“Paraíba” Tourmaline and similar looking materials

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The popularity of “Paraíba” tourmaline has remarkably increased in last two decades and currently is one of the most sought after gems; the reason being their bright electric blue- green colours. “Paraíba” has slowly evolved in recent past as a particular shade of copper bearing elbaite tourmaline rather than a source in Brazil, a fact that is also reflected in identification reports of various laboratories. The popularity of “Paraíba” is now encouraging the jewellers, miners, or manufacturers to provide a cheaper alternate.

At the Gem Testing Laboratory of Jaipur, India we have encountered a number of gem materials, which simulated the colour appearance of “Paraíba” tourmalines. Some of those include apatite, glass, cubic zirconia and synthetic beryl. Materials like apatite and glasses have been known as “Paraíba” simulants for several years, but cubic zirconia and synthetic beryls have been launched recently on commercial scale. Keeping in mind the importance and the demand of “Paraíba” we decided to compile some of its simulants we have encountered along with its identification features. Following is the description of each of these gem materials:

Apatite

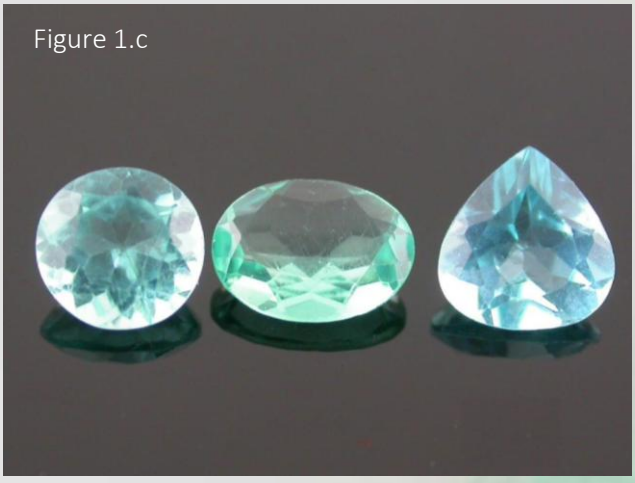
Apatite has been known in various colours and phenomenas and one of its colours is the ‘Paraíba’ shade. Specimens encountered include rough as well as cut in packet lots as well as single specimens (figures 1.a, 1.b & 1.c).

Figure 1.a

It is the colour shade, similar life and fire that makes apatite a very close simulant of Paraíba tourmalines however the dull lustre for an experienced eye is enough to separate it. Apatite is generally abraded and scratched due to its low hardness; however this should not be taken as a conclusion.

Figure 1.b

Figure 1.c



Apatite may however be easily separated from tourmaline and other simulants as well by its properties as listed in table 1. The most characteristic features include the strong didymium spectrum, under magnification, 'black canals' or fine tubes oriented in one direction (along 'c' axis), disc like inclusions, fingerprints and cleavage planes may be seen. Also the low birefringence and absence of "doubling of back facets or inclusions" is an important feature to eliminate the possibility of tourmaline.

Glasses

Several "Paraíba shade" rough as well as cut glass specimens have been encountered (figures 2.a and 2.b) Glasses can easily be identified by its standard optical properties and presence of gas bubbles, swirl marks or devitrification features. Again refer to table 1 for properties of glass.

However, out of many glass samples observed, one of the specimens stands out an interesting one, which requires a special mention. A blue green rough (figure 2.c) 'appeared' to be dichroic, similar to the feature seen in "Paraíba" tourmalines. Tourmalines are characterized by their strong pleochroism where when viewed in

different directions perpendicular to each other they exhibit variable colours. An almost similar effect was seen in the glass sample as well. When the sample was viewed from top it appeared yellowish green while from side greenish blue.

Figure 2.a

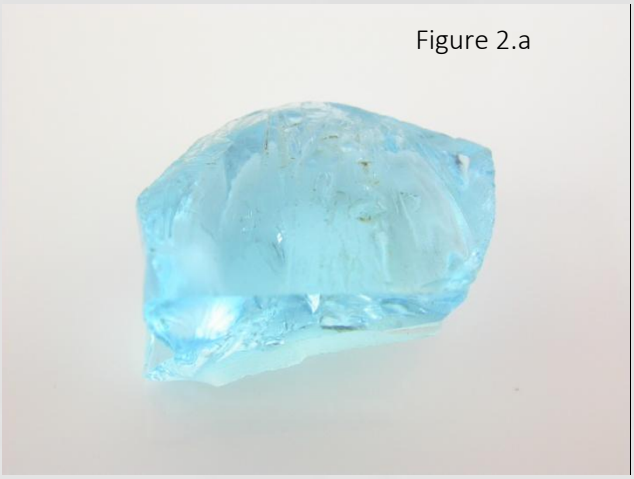
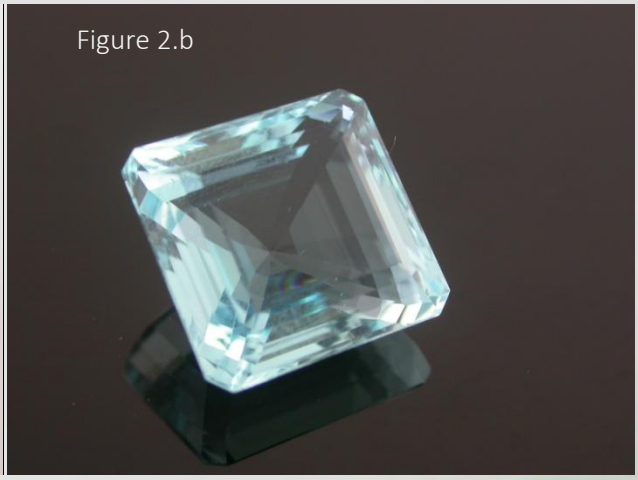


