Université de Liège
Faculté des Sciences
Département de Géologie
Laboratoire de Minéralogie

Université de Liège

The IMA Commission on New Minerals, Nomenclature and Classification

Prof. Dr. Frédéric Hatert

Jena, December 1st, 2015

Contents

CNMNC-IMA: Composition

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IMA = International Mineralogical Association

12 Officers, 7 Commissions, 5 working groups

CNMNC = Commission on New Minerals, Nomenclature and Classification

4 Officers, 34 Members (1 member per IMA country)

Ulf Hålenius (Norway): Chairman
Frédéric Hatert (Belgium): 1st Vice-Chairman (Nomenclature)
Marco Pasero (Italy): 2nd Vice-Chairman (Classification)
Stuart Mills (Australia): Secretary

CNMNC-IMA: Roles

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CNMNC roles

- Examine new mineral species proposals
- Validation of new mineral species and of their names
- Nomenclature questions
  (discreditations, revalidations, renamings, …)
- Group nomenclature
- Classification of minerals
  (groups, supergroups, sub-classes, classes, families, …)

Sub-committees

- Mineral groups
- Unnamed minerals

International Mineralogical Association IMA

CNMNC-IMA: Roles

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CNMNC was created in 2006

…from the fusion of the « Commission on New Minerals and Mineral Names » (CNMMN) with the « Commission on Classification of minerals » (CCM)

CNMMN was founded in 1959

President: Michael Fleischer (USA)
Vice-Chairman: Max Hey (UK)
Treasurer: François Permingeat (Toulouse, France)

Roles of CNMNC Officers

Ulf Hålenius: New mineral proposals
Frédéric Hatert: Nomenclature
Marco Pasero: CNMNC mineral list, Newsletter
Stuart Mills: Group nomenclature

Minerals described before 1959: « Grandfathered »

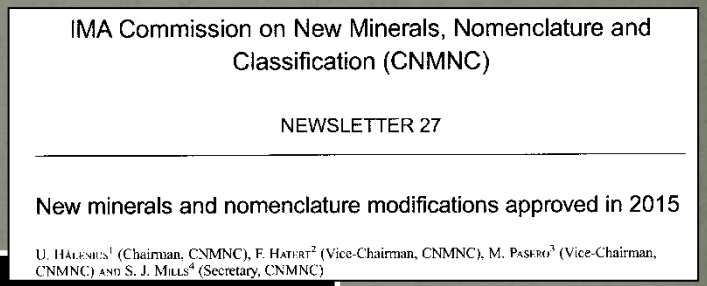
CNMNC-IMA: Outreach

The IMA-CNMNC Mineral list

Handled by Marco Pasero
Last update: March 2015
Accepted formulae, CNMNC status, and reference for all species
Freely available on the CNMNC website

The CNMNC website

Webmaster: Ulf Hålenius
Contains all CNMNC reports and a Newsletters
Template with CNMNC new mineral checklist
Lists of unnamed minerals
Restricted access for CNMNC members
http://nrmima.nrm.se/



IMA Commission on New Minerals, Nomenclature and Classification (CNMNC)

NEWSLETTER 27

New minerals and nomenclature modifications approved in 2015

U. Hålenius[1] (Chairman, CNMNC), F. Hatert[2] (Vice-Chairman, CNMNC), M. Pasero[3] (Vice-Chairman, CNMNC) and S. J. Mills[4] (Secretary, CNMNC)

The CNMNC Newsletter

Published in the Mineralogical Magazine
Editor: Marco Pasero
27 Newsletters published to date
New species and nomenclature modifications from 2010 to 2015

Definition of new minerals: the CNMNC checklist

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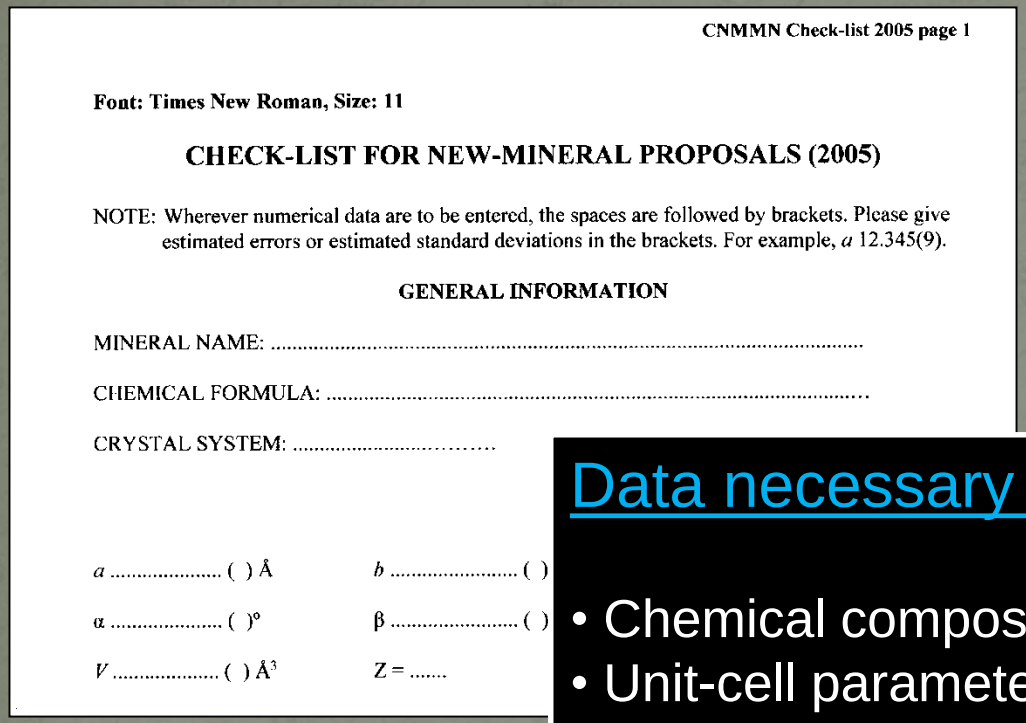

CNMMN Check-list 2005 page 1

Font: Times New Roman, Size: 11

CHECK-LIST FOR NEW-MINERAL PROPOSALS (2005)

NOTE: Wherever numerical data are to be entered, the spaces are followed by brackets. Please give estimated errors or estimated standard deviations in the brackets. For example, *a* 12.345(9).

