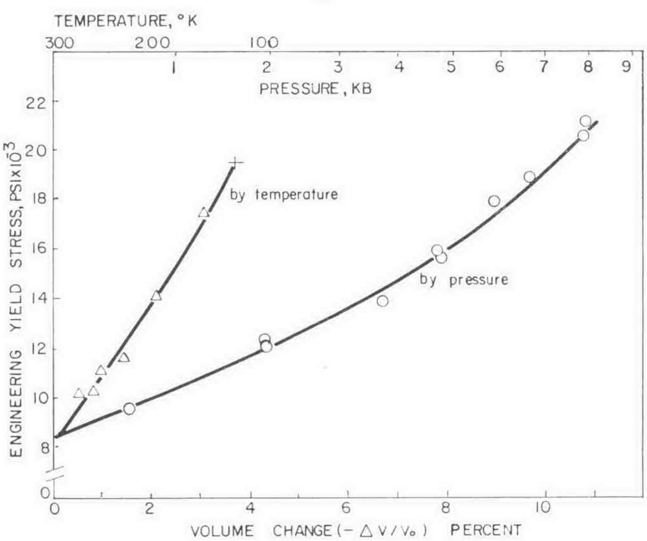
Table 1. Values of parameters from the yield criterion $\tau_{oct} = \tau_s - \mu\sigma_m$

Material	μ	τ_s (p.s.i. $\times 10^{-3}$)	T_m† (°C)	T_g † (°C)
		Crystalline		
PCTFE	0·12	2·9	220	
POM	0·10	7·3	181	
PP‡	0·092	3·2	165	
PE‡	0·046	2·0	137	
PTFE (to 4 kb)	0·048	0·4	327	
PTFE §	0·032	0·8	327	
		Amorphous		
PBAC	0·072	4·5		150
PBAC‖	0·047	6·2		150
PS	0·084	8·3		100
PS ¶	0·055	7·5		100
PET	0·054	4·2		69

† Values taken from Nielsen (1962).
‡ Calculated from the data of Mears *et al.* (1969).
§ Calculated from the data of Pae and Mears (1968).
‖ Calculated from the data of Mears and Pae (1969).
¶ Calculated from the data of Holliday and Mann (1968).

Fig. 7



Cross-plot of engineering yield stresses against volume changes at the corresponding temperatures or pressures.

relationship between volume change and change of yield stress. At any specified volume change, the effects of a changed temperature affect the yield stress more than do those of a changed pressure, thus negating Ainbinder's simple relationship.

There is, however, a similarity in the forms of the relations between yield stress and volume change which might allow a shifting to superimpose the behaviour if the proper factor is used. From fig. 7 it appears that some relatively constant proportion of the volume changes may provide this factor. Indeed, by going back to the defining equations for changes of volume by temperature and pressure, $\alpha = V_T^{-1}(dV_T/dT)_p$ and $\beta = K^{-1} = V_p^{-1}(dV_p/dP)_T$, and approximating these by differences, $\alpha \simeq V_T^{-1}(\Delta V_T/\Delta T)$ and $\beta \simeq K^{-1} = V_p^{-1}(\Delta V_p/\Delta P)$, one can obtain

$$(\alpha K)^{-1} \simeq (V_T/V_p)(\Delta V_p/\Delta V_T)(\Delta T/\Delta P). \quad . \quad . \quad . \quad . \quad (2)$$

Since the ratio of volume changes is much further from unity than the ratio of volumes, the latter can be neglected to simplify the equation, which when rearranged can be written as

$$(\Delta T/\Delta P) \simeq (1/\alpha K)(\Delta V_T/\Delta V_p). \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Using both present results and literature values for changes of yield stress and volume with temperature and pressure, and for bulk modulus and thermal expansion, eqn. (3) can be evaluated. In table 2 the second and last numerical columns correspond to the left and right sides of eqn. (3) and show fairly good agreement, considering the diverse sources and

Table 2. Evaluation of equation $-\Delta T/\Delta P \simeq (1/\alpha K)(\Delta V_T/\Delta V_p)$

Material	Stress range (10^3 p.s.i.)	$-\Delta T/\Delta P$ (°c × 10^3/p.s.i.)	$(1/\alpha K)$ (°c × 10^3/p.s.i.)	$(\Delta V_T/\Delta V_p)$	$(1/\alpha K)(\Delta V_T/\Delta V_p)$ (°c × 10^3/p.s.i.)
POM	4·0	3·4(*a–d*)	7·6(*a*, *e*)	0·67	5·1
PP	5·8	2·7(*f–h*)	5·1(*h*)	0·54	2·8
PE	2·5	2·3(*f*, *i–k*)	6·5(*k*, *l*)	0·53	3·4
PCTFE	12·0	2·3(*b*, *l*, *m*)	5·5(*b*, *n*)	0·38	2·1
PC	4·5	2·2(*b*, *e*)	8·3(*e*, *o*)	0·28	2·3
PET	2·9	1·6(*l*, *p*, *q*)	5·9(*e*, *l*)	0·26	1·5
PS	9·1	1·2(*b*, *k*, *r*, *s*)	7·5(*l*, *t*)	0·26	1·9

(*a*) Sardar *et al.* (1968); (*b*) Warfield (1967); (*c*) duPont; (*d*) Stehling and Mandelkern (1969); (*e*) Hellwege *et al.* (1962); (*f*) Mears, *et al.* (1969); (*g*) Vincent (1963 b); (*h*) Passaglia and Martin (1964); (*i*) Vincent (1963 a); (*j*) Warfield (1966); (*k*) Zakin, Simha and Hershey (1966); (*l*) Hellwege, Knappe and Lehmann (1962); (*m*) Mowers (1961); (*n*) Mowers 1962); (*o*) Hennig (1965); (*p*) Vincent (1963 c); (*q*) Haldon, Schell and Simha (1967); (*r*) Biglione *et al.* (1969); (*s*) Argon, Andrews, Godrick and Whitney (1968); (*t*) DiBenedetto (1963).