



Novel Amphiphilic Polymer for Single Step Synthesis of Mesoporous Solar Cells

Ryan Chan, Andrew Clark, and Sarah Tolbert

Brown University

and

Department of Chemistry, UCLA

Solar power has received much interest in the search for a renewable energy source, promising cheap, portable, unlimited energy. Many different types of solar cells exist, but organic cells have emerged as strong competitors in inexpensive power. However, a fundamental limitation of traditional bulk organic devices is the limited recombination distance of the excitonic electron-hole pair. In order to overcome this barrier, we use a novel, amphiphilic polymer, to create a mesoporous titania network, increasing the surface area of the electron acceptor and minimizing the amount of recombination that occurs. Generally, this process is multi-step: mesoporous titania is created using an organic template, which is subsequently removed, after which the pores are filled with polymer. However, our polymer, poly(fluorene-co-thiophene) (PFO-PT), acts both as a structure directing agent for the evaporation induced self assembly and as the active layer for the completed solar cell, allowing for a one-step synthesis. So far, results have been promising. In films and in solution, PFO-PT absorbs in the visible light spectrum. The polymer has been shown to be undamaged by strong acid, which is a necessary reagent in the synthesis of the titania. It has also been verified through small angle x-ray scattering (SAXS) and DLS measurements to form cylindrical micellar structures in solution. Furthermore, AFM images of spin-cast polymer films show aggregate structures of similar size to what was seen in the DLS measurements. Our future work will be to create and characterize the ordered titania composite structures.