Mg- AND Na-BEARING MUSCOVITE IN THE CRYSTALLINE SCHIST FROM AMAKUSA, NAGASAKI PREFECTURE, JAPAN

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ABSTRACT

$2M_1$-muscovite with 18 mole % paragonite has c 20.010 Å, slightly smaller than pure potassium muscovite.

INTRODUCTION

A muscovite containing 1.42 weight percent of Na_2O and 3.02 weight percent of MgO occurs in the metamorphosed pegmatite intruded into crystalline schist along the western coast of Shimozima in the Amakusa Islands, Nagasaki Prefecture, Japan. The mode of occurrence of the mica was reported by Tachibana (1967). K-Ar dating of the mineral gave an age of 86 m.y. (Ueda and Onuki, 1968). This note provides the mineralogical properties of the muscovite in some detail.

MINERALOGY

Colorless to pale brownish yellow crystals up to 2 cm wide and 1 cm thick are enclosed in the quartz-albite pegmatite and comprise about 20 to 30 percent of its volume (Fig. 1). The pegmatite body is approximately 1 m thick and 20 m long; it was strongly deformed by successive metamorphism(Tachibana, 1967). About 4 g of hand-picked pure crystals are used for study.

Physical Data. Refractive indices determined by the immersion method using Na_D light at 20°C and 2V measured on the universal stage gave; α 1.575±0.001, β 1.598±0.001, γ 1.602±0.001 and $\gamma-\alpha$ 0.027 and (−) $2V$ 22°. These values are close to the muscovite data (Deer, Howie and Zussman, 1963). Specific gravity determined by pycnometer at 20°C gives 2.80_1.

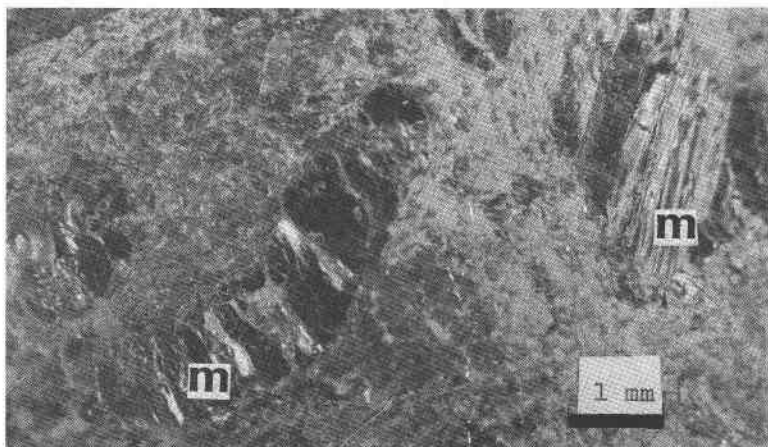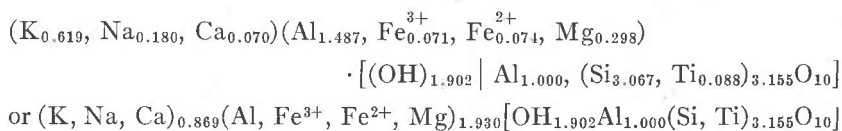*X-ray Data.* X-ray diffraction data for muscovite are obtained using an

Fig. 1. Na and Mg bearing muscovite in the metamorphosed pegmatite.

X-ray diffractometer with Ni-filtered $CuK\bar{a}$(1.5418Å) radiation. X-ray diffraction data for muscovite agree well with the indexed powder data of synthetic $2M_1$ polymorph given by Yoder and Eugster (1955; XRDF card 7–32). Using that indexing the following unit cell edges were obtained with silicon metal as an internal standard: a $5.17_4 \pm 0.003$, b $9.05_1 \pm 0.003$, c 20.010 ± 0.003 ($c \sin \beta$ 19.930), and β 95°20′. The c value of the muscovite is slightly smaller than that of $2M_1$ muscovite due to the substitutions of Na for K in the sheets.

Chemical data. Chemical analysis by Kazuso Nakao and Kazuo Harada on 3.5 g of pure sample gave: SiO_2 46.69, TiO_2 1.77, Al_2O_3 31.82, Fe_2O_3 1.42, FeO, 1.33; MnO, 0.02; MgO, 3.02; CaO, 0.98; Na_2O, 1.42; K_2O, 7.29; H_2O(total) 4.30 and total 100.06.

When O+OH are set to be 13, this corresponds to;

$$(K_{0.619}, Na_{0.180}, Ca_{0.070})(Al_{1.487}, Fe^{3+}_{0.071}, Fe^{2+}_{0.074}, Mg_{0.298})$$
$$\cdot [(OH)_{1.902} | Al_{1.000}, (Si_{3.067}, Ti_{0.088})_{3.155}O_{10}]$$

or $(K, Na, Ca)_{0.869}(Al, Fe^{3+}, Fe^{2+}, Mg)_{1.930}[OH_{1.902}Al_{1.000}(Si, Ti)_{3.155}O_{10}]$

This formula agrees with muscovite $(OH_2KAl_3Si_3O_{10}$ (Strunz, 1970), but considerable amounts of Mg proxy for Al and Na for K. The specimen from Amakusa contains 18 mol. percent of paragonite end-member.

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ON THE OPTICAL SPECTRA OF DI- AND TRIVALENT IRON IN CORUNDUM: A DISCUSSION

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INTRODUCTION

The color and pleochroism of blue kyanite (Al_2SiO_5) has been attributed to traces of Ti^{3+} by White and White (1967); however, subsequently, Faye and Nickel (1969) showed that these optical properties could be accounted for more readily on the basis of $Fe^{2+} \rightarrow Fe^{3+}$ charge-transfer processes. This writer contends that the latter interpretation is supported by the spectra of iron-bearing corundum reported recently in this journal by Lehmann and Harder (1970). However, the correlation of the spectra of blue kyanite with that of the iron-corundum suggests that aspects of Lehmann and Harder's interpretation of certain of their spectra are open to question.

DISCUSSION

Figure 1 shows the polarized optical spectra of blue kyanite [Figure 1(a)] and Fe^{2+}-corundum [Fig. 1(b)] approximately in the 8,000 to 22,000 cm^{-1} range. It is evident that each absorption envelope is composed of two polarized components; however, only the high-energy band lies in the visible region and it is largely responsible for the colour and pleochroism of the mineral.