TABLE I Corresponding lattice planes in $CdCO_3$–CdO transformation. $\Delta\phi$ is the angle between the corresponding planes

$CdCO_3$ habit	Population A		Population B		Population C	
	(hkl)	$\Delta\phi$	(hkl)	$\Delta\phi$	(hkl)	$\Delta\phi$
(0 0 .1)	$(\bar{1}\,4\,0)$	0	$(\bar{1}\,4\,0)$	0	$(\bar{1}\,4\,0)$	0
$(0\,1\,\bar{1}\,2)$	$(\bar{1}\,0\,0)$	12°	$(1\,1\,\bar{1})$	20°	(1 1 1)	20°
$(\bar{1}\,0\,1\,2)$	(1 1 1)	20°	$(\bar{1}\,0\,0)$	12°	$(1\,1\,\bar{1})$	20°
$(1\,\bar{1}\,0\,2)$	$(1\,1\,\bar{1})$	20°	(1 1 1)	20°	$(\bar{1}\,0\,0)$	12°
$(\bar{1}\,1\,0\,4)$	$(\bar{1}\,1\,1)$	2°	$(\bar{1}\,1\,\bar{1})$	2°	(1 1 0)	12°
$(0\,\bar{1}\,1\,4)$	(1 1 0)	12°	$(\bar{1}\,1\,1)$	2°	$(\bar{1}\,1\,\bar{1})$	2°
$(1\,0\,\bar{1}\,4)$	$(\bar{1}\,1\,\bar{1})$	2°	(1 1 0)	12°	$(\bar{1}\,1\,1)$	2°
$(0\,\bar{1}\,1\,1)$	(2 1 0)	0				
$(1\,0\,\bar{1}\,1)$			(2 1 0)	0		
$(\bar{1}\,1\,0\,1)$					(2 1 0)	0
$(\bar{2}\,1\,1\,0)$	(0 0 1)	0				
$(1\,\bar{2}\,1\,0)$			(0 0 1)	0		
$(1\,1\,\bar{2}\,0)$					(0 0 1)	0

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Thermal expansion of indium borate

Under a programme of X-ray studies on calcite-type compounds, the authors have determined the precision lattice parameters and the coefficients of thermal expansion of a number of carbonates [1–4], nitrates [5] and borates [6]. A search of the literature shows that the thermal expansion of indium borate, which has the same structure as calcite, has not so far been studied. Hence it is thought worthwhile to include indium borate as part of a programme of X-ray studies on calcite-type compounds.

The sample used in the present study was supplied by the Mackway Company, New York. It was found necessary to heat the sample to 900° C to get well resolved sharp lines in the high angle region. The powder sample for the study was prepared by placing it in a thin-walled quartz capillary. The powder pattern showed few extra reflections, identified as being due to In_2O_3, as observed by Levin *et al.* [7]. Using a 19 cm high temperature camera, powder photographs were taken with Cu radiation at different temperatures ranging from 30 to 658° C. Five reflections $(2.2.12)_{\alpha_1}$, $(3.1.14)_{\alpha_1}$, $(3.1.14)_{\alpha_2}$, $(4.1.10)_{\alpha_1}$ and $(4.1.10)_{\alpha_2}$, recorded in the Bragg angle region 61° and 79°, were used to evaluate the lattice parameters at different temperatures. The experimental details and the method of evaluating the precision lattice parameters and the coefficients of thermal expansion have been described in an earlier paper [1].

The lattice parameters determined at different temperatures are given in Table I. It can be seen that both the parameters a and c increase with temperature. The mean standard error of the lattice parameters, in the temperature range 30 to

TABLE I Lattice parameters of $InBO_3$ at different temperatures

Temperature (°C)	a (Å)	c (Å)
30	4.8224	15.4891
165	4.8261	15.5041
217	4.8289	15.5087
361	4.8336	15.5279
462	4.8378	15.5411
516	4.8399	15.5438
565	4.8407	15.5538
608	4.8422	15.5592
658	4.8441	15.5642

658° C is about 0.000 27 Å in the a parameter and about 0.001 03 Å in the c parameter.

The temperature dependence of the coefficients of thermal expansion $\alpha_{\parallel}$ along the c-axis and $\alpha_{\perp}$ at right angles to the c-axis are represented by the following equations:

$$\alpha_{\parallel} = 6.221 \times 10^{-6} + 4.876 \times 10^{-9} T - 2.226 \times 10^{-13} T^2 \quad (1)$$

$$\alpha_{\perp} = 5.583 \times 10^{-6} + 7.181 \times 10^{-9} T - 7.023 \times 10^{-12} T^2 \quad (2)$$

where T is the temperature in °C.

The observed coefficients of expansion at different temperatures are given in Table II along with the calculated values obtained from Equations 1 and 2.

TABLE II Coefficients of thermal expansion of $InBO_3$ at different temperatures

Temperature (°C)	$\alpha_{\parallel} \times 10^6$		$\alpha_{\perp} \times 10^6$	
	Obs.	Calc.	Obs.	Calc.
50	6.53	6.46	5.70	5.93
90	6.69	6.66	6.22	6.18
130	6.77	6.85	6.47	6.41
170	6.85	7.04	6.73	6.61
210	7.26	7.24	6.84	6.79
250	7.58	7.43	7.15	6.95
290	7.74	7.62	7.15	7.08
330	7.74	7.80	7.15	7.19
370	7.98	7.99	7.26	7.29
410	8.07	8.18	7.36	7.35
450	8.47	8.37	7.04	7.40
490	8.47	8.55	7.36	7.42
530	8.87	8.74	7.36	7.43
570	8.87	8.92	7.51	7.40
610	9.11	9.11	7.51	7.36

In Table III, the room temperature lattice constants obtained in the present study are compared with those available in the literature. The value of the c parameter obtained in the present study is slightly higher than those reported by the other investigators. In the case of a, the value reported by Goldschmidt and Hauptmann [8] is lower than the other values.

TABLE III Lattice parameters of $InBO_3$ at room temperature

Reference	a (Å)	c (Å)
[7]	4.823	15.456
[8]	4.766 ± 0.01	15.455 ± 0.04
Present study	4.8224 ± 0.0002	15.4891 ± 0.001

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Fracture surface energies of high explosives PETN and RDX

PETN (pentaerythritol tetranitrate) and RDX (cyclotrimethylene trinitramine) are important solid high explosives which are used extensively in industrial and military applications. Explosion in these materials can be initiated by mechanical impact and shock. Although a considerable amount of work has been done on their sensitiveness, the exact role of their mechanical properties is not understood. It has, however, been pointed out by some workers that the localization of energy by plastic flow can play an important role in the