## P-027

**EFFECTS OF $BF_2^+$-IMPLANTATION ON THE STRAIN-RELAXATION AND CURRENT LEAKAGE IN N-TYPE $Ge_{0.06}Si_{0.94}$ LAYERS ON Si(100)**, M. S. OH, M. H. JOO, S. IM(Department of Metallurgical Engineering, Yonsei University, Seoul, 120-749, Korea), H. B. KIM(Dept. of Physics & Atomic-scale Surface Science Research Center, Yonsei Univ., Seoul 120-749, Korea), J. H. SONG(Advanced Analysis Center, Korea Institute of Science and Technology, Seoul, 130-650, Korea), and H. K. KIM(Surface Analysis Group, Korea Research Institute of Standards and Science, Taedoc Science Town, Taejon, 305-606, Korea)

For a doping method in strained GeSi thin films, in-situ method has mainly been used in growth chambers, because conventional implantation may accompany irradiation damage bringing enhanced relaxation of strain in the GeSi layers. Nonetheless, ion implantation doping has recently been succeeded. In this study, we present dose-windows for successful strain-conservation, and the effects of $BF_2^+$ implantation on the current leakage of pseudomorphic n-type $Ge_{0.06}Si_{0.94}$ alloy layers are discussed. $Ge_{0.06}Si_{0.94}$ layers(n-type) grown by MBE on Si(100) were implanted at room temperature with 70 keV $BF_2^+$ ions to doses of $3x10^{13}$,$1x10^{14}$,and $2.5x10^{14} cm^{-2}$. The samples were subsequently annealed in a vacuum or nitrogen furnace for 30 min at 700, 800, and 900℃. Observed by MeV $^4He$ channeling spectrometry, the GeSi implanted at a dose of $2.5x10^{14}$ $BF_2^+$ $cm^{-2}$ seems to be amorphized from surface to a depth of about 100 nm. Crystalline degradation of post-annealed $Ge_{0.06}Si_{0.94}$ samples becomes pronounced as the dose increases, although the samples implanted at $3x10^{13}$ $cm^{-2}$ do not visibly degrade after annealing. It is thus concluded that such a low dose of $3x10^{13}$ $cm^{-2}$ can only conserve intrinsic strain. For a detailed study of such a behavior of strain-relaxation enhanced by ion beam damages, SIMS, x-ray rocking curve, and current leakage measurements will be discussed.

## P-028

**DEFECT STRUCTURES IN SiGe LAYERS GROWN ON (001) Si BY RPCVD**, **R. SPIRYDON, J.H. CHO, T-Y. SEONG (Dept. of Materials Science and Engineering, K-JIST, 506-712 Kwangju, Korea) H.S. LEE (Dept. of Physics and Institute of Natural Sciences, Kyung Hee University, 449-701 Suwon, Korea)**

Misfit-related defects at the SiGe/Si substrate interface have been characterised by transmission electron microscopy. TEM weak beam imaging results show that defect behaviour depends on the layer thickness. The density of the misfit dislocations increases with increasing the layer thickness; it is, $\sim 2\times10^7$ $cm^{-2}$, $\sim 1\times10^8$ $cm^{-2}$, $\sim 5\times10^8$ $cm^{-2}$ for the layer thickness of 20 nm, 40 nm and 50 nm, respectively. Diffraction contrast examination shows that as for the 20 nm layer, there are mainly 60° dislocations with very few 90° dislocations; for 40 nm layer, 60° dislocations with some 90° dislocations; as for 50 nm layer mainly 90° dislocations with some 60° dislocations. Threading dislocations are observed for 40 nm and 50 nm layers. A model is proposed to explain how the lattice misfit strain is relieved during growth.

## P-029

**FREQUENCY CHARACTERIZATIONS OF ELECTRODES ON QUARTZ CRYSTAL FOR SMD TYPE TCXO(TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR)**, H. G. SHIN, D. K. CHOI(Dept. of Inorg. Mat. Eng., Hanyang Univ., Seoul 133-791, Korea), N. H. MIN, W. C. SON, Y. D. KO(Mirae Comm. Co., Cheonan 330-810, Korea), H. S. LEE, W. S. UM(KITECH-KTL, Seoul 152-053, Korea)

TCXO is one of the most important devices in communication field. The optimum conditions of electrode deposition were studied. Au, Ag thin films were deposited onto quartz crystals ($4.4\times1.95$ and $5\times2.6$ ㎜) by thermal evaporation and sputtering method. Ni-Cr was used as adhesion layer between Au film and quartz. Thickness ratio of electrode to adhesion layer, substrate temp.(R.T~500℃) and deposition rate were considered as processing variables. Freq. vs temp. characteristics were measured at -20 to 60℃. Relatively uniform adhesive electrodes were obtained by sputtering method, compared with evaporation method. Initial frequency characteristics were influenced by physical factors such as thickness, size and materials of electrodes. However, microstructures and interface reactions became more effective factors in terms of reliabilities(aging, humidity, temp.). The influence of processing parameters on frequency characteristics will be discussed.

## P-030

**THE GROWTH OF HIGH RESISTIVE UNDOPED InP EPILAYER BY CHLORIDE VAPOR PHASE EPITAXY**, YOUNG-GEUN JANG, HYUN-SOO KIM, DONG-SUK SHIN, IN-HOON CHOI (Dept. of Materials Science, Korea University, Seoul, 136-701, Korea)

We examined the dependence of the growth of undoped InP epilayer by chloride vapor phase epitaxy on the growth temperature and on the $PCl_3$ molar fraction. The growth temperature was varied from 620 ℃ to 650℃ and the $PCl_3$ molar fraction from $2.5\times10^{-2}$ to $4.5\times10^{-2}$. The undoped InP epilayer with hillock free surface was obtained at the growth temperature of 640℃ and at the $PCl_3$ molar fraction of $3.0\times10^{-2}$. The surface morphology was improved with the decrease of the $PCl_3$ molar fraction. The carrier concentration measured by Hall and ECV was less than $1\times10^{14}cm^{-3}$. The resistivity of the undoped InP epilayer, measured by using four probe method, showed a high value of $3.0\times10^6\Omega cm$.

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