Phenakite from Volodarsk-Volynski, Ukraine

Miarolitic granitic pegmatites in Ukraine's Volodarsk-Volynski region (renamed the Khoroshiv region in 2015) have been known for decades for producing spectacular gem crystals of beryl and topaz that are coveted by collectors. In addition, pegmatites in this region have occasionally produced gem-quality phenakite (Lyckberg *et al*. 2009), which is a beryllium silicate mineral (Be_2SiO_4) that crystallises in the trigonal system. The mineral is colourless to very pale pink or yellow, and has a Mohs hardness of 7½–8. Faceted examples are not commonly encountered, and phenakite is typically considered a collector's stone, although it is durable enough for use in jewellery.

In July 2023, gem and mineral dealer Dudley Blauwet (Dudley Blauwet Gems, Louisville, Colorado, USA) faceted some phenakite gemstones from a damaged crystal that he obtained from a Ukrainian miner. The largest stone was fairly clean and weighed 2.45 ct. Blauwet loaned three of the gems for this report (0.47–0.69 ct; Figure 17). All of them were colourless and had an excellent polish with good light return. They had RIs of 1.654–1.670, and a birefringence of 0.016, which are typical for phenakite. Their SG values ranged from 2.98 to 3.08, which are somewhat higher than reported in the literature (e.g. 2.93–3.00; O'Donoghue 2006). The stones were inert to long- and short-wave UV radiation. Each of them displayed distinctive and quite different internal features. The 0.49 ct pear-shape sample was remarkably free of inclusions, with a few thin, randomly oriented needles visible with the microscope. The 0.69 ct rectangular step cut displayed clusters of etch/growth tubes, mostly with parallel orientation (e.g. Figure 18a). The 0.47 ct round-cut stone was more heavily included, with negative crystals and two-phase (liquid and gas) inclusions (Figure 18b), but no needles or etch tubes.

Figure 17: The three faceted Ukrainian phenakite gemstones examined for this report consist of a 0.49 ct pear with excellent clarity, a 0.47 ct round containing two-phase and negative inclusions, and a 0.69 ct rectangular step cut with distinctive etch tubes. Photo by Breanna McKinney, JTV.

Raman spectroscopy yielded results that closely resembled the reference spectra for phenakite in the RRUFF (https://rruff.info/Phenakite/R050137) and Magilabs databases. EDXRF chemical analysis showed weak indications of Fe, Ge and Ca in all three samples. FTIR spectroscopy of the three samples yielded a significant OH signature, consistent with the features recorded for phenakite at http://minerals.gps.caltech.edu/FILES/Infrared_OH/Phenakite/INDEX.html). Although phenakite is a nominally anhydrous mineral, it is not uncommon for it (and other 'anhydrous' minerals) to contain traces of hydroxide ions (Rossman 1996).

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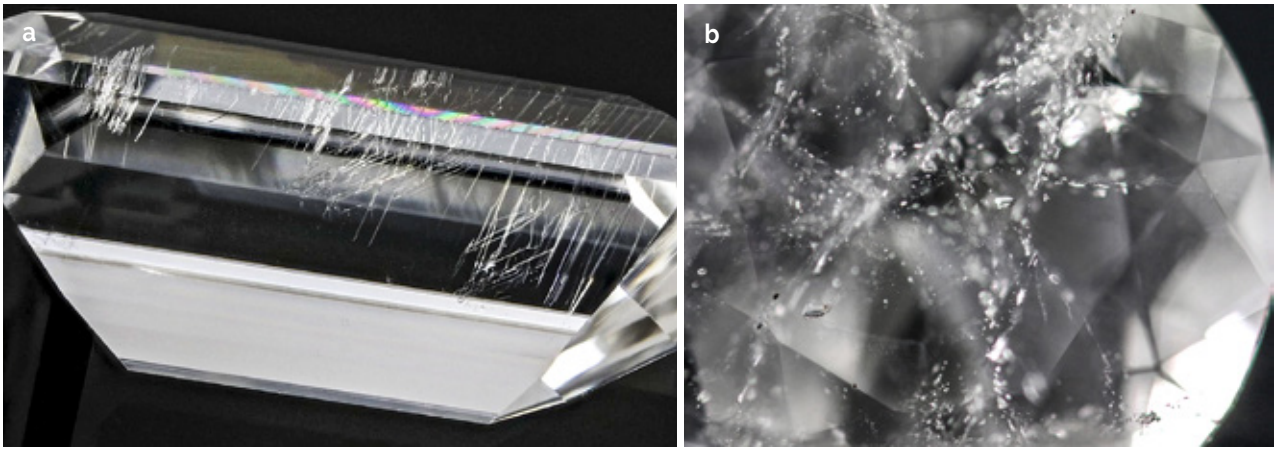

Figure 18: (**a**) A series of etch tubes create distinctive internal features in the 0.69 ct phenakite. (**b**) The 0.47 ct phenakite contains networks of two-phase (liquid and gas) inclusions and negative crystals. Photomicrographs by Breanna McKinney, JTV; image widths (a) 6.5 mm and (b) 2.8 mm.

