

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



New Challenges in Mineral Nomenclature and Classification

Prof. Frédéric Hatert

Rimini, September 12th, 2016

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CNMNC-IMA: Composition and roles

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 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, ...)



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/>

Mineralogical Magazine, June 2016, Vol. 80(4), pp. 691–697

CNMNC
Newsletter

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

NEWSLETTER 31

New minerals and nomenclature modifications approved in 2016

The CNMNC Newsletter

Published in the Mineralogical Magazine

Editor: Marco Pasero

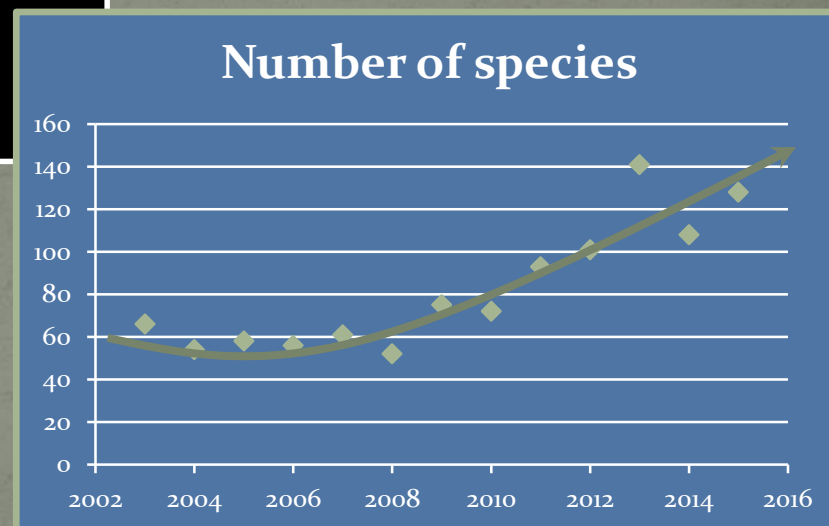
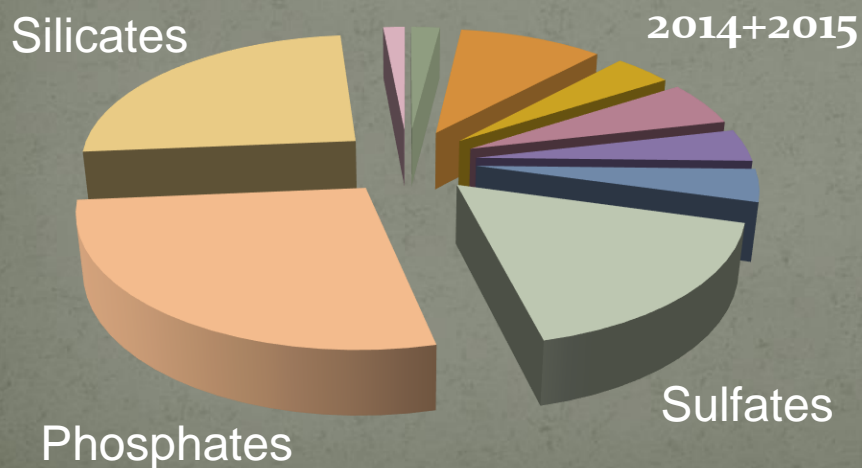
31 Newsletters published to date

New species and nomenclature modifications from 2010 to 2016

Definition of new minerals

Data necessary to define a new species

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



The dominant constituent rule (« 50 % 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

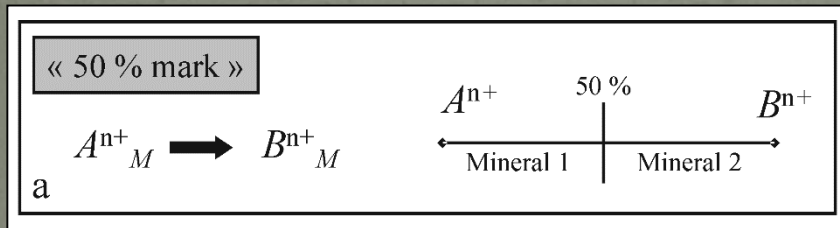
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Homovalent substitutions on one site



