



The Gem and Jewelry Institute of Thailand (Public Organization)

URGENT LAB INFO

“BLUE DYED AND CLARITY MODIFIED SAPPHIRE WITH COBALT+LEAD-GLASS FILLER IN FRACTURES AND CAVITIES”

By Gem Testing Laboratory
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Recently, GIT-GTL received two unusual blue stones weighing 6.62 ct (cabochon cut) and 7.57 ct. (mixed cut, faceted on one side and cabochon on the other side), respectively for report identification (Figure 1). These two stones claimed to be conventional or traditional heat-treated blue sapphires.



Figure 1: Two blue stones weighing 6.62 ct (right) and 7.57 ct (left) submitted to GIT-GTL for testing. (photo: Warinthip K.)

The RI and SG values (~1.77 (spot test) ; 4.00 for the smaller stone and 1.76-1.77; 3.98 for the larger one) suggest that these two stones are gem corundum. Microscopic observation revealed their natural features, i.e., crystal inclusions and lamellar twins. However, among the microscopic features found in those two stones, the most striking ones are the inhomogeneous color concentration due to the presence of blue glass filler in open fractures and cavities, which is clearly in contrast to the colorless sapphire background (Figure 2, left). This feature is obviously the main cause of blue coloration in these sapphires. Most fractures are still open (not healed) and almost completely filled with lower luster colored glass material of sapphire matrix (Figure 2, right). This suggests that the stones might have been treated at a relatively low temperature. In addition most open fractures obviously show yellow/blue/pink flashes when twisting the stones in fiber optics, and many of them also trap numerous tabular and small gas bubbles similar to those found in common lead-glass fracture-filled rubies (Figure 3). The stones fluoresce red under LWUV and visually being more intense along the glass-filled areas. Hence, based simply on such internal features and fluorescent characteristics, these stones are natural sapphires treated with blue glass to modify both color and clarity.

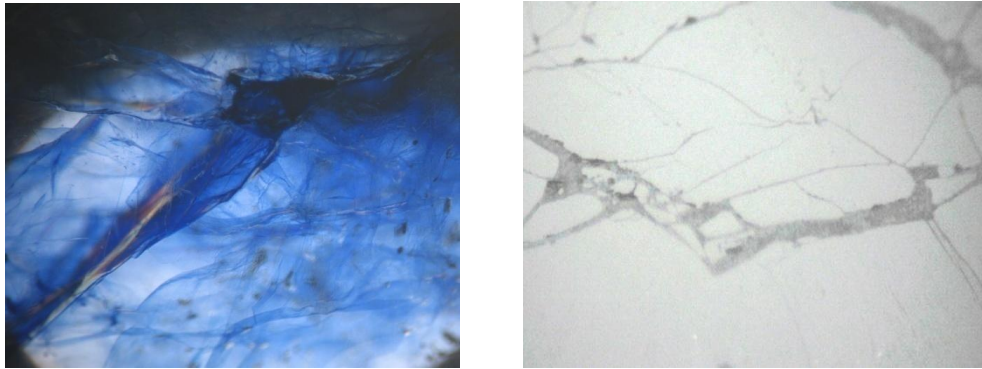


Figure 2: Color concentration due to blue glass filler present along fractures in colorless sapphire matrix (left, Darkfield), and the lower luster glass filling in open fractures (right, Reflected light). (photo: Papawarin O.)

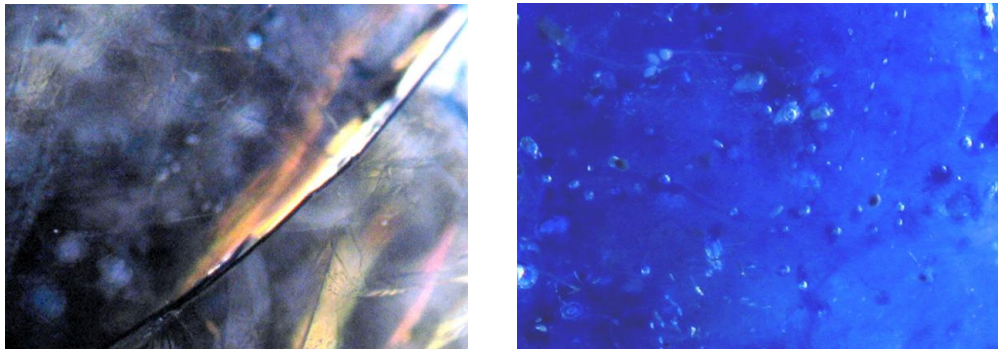


Figure 3: Yellow/Blue/Pink flash effect and finer wispy veil-like blue fissures (left); trapped gas bubbles along fractures (right) (photo: Papawarin O.) (Darkfield)

For the routine testing procedure, the chemical analysis by EDXRF is always carried out in order to check the composition of the filler. As expected, rather high content of cobalt (Co) and significant content of lead (Pb) from the blue glass filler have been detected. Further analysis by X-radiography also reveals the opaque areas in the X-ray images coincide with the positions of those fractures and cavities filled with the glass (Figure 4).

