



G&G

Micro-World

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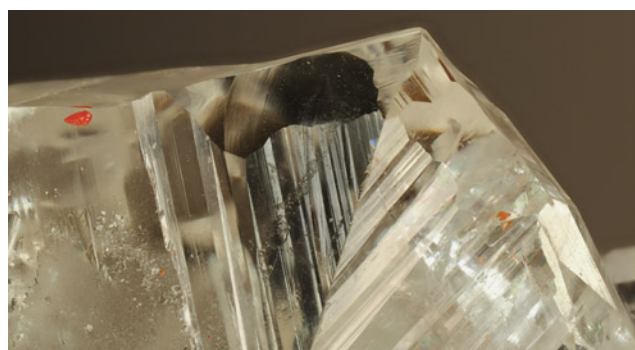


Figure 1. Left: Contact-twinned calcite host with scattered red realgar inclusions. Right: A closer view of one of the vivid inclusions. Photomicrographs by Wingtak Lui; fields of view 12 mm (left) and 3.2 mm (right).

Twinned Calcite with Realgar Inclusions

Microscopic examination of a transparent contact-twinned calcite crystal from the Jiepaiyu mine in Shimen County, Changde, Hunan, China, revealed vivid red to orange-red blebby to platy realgar (As_4S_4) inclusions scattered throughout the host, consistent with calcite's common e-twin law (figure 1). Raman microspectroscopy was targeted directly on the red inclusions using 785 nm excitation over shorter

wavelengths. This approach was followed since the light-induced realgar-to-pararealgar conversion is reportedly most efficient under ~500–670 nm and is markedly decreased at longer wavelengths (>670 nm) (D.L. Douglass et al., "The light-induced alteration of realgar to pararealgar," *American Mineralogist*, Vol. 77, No. 11-12, 1992, pp. 1266–1274). The resulting spectrum showed calcite bands together with diagnostic realgar bands. The occurrence of well-preserved realgar inclusions within transparent contact-twinned calcite is mineralogically noteworthy given realgar's tendency to alter under prolonged light exposure.

About the banner: An opaque plate of hematite displays iridescence in its rock crystal quartz host from the Rist mine in Alexander County, North Carolina. Photomicrograph by Nathan Renfro; field of view 5.99 mm.

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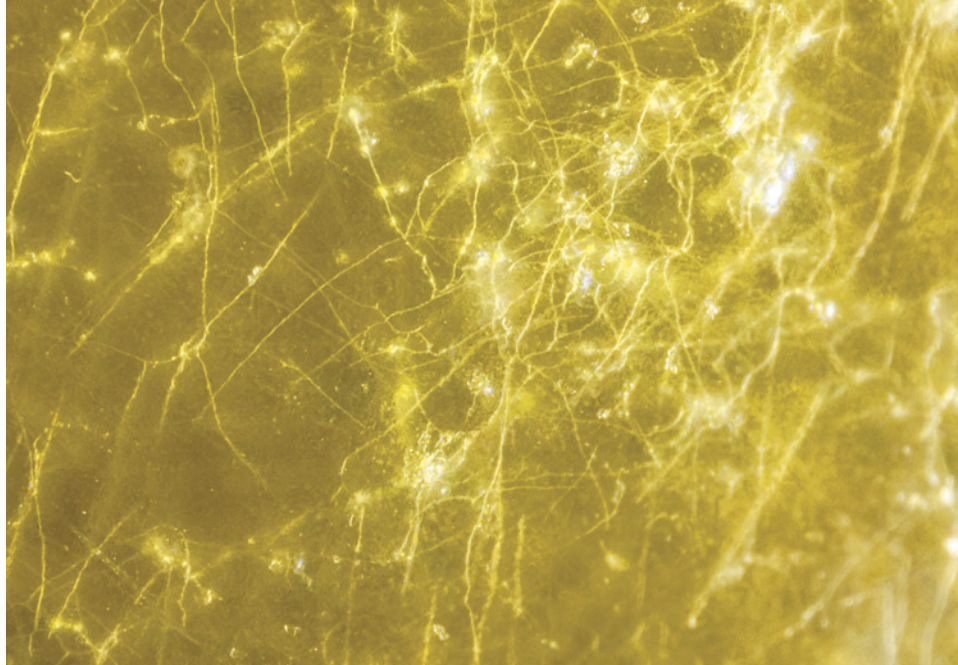


Figure 2. A fine, complex network of microscopic shell-boring parasitic tunnels with intersecting nodes resembling fungal hyphae in a mabe pearl. Photomicrograph by Gauri Sarvankar; field of view 1.65 mm.

