TABLE 1. CELL CONSTANTS OF BERYL

Sample	Colour	n*	a(Å)	S.E.**	c(Å)	S.E.**
DR 609	Aquamarine	15	9.2148	0.0021	9.1875	0.0031
DR 522	Yellow	17	9.2091	0.0006	9.1927	0.0015
DR 551	Green	25	9.2232	0.0009	9.1905	0.0013

*Number of lines used in calculation of mean cell dimensions.
**Standard error of the mean.

TABLE 2. LINEAR REGRESSION OF m(= MOLE % ($R_2O + R_2O_3$)) ON THE PHYSICAL PROPERTIES OF BERYL

Argument	Linear Regression Function	Standard Error of Estimate of m
Cell Edge, a(Å)	$m = -1649.27 + 179.33_a$	0.5
R. Index, N_e	$m = -483.53 + 310N_e$	0.3
R. Index, N_o	$m = -532.14 + 340N_o$	0.1
Density, d	$m = -67.87 + 26.01_d$	0.05

essential elements in the beryl structure up to a possible maximum of 6 mole %. These for the most part are thought to occupy the open channels of beryl which parallel the c crystallographic direction.

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THE BIREFRINGENCE AND DICHROISM OF SILICON CARBIDE POLYTYPES

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The birefringence, δ, of eleven synthetic nitrogen-doped silicon carbide polytypes has been measured using an interference fringe method in prisms cut from syntactically intergrown polytypic crystals.

The prisms were cut and polished using standard petrographic techniques, with the principal axes of the optical indicatrix in the plane of the

TABLE 1*

Polytype (A)	δ(A)	h	Eg(eV)	Dichroism O-Ray	Dichroism E-Ray	Stacking Sequence
3C	0.0	0.0	2.25	Isotropic yellow-green		*k*
8H	0.0377	0.25	2.56	light yellow orange	light yellow	*hkkkhkkk*
24R	0.0369	0.25	—	light purplish grey	light red purple	*hkkhkkkk*
21R	0.0382	0.286	2.77	light greenish yellow	light green	*hkkhkkk*
39R	0.0408	0.325	—	light greenish yellow	light greenish yellow	*hkkhkkhkkhkkk*
6H	0.043	0.333	2.86	green	dark blue-green	*hkkhkk*
15R	0.0474	0.400	2.90	light orange yellow	light green	*hkkkk*
27R	0.0488 ± .0004	0.445	—	red	light green	*hkkhkkhkk*
4H	0.0543 ± .0023	0.500	3.1	intense yellow orange	intense blue	*hkhk*
60R	.0407	?	—	light purplish grey		?
75R	.0409	?	—	light buff	light purplish grey	?
126R	.0397	?	—	light green	orange-yellow	?

*Birefringence, hexagonality, dichroic scheme, energy gap and crystal structure of twelve polytypes of silicon carbide: The optical data are for *n*-type nitrogen-doped crystals. Energy gap and structural data are from Verma and Krishna (1966) and δ(6H) data are from Thibault (1944). All measurements of δ were made in yellow light, $\lambda = 0.584\ \mu$. The stacking notation gives the sequence of cubic, *k*, and hexagonal, *h*, close-packed SiC layers in the primitive unit cell (R cells are non-primitive). The polytype 126R is previously unreported and the polytype 75R is not the same as the 75R whose structure has been reported.

section (usually $\{10\bar{1}0\}$). The prism angle, α, was usually 5°–10°, tapering in the *a*-axis direction. Polytypes were identified using $(h0\bar{h}1)$ *x*-ray precession photographs.

The spacing, S(A), of interference fringes in polytype A in monochromatic light with crossed-polarizers is given by:

$$S(A) = \lambda \cdot \mathrm{Cot}\ \alpha/\delta(A) \qquad (1)$$

where λ is the wavelength of light. Almost invariably, however, the rarer polytypes of SiC occur in laminar intergrowths with the common six-layer hexagonal polytype, 6H, by sharing a {0001} plane. If S(A) and

