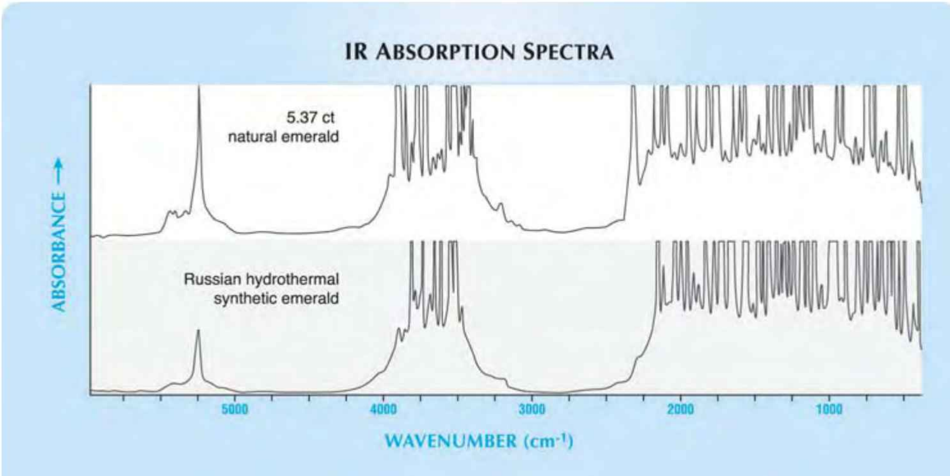

Figure 5. A comparison of the infrared spectrum of the 5.37 ct emerald with that of a Russian hydrothermal synthetic emerald shows differences in the absorption bands between 4000 and 3000 cm^{-1} and in the intensity of the peak at around 5270 cm^{-1}. The IR absorption features shown by the 5.37 ct emerald are indicative of natural origin.

to hydrothermal synthetic emeralds, there were significant differences in the intensity of the absorption features due to type II water between 4000 and 3000 cm^{-1}. Another major difference was the intensity of the peaks at around 5270 cm^{-1}, which were much stronger in the natural emerald reported here.

Although the stone contained some unusual internal features, the FTIR spectra led us to conclude that it was a natural emerald.

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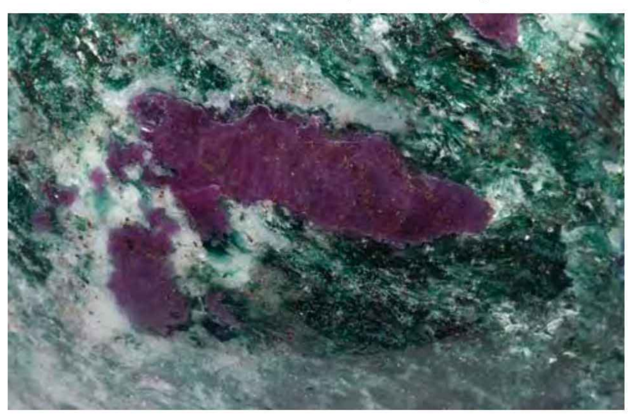
Figure 6. This sphere (5.4 cm in diameter) was cut from a rock consisting of fuchsite, corundum, and alkali feldspar. The material comes from a new deposit in Bahia, Brazil. Photo by C. D. Mengason; GIA Collection no. 32380.

Fuchsite-corundum rock from Bahia, Brazil. Green quartzite, or aventurine quartz, is widespread in the Precambrian terranes of Brazil. It is found in small deposits from the southern tip of Minas Gerais to northern Bahia and western Goiás. The material is composed mainly of fine- to coarse-grained quartz and fuchsite mica (chromian muscovite). The amount of fuchsite in the rock may be quite variable, from a few percent up to, rarely, 100%. Although the origin of these Cr-rich rocks is not yet well understood, it seems likely that they formed through the metamorphism of Cr-bearing sedimentary strata.