“Fungal Hyphae” in a Mabe Pearl

Recently, the authors examined an intriguing white button-shaped assembled cultured shell blister, commonly referred to in the trade as a mabe pearl. This mabe pearl, which measured approximately 15.31×15.10 mm and was mounted in an earring, exhibited a semitranslucent surface with iridescence. When examined under higher magnification with fiber-optic illumination, an intricate network of fine branch-like structures was observed just beneath the nacreous surface. Closer examination revealed channels resembling a mass of fungal hyphae, the microscopic thread-like filaments found in fungi and molds (figure 2). These channels were likely formed by shell-boring parasites; parasitic worms often infest pearl-producing mollusks, resulting in the formation of elongated channels with varying patterns. Although parasitic boreholes have been previously documented in

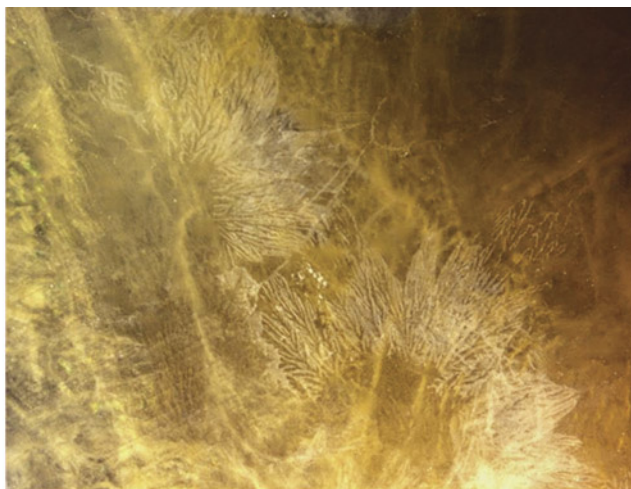
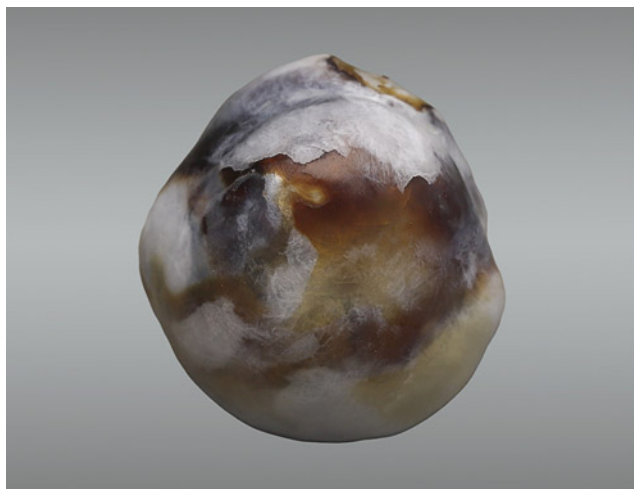
both shells and pearls (Spring 2024 *G&G Micro-World*, p. 78), this unique arrangement of intersecting tunnels displays a striking resemblance to the microscopic morphology of fungal hyphae, highlighting the complex biological interactions that can influence nacre formation.

*Gauri Sarvankar and Abeer Al-Alawi
GIA, Mumbai*

Leaf-Like Imprint on Non-Nacreous Pearl

Recently, a vein-like structure similar to that of a leaf was observed on the surface of a baroque-shaped non-nacreous natural pearl. The white and yellowish brown pearl weighed 12.54 ct and measured $13.40 \times 13.12 \times 12.22$ mm (figure 3, left). Visually, it displayed a striking contrast between its white frosty surface and its underlying yellowish brown bodycolor. Higher magnification unveiled

Figure 3. A 12.54 ct natural non-nacreous pearl (left) with formations displaying a leaf-like imprint on its surface (right). Photos by Gourav Bera (left) and Jayesh Surve; field of view 1.30 mm (right).



captivating formations resembling leaves with intricate vein structures (figure 3, right). While non-nacreous pearls exhibit various surface patterns, the distinctive leaf-like pattern observed on this specimen identifies it as a particularly intriguing non-nacreous natural pearl.

