The surface of heteroepitaxial silicon grown on sapphire substrates exhibits a haze-like appearance. It has been noted that device yield and performance can be correlated with the degree and extent of haze observed on the silicon. Considerable effort has therefore been expended on developing quantitative optical procedures for the assessment of haze. Little has been reported on work aimed at establishing the structural origin of haze.

This contribution describes recent results on the determination of twin concentrations in hetero-epitaxial silicon on sapphire. Details of the instrumentation employed will be given. It is shown that a correlation exists between twin concentrations and measurements of haze.

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**07. 8-7 THE STRUCTURE OF MBE GROWN (Ga1-xAlxAs)0.5/GaAs0.5 SUPERLATTICES AS DETERMINED BY MEANS OF X-RAYS DIFFRACTION TECHNIQUES.** By J. Kervarc, M. Baudet, P. Auvray and A. Regreny, Centre National d'Etudes des Télécommunications, 22301 LANNION FRANCE

The study of the physical properties of the superlattices (Ga1-xAlxAs)0.5/GaAs0.5 requires the knowledge of their structural parameters \( n_1, n_2 \) and \( x \) and of their crystalline perfection.

For this purpose, two experimental techniques are used a standard powder goniometer and a double crystal diffractometer. The diffraction diagrams directly yield the super period and the average Al concentration in the superlattices. The value of \( x \) is determined by refinement between observed and calculated structure factors. The results are even more accurate when the number of observed satellite peaks for a given periodicity is greater; this number depends at the same time on the Al composition \( x \), the \( n_1/n_2 \) ratio, the periodicity and its dispersion and the characteristic features of the interfaces.

This method is illustrated by a few examples. The consequences of various defects (dispersion in \( n_1 \) and \( n_2 \), super period gradient, Al diffusion) on the X-ray diagrams will be discussed.

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**07. 8-8 CHARACTERIZATION OF THE BaLaGa3O7 SINGLE CRYSTALS GROWN BY CZOCZRALSKI METHOD.** By G. Jasiolek, M. Berkowski and W. Piekarzyc, Institute of Physics of Polish Academy of Sciences, Warszawa, Poland.

The single crystal samples cut from the Czochralski growth BaLaGa3O7 crystals have been the subject of our investigations (W. Piekarzyk, M. Berkowski, G. Jasiolek, submitted to the J. Crystal Growth). The samples were prepared in the slice form with the surfaces parallel or perpendicular to the growth axis of the crystals. [001]. These samples were extracted from the part of the crystals with the convex crystallization front as well as from the part of the flat front. The morphology of the samples were revealed by the X-ray topography and the SEM techniques. These techniques permitted to detect few regions of the crystals which differ from the surroundings. Particular attention was paid to the melt-back region as well as to the skin and core regions of the crystals. The observations of the changes of the lattice parameter \( c \) up to 0.0003\( \text{nm} \) were carried out using photographically modified Popovic method (J. Appi. Crystall., 1971, 4, 240). The lattice parameters mapping along one of the crystals has been done using Bond method (Acta Cryst. 1980, 3, 330). The concentration of the gallium, barium and lanthanum as well as the level of distribution homogeneity of these elements were measured in the different regions of the crystals using the electron microprobe analyzer. The increase of the gallium concentration was confirmed in the core region of the crystals. A slight increase of the barium concentration was observed in this region, too. It was found that the distribution of lanthanum is homogeneous in the whole crystal. The barium and gallium distributions are homogeneous out of inter-regions. Vickers microhardness was measured in the selected regions of the crystals, for the different orientations of the specimen.
Oxidation behaviour of magnetite, investigated by means of x-ray analysis.

By M. Alavi, Chemistry Dept., Univ. Isfahan

Quantitative x-ray analysis, using soft radiation, results in information about the species and amount of oxidation products of so-called active magnetite.

For the formation of Fe₃O₄ the starting material Y-Fe₂O₃ is applicatible, which is to be reduced at 460-550°C by H₂/N₂. The active magnetite formed will be converted into magnetite, Y-Fe₂O₃ either directly after formation or after keeping a certain time at room temperature.

Contrary to the aged Fe₂O₃ which forms Y-Fe₂O₃ besides Y-Fe₃O₄, the active Fe₂O₃ oxidizes to Y-Fe₃O₄ completely. While cooling in an oxidizing atmosphere, the magnetite primarily formed shows an anomaly in Fe₂O₃ decrease between 290 and 350°C. An explanation is given by Faraday's passivation theory: temporarily an oxide skin is formed around the Fe₂O₃ grain which is hindering a further bulk oxidation.

The microstructure of unidirectionally solidified Ni-W eutectic composite. By S.F. Minafield and D. Shetman, Dept. of Materials Engineering, Technion, Israel Institute of Technology, Haifa, Israel.

The microstructure of unidirectionally solidified (UDS) specimens of a Ni-W eutectic composition consists of W-fibres in a Ni(W) solid solution matrix which contains semi-coherent Ni₄W precipitates of the D₁₉ type. The growth axis of the W fibres and the orientation relationship between the phases is as grown condition as well as after creep experiments at elevated temperatures were studied by transmission electron microscopy. Small area diffraction patterns indicate that the growth axis (checked on three different fibres) is of the <111> family. The analysis of the diffraction patterns taken from the boundary region of the Ni(W) and W phases shows that the orientation relationship between the phases is of the Bain type, so that <100> of the W fibres is parallel to the <100> of the Ni(W) matrix. It was found that the matrix of the as-grown specimens solidified at relatively high solidification rate (369°C/hr) contains equiaxial Ni₄W precipitates of D₁₉ type (face centered tetragonal structure) with the same orientation relationship as in Ni₄Mo (Okamoto and Thomas, Acta Met. 1971, 19, 825). The Ni₄W precipitates in specimens solidified at lower rates are plate-like in shape with identical orientation relationship as mentioned before. The boundary between the two phases Ni₄W and Ni(W) solid solution consists of dislocation networks to compensate for the incoherency between the two structures. The fault structure of the W fibres shows low density of dislocation and no subboundaries were detected. A specimen that was subjected to creep for 95 hours at 960°C shows strained areas. The boundary between the W fibres and the matrix is highly stressed at elevated temperature due to the difference in the thermal expansion coefficients and the different ductility of the two phases.