Glass-like Fillings in Rubies and Sapphires

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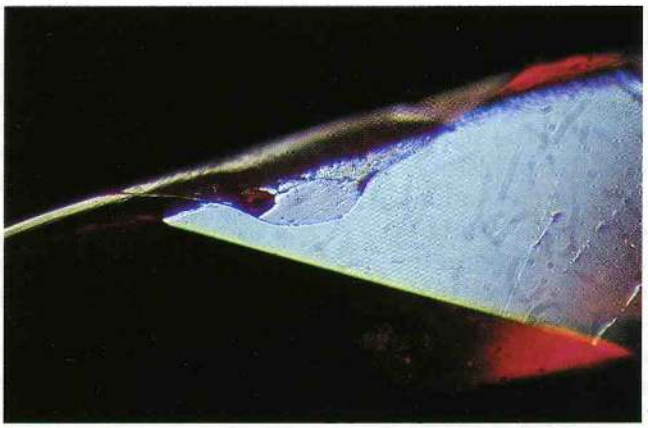
Another method has been found to improve the appearance of certain corundums. For some time, we have occasionally observed stones with additions of a glass-like material. Cavities in the girdle region and depressions on the pavilion are filled with this substance. Actually, such re-entrant regions should have been removed by cutting. To avoid this loss of weight, but nevertheless to ensure a perfect surface, the glass-like fillings were applied. All rubies and sapphires treated in this way show signs of a thermal treatment. Probably, the glass was added in the course of this treatment and then flowed as a thin liquid into depressions and holes. It was even found in narrow fissures. There, the glass fulfilled the same function as oil does in the fissures of emeralds: the visibility of the fissures is reduced drastically. But while the improvement (i.e. the oil) in emerald is only loosely attached to the stone, a glass-like filling remains fixed to the corundum until cut away or dissolved by hydrofluoric acid.

Microchemical analyses of the fillings showed them to consist mainly of silicon, aluminium, magnesium, sodium, calcium, potassium and some iron. The presence of boron (from added borax) can only be assumed, since tests for boron would be destructive. The chemical composition of the fillings of different stones varies significantly. Therefore it seems, that the Thai companies carrying out filling-treatment use their own prescriptions.

A part of the observed glass-like fillings were not transparent and colourless, but opaque and whitish or yellowish. With a slow cooling rate and a suitable chemical composition, crystals precipitated from the glassy melt. The growth of crystals at the expense of the glass substance may proceed to the extent that only a slight amount of glass remains. In this case, one should no longer refer to the filling as a glass or glassy, but rather as a ceramic. Since in some cases the filled depressions have dimensions of 0.5 to 1 mm, they are easily seen in the microscope. It is of great importance to observe the surface of the stone in reflected light. In this way, the inferior extent of reflection and in some cases a negative relief in polish may be discerned. Occasionally, gas bubbles and sheafs of crystals can be found in the glassy fillings. Ceramic fillings may appear to be opaque mineral inclusions.



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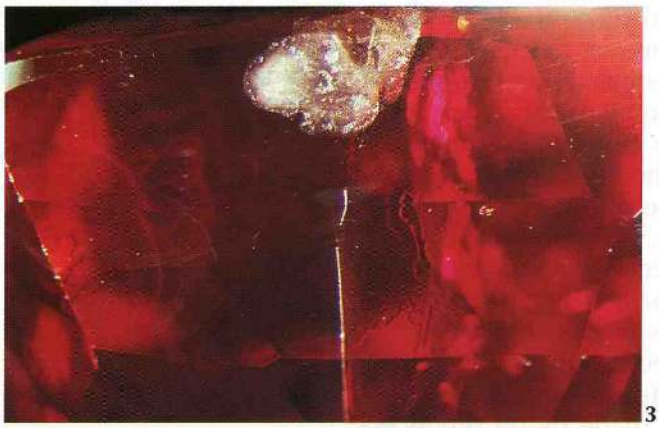

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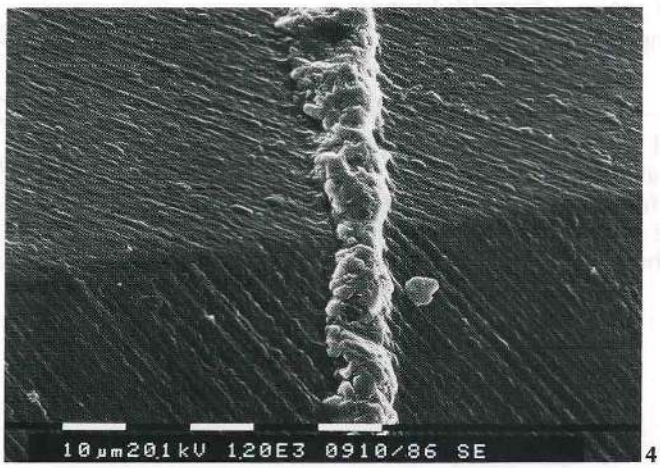

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With this contribution I hope to assist the reader in finding fillings in corundum since, following the CIBJO-rules, such stones must be designated as **treated rubies** or **treated sapphires.**

Further literature on this subject:

Scarratt, K. & Harding, R. (1984): Glass fillings in natural ruby. Journal of Gemmology, XIX, 4, 293–297.

Kane, R. (1984): Natural rubies with glass-filled cavities. Gems & Gemology, Winter, 187–199.

CIBJO, (1986): Definitions, Rules of Application, Nomenclature. In press.

1) Glass-like filling at the girdle of a ruby. In reflected light, the slightly lower reflectivity and the negative polishing relief of the filling becomes visible.

2) Sapphire with addition on the pavilion. In dark-field illumination, the exsolved white crystals and gas bubbles are clearly visible.

3) Yellowish ceramic substance filling a pit and a fissure extending from it. The former homogeneous glass melt has yielded crystals and therefore turned opaque.

4) Strongly enlarged picture of a facet edge which is crossed by a filled fissure. The crystalline nature of the filling is visible. The picture has a width of 1/10 mm. SEM-micrograph courtesy of M. Düggelin, SEM-laboratory, University of Basel, Switzerland.