GENERAL INFORMATION

MINERAL NAME: .....

CHEMICAL FORMULA: .....

CRYSTAL SYSTEM: .....

a ..... ( ) Å *b* ..... ( )

α ..... ( )° β ..... ( )

V ..... ( ) Å^3 Z = ...

Data necessary to define a new species

- Chemical composition
- Unit-cell parameters and space group
- Crystal structure: recommanded
- X-ray powder pattern
- Crystal optics
- Physical properties
- Other properties: Raman, Infrared, …

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New minerals: limits

Mercury, Hg
Liquid mineral

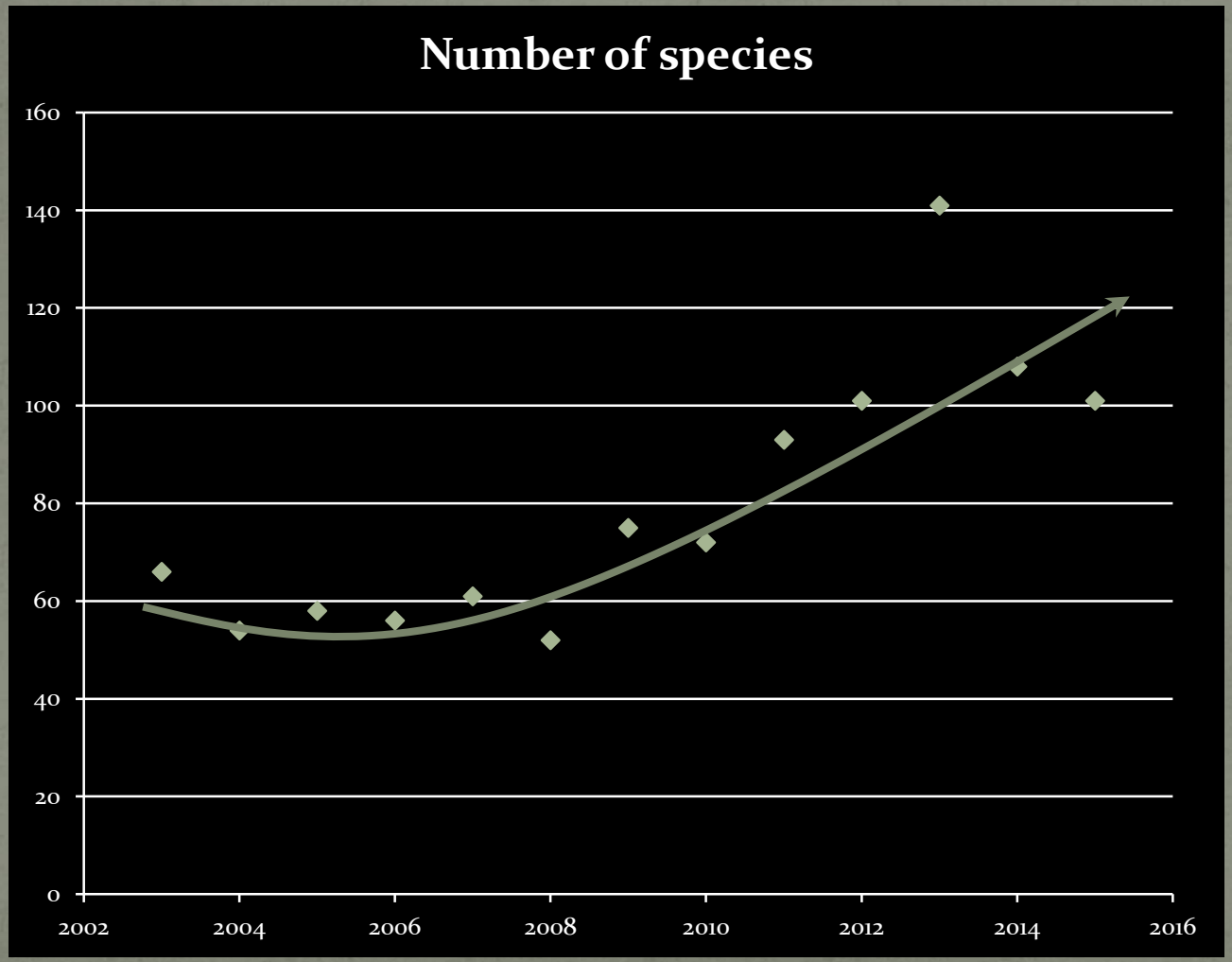
Opale, $SiO_2.nH_2O$
Amorphous mineral

Inorganic crystalline solid with a defined chemical composition, produced by geological processes

