A NEW METHOD FOR IMITATING ASTERISM

By Shane F. McClure and John I. Koivula

Several gems were recently examined that showed stars with an unnatural appearance or an unusual number of rays. Asterism in some of these gem materials is very rare, or has not been seen previously by the authors. Microscopic examination revealed that these "stars" were produced by using what appeared to be a rough polish to scratch lines in an oriented fashion onto the upper surface of the cabochons.

Asterism and chatoyancy (i.e., the phenomena of stars and cat's-eyes, respectively) can potentially occur in almost any gemstone. Chatoyancy will occur if a sufficient volume and concentration of acicular (needle-like) inclusions line up parallel to one another within a gem material, and the gem material then is cut into a properly oriented cabochon. To create asterism, these concentrations of needles must line up in more than one direction— almost always in specific relationship to crystallographic axes—which gives rise to stars with four, six, and sometimes more rays. Chatoyancy can actually be caused by mechanisms other than acicular inclusions, such as the fibrous structure in some cat's-eye opal, or by other phenomena, such as the oriented adularescence in cat's-eye moonstone (Hurlbut and Kammerling, 1991). For those not familiar with phenomena such as asterism and adularescence in gems, a good general reference is Webster's *Gems* (1994).

Nevertheless, even though the potential for asterism exists in almost any gemstone (see, e.g., Kumaratilake, 1997, 1998), asterism has never been observed in many gemstones and is very rare in others. The presence of asterism in a gemstone can add significant value, especially if it occurs in a material in which it has not previously been observed, such as sinhalite (figure 1). Collectors of phenomenal gems have been known to pay handsomely for such a stone, even if the gem material itself is unattractive, or otherwise of little value.

Many methods have been used over the years to imitate asterism. These include: engraving a series of intersecting parallel lines on the back of a transparent cabochon which is then covered by a reflective backing, or adding a thin engraved metallic plate to the back of a transparent cabochon (figure 2; see also Hurlbut and Kammerling, 1991); or using a diffusion process to put fine, oriented rutile needles in a thin layer just under the surface of a cabochon (figure 3; Fryer et al., 1985). These star imitations can be quite effective, but usually they are found only in gem materials that are known for asterism, such as rubies and sapphires.

Therefore, we were surprised to learn that an evidently new process was being used to create the appearance of asterism in gems that had not shown this phenomenon previously. The first such stones seen at the GIA Gem Trade Laboratory had been represented to our client as rare examples of stars in unusual materials. Some of these stars showed as many as 15 or 16 rays. Subsequently, we received more asteriated stones, many of which were

See end of article for About the Authors information and Acknowledgments.

