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PERRIERITE FROM THE SOGNDAL ANORTHOSITE, SOUTH NORWAY

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The first occurrence of perrierite in Norway is reported from a quartz-rich pegmatitic lens in anorthosite. X-ray powder data and qualitative X-ray spectrometry results are given.

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Perrierite, (REE, Th, Ca)$_4$ (Fe^{II}, Fe^{III}, Ti)$_3$ (Ti, Nb)$_2$ [O$_4$ | Si$_2$O$_7$]$_2$, was first described by Bonatti & Gottardi (1950) from shore sands at Nettuno, Rome, Italy. Further data on this new mineral were published by Bonatti & Gottardi (1954) and Bonatti (1959). The crystal structure was determined by Gottardi (1960), and a structure refinement was published by Galli (1965).

The present note reports the first find of perrierite in Norway. It was detected in an anorthosite specimen collected on the dumps of the Storgangen ilmenite mine, Sogndal, South Norway. The mineral occurs in dark brown to black masses, up to 1 cm in length, in a coarse-grained, pegmatitic lens in the anorthosite. The lens is very rich in quartz and is about 15 cm long. The mineral has thin, irregular, outer zones of yellow-brown and brownish grey colour. The dark material of the core has hardness 6½ and specific gravity 4.14.

X-ray powder diagrams show that the core and outer zones are completely metamict. After heating at 1000°C for 1 day they give patterns identical with that published by Neumann et al. (1957) for perrierite from the original locality in Italy, except that films of the outer zones show a few more lines. The d-values of the black core, obtained with a 9 cm camera using Fe radiation, are given in Table 1, together with powder data for

Table 1. X-ray powder data for perrierite

Storgangen, Sogndal (1000°C)		Ilmen, Urals (700°C, 2 kb) Ito 1967		Nettuno, Rome (unheated) Bonatti 1959	
d (Å) obs.	I	d (Å) obs.	I	d (Å) obs.	I
5.39	w	5.34	15	5.34	65
5.14	w	5.15	10	5.13	25
–	–	4.98	5	–	–
4.04	w	–	–	4.06	20
–	–	3.57	10	3.56	20
3.54	w	3.537	40	3.53	15
3.44	w	3.435	5	3.43	20
3.34	w	–	–	–	–
3.11	w	3.106	10	3.15	15
3.03	w	3.021	15	3.03	20
2.96	s	2.959	90	2.96	100
2.93	s	2.938	100	2.93	55
2.82	m	2.822	60	2.82	65
2.72	w	2.722	5	2.73	15
2.67	m	2.677	70	2.675	20
–	–	2.612	5	2.550	15
2.49	w	2.495	15	2.488	15
2.23	w	2.220	5	2.229	50
2.16	m	2.169	20	2.166	25
		2.154	20	2.156	25
–	–	2.097	5	2.095	15
–	–	2.056	5	2.088	15
1.94	m	1.949	20	1.941	50
1.83	w	1.821	3	–	–
1.79	w	1.781	3	1.779	15
1.74	w	1.735	5	–	–
1.72	w	1.720	3	1.719	10
–	–	1.679	5	–	–
1.65	w	1.650	10	1.658	10
1.60	w	–	–	1.649	15
1.58	w	1.587	5	1.585	15
1.41	w	–	–	–	–
1.25	w	–	–	–	–

recrystallized perrierite from Ilmen, Urals (Ito 1967) and unheated perrierite from Nettuno, Italy (Bonatti 1959).

Structural changes produced by heating perrierite and the closely related mineral chevkinite were studied by Lima-de-Faria (1962), using X-ray powder diffraction methods. Perrierites gave the perrierite phase when heated in air or nitrogen up to 1300°C; chevkinites usually gave the chevkinite phase, but when heated in *air* above 1000°C the perrierite phase was produced. The structural relations between perrierite and chevkinite were explained by Bonatti & Gottardi (1966) as a case of layer polymorphism. Ito (1967) synthesized 68 perrierites and chevkinites of different chemical compositions, and stated that these structures are not polymorphs in the strict

sense, but that the structural transition appears to be controlled by the average size of the ions occupying the various structural sites.

An X-ray spectrogram of the black metamict perrierite from Sogndal gave as result: Ti, Fe, Y, Ce are major constituents (Si was not sought for); La, Pr, Nd, Sm, Zr, Nb, Th are minor constituents; Gd, Dy, Pb are present in very small amounts only. It is interesting to note that the Sogndal perrierite seems to be much richer in Y than any previously reported perrierite (e. g. Mitchell 1966).

Perrierite is mainly found in pegmatites associated with granites (Takubo & Nishimura 1953), alkali syenites (Portnov 1964), or granodiorites (Mitchell 1966). The mineral is also known from tuffs and ash beds (Bonatti & Gottardi 1950, Izett & Wilcox 1968). The only previous report of perrierite from rocks of the gabbro family was given by Kallio (1967), who found it as an accessory mineral in gabbro-anorthosite from Finland.

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