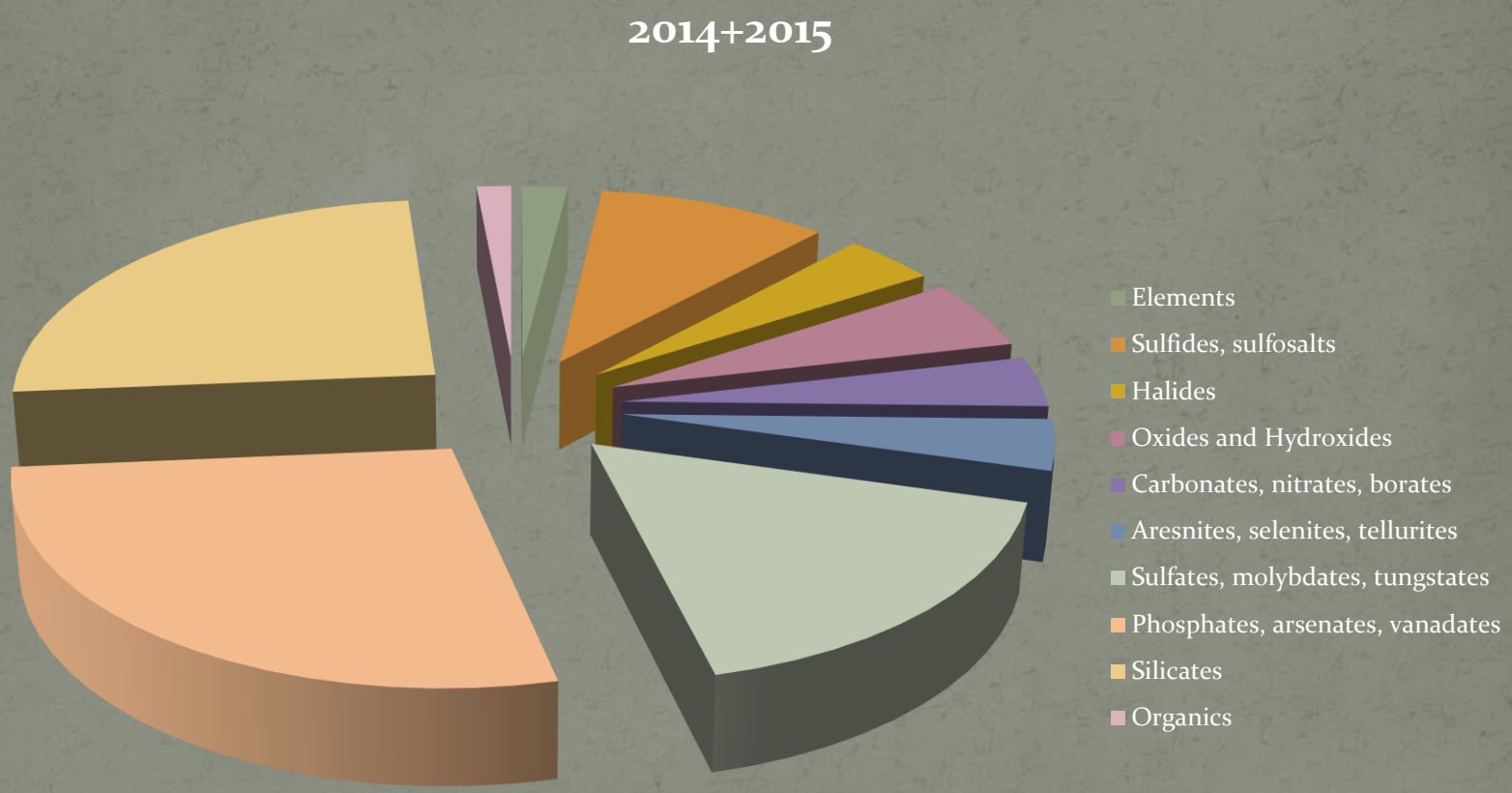
Amber
Organic mineral

Struvite, $(NH_4)Mg(PO_4)\cdot 6H_2O$
Bio-mineral

New minerals: statistics



New minerals: statistics



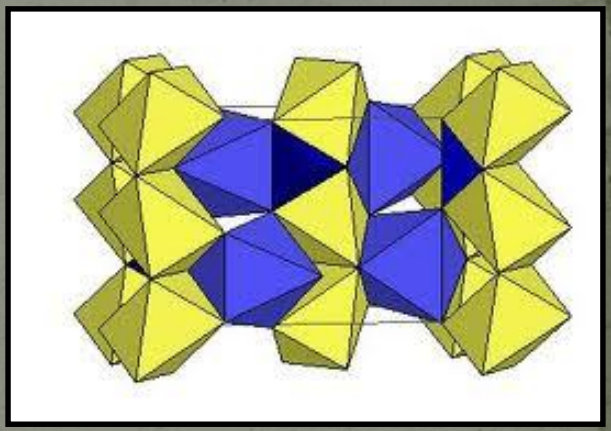
Solid solutions series

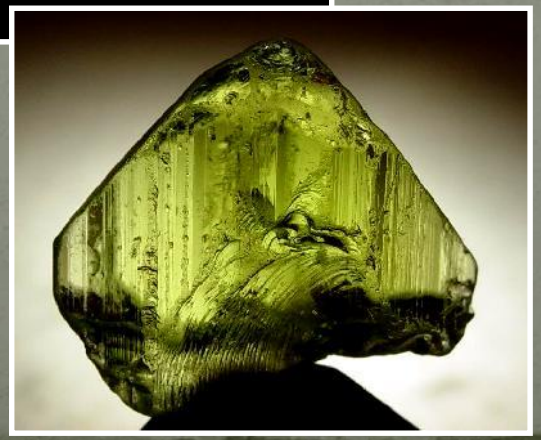
Two minerals may show the same crystal structure (isostructural). But to define a new mineral species, it is necessary to replace at least one atom in the structure, by an atom of different nature.

Solid solution series:

Fayalite - Forsterite

Fe_2SiO_4 – Mg_2SiO_4





50 % Rule

The dominant constituent rule

Hatert & Burke (2008)

The Canadian Mineralogist
Vol. 46, pp. 717-728 (2008)
DOI: 10.3749/canmin.46.3.717

THE IMA–CNMNC DOMINANT-CONSTITUENT RULE REVISITED AND EXTENDED

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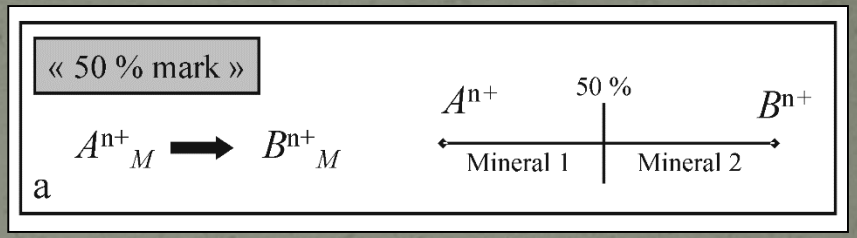
« Constituent »

- Cations
- Anions
- Anionic or cationic groups
- Molecules
- Vacancies

Diospide, Val d'Aosta, Italie (Webmineral.com)



