Organic electronics: new physics and new engineering

Conjugated polymers are now well established as useful semiconducting materials, allowing both convenient processing, usually from solution, together with a range of electronic properties that support operation of light-emitting diodes, LEDs, field-effect transistors, FETs, and photovoltaic diodes, PVs. The very substantial improvements over the past few years in all aspects of device performance (LED and PV efficiency, FET mobility) have been achieved principally through the control of polymer structure, both in bulk, and more particularly, at heterointerfaces. Semiconductor-semiconductor interfaces are critical for the operation of both LEDs and PVs since these are required to control the energetics of charge carrier recombination (LEDs) or separation (PVs), and semiconductor dielectric interfaces control the performance of FETs. I will illustrate some of the recent progress made in the design and control of both structure and electronic structure in these systems.