

Habit Variations in Palermo Mine Goyazite

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The secondary phosphate, goyazite, $\text{SrAl}_3(\text{PO}_4)_2(\text{OH}, \text{H}_2\text{O})_6$, is somewhat uncommon at the Palermo #1 Mine, N. Groton, NH. Four different goyazite habits, or types, are illustrated in *The Pegmatite Mines Known as Palermo* by Whitmore and Lawrence, (2004). The most easily recognized form is “Type 2”, the pseudocubic habit. Type 2 crystals typically range in size from a few tenths of a millimeter to several millimeters. Exceptional ones may reach 20 mm. Figures 1, 2, 3, and 4 illustrate this form. An interesting characteristic of some of these type 2 pseudocubes is the brilliant white reflection observed when the incident light is at a critical angle. This is illustrated in Figures 3 and 4, the same cluster at two different incident light angles.



Figure 1
Type 2 goyazite. Largest crystal is 0.7 mm



Figure 2
Type 2 goyazite, 1.7 mm zoned (phantom) crystal



Figure 3
Type 2 goyazite. 1.7 mm field of view

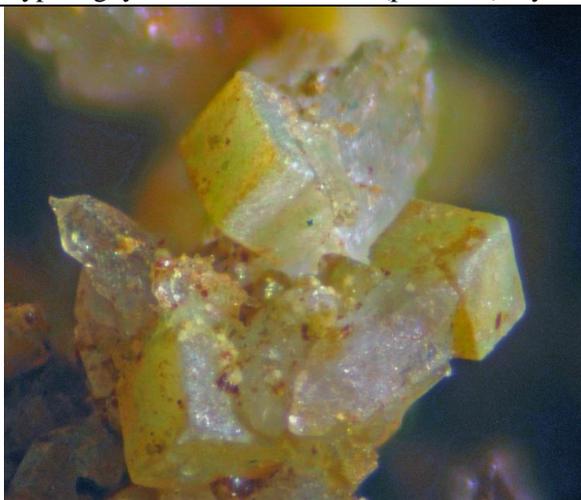


Figure 4 Alternate lighting angle
Type 2 goyazite. 1.7 mm field of view

Perhaps the second most common habit is type 4. These are “Spheres or thin plates, sometimes called potato chip goyazite” per Whitmore and Lawrence. Figures 5 and 6 illustrate this form.



Figure 5 A Bob Janules specimen
Type 4 goyazite. 5 mm field of view.



Figure 6 A Bob Janules specimen
Type 4 goyazite with quartz. 3 mm field of view.

Figures 7 and 8 illustrate goyazite type 3. These may be described as spiky balls of steep rhombohedral crystals. These images are an excellent match for the illustration on page 129 of the Whitmore and Lawrence (W&L) book.

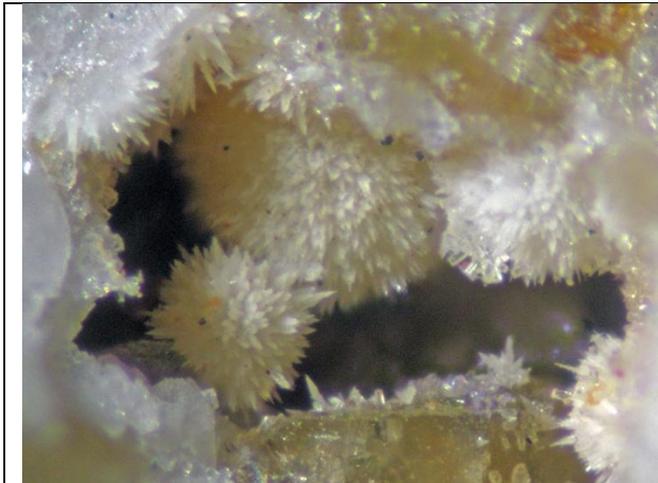


Figure 7
Type 3 goyazite. 2.5 mm field of view

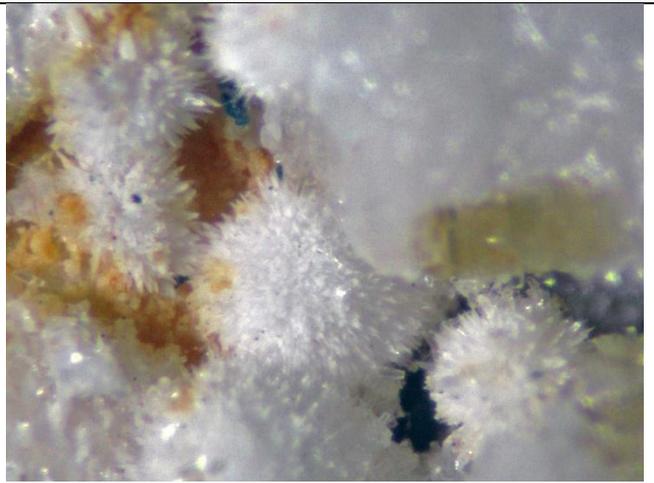


Figure 8
Type 3 goyazite. 2 mm field of view.