GEMS & GEMOLOGY, Vol. 37, No. 2, pp. 124–128

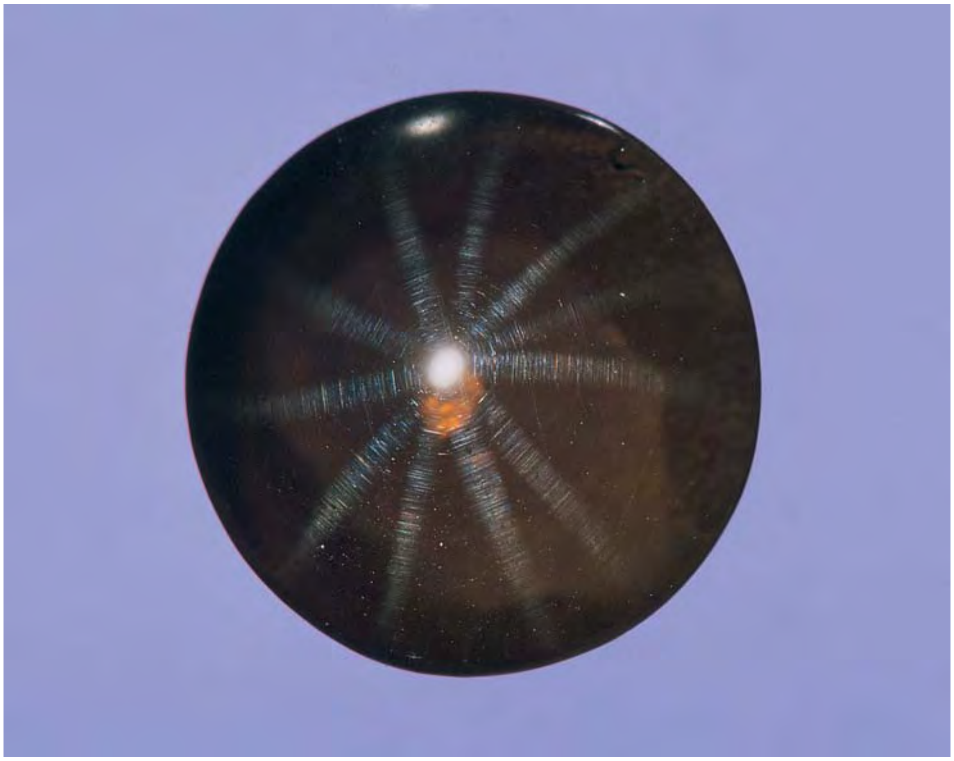

Figure 1. This 6.17 ct sinhalite, a gemstone that has not been reported to display asterism, showed a very unusual 11-rayed star that ultimately proved to be manufactured. Photo by Maha Tannous.

opaque, that represented an array of different materials. One even sported a double star. Most of the stars showed essentially straight rays, but in some cases the rays were obviously curved down the sides of the cabochon (figure 4). These stones were supplied to us by three dealers from three very different locations (Louisville, Colorado; Bangkok, Thailand; and Falls Church, Virginia), and were purported to be from Sri Lanka and India. Because of the types of gem materials involved, the superficial appearance of the stars, and the odd number and orientation of some of the rays in the stars, the dealers suspected that the asterism had been artificially created. We conducted the present study to learn more about this new technique and to establish the best means of identifying this imitation asterism.

Figure 2. Oriented lines engraved on this thin metal plate give the appearance of asterism in the synthetic ruby cabochon to which it is attached. Photomicrograph, taken through the dome of the cabochon, by John I. Koivula; magnified 30×.

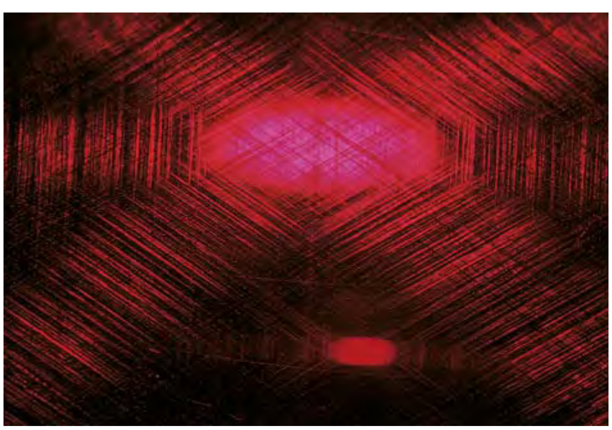

Figure 3. This very fine, unnatural-looking silk (similar in appearance to the silk found in flame-fusion synthetic star rubies or sapphires) is typically seen in a star created by diffusion treatment. Photomicrograph by John I. Koivula; magnified 40×.

Figure 4. This rutile cabochon displayed at least 16 rays, most of which showed a noticeable curve as they approached the girdle. Photo by Maha Tannous.

