DIAMOND GRIT–IMPREGNATED TWEEZERS: A POTENTIALLY DESTRUCTIVE GEMOLOGICAL TOOL

By John I. Koivula, Edward Boehm, and Robert C. Kammerling

The authors examined diamond grit–impregnated tweezers that reportedly were being marketed out of Japan. The tweezers were shown to damage virtually any type of gemstone with the possible exception of diamond; owners of these tweezers are advised to use caution.

Just as a tennis racket is an extension of the arm for the professional tennis player, so a pair of tweezers is an extension of the hand for the jeweler-gemologist. The gemologist thinks no more about how to use tweezers when examining a stone than a tennis player does about racket technique during match play. Years of practice make these actions automatic, almost instinctive.

And yet it is this very instinctiveness that can cause problems when a new type of tool is used in the same manner as the more familiar one. It was with this in mind that the authors investigated a new type of tweezers that appeared to be potentially damaging to gemstones.

Instead of the standard metal "waffle pattern" seen on most gem tweezers (figure 1, top), this new type is impregnated with particles of randomly oriented, sharp-edged diamond grit (figure 1, bottom). According to the literature that accompanied the tweezers (which were sold in pairs—one fine point and one medium point—and are reportedly manufactured in Japan), the purpose of the diamond grit is to give them a superior grip in handling diamond melee. It is interesting to note in this regard that our extensive use of these tweezers during testing did not reveal any significant difference in grip from the standard type.

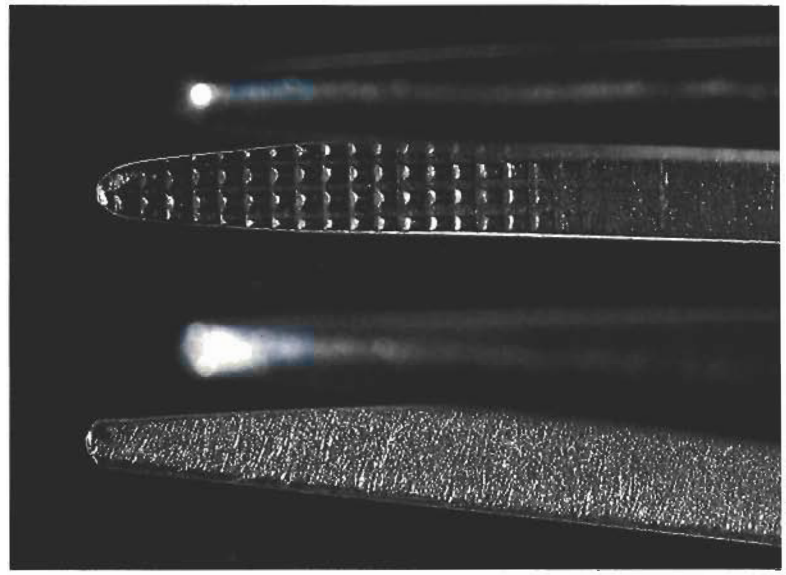

Figure 1. The tweezers at top show the scored metal "waffle" pattern of standard tweezer tips, while those below are impregnated with diamond grit. Photomicrograph by John I. Koivula; magnified 3×.

Although the tweezers were designed for use with small diamonds, it would not be unusual for someone to forget, once the tweezers were in the workplace, and use them to manipulate other gems as well. Given that diamond is the hardest naturally occurring substance known, what is the risk of using these tweezers to handle colored stones such as sapphires, rubies, or emeralds? Also, diamond has directional hardness. And it is reasonable to assume that if the diamond grit was randomly implanted into the tips of the tweezers, some of the grains would be oriented so that their hardest directional surfaces were at the gripping surface of the tweezers. Wouldn't this present a hazard even to diamond?

