The Care and Feeding of Your Benitoite Specimen
Helpful Etching Techniques

Rick

Background

Geology (reprinted from the 1977 California issue of The Mineralogical Record)

"The Benitoite Gem Mine is located at the southern end or the Diablo Range, a belt of mountains along the west side of California's San Joaquin Valley. The range is built of rocks of the Jurassic Franciscan Formation (graywacke, shale, chert and basalt) and serpentine with Cretaceous and Tertiary sandstones. Throughout much of the range the Franciscan rocks are metamorphosed to high pressure, low temperature mineral assemblages which include jadeite, lawsonite, glaucophane and aragonite. The Franciscan rocks are intimately associated with serpentine. Moreover, these rocks have been repeatedly deformed since the Jurassic Period, so that the units have locally been broken and intermixed. One of the largest blocks of serpentine in the Diablo Range occurs in the New Idria District. Within its 13 mile length are several slabs of metamorphosed Franciscan rocks up to a half mile long.

29% solution muriatic acid to 1

During the time that the New Idria serpentine block has been in place there have been periods during which solutions percolated through the fracture systems. These fluids have brought about emplacement of cinnabar and metacinnabar at New dria, altered serpentine to calc-silicate assemblages (these include melanite and topazolite garnet,diopside and vesuvianite), reacted with serpentine to form coalingite and artinite and altered some of the Franciscan blocks. The Benitoite Gem Mine is located in one of these blocks. In a representative cross section through the block in which the veins contain benitoite, neptunite and other minerals, the block will be composed of greenstone (metamorphosed graywacke) and blue-schist (metamorphosed basalt). Veins occur in a brecciated zone in the schist, which is composed largely of albite, crossite and epidote. The schist was not only crushed, but was converted in many places to soft, felted masses of actinolite or crossite fibers. Benitoite, neptunite, joaquinite and the other minerals formed in the cavities and filled pore spaces in felted amphibole. The crystals that grew in the cavities are well formed with the

characteristic colors associated with the minerals, while those that included crossite or actinolite have a dull, porous appearance with their colors tinted by the amphibole. Other minerals that formed at about the same time include albite, apatite, jonesite and the copper sulfides djurleite and digenite. At a later stage natrolite partially to completely coated the earlier formed minerals and filled much of the remaining pore spaces in the crossite rock."

Benitoite is the only mineral that crystallizes in the trigonal bipyramidal form. It is a lovely blue-purple color and is a beautiful and valuable gemstone.
Neptunite is a rare mineral, only found in a few other places in the world, it is a very very deep red that appears as black. The form and luster from this locality makes it the best in the world.
Joaquinite was first discovered at the Benitoite Gem Mine and remains a rare mineral. Careful etching will help you save those Joaquinites that you would otherwise wash right off of your specimen
Jonesite is extremely rare, even at the Benitoite Gem Mine, the only place it has been found.

What is etching?

As stated above, natrolite was the last mineral to form at the deposit and it coated all of the minerals of interest from that deposit. In order to enjoy the minerals below, the natrolite must be removed so as to expose the crystals of benitoite, etc. I hope to show techniques that will give all a better understanding of the material as well as the ability to get the best specimen possible out of your piece of rough.

Getting Started

The person getting started will need these basic items: Muriatic acid, one or several plastic containers (Tupperware works very well for this), rubber gloves (latex gloves will react to the acid, so use the heavy duty yellow 'Mr. Clean' gloves), toothbrushes, paraffin, a sharp instrument (dental pick), hammer and chisel for trimming, lye (Lewis Red Devil drain cleaner is great), an outdoor (camping) stove and an artist's brush or two. For more advanced work, the following items have proved most helpful: Watergun, Dop waxer, Zuber mineral trimmer, an ultrasonic cleaner, trim saw, hand grinding unit(Foredom or Dremel).

