Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

High-performance ZnO/ZnMgO FET using a hetero-MIS stricture SHIGEHIKO SASA, Osaka Institute of Technology, MASASHI OZAKI, KAZUTO KOIKE, MITSUAKI YANO, MASATAKA INOUE — We propose a new structure of ZnO/ZnMgO field-effect transistors (FETs) for simplifying the fabrication process as well as for the improvement of the FET characteristics. Recently, we developed a ZnO/ZnMgO heterostructure FET (HFET) by utilizing a two-dimensional electron gas channel layer formed in the selectively-doped single quantum well structure.[1)] In the HFET fabrication process, the ohmic contact formation is crucial because of the difficulty in removing the top ZnMgO barrier layer with the underlying ZnO channel remained. The use of a very thin (1-2 nm) ZnMgO top barrier layer enables the formations of both good ohmic contacts without the ZnMgO etching and the gate electrodeD We used metal-insulator semiconductor (MIS) gate structure with the use of a 50-nm-thick Al_2O_3 gate insulator. The thin ZnMgO barrier acts as a setback layer for the channel electrons from the ZnMgO/Al_2O_3 interface. The 1-μm-gate device showed a complete FET operation with a transconductance of as high as 28 mS/mm and the effective mobility of 62 cm^2/Vs. 1) K. Koike et al., Appl. Phys. Lett. **87**, 112106 (2005).

Shigehiko Sasa
Osaka Institute of Technology

Date submitted: 30 Nov 2005 Electronic form version 1.4