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# A SYSTEM OF CODIFICATION FOR UNNAMED MINERALS: REPORT OF THE SUBCOMMITTEE FOR UNNAMED MINERALS OF THE IMA COMMISSION ON NEW MINERALS, NOMENCLATURE AND CLASSIFICATION

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## Abstract

A system of codification that includes the year of publication and qualitative chemical composition has been developed for unnamed minerals reported in the literature. Such minerals are divided into two categories: those regarded as being "valid as unnamed minerals" (1363 in this listing) are those that do not correspond to existing species, have not been reported previously, and whose published descriptions enable them to be recognized if found elsewhere. Unnamed minerals regarded as being "invalid as unnamed minerals" (1460 in this listing) are those whose published descriptions are inadequate for their confident recognition if found elsewhere, or which correspond to existing mineral species or unnamed minerals published previously. Separate lists of unnamed minerals in the two categories, distinguished by different codings, are given as appendices.

*Keywords*: unnamed minerals, International Mineralogical Association, Commission on New Minerals, Nomenclature and Classification.

## Sommaire

Nous avons développé un système de codification des minéraux sans nom cités dans la littérature; il inclut l'année de la publication et une composition chimique qualitative. Ces minéraux sont traités en deux catégories. Les minéraux sans nom considérés valides (1363 cas) sont ceux qui ne correspondent pas à une espèce connue, qui n'ont jamais été décrits auparavant, et dont les descriptions publiées permettent de les reconnaître s'ils sont trouvés ailleurs. Les minéraux sans nom considérés non valides (1460 cas) sont ceux pour lesquels la description publiée est inadéquate pour permettre de les reconnaître s'ils sont trouvés ailleurs, ou qui correspondent à des espèces minérales déjà connues ou à des minéraux sans nom déjà décrits dans la littérature. Des listes de minéraux sans nom préparées selon ces deux catégories, avec une codification distincte, sont présentées en appendice.

(Traduit par la Rédaction)

*Mots-clés*: minéraux sans nom, Association Minéralogique Internationale, Commission des Minéraux Nouveaux, de Nomenclature et de Classification.

## Introduction

The naming of new minerals has always been an important activity amongst mineralogists. Unfortunately, in the early years of the science, many names were given on what would now be considered far too flimsy descriptions. This resulted in a proliferation of names; many, if not the majority, of these have since been abandoned, declared synonyms, formally discredited or relegated to varietal status. Recognizing that such a plethora of unnecessary names is undesirable, and also that a name should not be applied unless and until sufficient data could be obtained to allow subsequent recognition of other specimens, the IMA Commission on New Minerals and Mineral Names (recently renamed the Commission on New Minerals, Nomenclature and

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Classification, and hereafter referred to as CNMNC), instituted a substantial and detailed set of guidelines to authors contemplating naming new minerals (*e.g.*, Nickel & Grice 1998). Some mineralogists, when reporting on minerals with insufficient data to qualify for CNMNC approval, took a more cautious approach, leaving such minerals unnamed, thereby adding to the list of unnamed minerals already in the literature. This has had the effect of highlighting another problem, that of an appropriate terminology for unnamed minerals.

Hardly surprisingly, the quality and breadth of data recorded for such minerals have been extremely variable, ranging from a few properties visible with the naked eye to very thorough and, at times, nearly complete descriptions. These minerals are variously referred to as unnamed, unidentified or unknown, but for the purposes of this report, they are all categorized as unnamed minerals. There are now embedded in the literature more than twenty-eight hundred and twenty descriptions of unnamed minerals, and only a few sporadic attempts have been made to compile these (*e.g.*, Hey 1950, 1962, 1963, Hey & Embrey 1974). In general, these initiatives have been hampered by the absence of an accepted terminology and by the lack of a consensus about what constitutes an unnamed mineral. In this report, we address these problems and describe a simple but flexible coding system that has now been officially adopted by the IMA (CNMNC).

