Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

High transconductance zinc oxide thin-film transistors on flexible plastic substrates YUTA KIMURA, TOMOHIRO HIGAKI, TOSHIHIKO MAEMOTO, SHIGEHIKO SASA, MASATAKA INOUE, Osaka Institute of Technology
— We report the fabrication and characterization on high-performance ZnO based TFTs on unheated plastic substrate. ZnO films were grown by pulsed laser deposition (PLD) on polyethylene napthalate (PEN) substrates. Top-gate ZnO-TFTs were fabricated by photolithography and wet chemical etching. The source and drain contacts were formed by lift-off of e-beam deposited Ti(20 nm)/Au(200 nm). An HfO_2 with thickness 100 nm was selected as the gate insulator, and top gate electrode Ti(20 nm)/Au(200 nm) was deposited by e-beam evaporation. We prepared a set of the structure with SiO_2/TiO_2 to investigate the characteristic changes that appear in the film characteristics in response to bending. From the $I_D - V_{DS}$ and the transfer characteristics which are affected by bending and return for the ZnO-TFT with SiO_2/TiO_2 buffers, the TFTs were bent to a curvature radius of 8.5 mm. The transconductance, g_m is obtained 1.7 mS/mm on flat, 1.4 mS/mm on bending and 1.3 mS/mm on returning the film, respectively. The $I_D - V_{DS}$ characteristics were therefore not changed by bending. All of the devices exhibited a clear pinch-off behavior and a high on/off current ratio of $\sim 10^6$. The threshold voltages, V_{th} were not changed drastically. Furthermore, TFT structures were changed from a conventional top-gate type to a bottom-gate type. A high transconductance of 95.8 mS/mm was achieved in the bottom-gate type TFT by using Al_2O_3 oxide buffer.

Toshihiko Maemoto
Osaka Institute of Technology

Date submitted: 01 Dec 2011 Electronic form version 1.4