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THE EFFECT OF PRESSURE ON ZINC BLENDE AND WURTZITE STRUCTURES*

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Abstract—The effect of pressure has been measured on the absorption edges of GaP, GaAs, GaSb, ZnS, ZnSe, ZnTe, ZnO and CdS. A tentative interpretation can be given consistent with previous work on silicon and germanium. Regularities in the shifts in horizontal and diagonal sequences are discussed.

An absorption peak which appears (irreversibly) on the low-energy side of the edge of the higher-molecular-weight compounds, and grows with pressure, indicates either the formation of a disordered phase or some chemical decomposition. For GaAs and GaSb both events may be present, but for ZnTe the former course seems definitely the more probable.

THE effect of pressure has been measured on the absorption edges of GaP, GaAs, GaSb, ZnS, ZnSe, ZnTe, ZnO and CdS. The first six of these have the zinc blende structure, while the last two have the wurtzite structure at 1 atm, but transform to zinc blende under pressure.

The apparatus and procedure has been previously described,[1–3] and results have been discussed for germanium and silicon[3] which will be compared with the present results.

1. GROUP IIIB–VB COMPOUNDS

(*a*) *Gallium phosphide*

Single crystals of GaP were obtained from Dr. A. A. GIARDINI, of the U.S. Army Signal Research and Development Laboratory. The samples used for the pressure runs were very slightly doped with titanium, which was not expected to have any effect on the pressure shift of the absorption edge. Figure 1 presents the data obtained from 1 to 50,000 atm. For the highest absorption coefficient, $\alpha = 100\ \text{cm}^{-1}$, there is an initial blue shift with pressure. Above 22,000 atm, the shift is red for all values of α below $100\ \text{cm}^{-1}$, with a slope of $-1{\cdot}7(10^{-6})$ eV/atm.

(b) *Gallium arsenide*

Single crystals of GaAs were obtained from Dr. J. H. WHELAN, of the Bell Telephone Laboratories

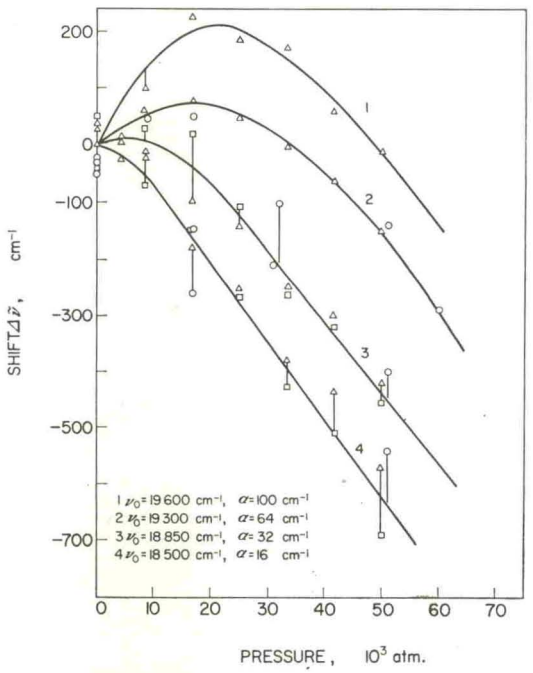

FIG. 1. Shift of gallium phosphide absorption edge with pressure.

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