New Hampshire Titanite Color Variations - Tom Mortimer

An article on the color variations in titanite by Bill Shelton in the Jan. 2013 issue of *Mineral News* got me thinking about the color range of New Hampshire titanite. As it often occurs in sharp, lustrous, crystals, titanite is a sought after species by many micro-mineral collectors. I have micro titanite specimens from ten New Hampshire localities. And, since titanite is a frequent component of many NH bedrock environments, I likely have just "scratched the surface" of the many collecting possibilities.

While the mineral chemistry for titanite is $CaTi(SiO_4)$, Bill's article notes "Mn and REE may replace [some] Ca while Al, Fe, Cr and V may replace Ti. O may be replaced by OH, F, or Cl, but charge adjustments [for these] are required elsewhere." The article suggests these elemental substitutions are responsible for the observed color variations.

In New Hampshire, the most common titanite color I have seen is pale-yellow to yellow-brown, Figures 1 – 4. The table in Bill Shelton's article suggests this coloration may be attributed to some iron substitution for calcium.

Figure 1
Titanite Joppa Hill, Bedford, NH
2.5 mm titanite crystal with diopside

Figure 2
Titanite Rt. 101 -101A Rd Cut, Amherst, NH
1 mm group of tan titanite crystals

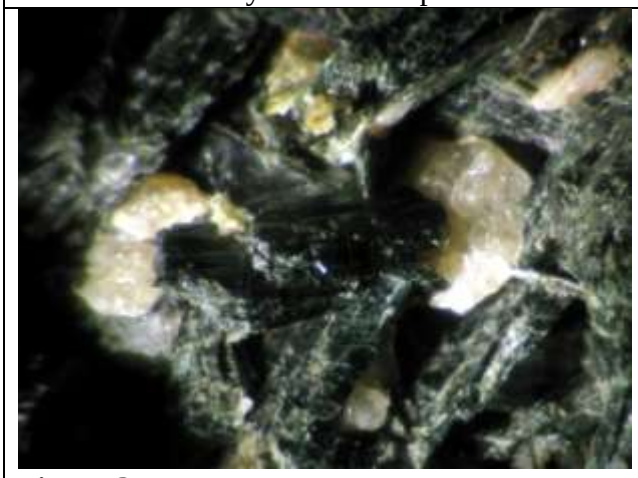

Figure 3
Titanite Mist Hill power line locale, Warren, NH
Titanite crystals to 2 mm in bladed ferrohornblende.

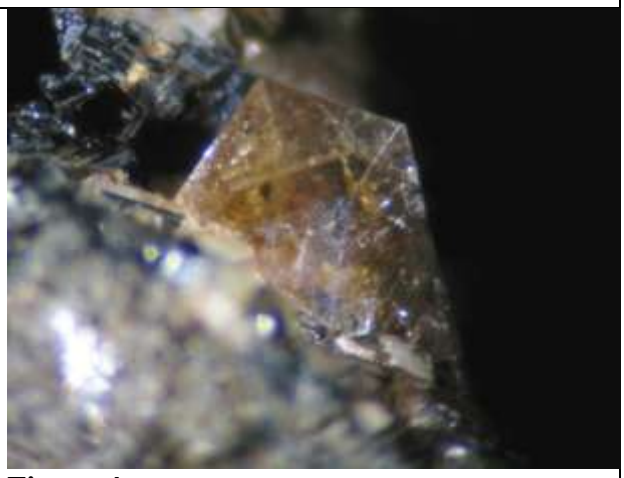

Figure 4
Titanite Ellacoya Locale, Alton, NH
2 mm titanite crystal

Titanite from Wheeler Mtn., Winchester, NH tends to a more yellow-green hue, Figures 5 & 6. The article table suggests the green tint is also due to an iron chromophore. The titanite crystal in Figure 5 is believed to be the largest one known from New Hampshire.

Figure 5
Titanite Wheeler Mtn. Winchester, NH
2.2 cm fishtail twin Titanite crystal on 3.7 cm specimen

Figure 6
Titanite Wheeler Mtn. Winchester, NH
5 mm pale yellow-green titanite crystal, no matrix.

At Red Hill, Moultonborough, NH, I have found striking red-orange titanite micro-crystals, Figure 7. Per Shelton, a red bias coloration is thought due to the inclusion of some manganese and perhaps a REE component. Although I have not had these red-orange Red Hill titanites analyzed, I did have a Red Hill lemon-yellow one checked by EDS (as part of my search for the rare mineral wohlerite reported from there). This titanite showed small amounts of Al, Fe and the REE Nb.

Figure 7
Titanite Red Hill, Moultonborough, NH
2 mm orange titanite crystal on hastingsite

Blue titanite micro-crystals were collected by MMNE member Gene Bearss from the Government Pit, Albany, NH in the 1970's, Figure 8. The coloring element for the blue hue is likely Y or Ce.

Figure 8
Titanite Government Pit, Albany, NH
0.6 mm blue titanite crystal

Moat Mtn. has also yielded some milky to pale-gray complex titanite crystal groups collected by MMNE member Bob Janules, Figures 9 & 10. An EDS analysis of these gray titanites showed small amounts of Nb, Al and Fe. Bill Shelton postulated that gray to colorless titanite may be due to an absence of chromophores or, more likely here, a multiple chromophore presence.

Figure 9
Titanite Eastman diggings, Moat Mtn. Hale's Location, NH. Pair of tan clusters of titanite crystals on mica. Largest cluster is 1.2 mm.

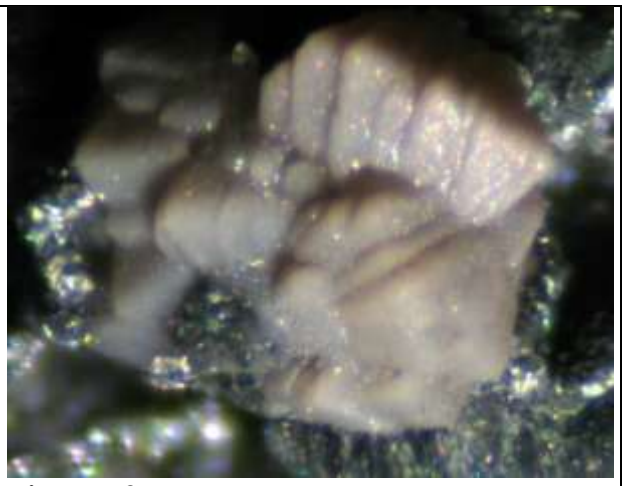

Figure 10
Titanite Eastman diggings, Moat Mtn. Hale's Location, NH.
0.8 mm tan cluster of titanite crystals.