Orange Lizardite from South Africa

Lizardite, $Mg_3(Si_2O_5)(OH)_4$, is a member of the kaolinite-serpentine group, and is probably the most common serpentine mineral. It has a Mohs hardness of 2–3, and is noticeably softer than antigorite and harder than chrysotile (Gaines et al., 1997). It is commonly green to yellow-green, bluish green, or nearly black, and rarely yellow or white. It was a surprise, therefore, to encounter faceted bright orange stones sold as 'lizardite' at the 2014 Tucson gem shows. The material was offered by Mauro Pantò (The Beauty in the Rocks, Laigueglia, Italy), who had two varieties: pure lizardite (Figure 4) and lizardite-included quartz (Figure 5). Pantò obtained the rough material at the February 2012 Tucson gem shows, in a parcel mixed with sugilite reportedly from the Wessels mine in South Africa. Although the orange stones in the parcel were sold to him as bustamite, an X-ray diffraction (XRD) analysis performed by John Attard (Attard's Minerals, San Diego, California, USA) showed that the material was actually lizardite.

Pantò reported that most of the rough lizardite was opaque with rare translucent areas. From the most saturated rough material, he had approximately 40 stones cut between 0.5 and 2 ct. In addition, from rough pieces of lizardite-included quartz he had around 20 stones cut, ranging from 0.80 to 1 ct. He donated to Gem-A one faceted lizardite (1.10 ct) and one faceted lizardite-included quartz (3.33 ct), and these were sent to one of the authors (GRR) to confirm the identity of the material and investigate the cause of its orange colour.

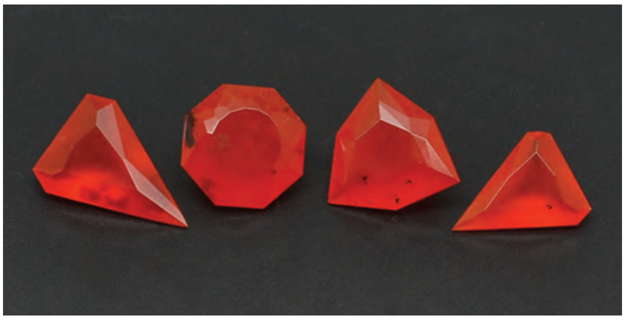

Figure 4: These translucent orange stones (0.80–1.88 ct) proved to be lizardite that is coloured by hematite micro-inclusions. Photo by Mauro Pantò.

Figure 5: These lizardite-included quartz specimens range from 1.87 to 3.33 ct. Photo by Mauro Pantò.

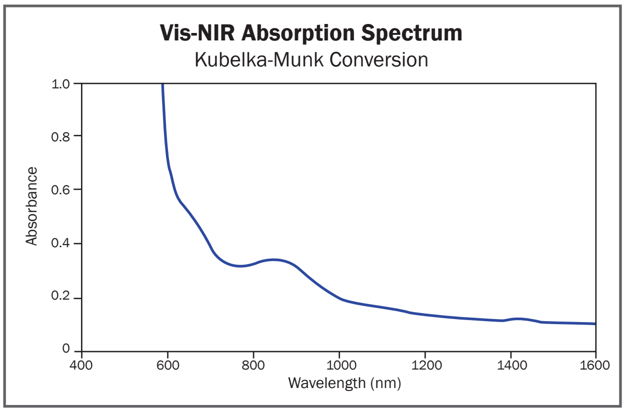

Figure 6: Vis-NIR spectroscopy of the orange lizardite gave a reflectance pattern typical of hematite. A Kubelka-Munk transformation of the reflectance pattern yields an absorption spectrum that is also characteristic of hematite.

Raman spectroscopy was performed on both samples, and the results were compared to data reported by Rinaudo et al. (2003). The spectrum of the 'lizardite' sample was a much closer match to lizardite than to antigorite, with the strongest peaks located at 688.7, 385.9 and 235.4 cm^{-1}. The 'lizardite-included quartz' sample was confirmed as quartz with weak, noisy features consistent with lizardite. Vis-NIR spectroscopy of this sample gave an excellent reflectance pattern for hematite (cf. Scheinost et al., 1998), with features at ~870 and ~680 nm (and saturation below 600 nm), as well as an OH band near 1400 nm that would be expected from lizardite. Following a Kubelka-Munk transformation, the data resemble an absorption spectrum that is typical of hematite (Figure 6). A similar spectrum was obtained from the 'lizardite' sample, although the transmission pattern was of lower quality, apparently due to the presence of black impurities in the stone. Still, the pattern indicated that hematite is the cause of colour. The hematite is apparently present as micro-inclusions within the lizardite.

To confirm the identity of the 'lizardite' sample that was used for the analyses described above, a small portion of it was sent to Attard for XRD analysis. The pattern matched lizardite, with a minor amount of garnet (probably andradite). Although hematite was not detected in the XRD pattern, this technique does not detect admixtures of minerals present at low concentrations, and only trace amounts of hematite would be needed to impart the orange coloration exhibited by this material.

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Large Faceted Quartz from Arkansas, USA

The McEarl mine in Garland County, Arkansas, is located within the Blue Springs area, which is famous for producing some of the world's finest quartz crystals. The deposits are hosted by the Blakely sandstone (Engel, 1951), and there are 10 mines in the area, two of which are currently active. Avant Mining LLC is the largest landholder in the district, and owns five mines on approximately 150 acres. Avant acquired a 50 acre portion of the McEarl mine (Figure 7) from Weyerhaeuser Co. in 2010, and has been developing the property since 2011.

The McEarl mine was first opened in 1940 and operated until 1943 by the Diamond Drill Carbon Co. of New York City, to explore for optically clear quartz suitable for use as radio frequency oscillators. Mini McEarl then owned the property from 1943 until 1981, when she sold the mine to Jimmy Coleman. (The well-known Coleman mine is located only 1 km from the McEarl property.) The last major McEarl find occurred in 1986–1987, when Coleman encountered a large pocket at the property's boundary (marked by the line of trees on the right side of Figure 7).

Figure 7: The McEarl mine is currently worked as an open pit with a trackhoe and dump truck. Photo by J. Zigras.