Transparent Conductors and Printable Electronics Focus Topic
Room: Central Hall - Session TC-ThP

Transparent Conductors and Printable Electronics Poster Session

TC-ThP2 Ellipsometry Characterization of Thin Organic Films for Flexible Electronics, *C. Eypert, M. Stchakovsky,* ***L. Yan***, Horiba Scientific

In recent years, there has been an enormous research effort on both materials and processes for the production of electronic devices on flexible polymeric substrates. Flexible electronics encompass a broad set of technologies applicable across a range of products, from flexible solar cells, printed solid state lighting, to medical devices, etc. Precise control of film thickness and optical constants is vital for optimization of the device performance (efficiency, reliability, cost, etc.) In this work, we demonstrate the use of ellipsometry as a non-destructive, powerful and sensitive optical means of studying organic electronic devices. Examples in two specific areas of applications are included: OLED, and organic solar cell based on the blend of P3HT and PCBM.

TC-ThP4 Toward Active-Matrix Lab-On-Chip: Programmable Electrofluidic Device Integrated with the Arrayed IGZO Oxide Thin Film Transistors, ***J.H. Noh****, J. Noh, P.D. Rack*, University of Tennessee Knoxville

Agile micro- and nano-fluidic control is critical to numerous life science and chemical science synthesis as well as kinetic and thermodynamic studies. Electrical addressability of lab-on-chip devices currently requires external switching devices for each individual electrode for droplet transport, merging, and splitting. Thus for complex arrays, many switching devices and interconnections are needed and scale directly with the number of elements (increased size or resolution). Therefore fabrication processes and cost can be complicated and expensive as the number of input-output connections becomes unwieldy. The active matrix (AM) addressing method integrated with an electrofluidic platform is a significant breakthrough for complex electrofluidic arrays (increased size or resolution) with enhanced function, agility and programmability because the AM method can minimize the number of control lines necessary (m + n lines for the m x n elements array) as is used in liquid crystal display technologies.

We have previously demonstrated arrayed amorphous indium gallium zinc oxide (a-IGZO) thin film transistors as a platform and the control of an electrofluidic array by AM addressing method. An a-IGZO semiconductor active layer is used because of its high mobility, low-temperature processing and transparency for spectroscopy and imaging. However, the a-IGZO transistors and an electrofluidic array were connected by external wires because the electrical properties of the a-IGZO thin film transistors were degraded after passivation. The degradation is likely due to reaction of hydrogen with a-IGZO active layer during PECVD SiO_2 passivation and post-annealing process, and this can be mitigated by changing deposition temperature and annealing ambient. In this study, the effects of hydrogen and oxygen on the PECVD passivated a-IGZO thin film transistors is investigated as a function of deposition temperature and post annealing ambient. The change of hydrogen and oxygen concentration in both the IGZO active layer and SiO_2 passivation layers are discussed. Finally, we review the process flow for fully integrated electrofluidic arrays on an a-IGZO transistor array and the programmable addressability of electrofluidic devices by AM addressing method. The requisite material and device parameters will be discussed for optimal active matrix addressing from device measurements in context with a VGA scale active matrix addressed electrofluidic platform.

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