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Panunzite, a new mineral from Mt. Somma–Vesuvio, Italy

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ABSTRACT

The new mineral panunzite occurs at short hexagonal prisms, up to 4 mm long, associated with nepheline, green augite, and biotite in small cavities in ejected pyroxene-rich blocks associated with one of the latest volcaniclastic deposits on Mt. Somma–Vesuvio, Italy. It is colorless, uniaxial (−) with $\epsilon = 1.535(1)$ $\omega = 1.540(1)$; the measured density is 2.59 g/cm³, the calculated density is 2.62 g/cm³. The chemical composition is SiO_2 39.60, Al_2O_3 31.90, Fe_2O_3 0.35, FeO 0.15, MgO 0.11, CaO 0.43, Na_2O 5.74, K_2O 21.52, BaO 0.12, Rb_2O 0.07, SrO 0.01, H_2O 0.12, sum 100.12 wt%, giving an ideal formula of $(K_{0.70}Na_{0.30})AlSiO_4$, based on 4 oxygen atoms. The six strongest lines in the X-ray powder pattern (*d* in Å) are 3.071(100), 3.929(70), 2.558(40), 2.914(30), 4.277(25), 2.380(20); the unit-cell parameters are $a = 20.513(8)$, $c = 8.553(3)$ Å, space group $P6_3$. The mineral is named after Dr. Achille Panunzi, University of Naples, and the mineral and mineral name have been approved by the International Mineralogical Association Commission on New Minerals and Mineral Names.

INTRODUCTION

Recent investigations of the metamorphic ejecta from Mt. Somma–Vesuvio unearthed some pyroxene-rich blocks in one of the latest deposits of volcaniclastic rocks. A new phase discovered in these blocks proved to have a composition and structure similar to the synthetic phase "tetrakalsilite" within the system $NaAlSiO_4$-$KAlSiO_4$, described by Smith and Tuttle (1957). The name "tetrakalsilite" was suggested by Sahama (1960) with reference to the unit-cell dimension, as $a = 20.46$ Å, about four times the *a* dimension in kalsilite. We though this name inappropriate, as it carries a connotation of tetragonal symmetry, and have named this mineral panunzite after Dr. Achille Panunzi, Professor of Chemistry at the University of Naples, who discovered these pyroxenic blocks. The new species and the name have received the approval of the International Commission of New Minerals and Mineral Names; type material is deposited in the Museo Mineralogico dell'Università di Napoli.

OCCURRENCE

Panunzite occurs as a cavity mineral in pyroxene-rich blocks found in one of the latest volcaniclastic deposits on Mt. Somma–Vesuvio (Benedetti et al., 1977). The host rock is a fine-grained intergrowth of augitic pyroxene and biotite, with rare nepheline. Panunzite occurs in cavities of the rock, associated with larger (up to 10 mm) crystals of nepheline, green augite, and biotite. A few of the feldspathoid crystals show microperthitic associations of nepheline-kalsilite or nepheline-panunzite.

CHEMICAL COMPOSITION

The chemical analysis was done on a sample of individually identified crystal fragments using gravimetric methods, except for the alkali ions, which were determined by flame photometry. The analysis and the number of ions normalized to 32 oxygen atoms are reported in Table 1. The ideal formula is $Na_{0.30}K_{0.70}AlSiO_4$, based on 4 oxygen atoms.

PHYSICAL PROPERTIES

Panunzite occurs as short hexagonal prisms, up to 4 mm long, and can be distinguished from the associated nepheline by its greater transparency. The mineral is colorless and the streak is white. The luster is vitreous. The hardness is 5.5 on Mohs' scale. The species is uniaxial (−) with $\epsilon = 1.535(1)$, $\omega = 1.540(1)$. The measured density is 2.59 g/cm³, close to the calculated value of 2.62 g/cm³. Poor cleavages parallel to $\{10\bar{1}0\}$ and $\{0001\}$ are observed.