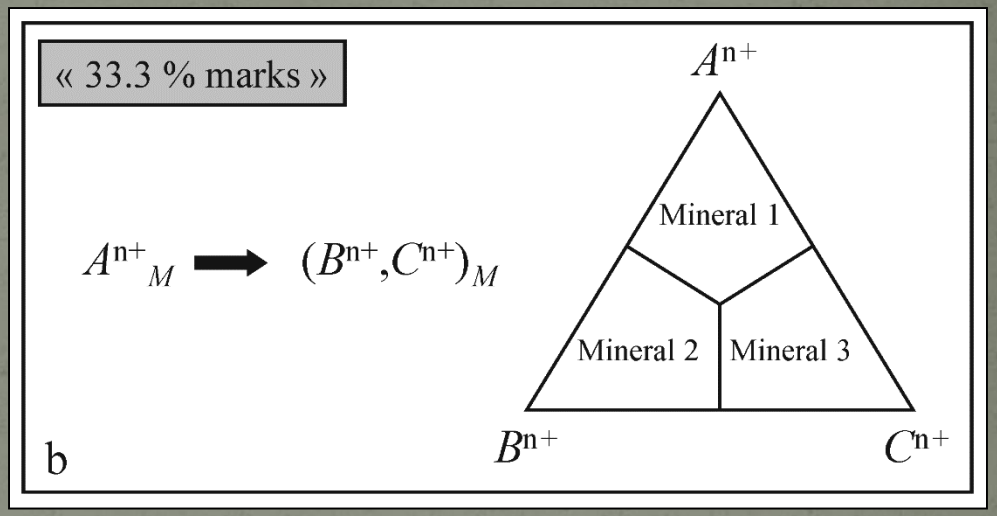
Diopside **Hedenbergite**

Homovalent substitutions on one site

$CaMgSi_2O_6 \rightarrow CaFeSi_2O_6$

$Mg^{2+} \rightarrow Fe^{2+}$

Homovalent substitutions on one site



Preisingerite group

Preisingerite, $Bi_3(AsO_4)_2OOH$
Schumacherite, $Bi_3(VO_4)_2OOH$
Petitjeanite, $Bi_3(PO_4)_2OOH$

33.3 % boundary

Schoenfliesite group

Schoenfliesite,$MgSn(OH)_6$
Natanite, $FeSn(OH)_6$
Wickmanite, $MnSn(OH)_6$
Mushistonite, $CuSn(OH)_6$
Vismirnovite, $ZnSn(OH)_6$
Burtite, $CaSn(OH)_6$

16.6 % boundary

Independant homovalent substitutions on two sites

Columbite group

$Fe^{2+} \rightarrow Mn^{2+}$
Site A

$FeTa_2O_6$	$MnTa_2O_6$
Tantalite-(Fe)	Tantalite-(Mn)
Columbite-(Fe)	Columbite-(Mn)
$FeNb_2O_6$	$MnNb_2O_6$

$Ta^{5+} \rightarrow Nb^{5+}$
Site B

Ferrocolumbite, Crystal Park, El Paso So., Colorado, USA
(from Webmineral.com)

Heterovalent substitutions on one site

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Monazite-(Ce), Conselheiro Pena, Minas Gerais, Brazil (from Webmineral.com)

« 50 % mark »

$$A^{n+}{}_M \rightarrow (B^{(n+1)+}{}_{0.5} C^{(n-1)+}{}_{0.5})_M$$

$$A^{n+} \overset{50\ \%}{\longleftrightarrow} (B^{(n+1)+}{}_{0.5} C^{(n-1)+}{}_{0.5})$$

Mineral 1 | Mineral 2

Monazite-(Ce) **Cheralite**

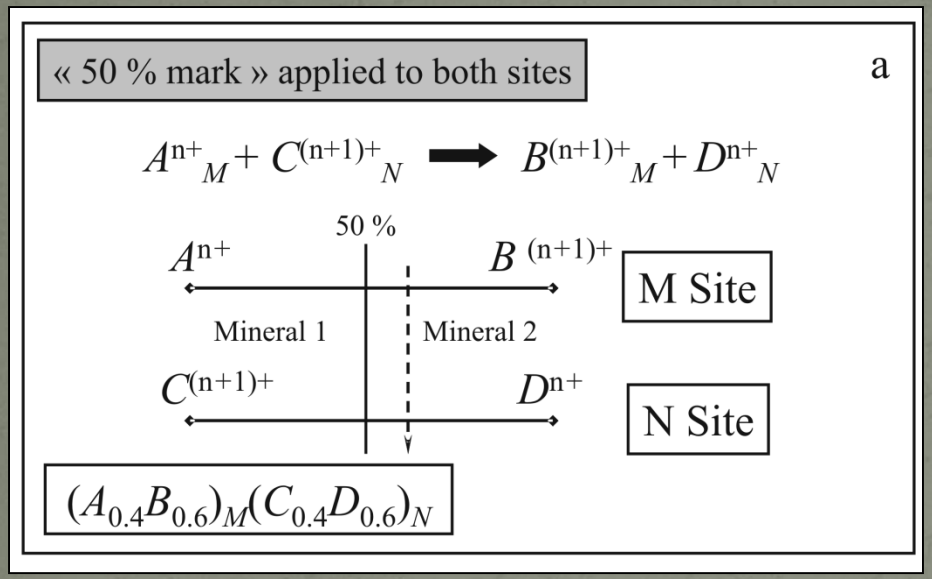
« Valency-imposed double-site occupancy »!

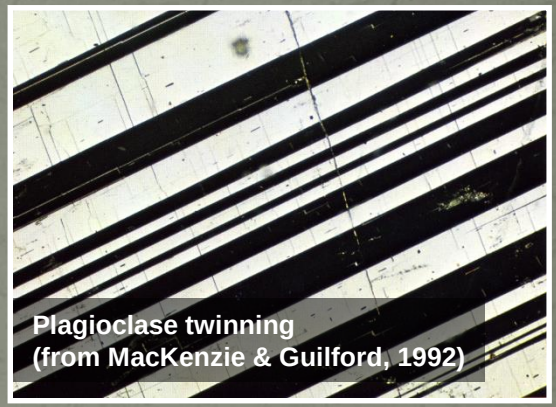
$$Ce(PO_4) \rightarrow (Ca_{0.5}Th_{0.5})(PO_4)$$

$$Ce^{3+} \rightarrow 0.5\ Ca^{2+} + 0.5\ Th^{4+}$$

>< 50 % Rule !

