Electron Diffusion in 2D Perovskite

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There is interest around perovskite (a semiconductor material) because of the ease with which it can be manufactured. Where silicon wafers for solar cells are made by vacuum deposition (in which silicon is deposited on a substrate at high temperature), perovskite can be fabricated through a cheap chemical process. Thus, perovskite semiconductor devices have the potential to be drastically cheaper than their silicon counterparts. As such, the characterization of electron dynamics in perovskites is of interest. Ultrafast laser pulses (whose duration is on the order of 10-15 s) provide the high temporal precision required to measure the excitation and relaxation of charge carriers in semiconductors. I will discuss an ultrafast optical experiment called pump probe. In this experiment a "pump" pulse hits the material and is followed by a "probe" pulse. By varying the delay between pump and probe pulses, one can measure the material's transparency as a function of time. Transparency is proportional to the number of excited electrons, thus the experiment yields excitons as a function of time. Pump probe can also be extended to include spatial resolution. With this modification, it is possible to visualise the spatial diffusion of excited electrons throughout the sample as a function of time. The diffusion of charge carriers is important information in the fabrication of solar cells because it determines what physical dimensions are optimal. In this presentation, I will describe a spatially-resolved differential transmission experimental apparatus I contributed to building that will be used to probe electron transport in perovskites, as well as initial progress towards fabrication of exfoliated perovskite films.