

## Thin-film laser lift-off for dual-mode display application

Jong-Heon Yang<sup>1,3</sup>, Sang Chul Lim<sup>2</sup>, Chun-Won Byun<sup>1</sup>, Hyunkoo Lee<sup>1</sup>, Byoung-Hwa Kwon<sup>1</sup>, Jong Tae Lim<sup>1</sup>,  
Seong M. Cho<sup>1</sup>, Seunghyup Yoo<sup>3</sup>, Sung Haeng Cho<sup>1</sup>, Chi-Sun Hwang<sup>1</sup>

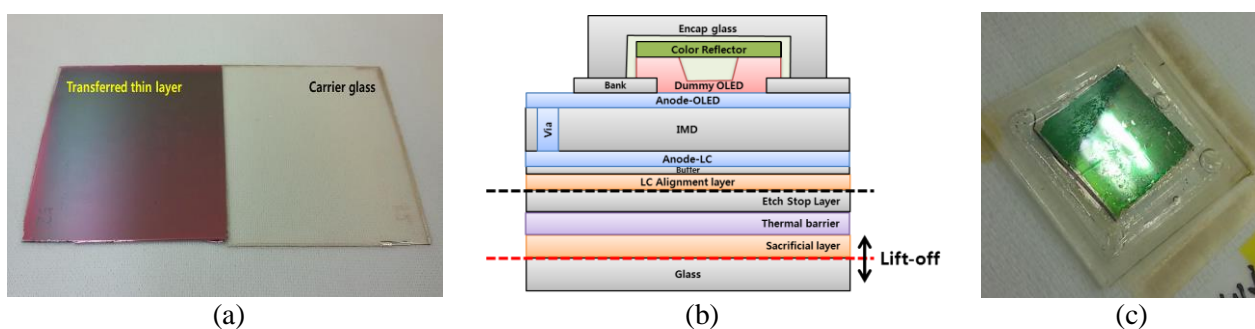
<sup>1</sup>Electronics and Telecommunications Research Institute, 218 Gajeong-ro, Yuseong-gu, Daejeon 305-700,  
Korea Tel.: 82-42-860-1773, E-mail: [delmo@etri.re.kr](mailto:delmo@etri.re.kr)

<sup>2</sup>Gumi Electronics & Information Technology Research Institute, Korea

<sup>3</sup>Dept. of Electric Engineering, Korea Advanced Institute of Science and Technology, Korea

For a decade, there have been many research and development in new emerging display, such as double-sided OLED or LCD display for DID and mobile applications. A reflective/emissive dual-mode display can reduce power consumption and enhance image quality by switching its mode depending on surrounding brightness. By integrating two functional devices or displays in a single panel, it could reduce panel thickness and manufacturing cost, and invent a new application. It needs a very thin layer structure, which has functional devices and interconnection lines above and below. Lifting of this thin layer off a carrier substrate and making it intact is important.

An aim of our experiments was to investigate a sacrificial multi-layer structure for laser lift-off, which can transfer sub-10- $\mu\text{m}$ -thick thin layer. By adjusting deposition process of sacrificial layer and inserting thermal barrier layer, we could reduce a laser energy for lift-off and thermal budget to device above. Cracks and wrinkles of thin layer suppressed by optimum laser energy. To demonstrate thin layer lift-off, we fabricated dummy structure with green fabry-perot reflector integrated in OLED encapsulation on 5- $\mu\text{m}$ -thick thin layer, which has double-sided ITO anode electrodes, and successfully lifted off thin layer structure from carrier glass. In the near future, this thin layer lift-off will be key integration process for reflective/emissive dual-mode display application.



**Fig. 1. (a) Lifted-off thin layer and carrier glass (5cm x 5cm)**  
**(b) Thin layer structure for laser lift-off in dummy dual-mode device**  
**(c) Lifted-off device after sacrificial layer strip**

### Acknowledgment

This work was supported by the ICT R&D program of MSIP/IITP[10041416, The core technology development of light and space adaptable energy-saving I/O platform for future advertising service].

### References

1. C.-W. Ko, Journal of society for information display, 14/1, 57 (2006)