P-125

DEPOSITION OF HIGHLY (111)-ORIENTED $Pb(Zr_xTi_{1-x})O_3$ THIN FILMS THROUGH THE CONTROL OF Zr FRACTION BY METAL ORGANIC CHEMICAL VAPOR DEPOSITION, K. H. BU, Y. J. PARK, D. K. CHOI, W. K. SEONG, J. D. KIM (Electronic Materials Lab, Institute for Advanced Engineering, Yongin P. O. Box 25, Kyonggi Do, Korea)

PZT thin films have been grown on Pt/Ta/SiN_x/Si substrate by MOCVD using $Pb(C_2H_5)_4$, $Zr(O\text{-}t\text{-}C_4H_9)_4$, $Ti(O\text{-}i\text{-}C_3H_7)_4$ as source materials and O_2 as an oxidizing gas. The Zr fraction in thin films was controlled by varying the flow rate of Zr source material. The crystal structure and the electrical properties were investigated as a function of the composition. XRD analysis showed that at a certain range of Zr fraction highly (111)-oriented PZT thin films with no pyrochlore phases were deposited. On the other hand, at low Zr fraction there were peaks from Pb oxide phases and at high Zr fraction peaks from pyrochlore phases were shown. The films showed also good electrical properties such as high dielectric constant more than 1200, and high breakdown voltages.

P-126

Effect of PbO under layer on the microstructure and characteristics of MOCVD grown Pb(ZrxTi1-x)O3 thin films. **Daesig Kim and J.S. Lee** (Electronic Materials Lab., Materials Sector, Samsung Advanced Institute of Technology, P.O. Box 111 Suwon 440-600, Korea)

Pb(ZrxTi1-x)O3 thin films were grown on PbO seeded platinum substrates (Si/ SiO2/ Ti/ Pt/ PbO) to investigate the effect of lead on the nucleation of PZT perovskite on Pt substrate. Uniform PbO seed layers with thickness of 10~40nm were prepared on Pt at 450℃ and PZT growth was followed at 600℃ by MOCVD. The PbO layer revealed recrystallization upon substrate heating up to 600℃ forming small gains of 10~30nm in size at the grain boundaries of Pt sub-layer. This, as a result, protected the top surface of Pt substrate from thermal deformation and also altered the microstructure of PZT thin film grown on it, providing nucleation sites for PZT perovskite phase. As a consequence, the promotion in nucleation density made the PZT films homogenous with small grains and, in turn, improved the surface morphology and electrical characteristics.

P-127

$SrBi_2Ta_2O_9$/INSULATORS/Si STRUCTURE FOR METAL /FERROELECTRICS/INSULATORS/Si(MFIS) in NDRO-TYPE FRAM, **WON-JAE LEE, BYOUNG-GON YU, JONG-SON LYU, CHANG-HO SHIN*, HEE-CHUL LEE*, JIN-HYO LEE and BO-WOO KIM (Semiconductor Technology Div. ETRI, Daejon, 305-350, Korea, *Dept. of Electri. Eng., KAIST, Daejon 305-701, Korea)**

Metal-ferroelectric-insulator-semiconductor (MFIS) devices are expected to be a good candidate for storage devices in non-volatile high density IC memories and for functional neuron devices. For these applications, we have fabricated Pt/SBT/insulator/Si structure for the transistor gate in MFIS -FET and investigated the electrical properties of MFIS structure with various insulator materials. $SrBi_2Ta_2O_9$ films as a ferroelectric layer were fabricated by metal organic deposition(MOD) technique, on various insulators structures including SiON, Al_2O_3 and Ta_2O_5, as well as on Pt/Ti/SiO_2 /Si structures. The I-V characteristics by using Miller's theoretical MFSFET model were calculated with various insulator materials and the interface characteristics of ferroelectrics/insulators were analyzed to explain the difference between simulated and measured values.

P-128

CHARACTERIZATION AND FORMATION OF METAL/FERRO-ELECTRIC/INSULATOR/SEMICONDUCTOR(MFIS) STRUCTURE WITH A SPIN-ON GLASS AND Ta_2O_5 FILM AS THE BUFFER LAYER, YEON H. CHOI and C. J. KIM (Dept. of Electronic Engineering, The University of Seoul, 90 Jeonnong-dong, Dongdaemun-ku, Seoul 130-743, Korea)

$PbZr_xTi_{1-x}O_3$(PZT) Films were prepared by Sol-Gel method on SOG(Spin-On Glass) film and Ta_2O_5 film as the buffer layer for Metal-Ferroelectric-Insulator-Semiconductor(MFIS) structure.

In order to form PZT films with perovskite phase, we processed at low temperature and inserted $PbTiO_3$ layer between PZT films and the buffer layer because the spin-coated SOG films and Ta_2O_5 formed by the MOCVD were in amorphous phase. In this study, these films were deposited on two different substrates, one is on Pt/Ti/SiO_2/p-Si(111) and the other is on p-Si(100) substrates. The resultant films annealed at about 450℃ for 2 hours in O_2 were highly orientated in the c-axis direction and had smooth surface morphology attributed to SOG film.

In the Polarization-Electric field(P-E) curves, hysteresis loops of the resultant films using SOG showed very good characteristics as the remanent polarization(P_r) and the coercive field(E_c) were 26 μC/㎠ and 60kV/㎝ for 400-㎚-thick film, respectively. The memory effects of capacitance-voltage(C-V) curves were measured at MFIS structure and the memory windows of SOG film and Ta_2O_5 film were about 2.5V and 3V, respectively. It means that ferroelectric hysteresis controls the Si surface potential and this can be applied to MFIS-FET memory device.

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