Glassy fillings: a loupe just isn't enough

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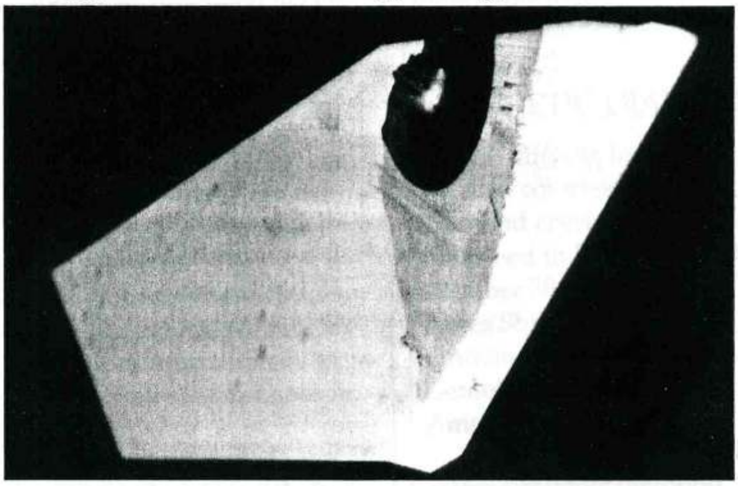
The nomenclature for glass-treated ruby in the industry today is not easy to handle. First, there is the question of the extent of the treatment. Second, the situation or technique under which a treatment can be observed and assessed has to be defined. How we are going to handle the situation has not yet been clearly defined by the trade.

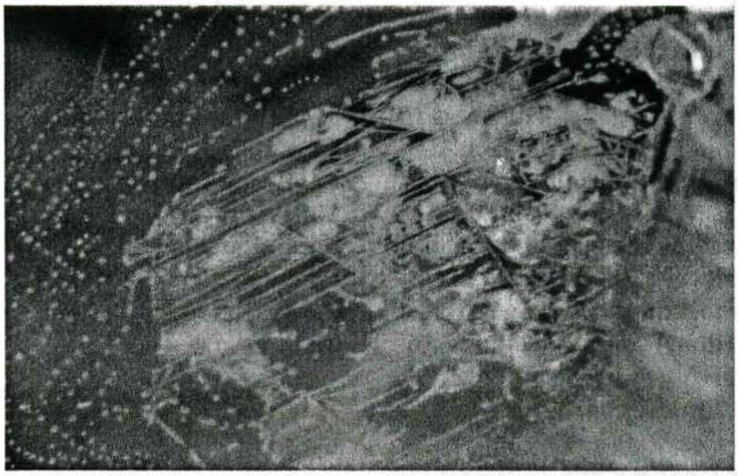
Today the majority of rubies in the marketplace have been heat-treated. Different ways of heating enhance the appearance of ruby by improving the color, increasing the degree of transparency, and hiding or even healing fractures by recrystallization, which increases the structural integrity of the ruby.

For different reasons, the stones are covered with foreign substances such as borax or other materials before they are heated. During the heat treatment, the added substances form a melt which dissolves some material from the surface of the ruby and incorporates whatever other substances are present. Therefore the melt changes its composition from molten borax to a boron silica alumina melt.

During the heat treatment process, this melt runs by capillary action into all voids or fissures of a ruby



A cavity and all open fractures of this heat and glass treated ruby have been filled with glass, identifiable by lower luster. Within the glass, an air bubble is cut by the surface. (Magnification 20x)



This artificially healed fracture has recrystallized under the flux effect of the glass. In newly formed crystalline cells, the glass has been trapped, devitrified, and formed white radiating crystals.

which reach the surface. When this melt cools, it may sometimes stay homogeneous and glassy. Usually the melt traps some tiny gas bubbles in the fissures of the ruby which are visible through the microscope. The glassy melt in the fissures may also become partly crystalline by devitrification. This is visible by the presence of whitish radiating crystals in the former fracture planes or voids.

When there are no openings - no cracks, holes, chips, or fissures - the glassy substance on the surface of the stone is completely removed during the polishing process. When there are minor fissures or chips, the glassy substance will fill them and be present in small amounts. If the stone was rather porous to begin with and substantial chips and fractures are filled with the glassy melt, the glassy substance will even be visible on the suface of the polished ruby by its lower luster.

