TABLE XI. Transformation volume changes in II–VI Cd compounds.

Element	Investigator	$(\Delta V/V_0)$ trans.
CdS	Mariano and Warekois	0.199
	Rooymans	0.218
	Cline and Stephens	0.160
	Jayaraman *et al.*	~0.100
CdSe	Mariano and Warekois	0.206
	Rooymans	0.188
	Cline and Stephens	0.164
	Jayaraman *et al.*	0.090
CdTe	Mariano and Warekois	0.190
	Cline and Stephens	0.164
	Jayaraman *et al.*	0.100

The isothermal value of Gutsche[1] is in good agreement with the adiabatic value; the reason for the disagreement of the two sets of isothermal measurements is unknown.

CdSe

The CdSe was available in large crystals; we feel that the data are good. The transformation pressure is compared with other data in Table X. The compressibility plot is given in Fig. 5. In all cases the CdSe returned to the wurtzite form on release of pressure to 1 atm. There was no trace of the sphalerite form from powder x-ray data.

The lack of agreement between the adiabatic and isothermal compressibility is of concern to us as we would not have expected the $(1+\alpha\gamma T)$ correction to be so large; however, the same behavior is observed when Bridgman's[20] data on ZnSe are compared with adiabatic results.[12] The data for γ and α are not known for ZnSe, but data on CdSe[13] do not explain the disagreement.

CdTe

The cadmium telluride was in the form of 0.5-in. cubes; two runs were made. The plot of $-\Delta V/V_0$ vs pressure is presented in Fig. 6; the transformation pressure data is compared with other data in Table X.

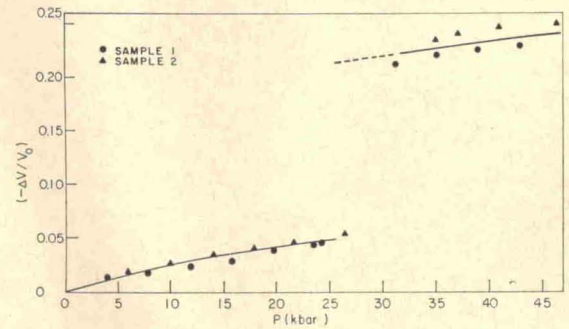

FIG. 5. Compression of CdSe.

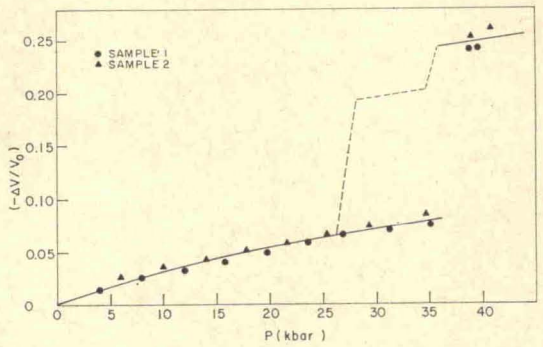

FIG. 6. Compression of CdTe.

The compressibility runs indicated a possible second transformation on the reverse cycle, which was reproducible. This transformation may be from the rocksalt to the cinnabar structure, since the cinnabar structure is a distorted rocksalt structure. However, our preliminary high-pressure x-ray studies using a diamond cell have indicated no structural change below the rocksalt → sphalerite change. The x-ray apparatus is, however, a high-shear device since the sample is contained between two diamond flats, while the compressibility studies are essentially hydrostatic. The CdTe returned to the sphalerite form in both runs.

CONCLUSIONS

The volume compressibilities of BeO and other II–VI compounds follow expected trends based on available elastic data. The trend in a given homologous series, for example the Cd series, is that compressibility increases with increasing polarizability of the anion. It appears that for other series, i.e., Zn, Cd, H, etc., the smaller the average Z (atomic number), the lower the compressibility.

The solid–solid transformations observed in CdS, CdSe, and CdTe by previous investigators were verified in this work. We feel that the trend of the increasing transformation pressure as one proceeds down a series is due to the increased energy required for the electronic rearrangement necessary to exist in the rocksalt structure.

The indication that a second transformation may exist on the reverse cycle for CdTe (perhaps the cinnabar structure) has not been previously mentioned.

The disagreement between the isothermal and adiabatic compressibility seems to be real for the Cd series; however, the $(1+\alpha\gamma T)$ correction does not seem to explain the observed differences.