*Jayesh Surve and Abeer Al-Alawi
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Reticulated Pattern on Pearls' Surfaces

Pearls formed in an organic environment often show unique external and internal features. In a recently examined multistrand necklace composed of small natural pearls ranging from 3.45×2.49 mm to 6.51×6.30 mm, some pearls displayed an interesting surface pattern. Unlike typical hammering effects, which produce a series of flat facets or shallow indentations (Summer 2025 Gem News International, pp. 210–212), these pearls featured a reticulated pattern with deeper indentations and distinct ridges (figure 4). This unique surface texture is a result of natural pearl growth; no post-harvest treatment or alterations were detected.

*Emiko Yazawa
GIA, New York*

Two-Phase Inclusion in Peridot

Pakistani peridot is known for its diagnostic ludwigite inclusions, but something far rarer was recently observed in a 7.44 ct faceted stone—a fluid-filled cylindrical void

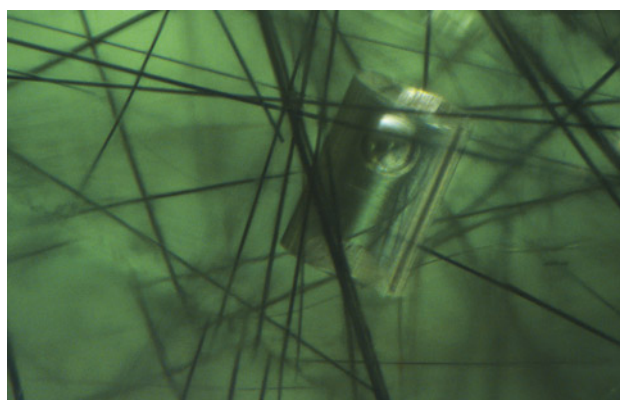


Figure 5. A cylindrical-shaped void encapsulates liquid and a gas bubble within a myriad of needle-like ludwigite inclusions in a Pakistani peridot. Photomicrograph by Britni LeCroy; field of view 1.42 mm.

among a myriad of needle-like ludwigite crystals (figure 5). The void also contained a spherical gas bubble that shifted within the liquid as the stone was moved. This feature is known as a two-phase inclusion due to the negative space containing a liquid and a gas. Cylindrical-shaped inclusions are uncommon in any stone, as cylinders do not conform to any crystallographic habit; however, a similar example has been documented in a pink euclase crystal (Fall 2021 *G&G Micro-World*, pp. 274–275).

*Britni LeCroy
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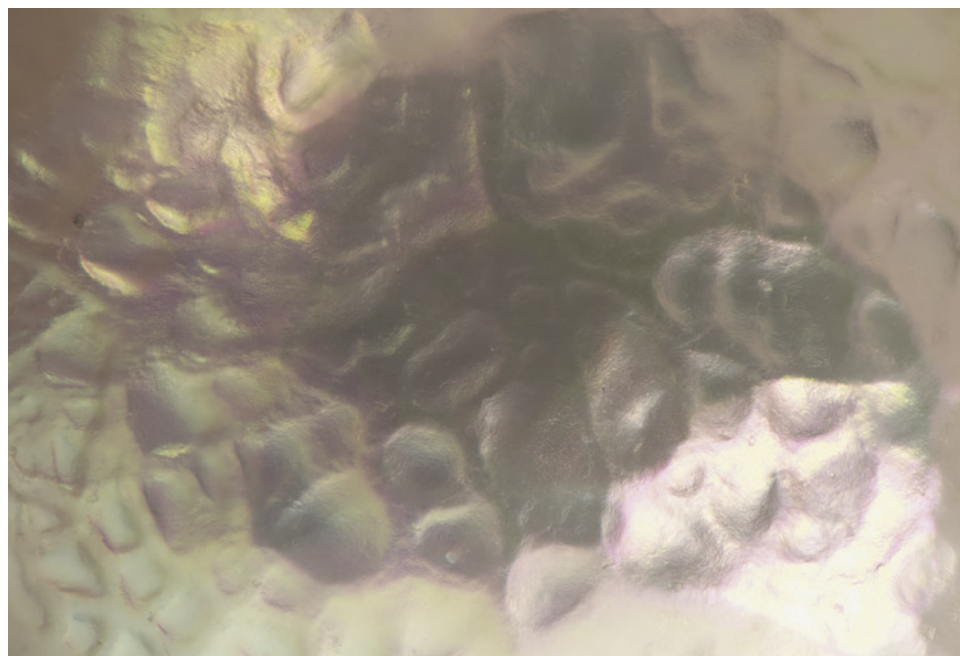


Figure 4. A small natural pearl displays a reticulated pattern with indentations and distinct ridges, differing from the hammered texture commonly observed in pearls. Photomicrograph by Emiko Yazawa; field of view 3.57 mm.

