

## **Developing Next Generation Optoelectronic Devices Using Organic Semiconductors**

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In recent years, organic semiconductors have attracted considerable attention because of their potential for creating low-cost portable electronic and optoelectronic devices such as organic light emitting diodes (OLEDs) and organic field-effect transistors (OTFTs). OLED performance and reliability are now sufficient for commercial products. Devices combining two or more functions are attractive because such integration gives not only an opportunity to simplify the design and fabrication processes but also leads to new applications. This talk will show recent progress in developing next generation devices using organic semiconductors. Examples include the following:

- Solution-processed light-emitting field-effect transistors (LEFETs) – a relatively new device combining the emission properties of light-emitting diodes with the switching properties of a transistor in a single device structure.
- Demonstration of multifunctional optoelectronics gate dielectrics for high brightness LEFETs.
- Demonstration of light-emitting complementary CMOS inverters, obtained by integrating two identical LEFETs.
- Split-gate Organic Field Effect Transistors – a relatively new organic FET architecture with a source, a drain and two gate electrodes (the two gate electrodes are separated by a small gap).

We will discuss the interplay between charge injection, charge transport and photo-physical properties in the operation of these devices. State of the art materials, design and performance will be presented and discussed in this talk.