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# TAOS Based Cu/TiW/IGZO/$Ga_2O_3$/Pt Bilayer CBRAM for Low-power Display Technology

Kai-Jhih Gan [a], Po-Tsun Liu [b,*], Yu-Chuan Chiu [b], Dun-Bao Ruan [a], Ta-Chun Chien [b], Simon M. Sze [a]

[a] *Department of Electronics Engineering and Institute of Electronics, National Chiao-Tung University, Hsinchu, Taiwan, 30010, R.O.C.,*

[b] *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/$Ga_2O_3$/Pt stack structure. The addition of a thin metal-oxide layer (4.5 nm-thick $Ga_2O_3$) 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 μA), 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 ℃. The resistive switching stability and electrical uniformity of bi-layer IGZO/$Ga_2O_3$ 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);