A mineral name may be viewed as a shorthand code for the physical and chemical characteristics of a naturally occurring substance. This applies not only to accepted mineral names but also to unnamed minerals; only the amount of available data differs. In many instances, the type and quantity of data available suggest that such substances could possibly be investigated further and shown to be genuine new species. Having a standardized coding for such minerals will make it much easier for potential investigators to track down type specimens for further study or for comparative purposes.

## Characterization of Unnamed Minerals

Early literature included statements such as *"Unnamed: In parallel and divergent groups of orthorhombic crystals resembling eschynite in habit. Forms {100}, {010} and {101} with (101) ^ ($\bar{1}$01) about 75°. Fracture subconchoidal. H=5.5 G=4.49. Luster resinous. Color on fracture dark chocolate to clear maroon"* [quoted in Palache *et al.* (1944) from early twentieth century Brazilian literature]. Such descriptions may be useful in allowing later observers to locate the material that was being described in that particular sample, but it remains most unlikely that, on the basis of this description, the mineral will ever be matched with confidence to a mineral in another unrelated sample. Probably the most useful type of data for obtaining a reasonable match are X-ray powder-diffraction patterns and, in fact, for many years, these were considered to constitute the only really definitive evidence. During the last three or four decades, however, electron-beam instruments have been developed to the point where semiquantitative to quantitative compositional data can be obtained rather readily. Although such evidence does not provide the possibility of completely unequivocal identification in all cases (since several percent of known minerals have dimorphs or polymorphs), in most instances compositional data may, at the very least, be used to determine whether any polymorph of a particular compound has been described previously. Such data can therefore form the basis for the description of an unnamed mineral and, indeed, hundreds of such descriptions have already been published. Only in rare instances can data other than compositional or X-ray diffraction characteristics be adequate by themselves to define an "unnamed" mineral.

## A Codification System for Unnamed Minerals

### *Description of the system*

The compilation has been separated into two categories, "Valid as an unnamed mineral" and "Invalid as an unnamed mineral". An unnamed mineral in the "Valid" list is one whose published description is probably adequate to identify the mineral in another occurrence, and which cannot be equated with a named mineral or with an unnamed mineral that has previously been described. An unnamed mineral in the "Invalid" category is one whose description is inadequate to enable its recognition in another occurrence, or which may be equated with a previously described named or unnamed mineral, or with a subsequently recognized and named mineral. The codings for the two categories are somewhat different.

For minerals in the "Valid" category, a primary concern in devising a system was to make the codes indexable and to simplify literature and computer database searches. The designation finally adopted takes the form shown in the following example:

**UM1959–01–BO:CaMgMn**.

The use of the initial letters "UM" clearly places unnamed minerals in an alphabetical listing such as is used in most journals and books, as well as in computer databases. Furthermore, it has the somewhat fortuitous advantage that the abbreviation could also stand in some other Germanic languages.

The "UM" is followed by two groups of numerals. The initial group indicates the year when the mineral was first reported. The two numerals after the first hyphen constitute a trivial "serial" number, assigned to give different identities to minerals described in the same year. Although it is recognized that, in time, some

numbers will be eliminated when previously unnamed minerals are given names, discredited, or declared synonymous with other named or unnamed minerals, to avoid confusion, the sequential numbers will not be changed, nor will eliminated numbers be reused, now that this system of coding has been adopted by the IMA.

The numerals are followed by a further hyphen and then one or more alphabetical characters that represent a chemical code designed to indicate the chemical grouping to which the mineral has been assigned. The following chemical codes have been devised:

| | |
|---|---|
| As | arsenides (if both S and As are present in substantial amounts, S takes precedence) |
| AsO | arsenates or arsenites |
| Bi | bismuthides |
| BO | borates |
| Br | bromides |
| C | carbides |
| CH | hydrocarbons, oxalates, porphyrins, organic compounds |
| CO | carbonates |
| Cl | chlorides |
| CrO | chromates |
| E | elements and intermetallic compounds |
| F | fluorides |
| FCO | fluorcarbonates |
| GeO | germanates |
| I | iodides |
| IO | iodates |
| MoO | molybdates |
| N | nitrides |
| NO | nitrates |
| O | oxides |
| OC | oxalates |
| OH | hydroxides |
| OS | oxysulfides |
| P | phosphides |
| PO | phosphates |
| S | sulfides or sulfosalts |
| Sb | antimonides |
| SO | sulfates or sulfites |
| Se | selenides |
| SeO | selenates or selenites |
| Si | silicides |
| SiO | silicates |
| Te | tellurides |
| TeO | tellurates or tellurites |
| VO | vanadates |
| WO | tungstates |