Coupled heterovalent substitutions on two sites




Plagioclase twinning
(from MacKenzie & Guilford, 1992)

Albite **Anorthite**

$$Na(AlSi_3O_8) \rightarrow Ca(Al_2Si_2O_8)$$

$$Na^+ + Si^{4+} \rightarrow Ca^{2+} + Al^{3+}$$

Valency-imposed double-site occupancy

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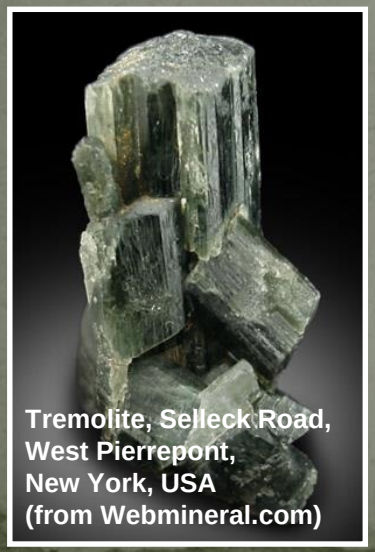
Heterovalent substitutions on one site

Schorl → **Elbaite**

$NaFe^{2+}_3Al_6(Si_6O_{18})(BO_3)_3(OH)_4 \rightarrow Na(Li_{1.5}Al_{1.5})Al_6(Si_6O_{18})(BO_3)_3(OH)_4$

$Fe^{2+} \rightarrow 0.5\ Li^{+} + 0.5\ Al^{3+}$

Heterovalent substitutions on two sites



Tremolite, Selleck Road, West Pierrepont, New York, USA (from Webmineral.com)

Tremolite → **Richterite**

$\square Ca_2Mg_5(Si_8O_{22})(OH)_2 \rightarrow Na(NaCa)Mg_5(Si_8O_{22})(OH)_2$

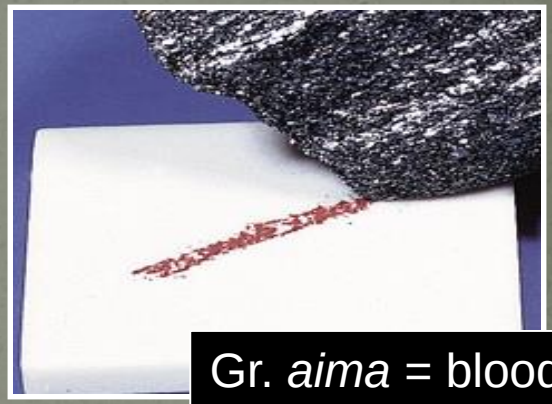
$\square_A + Ca^{2+}_B \rightarrow Na^{+}_A + Na^{+}_B$

Mineral Names: Colour

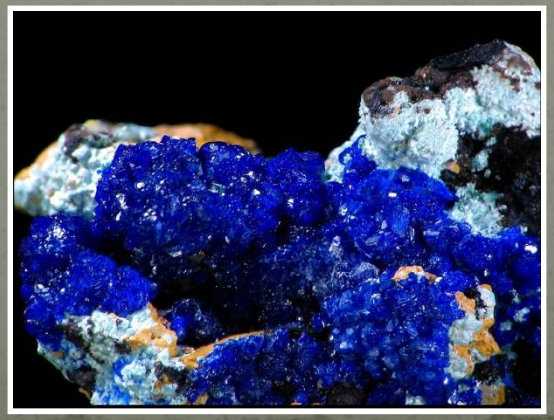
Albite, azurite, chlorite, crocoite, erythrite, hematite, lazulite, leucite, orpiment, purpurite, rutile

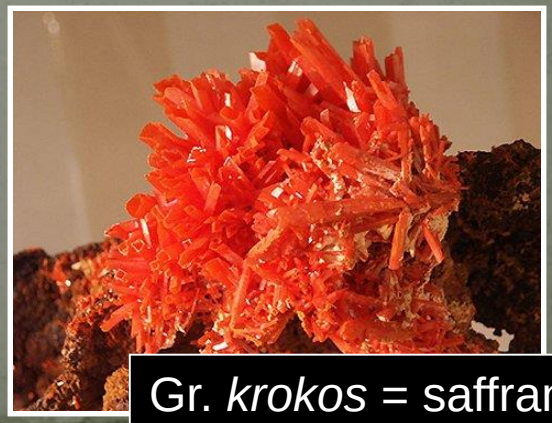
Lat. *albus* = white

Lat. *aurum* = gold



Gr. *aima* = blood



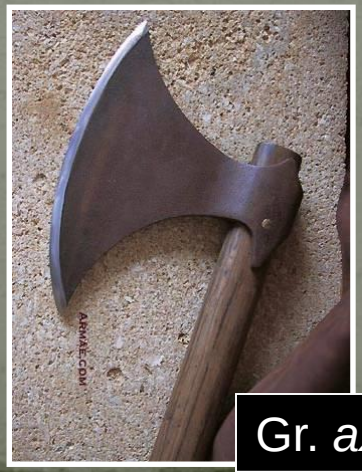


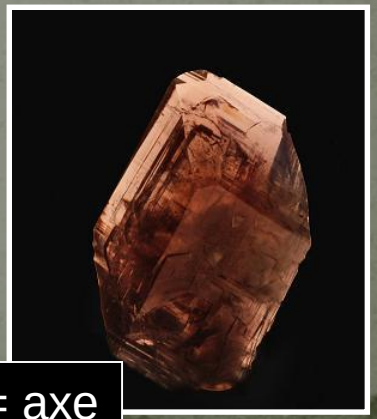
Gr. *krokos* = saffran

Mineral Names: Morphology

Anatase, axinite, auriacusite, fibroferrite, oursinite, pyromorphite, staurolite, tetrahedrite

Gr. *stauros* = cross





Gr. *axine* = axe

Mineral Names: Chemical composition

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Anhydrite, arsenopyrite, babefphite, chalcocite, chalcopyrite, cobaltite, cuprite, cavansite, fluorapatite, rutheniridosmine, siderite, sodalite, uraninite

