Schmetzer K., Burford M., Kiefert L. and Bernhardt H.-J., 2003. The first transparent faceted grandidierite, from Sri Lanka. *Gems & Gemology*, **39**(1), 32–37, http://dx.doi.org/10.5741/gems.39.1.32.

Vertriest W., Detroyat S., Sangsawong S., Raynaud V. and Pardieu V., 2015. Gem News International: Grandidierite from Madagascar. *Gems & Gemology*, **51**(4), 449–450.

A Lalique Quartz Pendant, in Polarized Light

Singly polarized or cross-polarized light is often used by gemmologists when testing transparent and translucent rough or cut gem materials. The way the light is modified after passing through the material reveals important characteristics about the crystalline nature of the sample.

In October 2015, GGTL Laboratories in Geneva received for identification a colourless pendant (~37.1 × 34.3 × 5.1 mm; Figure 13) that displayed two human figures engraved in relief. The client indicated that René Lalique made the pendant. Lalique (1860–1945) was a famous designer and well-known for his glassmaking art, but he was also a jeweller who worked with a variety of gem materials (Passos Leite, 2008). At first sight the pendant appeared to be glass, but the cool sensation of the piece on the skin suggested it was quartz. (Glass has a lower thermal conductivity than quartz, and hence feels 'warmer' than quartz.)

Figure 13: This Lalique quartz pendant (~37.1 × 34.3 × 5.1 mm) displays two engraved human figures. Photo by C. Caplan.

Initial gemmological observations were done using a binocular microscope, first in transmitted light and then with crossed polarizers. Bright interference colours indicated the material was anisotropic. When we observed the pendant in the direction of the optic axis with a glass sphere (used as a convergent lens known as a conoscope), we immediately saw a 'bull's-eye' figure that is distinctive for quartz (Figure 14).

Quartz crystallizes in the trigonal system, and the tablet used for this pendant had been cut perpendicular to the optic axis (or three-fold symmetry axis). The common habit of quartz is an elongated prism with rhombohedral terminations, and the crystals are frequently

Figure 14: Viewed with crossed polarizers, the pendant shows a 'bull's-eye' interference figure with the conoscope, as expected for quartz. Distorted Dauphiné twinning interference patterns are visible in the minor rhombohedron at top and left. Photo by C. Caplan; image width ~28 mm.

Figure 15: The quartz pendant (~37.1 × 34.3 mm) shows various interference colours as the analyser is rotated over a stationary polarizer, from the front side (left) and the reverse side (right). Photos by C. Caplan.

twinned (O'Donoghue, 1987). Viewed with crossed polarizers, the quartz showed angular interference colour patterns on the top and left edges of the pendant due to twinning of the minor rhombohedron *z* faces (again, see Figure 14). Consistent with the fact that there was no colourless synthetic quartz available on the market during Lalique's time, the distribution and orientation of the twinning characteristics confirmed it was natural quartz (Notari et al., 2001; Payette, 2013).

This pendant provides a good example of how interference colours are influenced by the thickness of the observed material and by its crystallographic orientation versus the polarization direction of the light. The two groups of photos in Figure 15 show variations in the appearance of the pendant as the analyser was rotated over the stationary polarizer, from the front side (left) and the reverse side (right). The human figures remain colourless in the front view, while they show interference colours in the back view. The colours observed between crossed polarizers are complementary to those seen between parallel polarizers (Figure 15-right, third picture of each line). This appearance is due to a combination of diffusion and diffraction phenomena caused by the curved shape of the engraving. Further, when viewed only with fully crossed polarizers, completely different interference colours are produced as the pendant is rotated (Figure 16).

It is always interesting to examine gem materials with polarized light, and sometimes a simple colourless object can appear complexly beautiful. As shown by this pendant, such examination yields useful information, and may allow one to distinguish natural from synthetic quartz.

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Figure 16: Different interference colours are also produced as the quartz pendant is rotated between crossed polarizers. Photos by C. Caplan; image width ~20 mm.

References

Notari F., Boillat P.Y. and Grobon C., 2001. Discrimination des améthystes et des citrines naturelles et synthétiques. *Revue de Gemmologie*, **141/142**, 75–80.

O'Donoghue M., 1987. *Quartz*. Butterworths, London, 110 pages.

Passos Leite M.F., 2008. *René Lalique at the Calouste Gulbenkian Museum*. Skira, Milan, Italy, 136 pages.

Payette F., 2013. A simple approach to separate natural from synthetic ametrine. *Australian Gemmologist*, **25**(4), 132–141.

Faceted Quartz with Petroleum Inclusions from Baluchistan, Pakistan

Euhedral quartz crystals with petroleum inclusions are well known from Baluchistan Province, western Pakistan (Koivula and Tannous, 2004; Koivula, 2008). These specimens typically have fluid inclusions containing yellow petroleum (with or without a colourless aqueous phase), a methane gas bubble and solid particles of black asphaltite. When exposed to UV radiation (particularly long-wave), the petroleum commonly luminesces a strong yellow or blue (see, e.g., Figure 28 [right] on p. 21).

Koivula and Tannous (2004) indicated that although gems can be cut from this quartz, the heat sensitivity of the inclusions requires caution to avoid fracturing them. It was therefore notable to see some of these faceted gemstones with Mark Kaufman (Kaufman Enterprises, San Diego, California, USA) during the 2016 Tucson gem shows (e.g. Figure 17). From 30 crystals that he purchased at the October 2015 Munich (Germany) show, Kaufman cut six stones weighing ~1–4 ct. He selected the crystals especially to show isolated petroleum inclusions after faceting, but unfortunately most of the inclusions were located too close to the surface of the crystals to avoid intersecting with the cutting wheel, causing the petroleum to leak out. Therefore, the greatest challenge that Kaufman faced while faceting this quartz was the difficulty of cutting around the inclusions without penetrating them.

Figure 17: Faceted Pakistani rock crystal quartz with petroleum inclusions (yellow) is seldom encountered in the marketplace. The stones shown here weigh 2.20–2.29 ct. Photo by Orasa Weldon.

For collectors who appreciate unusual inclusions, these quartz gems will provide interesting samples.

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References

Koivula J.I., 2008. Lab Notes: Unusual green fluid inclusions in quartz. *Gems & Gemology*, **44**(2), 161.

Koivula J.I. and Tannous M., 2004. Gem News International: Petroleum inclusions in quartz from Pakistan: A photo-essay. *Gems & Gemology*, **40**(1), 79–81.

Quartz Slabs from Inner Mongolia

Quartz crystals are prized by collectors for their transparency and prismatic crystal form, but some specimens are even more interesting when sliced into slabs to show their internal features. Such was the case for quartz tablets from Colombia that were recently described by Krzemnicki and Laurs (2014) as having a radiating fibrous structure.

During the 2016 Tucson gem shows, Luciana Barbosa (Gemological Center, Weaverville, North Carolina, USA) had some interesting quartz