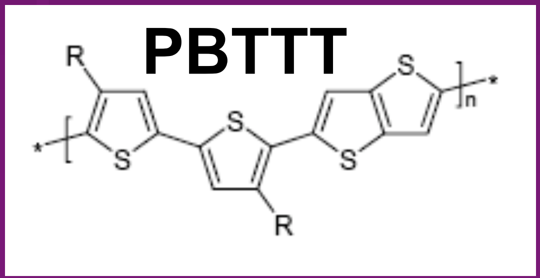
Fundamental Investigations of the Microstructure of Semicrystalline Polymers for Alternative Energy Generations

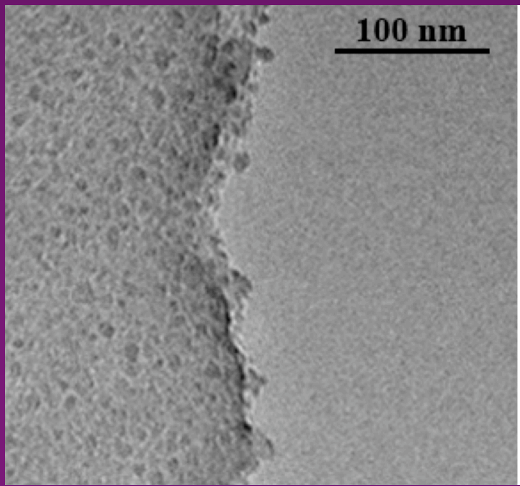
Alberto Salleo, Materials Science and Engineering, Stanford University

Stanford, CA 94305

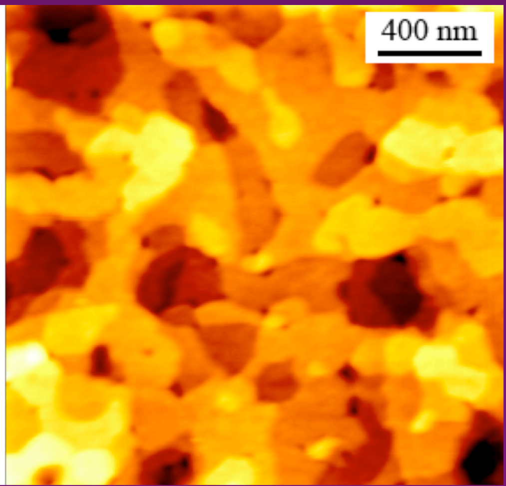
The electronic performance of conjugated polymers in solar cells, LEDs and transistors depends on the microstructure of the polymer at organic/inorganic interfaces. The inorganic counterpart of the polymer might be an inorganic crystal in a bulk heterojunction solar cell, a gate dielectric in transistors or a metal contact in LEDs.

We prepared TEM specimens of a high-mobility regio-regular polymer (PBTTT). This polymer exhibits the highest mobility reported for a polymeric semiconductor (1 $cm^2/V.s$) and is known to display large terraces when cast into a thin film and cooled slowly through its liquid crystalline mesophase. We were able to show that the large terraces are in fact composed of much smaller (~10 nm) subunits. This observation reconciles many charge transport peculiarities with the materials' microstructure.





TEM of a PBTTT film



AFM of a PBTTT film