It is therefore a matter of how much glass is accepted and how easy it is to prove its presence that are the main issues when we discuss the possibilities of disclosure.

It is also important to recognize the difference between an observation - "we think it is a glassy filling because it looks like a glassy filling" -and an identification - "we have analysed the glass and know its composition."

People in the trade may decide what they want to read on the identification reports but the labs may have to modify this according to the constraints of what is feasible under normal working conditions. We cannot use heavy equipment like the scanning electron microscope for every routine identification report of a one-carat ruby.

In the SSEF laboratory we have four degrees of disclosure statements to communicate the extent of treatment, regarding the application of heat alone or with the support of additives.

1. If we consider a ruby as not heated, i.e. we do not

observe signs typically associated with heated corundum, we state on the test report in the comments section: "No indications of heat treatment."

2. If we find characteristics typical for heated ruby, we omit the comment above. CIBJO rules consider pure heat treatment of ruby and sapphire a commonly used and accepted trade practice.

3. If we find easily visible portions of artificial glassy substances on the surface of the ruby, we identify it as "Treated Ruby" in accordance with CIBJO rules which require this statement under the identification section of the test report.

4. If we find indications that a ruby may have been glass filled only by the internal characteristics of the fissures under magnification or by identification of minor traces of glassy fillings on the surface by advanced tests, we mention under comments: "With indications of artificial glassy fillings in fissures."

For a trained observer, it is usually possible to recognize the stones that fall into category three above by using a 10-power loupe.

On the other hand, it is usually impossible to use a 10-power loupe to find the traces of glass in the fractures that would place a stone in the fourth category, although you might observe the flat bubbles and fingered tiny voids to support the assumption that glass may be present.

Deposits of glassy material on the surface of a ruby like those described in category three above are commonly removed by placing the stone in hydrofluoric acid for a few minutes. This effective but extremely dangerous acid dissolves the glass and leaves a clean ruby surface.

Unfortunately, it is usually not possible to remove all the minute traces of glass in the fissures like those in category four above because some of the fissures have contraced and closed after the material cools after heating.

Therefore the proposal that has been made to use what can be seen by a loupe or 10-power magnification to draw a line between heavy glass treatment and minor traces of glass in fissures will be of little importance. "Treated rubies" in category three will be easily cleaned after being identified as such, leaving only those stones in category four.

The significant effect of glass in all the tiny fissures, which is an increase in the beauty and value of the stone, will not be visible by using the loupe. As in the case of emeralds which have been enhanced by fracture filling, it is not the amount of material which matters but the effect of hiding the narrow fractures which would detract from the beauty and value of the stone. It is the increase in the value of the stone which makes this matter a difficult nomenclature issue.

By using these four categories of comments on ruby enhancement, SSEF tries to be fair both to buyers and sellers.

Synthetic diamond in ICA Lab Alert 78

The identifying features of a Russian colorless synthetic diamond crystal are described in ICA Lab Alert Number 78 submitted by James Shigley and Emmanuel Fritsch of the Gemological Institute of America.

The 0.42-carat near-colorless synthetic diamond crystal was loaned to GIA researchers by Chatham Created Gems. According to Tom Chatham, the crystal was grown using a belt apparatus, not the split-sphere technology which is said to produce yellow synthetic diamonds in Russia.

The crystal examined was a cuboctahedron modified by dodecahedral and trapezohedral faces. It contained a number of large metallic, magnetic inclusions which looked brown in reflected light. The crystal adhered to a magnet as a result of these inclusions which were determined to contain iron by energy-dispersive x-ray fluorescence chemical analysis. No graining and only very weak anomalous birefringence, or strain, were observed.

The crystal was slightly electrically conductive, but the conductivity varied considerably depending on the pair of faces selected for testing. There was no fluorescence to longwave ultraviolet light and weak yellow fluorescence to short-wave ultraviolet light. The crystal continued to emit yellow phosphorescence for approximately 30 to 45 seconds after the short-wave ultraviolet was turned off.

No absorption bands could be seen using a hand-held spectroscope. The authors said they were unable to record an infrared spectrum with features associated with type IIb diamond to confirm the measurements of electrical conductivity and said that this was probably due to the metallic inclusions.

The features most useful in identifiying the synthetic diamond were the metallic inclusions and yellow fluorescence to short wave ultraviolet with no reaction to long-wave ultra violet. All features are consistent with other synthetic diamonds the authors have examined.