C44

Solvent Dependence of Single Molecule Surface Enhanced Raman Spectroscopy of poly(3-hexylthiophene-2,5-diyl) on a Textured Silver Substrate

Daniel A. Clayton, Karson S. Brooks, Hongwei Geng, Caleb M. Hill, and Shanlin Pan

This study is intended to increase the fundamental knowledge of one of the most common organic dyes, poly(3-hexylthiophene-2,5-diyl) (P3HT), as pertains to its excitation and subsequent energy transfer dependence upon the shape and structure as determined by the solvent used for spin coating. This is accomplished by first confirming the single molecule capabilities of the confocal microscope set-up using rhodamine 6g (R6G) and a silver mirror single molecule Raman spectroscopy (SERS) surface. Single molecule capabilities are then demonstrated for P3HT, with multiple chromophores being apparent and thus showing extremely long lifetimes in comparison to the R6G single molecule trajectories. Chlorobenzene, dichloromethane, toluene, and tetrahydrofuran are used as solvents to dissolve and then spin coat the P3HT onto the silver mirror surface at 10^{-5} and 10^{-9} M concentrations for ensemble and single molecule experiments respectively. More than twenty single molecules were probed per solvent with their results indicating good agreement with the ensemble measurements. Toluene showed the most Raman bands in its spectra but similar overall intensity was seen in the trajectories using all solvents, indicating that total photoluminescence is solvent independent while the solvent plays a critical role in defining the folding of the molecule on the surface. Time dependent Raman spectra were measured with 30 seconds per spectrum using a spectrometer with a nitrogen cooled CCD camera. The spectra showed increases and decreases in various Raman band intensities independent of the solvent.