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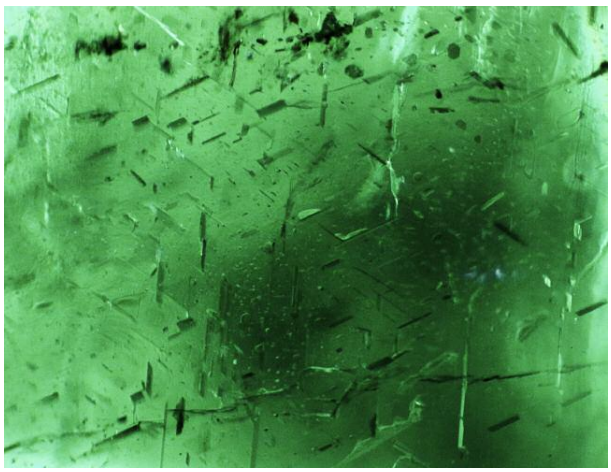
COLORED STONES AND ORGANIC MATERIALS

Natural emerald with inclusions along three directions. Recently, Guild Gem Laboratories received a 10.48 ct sugarloaf emerald (figure 1) for identification and origin determination. The refractive index (approximately 1.58) and specific gravity (approximately 2.80) fell within the range for beryl, and Fourier-transform infrared (FTIR) testing confirmed it as natural emerald. Additionally, energy-dispersive X-ray fluorescence (EDXRF) analysis revealed Fe, V, and Cr contents consistent with those in Zambian material.

The stone showed interference colors when placed under a polariscope with the bottom facing up. With a conoscope, the optic axis of this emerald was determined to be perpendicular to the bottom. Using the microscope, we found thin platy inclusions arranged in three directions intersected with each other at 60/120 degree angles (figure 2). Those inclusions were mainly dark brownish and transparent with well-formed rectangular shapes, some of which exhibited a light bodycolor resembling an unhealed fracture. Evenly distributed reflective light could be seen at certain angles. We deduced that those inclusions had relatively smooth surfaces, which means that their original crystal faces were not corroded during the emerald's formation. Further observation revealed hexagonal inclusions in the basal plane. Owing to uneven development during their crystalline formation, several of them were nearly triangular in shape. Their sides were parallel to the direction of the platy inclusions (figure 3, top). We also found distinct growth lines near the bottom of the sugarloaf perpendicular to the c-axis. These platy inclusions appeared to be concentrated sparsely in a thin layer with a thickness around 1.5–2.0 mm, as shown figure 3 (bottom). The sparseness of

Figure 1. This 10.48 ct sugarloaf emerald from Zambia shows a vivid and highly saturated green color. Photo by Yizhi Zhao.

Figure 2. Platy inclusions in the emerald in three directions, intersecting at 60/120 degree angles viewed along the c-axis. Photo by Yujie Gao; field of view 2.8 mm.



Editors' note: Interested contributors should send information and illustrations to Stuart Overlin at soverlin@gia.edu or GIA, The Robert Mouawad Campus, 5345 Armada Drive, Carlsbad, CA 92008.

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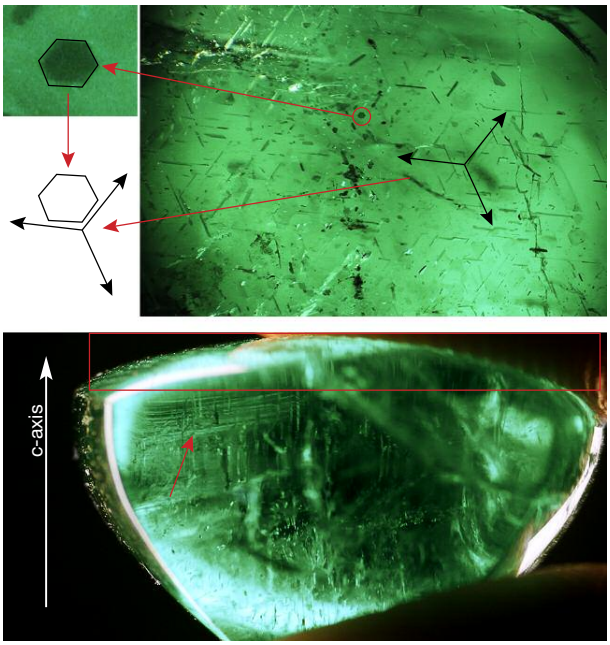

