Gary Green, Analysis by Reflectance Infrared Spectroscopy, Rev 2

Donald Kasper 7-27-2020

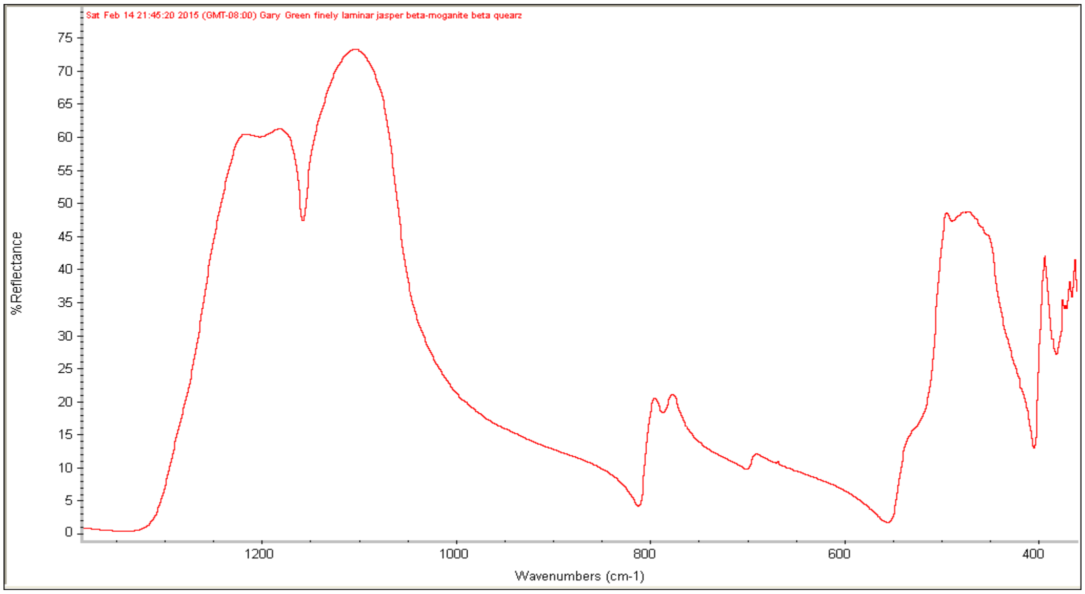
dtkasper@yahoo.com/donaldkasper.com

Gary green labelled green banded samples from several miners including Dale Huett, is a finely welded, laminar and granular volcanic tuff colorized green by the presence of celadonite clay. It also contains some boudin structures which are included elliptical tuffaceous stones indicative of pyroclastic flow. There are self-contained structures, but they commonly are found in fused masses leading to a lobate-merged orbicular glass structure linked to all worldwide sites by the author's infrared study to the presence of beta-moganite.

Subject to more discussion, advances in infrared understanding by the author allows identification of quartz, beta-quartz (a residue), and beta-moganite in this material as shown below. All silica species and glasses, in all forms (low temperature alpha and high temperature beta) silica can be identified clearly with infrared spectroscopy, but this technology is not part of widely circulating general literature. Mixed mineral species specimens commonly occur. Very typically, they are all found with quartz, except for the glass rocks. Beta-moganite forms at 354C, and beta-quartz at 575C. This mineralization is typical in siliceous volcanic rocks that includes hydrothermal mounds, vents, and sulfide chimneys. This is important as the range of temperature for rhyolite glass behavior is bracketed between these two temperatures, and with moderate pressure and water is a supercritical fluid state, a state of "water" where there is no surface tension and very high solubility of silica is possible.

Beta-moganite and beta-quartz are not found in low temperature rocks such as sedimentary silica rocks (sandstones, etc.). The dominant spectral graph below is quartz. The right cutoff is due to beta-moganite around the 475 cm^{-1} region, studied in collaboration with Dr. George Rossman at Caltech in the Planetary Science and the Mineralogy Chair there, calibrated to Raman spectroscopy, the instrument with which moganite is defined. This is distinct from alpha-moganite that forms a peak at the trough around 555 cm^{-1}. Typically, the two spectral band structures are conflated, confused, and merged together in science discussions due in large part to undersampling and misunderstanding of how moganite, an optical-slow silica, behaves in infrared relative to quartz, an optical-fast silica. There are, in fact, other optical slow silica species such as quartzine, which is distinct from moganite, produces its own spectral features, but confounds scientists when it forms with moganite and the two sets of spectral features occur together. Then here again, the two get confused from undersampling and overgeneralization in science studies and their published work products.

