UV-Vis-NIR spectroscopy showed absorption bands at 403, 444, 574, 617, 854, and 1170 nm, which can be assigned to spin-forbidden crystal-field transition of Fe^{3+}, substituted on the octahedral Al^{3+} site of the garnet structure. Our EPMA analyses of garnet generally indicated the presence of some divalent iron. The spectra showed absorption bands in the 900–1000 nm and 1150–1250 nm ranges, which are assigned to Fe^{2+}, and corresponding absorption features were observed at about 860 and 1170 nm. The simultaneous presence of both Fe^{3+} and Fe^{2+} means that intervalence charge transfer is possible (in accordance with A.S. Marfunin, *Advanced Mineralogy*, Vol. 2, Springer-Verlag, Berlin, 1995, pp. 113–114), and the 574 nm band is therefore assigned to an $Fe^{2+} \rightarrow Fe^{3+}$ intervalence charge transfer band. The typical absorption bands of Cr^{3+} in the visible region between 630 and 690 nm are absent, consistent with the EPMA results. Our investigations have also shown that some demantoid garnets from Russia do not show any chromium absorption, and their color is due to the presence of Fe^{3+} alone.

The color measuring system of the International Commission of Illumination (ICI) has been found useful for describing the color characteristics of minerals (K. Langer et al., "Optical absorption spectroscopy," in A.S. Marfunin, Ed., *Advanced Mineralogy*, Vol. 2, Springer-Verlag, Berlin, 1995, pp. 119–122). The color of a mineral is assigned to a point in the x-y coordinates of the ICI color chart. Special computer programs are used to calculate the color parameters (x-y coordinates, λ—dominant wavelength, P—saturation or purity, Y—lightness) of a mineral directly from the measured optical absorption spectrum. The dominant wavelength λ, or hue, is the human eye's psycho-sensory interpretation of wavelengths that are identified by the x-y coordinates of the ICI color chart. Preliminary colorimetric calculations showed that the colors of the Mexican demantoid have low saturation (P=20%) and lightness (Y=17%). Therefore, they are darker than pure green demantoid from other deposits (e.g., Bobrovka River in the Ural Mountains). The dominant wavelength of Mexican demantoid (λ=560 nm) is a slightly yellowish green. This combination of colorimetric parameters defines a color different from that of chromium-bearing demantoid. Measurements on the demantoid from the Urals showed higher values of saturation (P=44–50) and lightness (Y=20–37%) and a purer green hue, with λ=530–545 nm (M. Ostrooumov, "Colorimetry of minerals," *Priroda*, No. 6, 1987, pp. 43–53, in Russian). Such demantoids are more attractive to the gem trade.

Thus, electron microprobe (EPMA-WDS) chemical analyses, various spectroscopic techniques, X-ray diffraction, and standard gemological testing have confirmed the discovery of demantoid in the Las Vigas skarn deposits of Veracruz State. The discovery could represent an interesting mineralogical and gemological opportunity. Although the full range and economic potential of this demantoid has not been determined, it may well have features that distinguish it from other important deposits worldwide.

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A new natural-color bluish green chalcedony. A new type of chalcedony (figure 8) was recently submitted to GIA's Carlsbad laboratory by Yianni Melas of Greece. According to Melas, this material originated in Africa (figure 9), although a more precise location has not been made available. The translucent material displayed a vibrant bluish green color and is currently marketed under the trade name "Aquaprase." Although chalcedony varieties such as chrysoprase and Gem Silica are well known and occur in

Figure 8. This bluish green chalcedony, colored by chromium and nickel, is marketed under the trade name "Aquaprase." Photo by Kevin Schumacher.

Figure 9. A large piece of chalcedony rough recovered from the mining area. Photo by Yianni Melas.

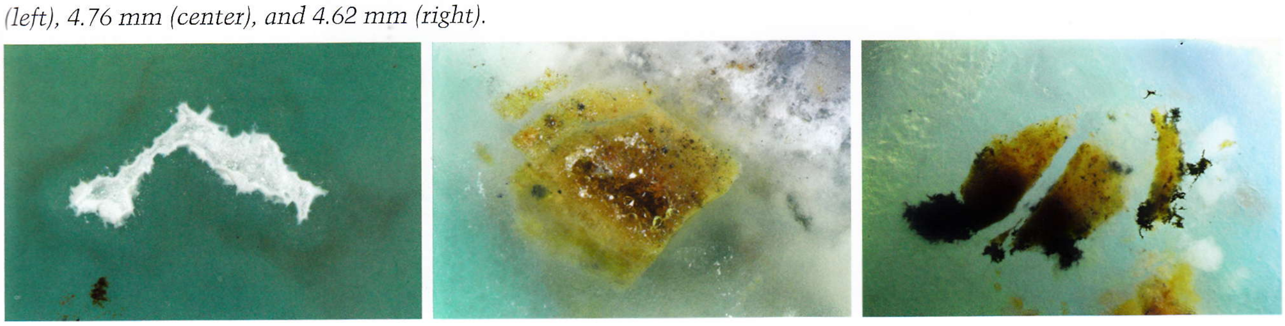
yellowish green and greenish blue colors, the color of this material was distinctly different from any African chalcedony examined by GIA to date.

