SHORT COMMUNICATIONS

Non-space-group absences in sapphirine

X-RAY studies of a number of sapphirines indicate that non-space-group absences are a characteristic of the diffraction patterns. The absences may be understood most simply when reflections are indexed with respect to a cell derived from that given by Kuzel (1961) [$a = 11{\cdot}26$, $b = 14{\cdot}46$, $c = 9{\cdot}95$ Å; $\beta = 125°\ 20'$] by the matrix $[10\bar{1}/0\bar{1}0/00\bar{1}]$. Accurate cell dimensions determined for this cell by precession-camera techniques with a pale-blue sapphirine from Fiskernaesset, West Greenland are $a = 9{\cdot}77$, $b = 14{\cdot}54$, $c = 10{\cdot}06$ Å (all $\pm 0{\cdot}01$ Å), $\beta = 110°\ 20'$ ($\pm 2'$). Statistical analyses of the intensities of this sapphirine indicate a centre of symmetry. The approximate formula (neglecting small amounts of Fe^{2+}, Fe^{3+}, Ti, Mn, Na, K) is $7MgO.9Al_2O_3.3SiO_2$ ($Z = 2$) which agrees with the formula proposed by Kuzel (1961).

Reflection conditions, which operate for each of the four sapphirines studied (from Fiskernaesset, W. Greenland; Sukkertöppen, W. Greenland; Madura, India; and Betroka, Madagascar), are: hkl absent if $h+k$ is even and $l = 4n+2$, or if $h+k$ is odd and $l = 4n$; $h0l$ absent if $h+l$ is odd.

The conditions are consistent with those obeyed by comparable reflections in the diffraction pattern of a sapphirine from Mautia Hill, Tanganyika studied by McKie (1963), though his specimen was unusual in showing a doubled b-axis and additional diffuse streaks parallel to b^*.

The non-space-group absences (hkl reflections) can be explained by supposing that the atoms in the unit cell are grouped into pairs whose coordinates are related by the displacements $a/2, b/2, c/4$, or $a/2, b/2, 3c/4$. Since the non-space-group absences include $0k0$ reflections with k odd quite irrespective of the presence or absence of a 2_1 axis, the space group may be either $P2/n$ or $P2_1/n$.

Preliminary structural investigations of the Fiskernaesset sapphirine show that the oxygens are approximately cubic-close-packed with the diagonals of one cube face parallel to [010] and [101] of sapphirine and the perpendicular cube edge parallel to $[10\bar{1}]$.

Patterson syntheses show that all the cations lie in octahedral or

tetrahedral interstices in the framework of close-packed oxygens. Further work is in progress to determine the detailed cation distribution.

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References

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Re-examination of pyrope from the Stockdale kimberlite, Riley County, Kansas

BAGROWSKI (1941) has reported the presence of pyrope in the Stockdale kimberlite pipe (39° 15′ 40″ N., 96° 42′ 8″ W.), twenty miles northwest of Manhattan, Riley County, Kansas. The identification was based on a chemical analysis the results of which are shown in table I. The striking feature of this analysis is the high percentage of Cr_2O_3 (7·90 %) reported, and the Stockdale pyrope has been subsequently cited in the literature as an example of chromium-rich pyrope (Deer, Howie, and Zussman, 1962, vol. 1, pp. 98 and 99; Tröger, 1959, No. 162, p. 32; and others). Based on this analysis Tröger (1959) presented an end-member composition of the pyrope as: pyrope 59·8, almandine 27·9, spessartine 0·00, grossular 3·1, andradite 0·0, and uvarovite 9·2 %.

This note is not intended to refute the identification of the Stockdale garnet as pyrope, as Eastwood and Brookins (1965) and Rosa (1966) have demonstrated by X-ray diffraction that pyrope is indeed the species present. However, the following points should be considered: according to the data reported by Bagrowski (1941) shown in table I, there are too many trivalent cations relative to divalent cations to allow a garnet formula to be calculated (even though the analysis does sum to 99·07 wt. %); according to the work of Nixon *et al.* (1963, fig. 7, p. 1106) a kimberlitic pyrope containing 7·90 % Cr_2O_3 should have a refractive index near 1·759 as opposed to the reported value of 1·746 (Bagrowski, 1941); in addition, Rosa (1966) determined the refractive index and unit cell for the garnet (see table I) and presented an end-member composition of pyrope 75, almandine-andradite 25 % based on the diagrams of n vs. a of Sriramadas (1957).

Because of these apparent discrepancies and as part of a long-range