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High performance organic light-emitting-diodes on graphene electrode and thin c-Si TFT for flexible display and lighting

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Abstract

Organic light emitting diodes (OLEDs) have improved remarkably over last twodecades. Ubiquitous application of OLEDs in high-end displays in consumer electronics is self-evident. In addition, OLEDs are emerging as a competitive low-cost product for general lighting. One differentiating feature of OLEDs from both conventional solid state lighting and display technologies is their mechanical flexibility. However, challenges remain to enable highly flexible OLEDs. In this talk, we will describe two technologies to resolve the mechanical flexibility issues of OLED lighting and display.

The flexibility of the current OLEDs is mainly limited by the use of crack prone indium tin oxide (ITO) which serves as the transparent electrode. To overcome this limitation and enable flexible OLED, we demonstrate the successful use of a single layer of graphene as the transparent electrode. The OLED made with graphene electrodes exhibit high performance that is not only suitable for display but also for general lighting.

Another limiting factor for flexible OLED display is their backplane. For a high resolution display, the use of single crystal Si (c-Si) backplane to drive the OLED pixel is ideal, as the a-Si or poly-Si TFT has limited resolution due to low carrier mobility and uniformity issues. However single crystal silicon (c-Si) wafer is rigid and not compatible with flexible applications. Application of a novel controlled spalling technology to obtain thin and flexible c-Si as OLED display backplane at low cost will be shown.

Biography

Ning Li is a Research Staff Member at IBM T. J. Watson Research Center working on electronic materials and devices. He received his Ph.D. from the University of Texas at Austin in 2005, after graduating from TsinghuaUniversity, Beijing, China. Before joining IBM, he is a Research Fellow at University of Michigan.