



Arrojadite-group nomenclature: sigismundite reinstated

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Abstract. The name sigismundite has been reinstated from arrojadite-(BaFe) following the IMA Commission on New Minerals, Nomenclature and Classification (CNMNC) recommendations defined by Hatert et al. (2013) for the preservation of historical names. The name change was approved by the CNMNC, voting proposal 22-C. The new mineral symbol for sigismundite is Sigi. Sigismundite honours Pietro Sigismund (1874–1962), and this paper outlines his significant contributions to Italian mineralogy.

1 Introduction

Arrojadite-group minerals have a long history. Dickinsonite was described from the Branchville pegmatite, Fairfield County, Connecticut, USA, by Brush and Dana (1878), and arrojadite was described from the Serra Branca pegmatite, Paraíba, Brazil, by Guimarães (1925). In the ca. 140 years of advancing sciences since, a suite of almost two dozen named and unnamed arrojadite-group minerals have been described, the latest being manganoarrojadite-(KNa) by Lykova et al. (2020).

Huminicki and Hawthorne (2002) wrote “arrojadites are infernally complex structures, with several partly occupied cations sites, and the complete details of their structures exceed our spatial parameters”. Standardization of nomenclature was therefore well-needed and was executed by Cámara et al. (2006) and Chopin et al. (2006).

The nomenclature is set up as follows:

1. The structural formula for the arrojadite group is $A_2B_2CaNa_{2+x}M_{13}Al(PO_4)_{11}(PO_3OH_{1-x})W_2$, where A is either large divalent (Ba, Sr and Pb) cations plus vacancy or monovalent (K and Na) cations and B is either small divalent cations (Fe, Mn and Mg) plus vacancy or monovalent (Na) cations.
2. The dominant cation at the M sites defines the root name – Fe²⁺, arrojadite, and Mn²⁺, dickinsonite.
3. Two suffixes are added to the root name according to the dominant cation of the dominant valence state at the A1

and B1 sites (the mono- or divalent nature of the cation used implicitly specifies the dominant occupancy by Na or the dominant vacancy, respectively, at the A2 and B2 sites, according to two heterovalent substitutions).

4. A third suffix is added in case the sum of non-(P,Al) cations exceeds 20.5 apfu.
5. Prefixes may be added to the root name in the case of dominance of F over OH at the W site or of Fe³⁺ over Al at the Al site.

All arrojadite-group minerals known prior to 2006 were re-named accordingly.

An unfortunate victim of this renaming process, however, was the renaming of sigismundite to arrojadite-(BaFe). With this paper, we reinstate sigismundite following the IMA Commission on New Minerals, Nomenclature and Classification (CNMNC) recommendations defined by Hatert et al. (2013) for the preservation of historical names. The name change was approved by the CNMNC, voting proposal 22-C (Miyawaki et al., 2022). The new mineral symbol (Warr, 2021) for sigismundite is Sigi.

2 Reinstating sigismundite

In Chopin et al. (2006), the name sigismundite was dropped in favour of arrojadite-(BaFe), with the authors stating

for the sake of consistency, and in the light of the following scheme that adopts suffixes based on the

dominant heterovalent substitution and the nature of its predominant cation at the A and B sites, the name sigismundite is abolished.

We feel that this was done in error, where well-meant consistency unfortunately prevailed over a historically accurate, well-deserved and well-established species named after Pietro Sigismund. The name sigismundite was – and is – “entrenched” and well-rooted in the scientific literature.

Hatert et al. (2013) clarified that

when possible, the CNMNC recommends avoiding changing names, especially for grandfathered species. Well-established mineral names or names dedicated to localities or persons have to be preserved . . . Historical names cannot be changed in order to standardize the nomenclature of a group or supergroup, since mixed nomenclature systems are accepted by the CNMNC.

The recent CNMNC decision to change the names “epidote-(Pb)”, “clinozoisite-(Sr)” and “manganipiemontite-(Sr)” back to hancockite, niigataite and tweddillite was one of the results of this clarification (Revheim and King, 2016), while in other groups such as the jahnsite group (Kampf et al., 2019), rittmannite and keckite are preserved following Hatert et al. (2013) guidelines.

Somehow, unfortunately, the renaming of sigismundite “fell off the radar” of the professional and amateur mineral community and did not receive the attention it deserved. We feel, however, that Pietro Sigismund deserves the mineral name that was given to him by Demartin et al. (1996). The next section will give more foundation to this statement.

