NH Scorzalite and Lazulite

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Scorzalite, $(Fe^{2+},Mg)Al_2(PO_4)_2(OH)_2$, and lazulite, $(Mg,Fe^{2+})Al_2(PO_4)_2(OH)_2$, are among the most colorful minerals to be found in New Hampshire pegmatites. The index in Phillip Morrill's *New Hampshire Mines and Mineral Localities* booklet lists four towns where these minerals were recorded: Alexandria, Groton, Newport, and Stoddard. Massive miniature to cabinet-sized specimens of scorzalite are not uncommon, but NH scorzalite crystals have been only found to a few millimeters.

The Palermo #1 Mine in N. Groton was the most prolific producer of massive scorzalite. As noted in Whitmore and Lawrence's book, *The Pegmatite Mines Known as Palermo*, "large pods of massive scorzalite were found behind altered triphylite between the core and core margin. These pods produced between 225 and 450 kgs of cutting grade material." This "cutting grade" material was popular with cabochon lapidarists. Mike Undercofler made the cabochon in Figure 2 for me from a sample I collected. I recall from Palermo Mine visits in the late 1970's that massive chunks of scorzalite were common in the main pit. The majority of this colorful mineral has been vacuumed up by field collectors since that time.

Figure 1: Massive scorzalite, Palermo #1 Mine
7 cm specimen

Figure 2: Scorzalite cabochon, 30 x 24 mm.
Mike Undercofler lapidary. Palermo #1 source.

Excellent specimens of scorzalite crystals occur at the Charles Davis Mine in N. Groton. These rarely exceed 2 mm in size. A review of scorzalite crystal photos on mindat.org supports the contention that the Charles Davis Mine specimens are "best in world". The only challenger is the Estaño Orcko Mine, Cornelio Saavedra Province, Potosi, Bolivia.

The best Charles Davis scorzalite crystal collecting was pre 1990, from a large dump pile north of the mine, This pile has since been hauled away for fill. No scorzalite crystal specimens were found during an August 2019 field trip.

Figure 3: Scorzalite, 1.2 mm crystal. Charles Davis Mine, N. Groton NH. TM # u2296.

Figure 4: Scorzalite, 2.3 mm crystal cluster. Charles Davis Mine, N. Groton NH. Bob Wilken specimen and photo.

The Plume Mine, southwest of the Charles Davis Mine, has produced scorzalite crystals, Figure 5 and the Keyes Mines, Figure 15 (a late addition). Massive scorzalite has also been found at the Valencia Mine in north Groton, Figure 6.

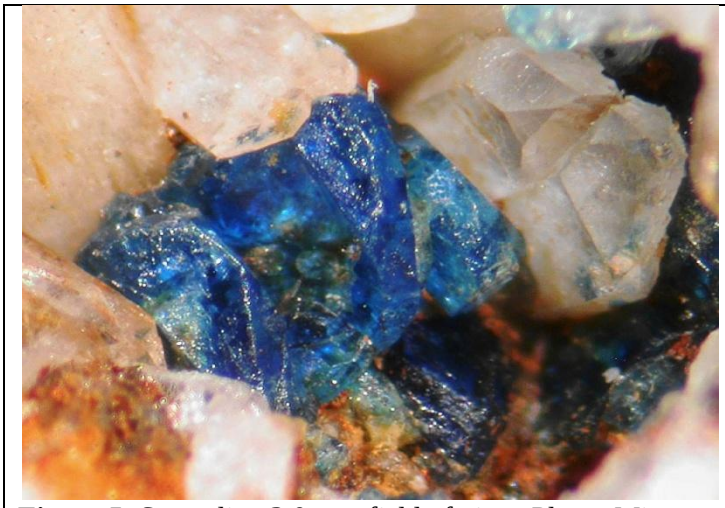

Figure 5: Scorzalite, 3.0 mm field of view. Plume Mine, N. Groton NH. Bob Wilken specimen and photo.