TABLE 1. Chemical analysis of panunzite

	Wt%	Number of ions for 32 O	
SiO_2	39.60	Si	8.11
Al_2O_3	31.90	Al	7.71
Fe_2O_3	0.35	Fe^{3+}	0.05
FeO	0.15	Fe^{2+}	0.03
MgO	0.11	Mg	0.03
CaO	0.43	Ca	0.09
Na_2O	5.74	Na	2.29
K_2O	21.52	K	5.63
BaO	0.12	Ba	0.01
Rb_2O	0.07	Rb	0.005
SrO	0.01	Sr	0.001
H_2O	0.12		
	100.12	Kls	70.29
		Ne	28.59
		Q	1.12

TABLE 2. X-ray powder-diffraction data for panunzite

I/I_0	d_{obs} (Å)	d_{calc} (Å)	*hkl*
5	4.435	4.4412	400
25	4.277	4.2765	002
70	3.929	3.9415	401
15	3.520	3.5308	411
5	3.360	3.3572	420
10	3.225	3.2296	312
100	3.071	3.0805	402
30	2.914	2.9205	430
10	2.866	2.8721	412
8	2.836	2.8446	520
4	2.640	2.6407	422
40	2.558	2.5641	440
10	2.424	2.4329	531, 701
20	2.380	2.3991	403
20	2.268	2.2687	711
8	2.218	2.2205	800
20	2.177	2.1824	702
10	1.969	1.9738	900
10	1.927	1.9353	722
12	1.751	1.7504	920
10	1.725	1.7252	434
10	1.617	1.6199	922
18	1.591	1.5873	662
12	1.560	1.5641	850
20	1.539	1.5385	851
5	1.484	1.4802	10.31
5	1.478	1.4802	554
15	1.458	1.4601	734
15	1.420	1.4211	10.32

X-RAY CRYSTALLOGRAPHY

Powder-diffraction data (Table 2) were recorded on a Philips 1730 powder diffractometer, using Cu$K\alpha$ radiation and a scan speed of ½° 2θ/min. Cell dimensions were derived by least-squares refinement, giving $a = 20.513(8)$, $c = 8.553(3)$ Å. The crystal structure of panunzite was reported by Merlino et al. (1985) in space group $P6_3$ (Z = 32). The structure consists of six-membered rings of alternating (SiO_4) and (AlO_4) tetrahedra and shows greater structural similarities to nepheline than to kalsilite, despite its chemical composition (Merlino, 1984; Perrotta and Smith, 1965).

DISCUSSION

Tuttle and Smith (1958) and Sahama (1960) have discussed the relationship between nepheline, kalsilite, and related phases (including panunzite). It is apparent from their discussions that the occurrence of panunzite will be promoted by fast cooling, and this is in line with its occurrence in ejected blocks in volcaniclastic rocks.

REFERENCES CITED

Benedetti, E., de Gennaro, M., and Franco, E. (1977) Primo rinvenimento in natura di tetrakalsilite. Rendiconti Accademia Nazionale Lincei Serie VIII, 62, 835–838.

Merlino, S. (1984) Feldspathoids: Their average and real structures. In W.L. Brown, Ed., Feldspars and feldspathoids, p. 435–470. D. Reidel Publishing Co.

Merlino, S., Franco, E., Mattia C.A., Pasero, M., and de Gennaro, M. (1985) The crystal structure of panunzite (natural tetrakalsilite). Neues Jahrbuch für Mineralogie Monatshefte, 1985, 322–328.

Perrotta, A.J., and Smith, J.V. (1965) The crystal structure of kalsilite $KAlSiO_4$. Mineralogical Magazine, 35, 588–595.

Sahama, Th.G. (1960) Kalsilite in the lavas of Mt. Nyiragongo. Journal of Petrology, 1, 146.

Smith, J.V., and Tuttle, O.F. (1957) The nepheline-kalsilite system. I. X-ray data for the crystalline phases. American Journal of Science, 255, 282–305.

Tuttle, O.F., and Smith, J.V. (1958) The nepheline-kalsilite system. II. Phase relations. American Journal of Science, 256, 571–589.

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