$CaSO_4$

FeAsS

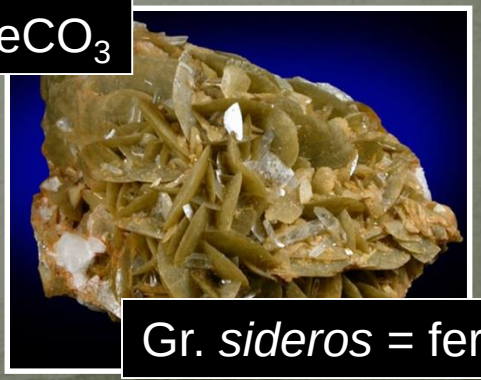
$CuFeS_2$

Cu_2O

$Ca(VO)Si_4O_{10}.4H_2O$

(Ir,Os,Ru)

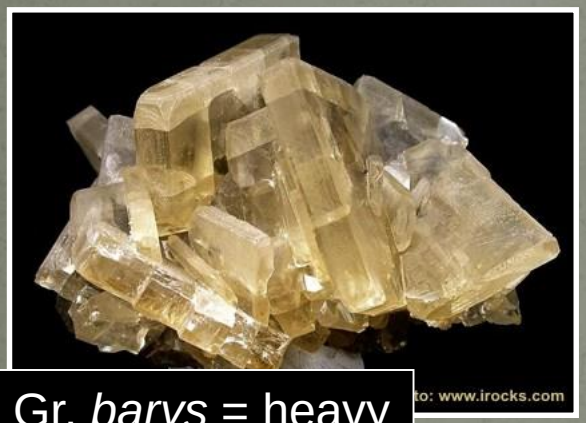
$FeCO_3$



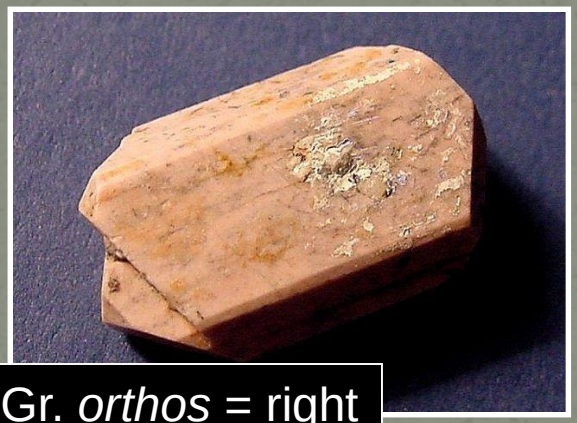
Gr. *sideros* = fer

Mineral Names: Physical properties

Barite, euclase, orthoclase, periclase, scorodite

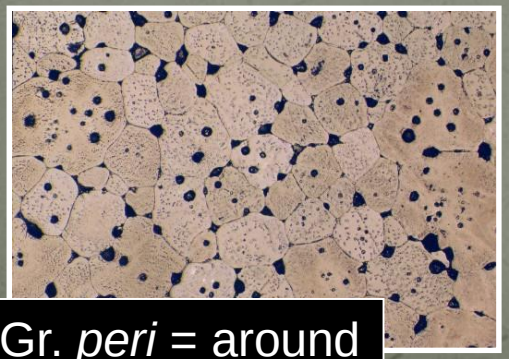


Gr. *barys* = heavy



Gr. *orthos* = right

Gr. *eu* = good, *klas* = cleavage



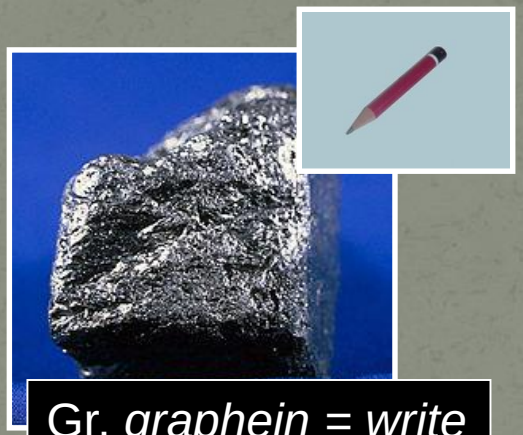
Gr. *peri* = around

Gr. *skorodion* = look

Mineral Names: Use

Fluorite, graphite, muscovite, pharmacolite, pyrite, pyrolusite

Muscovy glass

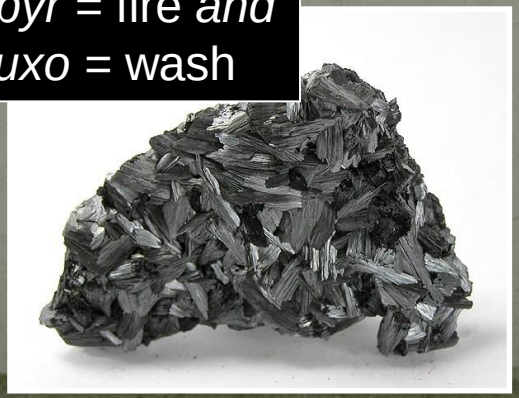


Gr. *graphein* = *write*

Gr. *pyr* = fire

Lat. *fluere* = flue

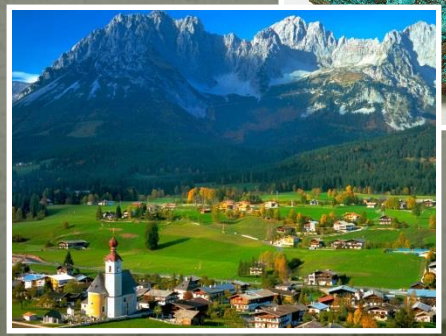
Gr. *pyr* = fire *and* *louxo* = wash

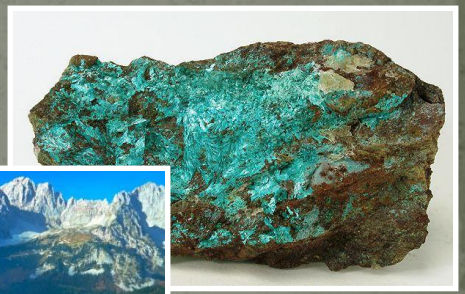


$CaHAsO_4.2H_2O$
Gr. *pharmaki* = poison

Mineral Names: Type locality

Andalousite, atacamite, brazilianite, ettringite, lakebogaite, lovozerite, montebrasite, tyrolite