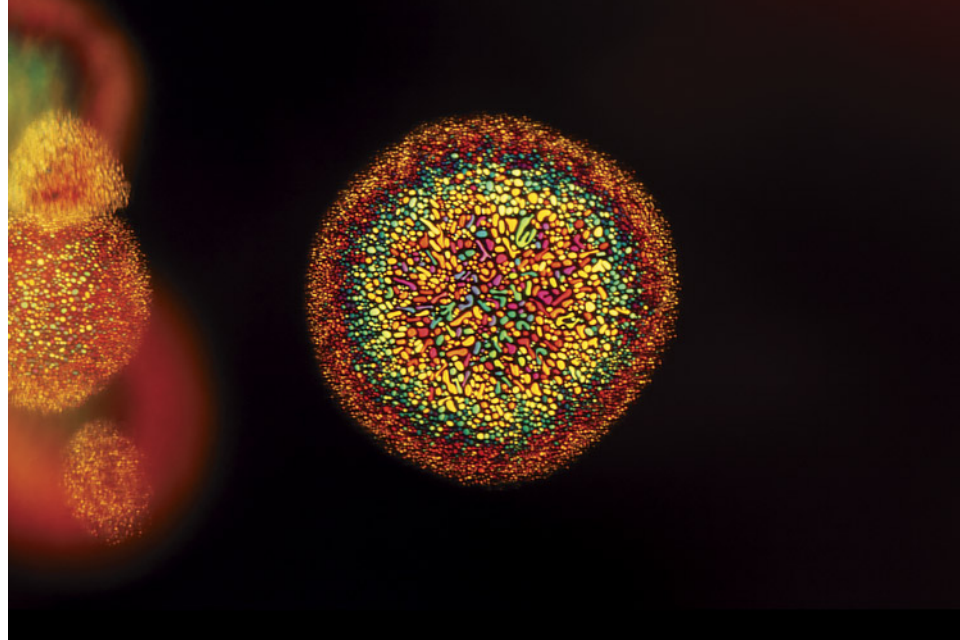


Figure 6. Thin-film decrepitation inclusions create a colorful mosaic pattern in a beryllium-diffused orange sapphire under diffused fiber-optic lighting. Photomicrograph by E. Billie Hughes; field of view 1.6 mm.

Colorful Mosaic Pattern in Heated Orange Sapphire

When viewing this inclusion scene (figure 6), one might wonder whether it represents a gemstone inclusion at all. This image has invoked comparisons to fireworks illuminating a night sky, a mosaic-like stained glass window, and the plates used in the Ishihara test for color blindness. In reality, the scene is composed of tiny thin-film decrepitation inclusions inside a beryllium-diffused orange sapphire. While this inclusion scene is not itself diagnostic of diffusion, it is likely the result of high-temperature heat treatment.

*E. Billie Hughes
Lotus Gemology, Bangkok*

“Shooting Stars” in Sapphire

The author recently examined a 3.46 ct bluish violet to purple color-change sapphire measuring $9.04 \times 7.61 \times 5.47$ mm. Microscopic examination revealed a scene reminiscent of shooting stars in a night sky, created by numerous Rose channels against a backdrop of scattered zircon crystals (figure 7). Commonly occurring in various gems including calcite, diamond, and sapphire, Rose channels are created by intersecting twin lamellae, formed by twinning along the rhombohedral faces (F. Notari et al., “‘Boehmite needles’ in corundum are Rose channels,” Fall 2018 *G&G*, p. 257).

*Michaela Damba
GIA, Carlsbad*



Figure 7. Numerous Rose channels with scattered zircon crystal inclusions in a 3.46 ct color-change sapphire. Photomicrograph by Michaela Damba; field of view 4.79 mm.