Figure 2.b



When observed carefully, we noted a yellowish / brownish swirl like plane running along the top surface giving rise to a yellow component in blue colour (figure 2.d), hence the sample appeared yellowish green, whereas from the side, the yellowish surface was not observed giving it an appearance of pleochroism. However, proper examination easily concluded it as a glass. It also exhibited a concentration of thick swirl like pattern forming a conical zone; on magnification scattered gas bubbles were also observed.

Figure 2.c

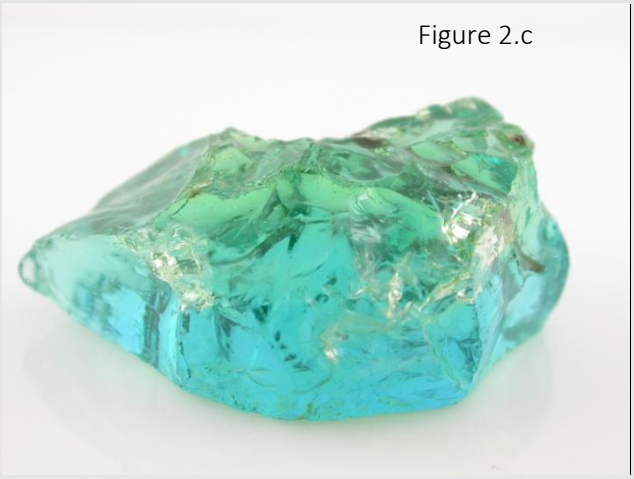
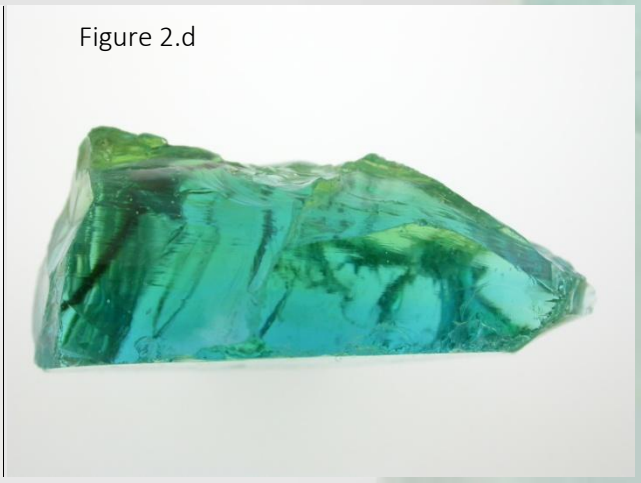


Figure 2.d



Synthetic Beryl “Paraíba” shade

At the September 2008 Bangkok Gem & Jewelry Fair, one of the authors (CG) encountered the booth of Tairus Co. Ltd., which, among various “created” products also sold synthetic “Paraíba”. Upon enquiry, the representative of Tairus informed that it was “Paraíba shade synthetic Beryl” which has commercially been launched recently. Both rough and cut stones were on a display ranging in size approximately from 0.20 to 3.00 carats.

Two purchased specimens (one cut and one rough) (figures 3.a and 3.b) displayed a bright ‘electric’ greenish blue colour. Visually, the rough sample was readily identifiable as a product of hydrothermal technique by the presence of typical wavy features on the surface similar to Tairus hydrothermal emerald (Schmetzer. K. et al. 2006); this followed inside the stone as chevron. The cut specimen also exhibited strong chevron growth patterns even to the unaided eye (again figure 3.a).

Figure 3.a

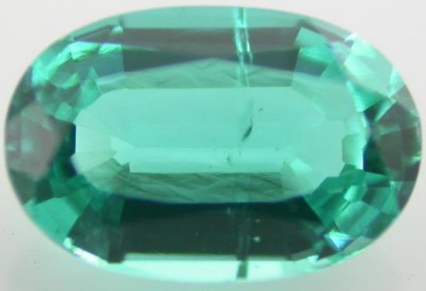


Figure 3.b

Measured gemological properties were consistent with beryls. The tested specimen gave RI and SG values of 1.594 – 1.600 and 2.75 respectively, whichwere much higher as compared to those reported previously for synthetic beryl, aquamarine (Schmetzer K.1990). Apart from chevrons even hounds tooth features were visible under magnification.

