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Polymer thin film transistors - from transport mechanisms to display backplanes

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Organic semiconductors have dramatically improved in performance so that they are now competitive with amorphous silicon thin film transistors (TFT), and may even challenge crystalline silicon for electronic device applications. The research at PARC has focused on polymers which have the advantage of simple deposition from solution. The improvement in electronic transport is largely due to developments in material synthesis and an understanding of how to deposit films with a high degree of structural order. The talk will discuss how the ordering is achieved and describe recent progress toward understanding the relation between structural order and electronic transport in TFTs, as well as other aspects of transistor performance. Solution-based deposition allows conventional photolithography to be replaced by simpler printing processes such as jet-printing, for the fabrication of electronic circuits. Polymer TFT arrays can now be made with jet-printing as the only patterning technique. This is a revolutionary manufacturing approach for flat panel displays, with the opportunity for greatly reduced cost but with many remaining challenges to overcome.