Thus, in the above example, BO indicates that the mineral is a borate. In cases where a mineral includes multiple anions or anionic groups of similar importance, both have been used; for example, carbonate–phosphate minerals have been represented by the coding COPO. It is possible that some further composite groups may be introduced in the future.

Following a colon are further element symbols (in mixed case and alphabetical order) for the **principal** elemental constituents, but omitting any element defined by the chemical code. Thus, oxygen can also be omitted in most cases since its presence will be implied by the chemical code. This system allows rapid computer searching and matching on the basis of observed elements and the compositional symbol for an unnamed mineral. In alphabetical listings, indices and databases, the chemical extension of the coding (–BO: CaMgMn in the above example) may, if appropriate, be omitted for the sake of brevity since the number alone makes the code unique. It was further decided that only the chemical elements **reported or implied** for an unnamed mineral would appear in its code. Thus, if an unnamed mineral was later shown to contain one or more elements that had originally been missed, such additional elements would not be included in the code. For example, if a hypothetical mineral was initially reported as, say, a sodium manganese silicate, but later investigations showed that, actually, it is hydrated, the code would not contain an H. However, remarks to this effect may appear in the "Comments" field in Appendix 1.

Some difficulty was encountered in deciding what level of concentration of an element warrants its inclusion in the code. Thus, for example, whereas 30 wt.% would obviously warrant the element's inclusion, would 3 wt.% or 0.3 wt.%? Recognizing that this is a grey area, and that the answer depends on structural considerations and the element involved, the authors were guided first by any subsequent, additional investigations of the mineral and by the indicated extent of substitution in a particular site. In general, it has not been too difficult to reach a consensus. There has, perhaps, been a tendency to err on the side of including rather than excluding minor elements.

An advantage of this coding system is that any further minerals that come to light at a later date (even those described many years ago) can be incorporated very simply by assigning the next available sequential serial number for the particular year. The assignment of these numbers will be governed by a subcommittee of the IMA (CNMNC).

Consideration was given to adding yet another part to the nomenclature that would indicate the source reference for the data by means of a set of *codens*. These are a standardized list of abbreviations adopted by the American Chemical Society and used in the journal *Chemical Abstracts*. However, we decided that this would make the designation too long and unwieldy and that, in fact, the codens would neither be readily recognized nor understood by most readers.

The coding for minerals in the "Invalid" category is similar to that used for those in the "Valid" category, except that the second set of numerical symbols (the serial number) is replaced by a double forward stroke, as, for example, UM1997–//–F:KMgNa. The compila-

tion of "Invalid" minerals has been ordered first by year and then, since there are no trivial numbers, alphabetically on the basis of the chemical coding. Later additions can be simply slotted in at the appropriate place. In some instances, two or more (apparently distinct) "Invalid" minerals with identical chemical codes in the same year were found. These have been distinguished by adding a numeral in square brackets after the year (see, for example, UM1970–//–E:PbPd[1] and UM1970–//–E:PbPd[2]).

*Sources of data*

A wide range of journals was consulted in compiling the data shown in Appendices 1 and 2, and a list of these and other sources, together with their abbreviations, is shown in Appendix 3. In particular, great use was made of the secondary reports of unnamed minerals that have appeared for many years under the heading "New Mineral Names" in issues of the *American Mineralogist* and under "Novye Mineraly" in issues of *Zapiski Vserossiskogo Mineralogicheskogo Obshchetstva* and its predecessor, *Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva*. In addition, use was made, whenever possible, of previous compilations. These included those by Cabri (1981), Daltry & Wilson (1997) and de Fourestier (1998).

