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

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# Mineral names: physical properties

## The System of Mineralogy, J.D. Dana (1895)

Albite



Lat. *albus* = white

Staurolite



Gr. *stauros* = cross

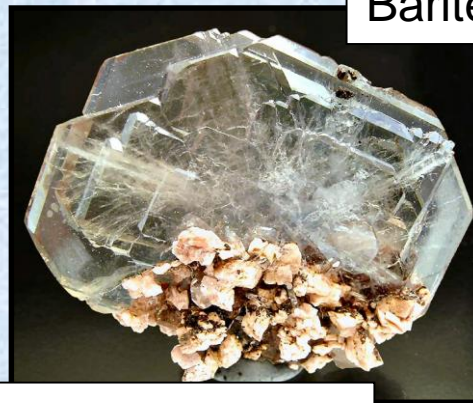


Crocoite



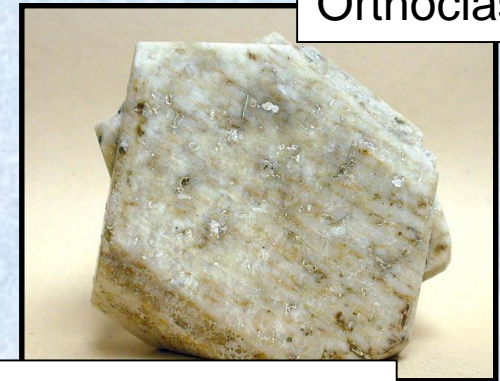
Gr. *krokos* = saffron

Barite



Gr. *barys* = heavy

Orthoclase



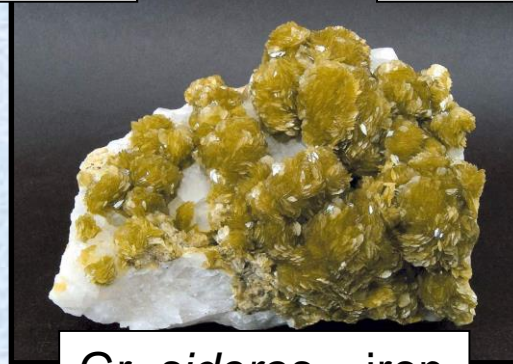
Gr. *orthos* = right

# Mineral names: chemical composition

Anhydrite

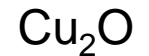


Siderite



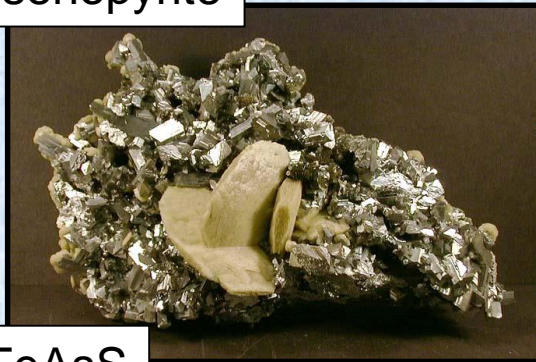
Gr. *sideros* = iron

Cuprite



Lat. *cuprum* = copper

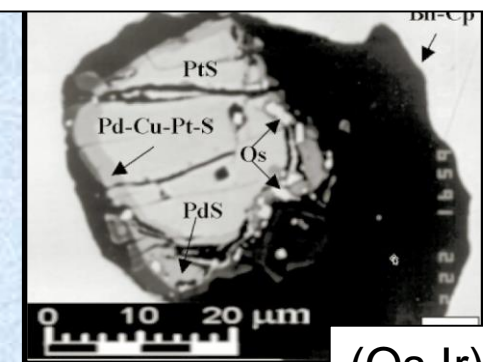
Arsenopyrite



Vanadinite



« Iridosmine » (= osmium)



(Os, Ir)

# Mineral names: localities, scientists



Vesuvianite



Atacamite

Thomas-Charles  
Hope



Hopeite

Georg Agricola



« Agricolaite » (= eulytite)

# Prefixes

## Dana (1895)

- Chemical prefixes: Calciovolborthite, cuprobismutite, cuprotungstite, hydrocerussite, hydromagnesite, hydronephelite, nitrobarite, nitrocalcite, nitroglauoberite, nitromagnesite, phosphosiderite, phosphuranylite,
- Other prefixes: Epistilbite, metabrushite, metacinnabarite, paraluminate, pseudobrookite, pseudomalachite.

