The coarse kaolinite layer was found in seven auger holes near the surface. No actual outcrops were seen, probably because the material is prone to rapid erosion. The few wells drilled in recent years down the dip report a white talc-like layer which may be related to the kaolinite layer.

COMPOSITION

A characteristic size distribution shows a double mode for kaolinite with maxima at 15.0 and approximately 0.5 microns, and a single mode for quartz at 45 microns. The finest fraction is composed of kaolinite plus approximately 25% amorphous hydrous aluminum silicates (allophane ?) and 5% hydrous iron oxides.

Diffraction peaks of the 001 and 002 reflections were measured on some single kaolinite platelets. Good crystals have the 001 reflection at 7.16 Å; those platelets showing substructure in Laue patterns have double peaks at 7.19 and 7.09 Å for the 001 line and at 3.58 and 3.54 Å for the 002 reflection. The large basal reflections suggest nacrite-type spacing (Bailey, 1963), but other lines are not in agreement.

Chemical composition of the purified kaolinite is as follows: SiO_2—43.8%; Al_2O_3—39.1%; Fe_2O_3—0.90%; K_2O—0.40%; Na_2O—0.18%; L.I.—15. 25%; Total—99.63%. The alkalies are due to distinct grains of feldspar and muscovite inclusions; most of the iron oxide is in the form of iron oxide stains.

DTA thermograms of the purified fraction have the single deshydroxilation endotherm at 600° C. and the sharp narrow exotherm at 980° C. characteristic of well-developed kaolinite.

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THE AMERICAN MINERALOGIST, VOL. 50, JULY-AUGUST, 1965

SYNTHESIS OF A NEW MICA, $KMg_{2.5}[Si_4O_{10}]D(OH)_2$[1]

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In the course of a more extensive experimental study on phlogopite solid solubility, a mica intermediate between the dioctahedral and trioctahedral mica series was synthesized in the pure system K_2O-MgO-SiO_2-H_2O. Standard hydrothermal techniques were employed using start-

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[1] Research supported by Deutsche Forschungsgemeinschaft, Bad Godesberg, Germany.

ing materials consisting of crystallized potassium silicate glasses plus periclase in various proportions. The mica phase akin to pure phlogopite, $KMg_3[Si_3AlO_{10}](OH)_2$, was obtained, together with other crystalline phases, over a wide range of starting compositions. As a single phase it grew readily at 1000 bars water pressure and 300°–600° C. from the bulk composition $K_2O \cdot 5MgO \cdot 8SiO_2 \cdot XH_2O$, where $X > 2$. Therefore, the structural formula of this mica may be given as $KMg_{2.5}[Si_4O_{10}](OH)_2$.

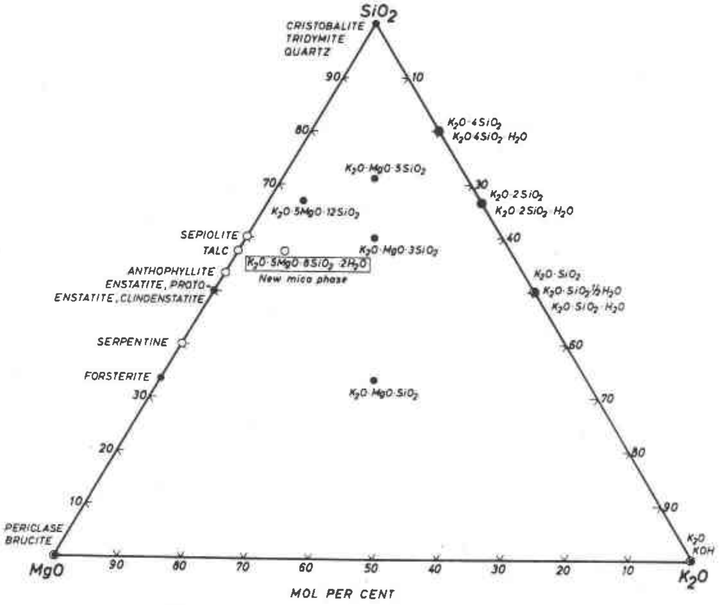

FIG. 1. Projection of the system K_2O-MgO-SiO_2-H_2O on the water-free base plane. Compositions of phases are taken from Morey (1917), Bowen and Tuttle (1949), and Roedder (1951). Water-bearing phases are indicated by open circles, water-free phases by solid dots.

