, by using pyridine molecules as a linker to non-covalently attach NQDs to SWNTs, we were able to assemble NQDs on SWNTs with precise density control without harming their electronic structures. Furthermore, by measuring electrical signals from the fabricated aligned SWNTs-FET using dielectrophoresis (DEP), we were able to elucidate the charge transfer mechanism.



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