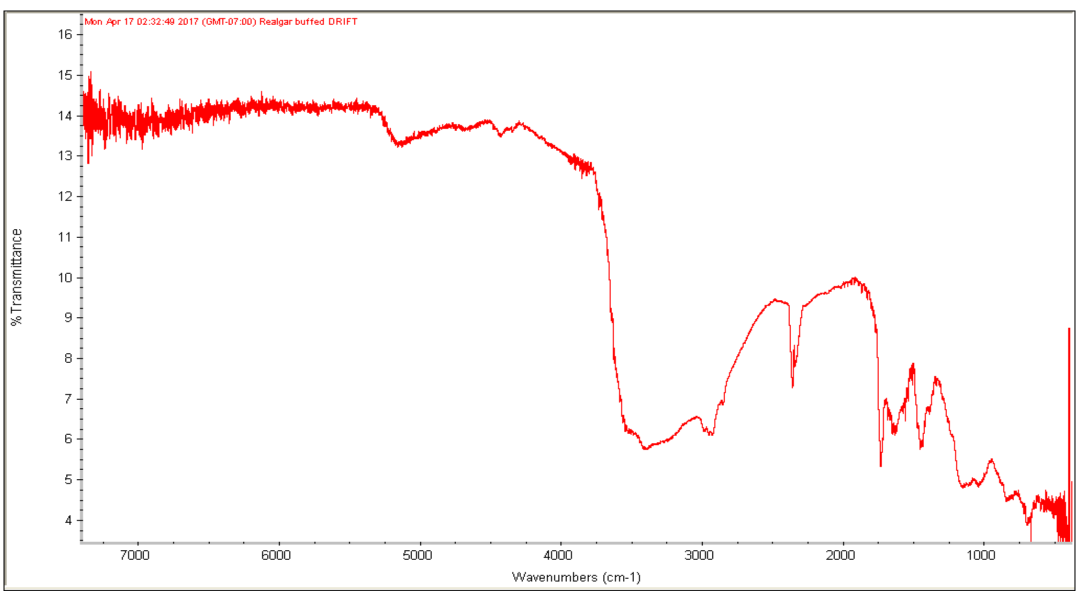
High temperature alteration is indicated in infrared with a number of spectral bands for high temperature host silica, such as the 3737 cm^{-1} and 3585 cm^{-1} water bands. Neither is present in the Gary Green claim mineralization. There is no sericite alteration indicative of hydrothermal intrusion. The Gary Green rocks are post-genetically altered at very low temperature with 3000-2000 cm^{-1} bands indicative of caliche (hard water scale). The deposit is not associated with high sulfide mineralization content such as in a volcanogenic massive sulfide vents.



Gary Green with quartz, some relict beta-quartz, and beta-moganite. All occurrences of beta-quartz, quartzine, and both moganites occur in alpha-quartz, the low temperature quartz form.

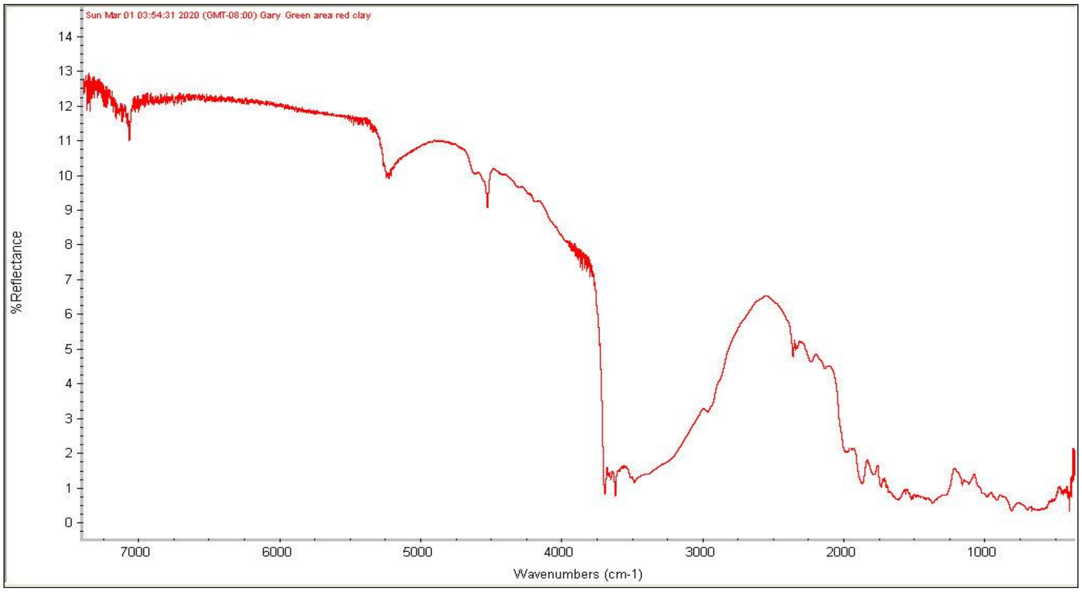
In terms of red mineralization speculated to be cinnabar in Gary Green:

