Thin Film Transistors of Liquid Crystalline Semiconducting Polymers

Michael L. Chabinyc
Materials Department, University of California, Santa Barbara, CA 93106

Semiconducting polymers are promising materials for low cost, large-area electronics. Thin film transistors (TFTs) of polymers can be fabricated using solution-processing methods such as jet-printing or spin coating. These processes produce thin films of semiconductors with kinetically controlled microstructures. In many cases, thermal annealing processes are used to enhance their field effect mobility by allowing molecular reorganization in the deposited film. Because transport occurs at the interface with the gate dielectric, interfacial interactions are an important consideration in understanding their electrical performance. We have studied the nature of the thermal annealing process for several liquid crystalline semiconducting polymers such as poly(2,5-bis(3-hexadecylthiophen-2-yl)thieno[3,2-*b*]thiophene), PBTTT using x-ray scattering. These data show that the polymer chains in as-deposited films are relatively well ordered with improvement after thermal annealing on inorganic dielectrics. Using a dry thin film transfer method we have also fabricated bilayers of PBTTT with organic dielectric polymers that are inaccessible directly using spin coating. These model systems allow us to further study the influence of interfacial interactions on the thermal ordering process. Both physical and electrical characterization of these model bilayers will be discussed.