the long-wavelength side of the absorption edge, and the edge begins to shift red rapidly. Above 50 kilobars, the long-wavelength transmission dropped off rapidly, and the reflection correction increased rapidly in slope, indicating that the sample was being crushed. The maximum blue shift of the edge was 2500 wave numbers at about 45 kilobars.

InAs was obtained from the Ohio Semiconductor Company, in the form of a large polycrystalline section, labeled "type IN." Samples for the $\frac{1}{8}$-in. bomb were polished to thicknesses from 6.7 to 7.8 mils thick. Spectra were obtained in the infrared spectrometer, using a globar source and a thermocouple detector, with a slit of 2.0 mm in the monochromator. The absorption curves at low pressures were very steep, increasing by two orders of magnitude within 300 wave numbers at 1 atm. At higher pressures, the absorption curves became less steep, and at 50 kilobars, the same increase required about 2000 wave numbers. The shift of the absorption edge with pressure was measured from an initial value of 2460 wave numbers at an absorption coefficient of 15 cm^{-1}, and the results are shown in Fig. 5. There is an initial blue shift up to 20 kilobars with a slope of 0.0048 ev/kilobar. At 20 kilobars, the shift with pressure appears to decrease, and from 20 to 50 kilobars, the slope of the shift is 0.0032 ev/kilobar. The maximum blue shift is about 1500 wave numbers at 50 kilobars.

It is apparent that the results obtained for AlSb, GaSb, InP, and InAs are closely related to the results previously reported for Si and Ge,[1] and for GaP, GaAs, and GaSb.[2] The similarities will be discussed below.

In the case of AlSb, the red shift with pressure indicates that the transition may be in the [100] direction, as is generally regarded to be the case also in Si. The slope of the shift for AlSb, -0.0016 ev/kilobar, compares with a slope of -0.0020 ev/kilobar[1] and -0.0013 ev/kilobar[6] reported for Si, and the slope of -0.0017 ev/kilobar[2] reported for GaP, which is also interpreted as having a transition in the [100] direction. Thus,

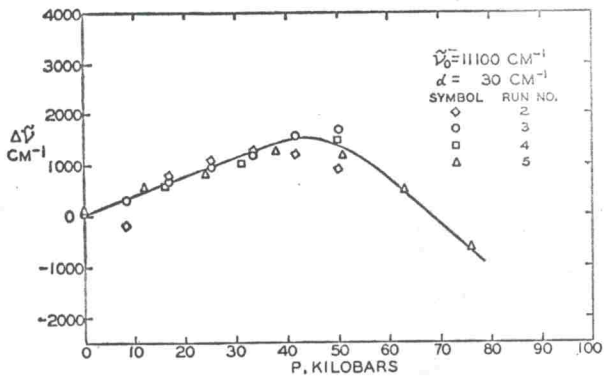

FIG. 4. Shift of InP absorption edge with pressure.

[6] W. Paul and D. M. Warschauer, J. Phys. Chem. Solids 5, 102 (1958).

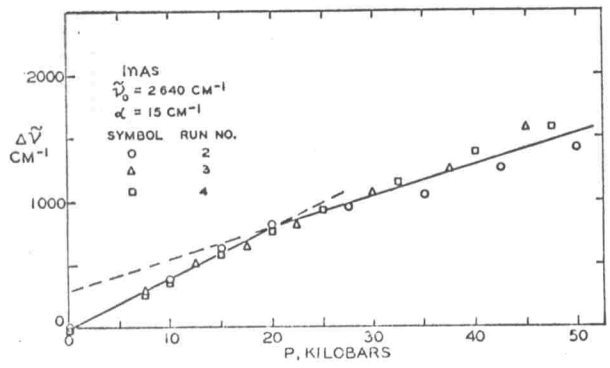

FIG. 5. Shift of InAs absorption edge with pressure.

although AlSb is isoelectronic with Ge, it may be more like Si in the relative order of the conduction band states.

The initial blue shift in GaSb agrees with the data previously reported by Edwards, Slykhouse, and Drickamer.[2] The slope of 0.0120 ev/kilobar compares with the slope of 0.0123 ev/kilobar previously obtained,[2] and the slope of 0.0157 ev/kilobar reported by Taylor[7] for the pressure range 0–2 kilobars. The change in the slope at 18 kilobars indicates a change in the transition direction, and the slope of 0.0073 ev/kilobar is comparable with the slope of 0.0080 ev/kilobar obtained for Ge, at about the same absorption coefficient for the indirect transition in the [111] direction. If the shift in GaSb between 18 and 32 kilobars is extrapolated back to 1 atm, it indicates an initial energy level about 700 wave numbers, or 0.09 ev, above the lowest energy level at 1 atm. The interpretation of this picture is that the minimum energy gap in GaSb at 1 atm is at the zone center, and that the conduction band minima in the [111] direction are about 0.09 ev above that at the zone center. Zwerdling, *et al.*[8] showed through oscillatory magnetoabsorption measurements that the transition in GaSb is direct. If it is assumed that the [100] conduction band minima move down at the rate of about -0.0015 ev/kilobar, the leveling off of the shift at about 45 kilobars indicates that the [100] minima are about 0.4 ev above the [000] minimum at atmospheric pressure. Ehrenreich and Olechna[9] conclude that a consistent picture for GaAs places the [111] minima 0.25 ev above the [000] minimum, and the [100] minima about 0.5 ev above the [000] minimum. It is quite likely, then, that GaSb has the same relative order of conduction band states as GaAs.

InP and InAs can be assumed to have similar band structures since Weiss[10] has found that in mixed crystals of the form $In(As_yP_{1-y})$, there is a linear relationship between y and the size of the forbidden energy gap. This

[7] J. H. Taylor, Bull. Am. Phys. Soc. **3**, 121 (1958).
[8] S. Zwerdling, B. Lax, K. J. Button, and L. M. Roth, J. Phys. Chem. Solids **9**, 320 (1959).
[9] H. Ehrenreich and D. J. Olechna, Bull. Am. Phys. Soc. **5**, 151 (1960).
[10] H. Weiss, Z. Naturforsch. **11a**, 430 (1956).