The spectral graph below of a realgar specimen shows 4432 cm^{-1} water bands that stand out. They are mineralogically bound water meaning, the water is in the crystal structure. Other rolling troughs are free water that do not identify the mineral they are found in. Generally, phyllosilicates (clays) vibrate in this region, so confusing it with other minerals would not be easy. The phyllosilicates are at exact band positions not seen here. Water in infrared is probably sensitive down to just a few tens of parts-per-million and can show minerals that are sometimes not evident in the mid-infrared region compositionally based peaks when those peaks are overwhelmed with quartz peaks. DRIFT here means diffuse reflectance infrared spectroscopy. This is an optical setup to handle rough specimens with a lot of infrared signal scatter. Very deep weathering profiles produce the 1732 cm^{-1} trough shown in this specimen. It is not present in Gary Green.



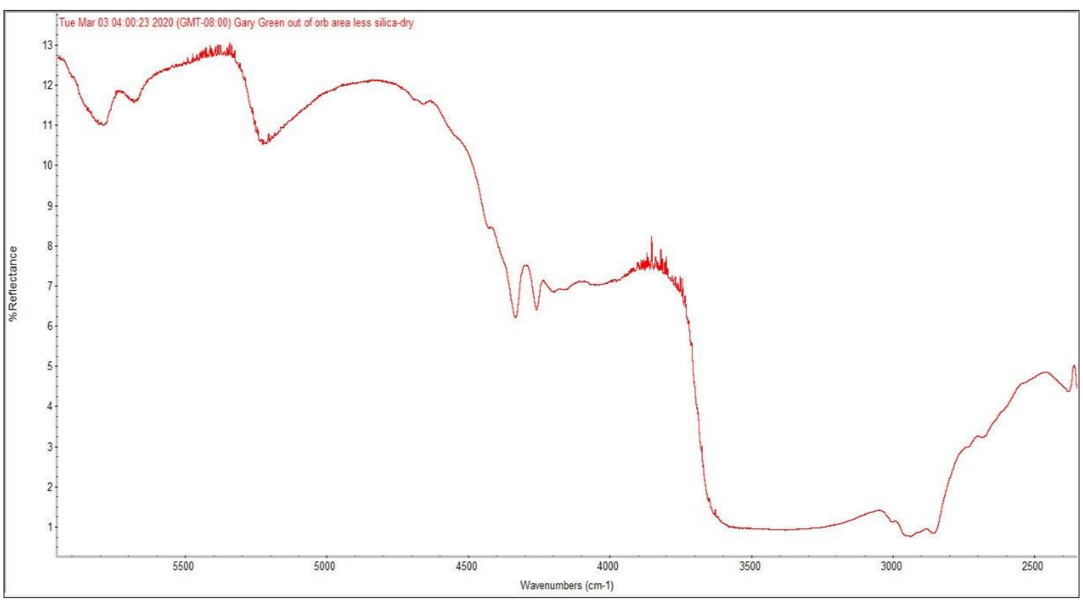
Water bands for realgar in the 4400 cm^{-1} region. Nothing similar is indicated in Gary Green mineralization.

Red areas of Gary Green have kaolinite clay as identified in its unique water bands signatures as shown below.