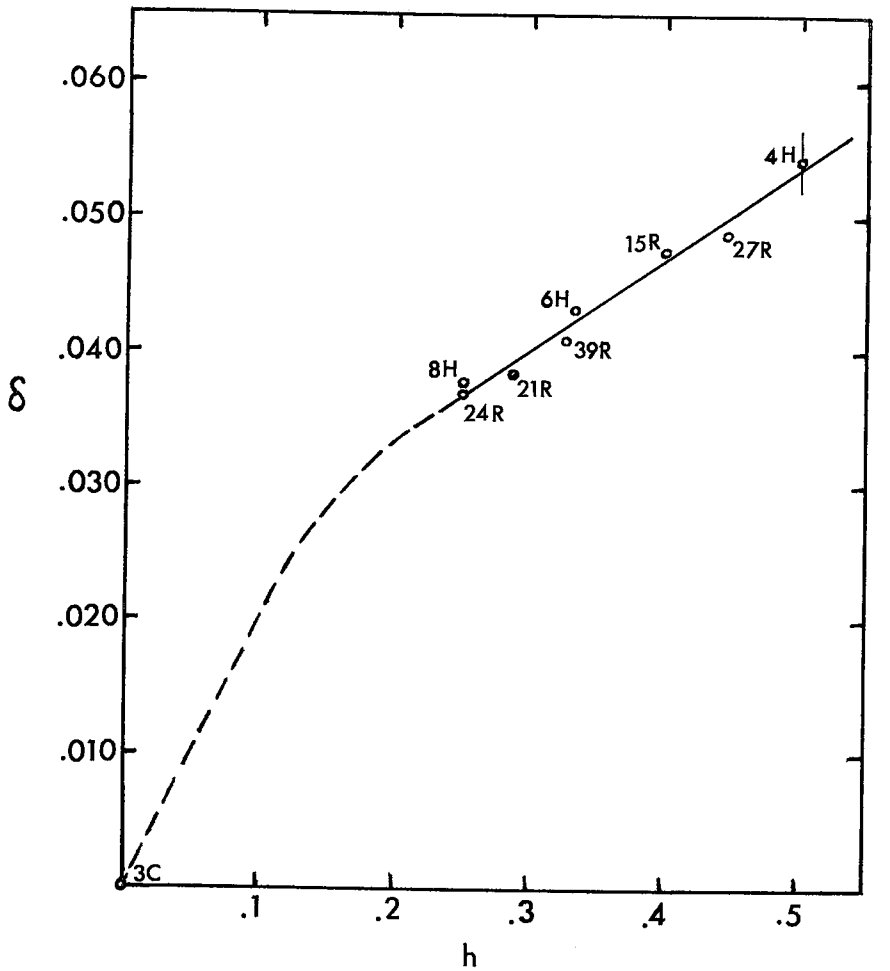

FIG. 1. Birefringence, δ, *versus* hexagonality, h, for some known SiC structures.

S(6H) are measured at the boundary between A and 6H, λ Cot α can be eliminated from (1) giving:

$$\begin{aligned}\delta(\mathrm{A}) &= \delta(6\mathrm{H}) \cdot (\mathrm{S}(6\mathrm{H})/\mathrm{S}(\mathrm{A})) \\ &= .043\ (\mathrm{S}(6\mathrm{H})/\mathrm{S}(\mathrm{A}))\end{aligned}$$

where we have used Thibault's (1944) value for δ(6H) for yellow sodium light.

In practice we are able to average S(A), S(6H) over 10 to 30 fringes and the accuracy of the determination may be as high as two significant

figures. This is certainly better than the accuracy of δ(6H) since Thibault found no significant difference in δ between different polytypes.

The results are listed in Table 1. The dichroic schemes are typical of only *n*-type (nitrogen-doped) SiC. The colours arise by promotion of free-electrons at the bottom of the conduction band up to higher levels in the conduction bands. (Biedermann, 1965)

The value of δ is insensitive to the concentration of free electrons (typically between 10^{15}–10^{20} cm^{-3} from Hall effect measurements) and to small additions of boron impurity. Addition of aluminum, however, causes an increase in δ that seems to depend on the number of holes in the valence band if the holes are the dominant free charge carriers.

The value of δ appears, by analogy with ZnS polytypes (Brafman & Steinberger, 1966), to be closely dependent on the proportion, h, of hexagonal close-packed planes in the polytype crystal structure (see Fig. 1). There seems to be a tendency for the rhombohedral polytypes to have a slightly lower δ than that of a corresponding hexagonal polytype with the same h. The relation suggests that measurement of δ is a valuable preliminary step in determination of an SiC polytype crystal structure.

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FABIANITE AND ITS SYNTHETIC DIMORPH, $CaB_3O_5(OH)$: NEW DATA*

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The structure and other crystallographic properties of the synthetic compound $CaB_3O_5(OH)$ were reported by Clark *et al.* (1962). At nearly

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