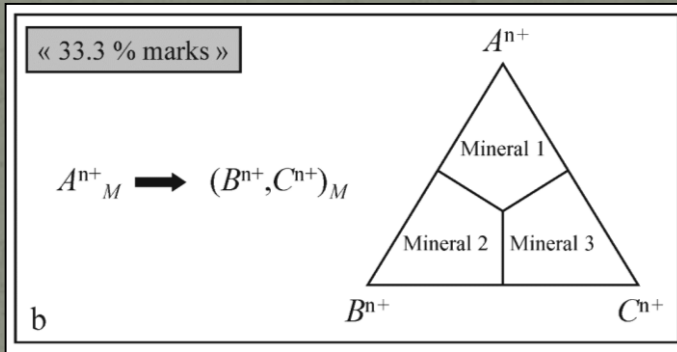
Diopside

Hedenbergite



« Constituent »

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



Preisingerite group

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

33.3 % boundary

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

FRÉDÉRIC HATERT^{1,*}, STUART J. MILLS², MARCO PASERO³ and PETER A. WILLIAMS⁴

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⁴ School of Science and Health, University of Western Sydney, Locked Bag 1797, Penrith, NSW 2751, Australia

Prefixes:

- Better to facilitate the pronunciation 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)

Preservation of historical names

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⁴ School of Science and Health, University of Western Sydney, Locked Bag 1797, Penrith, NSW 2751, Australia

Apatite supergroup:

- Apatite-(CaOH) → Hydroxylapatite
- Apatite-(CaF) → Fluorapatite
- Apatite-(CaCl) → Chlorapatite



Epidote supergroup:

- Epidote-(Pb) → Hancockite
- Clinozoizite-(Sr) → Niigataite
- Manganpiemontite-(Sr) → Tweddillite

New guidelines on structural modifiers ?

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

Clinoenstatite, orthoserpierite, parahopeite

- **Meta-** = Gr. *meta* = besides: close chemical composition

Metatorbernite, meta-autunite, meta-alunogen

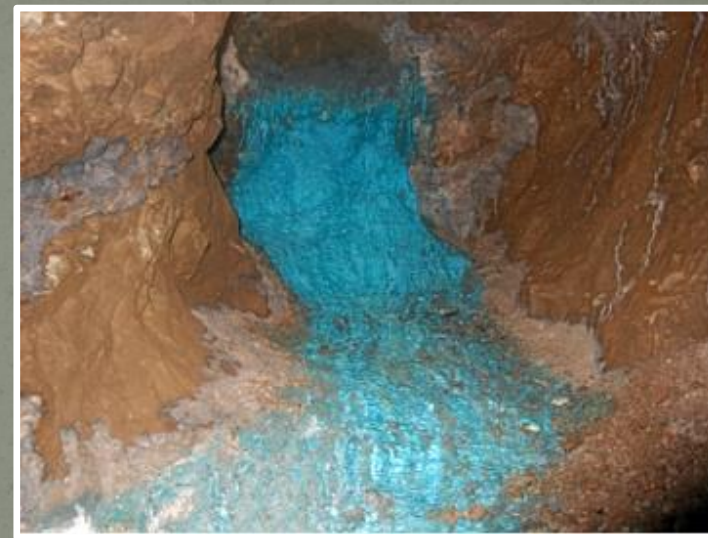
- **-β** = polymorph suffix
- **-roman numbers** = multiple unit-cell parameters
- **-letters** = different chemistry
- **-SG** = different space groups
- **-Å** = different unit-cell parameters
- **-modules** = modular structures

Sulfur-β, fergusonite-(Ce)-β, metauranocircite-I, andorite-IV, andorite-VI, mertieite-I, mertieite-II, joséite-A, joséite-B, gersdorffite-*Pa3*, gersdorffite-*P2₁3*, halloysite-10Å, halloysite-7Å, magnesionigerite-*2M1S*, magnesiohögbomite-*2N4S*