The rarest form is type 1, translucent, star-shaped, crystals. For this article, the author was unable to locate a matching example of the type 1 form illustrated on W&L page 130, (despite contacting several long-time Palermo collectors). MMNE member Bob Janules provided the closest approximation, shown in figure 10.



Figure 9 Illustration sketch
© Fredrick Wilda, with permission
Type 1 goyazite. 0.5 mm star crystals



Figure 10
A Bob Janules specimen & photo
Type 1 goyazite. 7 mm field of view.

An additional goyazite type observed by the author and MMNE member Bob Wilken (and perhaps others) is shown in figure 11. Bob coined the term “fluffy balls” for these composite petal rosettes. These were recently identified as goyazite by a qualitative EDS analysis. Significantly diagnostic is the strong strontium (Sr) peak. Sr is an essential element for the goyazite chemistry. The small Ca and Ba peaks are likely due to minor impurities. Analyses of several similar specimens with this form might reveal whether these impurities bias the crystal shape to this habit. These rosettes may be confused with the similar appearing (and much rarer) foggite species. However the individual blades of the foggite rosettes have a square termination.

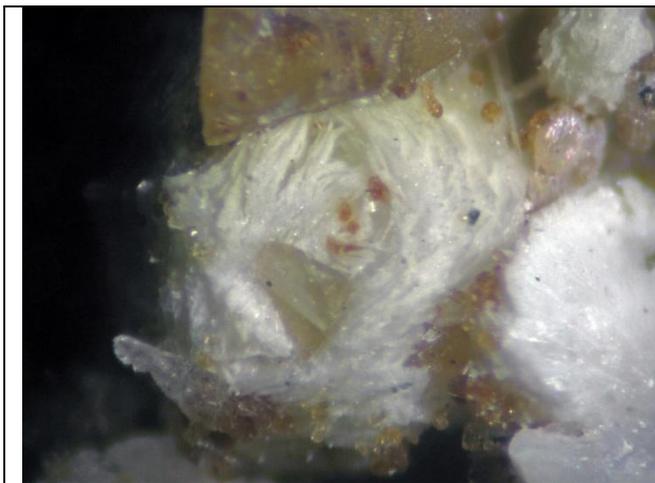


Figure 11
“Fluffy” goyazite. 1 mm rosette of crystals.

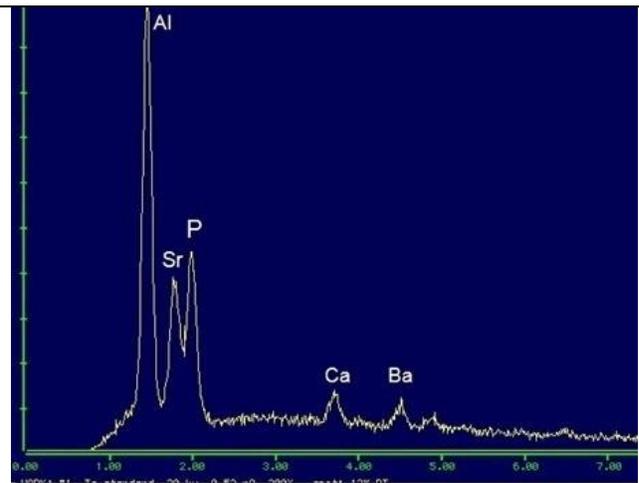


Figure 12
“Fluffy” goyazite. Qualitative EDS spectrum

In summary, the habit variety of the goyazite species can provide a challenge for the micro mineral collector. However, this variety also provides an opportunity to seek an example of all goyazite types. Higher resolution views of these article images, as well as many additional photos of goyazite from Palermo and other New Hampshire localities may be viewed at: <http://mindatnh.org/Goyazite%20Gallery.html> .