3 Sigismundite and Pietro Sigismund

The first specimens of sigismundite were found by Paolo Gentile in a phosphate occurrence on the Alpe Grop-pera near Madesimo, Valle Spluga, Lombardy, Italy, and were soon after described by Demartin et al. (1996) and named after Pietro Sigismund. The only information Demartin et al. (1996) shared in their article was that they named it “in honor of Pietro Sigismund (1874–1962), a well-known collector of minerals from Valtellina (especially Val Malenco)”. We wish to give some more context on Pietro Sigismund to show why we feel it is vital that he rightly deserved and still deserves “his” sigismundite. Sigismund was not “just” a collector of minerals; that is an understatement that does not do Sigismund’s achievements justice.

For example, at the age of 25 Pietro Sigismund collected the first specimens of artinite, which were then described by Luigi Brugnatelli (1902) and named after Ettore Artini. Brugnatelli thanked Sigismund in detail in his 1902 article, which is too nice not to quote here in translation.

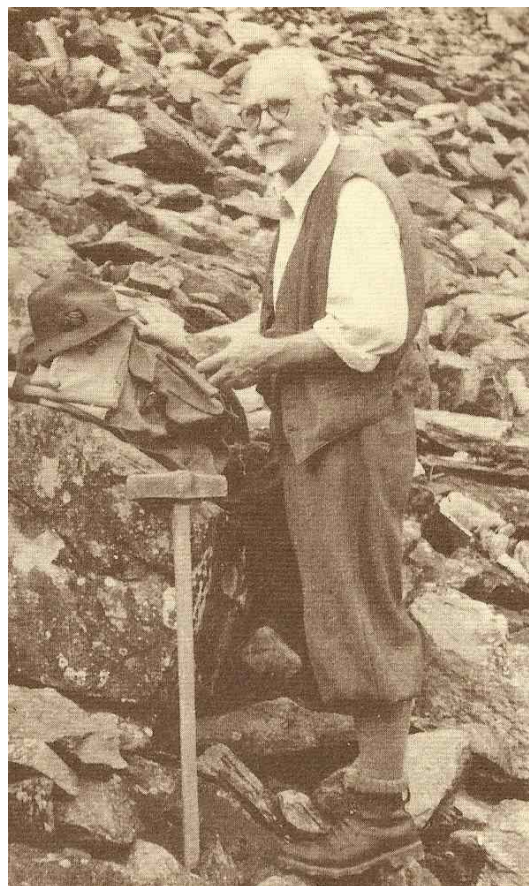


Figure 1. Pietro Sigismund collecting at Valmalenco. Figure reproduced with permission from the Ecomuseo della Valmalenco.

I have made numerous visits to the quarries of Val Brutta and to those very close to Franscia, and with all diligence I searched for the interesting mineral [artinite], but unfortunately my research remained fruitless. Luckier than me was the distinguished and passionate mineral collector Mr. Pietro Sigismund, who last summer found some samples of a mineral, which he kindly communicated to me from Professor Ettore Artini. I could easily recognize it was identical to the one I had been looking for so much. To Mr. Sigismund and Professor Artini, who by placing one of the specimens at my disposal, gave me the opportunity to complete my previous research, I extend my heartfelt thanks here. The place where Mr. Sigismund found his samples is in the Franscia quarries, and precisely, as Artini told me, “to the left of the path one takes towards the last quarry above Franscia, before descending towards the huts”.



Figure 2. Pietro Sigismund collection housed in ETH Zurich, focusing on specimens from Valmalenco. Photo: Martin Jensen taken 28 March 2022.

As well as artinite, Sigismund discovered the first localities in Italy for nesquehonite in 1921 and morenosite in 1930. He also discovered the now well-known deposits for gem-quality serpentine and clinothulite at the Pizzo Tremogge in Valmalenco. The many mineralogical articles that Sigismund wrote, mostly on Valmalenco, were published in a 50-year period until 1953. He was still actively field collecting at the age of 80 (Fig. 1). Sigismund's life and works were published by Gramaccioli (1962) in the 179-page book *I minerali Valtellinesi nella raccolta di Pietro Sigismund*. A part of his mineral collection and collecting equipment are on permanent display in the Ecomuseo della Valmalenco (Costa, 2008), and 1700 specimens are in the collections of the Laboratory of Crystallography at ETH Zurich (Fig. 2). In 1971 the town of Chiesa (Valmalenco, Sondrio) named a new street after Sigismund and in 1976 a new middle school.