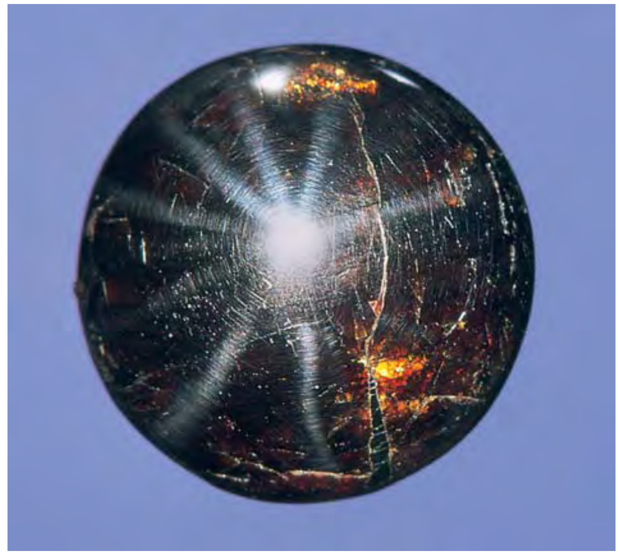

Figure 6. The stars made by the "scratching" process described here often displayed asymmetrical rays, such as in this 17.08 ct cassiterite that shows nine rays. Photo by Maha Tannous.

MATERIALS AND METHODS

Altogether, we examined a dozen stones that displayed evidence of this new method of imitating asterism. We studied one each of sinhalite, cassiterite, chrysoberyl, and garnet, and one stone that was represented to be scheelite but turned out to be a member of a series of naturally radioactive rare earth–bearing minerals, possibly samarskite. Chrysoberyl is well known for chatoyancy, but it rarely shows asterism. Star garnet is relatively common, but cat's-eye garnet is rare. The authors have not seen examples of either phenomenon in sinhalite, cassiterite, and scheelite (or samarskite). The balance of the cabochons were rutile, in which natural chatoyancy is occasionally seen (figure 5) and asterism is reported to be very rare (Kumaratilake, 1997).

Figure 5. The eye of this natural cat's-eye rutile shows a very dense concentration of needles that are clearly inside the stone. Photomicrograph by John I. Koivula; magnified 45×.

The 12 cabochons in this study ranged from 3.29 ct to more than 20 ct; all were oval or round and semi-transparent to opaque.

All of the gem materials were identified by standard gemological procedures. To determine the cause of the asterism, we used a GIA Gem Instruments Mark VII Gemolite gemological microscope, at magnifications up to 45×, with fiber-optic illumination.

RESULTS AND DISCUSSION

Each stone displayed a star that had as few as six rays (in the case of the chrysoberyl), to more than a dozen rays (in the case of several rutiles). The garnet showed a double star, one with four rays and the other with eight. The first thing anyone familiar with natural asterism will notice is the unusual appearance of most of these stars. In many of the stones, the stars had too many rays and the rays were not symmetrical (figure 6). Many stars also displayed an unusual number of rays, such as eight or 10, or an odd number such as 11 (again, see figure 1), which is not typical for any material. Also, the asterism appeared to be very superficial, even in stones that were almost transparent, whereas true asterism usually has depth to it.

Microscopic examination quickly identified the

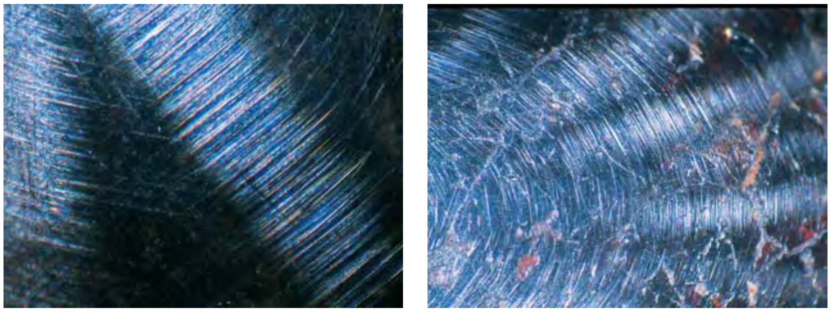

Figure 7. These photos illustrate how superficial the imitation stars are and that they are being created by oriented "polishing" lines. The specimen on the left may be samarskite; the cabochon on the right is rutile. Photomicrographs by Shane F. McClure; magnified 40×.

source of the asterism: oriented, coarse, parallel lines scratched on the domed surfaces of the stones (figure 7). At first one might think the lines were the result of a bad polishing job, but close inspection revealed that this "bad polish" was deliberate. By making the lines coarse and keeping them parallel in certain directions, the treater was able to use them to reflect light in essentially the same way that natural subsurface needle-like inclusions do.