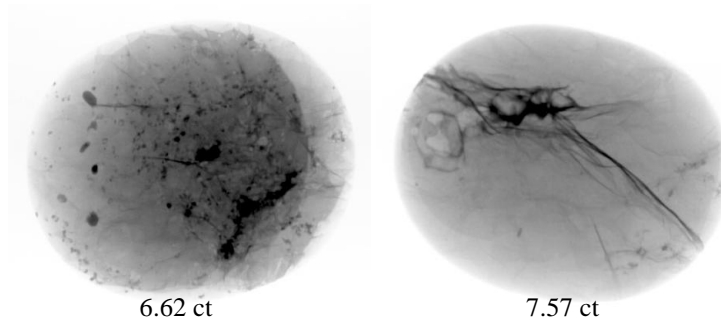


Figure 4: X-ray images of the two blue stones showing opaque areas along the fractures.

The UV-Vis-NIR spectra measured from both stones show clearly cobalt related absorption bands peaked at 544, 591 and 625 nm (Figure 5) which perfectly match with our reference spectra of "cobalt-blue glass". The Mid-IR spectra also show absorption humps at around 3500, 2597 and 2256 cm^{-1} (Figure 6), which are commonly found in the normal glass-filled ruby.

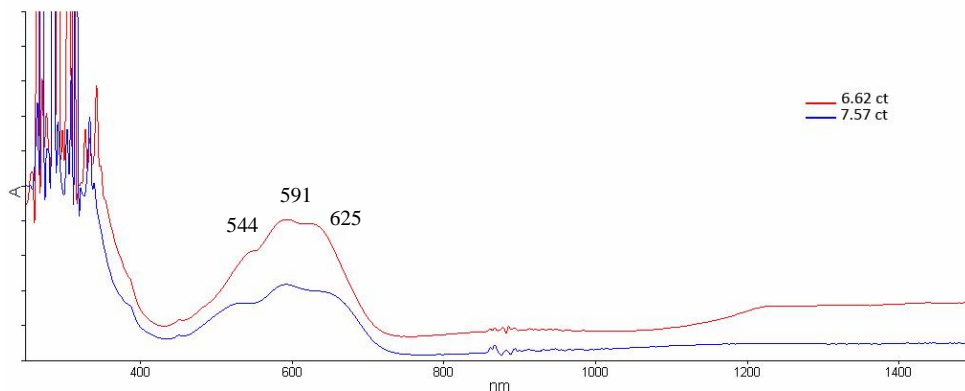


Figure 5: Non polarized UV-Vis-NIR spectra of these stones showing cobalt-related absorption bands peaked at 544, 591 and 625 nm.

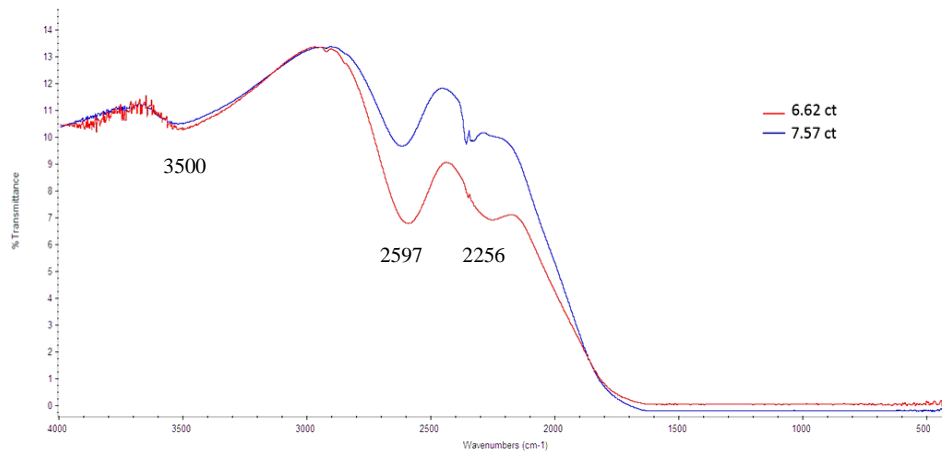


Figure 6: Mid-IR spectra of the two blue stones showing absorption bands at 3,500, 2,597 and 2,256 cm^{-1} normally present in glass-filled stones.

In conclusion, based on its internal feature aspects and data from other advanced analytical techniques, we are strongly convinced that these two stones are “blue dyed and clarity-modified sapphires with Co+Pb glass filler in fractures and cavities”.

However, the most urgent aspect concerning this new treatment is that the stones were sold to our client as “conventionally or traditionally heated blue sapphire”, but actually they are newly treated sapphires. This is our first time to test this newly treated material but we don’t exactly know how long these new materials have been commercially available in the market. Fortunately, these stones are quite easy to observe even with the normal 10X loupe. Nonetheless, carefully observation is strongly recommended for traders and jewellers to avoid any mix-up and/or mis-identification of these new treated stones, especially for mounted, or possibly, melee stones.

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