OK

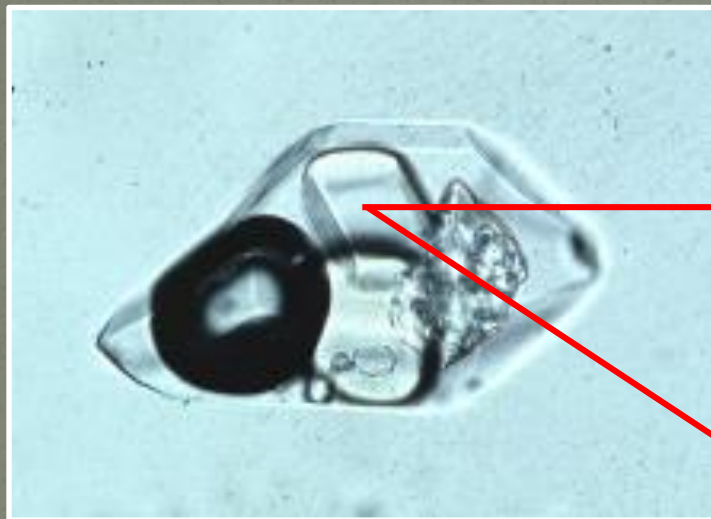
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New guidelines on « anthropogenic » minerals ?

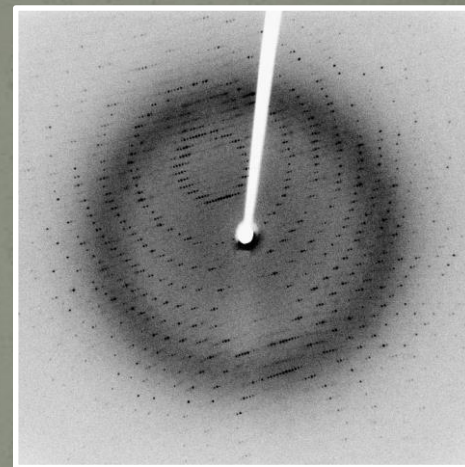


- Minerals forming on mine tailings (Lavrion deposit)?
- Minerals formed by the burning of coal dumps?

New guidelines on nanominerals ?

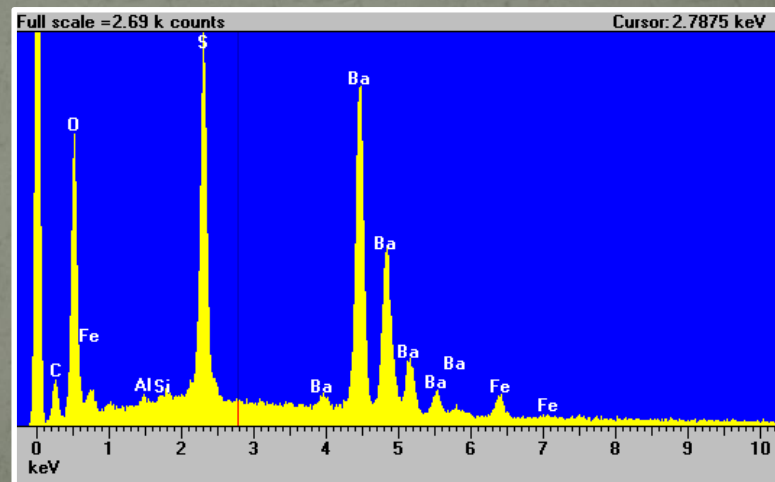


Diffraction pattern



Chemistry

Fluid inclusions



Nanoparticle → no diffraction → not crystalline → not a mineral

Guidelines on classification

New guidelines for mineral group hierarchies

Mills *et al.* (2009)

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

STUART J. MILLS^{1,*}, FRÉDÉRIC HATERT², ERNEST H. NICKEL^{3,**} and GIOVANNI FERRARIS⁴

- **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!

Classification problems?

Mills et al. (2009): « A mineral supergroup consists of two or more groups which have essentially the same structure and composed of **chemically similar elements** »

Apatite supergroup:

- Fluorapatite → Phosphate
- Vanadinite → Vanadate
- Cesanite → Sulfate
- Britholite-(Ce) → Silicate



Gadolinite supergroup:

- Gadolinite → Silicate
- Herderite → Phosphate
- Bergslagite → Arsenate

- Halite → Chloride
- Galena → Sulfide



Same crystal structure, but not the same supergroup... !!!???

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 compromise!
- A lot of work made by volunteers (>100 proposal/year).

Thank you for your attention!