Oxide TFTs: Novel Process

**Date:** Aug. 30, 2017 (Wednesday)
**Time:** 16:00~17:30
**Session Chairs:** Dr. Jong Uk Bae (LG Display Co., Ltd., Korea)
Prof. I-Chun Cheng (Nat’l Taiwan Univ., Taiwan)

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**E45-1 16:00~16:25**

*Rational Design of Molecular Precursor and Processing Method for High Performance and Low Temperature Solution-Processed Oxide Electronics*

*Myung-Gil Kim (Chung-Ang Univ., Korea)*

Solution processed metal oxide electronics could potentially meet the requirements of commercial large area electronics, such as high-throughput fabrication processes and a choice of materials with appropriate electrical performance. However, this area still faces several challenges, such as low performance, high annealing temperatures, and the inability to fine-tune intrinsic properties. An intensive study of interface optimization, novel fabrication concepts, and new materials development can address critical issues in solution processed metal oxide semiconductor electronics. The new precursor designing principle, processing concepts and hybrid interface afford the development of high performance electronic materials (conductor, semiconductor, insulator), low processing temperature ($T_{\text{process}} \sim 60^\circ C$) and device stabilization against Cu ion and gas diffusion. Compared to the conventional sol-gel precursors, the novel precursor design concepts, such as combustion precursors and molecular metal-hydroxy-oxo cluster, dramatically reduce the processing temperature as low as 60 ~ 200 °C, in combination with the photochemical activation process.

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**E45-2 16:25~16:50**

*Metal Oxide based Printed Devices*

*Jaewon Jang (Kyungpook Nat’l Univ., Korea), Will Scheideler, and Vivek Subramanian (California Univ., USA)*

Conventional IC fabrication is normally a vacuum-based deposition technique and photolithography process. The conventional vacuum-based technology requires an expensive and time-consuming high vacuum conditioning process before deposition or etching. Therefore, we have chosen an alternative fabrication process suitable for large area applications with high throughput and a reduced cost. This alternate printing technology originates with the newspaper media and graphic arts fields. The sol-gel process is a promising method to deposit metal oxides, where the starting materials are liquid phase precursors. By controlling the physical properties of the liquid phase precursors, inkjet-printed thin-film transistors, complementary resistive switching memory, and transparent metal oxide electrodes were successfully realized.
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E45-3 16:50~17:15

High-Performance Oxide Transistors, and the Road to Roll-to-Roll Manufacturing

Gerwin Gelinck (Holst Centre/TNO, Netherlands), Joris de Riet, Auke Kronemeijer (Eindhoven Univ. of Tech., Netherlands), Ilias Katsouras, and Paul Poodt (Holst Centre/TNO, Netherlands)

Amorphous oxide thin-film transistors offer advantages in terms of process simplification, performance and compatibility with flexible plastic substrates. These n-type transistors form the fundamental building blocks for a wide range of applications such as foil-based display and sensor backplanes, intelligent labels, and other forms of flexible electronics. Today’s approach, based on photolithography, vacuum processing and etching steps of the oxide TFTs, allows FPD industry to utilize today’s equipment and fab infrastructure that is based on large (glass) sheets.

E45-4 17:15~17:30

A Study on the Electric Performance of Amorphous Indium Gallium Zinc Oxide Thin Film Transistor Grown by Atomic Layer Deposition

Minhoe Cho, Hyeonjoo Seul, Jeongoh Kim (Hanyang Univ., Korea), Pilsang Yun, Jong-uk Bae, Kwonshik Park (LG Display Co., Ltd., Korea), and Jaekyeong Jeong (Hanyang Univ., Korea)

Amorphous indium gallium zinc oxide (a-IGZO) thin films were fabricated by atomic layer deposition (ALD) using [3-(dimethylamino)propyl] dimethyl indium (DADI), trimethyl gallium (TMGa), diethyl zinc (DEZ) and ozone (O₃) as the indium, gallium, zinc precursor and reactant, respectively. The layer of IGZO was grown by sequential ALD cycles in order injection of indium oxide (In₂O₃), zinc oxide (ZnO) and gallium oxide (Ga₂O₃) at 250°C. IGZO layer was treated Post-deposition annealing by different temperature. The amorphous IGZO TFTs exhibited high electron mobility of 36.8 cm²/V·s, Vₜh of 1.49 V, SS of 0.45 V/decade, and ION/OFF ratio of 7 × 10⁸.