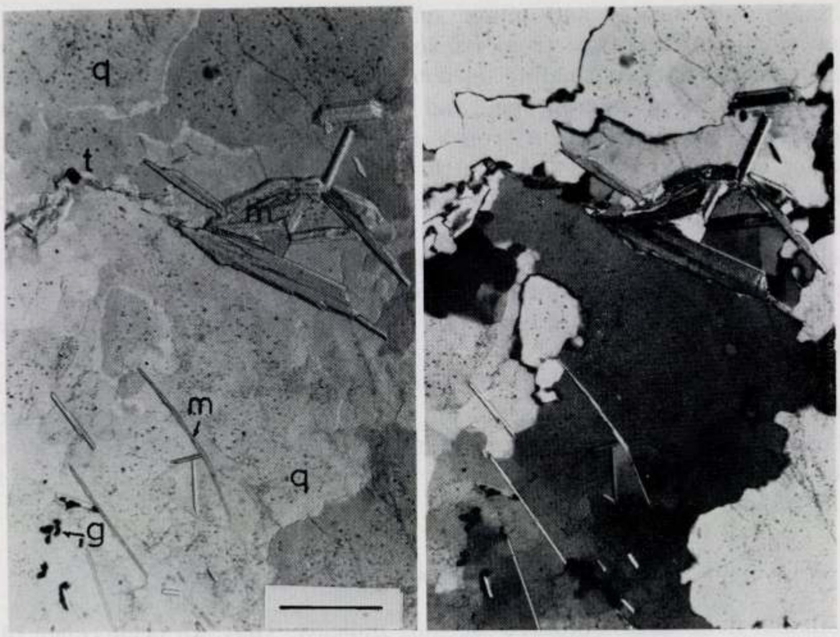

FIG. 2 Photomicrographs showing the mode of occurrence of green mica (specimen J-910). Left: one polar, right: crossed polars. Scale (horizontal bar) indicates 500 μm. Abbreviations; m=green mica, q=quartz, g=graphite, t=vanadium tourmaline.

products of simultaneous recrystallization. It has usually perfect cleavages and contains minute inclusions of graphite.

MATERIAL INVESTIGATED

Among many rock specimens of the quartzite containing the green mica now under investigation, specimen J-910, in which the mineral shows the mode of occurrence (2), was selected because of the ease of purification, and was subjected to a close examination.

Dark green patch consisting of scaly or felted aggregates of the mineral was extracted from the specimen with a steel needle and the purification of the sample was made by careful selection under the binocular microscope. The sample thus prepared was examined by both optical and electron microscopes with the aids of X-ray diffraction and infrared spectrometry, in order to detect the impurities (quartz and vanadium tourmaline). In particular, 1380 cm^{-1} band on the infrared absorption spectra served to detect vanadium tourmaline. The results showed the purification to be satisfactory, except for the presence of negligible amounts of finely-intergrown quartz and vanadium tourmaline.

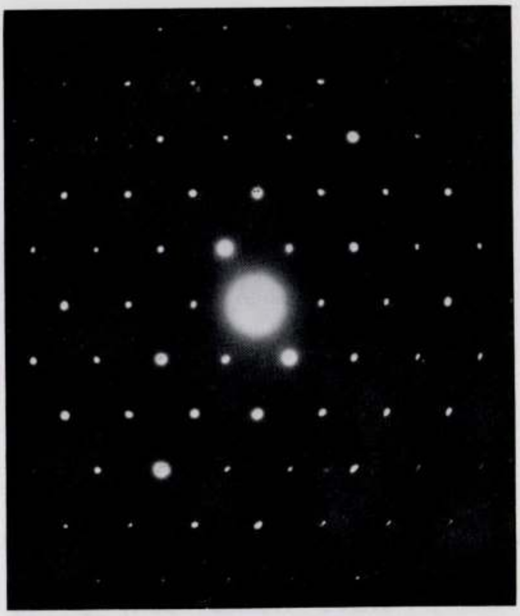

Fig. 5 Selected-area electron diffraction pattern from a thin, single flake of green mica (specimen J-910).

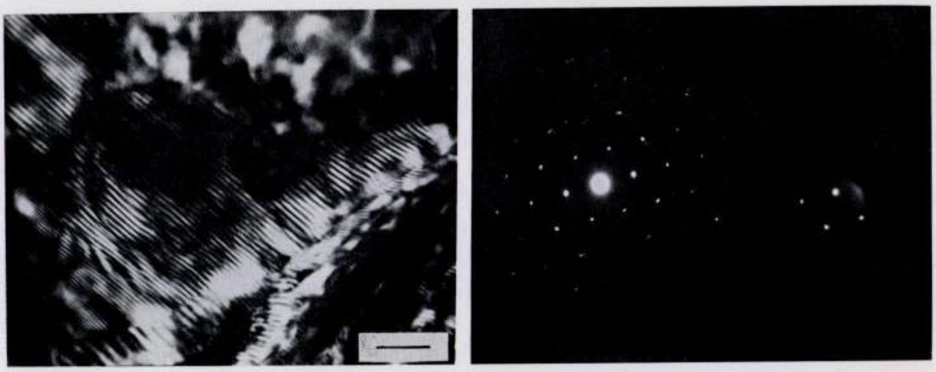

Fig. 6 Moiré pattern on a dark-field image and the corresponding selected-area electron diffraction patterns of green mica (specimen J-910). Scale (horizontal bar) indicates 100 Å.

eration voltage of 200 kV. Electron-optical images were taken at a direct magnification of $\times 10^5$. The material was shown under the electron microscope to occur in small, poorly-defined flakes commonly grouped together in irregular aggregates. Fig. 5 gives the selected-area electron-diffraction pattern from a thin, single flake, showing the *hk* diffraction-spots with a pseudo-hexagonal array. Fig. 6 illustrates the moiré pattern on a dark-field image and the corresponding selected-area electron diffraction pattern, showing the slight rotation of the superimposed two crystal plates.

In order to reveal the surface morphology of the mineral, the small chips, the surface of which had been coated by gold with an ion spatter, were examined by scanning electron microscopy, using the SEM system of a JEOL JXA-50 A electron microprobe. The electron micrograph shows relatively large, flat crystals in a crude, book-like structure (Fig. 7). The basal surfaces are planar, suggesting little or no internal strains in the structure.

FIG. 7 Scanning electron micrograph of green mica (specimen J-910). Scale (horizontal bar) indicates 10 μm.

DISCUSSION AND CONCLUSIONS

Mineralogy

Summarizing the mineralogical data given so far, it may be said that the present green mica is a vanadium-bearing variety of 2 M_1 muscovite, in which a small amount of vanadium and a very small amount of chromium replace about 1/6 of aluminum in the octahedral sites.

It has been recognized that, in normal 2 M muscovite vanadium substitutes for octahedral aluminum in a small amount, and a small quantity of barium can also enter into the interlayer sites (Heinrich and Levinson, 1955). In fact, both natural roscoelite characterized by high vanadium content (Blake,