Sym. F : Ferroelectric Thin Films

DEVICE MATERIALS & SCIENCE

A-TUE-03

ON THE PROSPECT OF FUTURE HIGH DENSITY NON-VOLATILE MEMORY TECHNOLOGIES, Keizo Sakiyama (Process Development Center, IC Group, Sharp Corporation, Japan)

Non-volatile memories should be able to eliminate additional battery and hard disk devices and to contribute miniaturization and simplification of end products, which should generate and popularization of new handheld digital pc high performance mobile phone and so on, therefore, it has been one of the most important infrastructure technologies in advanced multi-media world. Mask ROM which is one of very traditional Non-volatile memories may not expand its market because of non-reprogramable and facing tough competition with cheaper devices like CD-ROM etc. While, flash memory is the major technology in existing market to lead this expanding market. As key technology, increasing capacitance coupling ratio between two poly Si gates and to improve tunnel oxide immunity for higher programming speed, so on. For more ultimate feature, Ferroelectric memory has been expecting to realize due to its high speed random access read/write performance. It seems to be so difficult to realize high density to complete with flash and DRAM, however, Market prospect to realize 400M$ in tear 2000. Key gate is how soon to complete IT/IC technology. As very unique candidate, photonic NVFET which has same MOS transistor structure and switch to move proton charge between upper and lower surface of gate Si oxide corresponding gate polarity. For future technology, those promising candidate has been there now to be able to meet the requirement.

A-TUE-04

LOW TEMPERATURE PREPARATION OF FERROELECTRIC $SrBi_2Ta_2O_9$ THIN FILMS BY A MODIFIED RF MAGNETRON SPUTTERING TECHNIQUE, CHEOL-HOON YANG, JAE-SUN KIM and SOON-GIL YOON (Department of Materials Engineering, Chungnam National University, Daeduk Science Town, Taejon, 305-764, Korea

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Bi-layered ferroelectric $SrBi_2Ta_2O_9$ (SBT) films were successfully prepared on Pt/Ti/SiO_2/Si substrates at 650℃ by a modified rf magnetron sputtering technique. The SBT films annealed for 1 h in O_2 (760 torr) and again for 30 min in O_2 (5 torr) at 650℃ show a average grain size of about 49 nm. The SBT films annealed at 650℃ have a remanent polarization (P_r) of 6.0 $\mu C/cm^2$ and coercive field (E_c) of 36 kV/cm at an excitation voltage of 5 V. The films showed fatigue-free characteristics up to 4.0×10^{10} switching cycles under 5 V bipolar pulse. The retention characteristics of SBT films looked very promising up to 1.0×10^5 s. The films showed a leakage current density of 2.2×10^{-7} A/cm^2 at 120 kV/cm.

A-TUE-05

EFFECT OF MODIFIED HEAT TREATMENTS ON THE SURFACE MORPHOLGY OF $SrBi_2Ta_2O_9$ THIN FILMS TAE-YOUNG KIM, CHEE WON CHUNG (Electronic Materials Lab., Samsung Advanced Institute of Technology, P.O. Box 111 Suwon 440-600, Korea). KYU SANG LEE and WAN IN LEE (Dept. of Chemistry, Inha University, Inchon 402-751, Korea)

Typical surface morphology of $SrBi_2Ta_2O_9$ thin films prepared by chemical solution deposition at high temperature has revealed inferior characteristics. From the viewpoint of the requirements in the integrated circuits over the use of the ferroelectric capacitors, we have investigated the effects of thermal treatments combining rapid thermal annealing and furnace annealing on the variation of surface morphology of $SrBi_2Ta_2O_9$ thin films. In this work, annealing temperature, annealing time and presence of the seeding layer were taken as experimental parameters. The attempt was also made to obtain appropriate ferroelectric properties for nonvolatile memory applications such as high remanent polarization ($Pr > 6\mu C/cm^2$) and low coercive field ($Ec < 50kV/cm$) while maintaining improved morphology.

A-TUE-06

REFINEMENT ON CHARACTERIZATION OF ARTIFICIAL SUPERSTRUCTURE FROM X-RAY DIFFRACTION, YURIKA ISHIBASHI, T. TSURUMI and N. OHASHI (Dept. of Inorg. Mater., Tokyo Inst. Tech., 2-12-1 Ookayama, Meguro-ku, Tokyo 152-8552, Japan)

We show the refinement of structural analysis for artificial superlattices by simulating X-ray diffraction (XRD) profiles. The $BaTiO_3/SrTiO_3$ superstructured thin films were prepared on $SrTiO_3$ (001) single-crystal substrates by low-energy positive oxygen ion-assisted molecular beam epitaxy. The atomic interdiffusion occurs in the deposited films because of heating the substrate during film growth. In order to take account of the interdiffusion, the structure of specimens was analyzed using a model combined with Fick's law of diffusion. From the simulation by the model, we found that the XRD profiles of diffused superlattices were obtained from the intensity ratio of 1st satellite peak to 0th satellite peak. The change of the intensity ratio for the specimens annealed at different temperatures (500°C to 800°C) indicates that the interdiffusion between $BaTiO_3$ and $SrTiO_3$ takes place by annealing below 800°C.