

NOMENCLATURE SUB-COMMITTEE OF C.I.P.E.A.

In continuance of earlier attempts to standardize the classification and nomenclature of clay minerals (Brindley *et al.*, 1951; Mackenzie, 1959; Caillère, 1960) the above Sub-Committee met at Stockholm during the 1963 International Clay Conference and after much subsequent correspondence submitted the following report to the Commission on New Minerals and Mineral Names of the International Mineralogical Association:

‘Since the meeting in July 1958, the proceedings of which have been fully described in *Clay Miner. Bull.* (1959) 4, 52–66, much international consultation has taken place among clay mineralogists on the question of the classification and nomenclature of those minerals in which they are most interested. This culminated in a meeting of a sub-committee of six representatives (from Australia, Czechoslovakia, France, Great Britain, U.S.A., and U.S.S.R.—the representative from Japan was unfortunately unable to attend) in Stockholm in 1963. At this meeting the results of all earlier meetings were reviewed and replies to questionnaires submitted to thirty-two countries* assessed.

The decisions arrived at this meeting and by subsequent correspondence with the other countries concerned are as follows:

1. It was agreed that before one could evolve a satisfactory nomenclature it is necessary to have a suitable classification. Because clay mineralogy is involved in so many disciplines it was also agreed that any classification scheme must be very broadly based so that it could be developed in detail to suit the purposes of the various disciplines involved. It was the unanimous opinion of the meeting that any scheme for clay minerals must be compatible with those acceptable for minerals as a whole, and that for layer-lattice clay minerals one must devise a broad classification scheme for the phyllosilicates as a whole†. The scheme eventually adopted by a large majority has been submitted to the other interested countries and from correspondence it is clear that the attached scheme (Table 1) would be generally acceptable to all countries except one (France). The Sub-Committee, therefore, would recommend that this general scheme be endorsed by the International Mineralogical Association.

2. Much discussion concerned group names. There was obviously considerable disagreement, not only within the small committee but among the other nations contacted, as to the best manner of naming groups. In the attached scheme it will be noted, however, that the main question in this respect, which generates strong feeling on both sides, is the use of *montmorillonite-saponite* or *smectite* for the 2 : 1 minerals with layer-charge between 0.5 and 1.0. The supporters of the name

* Listed in ‘Appendix’. † That is, those based on gibbsite- or brucite-like sheets

TABLE 1. Proposed classification scheme for the phyllosilicates (including layer-lattice clay minerals)

Type	Group (x = layer charge)	Sub-group	Species*
2 : 1	Pyrophyllite-Talc $x \sim 0$	Pyrophyllites Talc	Pyrophyllite Talc
	Smectite or Montmorillonite-Saponite $x \sim 0.5-1$	Dioctahedral smectites or Montmorillonites Trioctahedral smectites or Saponites	Montmorillonite, beidellite, nontronite Saponite, hectorite, saucornite
	Vermiculite $x \sim 1-1.5$	Dioctahedral vermiculite Trioctahedral vermiculite	Dioctahedral vermiculite Trioctahedral vermiculite
	Mica† $x \sim 2$	Dioctahedral micas Trioctahedral micas	Muscovite, paragonite Biotite, phlogopite
	Brittle mica $x \sim 4$	Dioctahedral brittle micas Trioctahedral brittle micas	Margarite Seybertite, xanthophyllite, brandisite
2 : 1 : 1	Chlorite x variable	Dioctahedral chlorites Trioctahedral chlorites	Pennine, clinochlore, prochlorite
1 : 1	Kaolinite-Serpentine $x \sim 0$	Kaolinites Serpentines	Kaolinite †, halloysite § Chrysotile, lizardite, amigorite

* Only a few examples given.

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

‡ See Paragraph 5 of *Memorandum to International Mineralogical Association*.

§ See Paragraph 4 of *Memorandum to International Mineralogical Association*.

montmorillonite-saponite make the point that it follows standard mineralogical usage whereby the group is named after the most common representative (the name *montmorillonite* is reserved for the dioctahedral sub-group and therefore cannot be used for the group as a whole). Proponents of the name *smectite* point out that use of an independent name for a group is by no means uncommon in mineralogy and that referring to a mineral always as 'a member of the . . . group' is very cumbersome, particularly for such a complex group as that under consideration, where it is frequently impossible to ascertain which member is present. The meeting at Stockholm was completely divided on this matter, four being in favour of *smectite*, two in favour of *montmorillonite-saponite*, and one abstaining. International—and even national—feeling on the subject is just as divided. Of those countries which subsequently expressed opinions the vote is almost exactly 50 : 50 and one country (U.S.A.) is internally almost equally divided. In consequence I, as Chairman of the Nomenclature Sub-Committee of C.I.P.E.A., would recommend that the group name in this instance be left as an alternative and that the most acceptable term, be it *montmorillonite-saponite* or *smectite*, will eventually emerge by usage.