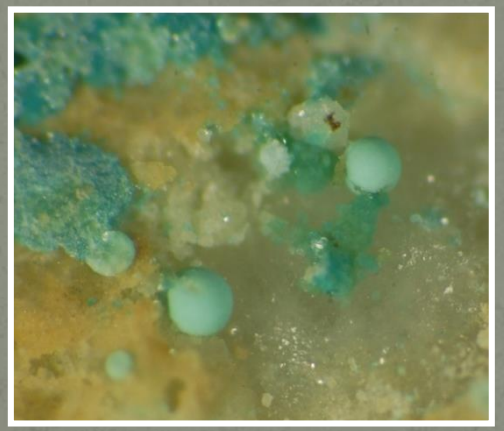




Minerals dedicated to German Localities

Freibergite
$(Ag,Cu,Fe)_{12}(Sb,As)_4S_{13}$
Freiberg district, Saxony

Hagendorfite
$NaCaMn(Fe^{2+},Fe^{3+},Mg)_2(PO_4)_3$
Hagendorf, Bavaria



Claraite
$(Cu,Zn)_3(CO_3)(OH)_4 \cdot 4(H_2O)$
Clara mine, Black Forest

Mineral Names: Dedicated to Scientists

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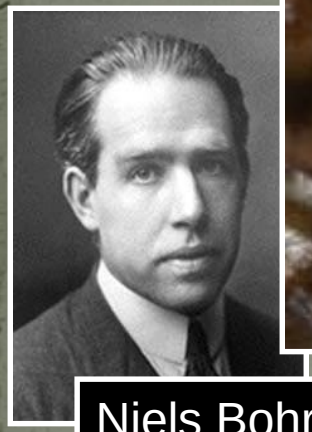
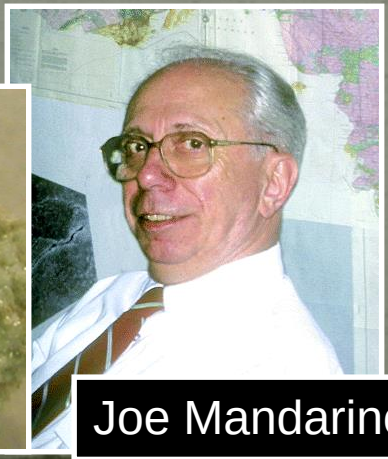
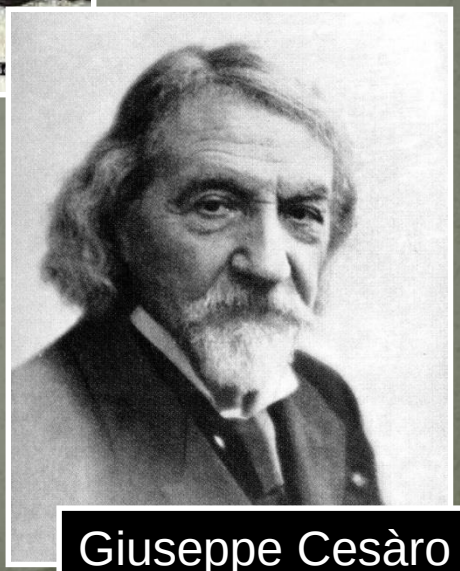
Bobfergusonite, breithauptite, cesàrolite, eskolaite, haüyne, hurbutite, mandarinoite, millerite, moissanite, nielsbohrite, sillimanite, wollastonite



Niels Bohr



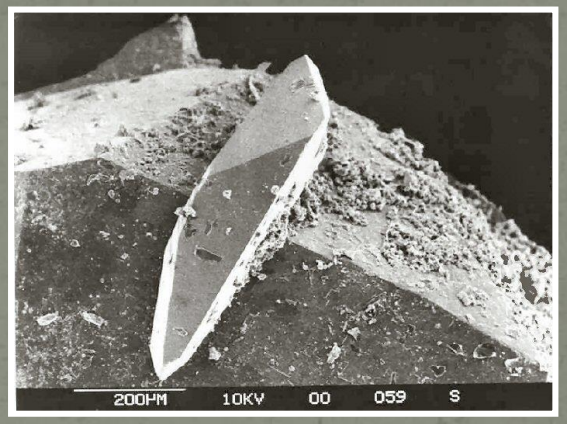
Joe Mandarino

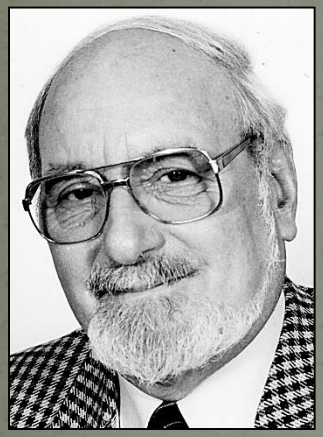


Giuseppe Cesàro

Minerals dedicated to German Scientists

Paulkellerite
$Bi_2Fe^{3+}(PO_4)O_2(OH)_2$
Schneeberg, Saxony, Germany





Goethite, FeO(OH)
German poet Johann Wolfgang von Goethe (1749–1832),

Schreyerite
$V^{3+}{}_2Ti_3O_9$
Kenya

Mineral Names: Structural features

Clinoenstatite, clinomimetite, orthoserpierite, parafransoletite, parahopeite

- Ortho- = Gr. *orthos* = right: orthorhombic
- Clino- = Gr. *klinein* = inclined: monoclinic
- Para- = Gr. *para* = close to: structural analogies

New guidelines on prefixes and suffixes

Hatert *et al.* (2013)

CNMNC guidelines for the use of suffixes and prefixes in mineral nomenclature, and for the preservation of historical names

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[2] Geosciences, Museum Victoria, GPO Box 666, Melbourne 3001, Victoria, Australia
[3] Dipartimento di Scienze della Terra, Università degli Studi di Pisa, Via Santa Maria 53, I-56126 Pisa, Italy
[4] School of Science and Health, University of Western Sydney, Locked Bag 1797, Penrith, NSW 2751, Australia

Prefixes:

- Better to facilitate the pronounciation of common names
- Maximum two chemical prefixes are allowed
- A combination of chemical, structural, or other descriptive prefixes is allowed

Examples: Fluorapatite, clino-ferri-ferroholmquistite, …

Suffixes:

- Maximum 3 suffixes are allowed
- With parentheses: framework cations
- Without parentheses: non-framework cations (zeolites)
- Cations and anions cannot be used together (anions as prefix)

Examples: Jahnsite-(CaMnMn), chabazite-Ca, fluorapophyllite-(K)

Nomenclature: Discreditations

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Proposal 13-E

The name “clinobarylite” is discredited since it corresponds to the polytype barylite-1*O*. The mineral reported in the literature as barylite corresponds to the polytype barylite-2*O*.