*Testing the data in the literature*

Both of the authors maintain completely independent and very comprehensive mineral databases "MinIdent" and "Mineral" [www.micronex.ca (Smith & Leibovitz 1986), and www.materialsdata.com, respectively]. The approach that has been taken in compiling the lists in Appendices 1 and 2 has been to identify as many so-called unnamed (unidentified, unknown) minerals in the literature as possible, beginning in the 19$^{th}$ century and working forward to the end of the year 2005. Each author has tested the published data against his own current database and come to a conclusion about each set of data, *i.e.,* whether or not it represents a valid unnamed mineral, as defined above. Although in the vast majority of cases the authors concurred in these decisions, lengthy discussions ensued in some cases before an assignment was made.

*Problems and "grey areas"*

What should be done with minerals that were described and then incorrectly named? This matter generated considerable debate. Several different kinds of situations that can arise when such a mineral is described were encountered: 1) An unapproved name was assigned to the mineral, 2) a descriptive, commonly multi-part name was applied, 3) a working name, in some cases an acronym, was applied, 4) a designation such as "Mineral A" was applied, 5) it was erroneously assigned to a known species, or 6) it was erroneously equated with a previously described unnamed mineral.

In instances where the first of the above situations applies, the minerals were excluded from the compilation on the grounds that they are obviously not "unnamed", and that the names that were applied will appear in glossaries such as Hey's Mineral Index (Clark 1993).

Unnamed minerals with designations falling in one of the last five categories have generally been included, although in the case of "2)", minerals given an existing (accepted) name but prefixed by an element name or symbol, *e.g.*, Magnesium or Mg, have usually been excluded as there are plenty of examples of the IMA (CNMNC) having in the past accepted these as legitimate names.

A pervasive problem has been deciding into which category certain minerals should be placed if it is apparent that they have been very inadequately described. In general, compositional and X-ray powder data have been taken as definitive, and most other data have been rejected **where they stand alone**, as it is very rare indeed that a positive and unique identification can be made on the basis of such data unless they are very extensive. In most cases, those minerals for which only a very generalized formula is given [*e.g.*, $(Ru,Os,Ir,Fe)_2O_{2-3}$], or where compositional information is otherwise too vague (*e.g.*, "rare-earth silicate" or only a list of constituent elements has been provided), have been rejected. In a few cases, where no other mineral with even a remotely similar formula is known, such minerals have been included. Many minerals where only an empirical formula is given (*e.g.*, $Ag_{1.7}CuPb_{0.7}Bi_{10}S_{15.6}$) have also been included, since the precise proportions indicate that an analysis must have been carried out. Unnamed minerals that appear only in conference abstracts have not been included, because their absence from the subsequent literature renders them suspect. By and large, the authors have tended to be inclusive rather than exclusive in what has been placed in the "Valid" group, and recognize that some minerals may well have to be transferred from one group to the other in future years.

Another difficulty has arisen with unnamed minerals that fall into the elements or alloys category. In numerous cases, it is difficult to tell whether these represent substituted native elements or rather a distinct compound (alloy) of either fixed composition or at least limited compositional range. X-ray data would generally be required to establish this. Again, the authors have tended to include such minerals in the "Valid" list, particularly where synthetic alloys are known within or close to the compositional range reported.

Not infrequently, a description has been published that includes compositional data but with a very low total. This is particularly the case since the use of electron-beam instruments for analysis became common

because the measurement of concentrations of light elements is impossible (H, Li, Be) or fraught with problems (B, C, N, O, F). In some cases, authors have stated that there is other evidence as to the nature of the missing component(s), for example, data from an ion probe or from infrared spectroscopy, and in such cases the suggested missing component(s) have been included in the code; otherwise not.