Figure 6: Massive scorzalite, 2.8 cm specimen. Valencia Mine, N. Groton. TM # 1609

Lazulite is the magnesium dominant member of the scorzalite-lazulite series. Lazulite is much less common in New Hampshire than scorzalite. It is not uncommon to see Palermo #1 specimens labeled lazulite at mineral shows. Lacking supporting analysis, these specimens are most certainly scorzalite.

The starting point for my search (1990's) for a NH lazulite was a 1948 *American Mineralogist* article "Green Lazulite from Stoddard, New Hampshire" by T.R. Meyers. The article starts with: "A dark green variety of lazulite, at first believed to be apatite, is present in a small vein exposed on the southwest side of Jackson Hill in the northwest corner of the town of Stoddard, Cheshire County, New Hampshire." A review of Harvard University's basement reference collection revealed the specimen shown in Figure 7. Curator Carl Francis allowed me to take a small grain of this for EDS analysis. A Kerry Day EDS analysis gave the plot in Figure 8. Kerry opined that this is scorzalite, by the strong Fe response. The Kerry Day instrument has poor light element response below 1.0 KeV. The Mg line would be at 1.25 KeV. Although the instrument response is low in this area, if Mg were greater than Fe, it would have registered, per Kerry Day.

Figure 7: Harvard University specimen #100715. Stoddard, New Hampshire.
3 cm zone of massive scorzalite with muscovite mica.

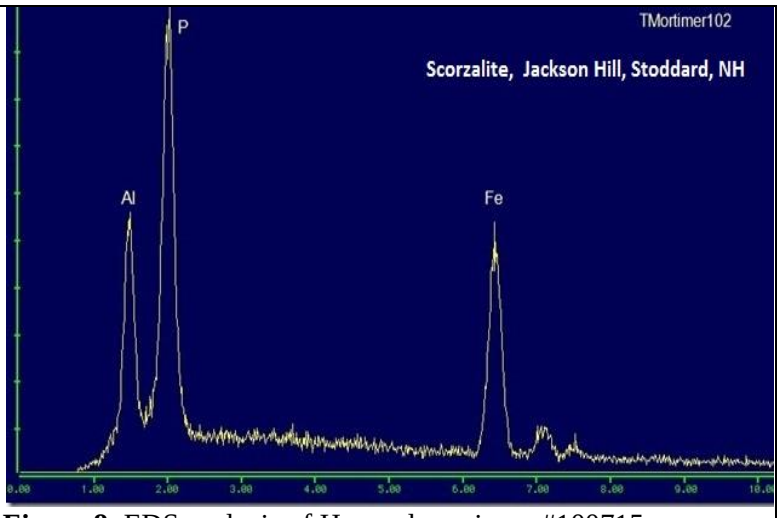

Figure 8: EDS analysis of Harvard specimen #100715.

Curt Laplante and I searched for this Jackson Hill locality. We believed we found it, near the hill crest, on the southwest side. A one foot wide quartz vein was exposed for several dozen yards, running down hill. This vein appears to have been excavated in a few spots. We found no interesting minerals.

It is significant to note that scorzalite was not identified until 1949, (a year after Meyers AM article). Scorzalite was first reported from the Corrego Frio pegmatite, Minas Gerais, Brazil; *American Mineralogist*, 34: 83-93. It is

understandable that Meyers determined that lazulite was the "best fit" for the Stoddard material, even though the analysis of his samples showed "the ratio of iron to manganese is unusually large" [for lazulite]. The 1948 chemical analysis of Meyers' "lazulite" reported slightly more Fe than Mg. Perhaps with a bit more careful study, New Hampshire could have been the type locality for scorzalite! As will be discussed below, the chemistry of this Mg-Fe mineral can vary substantially over short distances. This might account for the Meyers sample analysis indicating a much higher magnesium content than that suggested by my Kerry Day analysis.

Micro specimens of scorzalite from the Charles Davis Mine infrequently have crystals that are a pale green. A 2004 EDS analysis by Jim Nizamoff (while at UNO) on a specimen provided by Bob Janules indicated these greenish crystals had Mg > Fe, so were lazulite. (Figures 9 & 10).