The location of this composition in the projection of the system K_2O-MgO-SiO_2-H_2O is shown in Fig. 1.

Experiments aimed at determining the stability range of this mica are under way. It appears that the phase is thermodynamically stable under the conditions of its synthesis, because no signs of breakdown into more stable assemblages were recognized in runs of 3 weeks duration. As for most micas the PT-stability range seems to be rather extensive.

The powder x-ray diffraction pattern of the new mica phase as compared with that of synthetic phlogopite is given in Fig. 2. It follows that the new phase is a 1M or 3T polytype probably partly disordered (1Md?). The lattice constants are given in Table 1. Because of the fine-grained na-

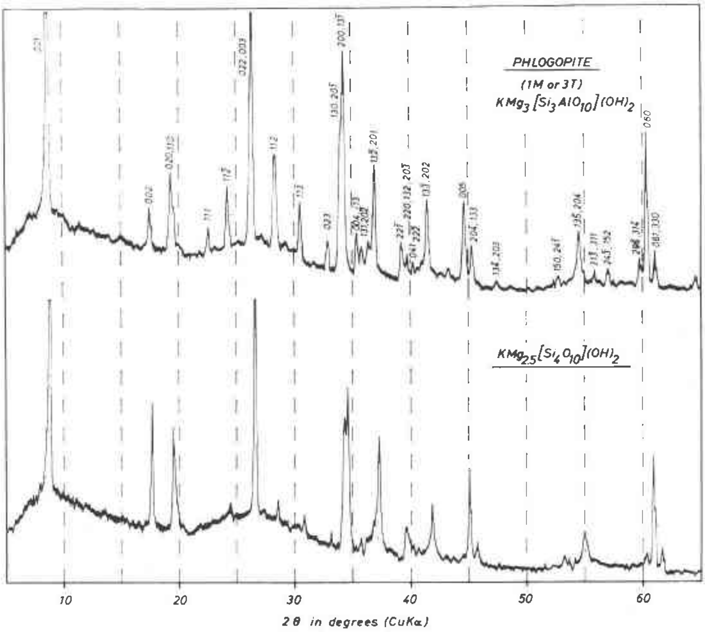

FIG. 2. Tracings of x-ray diffraction patterns of synthetic phlogopite (1M or 3T polytype) and the new mica phase $KMg_{2.5}[Si_4O_{10}](OH)_2$. The phlogopite pattern is indexed on the basis of a 1M cell. In the lower pattern only h00, 0k0, 001 and 201 peaks are strong, whereas hkl reflections are weak compared to those of synthetic phlogopite. This may be an indication of partial disorder in the stacking of the individual mica sheets (1Md polytype?).

ture of the material synthesized optical data are somewhat scarce. The mean index of refraction as determined by the immersion method is 1.565.

The existence of a mica with the composition $KMg_{2.5}[Si_4O_{10}](OH)_2$ is of

TABLE 1. COMPARISON OF LATTICE CONSTANTS OF PHLOGOPITE, LEUCOPHYLLITE, CELADONITE AND THE NEW MICA PHASE

	Synthetic phlogopite (1M cell) (Yoder and Eugster, 1954)	New Mica phase (1M cell)	Natural leucophyllite Kardymovicz (1960)	Natural celadonite (Wise and Eugster, 1964)
a	5.314Å	5.256±0.005		5.23
b	9.204	9.089±0.008	9.00	9.06
c	10.314	10.201±0.010		10.13
β	99°54′	99°59′±10′		100°55′
$c \sin \beta$	10.160	10.046±0.010	10.08	

