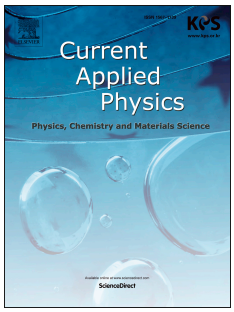
# Accepted Manuscript




High-performance amorphous indium gallium zinc oxide thin-film transistors with sol-gel processed gate dielectric and channel layer fabricated using microwave irradiation

Min-Soo Kang, Won-Ju Cho

PII: S1567-1739(18)30158-5

DOI: 10.1016/j.cap.2018.06.003

Reference: CAP 4769

To appear in: *Current Applied Physics*

Received Date: 12 March 2018

Revised Date: 24 May 2018

Accepted Date: 3 June 2018

Please cite this article as: M.-S. Kang, W.-J. Cho, High-performance amorphous indium gallium zinc oxide thin-film transistors with sol-gel processed gate dielectric and channel layer fabricated using microwave irradiation, *Current Applied Physics* (2018), doi: 10.1016/j.cap.2018.06.003.

# High-performance amorphous indium gallium zinc oxide thin-film transistors with sol-gel processed gate dielectric and channel layer fabricated using microwave irradiation

Min-Soo Kang and Won-Ju Cho*

Department of Electronic Materials Engineering, Kwangwoon University, 447-1, Wolgye-dong, Nowon-gu, Seoul 139-701, Korea

**Abstract** - In this study, we fabricated high-performance a-IGZO TFTs by forming $Al_2O_3$ and a-IGZO thin films for gate insulator and active channel layer, respectively, using a sol-gel process. MWI for low thermal budget process was used to condensate $Al_2O_3$ and a-IGZO films, which was compared with the CTA. It is found that the MWI is superior process to the conventional method in terms of precursor and solvent decomposition and has proven to be more effective for eliminating residual organic contaminants. In addition, the MWI-treated $Al_2O_3$ and IGZO films have smoother surfaces, higher visible light transmittance, lower carbon contamination and impurities than the CTA-treated films. We have demonstrated that a-IGZO TFTs with sol-gel solution-processed $Al_2O_3$ gate insulator and a-IGZO channel layer can achieve a field effect mobility of 69.2 $cm^2/V \cdot s$, a subthreshold swing of 86.2 mV/decade and a large on/off current ratio of $1.48 \times 10^8$, by the MWI process even at temperatures below 200 °C. In addition, the MWI-treated a-IGZO TFTs have excellent resistance to electron trapping and good stability to positive and negative gate-bias stress. Therefore, the sol-gel processed a-IGZO TFTs with $Al_2O_3$ gate oxide and the MWI treatment with a low thermal budget are promising for emerging transparent flat panel displays applications.

Keywords: thin film transistor, sol-gel solution deposition, $Al_2O_3$ gate insulator, a-IGZO channel, microwave irradiation
*E-mail: chowj@kw.ac.kr, Tel: +82-2-940-5163, Fax: +82-2-943-5163

## 1. Introduction