Although, synthetic beryls have been encountered for over a decade but this colour variety is one of the exceptional qualities.

Synthetic Cubic Zirconia:

At the Hong Kong Gem and Jewelry fair, 2007 “Paraíba” shade synthetic cubic zirconia was seen. Rough columns were available and one such was purchased for a collection (figure 4.a). A part of the rough was sawn and two cut stones (figure 4.b) were made out of it. Though the rough appeared very dark, the cut stones showed the true “Paraíba shade”. Other measured properties were consistent with Synthetic Cubic Zirconia (again table 1). This stone may easily be identified visually by the high sub-adamantine lustre, high heft, high life, and high dispersion (which may be masked by darker shades).

Figure 4.a

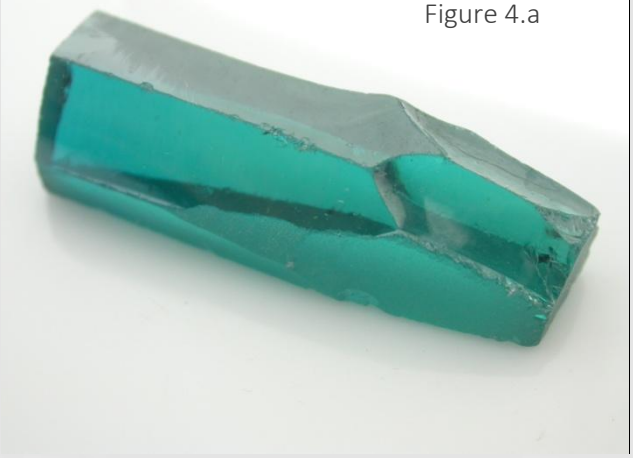
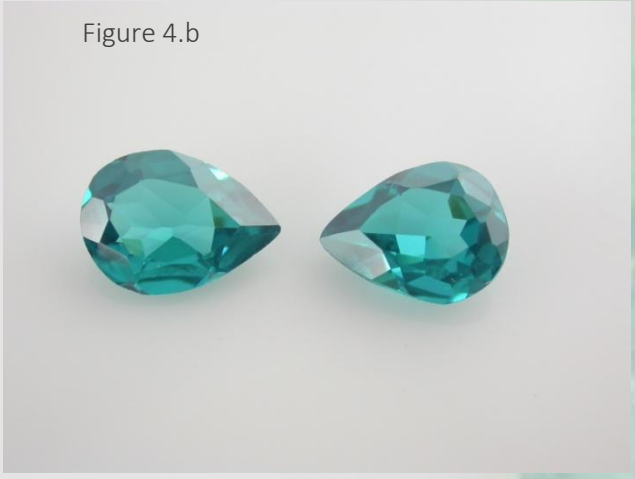


Figure 4.b



The prices of “Paraíba” tourmalines are soaring up and in this case where certain laboratories encourage it by mentioning it on its identification reports, trade has won the confidence of customers in marketing this “special product”. For others, such simulants provide much cheaper alternative to the demand of “Paraíba”. Identification and separation of these stones from tourmaline may be made by simple testing but origin determination of “Paraíba” can only be done by a well equipped laboratory.

Table: 1 Gemmological Properties of Tourmaline and its 'Paraíba' type simulants

	Tourmaline	Apatite	Glass	Synthetic Beryl (Hydrothermal)	Cubic Zirconia
Optic Character	DR/Uniaxial	DR/Uniaxial	ADR/ SR	DR/Uniaxial	ADR/ SR
Pleochroism	Strong dichroic	Moderate dichroic	Nil	Moderate dichroic	Nil
R.I. range	1.61 to 1.65	1.64 to 1.65	1.45 to over range	1.57 to 1.60	Over range
Birefringence	0.020	0.002 – 0.006	-	0.004 to 0.008	-
S.G.	3.03-3.12	3.17-3.23	Variable 2.30-4.50	2.70-2.75	5.80-6.20
Magnification features	Highly reflective fine liquid inclusions "trichites"; doubling	Black canals, fine parallel needle like inclusions along optic axes, fingerprints at 90° to black canals, cleavage cracks,	Swirl marks, gas bubbles, devitrification effect	Undulating growth patterns "chevrons"; hounds tooth. Other possible inclusions are Nailhead spicule, seed plate, liquid fingerprints, and small crystals	Generally clean; gas bubbles or unmelted zirconium powder may possibly be observed.
Other characteristic features to separate.		typical rare-earth spectrum-series of lines in yellow/green region	ADR/ SR, gas bubbles and swirl marks. Sometimes rounded facets	Floats in 2.88, strong chevron effect.	Sub-adamantine lustre, very high heft, life and dispersion.

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