From a gemological perspective, it was important to conclusively determine that this material was naturally colored and not artificially dyed. Since the quartz crystals present in this material were colorless rather than brown, we ruled irradiation out as a possible treatment. Microscopic examination of rough and cut stones in conjunction with chemical analysis and visible spectroscopy were used to characterize this chalcedony. Standard gemological testing revealed an RI range from 1.531 to 1.539, with no observable birefringence. The SG, measured hydrostatically, ranged from 2.55 to 2.57. A handheld spectroscope revealed faint, narrow lines in the red end of the spectrum, rather than the broadband absorption one would expect if the material had been dyed with an organic pigment. All of these features were consistent with natural-color chalcedony.

Microscopic examination revealed a granular aggregate structure with a few areas showing subtle banding and faint green concentrations of color between some of the coarser quartz grains, which appeared to be a greenish mineral phase located along the grain boundaries. A waxy luster was observed on fractured areas, consistent with an aggregate material. Some areas contained small cavities that were filled with colorless drusy quartz crystals (figure 10, left and center). Dark brown and black inclusions of various metal oxides were also observed scattered throughout most of the samples examined, along with some areas of whitish cloudy inclusions that were not identified (figure 10, right).

Raman analysis confirmed the material was quartz. EDXRF was used to analyze the trace-element metals that might be responsible for the bluish green color. All seven finished gemstones tested showed the presence of chromium and nickel. Interestingly, iron, vanadium, and copper were also detected in one of the cut samples, but these elements might not be related to the color, as other bluish green samples did not contain them. Visible spectroscopy (figure 11) revealed broad absorption bands centered at approximately 420 and 600 nm, with a large transmission window at approximately 500 nm producing the bluish

Figure 10. The Aquaprase samples contained minute pockets of colorless drusy quartz (left and center) and irregular brown and black metal oxide inclusions (right). Photomicrographs by Nathan Renfro; field of view 2.83 mm (left), 4.76 mm (center), and 4.62 mm (right).



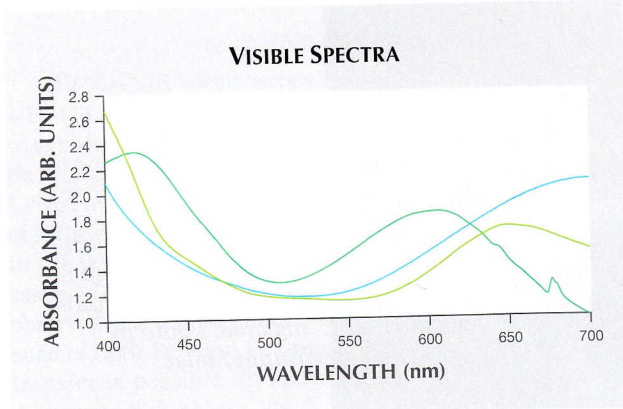


Figure 11. The visible spectrum for the Aquaprase (bluish green trace) showed two broad absorption bands at 420 and 600 nm in addition to sharper peaks at 646, 676, and 679 nm. This absorption pattern is clearly different from that of chrysoprase (yellowish green trace) and Gem Silica (greenish blue trace).

green color. Sharp absorption peaks at 646, 676, and 679 nm were presumably related to chromium (http://www.gia.edu/gia-news-research-nr7809).

This new type of African chalcedony is easily recognized by its unique composition and absorption spectrum, which is significantly different from the chrysoprase and Gem Silica varieties. The attractive bluish green color of Aquaprase, which may be caused by chromium and nickel, should prove to be a popular and welcome addition to the gem trade.

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Rubies from a new deposit in Zahamena National Park, Madagascar. In July 2015, news circulated through the trade about a ruby discovery south of Andilamena, near Lake Alotra (figure 12). Photos of clean, attractive stones of over 10 carats were shared on social media by Malagasy and Sri Lankan gem merchants. Several thousand unlicensed miners quickly descended on the area, creating serious conservation concerns as the new deposit was located inside Zahamena National Park. In August 2015, the Malagasy government sent soldiers to close the mining site. But because the area is very remote, they could not maintain their presence longer than a month. As soon as the soldiers departed, the miners returned in numbers.

Gem-quality rubies and sapphires are not unknown in northeastern Madagascar: They were first found in 2000, east of Andilamena and west of Vatomandry (Summer 2001 GNI, pp. 147–149). These discoveries were followed by a blue sapphire deposit near Andrebabe, a few kilometers south of Andilamena, in 2002 (www.ruby-sapphire.com/madagascar_ruby_sapphire.htm). Ruby mining was limited until 2004, when demand for the heavily fractured material from Andilamena dramatically increased with the advent of the lead-glass filling treatment developed in Thailand between 2001 and 2004. Visiting the deposit in June and September 2005, author VP could see that more than 10,000 miners were living and working in the jungle (www.rwwise.com/madagascar1.html). In 2011 and 2012, two new discoveries occurred in the region. The first was a pink and blue sapphire deposit near Mandraka village, north of Toamasina. In 2012, a deposit was discovered east of Didy (www.giathai.net/pdf/Didy_Madagascar_US.pdf). That deposit produced some large, clean, and attractive rubies and blue sapphires. More discoveries followed—near Bemainty, north of Didy, for instance—but either the gems were ordi-

Figure 12. Rough rubies from Zahamena National Park with a combination of good shape, transparency, and attractive color. Photo by Vincent Pardieu/GIA.