

# THE JOURNAL OF GEMMOLOGY

AND PROCEEDINGS OF THE  
GEMMOLOGICAL ASSOCIATION  
OF GREAT BRITAIN

Vol. 13 No. 2

APRIL 1972

## NEEDLES IN CORUNDUM OTHER THAN RUTILE

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RECENTLY, a paper was published with the description of inclusions of corundum in corundum<sup>(1)</sup>. The stones in question are light blue sapphires with a tinge of green or brownish or purple-coloured corundums respectively. They are found in the Umba mine near the river Umba in the Northeast of Tanzania in the neighbourhood of the Kilimanjaro mountain.

The inclusions are elongated needles which, at first sight, seem to be similar to the well known rutile needles that occur in so many corundums. They are shown in Fig. 1. The picture shows that the needles follow three directions, which appear to be at right angles to each other. Fig. 2 confirms this impression, but in reality they differ from the right angle to a small but certain amount. According to the above mentioned publication, they run at right angles to the faces  $(42\bar{1})$ ,  $(22\bar{1})$ , and  $(24\bar{1})$ , which represent the faces of steep hexagonal pyramids. With an X-ray analysis it could be found that the "needles" consist of corundum and that they are in "twin positions" to the host crystal. Surprisingly, each of the needles is again twinned parallel to the prism faces of the host corundum. Furthermore, the needles are of secondary origin with respect to the surrounding corundum crystal. This and the fact that the inclusions are the cause of a considerable tension make it likely that the needles are originated by pressure. But this theory is not yet proved.

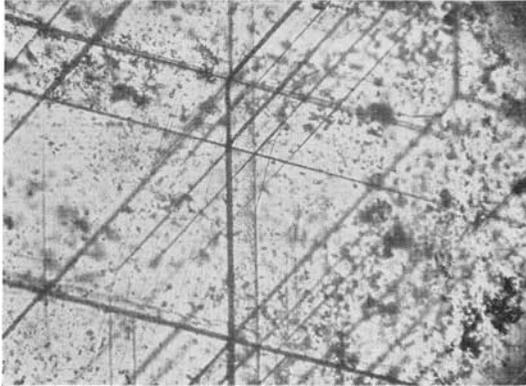


FIG. 1. Light blue sapphire from Tanzania with strictly orientated dark needles of corundum accompanied by a great number of small and rounded zircons (here out of focus). 22 ×

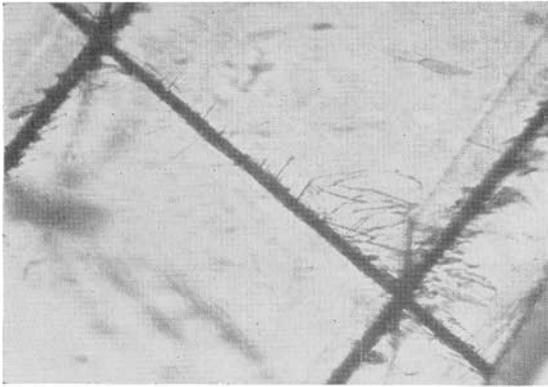


FIG. 2. Same sapphire as in Fig. 1 at a greater enlargement. The needles appear to be perpendicular to each other. 65 ×

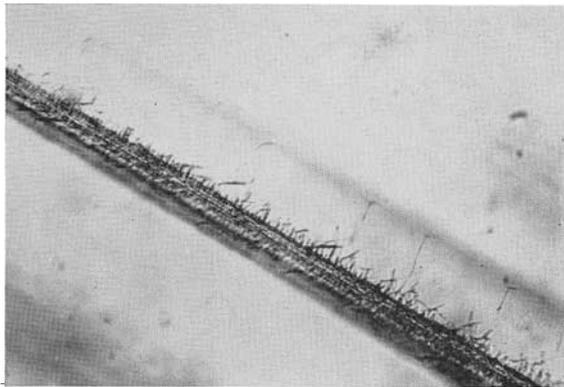


FIG. 3. A light violet sapphire from Tanzania with part of a needle and "fringes". 120 × (As Fig. 1 taken from Ref. 1)

Fig. 2 reveals some very fine cracks starting from the needles. They are shown at a higher magnification in Fig. 3 and are considered to be tension cracks. It is assumed that they are also the cause for the opacity of the needles.

