SHORT COMMUNICATIONS

Berlinite from Rwanda

THE occurrence of berlinite at Westanå iron mine, near Nasüm, Kristianstad, Sweden, forms the only previous record of $AlPO_4$ in nature. Independent examinations in England and Belgium of material from the Buranga pegmatite, in the Katumba region of Rwanda, show that berlinite forms part of the exceptionally rich suite of phosphate minerals developed in the pegmatite, a preliminary account of which has been given by Bertossa (1961). The writers would like to thank Mr. A. Bertossa and Dr. W. Krenning of the former Geological Survey of Ruanda-Urundi for providing the specimens.

In one specimen, an elongated, whitish-coloured patch of berlinite about 2 cm in thickness is bordered on one side by massive amblygonite with disseminated lazulite and on the other by very fine-grained muscovite grading into a muscovite–apatite assemblage. At the contact of the amblygonite and the berlinite, a micropegmatitic intergrowth of the two minerals is developed and isolated grains of amblygonite occur in the berlinite. The berlinite forms anhedral grains, 0·5 to 6 mm across. Twinning in the form of sub-parallel lamellae, 0·1–0·5 mm in width, is shown by many grains. In a second specimen, the berlinite occurs as an anhedral aggregate 2 cm across interspersed by bluish lazulite which is developed chiefly at berlinite grain boundaries but also occurs as minute veinlets. Individual grains of berlinite range from 0·1 to 3·0 mm across and sometimes show twinning.

The berlinite is uniaxial positive with refractive indices (determined in sodium light) ω 1·524 and ϵ 1·532 (both $\pm$0·001). Determinations of specific gravity on small inclusion-free fragments using a torsion balance gave an average value of 2·66, compared with 2·62 calculated from the cell dimensions and an assumed cell-content of $3[AlPO_4]$.

The X-ray powder data and the lattice parameters have been derived by Mr. D. Atkin from Cu-$K\alpha$ photographs taken in a 114·6 mm diameter Debye-Scherrer camera. The spacings and intensities are listed in table I; similar d-values were obtained independently by Mr. R. Vanderstappen. The powder lines were indexed by comparison with the diffractometer data for synthetic $AlPO_4$ given on card 10–423 of the A.S.T.M. X-ray Powder Data File. In checking the indexing by calculation,

TABLE I. X-ray powder data for berlinite from Rwanda; from photographs taken with Cu-$K\alpha$ radiation (λ 1·5418 Å) in a 114·6-mm diameter Debye-Scherrer camera; intensities estimated visually by comparison with an intensity scale

d, Å	*I*	*hkil*	*d*, Å	*I*	*hkil*
4·27	22	$10\bar{1}0$	1·467	2	$11\bar{2}6$
3·99	3	$10\bar{1}1$			$10\bar{1}7$
3·65	1	0003	—	—	$30\bar{3}0$
3·37	100	$10\bar{1}2$	1·390	5	$21\bar{3}4$
2·47	7	$11\bar{2}0$			$20\bar{2}6$
—	—	$11\bar{2}1$	1·380	2	$30\bar{3}2$
2·31	8	$10\bar{1}4$	1·303	1	$21\bar{3}5$
2·25	5	$11\bar{2}2$			$10\bar{1}8$
2·14	7	$20\bar{2}0$	1·265	2	$30\bar{3}4$
1·991	3	$20\bar{2}2$			$20\bar{2}7$
1·831	14	$11\bar{2}4$	1·236	1	$22\bar{4}0$
1·684	5	$20\bar{2}4$	1·209	2	$21\bar{3}6$
		$10\bar{1}6$	—	—	$22\bar{4}2$
—	—	$11\bar{2}5$	1·197	1	$30\bar{3}5$
—	—	$21\bar{3}0$			$11\bar{2}8$
—	—	$21\bar{3}1$	1·186	2	$31\bar{4}0$
1·551	10	$21\bar{3}2$	—	—	$22\bar{4}3$
—	—	$20\bar{2}5$	1·160	1	$31\bar{4}2$
—	—	$21\bar{3}3$			

additional reflections were found that could contribute to three of the lines ($10\bar{1}7$, $10\bar{1}8$, and $11\bar{2}8$).

Preliminary values for the lattice parameters, derived from $42\bar{6}0$ and $33\bar{6}0$ (for *a*) and from $2.0.\bar{2}.12$ and $2.2.\bar{4}.10$ (for *c*), enabled reflections at 83·14° and 86·66° θ to be indexed as $42\bar{6}4$ α_1 and $41\bar{5}8$ α_1 respectively. These high-angle reflections in turn permitted *a* and *c* to be recalculated, though the values were not in fact materially altered. The lattice parameters are listed below, together with published determinations for synthetic $AlPO_4$ and for berlinite from the type locality.

	Synthetic $AlPO_4$		Berlinite	
	Huttenlocher[1] (1935, p. 516)	A.S.T.M. card 10–423	Westanå mine (Strunz, 1940)	Buranga (this paper)
a	4·94 Å	4·942 Å	4·92 Å	4·943±0·002 Å
c	10·96 Å	10·97 Å	10·91 Å	10·948±0·004 Å

Associated with the berlinite at Westanå mine are the phosphates augelite, attacolite, and lazulite. Augelite and lazulite occur amongst the very wide variety of phosphates recorded from the Buranga pegmatite and from other pegmatites in the Katumba region of Rwanda (Altmann, 1961; Polinard, 1950; Van Tassel, 1961; Thoreau, 1954; Thoreau and Bastien, 1954; Thoreau and Delhal, 1950; Thoreau and

Safiannikoff, 1957). Additional species identified by the present writers from the Buranga pegmatite are phosphosiderite, purpurite, and fremontite.

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[1] Published values increased by 1 in 500 to convert kX to Å.

[2] Published by permission of the Director of the Geological Survey of Great Britain and of the Director of the Royal Museum of Central Africa, Tervuren.

Crystal structure of stokesite, $CaSnSi_3O_9.2H_2O$

STOKESITE was first described by Hutchinson (1899, 1900) and later on reinvestigated by X-ray and micro-analytical methods by Gay and Rickson (1960). The present author had an opportunity to do X-ray crystallographic work (1961–62) at the Department of Mineralogy and Petrology of the University of Cambridge, England, during which he determined the crystal structure of stokesite. The specimen was kindly supplied by Dr. P. Gay.

The space group as determined by Gay and Rickson (*ibid.*) is *Pnna* and the lengths of the axes are: *a* 14·465 Å, *b* 11·625 Å, *c* 5·235 Å. There are four formulae units of stokesite in a unit cell. The intensity data was collected by Weissenberg camera from the axial projections on (001), (010), and (100) using Mo-$K\alpha$-radiation. The trial structure was concluded