3. The place of *illite* (or *hydromica*) in the classification scheme generated much discussion. It seems to be generally felt that this is a useful field term, rather like *limonite*, but that in future it may well be better defined. In consequence, it seems reasonable meantime to include the term in the present suggested classification scheme only as a footnote reference, until further research shows whether it constitutes a valid separate group from the micas or ought to be included along with interstratified minerals. The Sub-Committee therefore recommends that the question of inclusion or non-inclusion of *illite* in a classification scheme be left open meantime.

4. The question of *halloysite/endellite* was also raised at the Stockholm meeting and has since been considered internationally. At Stockholm only one member (U.S.A.) strongly supported use of the terms *endellite* and *halloysite* and international consideration later has shown that they are supported by only one other nation (Canada). All others agree with the nomenclature *halloysite/metahalloysite*, except Japan which would prefer *hydrated halloysite/halloysite*, although they would accept *halloysite/metahalloysite* if this were the decision of the majority. In view of the overwhelming vote on this I, as Chairman of the Sub-Committee, would recommend, for endorsement by I.M.A., that the names *halloysite/metahalloysite* be adopted and that the name *endellite* be dropped.

5. It was agreed that the structural varieties of kaolinite, namely kaolinite, dickite, and nacrite, could justifiably be renamed on the basis of the symmetry of stacking of the layers. One could thus use kaolinite-1Tc in place of kaolinite, kaolinite-2M₁ in place of dickite, and kaolinite-2M₂ in place of nacrite. Subsequent to this decision the paper by S. W. Bailey (*Am. Miner.* (1963) **48**, 1196–1209) has considered this matter much more fully and he has derived alternative symbols. It might be best, therefore, at present not to make a definite decision as to symbol, but we would suggest that I.M.A. endorse the *principle* of using a single name followed by symmetry symbols in such instances (it is preferable that the symmetry symbol follow the name for indexing purposes).

6. Many other aspects of classification and nomenclature still remain to be considered—for example, the chain-lattice minerals, interstratified minerals, and amorphous minerals. The Sub-Committee would suggest to I.M.A. that any recommendation they may promulgate at their current meeting should not go beyond points 1–5 raised in this memorandum, since it is intended to have further consultations regarding these and other outstanding matters between clay mineralogists in the near future and it is hoped that definite agreed recommendations may be submitted to I.M.A. within the next few years. It is believed that agreement by consent is more effective than agreement by dictation.

(Signed) R. C. MACKENZIE, Chairman,
Nomenclature Sub-Committee of C.I.P.E.A.

APPENDIX

Countries which were contacted concerning their views: Australia, Belgium, Brazil, Bulgaria, Canada, China, Czechoslovakia, Denmark, Egypt, Finland, France, Germany, Great Britain, Holland, Hungary, India, Israel, Italy, Japan, Jugoslavia, Mexico, New Zealand, Norway, Poland, Portugal, South Africa, Spain, Sweden, Switzerland, Turkey, U.S.A., and U.S.S.R.

The Commission on New Minerals and Mineral Names has now voted on these recommendations with the following results (using the numbering of paragraphs in the report):

1. Acceptable—13; Not acceptable—1; Abstained—1.
2. Montmorillonite-saponite—8; Smectite—3; Montmorillonite alone—2; Abstained—2.
3. In favour of proposal—12; In favour but include hydromica with mica—1; Not in favour—1; Abstained—1.
4. Endellite/halloysite—1; Hydrated halloysite/halloysite—2; Halloysite/meta-halloysite—9; Abstained—1; Alternatives—2.
5. In favour of general principle—9 (2 with reservations); Not in favour—5; Abstained—1.

The Sub-Committee are extremely grateful to the Commission for their consideration of the proposals presented and look forward to close liaison in the future.

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The Macaulay Institute for Soil Research,
Craigiebuckler, Aberdeen. 12 October 1965.

BRINDLEY G.W., MACÉWAN D.M.C., CAILLÈRE S., CORRENS C.W., FAVEJEE J.C.L. & GRIM R.E.
(1951) *Am. Miner.* **36**, 370.
CAILLÈRE S. (1960) *Bull. Grpe fr. Argiles.* **12**, 97.
MACKENZIE R.C. (1959) *Clay Miner. Bull.* **4**, 52.