07. MATERIALS SCIENCE C-121

07.2-2 DIFFRACTION STUDIES OF THE INTERFACE BETWEEN NICKEL FILMS AND SAPPHIRE SUBSTRACTS.* By C.G. Sparks and G.T. 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 Å thick grown on the (00-2) or basal plane of heated sapphire (Al₂O₃) 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 00-2 deposition plane of sapphire is Ni(111)|Al₂O₃ and Ni<110>|Al₂O₃<11-2>. The Warren-Averbach line 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)] show that a twodimensional surface layer was formed on the interface between nickel and sapphire. The structure of this layer has been studied with TEM and SEM techniques.

07.2-3 X-RAY DIFFRACTION OF Cu-Zn 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. 19:25, 1986) The similarity methods and procedures are performed. This report finds out the difference between the crystal defects in Cu₇₀Zn₃₀ at films vacuum-deposited on different substrates at different temperatures. Al poly/crystals, Al monocrystals, Cu poly/crystals and Si monocrystals are used as the substrates. The substrate temperature vary from 40°C to 623°C. The thickness of all the films is around 1500 Å. 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 temperature 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 temperature. 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 Pb₀.₈Sn₀.₂Te THIN FILMS. By A.J. 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. Pb₀.₈Sn₀.₂Te 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/cm². The pulse width was 20 nsec and pulse repetition rate was 1pps.

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.

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