*Unnamed mineral descriptions in the literature recommended as "Valid"*

Appendix 1 is a tabulation of all the minerals that appear on the "Valid" list, *i.e.*, those that are recommended for retention (a total of 1363 at the time of writing). It was constructed as a spreadsheet with the first column carrying the codes for each of the minerals ordered by year and then a trivial serial number, from earliest to latest. In this initial listing, for the convenience of readers, the increasing trivial serial numbers have been made to coincide with alphabetical ordering on the basis of the chemical coding. However, as sequential serial numbers are added for new entries in the future, clearly it will not be possible to maintain this coincidence. The second column contains the primary source for the data. Where volume numbers are not used by the journal, the year of publication has been substituted. Some of the primary references to foreign-language publications are to books, reports or compilations that are not readily fitted into the allotted field. Such references have therefore been given by the name of the author(s), and these are included in the list of references in Appendix 3 at the end of this report, together with a list of the journal abbreviations that have been used. If the reference given is preceded by an asterisk, it indicates that neither author has seen that primary reference. In such cases, decisions were based on data contained in the secondary reference, which is shown in column 3. In this context the "New Minerals" abstracts published regularly in the *American Mineralogist* have proved invaluable. The final column contains notes on such items as the suggested formula; any reservations there may have been about the assignment, as well as relationships to any named or unnamed mineral(s).

*Unnamed mineral descriptions in the literature recommended as "Invalid"*

Minerals that are not considered for one reason or another to be legitimate unnamed mineral species, have been coded as far as possible, and have then been placed in the "Invalid" category. In the list shown in Appendix 2, wherever possible and appropriate, the published (or in some cases corrected) chemical formula has been included, using changes in font size to indicate numerical proportions. Where a description of the same mineral has subsequently been published under an IMA-approved name, this has been so indicated and the primary reference to that named mineral has been given, along with its year of publication. Other reason(s) for recommending rejection from the "Valid" list are also indicated in this "Comments" field. Thus they may include:

a) The mineral has subsequently been named.

b) The data given for the unnamed mineral are considered to be inadequate for a match with another unrelated sample to be made with any confidence. However, in this case, the published descriptions may remain useful in allowing type material to be re-examined and a refined, perhaps complete, description to be prepared of the unidentified mineral.

c) On the basis of the reported data, the unnamed mineral is not distinct from a previously described, named or unnamed mineral.

d) The material examined was probably a mixture.

e) The unnamed mineral has been discredited.

f) The unnamed substance does not meet IMA-accepted definitions of a mineral. For example, it might be formed by anthropogenic processes. In the matter of minerals reported as combustion products, it was decided that **all** such minerals that remain unnamed would be consigned to the "Invalid" category, regardless of when they were reported, with an appropriate entry being made in the "Comments" field.

At the time of writing, of the 1460 "Invalid" unnamed minerals, 383 fall into category a), 507 into category b), 493 into category c), 41 into category d), 3 into category e) and 33 into category f). This rejection code is shown in the fifth column in Appendix 2, and where there was more than one reason for rejection, a second letter has been appended.

Occasionally, the same unnamed mineral is reported in two quite independent publications, in some cases even in different years. In such cases, after retaining one entry (where appropriate) in the compilation of "Valid" minerals, each additional occurrence has been consigned to the "Invalid" compilation, with a suitable entry being placed in the "Comments" field.

The number of times that essentially the same data for an unnamed mineral appear in two different publications (even in the same language) is surprisingly large. All such reports that have been encountered have been included, with all but the first being placed in the "Invalid" category with an appropriate annotation in the "Comments" field. The authors consider that this will avoid the impression that such reports have been missed in carrying out the survey.

It was also decided that minerals that were not initially unnamed but had received a name that was, however, subsequently rejected by the CNMNC, would not be included in the compilation of unnamed minerals, as they would be covered by other compilations and glossaries of synonyms and mineral names.

