15:45 Invited Talk

**R91 New materials for truly flexible oxide TFT backplane and AMOLED application**

Hsing-Hung Hsieh, Director
Polyera Taiwan Corporation, Taiwan

Flexible and wearable displays are very attracting opto-electronic devices, yet thin-film transistors (TFTs) with high good electrical characteristics and mechanical flexibility are essential to develop this new technology. We have developed the new hybrid oxide TFT technology which couple oxide TFTs with proprietary Polyera organic gate insulator (OGI). With the thermally-stable and photo-patternable Polyera OGI, our hybrid oxide TFTs show groundbreaking performance compared to the reported literatures. Finally we demonstrated a 5 inch flexible AMOLED based on oxide TFTs with Polyera OGI, showing both electrical function validity and excellent mechanical flexibility.

16:15

**R92 Conversion of Printed Carbon Nanotube Thin-film Transistors from P-type to N-type for High-performance CMOS Inverters**

Jianwen Zhao*, Long Qian, Wenya Xu, and Zheng Cui
Printable Electronics Research Centre, Suzhou Institute of Nanotech and nanobionics, CAS, China

Here, we report a facile and valid method to selectively produce n-type SWCNT thin-film transistors using zirconium (IV) acetylacetonate. The threshold voltages of n-type SWCNT TFTs could be tuned accurately by controlling the concentration of zirconium(IV) acetylacetonate or the printing process. SWCNT CMOS inverters were also fabricated on flexible and rigid substrates via aerosol jet printing method. The printed CMOS inverters showed high gain (up to 22), large noise margin (up to 80% 1/2 Vdd) and subnanowatt power consumption at the applied voltage of only 1 V.
16:30

**R93 Silicon nanopillar-templated vertical field effect transistor using organic semiconductor as channel material**

Chi Chih Hoa, b,c, Ding Chi Huang and Yu Tai Taoa*

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Arrays of silicon nanopillar (SiNP) were used as scaffold to prepare a vertical organic field-effect transistor (VOFET) using benzothienobenzothiophene (BTBT) as the conducting channel. Uniform films were obtained by simple melting process, giving a typical transistor characteristic with low operating voltage.

16:45

**R94 Selective Electrodeposition Method for Step-Edge Vertical-Channel Organic Transistor Circuits**

Kazuhiro Kudo, Hiroshi Yamauchi, and Masatoshi Sakai

Chiba University, Japan

We proposed a new selective electrospray deposition (SESD) method for integrated circuits. In this SESD method, the electric fields are applied between the nozzle and selected patterned electrodes, i.e., gate lines fabricated on a master substrate. The SESD method can be applied to fabricate n- and p-channel complementary field-effect transistors (FETs) because of the selectivity of the direct patterning process without the need for masking during the deposition. Step-edge vertical-channel FETs with submicron channel length based on p- and n-type semiconductors were fabricated by the SESD method and have measured basic FET characteristics.
17:00

**R95 Solvent-free and Low Temperature Printing by Ultrasonic Welding Method**


Graduate School of Engineering, Chiba University, Japan

In this study, we tried to form C8-BTBT (Dioctylbenzothienobenzothiophene, m.p. 126.5°C) active layer of organic field effect transistor (OFET) on flexible substrates by ultrasonic welding, which is widely used to weld thermoplastics parts by local frictional heat generated from ultrasonic vibration without raising temperature of whole volume. It was demonstrated that C8-BTBT thin films were fabricated between polyethylene terephthalate (PET, heat-resistant temp. 110°C) films by ultrasonic welding without damaging PET films, contact electrodes, and gate insulating layer. We succeeded in fabricating OFET having field effect mobility of 0.14 cm²/Vs.

17:15

**R96 Control of Crystallinity of Zone-cast Semiconductors in Binary System**

Yongjin Jo, Mijung Lee

Kookmin University, Korea, South

In recent extensive study of organic thin film transistor (OTFTs), organic semiconductors (OSCs) have shown great potential for transparent and flexible electronic applications produced with low cost and in large area. Small molecule blends and multicomponent systems are introduced to fulfill the properties of OSCs in optoelectronic systems with easy and inexpensive. Here, 6,13-bis(triisopropylsilylvinyl)pentacene (TIPS-pentacenePEN) and polystyrene are blended to form semiconducting layer by zone casting to produce aligned OSCs. We varied ratio of TIPS-pentacene PEN and polystyrene ratio and observed the improved field effect mobilities mobility compared with pure OSC layer. These results demonstrate that varied ratio effects on the crystallinity of TIPS-pentacene PEN and enhanced properties are from metastable state.
Polymer type semiconductors are one of the promising materials for low cost processes. To achieve sufficient charge mobility in several device structures (top gate bottom contact (TGB), bottom gate bottom contact (BGB), etc.) are one of the key factors for low cost fabrication. From an industrial point of view, we report the recent development in polymer type semiconductors and dielectric polymers to balance processability (high solubility for semiconducting polymer) and mobility in any kind of device structure.