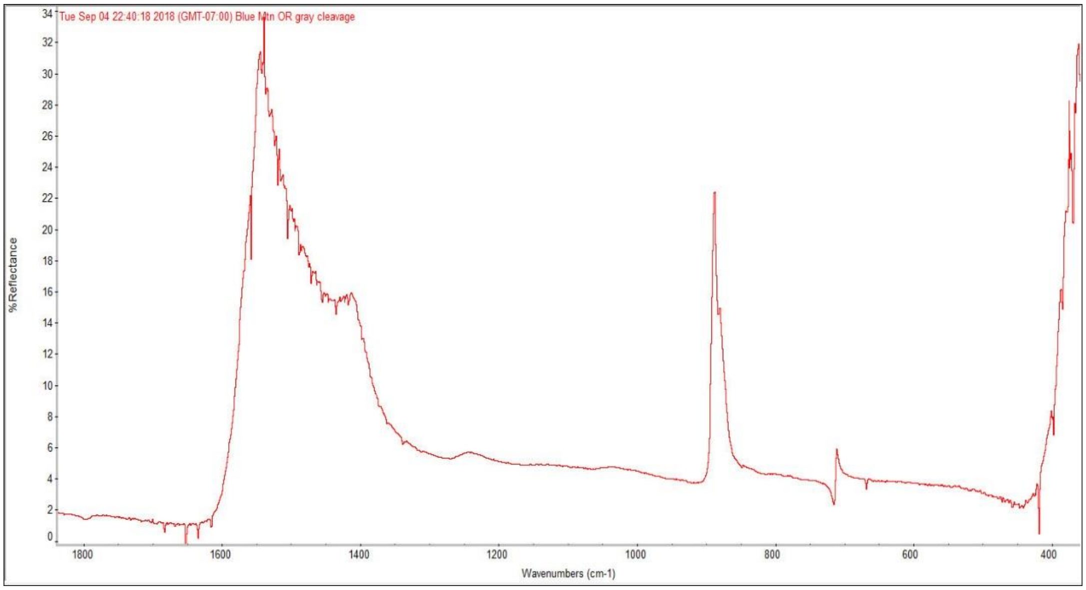
Water bands for kaolinite. The doublet spike on the far left and doublet spike around 4545 cm^{-1} are diagnostic. The two spike troughs in the 3600 cm^{-1} region only occur for kaolinite group clays. Kaolinite forms in wet climates very slowly over the course of a geologic age—tens of millions of years.

The chalky green areas have less quartz, so the celadonite shows up well there for water bands as shown below.



Water bands for celadonite. The doublet on the far left and doublet around 4331 cm^{-1} are diagnostic.

Does the site have marine influence? This can be indicated with salt, which produces just one peak in the 1240 cm^{-1} region. This shows up as a small roll particularly scanning carbonate inclusions such as calcite in the orbicular green jasper of Blue Mtn., OR shown below. With quartz, the peak is so pronounced, seeing the salt band is not possible. It is not seen in Gary Green infrared scans, but this may be from quartz interference. McDermitt chert with caliche, scanned on the caliche coating does show mainly calcite, with barite, halite, and quartz.



Blue Mtn., OR orbicular jasper with a spectral graph of a calcite inclusion with a 1240 cm^{-1} halite (salt) roll. Halite is not a general weathering mineral, so does not typically occur with caliche. Halite with agates and jaspers is very uncommon.

Gary Green Infrared Study Conclusions:

There is no evidence of host rock alteration from hydrothermal intrusion, which is readily detectable in infrared. The fine laminar layering in the material is from micron silica particulate settling and plastic state flow along with pyrite and other debris and trace minerals below infrared detection. Red staining of the rock is from pyrite oxidation to iron compounds. Unconsolidated ash flows elsewhere in the area are going to be bentonite clay, formed more recently in arid conditions. Kaolinite presence typically shows a very old rock occurrence, meaning hundreds of millions of years. The rock is typical pyroclastic material with beta-moganite and some beta-quartz found in infrared using specific marker bands. Beta-moganite is supercritical fluid rock evolution, which is found in all fused-lobate (orbicular) pyroclastic rocks around the world, including the Gary Green site. This means it the orbs are formed as a glass state structure. So far, there are no exceptions to the correlation of orbicular, fused jaspers and the candidate beta-moganite.

Does Gary Green have any cell structure to indicate the presence of petrified wood? No, the banding is granular quartz, which does not occur in petrified woods.

Does Gary Green have any oceanic influence? Salt produces a 1240 cm^{-1} spectral band whose residue is found in some quartz petrified woods and even agate sites in the Western US, but is not in Gary Green samples so far. Nearby cherts have salt.

Does Gary Green have celadonite? Yes, it is found as celadonite water whose main spectral bands elsewhere are overwhelmed with quartz. Celadonite is a volcanic clay not formed by weathering. It gives Gary Green its green color.

Do petrified woods contain celadonite? Yes, all the time, commonly in replacement woods meaning almost none to none of the cell structure remains. These are rich in beta-moganite. Petrified woods only form in pyroclastic flows, and those flows will have celadonite much of the time. The granular bands and all of the shearing offsets and pinchouts of those bands do not occur in petrified woods.