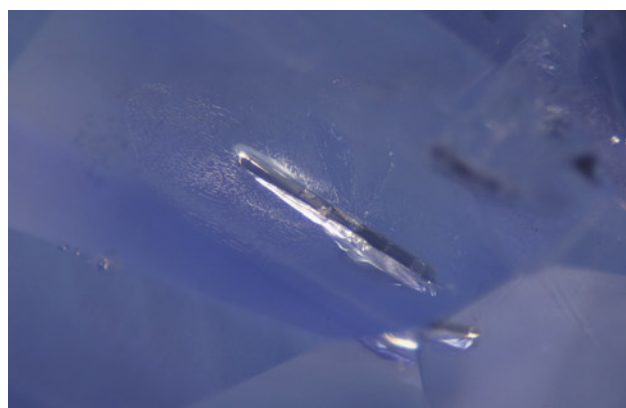


Figure 8. Elongated, rod-shaped vesuvianite crystal in sapphire associated with a partially healed fissure. Photomicrograph by Keith Chow; field of view 3.10 mm.

Vesuvianite in Sapphire

The author recently examined a sapphire containing an elongated, rod-shaped crystal associated with a partially healed fissure (figure 8). Due to its morphology and color, the inclusion appeared to be pargasite. However, subsequent analysis using Raman spectroscopy identified the inclusion as vesuvianite.

Vesuvianite is an accessory sorosilicate mineral that typically forms in skarn during metasomatism of carbonate rocks such as limestone. Exceptionally rare as an inclusion in gemstones, vesuvianite has previously only been documented in two rubies from Mogok, Myanmar (Winter 2017 *G&G Micro-World*, p. 469; C.P. Smith and R. Zellagui, "Vesuvianite (idocrase) and apatite inclusions in ruby identifiable by infrared spectroscopy," *Journal of Gemmology*, Vol. 37, No. 4, 2020, pp. 346–348). Given the association of vesuvianite with skarns, these inclusions may also occur in sapphires from skarn deposits, such as those in Andranondambo, Madagascar, and Kataragama and Elahera, Sri Lanka (G. Giuliani and L.A. Groat, "Geology of corundum and

emerald gem deposits: A review," Winter 2019 *G&G*, pp. 464–489).

To the author's knowledge, this is the first report of vesuvianite as an inclusion in sapphire.

Sharon Tao
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Distinctive Fluorescent Crystal Inclusions in Spinel

The authors examined a 7.01 ct spinel reportedly from Tanzania. Under short-wave (254 nm) ultraviolet light, a small fluorescent spot was observed on the stone's surface, caused by cut-through crystal inclusions. Micro-Raman analysis identified the inclusions as diopside, phlogopite, and edenite, forming a cluster of transparent crystals associated with a dark, opaque pyrite grain (figure 9A). In reflected light, the inclusions showed luster distinct from the spinel host, with the pyrite exhibiting a golden metallic luster (figure 9B). Under short-wave ultraviolet light, the crystals fluoresced in different colors: white for diopside, yellow for phlogopite, and blue for edenite (figure 9C). Fluorescence from inclusions is often overlooked but can provide important identification clues.

Natcha Rattana-anan and E. Billie Hughes
Lotus Gemology, Bangkok

Quarterly Crystal: Chromite in Diamond

Recognizable mineral inclusions in diamond are rather unusual. The most common inclusion in gem-quality diamond is often referred to as a "carbon spot," which is a collective term used to describe any dark inclusion in diamond. The most prominent dark mineral inclusions in diamond, carbon spots are typically chromite, graphite, or sulfides. Of the three, only graphite is composed of carbon. Sulfides are fairly common as inclusions, and chromite crystals are the only type of carbon spot that is actually rare.

This quarter's subject is a transparent, colorless, and partially etched diamond octahedron, which came from

Figure 9. A cluster of diopside, phlogopite, and edenite inclusions in spinel, associated with a dark, opaque pyrite crystal, shown in diffused fiber-optic light (A), reflected light (B), and short-wave ultraviolet light (C). Photomicrographs by Natcha Rattana-anan; field of view 3.6 mm.





Figure 10. Weighing 1.17 ct and measuring 6.61 mm in the largest dimension, this partially etched colorless diamond octahedron hosts numerous opaque black chromite crystals. Photo by Rhonda Wilson.

