

adsorbed Na) were freed of  $\text{NH}_4\text{Cl}$  by washing with acetone-water solutions, air-dried and subjected to various treatments for the removal of  $\text{NH}_4$ . The results obtained by steam distillation are reported here to show that  $\text{NH}_4$  in degraded micas can be replaced by Na with no apparent destructive effects on the mineral.

The data in Fig. 1 show the rate and extent of  $\text{NH}_4$  removal attained in steam-distillation experiments with the  $\text{NH}_4$ -degraded samples of biotite and muscovite. To minimize the possibility of mineral destruction, these steam-distillation experiments were carried out at pH 8 with 0.1 g mica in 10 ml of 2 N Na salt solution (0.4 M  $\text{Na}_2\text{HPO}_4$ -0.4 M  $\text{NaH}_2\text{PO}_4$  solution, with the pH and Na concentration adjusted with NaCl and NaOH additions). Also, the steam rate was adjusted to produce 5 ml distillate/min from a 100 ml reaction flask. Otherwise, the equipment and method was comparable to that described by Bremner and Keeney (1965).

The results obtained with this distillation method and 0.1 m mole  $\text{NH}_4\text{Cl}$  are included in Fig. 1 to show the  $\text{NH}_4$  in degraded mica is not removed as rapidly as dissolved  $\text{NH}_4$ . It is also evident from the mica curves that the micas released their  $\text{NH}_4$  at different rates. That is, relative to muscovite, biotite had a higher rate of release with fixed interlayer  $\text{NH}_4$ , just as it did with indigenous interlayer K (Scott and Smith, 1966). However, complete removal of  $\text{NH}_4$  was attained with both micas and in a relatively short time.

The changes in adsorbed cations and layer charge that occurred when the mica particles were subjected to the various treatments required in this method of preparing Na-degraded mica are shown in Table 1. The  $\text{NH}_4$ -original samples referred to in this table were prepared by leaching portions of the original mica with  $\text{NH}_4\text{Cl}$ . Also, each of these mica samples were washed with acetone-water solutions to remove the soluble salts before they were analyzed.

With the  $\text{NH}_4$ -saturated samples of original mica as a basis of comparison, it is evident that an exchange of Na for most of the K and all the  $\text{NH}_4$  was attained. Furthermore, the Na-degraded mica was prepared with no more change in layer charge than that anticipated for the K depletion step of the process (Scott and Smith, 1966). That is, the steam distillation treatment effected an exchange of Na for  $\text{NH}_4$  without a change in layer charge.

The results of these experiments show that it is possible to prepare and isolate Na-saturated samples of highly charged micaceous minerals by this procedure.

Table 1. Adsorbed cations and layer charge of original and degraded < 50  $\mu$  mica samples

Mica samples	Total analysis (meq/100 g)			
	K	Na	$\text{NH}_4$	Layer charge (K + Na + $\text{NH}_4$ )
<b>Biotite</b>				
$\text{NH}_4$ -original	196	26.5	2.2	225
$\text{NH}_4$ -degraded	3.1	58.7	115	177
Na-degraded	2.4	175	0.0	177
<b>Muscovite</b>				
$\text{NH}_4$ -original	219	25.5	2.9	247
$\text{NH}_4$ -degraded	7.4	173	68.7	249
Na-degraded	5.7	242	0.0	248

Complete removal of the K in these mica samples was not achieved, but this degree of Na saturation exceeds that obtained by other K-depletion methods. Even with muscovite, all but 5.7 meq K/100 g was replaced by Na. Consequently, this method of preparing Na-degraded mica samples will provide an opportunity of carrying out various mica and interlayer cation exchange experiments that heretofore have been impossible.

#### REFERENCES

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### Report of the Nomenclature Committee (1966-67) of The Clay Minerals Society

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THE COMMITTEE, consisting of G. W. Brindley (Chairman), S. W. Bailey, G. T. Faust, S. A. Forman, and C. I. Rich, recommends the following:

#### 1. Correct usage of the term "lattice"

It is recommended that the term "lattice" be used only in a strict, technical sense and in particular that it not

be regarded as synonymous with "structure". Clay mineralogists are not the only offenders, but they frequently do use erroneous expressions such as "substitution in the clay lattice", "lattice edges", "removal of K from the lattice", and "mica-type layer lattice".