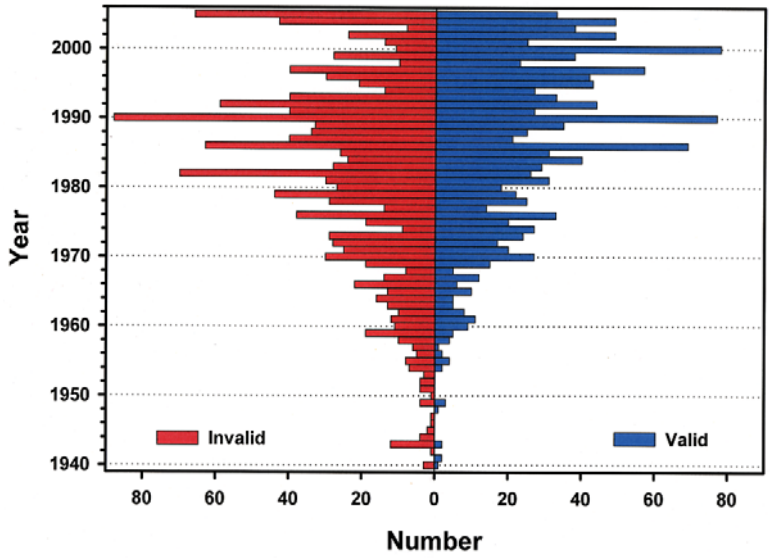


FIG. 1. The number of "Valid" and "Invalid" unnamed minerals published on a yearly basis. Note that the precise numbers vary very slightly from those in the text owing to the incorporation in the latter of late entries.

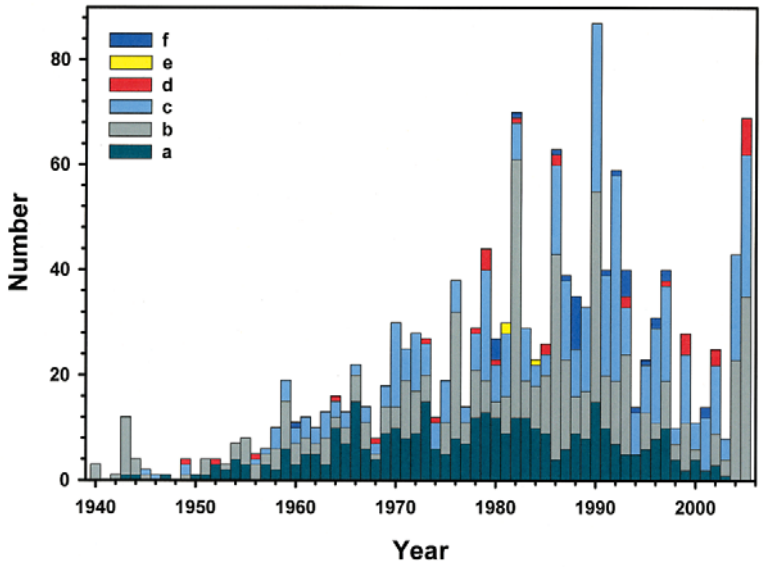


FIG. 2. The number of different categories of now "Invalid" unnamed minerals published on a yearly basis. a) The mineral has subsequently been named. b) The data given for the unnamed mineral are considered to be inadequate for a match with another unrelated sample to be made with any confidence. c) On the basis of the reported data, the unnamed mineral is not distinct from a previously described, named or unnamed mineral. d) The material examined is probably a mixture. e) The unnamed mineral has been discredited. f) The unnamed substance does not meet IMA-accepted definitions of a mineral. Note that the precise numbers vary very slightly from those in the text owing to the incorporation in the latter of late entries.

## Discussion

Figure 1 shows the number of minerals on a yearly basis in each category. Figure 2 shows on an annual basis the "Invalid" unnamed minerals divided into the categories described above. Several features of these figures are perhaps worthy of comment:

The number of early (pre-1950) unnamed minerals is very low, probably reflecting, in part, the casual use of names or provisional names in those years rather than leaving inadequately described minerals unnamed. The low numbers may also reflect to some extent the greater difficulty of surveying the early literature. Note that: 1) Relatively few of these minerals fall into the "Valid" category, 2) there is a clear and rapid increase in the numbers in both categories in the late 1960s and early 1970s. Apart from a general increase in the volume of mineralogical literature, this undoubtedly also reflects the increasingly widespread availability of the electron microprobe and then energy-dispersive spectrometers, as well as analytical electron microscopes. 3) Year-to-year fluctuations in numbers are surprisingly large in later years. In some cases, this has to do with the publication of certain review papers (*e.g.*, of the Mont Saint-Hilaire minerals).