Sierra Leone, by way of David New in Tucson, Arizona. The diamond crystal, weighing 1.17 ct and measuring 6.61 × 5.94 × 3.09 mm, hosts numerous opaque black solids

situated along octahedral planes (figure 10). Laser Raman microspectrometry identified one of the included crystals as chromite. As an inclusion in diamond, chromite is generally opaque and black with a submetallic to vitreous luster and typically forms as angular mineral grains (figure 11, top). In polarized light, the chromite inclusions are observed to cause strain in the diamond host (figure 11, bottom).

John I. Koivula and Nathan Renfro
GIA, Carlsbad

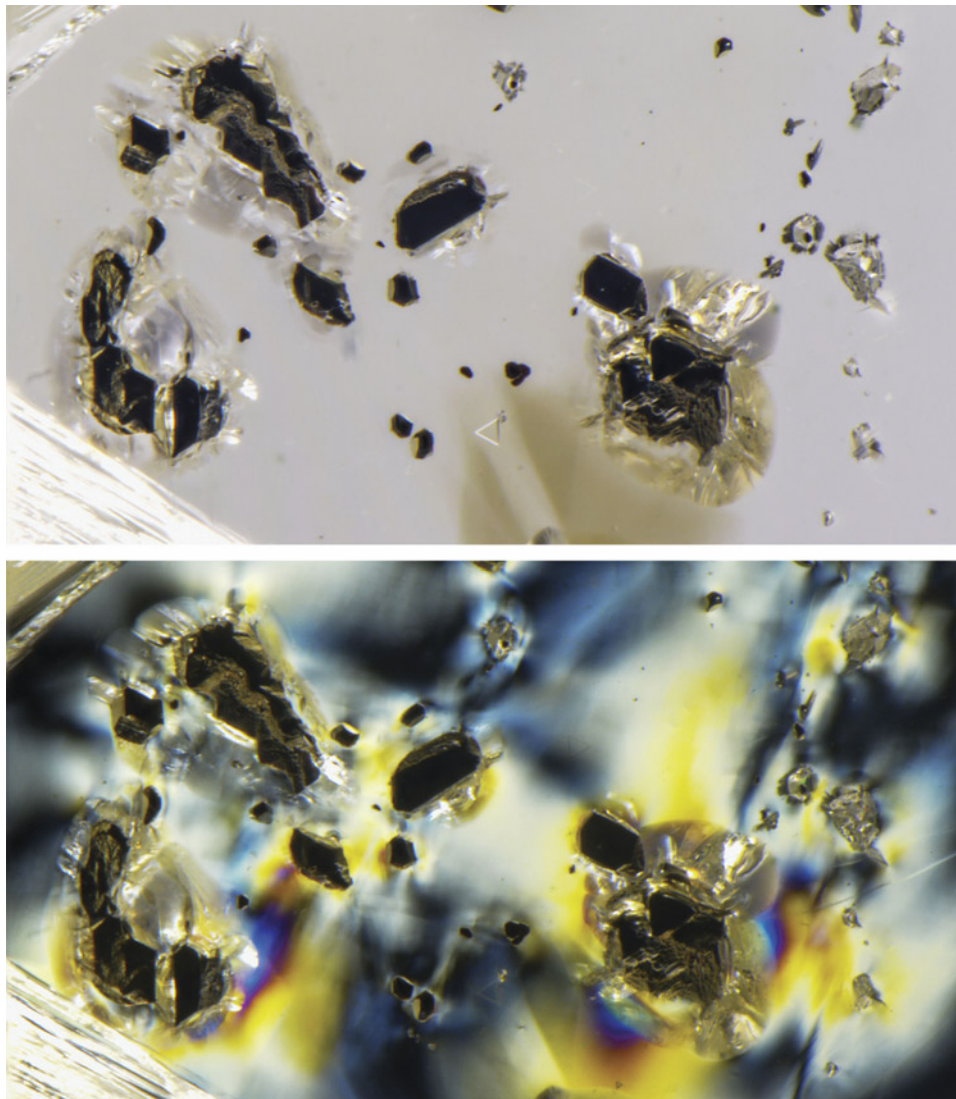


Figure 11. Top: Sometimes referred to as “carbon spots,” opaque black crystals of chromite are uncommon inclusions in diamonds. Bottom: Polarized light reveals the strain surrounding the scattered chromite crystals. Photomicrographs by Nathan Renfro; field of view 3.73 mm.