

Functional Materials Using Atomic Layer Deposition for Emerging Display Applications

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Atomic Layer Deposition (ALD) has remarkably developed in semiconductor and nano-structure applications since early 1990. The unique properties, including controlling atomic-level-thickness, manipulating atomic-level-composition control, and depositing impurity-free films uniformly, may accelerate ALD related industries and applications in functional thin film markets. One of big commercial industries, display market, just starts to look at the potential to adopt various functional inorganic/organic/hybrid films based on ALD/molecular layer deposition (MLD) techniques in emerging applications, such as transparent, flexible, and wearable electronics.

In this talk, I will take the brief emerging display market trend and forecast to understand what they are looking for. In fact, the AMOLED (active matrix organic light emitting diode) Television markets are just starting at early 2013. There are a few possibilities and needs to be developing for AMOLED, flexible and transparent Display markets. Then, firstly, the functional oxide conductor/semiconductor films deposited by ALD will be discussed for applying transparent conductor and thin film transistor as an active layer even on flexible substrates, including InOx, SnOx, ZnSnO, and InZnOx. Secondly, functional oxide and organic thin films, deposited by ALD/MLD have been demonstrated in emerging applications (flexible, transparent, and wearable things). In particular gas diffusion barrier property such as water and oxygen water vapor is important for passivation and encapsulation applications.

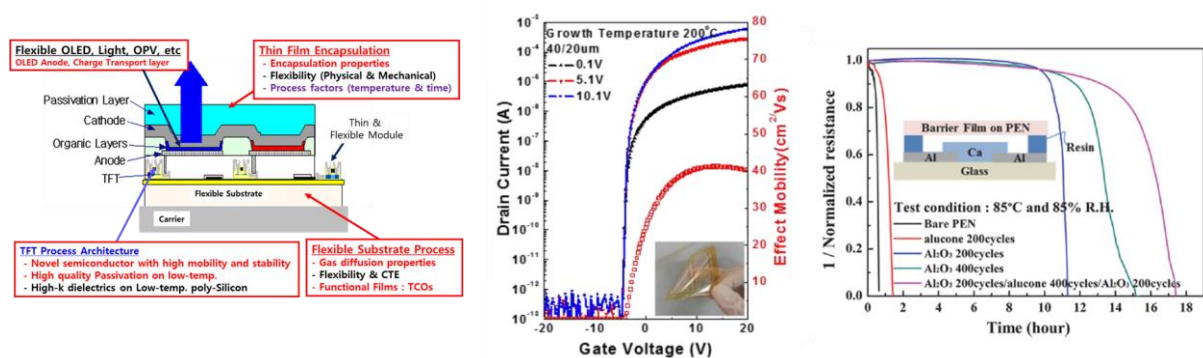


Figure 1. (Left) The schematic diagram of issued items on emerging flexible electronics. (Center) Transfer characteristics of the IZO TFT fabricated on PI substrate grown at 200°C. (Right) the Ca tests on difference thickness and structure using ALD Al₂O₃ and MLD Alucone layers.