To answer these questions, we decided to test the tweezers with regard to their potential for damage to synthetic ruby (Mohs hardness 9) and diamond (Mohs hardness 10) round brilliants. If either of these materials was damaged by the tweezers, all

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Acknowledgments: The authors thank Peter and Bobbi Flusser of Overland Gems for providing the diamond-impregnated tweezers investigated for this report and for bringing to our attention the potential for gemstone damage.

Gems & Gemology, Vol. 26, No. 2, pp. 149–151

other gem materials (which have comparable or lower hardness) would be at risk as well.

TESTING

For this test, we selected a 2.39-ct round brilliant–cut flame-fusion synthetic ruby (8.32–8.39 mm in diameter) and a 0.21-ct round brilliant–cut diamond (3.70–3.72 mm in diameter).

It is standard procedure in both gem identification and diamond clarity grading to examine a stone first through its largest facet, the table. For this procedure, the stone is usually picked up by the girdle edge. However, the next step commonly is examination through crown and pavilion facets, for which the stone is held table-to-culet (as shown in figure 2) so that it can be easily rotated and then examined through facets around its circumference.

With standard metal-tipped tweezers, such a procedure presents little potential for damage to all but the softest of gem materials, because stainless steel has a Mohs hardness of only about 5 1/2 to 6. The contact surface of the diamond-impregnated tweezers, however, exceeds the hardness of all gems but diamond.

Before handling either the synthetic ruby or the diamond with the tweezers, we photomicrographically documented the condition of their table facets in surface-reflected light (figures 3 and 4). We then picked up the synthetic ruby with standard medium-point, metal-tipped tweezers table-to-culet, using normal finger pressure. The stone was rotated 360° a total of 10 times and then carefully examined with magnification. We observed no damage on the table of the stone.

Next, using normal finger pressure, we picked the synthetic ruby up table-to-culet with the diamond-impregnated tweezers and rotated it once through 360°. This caused considerable damage to the stone: The table was covered with numerous concentric scratches (figure 5).

We then proceeded to pick up the diamond table-to-culet with the fine-tipped diamond-impregnated tweezers and, again using normal finger pressure, rotated it through 360°. When we subsequently examined the stone with magnification, there was no indication of damage. Next, we rotated the diamond a total of nine more times through 360° and reexamined it; again, visual inspection with magnification revealed no damage. We continued the procedure, reexamining the table facet after every 10 rotations. We noted the first evidence of damage after a total of 50 rotations. After a total of 100 rotations, damage was severe (figure 6). Notice the broken circular (as opposed to complete circular) pattern of the scratches. This results from "skipping" as the randomly oriented diamond grains in the tweezers encountered harder directions in the subject diamond.

Figure 2. As part of the identification and evaluation of a gemstone, it is commonly held in the tweezers table-to-culet for examination through the crown and pavilion facets. Photomicrograph by John I. Koivula.

CONCLUSION

Rubies and sapphires are correctly considered hard, durable gems. Yet the diamond-impregnated tweezers easily produced significant surface damage to the table facet of the synthetic ruby tested. If the tweezers can do this amount of damage to such a relatively hard gemstone, it is reasonable to expect that they would be even more destructive to softer gem materials such as alexandrite, garnet, tanzanite, tourmaline, and the quartz varieties. A cursory examination of a hardness comparison table in any standard gemological reference (e.g., Liddicoat, 1989; Webster, 1983) reveals that the majority of gemstones are notably lower in Mohs hardness than diamond and corundum.

While rather extreme handling was necessary to produce the damage shown in figure 6, the fact remains that the diamond-impregnated tweezers do have the potential to scratch even diamond. And a single scratch is all that is needed to remove a diamond from the flawless category. Because the

Figure 3. This photomicrograph shows the condition of the table facet on the 2.39-ct synthetic ruby before it was handled with the diamond-impregnated tweezers. Photomicrograph by John I. Koivula; magnified 5×.

Figure 5. After only one 360° rotation in the jaws of the diamond-impregnated tweezers, considerable damage was done to the table facet of the synthetic ruby seen in figure 3. Photomicrograph by John I. Koivula; magnified 5×.