In January 2005, a new occurrence of fuchsite with corundum and feldspar was found near Serra de Jacobina, northern Bahia State. Preliminary characterization of several samples with a microscope and powder X-ray diffraction

Figure 7. A closer view of the sphere in figure 6 shows blebs of corundum (here, up to 1.9 cm wide) that are surrounded by intergrowths of fuchsite and alkali feldspar. Tiny grains of reddish orange rutile are disseminated throughout the rock and also form inclusions in the corundum. Photo by C. D. Mengason.



showed that the rock consists of coarse-grained fuchsite with blebs of opaque pinkish purple corundum and irregular pods and interstitial areas of white alkali feldspar (figure 6). Also present were tiny grains of reddish orange rutile (figure 7) that showed a submetallic luster. No quartz could be found in the rock. The various textures and color combinations created by the minerals are particularly attractive when polished into spheres (again, see figure 6).

The association of fuchsite and corundum, together with kyanite, is also known from India, Zimbabwe, and South Africa (see Winter 2004 Gem News International, pp. 338–339, and the reference therein). These mineral associations are formed by prograde metamorphism at high temperature and pressure. The formation of the Brazilian occurrence may be explained by the following reaction: mica ↔ corundum + feldspar + H_2O. At the other occurrences, the initial presence of quartz may be responsible for the additional formation of kyanite in the rock: mica + quartz ↔ kyanite/corundum + feldspar + H_2O.

So far, about 150 kg of the fuchsite-corundum rock have been recovered from the Brazilian deposit. The geology of the deposit suggests that additional production is likely in the future.

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Pen shell pearls—nacreous and non-nacreous. The Winter 2003 Gem News International section (pp. 332–333) reported on pen shell pearls from the Pacific Coast of Baja California, Mexico. Pen shells from this area (i.e., *Pinna sp.* and *Atrina sp.*) have a nacreous layer on their interior that grows on top of, and is distinctly different in composition from, the underlying non-nacreous portion of the shell. Because the bond between these layers is weak, they readily separate after the death of the mollusk (figure 8).

*Figure 8. The interior of the rugose pen shell (*Pinna rugosa*) from Baja California has a light-colored nacreous layer that readily separates from the non-nacreous dark brown base layer. This shell is approximately 35.5 cm long. Courtesy of Oasis Pearl; photo by C. D. Mengason.*

Since the pearly layer covers only part of the shell's interior, the mollusk could conceivably host a nacreous pearl and a non-nacreous concretion simultaneously within the same shell. A nacreous and a non-nacreous sample (2.29 and 17.83 ct, respectively) were recently donated to GIA by Jeremy Norris of Oasis Pearl, Albion, California (figure 9). Although they did not come from the same mollusk, both reportedly originated from the same species of Baja California pen shell, identified as *Pinna rugosa* by Mr. Norris and confirmed by consulting shell experts Scott Rugh (San Diego Natural History Museum) and Paul Valentich-Scott (Santa Barbara Museum of Natural History). As shown in the Winter 2003 GNI entry, nacreous pen shell pearls can be quite attractive, and although the non-nacreous "pearls" would not be suitable for jewelry use because of their tendency to dry out and crack over time, concretions such as these can make interesting collectors' items.

Further characterization with UV-Vis reflectance spectroscopy was performed on both samples and on the different sections of the pen shell supplied by Mr. Norris. The spectrum for the nacreous pearl was distinctly different from that of the non-nacreous "pearl," and their spectra were similar to those of the corresponding sections of the pen shell. Although the spectral data suggest that both samples originated from the pen shell, given the limited data available, further research is necessary to establish the significance of the spectral matches between the pearl/concretion and their respective portions of the shell.

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Figure 9. The light brown nacreous pearl on the left (7.8 × 6.9 × 5.6 mm) and the dark brown non-nacreous "pearl" on the right (17.3 × 13.5 mm) both originated in rugose pen shells from Baja California, Mexico. Their dissimilar appearance and structure is the result of growth in compositionally different sections of the host shells. GIA Collection nos. 31758 (pearl) and 31759 (concretion); photo by C. D. Mengason.