As mentioned above, some of the stones displayed too many rays or an unnatural number of rays, so that the asterism was not believable. In one case, however, the illusion was very well executed. A 3.29 ct chrysoberyl showed an almost perfectly symmetrical six-rayed star (figure 8). The authors have seen a few examples of chrysoberyl with a natural six-rayed star over the years (figure 9), but they are so rare that most references do not even acknowledge their existence.

Perhaps the most interesting stone in our sample group was a 4.28 ct purplish red garnet that displayed a double star, that is, two stars adjacent to one another (in contrast to multiple stars that manifest themselves in different areas of the stone). Double stars have been noted in some corundums (Moses et al., 1998), and multiple stars actually are common in some materials, such as quartz (see, e.g., Johnson and Koivula, 1999). To our knowledge, though, no such double star has been reported in garnet. Even more suspicious was the fact that one of the stars had four rays and the other had eight. The authors are not aware of any reports of double stars with this kind of asymmetry. In this case, microscopic examination revealed that the four-rayed star was natural, and the eight-rayed star was manufactured by the method described above. The four-rayed star clearly showed the individual needle-like inclusions that one normally expects from a natural star, while the eight-rayed star was obviously caused by oriented "polish lines" and was evident only on the surface of the stone (figure 10). The close juxtaposition of a natural star to a

Figure 8. The almost-perfect six-rayed star in this transparent 3.29 ct chrysoberyl was found to be manufactured. Photomicrograph by Shane F. McClure; magnified 10×.

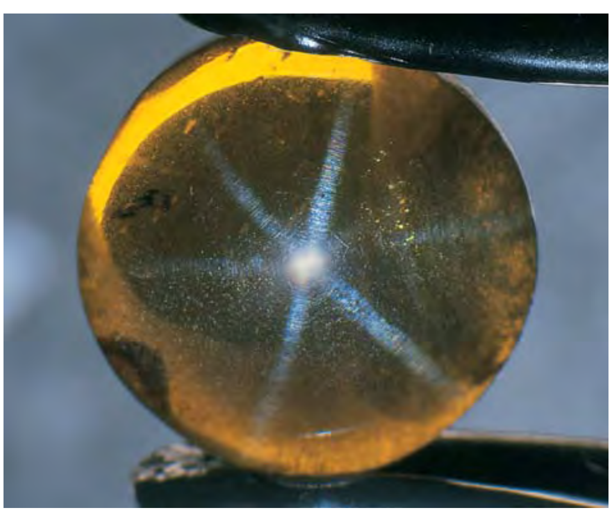

Figure 9. Natural six-rayed stars in chrysoberyl, as seen in this 2.29 ct cabochon, are very rare. Photo by Maha Tannous.

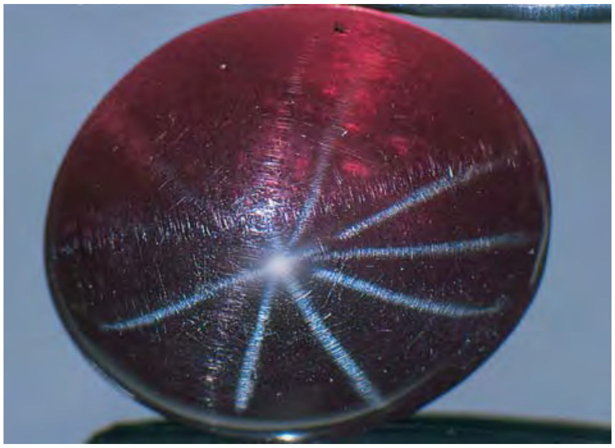

Figure 10. The double star in this 4.28 ct garnet cabochon consisted of one natural four-rayed star and one manufactured eight-rayed star. Note the difference in appearance between the two stars. Photomicrograph by Shane F. McClure; magnified 10×.

