

REFERENCES

- BANNISTER (F. A.) and HOLLINGWORTH (S. E.), 1948. *Nature*, **162**, 565.
 COCCO (G.), 1952. *Periodico Min.* **21**, 103.
 GEDEON (T. G.), 1955. *Acta geol. Hung.* **3**, 27.
 HOLLINGWORTH (S. E.) and BANNISTER (F. A.), 1950. *Min. Mag.* **29**, 1.
 MATLEY (C. A.) and WILSON (T. S.), 1946. *Quart. Journ. Geol. Soc.* **102**, 1.
 MOHR (P. A.), 1964. *Journ. Sed. Petr.* **64**, 819.
 TIEN (PEI-LIN), 1968. *Amer. Min.* **53**, 722.
 WINCHELL (A. N.), 1939. *Elements of Optical Mineralogy*, Part iii. New York (Wiley).

[Manuscript received 27 September 1968]

MINERALOGICAL MAGAZINE, JUNE 1969, VOL. 37, NO. 286

Chlorine in tourmalines from SW. England

CHLORINE has been shown to be present in certain hydroxy-silicates such as amphiboles and biotites but we have been able to discover only one previous analysis for chlorine in tourmalines. Kuroda and Sandell (1953) found 60 ppm chlorine in a black tourmaline but Correns (1956) suggests that this may perhaps be due to inclusions.

TABLE I. Chlorine and leachable chlorine in tourmalines from SW. England. Sample numbers after Power, 1968. Col. a: Environment from which sample originated. P: pegmatite, A: aplite, G: granite, T: topazfels, Q: quartz-tourmaline rock, V: tourmaline vein, C: contact zone, H: hydrothermal. Col. b: Leachable chlorine as a percentage of total chlorine content

No.	a	Cl, %	No.	a	Cl, %	No.	a	Cl, %	b	No.	a	Cl, %	b
18/P	P	0.040	77/P	T	0.051	80/P	V	0.033	—	69/P	V	0.102	3
20/P	P	0.031	51/P	Q	0.046	T5	V	0.061	—	100/P	H	0.071	10
57/P	P	0.032	53/P	Q	0.031	56/P	P	0.049	7	T2	H	0.051	10
301	P	0.024	75/P	Q	0.052	14/P	A	0.038	6	T3	H	0.038	13
11/P	A	0.040	9/P	V	0.042	54/P	Q	0.030	0	26/P	H	0.070	48
13/P	A	0.039	12/P	V	0.031	15/P	C	0.073	13	49/P	H	0.059	6
89/P	G	0.045	23/P	V	0.062	17/P	C	0.078	4	96/P	H	0.035	—
55/P	G	0.040	27/P	V	0.040	99/P	C	0.067	22				

To investigate the distribution of chlorine in tourmalines, thirty-one samples of iron-rich tourmaline from the granitic rocks of SW. England have been analysed using the colorimetric procedure outlined by Huang and Johns (1967) modified for use on a Technicon 'Autoanalyser' (Fuge, unpublished).

The results (table I) show that the chlorine content of the tourmalines analysed ranges from 0.024 to 0.102 %, much the same order as that found in biotites. Only

a small proportion of the chlorine present in the tourmalines could be removed by leaching (table I). This was ascertained by boiling selected samples in distilled water for five hours and then determining the chlorine content of the water. Longer periods, up to three days, of this treatment failed to remove any further chlorine. The high soluble chlorine content found in one sample (26/P) appears to be anomalous and may be the result of contamination of the sample powder. The low soluble chlorine content of the majority of the tourmalines analysed suggests that little, if any, of the total chlorine found is present in fluid or soluble solid inclusions. It seems likely that the chlorine is present in the crystal lattice, possibly in hydroxyl positions.

The tourmalines analysed here are of a restricted range in chemical composition and other varieties may have a very different chlorine content. Also, from our work in progress, it is apparent that the granites of SW. England contain about double the estimated average chlorine for granites and this may have resulted in an abnormal chlorine content in the tourmalines.

*Department of Geology
University College of Wales
Aberystwyth*

R. FUGE
G. M. POWER

REFERENCES

- CORRENS (C. W.), 1956. In *Physics and Chemistry of the Earth*, 1, ed. AHRENS (L. H.), 181–233. London (Pergamon) [M.A. 13–218].
HUANG (W. H.) and JOHNS (W. D.), 1967. *Anal. Chim. Acta*, 37, 508–15 [M.A. 19–85].
KURODA (P. K.) and SANDELL (E. B.), 1953. *Bull. Geol. Soc. Amer.* 64, 879–96 [M.A. 12–286].
POWER (G. M.), 1968. *Min. Mag.* 36, 1078.

[Manuscript received 12 August 1968]

MINERALOGICAL MAGAZINE, JUNE 1969, VOL. 37, NO. 286

Naturally occurring compositions in the solid-solution series Bi_2S_3 – Sb_2S_3

HAYASE (1955) found a form of bismuthinite in which 36–55 % of the Bi_2S_3 molecule were replaced by Sb_2S_3 ; he named this mineral horobetsuite. It is, however, not yet clear if horobetsuite is a distinct species or only part of a solid-solution series extending from Bi_2S_3 towards Sb_2S_3 . Quantitative electron-probe microanalyses of a number of bismuthinite and stibnite samples have therefore been made in order to establish the range of their mutual solubility in nature.

A Cambridge Geoscan electron-probe microanalyser with a 75° X-ray take-off