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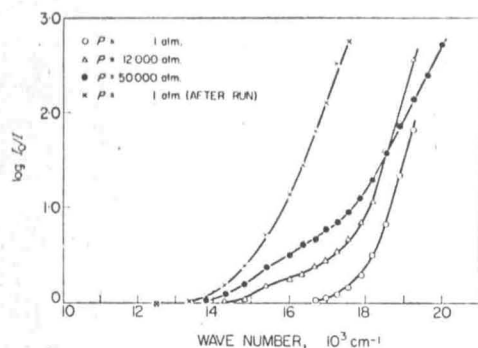each case,
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FIG. 12. Log I_0/I versus wave number for gallium antimonide.

pressure, which may in part account for the rapid shift in GaAs at high pressure. The minimum pressure at which the band first occurs depends

FIG. 13. Log I_0/I versus wave number for zinc telluride.

slightly on the size and preparation of the sample and on the method of loading the sample in the bomb. In general, a higher transition pressure was obtained the smaller and more perfect the sample, and the greater the difference between the height of the sample and the height of the salt pellet between the pistons. Thus, the mechanism of the process is most likely accelerated by imperfections and shear in the sample. GONSER and OKKERSE[16] have obtained a phase change of GaSb at temperatures below the melting point

Table 2. *Effect of pressure on the disorder transition of semiconductors*

Compound	$P(10^3$ atm) for $T_t = 27°C*$	$P(10^3$ atm) at which band appeared†
ZnS	184 ± 119	Not <180
ZnSe	153 ± 100	Small at 90
ZnTe	121 ± 79	12–45
GaP	218 ± 119	Not < 50
GaAs	188 ± 100	90–120
GaSb	130 ± 70	60

*Calculated using $\Delta E = 9 \pm 3$ kcal/mole for ZnS, ZnSe, and ZnTe, $\Delta E = 12 \pm 2$ kcal/mole for GaP, GaAs, and GaSb, and using $\Delta V = 6$–14 per cent of V_m in all cases.

†Very small peaks were present at lower pressures in the case of ZnTe, GaAs, and GaSb, probably due to impurities included during crystal growth. Microscopic dark specks were originally present in ZnTe, which could act as nucleating centers for phase change.

Table 3. *Effect of pressure on the decomposition of semiconductors*

Compound	$\Delta E_{dec}*$ (kcal/mole)	P for 70·7% decomp. $(10^3$ atm)	P for 0·71% decomp. $(10^3$ atm)†	$P_{absorb.}$ Peak obs. $(10^3$ atm)
Zns	48 ± 5	1150 ± 512	968 ± 568	Not <180
ZnSe	34 ± 3	641 ± 313	482 ± 378	Small at 90
ZnTe	29 ± 3	445 ± 217	342 ± 259	12–45‡
GaP	16 ± 2	350 ± 181	204 ± 242	Not <50
GaAs	11 ± 1	209 ± 102	80 ± 154	90–120
GaSb	$10 \pm$	152 ± 75	49 ± 117	60

*Ref. (17, 18); GaP and GaAs values assumed proportional to ZnS and ZnSe values, resp. $\Delta V = 614$ per cent of V_m.

†Where lower limit is negative, equilibrium decomposition would exceed 0·71 per cent at zero pressure.

‡Peaks did not increase greatly in size until a pressure of 45,000 atm. was reached.

by neutron irradiation, and report that the new form is a glassy solid with the liquid structure and has a volume about 8 per cent less than the normal form. The energy accompanying this process is within several per cent of the heat of fusion.

The absorption at the front of the edge could be due to the formation of this disordered state by pressure or to chemical decomposition. Table 2 shows the calculated range of pressures for melting at room temperature, using reasonable ranges of values for ΔH and ΔV. Table 3 shows similar results for $70\cdot7$ and $0\cdot71$ per cent decomposition. GaAs, GaSb and ZnTe all approach the melting pressure in the range where the band appears. Decomposition could also occur in significant amounts in GaAs and GaSb, but this is less likely for ZnTe.

It might be possible to prepare semiconductors or phosphors with controlled and uniform impurity levels by a combined application of pressure and temperature.

REFERENCES

1. FITCH R. A., SLYKHOUSE T. E. and DRICKAMER H. G., *J. Opt. Soc. Amer.* **47**, 1015 (1957).
2. SLYKHOUSE T. E. and DRICKAMER H. G., *J. Phys. Chem Solids* **7**, 207 (1958).
3. SLYKHOUSE T. E. and DRICKAMER H. G., *J. Phys. Chem. Solids* **7**, 210 (1958).
4. SHAKIN C. and BIRMAN J., *Phys. Rev.* **109**, 810, 818 (1958).
5. PIPER W. W., MARPLE D. T. F. and JOHNSON P. D., *Phys. Rev.* **110**, 223 (1958).
6. BRIDGMAN P. W., *Proc. Amer. Acad. Arts Sci.* **74**, 425 (1942); **76**, 1 (1945).
7. JOHNSON E. R. and CHRISTIAN S. M., *Phys. Rev.* **95**, 560 (1954).
8. PAUL W. and WARSCHAUER D. M., *J. Phys. Chem. Solids* **6**, 6 (1958).
9. HERMAN F., *J. Electronics* **1**, 103 (1955).
10. PAUL W. and WARSCHAUER D. M., *J. Phys. Chem. Solids* **5**, 89, 102 (1958).
11. PAUL W. and PEARSON G. L., *Phys. Rev.* **98**, 1755 (1955).
12. CALLAWAY J., *J. Electronics* **2**, 330 (1957).
13. GRAY P. V. and EHRENREICH H., *Bull. Amer. Phys. Soc.* **3**, 255 (1958).
14. SERAPHIN B., *Z. Naturforsch.* **9a**, 450 (1954).
15. WELKER H. and WEISS H., *Solid State Physics* (Ed. F. SEITZ and D. TURNBULL) Vol. 3, p. 1. Academic Press, New York (1956).
16. GONSER V. and OKKERSE B., *J. Phys. Chem. Solids* **7**, 55 (1958).
17. KIR'IASHKINA E. I., POPOV F. M., BILENKO D. I. and KIR'IASHKIN V. I., *Sov. Phys.* **2**, 69 (1955).
18. SCHOTTKY W. F. and BEVER M. B., *Acta Met.* **6**, 320 (1958).