## Hey & Gottardi (1980), Nickel & Grice (1998)

- Structural and chemical prefixes are allowed
- Use of hyphen avoided when possible
- Double prefixes are allowed

- Structural prefixes: Clinoenstatite, clinomimetite, orthoserpierite, parafransoletite, parahopeite
- Chemical prefixes (cations): Barioperovskite, ferristrunzite, ferrocapholite, magnesiostauroilite, manganiandrosite-(Ce), manganolangbeinite, nickelskutterudite, zincroselite
- Chemical prefixes (anions): Fluorvesuvianite, hydroxycancrinite, phosphoellenbergerite

# Suffixes

Dana (1895)



**No suffixes!**

Nickel & Grice (1998)

## Levinson modifiers

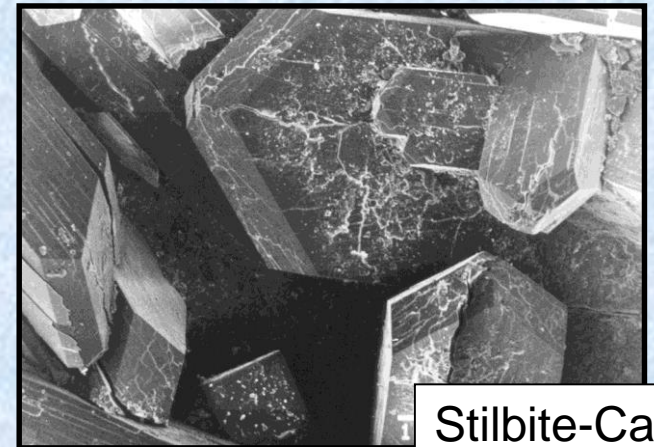
- Introduced by Levinson (1966) for REE-bearing minerals



Bastnäsite-(Ce)

## Extended Levinson modifiers

- The procedure has been extended to REE-free minerals (jahnsites, pumpellyites)
- In zeolites, the modifiers are used without parentheses, to indicate extra-framework cations



Stilbite-Ca

# Prefixes vs. suffixes

Burke (2008)

Replacement of prefixes by suffixes in several mineral groups, in order to facilitate the search of minerals in alphabetical indexes

Columbite-(Fe)



Ferrocolumbite = columbite-(Fe)  
Magnesiocolumbite = columbite-(Mg)  
Manganocolumbite = columbite-(Mn)

Ferro-axinite = axinite-(Fe)  
Magnesio-axinite = axinite-(Mg)  
Manganaxinite = axinite-(Mn)

Axinite-(Mn)



**Chaos in the mineralogical nomenclature, and in the mineralogical community!**

# Historical and well-established names

## Burke (2008): Apatite supergroup

Fluorapatite = apatite-(CaF)

Hydroxylapatite = apatite-(CaOH)

Chlorapatite = apatite-(CaCl)

## Armbruster *et al.* (2006): Epidote supergroup

Hancockite = epidote-(Pb)

Niigataite = clinozoisite-(Sr)

Tweddillite = manganipiemontite-(Sr)



Fluorapatite



Epidote



**Chaos in the mineralogical  
community, but also in chemistry,  
medical sciences, ...**



# New CNMNC guidelines

**Open discussion between the CNMNC members during the 2010 IMA meeting in Budapest**



**Proposal voted and accepted in July 2012**

- In mineral groups or supergroups, flexibility is allowed by the CNMNC when choosing between suffix- and prefix-based nomenclature systems.
- The authors can choose according to the nomenclature of pre-existing mineral species in the group/supergroup, and according to the recommendations given below.
- Mixed nomenclature systems are allowed, even within mineral groups or supergroups; however, authors should provide strong arguments to support such mixed systems.
- For new mineral proposals, it is recommended to follow the established nomenclature scheme.

Example: A mixed nomenclature system exists in the jahnsite supergroup, in which jahnsite-(CaMnFe) and whiteite-(CaMnMg) coexist with rittmannite and keckite.

# CNMNC guidelines - Prefixes

**(I) For common names, prefix-type nomenclature is preferred to facilitate pronunciation**

Example: The names « apatite-(CaOH) » and « apatite-(CaF) » are more difficult to pronounce than the approved names hydroxylapatite and fluorapatite

**(II) An unnecessary proliferation of prefixes must be avoided, and a maximum of three chemical prefixes is recommended. Hyphenated names may be chosen to assist in deciphering the name**

Example: Chromo-alumino-povondraite, fluorphosphohedyphane, oxycalciopyrochlore, and oxystibiomicrolite are valid mineral names

## CNMNC guidelines - Prefixes

**(III) It is allowed to use a combination of chemical, structural or other descriptive prefixes**

Example: Clinoferroholmquistite, hydroxylclinohumite, strontio-orthojoaquinite, bario-orthojoaquinite, and para-alumohydrocalcite are valid mineral names

