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Geology. — "*Pienaarite, a melanocratic foyaite from Transvaal.*"

By H. A. BROUWER. (Communicated by Prof. G. A. F. MOLENGRAAFF.)

(Communicated in the meeting of November 27, 1909).

Among the nepheline syenites on and to the west of the farm Leeuwfontein to the north-east of Pretoria, which show a complete series of varieties in chemical and mineralogical composition, the "collection MOLENGRAAFF" contains a variety very rich in titanite, which occurs $\frac{1}{4}$ mile to the west of the Pienaarsriver near the boundary of the farm Zeekoegat.

Macroscopically the rock shows red felpars to 1 cm. up in length, which have a tabular development after (010), and smaller crystals of red nepheline, with which contrast numerous slender prisms of aegirine and bright crystals of titanite, which make up over half of the rock.

Under the microscope the rock is seen to consist of feldspar, nepheline, less sodalite, much aegirine, (aegirine augite) and titanite and small quantities of apatite, fluorine, calcite, analcime, and titanite iron ore.

The feldspars are orthoclase and microperthite in Carlsbad twins.

Nearly always nepheline and sodalite are transformed, respectively into pseudomorphoses of mica and zeolites. In the crystals of nepheline, which are not entirely transformed into mica, the transformation begins along the fissures, but nearly all the crystals are entirely altered. The sodalite pseudomorphoses consist of zeolites, in which we find distributed some small flakes of mica.

The aegirine is strongly pleochroic from olive-green to yellowish green, some crystals are homogeneous, other ones contain a centre of aegirine augite, which has for the greater part very low extinction angles; they are very rich in inclusions of small crystals of titanite and apatite, and they are strongly impregnated with fluorspar.

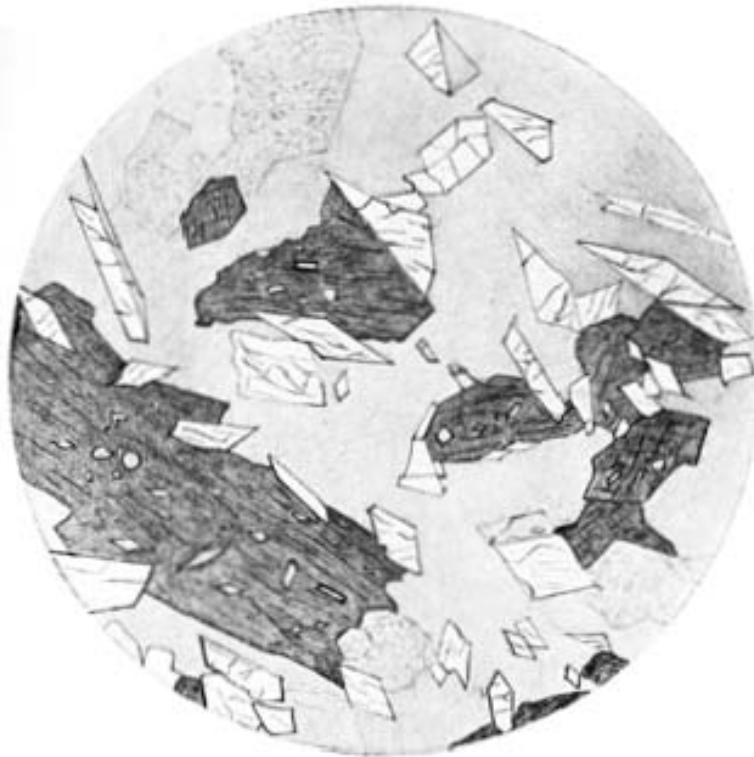
The titanite forms the well known twins after (001), in the rhombic sections the long diagonal is the twinning plane; both individuals are polysynthetically twinned. They are pleochroic from salmon coloured to colourless.

The apatite is the first product of crystallization, it is even formed as small idiomorphic inclusions in the titanite, for the greater part the crystallization of the other elements was simultaneous; the aegirine is idiomorphic in relation to feldspars and feldspatoids but in general the contactlines are irregular and show simultaneous crystallization. The feldspar includes some idiomorphic crystals of nepheline and sodalite, mainly it is the latest product of crystallization. Probably in pneumatolytical way, fluorine, calcite, and analcime crystallized in the remaining cavities.

It is evident how much the mineralogical composition of this rock differs from that of the normal types of nepheline syenite by its high content of aegirine and titanite. A. LACROIX¹⁾ gave the name of covite to the mesocratic form of this group and of teralite to the melanocratic form; as the type of covite he considers the rock of Magnet Cove in Arkansas, described by WASHINGTON and as type of teralite the alkali feldspar-nepheline rocks from the Crazy Mountains in Montana.

The chemical composition of the rock here described is shown in I of the following table (analysed by F. PISANI); it is compared with the analyses of some covites and teralites.

¹⁾ Matériaux pour la Minéralogie de Madagascar. Extr. nouv. Arch. du Museum, 4e serie, Tome 1, pag. 184.



Explanation of Figure.

(\times 30).

A part of a large individual of felspar shows poikilitic relation to aegirine, titanite, nepheline (at the top to the left) and sodalite (at the lower edge, in the middle and to the right).

The aegirine contains numerous idiomorphic inclusions of titanite, apatite and fluorspar

	I	II	III	IV	V	VI
SiO ₂	49.20	49.70	51.10	47.67	44.65	47.85
TiO ₂	7.13	1.33	1.38	—	0.95	—
Al ₂ O ₃	9.23	18.45	21.10	18.22	13.87	13.24
Fe ₂ O ₃	7.73	3.39	0.90	3.65	6.06	2.74
FeO	3.24	4.32	5.58	3.85	2.94	2.65
MnO	—	—	—	0.28	0.17	—
CaO	11.55	7.91	5.35	8.03	9.57	14.36
MgO	1.35	2.32	2.81	6.35	5.15	5.68
Na ₂ O	6.20	5.33	6.35	4.93	5.67	3.72
K ₂ O	1.96	4.95	4.21	3.82	4.49	5.25
P ₂ O ₅	0.06	0.40	—	2.97	2.10	2.74
H ₂ O	2.20	1.34	0.87		1.50	2.42
Som	99.85	99.44	99.65	100.15	99.93	100.65

- I. Pienaarite. Leeuwfontein (320) Pretoria. Transvaal.
- II. Covite. Magnet Cove. Arkansas cf. H. S. Washington. Journ. of Geol. IX. 614. 1901.
- III. Covite. Nosy Komba. cf. A. LACROIX Mat. Minéral. Madagascar Extr. Nouv. Arch. du Museum 4e Ser. I. 32.
- IV. Teralite. Crazy Mountains Bull. U. S. Geol. Surv. no. 150.
- V. Teralite. " " " " " " " " " "
- VI. Teralite. (nepheline pyroxene malignite) cf. A. C. LAWSON Bull. Dep. of Geol. Univ. of California I. 337. 1896.

We see how the rock, here described, differs in mineralogical and chemical composition from the melanocratic nepheline syenites, which are hitherto known, its characteristic features are the large amount of Fe₂O₃, TiO₂, and CaO (abundance of aegirine, aegirine-augite and titanite) and its low content of lime (diminuation of the feldspars and feldspatoids). Prof. MOLENGRAAFF proposed to me the name Pienaarite, after the Pienaar river because the locality, where he collected this rock, is situated in a region between a tributary of the Pienaar river called Mundtspruit, and the above river itself.