Figure 3. Top: The hexagonal inclusions in the basal plane are parallel to the orientation of the platy inclusion described in figure 2. Field of view 3.1 mm. Bottom: A thin layer exhibiting growth lines is perpendicular to the emerald's c-axis. Photos by Yujie Gao.

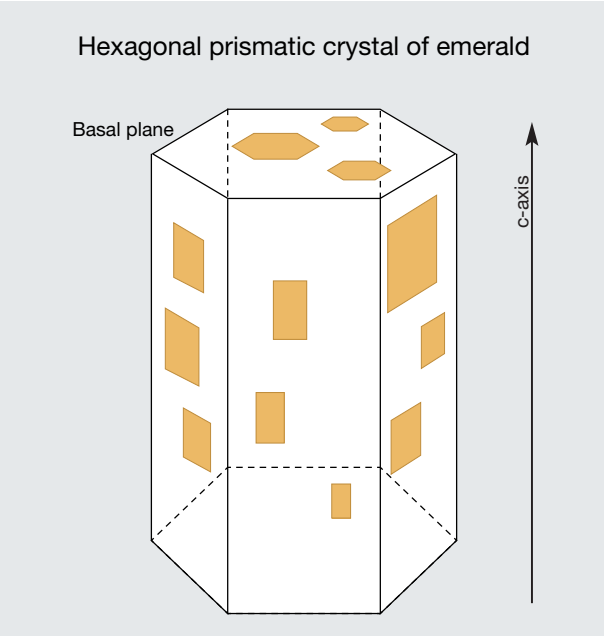

Figure 4. Proposed illustration of hexagonal inclusions in the basal plane and platy inclusions along the prismatic faces. Illustration by Yujie Gao.

the oriented inclusions resulted in the absence of asterism or cat's-eye phenomena.

Considering the optic axis, we concluded that the platy inclusions grew along the hexagonal prismatic emerald faces, with the hexagonal platy inclusion parallel to the basal plane, as illustrated in figure 4. However, it is still unclear whether they were syngenetic or exsolution, since their well-preserved shapes showed little evidence of corrosion and there was insufficient evidence of exsolution.

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DIAMONDS

Nominal type IaB diamond with detectable uncompensated boron. In recent years, nominal type IaAB and IIa diamonds with transient 2800 cm^{-1} FTIR absorption peaks arising from uncompensated boron produced under UV radiation have been reported (J. Li et al., "A diamond with a transient 2804 cm^{-1} absorption peak," *Journal of Gemmology*, Vol. 35, 2016, pp. 248–252; Winter 2016 Lab Notes, pp. 412–413). The National Center of Supervision and Inspection on Quality of Gold and Silver Products recently examined a type IaB diamond that exhibited instantaneous 2803 cm^{-1} FTIR absorption shortly after exposure to an ultra-short-wave (< 230 nm) UV source.

Under ultra-short-wave UV excitation, the 0.30 ct K-L diamond with faint brown color, mounted in an 18K gold prong setting (figure 5), showed strong blue fluorescence and strong greenish blue phosphorescence that lasted for approximately eight seconds (figure 6). Infrared absorption spectroscopy showed low concentrations of the hydrogen-related peak (3107 cm^{-1}) and nitrogen impurities in the B aggregates at 1174 cm^{-1} (figure 7), indicating a type IaB diamond (C.M. Breeding and J.E. Shigley, "The 'type' classi-

Figure 5. This 0.30 ct K-L diamond with faint brown color, mounted in an 18K gold prong setting, is a nominal type IaB diamond with detectable uncompensated boron. Photo by Wenqing Huang.