

not been under pressure, indicating that the high pressure results in a much smaller particle size.

CdSe was obtained from Dr. R. H. Bube, of the RCA Laboratories, Princeton, New Jersey, in the form of small needles and plates having the wurtzite structure. Spectra were obtained on the infrared spectrometer, with a tungsten lamp source and PbS detector. The shift was measured from an initial value of 13 150 wave numbers, at an absorption coefficient of  $60 \text{ cm}^{-1}$ . The results are quite similar to those for CdS, and are shown in Fig. 7. There is an initial irreversible red shift of about 750 wave numbers when the sample is pressed in, followed by a reversible blue shift with pressure of  $0.0037 \text{ ev/kilobar}$ . A phase transition begins at about 27 kilobars, and is complete at about 37 kilobars, as shown by a plot of light intensity vs pressure at 6500 wave numbers, Fig. 8. The absorption edge of the new phase is about 8000 wave numbers red from that of the wurtzite phase. In the high-pressure phase, the edge shifts red reversibly with a slope of  $-0.0015 \text{ ev/kilobar}$  up to 50 kilobars. The absorption edge returns to about 11 400 wave numbers, about 2500 wave numbers red from the original location, and 1750 from the zero point of measurement.

In an investigation to determine the factors affecting the initial irreversible red shift, several samples were repeatedly bent to a strain of 0.2% in the outer fibers, but this does not significantly affect the location or shape of the absorption edge. Another sample was polished in several steps, from a thickness of 14.7 to 7.1 mils, taking spectra at each step. This also does not significantly affect the location or shape of the edge, with the sample thickness taken into account. Another sample was loaded into the  $\frac{1}{8}$ -in. bomb between thin plates of AgCl, which has much less shear strength than NaCl, in an effort to reduce the shearing effect on the sample during the initial pressing in. In this case, the irreversible red shift took place in much the same way as for runs in which the sample was loaded in the usual way.

CdTe was obtained from Dr. A. A. Giardini, of the U. S. Army Signal Research and Development Laboratory, in the form of small pieces of single crystal material with the zinblend structure. Spectra were obtained on the infrared spectrometer, with a tungsten lamp source and a PbS detector. As in the case of CdS and CdSe, there is an initial irreversible red shift on being pressed in, so the shift was measured from an initial value of 11 630 wave numbers at an absorption coefficient of  $100 \text{ cm}^{-1}$ . The edge shifts reversibly from this point with a slope of  $0.0044 \text{ ev/kilobar}$ , up to about 35 kilobars, where a phase transition begins to occur. Since the edge shifts at least 8000 wave numbers red, beyond the range of the instrument, no spectra could be obtained above 39 kilobars. On reduction of pressure, the reverse transition begins at about 20 kilobars, and the absorption edge returns to about 10 630 wave numbers.

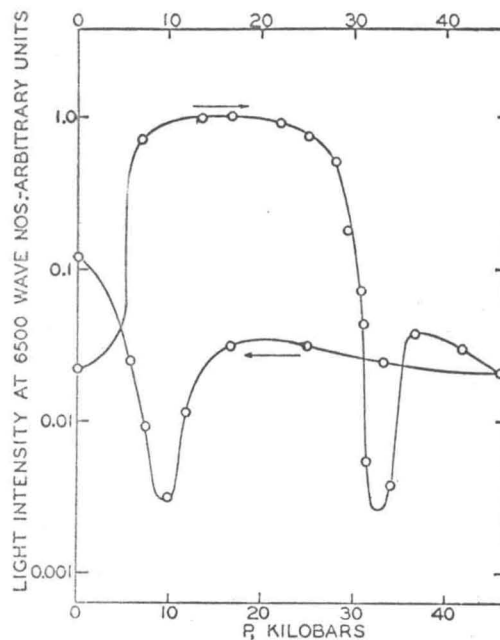


FIG. 8. Light intensity vs pressure for CdSe phase changes.

From this point, increasing results in a blue shift with a slope of  $0.0048 \text{ ev/kilobar}$  up to about 35 kilobars. The data appear in Fig. 9. In several runs, a small absorption band appeared on the tail of the absorption edge, centered at about 10 700 wave numbers, with a maximum absorption coefficient of about  $10 \text{ cm}^{-1}$ . This peak increases in size above 35 kilobars, but is hidden by the red shift due to the transition.

The effects of pressure on CdS, CdSe, and CdTe appear to be quite similar, although the first two com-

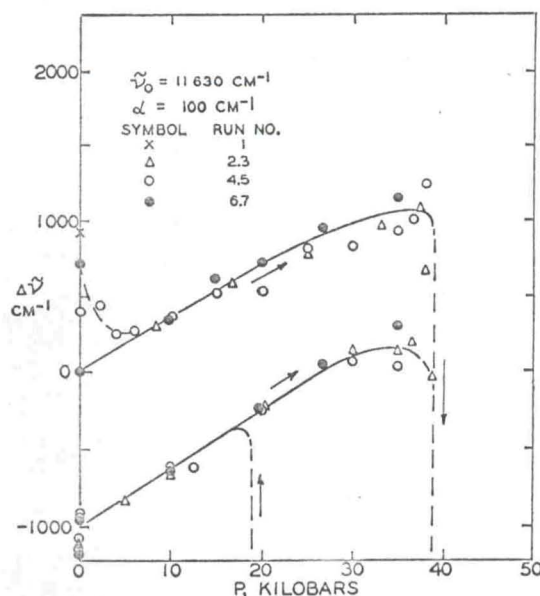


FIG. 9. Shift of CdTe absorption edge with pressure.