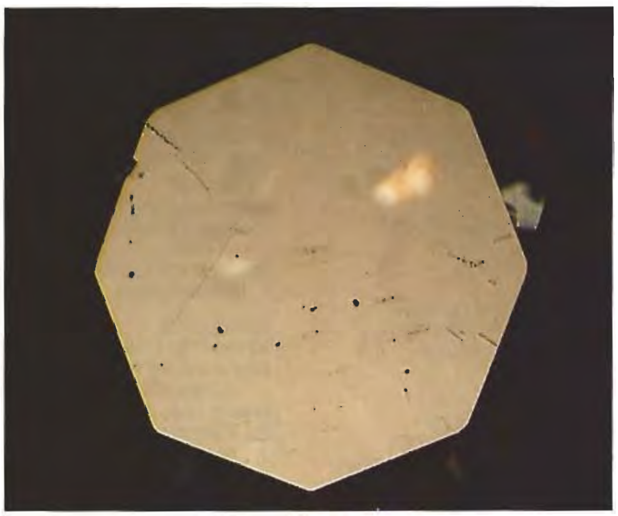

Figure 4. This photomicrograph shows the condition of the table facet on the 0.21-ct diamond before it was handled with the diamond-impregnated tweezers. Photomicrograph by John I. Koivula; magnified 12×.

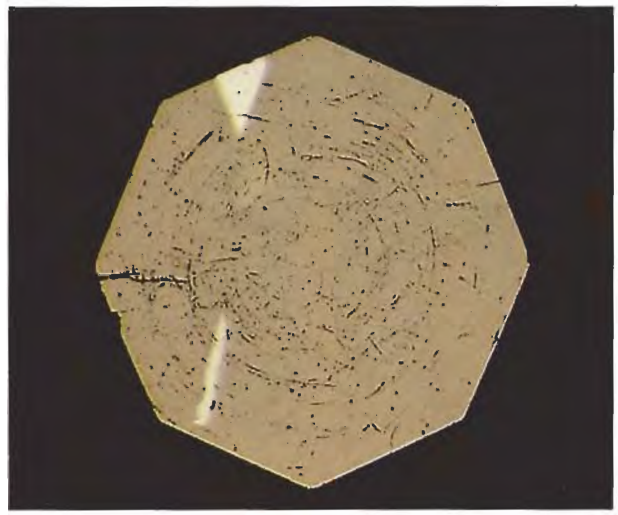

Figure 6. This damage was evident on the table of the diamond illustrated in figure 4 only after one hundred 360° rotations in the jaws of the diamond-impregnated tweezers. Photomicrograph by John I. Koivula; magnified 12×.

table is generally the largest facet on a gemstone, recutting a stone to remove damage from the table area will usually result in a significant loss of weight.

Damage such as that described here is apparently occurring to gems in the marketplace. Gemologists in the GIA Gem Trade Laboratory have reported seeing rubies and sapphires with concentric circular scratches on their tables (R. Crowningshield, pers. comm., 1989). Gem dealers have encountered diamonds, as well as colored stones, with similar damage (H. Adler, pers. comm., 1989). The jeweler-gemologist is advised to exercise great caution when using diamond-impregnated tweezers and to avoid using them on any gem material other than diamond.

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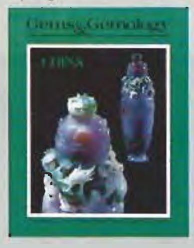

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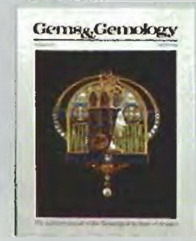

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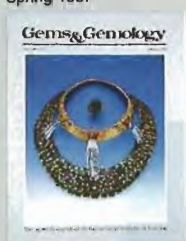

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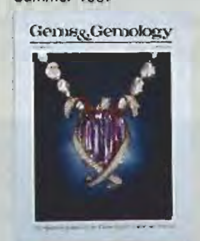

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