References

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An Ancient Engraved Pyrite Gem Featuring Aphrodite

There has been a long human association with pyrite, the golden-yellow iron disulphide (FeS_2) mineral commonly called *fool's gold*. Ötzi, the so-called 'Iceman', whose 5,000-year-old body was found in 1991 high in the Ötztal Alps (between Austria and Italy), carried on him a piece of pyrite for striking to make sparks to produce fire. The name *pyrite* comes from the Greek word for *fire*, πυρίτης (pyrites). The stone has borne various names at various times and places—often simply *firestone* or its equivalent in other languages, but there were numerous more localised names. In Cornwall, England, for example, miners knew it as *mundic* (see, e.g., Borlase 1758). In a jewellery context, it has generally been known as marcasite in English, until after around 1800 when the term *pyrite* was used for the cubic form of iron sulphide and *marcasite* for its orthorhombic form (Blackburn & Dennen 1997). The term *marcasite* ultimately comes from the Arabic *marqazat* or Persian *marqashota* via the Spanish *marcasite*.[1] In the 1491 *Hortus Sanitatus*, the section of *de lapidibus* lists *pyritides* and says the name used for it by the Arabs was *markasita* (Anonymous 1491).

The use of pyrite as an ornamental stone has been sporadic. It has been employed as a cheap substitute for diamond at least from the eighteenth century in European jewellery. In 1913, the British press noted that it had again become popular in jewellery in France, following the discovery of a large deposit in the Jura Mountains in 1846, and that there was a reawakening of interest in England with 'clever English craftsmen' producing beautiful marcasite jewellery (*The Derby Daily Telegraph*, 30 July 1913, p. 2). We can probably include pyrite with various substances used in ancient recipes for the production of acids, but early decorative use has seldom been reported. Ancient beads described as being of pyrite have been recorded from early Egypt, Iran and Pakistan (Ogden 1982). A small cubic crystal of pyrite was among a large assemblage of various gem materials found at Mahabodhi Temple (Bodh Gaya) in South India.[2] The most extraordinary use known to the present author were pyrite crystals studding the soles of a pair of women's leather boots that were excavated in 1947 in a burial at Pazyryk, Altai, Siberia, dating to around 300 BCE.[3]

The only ancient gold jewellery set with pyrite known to this author is an Early Byzantine gold ring from about the fifth to sixth century CE set with a partly decomposed, flat, circular pyrite inlay engraved with a monogram (Ogden 1982, p. 105 and figure 5.9) seen some 45 years ago. A few years later, the author was shown a simple little Roman engraved gem, said to be from Egypt (Figure 19). The owner had thought it to be garnet, but examination with a loupe revealed it was pyrite. An opportunity to study it again in more detail arose recently.

The gem has a shiny, wine-red appearance and is approximately circular, averaging about 1 cm in diameter and 2 mm thick. It bears a somewhat cursorily engraved figure of the Greek goddess of love and

Figure 19: A Roman engraved gem in pyrite depicts an image of the goddess Aphrodite, which has been cut through a reddened surface. It has an average diameter of 1 cm (and a thickness of 2.0 mm), and is shown from the front (left) and back (right). Private collection; composite photo by J. M. Ogden.

[1] For example, it was used as an ingredient in enamels in the medieval Arabic recipes of Nishaburi (Rogers & Bayani 2013).

[2] British Museum reg. no. 1892,1103.64. The excavation was published, but gem finds were not itemised, in Major-General Sir Alexander Cunningham's excavations (Cunningham 1892).

[3] Pazyryk, Altai, Siberia, barrow no. 2. H. 36 cm. Hermitage Museum, St Petersburg, Russia. Inv. no. 1681/218 (see Rudenko 1953, pp. 118–121, pl. XXV,2; Anonymous 1973–1974, p. 120, cat. no. 125).