Selecting a specimen

When looking to purchase a collection, buying mine run material or just going through your stash to see which piece to work on next, here are a couple of tips as to what to look for:

1. A nice thick blanket of natrolite
2. Signs of mineralization around the edges
3. Lumps in the natrolite
4. Certain types of matrix
5. Depositional direction

Etching your Benitoite

The first step is to wash the specimen as thoroughly as possible before the first acid bath, the water gun can be very helpful in that regard. After the specimen has been washed, it goes in a container of water that you add enough acid to create a solution no stronger than 10% acid to water. Let the solution sit from 4 – 24 hours, dump the acid and wash the specimen in clean water. At this point, go over the specimen very carefully and determine where you need to add paraffin to keep the acid from etching. Use the artists brush to paint the areas you need to coat. Make sure the wax is very hot as it adheres to the surface and fills gaps better that way. Repeat this process of changing the acid and cleaning the specimen until you are done. You may wish to melt off all of the paraffin a couple of time during this process in order to more accurately check your progress. When in doubt, be conservative. You can always remove more natrolite, you can't add any! A couple of notes, the warmer the acid is, the faster it works. The warmer the paraffin is, the faster it falls off! Room temparature is best! All of the advanced techniques can be incorporated into this simple routine. In shaping a specimen, trim saw, grinding tools and trimming by Zuber or hammer can be done at any time. I prefer to do as many of these things as early in the process as possible so I can use the acid to cover or fix any of the marks I make on the specimen.

Finishing off the Specimen – The Final Rinse

Now that you have etched your specimen as far as you want to go, it is time to finish it off. Remember that you have been soaking it in a fairly concentrated acid, washing it in clean water does not remove all of the residue and your specimen will turn yellow over time if not finished off

properly. You also want to melt the paraffin off in the process, here is how you do it: Needed is one porcelain pot and the Lewis Red Devil drain cleaner (pure NaOH). Put your specimens, water and lye in the pot and heat to a near boil. Once the solution gets to that temperature, turn off the heat and let it sit until it has cooled down to near room temperature. Then you will wash the specimens in clean water and let them sit to dry. If you have an ultrasonic cleaner, that is the best last step, but be forewarned, many of these crystals have fractures which could break in an ultrasonic cleaner... Be Careful!!

Frequently Asked Questions

Q. Should this process be done indoors?
R. No, you are working with strong chemicals here. Out in the open air is the best place

Q. How do I dispose of these chemicals?
R. The nice thing about using Muriatic acid (HCl) and lye (NaOH) is that they cancel each other out to form NaCl (salt) and H2O (water), so I keep my waste acidy water in a five gallon bucket and add lye when it is time to dispose of it.

Q. Where to purchase materials?
R. I have had my best luck at Orchard Supply for acid, lye, paraffin, gloves and the like. For some of the more heavy equipment I have purchased items from Dave Shannon Minerals (Ultrasonic cleaner and Zuber) and KQ Minerals (Water Gun). Mine run unetched specimens are now being offered by Steve Perry Minerals and Trinity Mineral Company

Q. What is that jelly-like gook and how does that form?
R. That stuff is a precipitate indicating that the solution is too rich in silica. It happens for two reasons: Too much acid in the mix or too long between cleanings. The precipitate coats the natrolite and slows down the etching process. It is a BAD thing!

Q. I have a specimen that has yellow all over the natrolite, is this fixable?
R. Yes, if there is enough natrolite, a quick soak in the acid and proper finishing technique should do wonders for that yellow rock!

Additional Items

Buying and selling – How to evaluate value.

Most specimens have damage to some of the crystals, saw marks, or poor aesthetics. It is the nature of the material, so always remember that a perfect, undamaged specimen will sell at a premium five to ten times what a similar, damaged piece would sell for. I use certain dealers as my standards, "What would XXXX price this piece at?" But in the end, you have to remember that these are objects of nature's art more than a straight commodity and that different people can put wildly different values on the same specimen.

Facet Rough and Gemstones

Benitoite is a very valuable gemstone. To many people that rationalizes their destruction of a great specimen to get any gemstone. Realistically, you have to determine your philosophy before you start looking at the specimens. For my part, I will not cut an undamaged crystal or break apart a great specimen. If there is damage, then it is fair game! When having Benitoite cut to resell, it is always best to go with a smaller stone if it will be clean. Again, as with the specimens, for your own personal use, whatever you want is right! Expect to get a yield of anywhere between 15% - 30%. Occasionally, you get lucky. I have had cutters get yields of 48% and 55% on clean stones, but I never expect it.