A lattice is a uniform distribution of points in space. There are fourteen different kinds of lattices, the fourteen Bravais lattices. A "layer lattice" is not one of the fourteen. Phyllosilicates are based mainly on monoclinic and triclinic lattices.

## 2. Use of "plane", "sheet", and "layer"

It is recommended that these terms be used in the following manner: a *plane* of atoms, a tetrahedral or

octahedral *sheet*, a 1:1 or 2:1 *layer*. Thus plane, sheet, and layer refer to increasingly thicker arrangements; a sheet is a combination of planes and a layer is a combination of sheets. In addition, *layers* may be separated from one another by various *interlayer* materials, including cations, hydrated cations, organic molecules, and hydroxide octahedral groups and sheets.

## 3. Use of X, Y, Z, and a, b, c.

While the committee unanimously agrees that X, Y, Z should be used for axes and a, b, c for repeat distances, it is considered that a recommendation should come first from an organization such as the International Union of Crystallography.

Table 1. Proposed classification scheme for phyllosilicates related to clay minerals

Type	Group ( $x$ = charge per formula unit)	Subgroup	Species*
1:1	Kaolinite-serpentine $x \sim 0$	Kaolinites	Kaolinite, halloysite
		Serpentines	Chrysotile, lizardite, antigorite
2:1	Pyrophyllite-talc $x \sim 0$	Pyrophyllites	Pyrophyllite
		Talcs	Talc
	Smectite or Montmorillonite- saponite $x \sim 0.25-0.6$	Diocahedral smectites or Montmorillonites	Montmorillonite, beidellite, nontronite
		Triocahedral smectites or Saponites	Saponite, hectorite, sauconite
	Vermiculite $x \sim 0.6-0.9$	Diocahedral vermiculites	Diocahedral vermiculite
		Triocahedral vermiculites	Triocahedral vermiculite
Mica <sup>†</sup> $x \sim 1$		Diocahedral micas	Muscovite, paragonite
	Triocahedral micas	Biotite, phlogopite	
Brittle mica $x \sim 2$	Diocahedral brittle micas	Margarite	
	Triocahedral brittle micas	Clintonite	
2:1:1	Chlorite $x$ variable	Diocahedral chlorites (4-5 oct. cations per formula unit)	Pennine, clinochlore, prochlorite
		Triocahedral chlorites (5-6 oct. cations per formula unit)	

\*Only a few examples are given

†The status of *illite* (or *hydromica*), *sericite*, etc. must be left open at present, because it is not clear whether or at what level they would enter the Table; many materials so designated may be interstratified.

#### 4. *Anauxite*

It is recommended that a critical re-evaluation be made of the material or mineral called "anauxite". The name should be either reconfirmed or discredited.

#### 5. *Chamosite and Berthierine*

It is agreed that two minerals of similar chemical compositions exist. One is a 2:1:1 chlorite and has long been called "chamosite". The other is a 1:1 type mineral that has also been called "chamosite", but which does not have priority for this name. The committee unanimously endorses the name "berthierine" for the 1:1 mineral. This endorsement is in line with the recommendation of Orcel, Caillère and Hénin (1949, *Compt. rend. Acad. Sci., Paris* **229**, 134–135).

#### 6. *Description of the chlorite structure*

It is agreed that the description of the chlorite structure

as being composed of talc layers and brucite sheets is not the best description, because the minerals talc and brucite admit very little or no substitution of Mg by Al, which is an essential feature of trioctahedral chlorites. It is unanimously agreed that "2:1 layer" in place of "talc layer" and "hydroxide sheet" in place of "brucite sheet" are preferable terms.

#### 7. *Revised classification scheme*

Several recommendations of this CMS Committee to the CIPEA (now AIPEA) Nomenclature Subcommittee were approved at the latter's meetings held in Israel in June 1966. As a result, the proposed classification scheme for phyllosilicates (*Clays and Clay Minerals* **14**, 31) has been modified slightly. Table 1 shows the revised scheme.