

Low Voltage Organic Thin Film Transistors: a flexible technology for sensing applications

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Organic Electronics, has attracted considerable attention over the past few decades as it offers the opportunity to produce electronic systems with multiple functionalities, over large areas, at low cost and possibly on flexible substrates. Amongst these devices, organic thin film transistors (OTFTs) are recognized as key tools/building blocks for the implementation of electronic logic circuits, but however, they still typically require slightly high operating voltages, which makes them not suitable for practical applications.

The aim of this lecture is, at first, to demonstrate that there exist reproducible techniques for fabricating low voltage OTFTs on highly flexible and conformable plastic substrates making them suitable for a wide range of applications going from wearable electronics to robotics. Moreover, it will be shown that they also represent a very interesting and versatile tool for the realization of sensing platforms. A wide review of OTFT based sensors will be given, focusing in particular on the employment of a novel architecture, called Organic Charge Modulated Field Effect Transistor (OCMFET) that has been successfully used for the fabrication of biochemical sensing devices such as pH sensors and DNA hybridization sensors, but also for the realization of multimodal physical sensors, able, at the same time, to monitor both temperature and pressure, and that can be employed for reproducing the sense of touch in a conformable artificial skin.