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CLINOFERROGEDRITE IN THE CONTACT-METAMORPHOSED BIWABIK IRON FORMATION, NORTHEASTERN MINNESOTA: DISCUSSION

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In the paper on which we are commenting (Joy & Evans 2014), the authors (hereafter referred to as J&E) introduced a new mineral belonging to the amphibole supergroup, gave it a name, and discussed its relations with coexisting amphiboles and amphiboles reported in previous literature.

First, we wish to state that J&E should have submitted a proposal to the IMA Commission on New Minerals, Nomenclature and Classification (IMA-CNMNC) for its formal approval, a procedure which is a prerequisite to introducing a new mineral name into the scientific literature. This procedure is agreed upon by all major mineralogical journals. Moreover, approval of a proposal for the recognition of a new mineral of the amphibole supergroup requires a more complete characterization, which includes determination of optical, physical, and XRD properties. In the case under discussion, this is admittedly a challenging requirement given the widespread occurrence of compositional zoning and exsolution lamellae.

Second, in this specific case, the proposed mineral name ("clinoferrogedrite") is not correct according to the CNMNC guidelines in force, and would not have ever been approved. We regret to note that this incorrect name is even mentioned in the title of the paper.

Since its establishment, the Subcommittee on Amphiboles has produced several reports (Leake 1978, Leake *et al.* 1997, 2003, Hawthorne *et al.* 2012), which have evolved together with our knowledge of amphibole crystal-chemistry. It is quite obvious, and hence implicitly assumed, that any new report supersedes all the previous ones.

According to the most recent report (Hawthorne *et al.* 2012), which considers the group charge of A, B, and C cations and W anions for classification and nomenclature, the amphibole composition reported by J&E should have been named ferro-rootname1 (*cf.* below for further discussion). In contrast, J&E decidedly ignored the rules in force. Based on their unilateral and unsupported statement that ^{T}Si is a better index for classification than $^{C}M^{3+}$ when dealing with magnesium–iron–manganese amphiboles, they used the former recommendations made by Leake *et al.* (1997), where the boundary between anthophyllite and

gedrite was set at 7 Si *apfu* and the amount of $^{C}M^{3+}$ was ignored, and then named the above composition "clinoferrogedrite". Similarly, they adopted the (out-of-date) criteria given by Leake *et al.* (1997) for the choice of the prefixes.

It is a bit surprising to see how this disregard for IMA-approved procedures has passed the peer-review process without any comment from the editorial board or consultation with the IMA-CNMNC.

When going into details, J&E presented EPMA data (9 spot analyses in total; see Table 2 in Joy & Evans 2014) for amphiboles from the Biwabik iron formation, Northeastern Minnesota, USA. Those analyses can be divided into two groups: (1) Analyses labelled 1/6a, 2/6a 15/6b, 82/13, and 76/7 are to be referred to the simplified formula $^{A}\square^{B}Fe^{2+}{}_{2}{}^{C}Fe^{2+}{}_{5}{}^{T}Si_{8}O_{22}{}^{W}(OH)_{2}$. Such a composition, once it is proven that the crystals have monoclinic symmetry, corresponds to grunerite, a well-established amphibole species (Kenngott 1853). (2) Analyses labelled 174/1, 156/9, 107/13, and 34/6b [with $^{A}(Na+K) > 0.50$ *apfu*, $^{C}M^{3+} \leq 1$ *apfu* and $^{B,C}Fe^{2+} > {}^{B,C}Mg$] are to be referred to the endmember composition $^{A}Na^{B}Fe^{2+}{}_{2}{}^{C}Fe^{2+}{}_{5}{}^{T}(Si_{7}Al)O_{22}{}^{W}(OH)_{2}$, which according to Hawthorne *et al.* (2012) should be named ferro-rootname1. However, to have its formal recognition as a valid species, its mineral description (and the selected rootname) should be submitted to the IMA-CNMNC for approval. Chemical compositions for synthetic PIN69, also reported in Table 2 of Joy & Evans (2014), for which monoclinic symmetry had been proved, are referred to in the paper as "highly aluminous cummingtonite grading into clinogedrite". Actually, they all refer to the simplified formula $^{A}\square^{B}Mg_{2}{}^{C}Mg_{5}{}^{T}Si_{8}O_{22}{}^{W}(OH)_{2}$ [because $^{A}(Na+K) \leq 0.50$ *apfu*, $^{C}M^{3+} < 1$ *apfu*, and $^{B,C}Mg > {}^{B,C}Fe^{2+}$], which corresponds to the synthetic analogue of cummingtonite. In any event, the name "clino-gedrite" should be written between quotes because this name derives from the rules in force but the mineral has not yet been formally approved.

Also, the statement that the mineral incorrectly named "clinoferrogedrite" would correspond to "sodic aluminous grunerite" according to Hawthorne *et al.* (2012) is incorrect, because in the last amphibole report (1) this composition corresponds to the simplified formula $^{A}Na^{B}Fe^{2+}{}_{2}{}^{C}Fe^{2+}{}_{5}{}^{T}(Si_{7}Al_{1})O_{22}{}^{W}(OH)_{2}$ and hence to ferro-rootname1, and (2) the use of the prefix sodic is abolished and the use of adjectival prefixes is discouraged.

Moreover, Hawthorne *et al.* (2012) explicitly stated that hyphens must be used to separate prefixes and rootnames in order to allow an easier understanding of the formula and searching in a database.

The IMA-CNMNC could accept that for certain purposes some authors, when describing the petrology of a specific geologic formation, may decide to adopt out-to-date phase diagrams and compositional fields in order to allow a better comparison with previous studies (as it is the case of the paper under discussion). However, as far as the mineralogical nomenclature and the status of valid mineral species are concerned, the IMA-CNMNC clearly states that they must refer to the rules in force, because there is no way to have a new mineral species approved when adopting obsolete grids and guidelines.

The key point we want to stress, besides this specific case, is that the IMA guidelines should be followed at all levels – by authors, by referees, and also by editors of scientific journals. These guidelines can be found in: Nickel & Grice (1998), Burke (2008), Hatert & Burke (2008), Mills *et al.* (2009), Mills (2010), and Hatert *et al.* (2013). All those involved in scientific research in mineralogy should speak a common language, and the IMA-CNMNC does represent the locus where these issues are discussed and put in the form of general guidelines.

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