Sigismund's contributions to Italian mineralogy are worthy of honouring, and it is therefore perfectly fitting to reinstate sigismundite. We note that renaming arrojadite-(BaFe) to "sigismundite-(BaFe)" might cause confusion; therefore like hancockite, we prefer to reinstate the name without suffixes.

4 Conclusion

Following the positive vote on proposal 22-C, the renaming of arrojadite-(BaFe) back to sigismundite is justified, conforms to CNMNC recommendations and will not lead to additional confusion in scientific literature referencing.

Data availability. No data sets were used in this article.

Author contributions. FdW conceptualized the project. Both authors contributed equally to writing the manuscript.

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References

- Brugnatelli, S. C. L.: Sopra un nuovo minerale delle cave d'Amianto della Valle Lanterna, *Rendiconti Reale Istituto Lombardo di Scienze e Lettere (Milano)*, 35, 869–874, 1902.
- Brush, G. and Dana, E.: On a new and remarkable mineral locality in Fairfield County, Connecticut; with a description of several

- new species occurring there, *American Journal of Science and Arts*, 116, 33–46, 114–123, 1878.
- Cámara, F., Oberti, R., Chopin, C., and Medenbach, O.: The arrojadite enigma I. A new formula and a new model for the arrojadite structure, *Am. Mineral.*, 91, 1249–1259, 2006.
- Chopin, C., Oberti, R., and Cámara, F.: The arrojadite enigma II. Compositional space, new members, and nomenclature of the group, *Am. Mineral.*, 91, 1260–1270, 2006.
- Costa, A.: Ricordo di Pietro Sigismund: le sue Collezioni mineralogiche, *Periodici dell'Istituto Valtellinese di Mineralogia*, 1, 4–6, 2008.
- Demartin, F., Gramaccioli, C. M., Pilati, T., and Sciesa, E.: Sigismundite, $(\text{Ba,K,Pb})\text{Na}_3(\text{Ca,Sr})(\text{Fe,Mg,Mn})_{14}(\text{OH})_2(\text{PO}_4)_{12}$, a new Ba-rich member of the arrojadite group from Spluga valley, Italy, *Can. Miner.*, 34, 827–834, 1996.
- Gramaccioli, C. M.: I minerali Valtellinesi nella raccolta di Pietro Sigismund, Milano, 179 pp., <https://www.worldcat.org/title/minerali-valtellinesi-nella-raccolta-di-pietro-sigismund/oclc/602645069> (last access: 20 March 2022), 1962.
- Guimarães, D.: Arrojadita, um novo mineral do grupo da wagnerita, *Publicação da Inspeção de Obras Contra as Secas*, Rio de Janeiro, 58, 119–122, 1925.
- Hatert, F., Mills, S., Pasero, M., and Williams, P.: CNMNC guidelines for the use of suffixes and prefixes in mineral nomenclature, and for the preservation of historical names, *Eur. J. Mineral.*, 25, 113–115, 2013.
- Humnicki, D. and Hawthorne, F.: The crystal chemistry of the phosphate minerals, in: *Phosphates: geochemical, geobiological, and materials importance*, edited by: Kohn, M., Rakovan, J., and Hughes, J., Vol. 48, 123–254, *Reviews in Mineralogy and Geochemistry*, Mineralogical Society of America, Chantilly, Virginia, <https://doi.org/10.2138/rmg.2002.48.5>, 2002.
- Kampf, A. R., Alves, P., Kasatkin, A., and Škoda, R.: Jahnsite-(MnMnZn), a new jahnsite-group mineral, and formal approval of the jahnsite group, *Eur. J. Mineral.*, 31, 167–172, 2019.
- Lykova, I., Rowe, R., Poirier, G., Helwig, K., and Friis, H.: Manganoarrojadite-(KNa), $\text{KNa}_5\text{MnFe}_{13}\text{Al}(\text{PO}_4)_{11}(\text{PO}_3\text{OH})(\text{OH})_2$, a new arrojadite-group mineral from the Palermo No.1 mine, New Hampshire, USA, *Miner. Mag.*, 84, 932–940, 2020.
- Miyawaki, R., Hatert, F., Pasero, M., and Mills, S. J.: Newsletter 66, *Miner. Mag.*, 86, 1–4, <https://doi.org/10.1180/mgm.2022.33>, 2022.
- Revheim, O. and King, V.: Epidote supergroup nomenclature: The names hancockite, niigataite and tweddillite reinstated, *Miner. Mag.*, 80, 877–880, 2016.
- Warr, L. N.: IMA–CNMNC approved mineral symbols, *Miner. Mag.*, 85, 291–320, 2021.