Observations of Pegmatitic Amethyst from São Paulo State, Brazil

In many parts of the world, construction can be halted by the discovery of ancient ruins or burial sites. In July 2006, during road construction in a rural area of southern São Paulo State in Brazil, an interruption occurred for a different reason—the discovery of a rich deposit of amethyst hosted by granitic pegmatites (see www.cprm.gov.br/publique/media/evento_1776.pdf). The site was rapidly overtaken by *garimpeiros* (Brazilian artisanal miners), causing the government to close the area, which lies approximately 90 km from the city of São Paulo. Due to the local poor economic conditions, the deposit may be reopened to the miners in the future as a potential source of income. However, environmental legislation would require that any future digging be done in a responsible manner.

Recently submitted for analysis by George Williams, a senior buyer for Jewelry Television (Knoxville, Tennessee, USA), was a selection of 39 amethyst gemstones reportedly obtained from this locale. Several of them were quite large, weighing more than 100 ct (e.g. Figures 5 and 6). Standard gemmological testing yielded results that were expected for single-crystal quartz (RI of 1.543–1.552 and hydrostatic SG of 2.65). The samples were a medium strong purple, and straight and angular colour zoning was prominent when they were viewed in certain orientations (Figure 6), which is not unusual for amethyst. No twinning was seen in the samples, which is consistent with the reported pegmatitic origin (Guzzo, 1992). Viewed with darkfield illumination, some of the stones contained numerous, evenly spaced, undulating dotted lines of fluid droplets that were oriented in various directions (Figure 7). Of the 39 stones examined, all but seven contained these inclusions. While fluid inclusions are common in all varieties of quartz, this type and arrangement has not been previously observed by the authors, and a literature search did not reveal any such inclusions in amethyst.

Figure 6: Straight and angular colour zoning is evident in this 113.79 ct São Paulo amethyst. Photo by B. Williams.

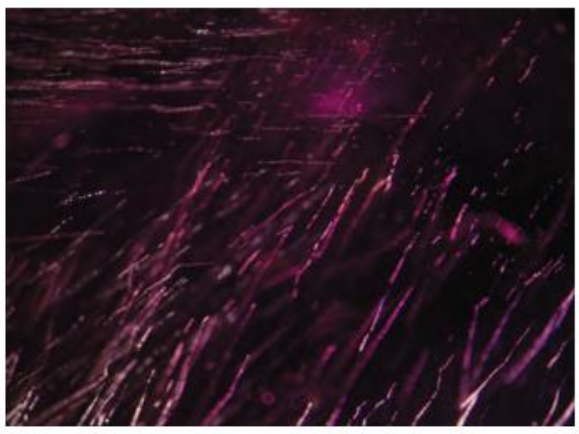

Figure 7: Undulating dotted lines of fluid inclusions such as these were present in most of the São Paulo amethysts examined. Photomicrograph by B. Williams; magnified 35×.

Figure 5: These large amethysts (113.79 and 114.15 ct) are from southern São Paulo State in Brazil. Photo by B. Williams.

The presence of abundant molecular H_2O was detected with Fourier-transform infrared spectroscopy (FTIR; see Figure 8, cf. Fukuda, 2012). This water was trapped in the fluid inclusions described above.

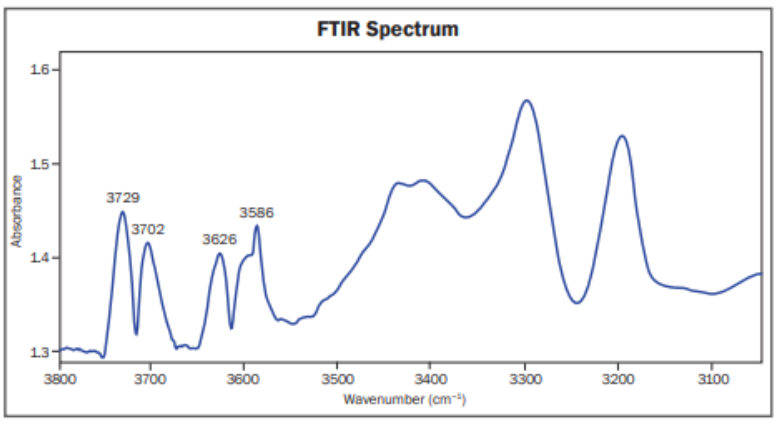

Figure 8: FTIR spectroscopy showed an unusually high water content in the amethyst. The four bands in the 3750–3550 cm^{-1} region correspond to molecular H_2O within the fluid inclusions of this pegmatitic amethyst.

Determining provenance for any material as plentiful and diverse as amethyst is problematic at best, but the unusual fluid inclusions could help differentiate material from this São Paulo locality. In addition to these inclusions, the pegmatitic origin of this amethyst makes it an interesting gem for collectors.

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References

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Guzzo P.L., 1992. Characterization of the Structures, Impurities and Defects Centers Related to Al and OH in Natural Quartz. PhD dissertation, Mechanical Engineering Department, University of Campinas, Brazil.