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Measuring Exciton Diffusion in Conjugated Polymer Films with Super-resolution Microscopy[1] SAMUEL PENWELL, LUCAS GINSBERG, RODRIGO NORIEGA MANEZ, NAOMI GINSBERG, UC Berkeley — Conjugated polymers are highly tunable organic semiconductors, which can be solution processed to form thin films, making them prime candidates for organic photovoltaic devices. One of the most important parameters in a conjugated polymer solar cell is the exciton diffusion length, which depends on intermolecular couplings, and is typically on the order of 10 nm. This mean exciton migration can vary dramatically between films and within a single film due to heterogeneities in morphology on length scales of 10's to 100's nm. To study the variability of exciton diffusion and morphology within individual conjugated polymer films, we are adapting stimulated emission depletion microscopy. STED is typically used in biology with well-engineered fluorescent labels or on NV-centers in diamond. I will, however, describe how we have demonstrated STED in conjugated polymer films of MEH-PPV and CN-PPV by taking care to first understand the film's photophysical properties. This new approach provides a way to study exciton diffusion by utilizing subdiffraction optical excitation volumes. In this way, we will obtain a spatiotemporal map of exciton distributions that will help to correlate the energetic landscape to film morphology at the nanoscale.

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