

## Effects of thickness of GIZO active layer on device performance in oxide thin-film-transistors

C. H. Woo, G. J. Jang, Y. H. Kim, B. H. Kong, and H. K. Cho\*

School of Advanced Materials Science and Engineering, Sungkyunkwan University, Korea

e-mail: chohk@skku.edu

**Abstract :** Thin-film transistors (TFTs) that can be prepared at low temperatures have attracted much attention due to the great potential for flexible electronics. One of the mainstreams in this field is the use of organic semiconductors such as pentacene. But device performance of the organic TFTs is still limited by low field effect mobility or rapidly degraded after exposing to air in many cases. Another approach is amorphous oxide semiconductors. Amorphous oxide semiconductors (AOSs) have exactly attracted considerable attention because AOSs were fabricated at room temperature and used lots of application such as flexible display, electronic paper, large solar cells. Among the various AOSs, a-IGZO was considerable material because it has high mobility and uniform surface and good transparent. The high mobility is attributed to the result of the overlap of spherical s-orbital of the heavy post-transition metal cations.

This study is demonstrated the effect of thickness channel layer from 30nm to 200nm. when the thickness was increased, turn on voltage and subthreshold swing were decreased. a-IGZO TFTs have used a shadow mask to deposit channel and source/drain(S/D). a-IGZO were deposited on SiO<sub>2</sub> wafer by rf magnetron sputtering. using power is 150W, working pressure is 3m Torr, and an O<sub>2</sub>/Ar(2/28 SCCM) atmosphere at room temperature. The electrodes were formed with Electron-beam evaporated Ti(30nm) and Au(70nm) structure. Finally, Al(150nm) as a gate metal was evaporated. TFT devices were heat treated in a furnace at 250°C in nitrogen atmosphere for an hour. The electrical properties of the TFTs were measured using a probe-station to measure I-V characteristic.

TFT whose thickness was 150nm exhibits a good subthreshold swing(S) of 0.72 V/decade and high on-off ratio of 1E +08. Field effect mobility, saturation effect mobility, and threshold voltage were evaluated 7.2, 5.8, 8V respectively.

**Key Words :** IGZO, TFTs, Al:ZnO

- Topic : Defects in compound semiconductors
- Type of presentation : poster

[1] Jong H. Na, M. Kitamura, and Y. Arakawa, Appl. Phys. Lett. 93.063501(2008)