Proposal 14-B

“Thorogummite” is discredited. This name has been used to describe heterogeneous mixtures of secondary, non-crystalline minerals, produced by the alteration, hydration, or metamictization of thorite.

Proposal 15-A

Anatacamite is discredited.

Proposal 15-C

Churchite-(Nd) is discredited.

Proposal 15-D

Iodine is discredited.

Revalidations

Proposal 14-E

Jamborite is no longer a “questionable species” but a valid species. Jamborite lies outside the hydrotalcite supergroup as defined by Mills *et al*. (2012); its ideal formula is $Ni^{2+}1\text{-}xCo^{3+}x(OH)2\text{-}x(SO4)x\cdot nH_2O$ [$x \leq \frac{1}{3}$; $n \leq (1 - x)$].

John L. Jambor, 1936-2008

Redefinitions

Proposal 13-B

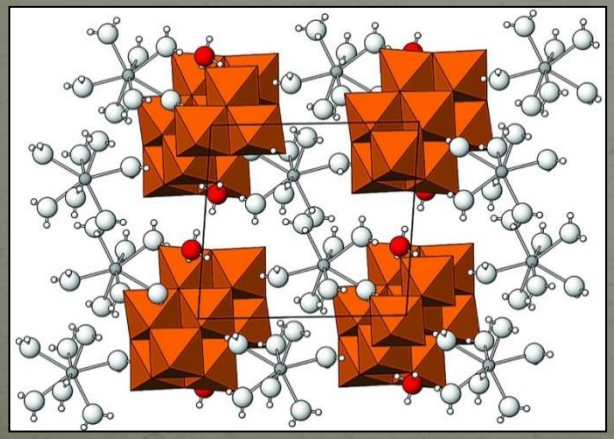
The formula of comancheite becomes $Hg^{2+}_{55}N^{3-}_{24}(NH_2,OH)_4(Cl,Br)_{34}$. Consequently, the mineral has to be considered as a nitride.

Proposal 14-H

Bohseite is redefined as $Ca_4Be_{3+x}Al_{1-x}Si_9O_{26}(OH)_{3+x}$ (with x = 0 to 1).

Proposal 14-I

Aradite is redefined as $BaCa_6[(SiO_4)(VO_4)](VO_4)_2F$.



Proposal 15-G

Wernerbaurite and schindlerite do not contain significant hydronium, but must be considered as ammonium-bearing decavanadate minerals. The simplified formula of wernerbaurite is $\{(NH_4)_2[Ca_2(H_2O)_{14}](H_2O)_2\}\{V_{10}O_{28}\}$, and the simplified formula of schindlerite is $\{(NH_4)_4Na_2(H_2O)_{10}\}\{V_{10}O_{28}\}$.

Renamings

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Proposal 12-E
Cerchiaraite is renamed cerchiaraite-(Mn)

Proposal 14-A
The mineral name “thenardite” becomes thénardite, in agreement with the original spelling.

Proposal 14-C
The mineral name “lithidionite” becomes litidionite, in agreement with its original spelling.

Proposal 15-E

The spelling of eight mineral names is modified :

#1 Achavalite => Achávalite

#2 Behierite => Béhierite
#3 Camerolaite => Camérolaite
#4 Fabriesite => Fabrièsite
#5 Remondite-(Ce) => Rémondite-(Ce)
#6 Remondite-(La) => Rémondite-(La)
#7 Sénarmontite => Senarmontite
#8 Sérandite => Serandite

Redefinition of type samples

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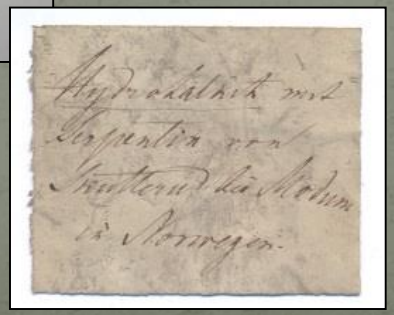
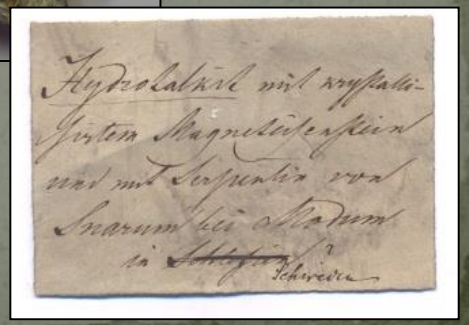
Proposal 15-J

The hydrotalcite samples MFN_MIN_1998_2751 and MFN_MIN_1998_2758, labelled by Gustave Rose and deposited at the Museum für Naturkunde Berlin, are defined as neotypes. The type locality is Snarum Modum, Buskerud, Norway.





New guidelines on classification

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New guidelines for mineral group hierarchies

The standardisation of mineral group hierarchies: application to recent nomenclature proposals

STUART J. MILLS[1,*], FRÉDÉRIC HATERT[2], ERNEST H. NICKEL[3,**] and GIOVANNI FERRARIS[4]

- Group: Same crystal structure and similar chemical elements
- Supergroup: Two or several groups with essentially the same structure, and constituted by similar chemical elements
- Sub-class: Nesosilicates, sorosilicates, inosilicates, cyclosilicates, phyllosilicates, tectosilicates + borates
- Class: Elements, sulfides, oxides, halogenides, carbonates, nitrates, borates, sulfates, phosphates, silicates
- Family: Groups or supergroups with structural and/or chemical similarities

Now it's time to give official CNMNC-approved names for groups and supergroups!

Conclusions

- Important role of the CNMNC to ensure a consistency in mineral names and nomenclature
- Necessary for all mineralogists, petrographers, geologists… but not always easy to reach a compromize!
- A lot of work made by volunteers (>100 proposal/year).

Thank you for your attention!