Organic Devices and Flexible Display

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Organic devices of organic light-emitting diodes (OLEDs) and organic thin-film transistors (OTFTs) have been used for various applications as in integrated circuits, flat panel display, sensors and solar cells. For these devices to be useful for flexible display, a number of problems have to be solved. These problems can be categorized into three main areas: flexible substrate, patterning/fabrication, and device performance. In the substrate area, impermeability of the substrate to oxygen and water vapor is the issue among other factors. Inadequacy of photolithography as applied to the fabrication of organic devices and therefore a need for non-photolithographic patterning is the major issue in the fabrication area. Low mobility and a shift in threshold voltage or hysteresis have to be contended with in the performance of OTFTs. An overview is given on these three areas.
We also present our work on patterning for the fabrication and improving the device performance. Various non-photolithographic patterning techniques are presented including those involving simple attachment and detachment of organic layers. These techniques are solvent-free, inexpensive, and suitable for mass production of flexible organic displays.