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PROGRESS REPORT

FOR

(6) RESEARCH ON DEVELOPMENT OF
LOW-RESISTANCE p-n JUNCTIONS IN ZnSe

March 1981

B. Fitzpatrick

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DISCUSSION

Several groups of wafers were implanted with nitrogen at the Naval Research Laboratory (H. Dietrich) and at the University of California, Santa Barbara (J. Merz). An n-type VPE wafer implanted at NRL with a dose of 3×10^{14} ions/cm² showed a p-type resistivity of 2×10^6 ohm-cm after a 600°C/30 min anneal in nitrogen. This value is, of course, still very high, but preliminary measurements of the activation energy of the conductivity showed that an acceptor level about 0.7 eV deep was interfering with the conductivity (the strong negative effect of deep levels on conductivity has been recently calculated in this laboratory). This level may be due to some impurity or residual damage from the implantation. Higher temperature anneals are being tried in order to remove more of the implantation damage. The wafers implanted at UCSB and annealed at 800°C did show the photoluminescence properties associated with nitrogen. A sample grown by vapor phase epitaxy at 1050°C with nitrogen doping showed a resistivity of 2×10^6 ohm-cm. Again, the activation energy of the conductivity showed the effect of a 0.7 eV level. The source of nitrogen in this experiment was nitrogen gas at atmospheric pressure, which is relatively unreactive. Efforts to enhance the reactivity of nitrogen by plasma techniques are underway.

The resistivity values are obtained by measuring the resistance between two gold dots in a four-point-probe arrangement. The gold dots had a 150 μm diameter with 300 μm spacing. The material resistivity is assumed to be given approximately by this resistance multiplied by the layer thickness. Due to geometrical factors and measurement difficulties, we believe this value is only absolute to an order of magnitude.

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