great theoretical importance for the crystal chemistry of the whole mica group. With 2.5 octahedral sites filled this phase represents an intermediate member between the dioctahedral muscovite-leucophyllite series and the trioctahedral eastonite-phlogopite series, which, so far, were regarded as largely independent groups and separated by a complete miscibility gap. The new mica is linked to other micas by simple substitutions. Preliminary experimental results suggest that the new phase may form solid solutions with trioctahedral pure phlogopite, $KMg_3[Si_3AlO_{10}](OH)_2$. In addition, solid solubility may extend towards dioctahedral leucophyllite, $KMgAl[Si_4O_{10}](OH)_2$. These relationships, summarized in Fig. 3, are further supported by the cell dimensions (Table 1). Although the synthesis of leucophyllite has not yet been accomplished in the laboratory (Crowley and Roy, 1964; Wise and Eugster, 1964), its existence in nature is made probable through the analysis given by Kardymowicz (1960). Moreover the Fe^{3+} for Al analogue of leucophyllite is well known in nature as the mineral celadonite (Table 1).

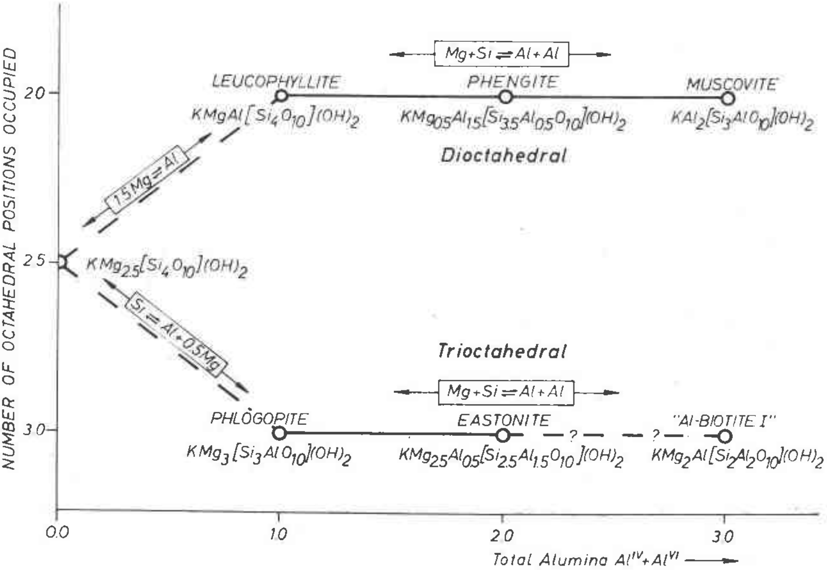

FIG. 3. Possible solid solubility of mica phases with compositions in the system K_2O-MgO-Al_2O_3-SiO_2-H_2O. The high alumina phlogopite series extending beyond eastonite to "Al-Biotite I" is taken from Crowley and Roy (1964).

It is possible that micas with compositions similar or identical to that of the new phase synthesized may also exist in nature. Perhaps many a phlogopite described from natural rocks is actually Al-deficient and richer in silica than the true phlogopite composition. The most promising environments, in which such micas can be expected, are potassic ultrabasic rocks such as kimberlites, mica peridotites, and perhaps mica carbonatites, etc. A search of the literature revealed a number of analyses of phlogopites which show an excess over 3.0 Si in the tetrahedral position. Rimšaite (1964) gives six analyses of such high-silica phlogopites with Si up to 3.18 from various rocks in the Bancroft area, Ontario. The authors are presently searching for further Al-deficient phlogopites.

Preliminary phase relations in the system K_2O-MgO-SiO_2-H_2O indicate that the phase $KMg_{2.5}[Si_4O_{10}](OH)_2$ described in this note is only one end member of a whole series of mica solid solutions in this system. Further researches as to the nature of the lattice substitution leading to this series are under way.

It is also worth noting that attempts at synthesizing an Fe^{2+} analogue of the mica here described have been successful.

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THE AMERICAN MINERALOGIST, VOL. 50, JULY-AUGUST, 1965

A METHOD FOR TAKING BACK REFLECTION OSCILLATION PHOTOGRAPHS OF SINGLE CRYSTALS

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In *x*-ray diffraction studies "back reflection" geometry is utilized in powder cameras (Cullity, 1956; Azaroff and Buerger, 1958) and in Weissenberg cameras (Buerger, 1937) for the accurate measurement of high