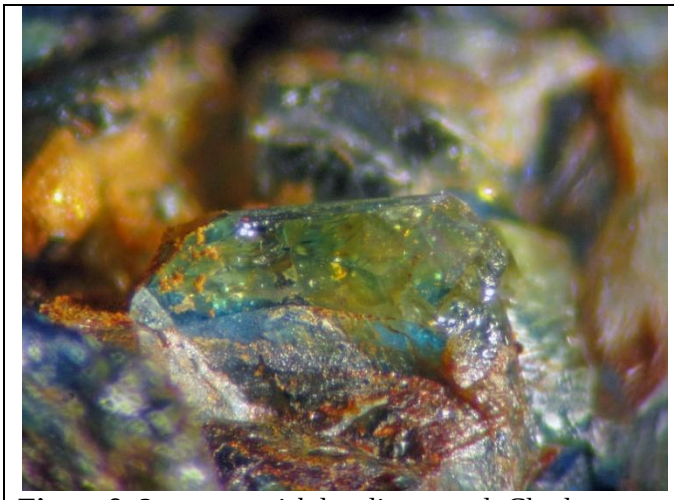

Figure 9: 2 mm greenish lazulite crystal. Charles Davis Mine, N. Groton. Collected by Clayton Ford

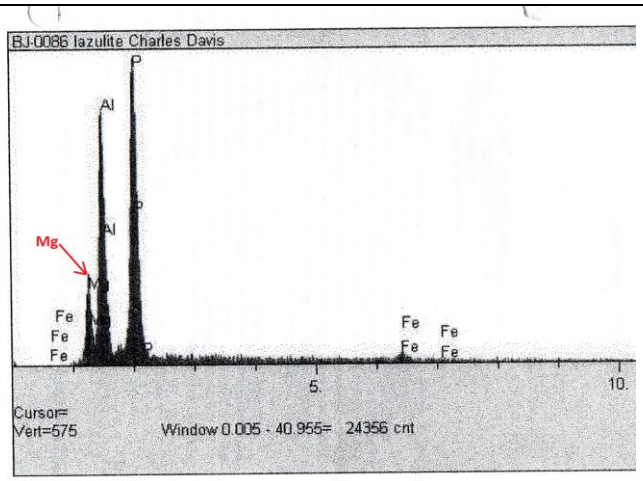

Figure 10: EDS analysis of a Charles Davis Mine lazulite by Jim Nizamoff on a Bob Janules specimen

I acquired a Janet Cares collection Charles Davis scorzalite specimen at the January, 2020 MMNE silent auction. Under the microscope I saw several green crystals were intermixed with the deep blue scorzalite crystals, (Figure 11). Desiring a quantified EDS analysis of these green crystals, I added a grain from this specimen to our Jan. 30, 2020 EDS analysis session. The plot is shown in Figure 12.

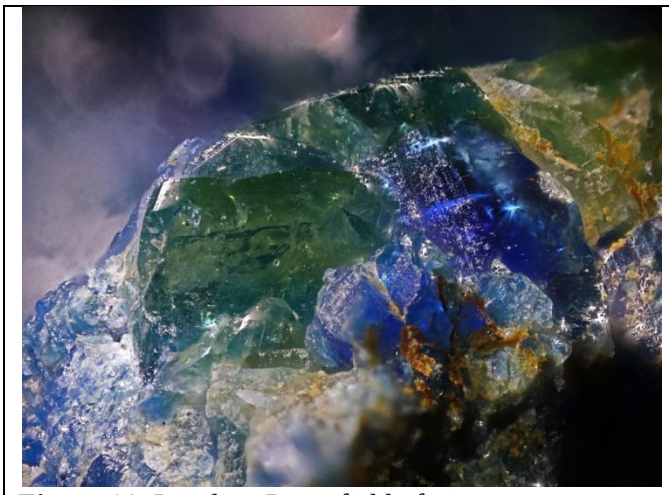

Figure 11: Lazulite, 5 mm field of view. Charles Davis Mine, N. Groton.

