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Ram Narayan Chauhan, Nidhi Tiwari, Han-Ping D. Shieh, Po-Tsun Liu

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Electrical performance and stability of Tungsten Indium Zinc Oxide Thin-Film Transistors

Ram Narayan Chauhan¹, Nidhi Tiwari^{*2}, Han-Ping D. Shieh³, Po-Tsun Liu³

¹Department of Physics, NIT Patna, India; ^{*2}Energy Research Institute NTU Singapore,

³Department of Photonics, NCTU, Taiwan

*Corresponding author Tel.: +6584561474

E-mail address: nidhi1611@gmail.com

Abstract—Amorphous tungsten indium zinc oxide thin film transistors (WIZO TFTs) have been prepared using radio-frequency (RF) magnetron co-sputtering system to co-sputter indium zinc oxide (IZO) and indium tungsten oxide (IWO) targets. The electrical performance parameters and positive biased stress (PBS) test of the co-sputtered WIZO TFT were investigated to obtain better characteristics with regards to the IZO and IWO TFT counterparts. The co-sputtered TFT displayed high electrical performance (field effect mobility, $\mu_{FE} \sim 22.30 \text{ cm}^2/\text{Vs}$, and sub-threshold swing, $SS \sim 0.36 \text{ V/decade}$) and stable electrical behavior (PBS value shift, $\Delta V_{th} \sim 1.23 \text{ V}$) than the IZO ($\mu_{FE} \sim 19.90 \text{ cm}^2/\text{Vs}$, $SS \sim 0.46 \text{ V/decade}$, $\Delta V_{th} \sim 7.79 \text{ V}$) and IWO (conducting in nature) TFTs for its application in flexible and transparent displays.

Keywords — Sputtering, Semiconductor, Thin films.

1. Introduction

Oxide semiconductor thin films can be deposited by various techniques for the realization of thin film transistors (TFTs) with better device performance, optical transparency, low temperature process, and low cost fabrication over silicon based TFTs [1, 2]. Among these, AOS materials now become potential candidate for the development of next generation fully transparent and flexible displays. However, the long term stability and reliability of AOS TFTs are the utmost issues nowadays [3]. The amorphous

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