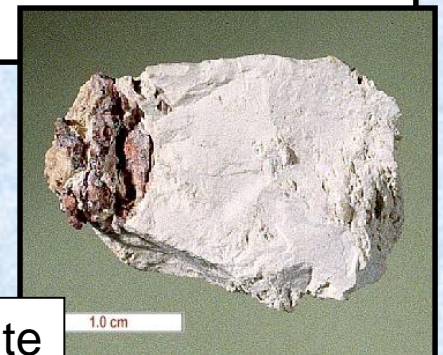
**(IV) When Levinson modifiers are used as suffix for REE, then other cations or anions have to be placed as a prefix. A new root-name can also be used**

Example: Manganiandrosite-(Ce), vanadoandrosite-(Ce), fluorbritholite-(Y), fluorbritholite-(Ce), arsenoflorencite-(Ce) and arsenoflorencite-(La), calcioancylite-(Ce), hydroxylbastnäsité-(Nd), and nioboeschynite-(Ce) are valid mineral names

## CNMNC guidelines - Prefixes

**(V) In case of polytypes and topologically similar polymorphs, a chemical prefix-type nomenclature is preferred, since the polytype and polymorph symbols have to be suffixes. It must be remembered, however, that polytypes and topologically similar polymorphs are not considered as separate mineral species (Nickel & Grice, 1998)**

Example: In the apatite supergroup, prefixes are preferred, since the polytypes chlorapatite-*M* and hydroxylapatite-*M* have been reported. In the alunite supergroup, a prefix-type nomenclature is applied for natroalunite, since the polymorphs natroalunite-1*c* and natroalunite-2*c* exist



Natroalunite

# CNMNC guidelines - Suffixes

- (I) Chemical suffixes have to be in parentheses, except for extra-framework cations. Extra-framework cations and framework cations cannot be mixed in the suffixes, and if such a situation would occur, we would recommend to use a suffix for the extra-framework cations, and a prefix for the framework cations**

Example: Na and Ca are extra-framework cations in chabazite-Na and chabazite-Ca, whereas they occur in the framework of arrojadite-(KNa) and of jahnsite-(CaMnMn)

- (II) A maximum of 3 chemical suffixes is allowed. The chemical suffixes must appear in the same order than in the chemical formula; generally, they must be classified by decreasing ionic radii**

Example: The nomenclature of the whiteite-jahnsite group is based on a root name followed by parentheses containing 3 chemical suffixes: whiteite-(CaMnMg), jahnsite-(CaMnMg), and jahnsite-(CaMnMn) are valid names

## CNMNC guidelines - Suffixes

**(III) Cations and anions should never be used together in the parentheses. In the case where both anions and cations have to appear in the name, then the anions have to be placed as a prefix**

Example: In the apatite supergroup, the names “apatite-(CaCl)” and “apatite-(CaF)” were introduced by Burke (2008), but the recent report of the apatite subcommittee has re-validated the previous names chlorapatite and fluorapatite, in which the anions occur as prefixes (Pasero *et al.*, 2010). Fluorbritholite-(Y) and fluorbritholite-(Ce) are also valid names of minerals in the apatite supergroup.

Remark: In the apophyllite group, Burke (2008) replaced the names “fluorapophyllite”, “hydroxyapophyllite”, and “natroapophyllite” by apophyllite-(KF), apophyllite-(KOH), and apophyllite-(NaF), in which cations and anions are grouped in the suffix. We propose here, for the sake of consistency, to re-name these minerals fluorapophyllite-(K), hydroxyapophyllite-(K), and fluorapophyllite-(Na)

# CNMNC guidelines – Historical names

- **When possible, the CNMNC recommends to avoid changing names, especially for grandfathered species.**
- **Well-established mineral names or names dedicated to localities or persons have to be preserved, except if the species is shown to be not valid. In this case, a renaming, redefinition or discreditation procedure has to be submitted to the CNMNC.**
- **Historical names cannot be changed in order to uniformize the nomenclature of a group or supergroup, since mixed nomenclature systems are accepted by the CNMNC.**
- **However, modern reorganisation of a group or supergroup may require re-examination of incompletely or ambiguously characterised type material, so that its associated historical name can be redefined to fit with a particular species composition field in the new classification scheme.**
- **If this cannot be done, then the name may need to be discredited as a species name, although it may be retained as a group name.**

# Conclusions

- **New guidelines were established for the use of prefixes and suffixes in mineralogical nomenclature.**
- **Flexibility is allowed, since authors can choose between prefix- or suffix-type nomenclature systems.**
- **Mixed nomenclature systems are allowed, even within mineral groups or supergroups.**
- **Well-established mineral names or names dedicated to localities or persons have to be preserved, and cannot be changed in order to uniformize the nomenclature of a group or supergroup.**