WHAT'S IN A NAME: STARKEYITE vs. LEONHARDITE

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In previous what's-in-a-name articles, Mason (1971) and Fleischer (1972) have both noted that difficulties arise when two different names are available for the same mineral. I recently had personal contact with such a case, and although the mineral is rare and not likely to be encountered by professional or amateur mineralogists, I think the problems of nomenclature encountered are of enough interest to make the incident worth telling about. My involvement in this situation came about as follows.

In the summer of 1969, I was in northern California sampling chromite localities. The Alta troilite mine (now-defunct) in southern Del Norte County yielded, as well as chromite, some small troilite boulders dusted with a yellowish efflorescence. Qualitative laboratory tests showed the dust had iron, magnesium and sulfur present in major amounts, the iron being ferrous. Ten milligrams of the efflorescence (obtained by brushing the dust off the troilite, followed by hand-picking of impurities) were analyzed quantitatively, giving MgO 17.5, FeO 4.5, SO_3 41.0 and H_2O 36.0 weight percent, summation 99.0. This calculated out to the formula $Mg_{0.86}Fe_{0.12}(SO_4)_{1.02}(H_2O)_4$, and the mineral was therefore $MgSO_4 \bullet 4H_2O$ with some iron substituting for magnesium. X-ray study confirmed this, giving a pattern similar to synthetic magnesium sulfate tetrahydrate. Chemistry of the mineral was thus simple but a look at the literature showed that picking a name for it was not so easy. Two names, starkeyite and leonhardtite, were available, as a result of the events below.

Grawe (1945), in a long treatise on the pyrite deposits of Missouri, noted finding a dull, white, powdery efflorescence on an altered mixture of pyrite and marcasite at the Starkey mine in Madison County. He assumed the dust was iron sulfate tetrahydrate, based on its association with iron sulfides, positive qualitative reaction for iron, and agreement of the x-ray pattern with that of $FeSO_4 \bullet 4H_2O$. As this phase had not previously been found in nature, Grawe decided he had a new mineral and named it starkeyite. The data were somewhat circumstantial for definition of a new mineral; lack of quantitative chemical results is particularly apparent. Upon reading Grawe's paper, W. T. Schaller reported to M. Fleischer that the refractive index given for starkeyite by Grawe was too low for $FeSO_4 \bullet 4H_2O$. Subsequent check of the composition at the U. S. Geological Survey showed minor FeO but abundant MgO, suggesting starkeyite was a magnesium many years after the erroneous description—Grawe (1956) rather than an iron sulfate. Subsequently—unfortunately transferred the name starkeyite to the magnesium sulfate. In the time between the initial publication and the revision of the starkeyite data, however, Berdesinski (1952) had an opportunity to find his own occurrence of $MgSO_4 \bullet 4H_2O$. Apparently characterizing the mineral by x-ray data alone, he called it leonhardtite (after Prof. J. Leonhardt, who had done research on analogous compounds). Berdesinski's description of leonhardtite was not very full, but he did correctly diagnose the chemistry of the mineral. He was apparently unaware of Grawe's (1945) work, and Grawe (1956) seems not to have seen Berdesinski's (1952) paper. Choice of the name leonhardtite for $MgSO_4 \bullet 4H_2O$ was unfortunate because—as noted by Fleischer (1952; 1957)—leonhardite (after Karl C. von Leonhard, German mineralogist) had long been used for a zeolite variety: dehydrated laumontite. Availability of two names for one mineral creates confusion; the problem is not alleviated if one of the two names is nearly identical to that of an entirely different mineral. Berdesinski knew of the leonhardite-leonhardtite interference but dismissed it by saying that leonhardite "...ist vor einiger Zeit gestrichen worden" (had been rejected some time ago). This opinion of Berdesinski is incorrect; leonhardite definitely remains in use today for the zeolite. (Incidentally Fleischer and Berdesinski in their discussions actually happen to spell the zeolite name with two "t's", but it is my distinct impression that zeolite workers more often spell it "leonhardite.")

In 1957 Fleischer suggested that in order to avoid confusion with the zeolite leonhardite, starkeyite be used instead of leonhardtite for $MgSO_4 \bullet 4H_2O$. Strunz (1966) and Hey (1962), however, continued to use leonhardtite (for the sulfate) and leonhardite (for the zeolite). Such was the state of nomenclatural affairs when I found the further example of $MgSO_4 \bullet 4H_2O$. Having characterized the mineral, and wishing to publish the data on it, I felt it was my responsibility to decide what to call it.

In weighing starkeyite *vs.* leonhardtite it had to be realized that leonhardtite definitely has precedence over starkeyite for the sulfate composition. In essential agreement with Fleischer's 1957 discussion, however, I felt that sufficient confusion existed between leonhardite and leonhardtite as to justify rejection of the latter. I did take into account that in a scientific context there would be no confusion between the name leonhardite occurring in a zeolite paper and leonhardtite in a report on sulfates. Further, most workers dealing with sulfates have in their research reports tended to use leonhardtite rather than

starkeyite. Nevertheless I felt—and still strongly feel—that leonhardite and leonhardtite are similar enough to be considered identical, and the duplication should be eliminated by rejecting leonhardtite. I drafted a proposal in favor of starkeyite, and submitted it to the I.M.A. Commission. In what was apparently a rare note of unanimity within the Commission, starkeyite was approved by a vote of 17-2, with one abstention (Fleischer, personal communication). I eventually published the starkeyite data with the approved nomenclature (Snetsinger, 1973), and that would seem to have put an end to the problem.

The I.M.A. Commission, however, obviously does not (cannot) enforce its rulings, and subsequent workers may in publication ignore I.M.A. rulings if they feel they have a good case for doing so. In this connection I have received communications from two professional mineralogists saying they regret the I.M.A. vote on starkeyite because they feel leonhardtite has precedence. I would therefore not be surprised to see a future sulfate paper repudiating starkeyite and insisting upon leonhardtite. At this point one may repeat the question "What's in a name?"; but as Mason (1971) points out, the problem is not trivial or mere hair-splitting.

I believe there are two very obvious lessons to be learned from the starkeyite *vs.* leonhardtite problem—but not so obvious that repeating them would be out of order: (1) minerals should not be named without first obtaining full chemical data, and (2) a name should not be given if it is so similar to an earlier one that confusion would result.

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