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Transparent Thin Film Transistors based on Pristine and Doped Indium Oxide Nanowires PO-CHIANG CHEN, GUOZHEN SHEN, SAOWALAK SUKCHAROENCHOKE, CHONGWU ZHOU, University of Southern California, UNIVERSITY OF SOUTHERN CALIFORNIA TEAM — The key to the realization of transparent electronics is the development of transparent thin film transistors (TTFT) with good device performance, in terms of high device mobility, low temperature fabrication, and optical transparency. We present our work on the fabrication of high performance TTFTs using both pristine In_2O_3 nanowires and doped In_2O_3 nanowires. In_2O_3 nanowire TTFTs were made on glass and PET substrates with Al_2O_3 as gate insulator and ITO source/drain electrodes. These devices showed a transparency of about 80% and n-type transistor performance. The device characteristics exhibit a subthreshold slope of 0.2 V/dec, a current on/off ratio of 10^6, and a field-effect mobility of 514 $cm^2V^{-1}S^{-1}$. We also fabricated TTFTs wbuilt on Arsenic-doped In_2O_3 nanowires with a field-effect mobility of 1,183.8 $cm^2V^{-1}S^{-1}$ without any post-treatments. In addition, we integrated TTFTs with organic light emitting diode (OLED) to make an active matrix organic light emitting diode (AMOLED) display, and thus made an animation by controlling the OLED light output.

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