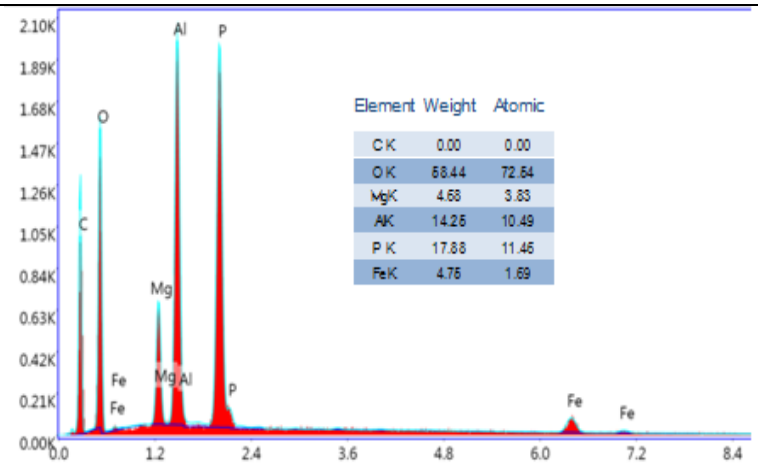

Figure 12: EDS analysis of a Janet Cares Charles Davis Mine specimen.

The chemistry calculated from this analysis is: $(Mg_{0.85},Fe_{0.16})_{\Sigma 1.01}Al_{2.1}(PO_4)_2O_{24}$,
normalized for two P. This is a very satisfying analysis with Mg + Fe essentially one, and both Al and P equal to two. As typical with our BC analyses, the oxygen is substantially over-stated.

An analysis of a self-collected lazulite from the Chandlers Mill Mine in Newport was confirmed by EDS analysis. Figures 13 and 14. I was somewhat surprised by the result, expecting the deep blue color to analyze as another scorzalite. The actual Mg content is higher than the plot would suggest because the response of this EDS detector is low for lighter elements. (In his review of this article, Jim Nizamoff cautioned that color is not a valid discriminator of lazulite vs. scorzalite, citing the deep blue lazulites from Rapid Creek, Yukon as an example.)

Figure 13: Lazulite, 5 cm specimen. TM #1844 Chandlers Mill Mine, Newport

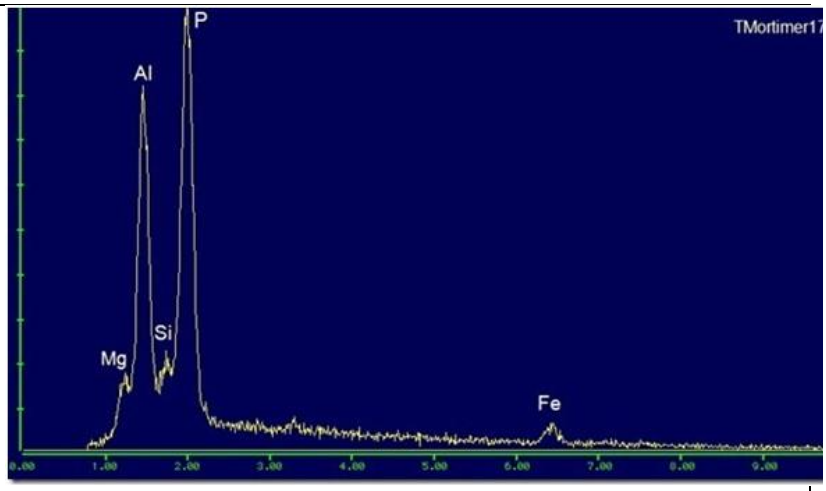

Figure 14: EDS analysis of Chandler Mills specimen #1844.

Figure 15: Scorzalite – visual ID. 5 cm specimen Keyes Mines, Orange. Collected by Curt Segeler.

Figure 16: Tom & son Kevin at Keyes #1 (I had to fill this space with something !)