The results of ED and XD observations indicated that (III)oriented-epitaxial films could be grown on (III)CaF_2 substrates under the above growth conditions. The half-width of x-ray rocking curve of the film tended to decrease gradually with increasing the growth temperature(T_g). There was an optimum etching time(t_e) for the growth of smooth epitaxial films which had the smallest value of half-width and the best electrical properties. From the measurements with the van der Pauw method, the carrier concentration and the Hall mobility for an as-grown p-type film, under the optimum growth conditions(T_g=485°C, t_e=I5 min.), were 2xI0^{I7} cm^{-3}, I.5xI0^4 cm^2/V·s at 77K, respectively. The surface morphology of films was changed by the growth conditions. The SEM observations will also be presented.

07.2-2 DIFFRACTION STUDIES OF THE INTERFACE BETWEEN NICKEL FILMS AND SAPPHIRE SUBSTRATES.* By C.J. Sparks and G.E. Ice, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831 USA and T. Habenschuss, Oak Ridge Associated Universities, Oak Ridge, Tennessee 37831 USA.

The structural perfection of epitaxial nickel films ~700 A thick grown on the (00·ℓ) or basal plane of heated sapphire (Al_2O_3) single crystals was studied with X-ray diffraction techniques. Rocking curve measurements on nickel films formed by vapor deposition showed that they increased in perfection as the temperature of the sapphire substrate approached 1400°C. The orientation relationship between the nickel film and the 00·ℓ deposition plane of sapphire is Ni(111)||Al_2O_3 and Ni<110>||Al_2O_3<11·0>. Warren-Averbach line shape analysis of the nickel film Bragg reflections was used to determine the particle size and strain. X-ray scattering from the interface between the nickel film and sapphire substrate was measured with synchrotron radiation. Measurements on the diffuse rods of X-ray scattering [see S.R. Andrews and R.A. Cowley, J. Phys. C 18, 6477 (1985) and I.K. Robinson, Phys. Rev. B 33(6), 3830 (1986)] normal to the interface gave information on the crystallography of the interface. Although the nearest nickel atom distances are 10.3% smaller than those of the close-packed direction in sapphire, the strain was accommodated at the interface rather than being distributed through the thickness of the nickel film. An analysis of the diffuse rods showed differences in the nature of the atomic roughness at the interface in comparison to studies on surfaces. Interpretation of the diffraction will be discussed.

*Research sponsored by the Division of Materials Sciences, U.S. Department of Energy, under contract DE-AC05-84OR21400 with the Martin Marietta Energy Systems, Inc.

07.2-3 X-RAY DIFFRACTION OF CU-ZU ALLOY FILMS. By Y. Wang, D. Su and S. Zwei, Physics Department, Jilin University, China.

X-ray diffraction line analysis has been applied to some deformed metals as well as metallic films to get information about the dislocations and stacking faults in crystals. (Wang Yuming et al, J. Appl. Cryst., 1982, 15, 35 and Y. Wang et al, J. Materials Sci., 1985, 4, 635) The similar methods and procedures are performed in this report to find out the difference between the crystal defects in Cu-Zu 33% at. films vacuum-deposited on different substrates at different temperatures. Al polycrystals, Al monocrystals, Cu polycrystals and Si monocrystals are used as the substrates. The substrate temperatures vary from 423 to 623K. The thickness of all the films is around 1500nm. Two Mo boats are used to evaporate Cu and Zn separately but simultaneously. Results show that the dislocation density in general decreases with increasing substrate temperatures in most samples while the dislocation distribution varies in a complicated manner. As for the stacking faults no deformation faults can be detected while the twin faults decrease with increasing substrate temperatures. The substrate material affects the state of crystal defects greatly. Some of the results can be explained from the viewpoint of film formation mechanism satisfactorily.

07.2-4 STRUCTURAL AND ELECTRICAL PROPERTIES OF LASER IRRADIATED $Pb_{0.8}Sn_{0.2}Te$ THIN FILMS

A.L.Dawar*, C. Jagadish** and P. C. Mathur
Department of Physics & Astrophysics, University of Delhi
Delhi-110 007, India.

Laser processing of semiconductors have drawn considerable interest in recent years. $Pb_{0.8}Sn_{0.2}Te$ thin films of 0.8 μm thick were grown onto glass, mica and KCl substrates kept at 400°C using flash evaporation technique. As-grown films were irradiated with Nd:YAG laser (1.06 μm) pulses of various energy densities in the range 2-30mJ/cm . The pulse width was 20 nsec and pulse repitition rate was 1 pps.

X-ray diffraction,Transmission Electron Microscopy studies were made on all the films in order to understand the structural changes occurred due to laser irradiation. It has been observed that there is a significant decrease in defect density and increase in grain size with the increase in energy density of the laser pulses. D.C. conductivity and Hall coefficient studies were made in the temperature range 77-300K. An increase in both Hall coefficient and Hall mobility was observed due to laser irradiation. This increase in Hall coefficient can be due to the removal of excess tin present in the films thereby reducing the free carrier concentration. Increase in mobility is due to the decrease in defect density. Mobility-temperature data have been analysed in the light of defect and lattice scattering mechanisms.

*Present add:Defence Science Center,Metcalfe House,Delhi.
**Present add: Department of Physics & Electronics, Sri Venkateswara College, University of Delhi, Dhaula Kuan, New Delhi-110 021, India.