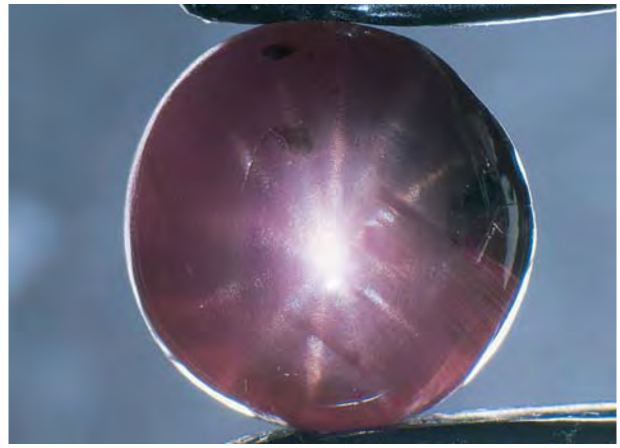

Figure 11. Natural 12-rayed stars (such as in this 4.41 ct sapphire) do exist, but they are easily distinguished from the manufactured stars discussed in this article. Photomicrograph by Shane F. McClure, magnified 10×.

manufactured one illustrates quite effectively the striking differences between the two.

It is interesting to note that one of the groups of suspect stones we received had a sapphire with a 12-rayed star (figure 11). The phenomenon in this stone was completely natural. For this reason it was not included as part of the study group.

Although no one has come forward to say exactly how this process is being done, the appearance of the stones suggests that it involves the use of a polishing wheel with a coarse grit. The oriented scratches are numerous and packed tightly together, so some type of spinning wheel is probably involved. Also, the asymmetry of most of the specimens would suggest that the process is being done by hand, rather than by some form of automation.

CONCLUSION

These imitation stars are not difficult to detect in most cases because of their unnatural appearance. The key, as is often the case in gemology, is in knowing that such a treatment exists, understanding the sources and appearances of naturally occurring phenomena such as asterism, and questioning any stone that appears suspicious. Microscopic examination should easily permit the identification, especially with the assistance of a fiber-optic light source.

The presence of a natural 12-rayed star sapphire in one of the groups of suspect stones we received serves as a reminder that while stones with such a large number of rays are rare, they do exist. Only with careful microscopic examination can you conclusively prove the origin of the asterism. Even if a stone appears suspicious, you should follow through with the proper examination before pronouncing judgment.

ABOUT THE AUTHORS

Mr. McClure is director of identification services, and Mr. Koivula is chief research gemologist, at the GIA Gem Trade Laboratory in Carlsbad.

ACKNOWLEDGMENTS: The authors wish to thank the following for providing the samples for this study: K & K International of Falls Church, Virginia; Mark Smith of Bangkok, Thailand; and Dudley Blauwet of Louisville, Colorado.

REFERENCES

Fryer C., Crowningshield R., Hurwit K., Kane R. (1985) Gem Trade Lab notes: Corundum. *Gems & Gemology*, Vol. 21, No. 3, p. 171.

Hurlbut S., Kammerling R. (1991) *Gemology*, 2nd ed. John Wiley & Sons, New York, 336 pp.

Johnson M.L., Koivula J.I., Eds. (1999) Gem news: Twelve-rayed star quartz from Sri Lanka. *Gems & Gemology*, Vol. 35, No. 1, pp. 54–55.

Kumaratilake W.L.D.R.A. (1997) Gems of Sri Lanka: A list of cat's-eyes and stars. *Journal of Gemmology*, Vol. 25, No. 7, pp. 453–516.

——— (1998) Spinel and garnet star networks: An interesting asterism in gems from Sri Lanka. *Journal of Gemmology*, Vol. 26, No. 1, pp. 24–28.

Moses T., Reinitz I., McClure S. (1998) Gem Trade Lab notes: Ruby, with a true double star. *Gems & Gemology*, Vol. 34, No. 3, p. 217.

Webster R. (1994) *Gems: Their Sources, Descriptions and Identification*, 5th ed. Revised by P.G. Read, Butterworth-Heinemann, Oxford, England, 1026 pp.