Pentacene Thin Film Transistors

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Abstract

Organic thin film transistors (OTFTs) are being developed in academic and industrial labs for "disposable" plastic electronics such as smart identification tags. Among the most promising organic semiconductors is pentacene, which yields transistors with performance similar to that of amorphous silicon. The interfaces of pentacene films with dielectric materials (gate oxide) and conductors (electrodes) play a major role in determining OTFT performance. A combination of synchrotron x-ray diffraction and atomic force microscopy was used to probe these interfaces and help optimize pentacene growth. By varying the growth conditions we were able to obtain polycrystalline films with crystallite sizes of the order of tens of microns. The connection between growth, morphology and OTFT performance will be discussed. Scaling of the transistors to 30 nanometer channel lengths will be addressed. Finally, applications in sensors will be demonstrated.

Biography

George Malliaras studied physics at the Aristotle University (Greece) and did his doctoral research in the University of Groningen (the Netherlands), on photorefractivity in polymers. Before joining the faculty at Cornell in July 1998, he was a post doctoral fellow at the University of Groningen ('96) and the Center for Polymer Interfaces and Macromolecular Assemblies (CPIMA), at the IBM Almaden Research Center ('97-'98). His research focuses on organic semiconductors and devices. He is a member of the American Physical Society and the Materials Research Society. He is the recipient of an NSF Young Investigator award and a College of Engineering Teaching award.