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Spin filtering of Photo-excited charge from Organic Nanostructures[1] ADITYA MOHITE, BRUCE ALPHENAAR, University of Louisville, TIFFANY SANTOS, JAGADEESH MOODERA, MIT, MIT COLLABORATION — In organic materials, coupling between the incident photon and the electron spin is very weak. Here we demonstrate that spin filtering materials can be used to induce intersystem crossing, and allow the spin polarized triplet excitonic states to be probed. A thin layer of EuS was deposited at the interface formed between a single-wall nanotube and an aluminum contact. EuS is a "spin filtering material," a ferromagnetic insulator with large spin-orbit coupling, allowing preferential tunneling by electrons of a preferred spin direction. A small magnetic field is applied to align the electron spin in the EuS with the carbon nanotube. The enhanced spin-orbit interaction allows for observation of a low-energy peak in the capacitive photocurrent scan. The energy spacing between the two peaks matches closely with the theoretical predictions for the S_1–T_1 spacing in nanotubes. Further measurements of the triplet peak reveal that its magnitude depends on the orientation of the B-field with maximum peak height occurring when the spins in EuS line up with the nanotube axis. These measurements suggest that introduction of a spin filtering layer could be used to study the triplet formation in organic solar cell materials.

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