

Peridot-Polymer Composite

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Composites assembled from opaque-to-translucent gem materials such as turquoise, chalcedony, opal and chrysocolla have become popular during the past few years, as evidenced by the number of samples received for identification at the Gem Testing Laboratory in Jaipur, India. We recently examined a translucent yellowish green, round faceted bead (Figure 1) that turned out to be a composite gem featuring peridot.



Figure 1: This 3.25 ct bead turned out to be a composite, made up of pieces of peridot embedded in a polymer matrix.

The bead weighed 3.25 ct and measured 9.09 x 8.91 x 5.36 mm. At first glance, it appeared to be peridot due to its typical colour. However, microscopic observation revealed numerous gas bubbles, which made us think otherwise. Further examination showed that the bead was actually composed of several pieces of yellowish green material that were embedded in a pale yellow matrix containing gas bubbles (Figure 2). This was further confirmed by the difference in surface lustre of the two materials when viewed with reflected light. The individual pieces were transparent with curved and smooth surfaces; although a few of them contained fractures, the majority was free from inclusions. Looking closely through the individual pieces, doubling of the gas bubbles within the polymer matrix was visible (Figure 3).

Although it was obvious that the bead was a composite, its major component had yet to be identified. A spot RI of ~ 1.67 was obtained with distinct birefringence blink, as expected for the doubling mentioned above. When exposed to long- and short-wave UV radiation the bead remained largely inert, except for a weak whitish glow overall. The desk-model spectroscope revealed three bands in the blue-green region at $\sim 450, 470$ and 490 nm, and these also were recorded with UV-

Vis-NIR spectroscopy. These properties suggested the yellowish green pieces composing the bead were peridot. Raman spectroscopy confirmed they were peridot and that the matrix was a polymer.



Figure 2: The bead in Figure 1 consisted of several pieces of yellowish green peridot embedded in a pale yellow polymer matrix. Note the presence of gas bubbles confined to the interstitial polymer areas. Magnified 24x.

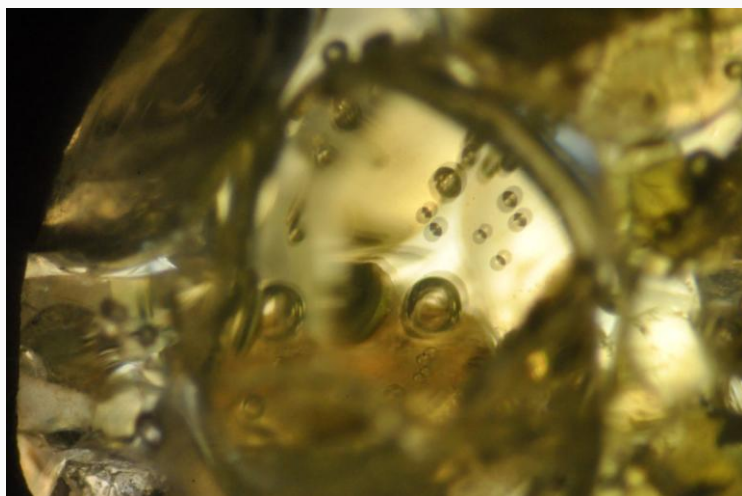


Figure 3: When viewed through the individual pieces of peridot, doubling of gas bubbles within the polymer matrix was visible. Magnified 48x.

The identification of this bead as a composite was straightforward, and determining the identity of its components was relatively simple using basic gemmological tools. The use of peridot for such a composite is surprising.

All photographs by Gagan Choudhary

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