An optimization of observed X-ray intensities is necessary to obtain a good correlation between theoretical work and experiments : this is possible for layers showing 10 to 20 fringes with different position and intensity.

The sensitivity is about 100 Å for the thickness variation at a total thickness of 8000 Å and about 2 10^{-5} for $\Delta a/a$, which corresponds to a variation of composition $\Delta x = 0.007$ in $Ga_{1-x}Al_x$ As epitaxial layers.

A unique solution will be found by a proper choice of thicknesses and compositions of different layers. This allows a rapid checking of epitaxial layers and gives information for different kinds of epitaxial growth as regards to homogeneity and concentration profiles.

07.8–3 X-RAY INVESTIGATION OF STRAIN FIELDS IN Sb ION-IMPLANTED Si. By A.P. Pogany, T. Preuss and H.K. Wagenfeld, Department of Applied Physics, Royal Melbourne Institute of Technology, Melbourne, Victoria, Australia.

A thick (100) Si crystal surface was implanted with $5.10^{15}/cm^2$ Sb^+ ions at 100 keV, and sequentially annealed at increasing temperatures. The initial amorphous layer regrows epitaxially with substitutional incorporation of the Sb, causing a strain field normal to the surface. X-ray rocking curves were measured with a double-crystal diffractometer, and matched to theoretical curves obtained from model strain fields using the Takagi-Taupin equations. The inferred strain is found to extend much further into the crystal than the Sb distribution itself; this is thought to result from movement of Si self-interstitials. After high temperature annealing the strain field decreases and ultimately disappears. This correlates with precipitation of Sb out of the solid solution. The general picture is supported by electron microscopy and ion backscattering measurements.

07.8–4 THERMAL EXPANSION AND CARRIER CONCENTRATION IN GaAs DOPED CRYSTALS. By J.Bak-Misiuk and M.Banasikowski, Institute of Physics of the Polish Academy of Sciences, Warszawa, Poland.

Lattice constant a of p and n types GaAs single crystals have been determined by the Bond method (accuracy $\frac{\Delta a}{a} = 10^{-5}$) at the temperature range of 300-700 K. Two kinds of courses of a = f(T) are observed - straight lines and lines with kinks. The obtained results are analysed on the basis of the equation proposed by Pietsch and Unger (phys.stat.sol. a, 1983, 80, 165).
The thermal expansion coefficient α is dependent on the dopant concentrations. For example α equals 5,37 x 10^{-6} and 6,18x 10^{-6} K^{-1} for the n type GaAs with Te concentrations 3 x 10^{16} and 5 x 10^{17} cm^{-3}, respectively. The kinks of a = f(T) courses are connected with the carrier excitation from the deeper levels. The carrier concentration and dopant level can be estimated from thermal expansion coefficient and temperature of kink.
The results suggest that the absolute values of the deformation potentials of top of valence band Dp and bottom of conduction band Dn in GaAs are almost the same. Precise lattice constant measurement at the higher temperature makes it possible to obtain the similar information also for another semiconductors.
The courses a = f(T) with kinks are also observed for InP doped with Sn (U.Pietsch, J.Bak-Misiuk, V.Gottschalch, phys.stat.sol. in print) and for CdSe single crystals, too.

07.8–5 DISLOCATION REDUCTION IN HEAVILY DOPED GALLIUM ARSENIDE SINGLE CRYSTALS. By G.Attolini, R.Fornari, C.Paorici and L.Zanotti, MASPEC-CNR, Parma, Italy.

As is known, important GaAs applications (e.g., microwave and optoelectronics devices) are still limited due to undesired structural defects, mainly dislocations. Dislocations occur because of thermoelastic stress, inherent to the growth process, in crystals having very low yield stress.
However, many authors reported (see, e.g., R. Fornari et al., J.Crystal Growth, 63 (1983) 415) that consistent yield stress increase (= hardening) can be achieved via heavy doping with particular dopants (S, Se, Si, In, etc.).
Object of this communication is here to refer to new results on dislocation reduction in lec grown silicon-doped and sulphur-doped GaAs.
In the case of GaAs:Si, the dislocation density (EPD) is correlated not only with the electrical activity, but also with the chemical activity, as defined by AAS analysis.
The results seem to confirm a solution-hardening type mechanism as the main cause of dislocation reduction.
In the case of GaAs:S, a "cracking" tendency is evidenced in heavily-doped dislocation-free crystals.