11-Surfaces, Interfaces and Thin Films

PS-11.01.25 PROFILING OF STRAIN AND DAMAGE DISTRIBUTION WITH DEPTH OF ION-IMPLANTATION ON STRAINED LAYER SUPERLATTICES. By

S.Swaminathan*, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore 2263 and M.C. Shrivastava, Department of Electronics and Communication Engineering, S.G. Institute of Technology and Science, Indore, India

Ion implantation in Strained Layer Superlattices (SLS) has been found to induce additional strain and lattice distortion arising out of damage due to random displacement of atoms (Myers D.R., *et al, J.Appl Phys.* 1986, 60, 3631-3640). Displacement damage from implantation causes an expansion of the implanted surface region due to point defect generation. Double Axis X-ray Diffraction technique has been found to be extremely useful in the study of layer characteristics of SLS structures (Wie C.R., *et al, J.Appl. Phys.*, 1986, 59, 3743-3746).

In the study made on Be implanted GaAsP/GaP SLS, rocking curves have been effectively used to analyse damage and strain distribution with depth. A simulation of the (004) experimental rocking curves was performed using a model based on Takagi's dynamical theory of X-ray diffraction of distorted crystal, wherein, the effect of spherically symmetric Gaussain distribution of randomly displaced atoms has been incorporated in the form of a modified structure factor, $F_H = F_H^o \exp[\{-(8\pi^2\sin^2\theta_b)/\lambda^2\}.U^2]$, where U is the average atomic displacement. From a simulated fit to the experimental rocking curve, strain and damage distribution with depth have been evaluated. The results show that maximum strain and damage occur at about the same depth and that damage due to ion implantation varies linearly with perpendicular strain, as long as the implantation dose is low enough such that inter-diffusion or atomic disordering due to implantation can be neglected.

PS-11.01.26 A MODERN SYSTEM FOR HIGH-SPEED DATA COLLECTION FROM A POWDER DIFFRACTOMETER OF ALL KINDS. By

Liu Mingguang*, Pei Guangwen, Liu Yueting, Guo Husen, Central Laboratory, Nankai University, Tianjin, China.

The powder diffractometer of all kinds has been modified to accommodata data collection and storage by AST 486 computer.The interface system is describe and relatirely low cost. The system is suitable for powder diffractometer of all kinds.

Introduction

The powder diffractometer collective techniques have been reviewed by several authors. Most of them were adopted from A/D converters. Unfortunately, the use of A/D converters inevitably introduces compounded conversion errors.

Therefore,our aim was to interface a AST 386,486 to a powder diffractometer given the following basic requirements:

(1)the computer must confirm the scan beginning and trace the stepped motor driver to count stepped pulses.

(2)the computer can collect the intensity data from PHA(Pulse High Analyzer)..

(3)the X-ray diffraction profiles can be display and plot out.

Hardware

Developed for IBM XT/AT/PS2, or compatible computers such as AST 486,COMPAQ 486 with a 100M byte hard disk was for the data collection and storage unit.A graghics adopter is required for this system which uses eigher an EGA or VGA or TVGA.

There are synchronism control signal port and data port in the interface.The control system of powder diffractometer was investigated,and it was found that the command signals are:

(1)high-level(5-12V)received from the pin of pen up/down when scan beginning.

(2)a group of stepped pulses acted as interrupted signals.

The present study utilized these signal to synchro control the counter working.The data can be counted in binary or ASCII from PHA.

Software

A program was written in Windows V3.0 and Assembly V5.0 language for the interface system.It provides four functions:

(1)an automatic data collection routine.

(2)a rapid graph profiles routine.

(3)a quick peak search routine.

(4)a profiles edit and plot routine.

The collection routine allows the operator to set measurement conditions such as star. stop angle and step width et.for the data file index.

The operator can enlarge or reduce the scan chart under Windows enviroment.The profiles can be printed out on the printer or X-Y plotter.The program packages are manu driven and easy to use.The intensity data is written to a data file by the operator.It can be transformed from binary into BASIC or FORTRAN format.

PS-11.01.27 NUCLEATION AND GROWTH OF <111> ORIENTATION HOMOEPITAXIAL DIAMOND MONOCRYSTAL. By

Z. M.Zhang, S.H.Li, Q.Y.Cai, H.M.Chen, X.C.He, D. L.Ling and S.J.Wang, Shanghai Jiao Tong Univ., Shanghai 200030, China. Z.W.Hu, S.S. Jiang, C. Z.Ge and N.B.Ming, Nanjing Univ., Nanjing 210008, China.

It has been reported that only polycrystal diamond film could be formed on heteroepitaxial substrate by CVD method, which stimulated great interesting to grow homoepitaxial film, however, few reports concerned the growth on <111> oriented substrate. In this paper, a successful growth of homoepitaxy on (111) natural diamond substrate is presented by using microwave PCVD method. The experimental process was almost same as that of (100) homoepitaxy reported before. There was quite difference of the nucleation and growth between the layers on (111) and (100) oriented substrates. It was shown that the (111) epitaxial film could not be formed without the addition of oxygen. In fact, there was small deflection of the substrate surface to <111> direction. It was noticed that the smooth epitaxial layers have been performed in the whole 2-3mm^2 area if argon was added to the reaction gases. The Raman spectroscopy showed a sharp diamond peak at 1333 cm^{-1} and a very small and broadening peak at 1550 cm^{-1} in relation to graphite phase. X-ray double crystal diffraction proved a single (111) diffraction peak which HMFW was 110". The topography pictures of synchrotron radiation indicated good quality of the epitaxy. In grazing incident condition, the RHEED pattern with hexagonal symmetry kept all the same when the sample was moved.

