Abstract

Solution-gated organic thin film transistors have shown promising applications in biosensors due to the high sensitivity, low working voltage and low cost of the devices [1]. Solution-gated transistors normally have no gate dielectric and the gate voltages are applied directly on the solid/electrolyte interfaces or electric double layers near the channel and the gate, leading to very low working voltages (< 1 V) of the transistors. On the other hand, the devices can be easily prepared by solution process or other convenient methods because of the much simpler device structure in comparison with that of a conventional field-effect transistor. Many biosensors can be developed based on the detection of potential changes across solid/electrolyte interfaces induced by electrochemical reactions or electrostatic interactions. The devices can show much higher sensitivity than conventional electrochemical approaches due to the inherent amplification function of the transistors. In this talk, I will introduce several types of biosensors investigated by our group recently, including cells [2], DNA [3], glucose [4], dopamine, uric acid [5], protein and bacteria sensors, based on solution-gated organic transistors or graphene transistors [6]. The biosensors show very low detection limits and high selectivity when the devices are modified with functional nanomaterials (e.g. graphene, Pt nanoparticles) and biomaterials (e.g. enzyme, antibody, DNA) on the gate electrodes or the channel. [5] Furthermore, the devices
are miniaturized successfully by our group for the application as multifunctional sensing arrays. It is expected that the solution-gated transistors will find broader applications in the future.

Reference:


About the Speaker

Dr. Feng Yan has research interests on biosensors, organic electronics, solar cells, transistors and 2D materials. He received his PhD degree in physics from Nanjing University in China. Then he joined the Engineering Department of Cambridge University in Feb 2001 as a Research Associate and joined National Physical Laboratory in UK in April 2006 as a Higher Research Scientist. He became an Assistant Professor at the Department of Applied Physics of the Hong Kong Polytechnic University in September 2006 and was promoted to Associate Professor in July 2012.

All are welcome!
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