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Parallel to the crystal growth a reduction of the fraction of stacking faults is observed indicated by the decrease of the c-lattice parameter and by the appearance of (hk0)-reflections. Differences in the initial film thickness influence the structural state of the untreated material but they disappear during heat treatment.

Recently, Pt/Co multilayer has stimulated the interests of many researchers due to its potential as a high-density magneto-optical storage material. Generally, such a candidate material must have a large Faraday or Kerr effect at short wavelength, a perpendicular anisotropy and a relatively large coercivity at room temperature. Pt/Co multilayers happen to satisfy all these conditions.

In our experiments, Pt/Co multilayers were prepared using dc magnetron sputtering on silicon substrates. The structures were determined by X-ray diffraction and the magnetic properties were measured by Kerr angle hysteresis loops. In table I are listed the sample parameters and their magnetic properties (omitted).

The low angle X-ray diffraction pattern, as shown in Fig. 1, clearly confirmed the existence of multilayer structure of sample 1. The bilayer thickness deduced from Bragg formulas agreed well with the sample parameter.

A simple simulation of high angle x-ray diffraction pattern was made. At any circumstances, the n=1 satellite peak was higher than the n+4 satellite peak, which is in contradiction to the real pattern shown in Fig. 2. We contribute this phenomena to the appearance of Pt/Co alloy at the interfaces, whose (111) peak overlaps with the Bragg peak of multilayers and (200) peak is at the same position of n=+1 satellite peak (C.-I. Lin and G.L. Gorman, Appl. Phys. Lett., 1992, 61(13), 1600). In sample 2, when Co layer was much thicker, the multilayer diffraction overwhelmed the PtCo alloy diffraction and the relative height of these two peaks reversed.

In conclusion, we have found the PtCo alloy diffraction at Pt/Co multilayers. And the appearance of PtCo alloy did not destroy the perpendicular magnetic anisotropy which is believed to be mainly induced by interface anisotropy, the influence of interface atoms on the anisotropy can be further studied.

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PS-11.02.16 THE STRUCTURE AND MAGNETIC ANISOTROPY OF Pt/Co MULTILAYERS By Zhi-hung Jiang, Yan, Chang-lin Kuo*, De-fang Shen, Rong-fa Gao*, Tian-shen Shi1. 1) Shanghai Institute of Metallurgy, Chinese Academy of Sciences, Shanghai, P.R. China. 2) Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, P.R. China.

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The cross-hatched morphology (CHM) has been commonly noticed in strained III-V semiconductor films (K. R. Chang et al. J. Appl. Phys., 1999, 67, 4093-4098). The CHM has been observed by means of Nomarski interference, X-ray topography, TEM, cathodoluminescent and photoluminescence but for results about the CHM we were presented for InGaAs/GaAs strained-layer superlattices (SLS).

In the present letter we report the x-ray topographic examinations of InGaAs/GaAs SLS. The specimens used in the experiments were grown by molecular beam epitaxy (MBE) on GaAs substrates. The nominal structure of the SLS samples were 100 periods of 70 A InGaAs/GaAs and 250 A GaAs with about 1 µm GaAs buffer layer and a 3 µm capping layer, respectively. In order to eliminate the influence of the capping layer on the reflection topographs a sample (denoted A) was etched to remove the capping layer. The x-ray topography experiments on sample A were performed at 4W1A beam line of the Beijing Synchrotron Radiation Facility (BSRF).

The actual structure of the specimens were determined by the simulations of experimentally measured rocking curves based on the dynamic diffraction theory for deformed crystals (Z.-B. Mei, B. F. Cui and C. C. Hs, Phys. Rev. B, 1999, 41, 9330-9334). Percentage relaxations of the two component layers of SLS were particularly found from the simulations.

224 reflection topographs were taken at the zero order peak of the SLS and the substrate peak, respectively. They were characterized as orthorhombic striation parallel to the [110] and [110] directions, respectively. X-ray topographs were also taken under anomalous transmission conditions using Cu Kα1 radiation (μ=17, where μ is the linear absorption constant and t is the sample thickness). In 222 or 220 anomalous transmission topographs shown in Fig. 1 the striations parallel to [110] or [110] disappeared, respectively. According to the indistinguishability criteria of striations, both the striations parallel to [110] or [110] were edge-type striations with Burger's vectors in [110] or [110] direction in the [001] growth plane.

It is interesting to see that in addition to the striations in the [001] growth plane other striations (see regions C of Fig. 1) which obeyed the symmetry extinction law were observed on the cleavage planes of sample A. The stereotopographic topographs provide us evidence that the misfit dislocations distribute on the SLS and...
are packed in columns along the surface normal. This is in agreement with the
simulation of experimental rocking curves in which the partial relaxations were
considered in every periods of the SLS.
Based on a series of experimental results a relaxed growth mechanism for
InGaAsP/InAsSb SLSs is proposed.

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**PS-11.02.19**

**DISTRIBUTION OF CRYSTALLITES IN AMORPHOUS SiO₂ FILM ON Si WAFER AND ITS
CHANGE WITH OXIDATION PROCESS**

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Electrical and mechanical properties of amorphous SiO₂ film grown on the Si substrate have been attractive much attention because of an industrial application as an atomically thin insulator on semiconductor devices. As a non-destructive method in investigating the structure of the amorphous phase and its interface, dida et al. (Surface Science, 258, 1991, pp.235–238) have recently applied the technique of X-ray crystal truncation rod (CTR) scattering and have found extra peaks on the low angle side of the 111 CTR scattering. It has been suggested that some crystalline scatters exist in the amorphous film. In this paper we show that the profile of the peak strongly depends on the condition of oxidation of Si wafer and the distribution of crystalline scatterers in the amorphous film can be obtained from the analysis of the profile. Three kinds of samples were prepared; normal dry O₃ oxidation heated at 900 degree denoted as Dry-O₃; low temperature oxidation (about 650 degrees) under the atmosphere of afterglow of microwave plasma of O₂ molecule denoted as AGMP. X-ray measurement was performed at Beam Line 4C in Photon Factory, KEK Tsukuba. Figure shows the change of the profile of the peak for three samples. Solid curves show the calculation obtained by the least squares fitting where the distribution of the crystalline scatters in amorphous phase was refined. We found that the distribution depends on the oxidation process. For instance the crystallites exist only at the interface especially for the sample AGMP.

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