The rubies and sapphires from Tanzania did not reach the market before 1960. Their particular "needles" could be considered as a hall-mark for corundums of this occurrence. But this is not possible, as rubies and sapphires from other and long-known localities include similar needles. In a small but very good coloured blue sapphire from Yogo Gulch in Montana, U.S.A., a group of the same needles could be observed, intersecting each other at nearly right angles (Fig. 4). There is no doubt that they

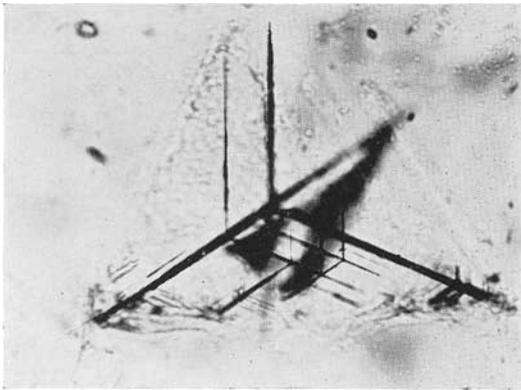


FIG. 4. Montana sapphire with a group of nearly rectangular intersecting needles. 120 ×

also consist of corundum. Even the famous "Mogok Stone Tract of Burma" has produced rubies with these particular inclusions. They are exhibited in Fig. 5. It must be confessed that these corundum needles are very small and that they can be overlooked very easily or mistaken for rutile.

Corundum, as an inclusion in corundum, was first mentioned by P. C. Zwaan<sup>(2)</sup>, who described it as "some platy colourless inclusions". H. J. Schubnel<sup>(3)</sup> characterized the "needles" in the Tanzanian corundums as a kind of dislocation, an opinion which later proved to be correct.

Another rarity could be observed in a light-brown-coloured sapphire from Tanzania, as it is exhibited in Fig. 6. This needle runs parallel to the base plane of the sapphire. It is colourless and doubly refractive, with a refractive index somewhat lower than that

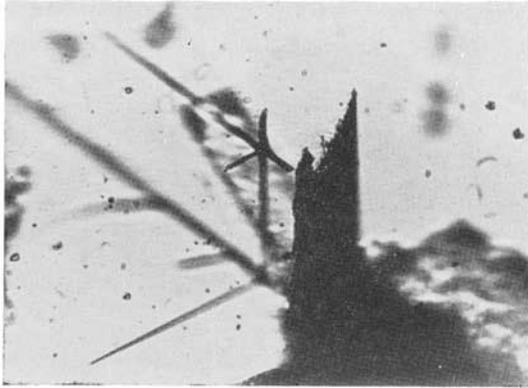


FIG. 5. Ruby from Burma with corundum needles. 228 ×

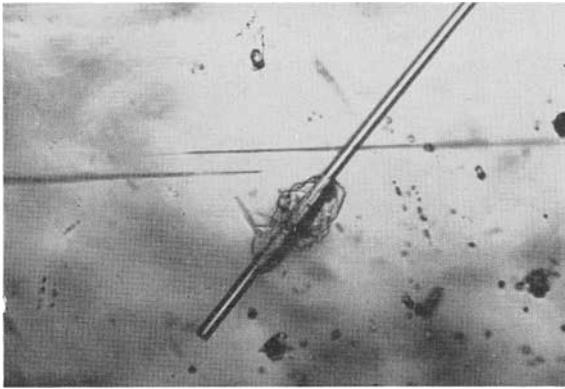


FIG. 6. A long and colourless needle (apatite ?) in a light brown sapphire from Tanzania. 65 ×

of the corundum. Therefore it is assumed, that this needle represents an apatite crystal, the mean R.I. of which is not very different from 1.64 (against 1.76 of corundum). In the lower part of the needle is a small tension crack and in the middle of the picture are two needles of corundum, running horizontal and parallel to each other.

The sapphires from Tanzania with the very interesting needles of corundum are a generous gift from Mr. R. Biehler, the owner of the firm Ernst Faerber in Munich, to whom the author owes a debt of gratitude.

#### REFERENCES

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3. H. J. Schubnel: Private communication.