### *Future updates of these compilations*

The lists of unnamed minerals shown in Appendices 1 and 2 will be posted on the IMA (CNMNC) website <http://www.geo.vu.nl/users/ima-cnmnc/> in a searchable form. It is recommended that they be updated on a semi-annual basis at the beginning and middle of each calendar year, with the proposed permanent Subcommittee on Unnamed Minerals bearing the responsibility for undertaking this function. Authors of papers describing unnamed minerals in the future should not attempt to apply the codings described in this paper to such minerals, as this has the potential to create duplication and confusion (see "Interim codings", below). However, the Subcommittee welcomes suggestions from the mineralogical community for additions or alterations to the list.

As the compilations of unnamed minerals evolve with time, it is important that the trivial numbers **never be re-used**. Thus, when a "Valid", unnamed mineral is at some time in the future transferred into the "Invalid" category, a gap will appear in the sequence of numbers. This will minimize subsequent possible confusion, since it is possible that, for brevity, the year plus the trivial number segment of the code may be used alone (*i.e.*, without the chemical information) for some purposes. At the same time, the authors anticipate that there may be (generally small) changes to the chemical segment of a few of the codes. These will likely arise either owing to oversight during initial coding or perhaps because subsequent information has shown that a minor element, previously regarded as of no significance, plays a more important role than was recognized at the time of coding.

### *Future recognition and naming of currently unnamed species*

The future identification and full description of currently unnamed species appearing in the "Valid" list will become much easier once the indexable codes and source references have been published and the data have been included in the various databases that are now available. Once such full descriptions are reported and approved names are applied, the relevant codes can be transferred to the appropriate slot in the "Invalid" category. However, it may well be that a very substantial number of unnamed minerals will not be fully described even in the long term. This is particularly likely to be so with unnamed minerals that occur as very minute, micrometric inclusions in other minerals, very commonly the case amongst the PGM.

### *Interim codings*

Researchers encountering what they believe to be new unnamed minerals are encouraged to use the following scheme for interim coding. As in the example below, the code should begin with the letters UKI all in upper case. These letters may be thought of as standing for "unknown" and "interim" and are distinct from any IMA code that may eventually be assigned. Then, following a hyphen, four alphanumeric characters (in lower case) take the place of the serial number in the IMA code for Valid unnamed minerals. Following a further hyphen, and in parentheses, a chemical code can be indicated using the system described earlier in this paper.

**Example:** UKI–ab71–(S:CoCuFeZn)

The chemical code extension will generally be very useful but can be considered optional, or in the case of illustrations, tables, *etc*. where conciseness is at a premium, unnecessary. The use of such codes in articles will permit electronic, case-sensitive searches of text for unnamed minerals to be carried out quickly and conveniently. Note that the year of description has been deliberately omitted from this code because of uncertainties concerning publication delays.

It should be noted that authors who have described new minerals without names do not have any priority rights on the subsequent naming of such minerals. Any names proposed subsequently (for previously unnamed minerals) have to be approved by the CNMNC, as do the minerals for which the names are proposed.

## Conclusions

The CNMNC will establish a permanent Subcommittee for Unnamed Minerals whose job it will be to:

1) oversee the assignment of numbers to future unnamed minerals, including those already described but which have not been identified in the initial lists.

2) decide and act upon future recommendations from the mineralogical community concerning the rejection of previously "Valid" unnamed minerals.

The Subcommittee will make recommendations to the CNMNC regarding the status of unnamed minerals.

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The late Dr. Jiri Just made important contributions to the definition of this project when it was conceived in Perth, Australia, in 1993. Dr. Just would likely have become the third member of the IMA (CNMMN) subcommittee had it not been for his untimely death in 1994. In 1995, the project was submitted for consideration by the IMA (CNMMN) where it was approved and designated Nomenclature Proposal 95–B. Dr. J.A. Mandarino, a past chairman of this IMA Commission, made a number of helpful suggestions during the development of the initial proposal that improved it significantly. We are also grateful to Drs. Ernst Burke, Anatoly Zaitsev and Natale Perchiazzi for contributions and suggestions made at various times over the last 14 years. We are particularly grateful to the editor, Bob Martin, for his meticulous editing of the compilations.

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