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# TAOS Based Cu/TiW/IGZO/Ga<sub>2</sub>O<sub>3</sub>/Pt Bilayer CBRAM for Low-power Display Technology

Kai-Jhih Gan <sup>a</sup>, Po-Tsun Liu <sup>b,\*</sup>, Yu-Chuan Chiu <sup>b</sup>, Dun-Bao Ruan <sup>a</sup>, Ta-Chun Chien <sup>b</sup>,

Simon M. Sze <sup>a</sup>

<sup>a</sup> *Department of Electronics Engineering and Institute of Electronics, National Chiao-Tung University, Hsinchu, Taiwan, 30010, R.O.C.,*

<sup>b</sup> *Department of Photonics, National Chiao Tung University, Hsinchu, Taiwan, 30010, R.O.C.,*

*\*Corresponding author; E-mail: ptliu@mail.nctu.edu.tw*

## Abstract

We demonstrate the characteristics of a conductive-bridging random access memory (CBRAM) with Cu/TiW/InGaZnO/Ga<sub>2</sub>O<sub>3</sub>/Pt stack structure. The addition of a thin metal-oxide layer (4.5 nm-thick Ga<sub>2</sub>O<sub>3</sub>) in the bottom of the CBRAM device significantly increases the off-state resistance ( $R_{OFF}$ ) and the memory window. The IGZO bi-layer CBRAM shows the excellent memory performances, such as low operation current (down to 50  $\mu$ A), high on/off resistance ratio (more than  $10^3$ ), high switching endurance (up to  $10^3$  cycles) and the capability of multi-level tuning. Meanwhile, high thermal stability was also achieved. Three decades of resistance window is constantly maintained beyond  $10^4$  s at 85 °C. The resistive switching stability and electrical uniformity of bi-layer IGZO/Ga<sub>2</sub>O<sub>3</sub> CBRAM device are obviously enhanced as compared with the one only with a single layer of IGZO film. These results have given a great potential for the transparent amorphous oxide semiconductor (TAOS)-based material utilizing in CBRAM stacks and integrating into the display circuits for future memory-in-pixel applications.

Keywords: Conductive-bridge random access memory (CBRAM);

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