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FERROGLAUCOPHANE FROM NEW CALEDONIA

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ABSTRACT

Ferroglaucophane is described from two localities in Northern New Caledonia. Chemical compositions, unit cell parameters and optical data are given.

Over the past few years there have been a number of publications dealing with the phase relations of the sodic amphiboles, their natural occurrences and correlations of their physical properties with their chemistry (summarized in Ernst, 1968). However, the stable synthesis of the ferrous iron, aluminous end member of the sodic amphibole series has apparently not yet been accomplished (Ernst, 1968, p 92); nor has any natural sodic amphibole been previously recorded which plots within the ferroglaucophane field of Miyashiro's (1957) sodic amphibole classification scheme.

This note reports the discovery of ferroglaucophane in New Caledonian blueschists, and presents chemical and physical data for two ferroglaucophanes. A later more general paper on amphiboles from New Caledonia will discuss the paragenetic significance of the ferroglaucophanes and their relations to the other sodic amphiboles and the physical conditions of blueschist facies metamorphism.

The two described amphiboles are from different lithologies and metamorphic grades.

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Ferroglaucophane has been found in a siliceous metasediment (10774) interbedded with lawsonite-albite bearing pelitic schists 5 Km west of Ouégoa. The metasediment consists essentially of a quartz mosaic enclosing ferroglaucophane and paragonite and accessory albite, phengite, stilpnomelane, spessartine and pyrite.

The second described ferroglaucophane (9995) is from a sequence of metamorphosed acid volcanics interstratified with high grade schists and gneisses at Bouehndep. The assemblage of the host rock is quartz, albite, omphacite, and phengite with accessory K-feldspar, almandine, epidote, sphene and pyrite.

TABLE 1. CHEMICAL COMPOSITION OF FERROGLAUCOPHANES

	10774		9995			10774	9995
		$6/\sqrt{N}$		$6/\sqrt{N}$			
SiO_2	53.4	3.0	53.8	1.9	Si	7.76	7.79
TiO_2	0.2	1.6	—		Al^{1+}	0.24	0.21
Al_2O_3	11.8	5.2	10.1	1.5			
Fe_2O_3[1]	1.8		4.0		Al^{6+}	1.79	1.51
FeO[2]	16.23		17.88		Ti	0.03	—
FeO[3]	17.8	3.1	21.4	1.6	Fe^{3+}	0.20	0.44
MnO	0.2	1.3	0.1	1.0	Fe^{2+}	1.96	2.17
MgO	4.9	1.2	3.9	0.6	Mn	0.03	0.01
CaO	0.4	2.9	0.9	1.5	Mg	1.07	0.84
Na_2O	7.0	1.9	6.8	1.8			
K_2O	—		—		Ca	0.06	0.14
Total	95.93		97.48		Na	1.97	1.91

[1] Calculated from the difference between the total iron and ferrous iron.

[2] Ferrous iron determined directly by wet chemical method (Analyst: E. Jarosewich).

[3] Electron microprobe determination of total iron calculated as FeO.

The two ferroglaucophanes were analysed in carbon coated thin sections with an A.R.L.-E.M.X. electron microprobe using the standards and analysing procedures of Klein (1968 a, b.). The ferroglaucophanes were checked for homogeneity. Values of $\sigma\sqrt{N}$ (Klein, 1968a) for each of the elements determined are listed in Table 1. Sufficient material of both ferroglaucophanes was separated and purified for a direct determination of ferrous iron content. The combined electron microprobe and ferrous iron analyses are presented in Table 1. Estimated errors are believed to be less than 3 percent for major and 5 percent for minor components. The analyses have been recalculated on the anhydrous basis of 23 oxygens per unit cell. The locations of the two ferroglaucophanes on the sodic amphibole classification diagram (after Miyashiro, 1957) are shown in Figure 1.

X-ray powder diffraction data for the ferroglaucophanes were obtained from a Norelco diffractometer using Ni filtered CuK α radiation, a goniometer scanning speed of $1/4°2\theta$ per minute and an internal silicon standard. Unit cell parameters were calculated from the powder data by a least squares computer refinement technique (Evans, Appleman and Handwerker, 1963).

Both ferroglaucophanes show weak dispersion (r < v) and the glaucophane pleochroic scheme α = colourless, β = violet, γ = blue although the more iron rich amphibole, 9995, has stronger pleochroic colours than 10774. Refractive indices were measured in white light and are believed
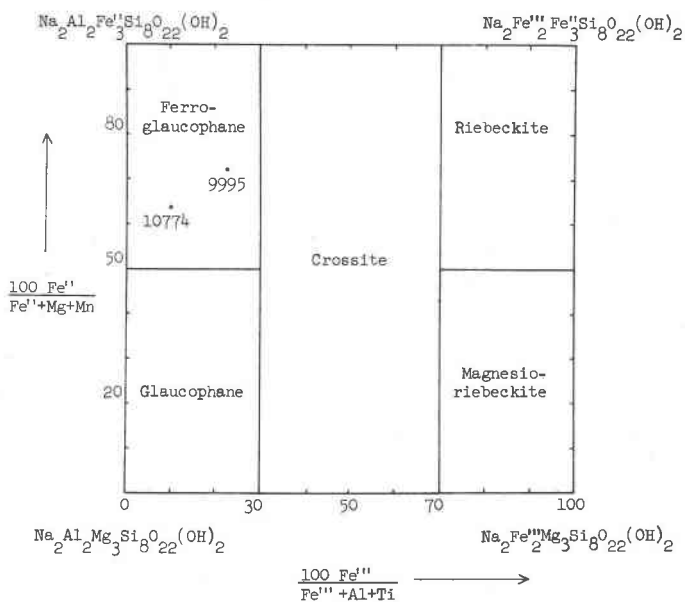

FIG. 1. Sodic amphibole compositional diagram (after Miyashiro, 1957) showing the position of the New Caledonian ferroglaucophanes.

accurate to ± 0.002. Optic and extinction angles were measured with a universal stage and have estimated errors of $\pm 2°$. Densities were determined by centrifuging grains in methylene iodide-acetone solutions of known density and are accurate to ± 0.01.

Physical data for the two ferroglaucophanes are summarised in Table 2. The observed data for the New Caledonian ferroglaucophanes are generally in quite good agreement with those which can be predicted from extrapolation from Borg's (1967) data for other sodic amphiboles.

TABLE 2. PHYSICAL PROPERTIES OF FERROGLAUCOPHANE

	10774	9995
α	1.630	1.641
β	1.648	1.659
γ	1.652	1.662
$2V_\alpha$	45°	42°
$\gamma_{\lambda c}$	4°	6°
D	3.21	3.23
a	9.558 ± 0.002 Å	9.599 ± 0.005 Å
b	17.801 ± 0.006 Å	17.874 ± 0.017 Å
c	5.319 ± 0.001 Å	5.302 ± 0.003 Å
β	$103°33' \pm 1'$	$103°38' \pm 4'$
V	879.8 ± 0.3 Å^3	884.1 ± 0.7 Å^3

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