SHORT COMMUNICATIONS

Kirschsteinite, a natural analogue to synthetic iron monticellite, from the Belgian Congo.

In a recent paper[1] the authors published brief descriptions of two new silicates from a complex melilite–nephelinite lava from the crater of Mt. Shaheru, Nyiragongo area, North Kivu, in the Belgian Congo. For these silicates the names götzenite and combeite, respectively, were proposed. The same nephelinite specimen, numbered S.80, contains another major constituent which could not be identified microscopically. In its optical properties and general appearance the mineral shows some relationships to olivine. It deviates, however, from the members of the forsterite–fayalite series and from monticellite. For this reason the mineral was subjected to a closer study. It proved to be essentially an iron analogue of monticellite, $CaMgSiO_4$, and glaucochroite, $CaMnSiO_4$, and for this natural $CaFeSiO_4$ the name kirschsteinite is proposed, in honour of the German geologist, the late Dr. Egon Kirschstein, who died in the events of the World War I in East Africa. As has been pointed out by Meyer,[2] Dr. Kirschstein was an early pioneer in the geological exploration of the Virunga volcanic field in North Kivu.

The kirschsteinite-bearing specimen from the Shaheru crater contains the following minerals: clinopyroxene, melilite, nepheline, kalsilite, götzenite, sodalite, kirschsteinite, combeite, magnetite, perovskite, apatite, brown hornblende, and pale biotite. In addition, an unknown mineral was found in sparing amounts, a study of which is in progress. Closer characteristics of these minerals and of the rock will be given elsewhere by Meyer and Sahama.[3]

The kirschsteinite was isolated from the rock with heavy liquids and a Frantz-type isodynamic separator. A microscopic test showed the material to be very pure. The result of the chemical analysis is: SiO_2 32·71 %, TiO_2 0·23, Al_2O_3 0·26, Fe_2O_3 0·66, FeO 29·34, MnO 1·65, MgO 4·95, CaO 29·30, Na_2O 0·34, K_2O 0·36, P_2O_5 0·07, H_2O+ 0·25, H_2O- 0·06, total 100·18. The analysis corresponds to the following molecular composition: $CaFeSiO_4$ 69·4 mol. %, $CaMnSiO_4$ 4·3, $CaMgSiO_4$ 22·6, excess Fe_2SiO_4 3·7. Accordingly, the mineral is to be called magnesian kirschsteinite. The analysis shows a slight deficiency in calcium in relation to the sum of iron, manganese, and magnesium. The most iron-rich monticellite previously known from natural rocks is that from the Island of

Muck, Scotland, with *ca.* 25 wt. % $CaFeSiO_4$.[4] A pycnometric specific gravity determination of the analysed material yielded $D = 3{\cdot}434$.

The indexed powder pattern, recorded with the Philips Norelco X-ray diffractometer, with filtered cobalt radiation and a silicon standard, is as follows:

hkl.	*I.*	$2\theta_{obs.}$	$d_{obs.}$	$Q_{obs.}$	$Q_{calc.}$	*hkl.*	*I.*	$2\theta_{obs.}$	$d_{obs.}$	$Q_{obs.}$	$Q_{calc.}$
020	35	18·485	5·569	0·0322	0·0323	{140 / 122	40	43·49	2·4143	0·17156	{0·17147 / 0·17167
021	25	24·56	4·205	0·0565	0·0565						
101	10	26·67	3·878	0·0665	0·0666	210	15	44·26	2·3744	0·17737	0·17747
111	70	28·305	3·658	0·0747	0·0747	211	10	47·405	2·2251	0·20197	0·20173
002	10	32·35	3·211	0·0970	0·0970	132	10	48·635	2·1721	0·21195	0·21202
130	100	35·31	2·9492	0·11497	0·11498	240	60	58·505	1·8304	0·29847	0·29852
040	25	37·495	2·7830	0·12911	0·12912	{160 / 133	10	62·16	1·7326	0·33312	{0·33287 / 0·33332
131	85	38·995	2·6798	0·13924	0·13924						
112	80	40·18	2·6040	0·14747	0·14746	152	10	62·945	1·7132	0·34070	0·34114
041	15	40·985	2·5549	0·15319	0·15338	062	30	67·65	1·6068	0·38732	0·38756

The indexing was based on the data for fayalite that has been given by Yoder and Sahama.[5] Unit-cell dimensions, calculated from the powder pattern, are as follows ($\pm 0{\cdot}005$ Å.): a 4·859, b 11·132, c 6·420 Å. The crystallographic axes were selected in a way that corresponds to that generally accepted for the forsterite–fayalite series. A series of rotation and Weissenberg photographs about the three crystallographic axes confirms the unit-cell dimensions given. Systematic extinctions are similar to those for forsterite.

When viewed in specimen under the binocular microscope, the mineral shows a very slight greenish colour. In thin section it is colourless. The optical properties are: α 1·689, β 1·720, γ 1·728, $\gamma-\alpha$ 0·039 (calc.), $2V_a$ $51°\pm1°$ (universal stage), $2V_a$ 53° (calc.). The optical orientation was tested with a thick Berek compensator on crystals mounted on the goniometer head of the Weissenberg camera. Comparison of optical tests and rotation photographs results in the following relationship between the axes of the unit cell and of the optical indicatrix: $a = \gamma$, $b = \alpha$, $c = \beta$. This optical orientation corresponds to that of the forsterite–fayalite series.

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[1] Th. G. Sahama and Kai Hytönen, Min. Mag., 1957, vol. 31, p. 503.

[2] André Meyer, Exploration du Parc National Albert, Mission d'études vulcanologiques, 1955, Fasc. 1.

[3] A. Meyer and Th. G. Sahama (in press).

[4] C. E. Tilley, Compt. Rend. Soc. géol. Finlande, 1947, No. 20, p. 97.

[5] Hatten S. Yoder and Th. G. Sahama, Amer. Min., 1957, vol. 42, p. 475.