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CELL CONSTANTS OF BIRCH PORTAGE BERYL, SASKATCHEWAN

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In an earlier paper (Radcliffe and Campbell, 1966) the cell edges of three beryl crystals were reported and correlated with chemical composition. At that time the cell constants were determined by a step-wise procedure involving *h*00 with *h* odd and 112. This was done because most diffraction peaks of beryl can be indexed on more than one possible *hkl* value, *e.g.*, 002 ≈ 110, 200 ≈ 102 etc., due to the similarity of the *a* and *c* dimensions.

To improve the precision and accuracy of these measurements it is necessary to calculate cell edge simultaneously by least squares analysis on at least 15 uniquely indexed reflections. Since most peaks may be non-unique a discrimination of tolerance 0.01–0.05° (2θ) has been utilized. The smaller value (0.01) represents the maximum measuring error and the range 0.01–0.05° represents the variation of spacings acceptable in the least squares analysis. Thus any two *hkl* values with calculated 2θ with a difference less than 0.01° are excluded from the computations. These were done automatically with an IBM 7094 using the program of Evans, Appleman and Hardwerker (1963), which assigns Miller indices, computes cell edges and iterates through 10 progressive cycles of least squares refinement.

The results of this procedure are given in Table 1. While the cell edges are somewhat less variable than those reported previously, similar correlation trends of cell constants with chemistry exist. This correlation involves the total of elements other than those required by the beryl formula $Be_3Al_2Si_6O_{18}$. These are for the most part R_2O and R_2O_3 group members, and the values used in the least squares approximation are the average of 5 analytical measurements on each crystal. The inverse linear regressions of $\Sigma(R_2O + R_2O_3)$ with lattice constants, measured density and two refractive indices as independent variables are given in Table 2. This gives four methods of estimating the total of non-

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