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INTEGRATED ORGANIC LIGHT EMITTING DIODE STRUCTURES USING SINGLE-LAYER DOPED POLYMER THIN FILMS, J.C. Sturm, C.C. Wu, S.D. Theiss, M. Lu, S. Wagner and R.A. Register*, Advanced Technology Center for Photonic and Optoelectronic Materials (ATC/POEM), Department of Electrical Engineering and *Chemical Engineering, Princeton University, Princeton, NJ 08544, USA; M.E. Thompson, Department of Chemistry, University of Southern California, Los Angeles, CA 90089-0744

It is well known in organic LEDs (OLEDs) that multiple organic materials are needed to optimize the functions of electron transport, hole transport and light emission. These materials are usually prepared in a layered structure of thin films. In this talk we describe how high efficiency (>1% external quantum efficiency) and low drive voltage (<10V) OLEDs may be achieved using single-layer doped polymer thin films with bipolar transport capabilities deposited by spin-coating. The films consist of a host material of the hole-transport polymer poly(N-vinylcarbazole) (PVK), into which various molecular electron-transport agents and red, green and blue emitting centers (e.g. nile red, coumarin 6, and coumarin 47) have been doped. Similar performance (and high efficiency) is obtained either with the typical Mg:Ag cathode or an air-stable Ag cathode.

Plasma etching has been used to pattern OLEDs to integrate orange, green and blue OLEDs (from three different organic materials) onto a single substrate, all with performance similar to isolated (unetched) devices. Finally, we have demonstrated the successful integration of OLEDs and amorphous silicon thin film transistors (a-Si TFTs) to show that sufficient current may be obtained from the TFTs to drive the OLEDs. This integration has been done not only on glass substrates, but also on thin (200 μm) unbreakable stainless steel foil using a top-emitting OLED structure. These finished substrates are unaffected by dropping them from a height of thirty feet onto concrete.

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