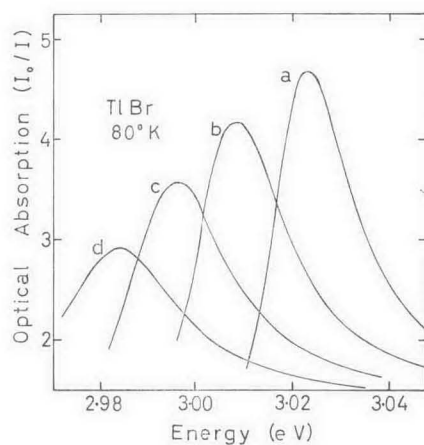


the same temperature, while there is an increase of more than a factor of two at 274°K compared to 80°K in TlBr and TlCl. Furthermore, there is also good agreement within experimental error between the values obtained using single crystals and evaporated films.

Fig. 3



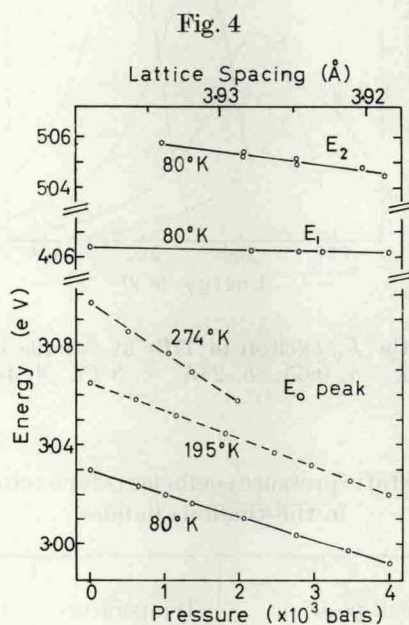
Absorption curves of the  $E_0$  exciton in TlBr at various hydrostatic pressures and at 80°K. *a*, 0.65; *b*, 2.07; *c*, 3.45; *d*, 4.85 kbars.

Table 2. The hydrostatic pressure coefficients for exciton absorption peaks in the thallous halides

Material film (f) or crystal (c)	Peak position (eV)	Temperature (°K)	Pressure coefficient ( $\times 10^{-6}$ eV/bar)
TlCl f	$E_0$ 3.40	80	$-8.6 \pm 0.4$
	$E_0$ 3.50	274	$-22.2 \pm 1.0$
TlBr c	$E_0$ 3.030	80	$-9.5 \pm 0.4$
	$E_0$ 3.030	80	$-9.2 \pm 0.4$
	$E_0$ 3.065	195	$-11.3 \pm 0.5$
	$E_0$ 3.097	274	$-20.1 \pm 1.0$
	$E_1$ 4.064	80	$-0.6 \pm 0.4$
	$E_2$ 5.06	80	$-4.1 \pm 0.7$
TlI f	$E_0$ 2.80	80	$-8.6 \pm 0.4$
	$E_0$ 3.50	80	$-8.1 \pm 0.5$

### 3.3. Pressure Coefficients for Higher Energy Transitions above the Band Edge

The pressure coefficients at 80°K for the absorption peaks  $E_1$  and  $E_2$  in TlBr are given in table 2. The variation of these peak energies, together with  $E_0$ , has been plotted versus pressure and lattice spacing in fig. 4. The lattice spacing has been calculated assuming a volume isothermal compressibility which is constant with respect to pressure:  $\beta_{T=80^\circ\text{K}} = 3.89 \times 10^{-6}/\text{bar}\dagger$ . The peak  $E_1$  was found to be considerably less sensitive to pressure than  $E_0$  and  $E_2$ . Together with the temperature dependence of these absorption peaks, this supports the view that the  $E_1$  and  $E_1 + \Delta$  transitions involve interband states of different symmetry from the remaining strong transitions.



The variation with pressure and lattice spacing of the energy of exciton absorption peaks in single crystals of TlBr at 80°K.

The next higher energy transition ( $E_0'$ ) after the minimum gap in TlI has also been studied under pressure. Table 2 shows that the pressure coefficients of  $E_0$  and  $E_0'$  at 80°K are similar.

† This value for the isothermal compressibility has been calculated from the adiabatic compressibility and density data of Vallin, Marklund and Sikström (1966); the specific heat per mole at constant pressure quoted by Kelley (1934); and the usual relation between adiabatic and isothermal compressibility (Morse and Lawson 1967). The specific heat and the expansion coefficient are assumed to obey the Grüneisen formula (Ziman 1964).