Padparadscha-Like Fancy Sapphires with Unstable Colors: Coloration Mechanisms and Disclosure

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In 2017, padparadscha-like fancy sapphires from the Ambatondrazaka area in Madagascar appeared on the market, partly of exceptional size and clarity. Some of these stones show a distinct change of color over time shifting from a distinct pinkish orange to just pink in the course of weeks (Krzemnicki, 2018). Research by SSEF over the past two years on the color stability of such stones has provided further insight into coloration mechanisms and applicable nomenclature to ensure full disclosure.

Color instability of certain corundum varieties (mainly yellow sapphires) is not new to gemologists and the trade (Nassau & Valente, 1987). For many years, SSEF has systematically applied a fading test (with the consent of the client) to determine the color stability of yellow sapphires. Based on recent research, color stability testing is performed also on sapphires of padparadscha-like color to be able to separate padparadscha of stable color from fancy sapphire showing instable color.

Padparadscha sapphires are generally described as exhibiting a pinkish orange to orangey pink color of moderate to low saturation (Crowningshield, 1983; Notari, 1996; LMHC, 2018). Originally known from alluvial deposits in Sri Lanka, today this attractive variety of corundum is also mined in Tanzania (Johnson and Koivula, 1997) and Madagascar (Milisenda et al., 2001), with additional production coming from a deposit discovered in late 2016 near Ambatondrazaka, which has also been a source of important blue sapphires (Perkins and Pardieu, 2016; Krzemnicki, 2017; Pardieu et al., 2017). This Ambatondrazaka area has produced both padparadscha sapphires of stable color and padparadscha-like sapphires of unstable color.

Coloration Mechanisms and Color Stability

As these new padparadscha-like fancy sapphires arrived on the market, it became clear that the color of these stones with unstable colors can be restored after a short exposure to UV light (similar to most yellow sapphires with unstable color), so that they become pinkish orange again (at least until they start to slowly fade out again in daylight).

In other terms, the stable color of these stones is in fact pink (chromium-related) and the superposed unstable color is yellow (due to an unstable yellow color center), resulting—if activated—in an overall orange to pinkish orange color of the stone (Figure 1).

The reason for this quite distinct color change (instability) is very similar to those of yellow sapphires of unstable color (Figure 2). Their subtle padparadscha color is, in fact, a mix of a weak chromium-related absorption (resulting in a pink color) superposed by broad absorption bands due to yellow color centers.

In cases where such a color center is not stable, it results in the observed shift of color from pinkish orange (color center active) to pink (color center inactive). Spectroscopically speaking, the color shift results from a distinct reduction (fading out) of a yellow color center, as can be seen in absorption spectra before and after fading tests.

Testing and Disclosure of Unstable Color

Based on current scientific knowledge, the color stability of gemstones can be quite easily tested—even by a well-trained gemstone dealer. Before testing, the color of the gemstone has to be very well defined (e.g. with Munsell color charts or other Color Scan systems). The stone is placed on a metallic reflecting plate and then exposed during approximately three hours to a very strong fiber optic light source (halogen). After this, the color is again meticulously determined.

Figure 1: Fancy sapphire recently found in Madagascar showing an unstable color, shifting from pinkish orange (padparadscha-like) to pink after a fading test. (Photo: SSEF)

Figure 2: Yellow sapphire of >50 carats with unstable (reversible color), seen before fading test (left), after fading test (middle), and after exposure to UV radiation (right). (Photos: J. Xaysongkham, SSEF)

Figure 3: Fancy sapphire from Ambatondrazaka (Madagascar) showing pink color (actually the chromium-related stable color of this stone), which shifts to pinkish orange after activation of the yellow color center, and subsequently returns to pure pink after fading (back to stable color). (Photos: V. Lanzafame, SSEF)

Any noticeable change/shift may also be confirmed by UV-Vis spectra taken before and after the fading test. To check restoration of color with UV radiation, the stone is subsequently placed table down directly on a strong UV light source (in a dark box) and exposed for about ten minutes to UV radiation. Again, thecolor needs to be meticulously determined to check if any change has occurred.

In cases where this tenebrescent shift of color is only minimal, it can be neglected and does not need specific attention. Some of this more recent material from Ambatondrazaka Madagascar, however, has shown a very marked shift of color from (slightly pinkish) orange to pure pink (Figure 3), which in our opinion requires specific

disclosure. Stones from Sri Lanka and Ilakaka (Madagascar) may also show such color instability, but in general much less frequently.

Summary

In summary, these orange to pink fancy sapphires of unstable color—so far mostly observed from this new source in Madagascar—can still be very attractive in color and size, but should not be named as padparadschas. The color shift they show is certainly a challenge for the trade dealing with padparadscha sapphires.

In November 2018, the Laboratory Harmonisation Committee (LMHC) announced that the term padparadscha may not be used if the color of the stone is not stable and shifting out of the padparadscha color range (e.g. shifting to pink) by a color stability test. The updated Information Sheet No. 4 for padparadscha sapphires can be downloaded on the new LMHC website (www.lmhc-gemmology.org).

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