

Padparadscha Color Grading for Gem Trade

**W. Atichat, J. Jakkawanvibul, M. Maneekrajangsaeng, T. Sripoonjan, T. Leelawatanasuk,
V. Pisutha-Arnond, N. Narudeesombat, P. Chanthayod, B. Sriprasert**

The Gem and Jewelry Institute of Thailand, Bangkok, Thailand;
Email: awilawan@git.or.th, wilawan.atichat@gmail.com

Introduction

Padparadscha is a variety of corundum with colors ranging from orange-pink to pink-orange, comparable to a lotus' color or sunset sky. Its name, padparadscha, is derived from "padmaraga" in Sanskrit, which means a lotus' color ("padma" means lotus while "raga" means color) (Crowningshield, 1983). Color grading for padparadscha is a sensitive subject as there is no universally accepted standard.

GIT Laboratory had an initiative in 2007 to create master sets of major varieties of corundum including padparadscha that made up entirely of natural stones. In practical work, when a stone was graded with reference to a standard of the same material, it made the grading process simpler and more precise. Those natural padparadscha stones were acquired from the trade and the Munsell color system, a globally trusted system used in many industries, was used as a basis for the comparison of colors of those stones (Chandayot et al., 2007). However, this master stone set was still ambiguous to some traders and buyers because they did not cover all the colors of padparadscha known in the trade yet. Therefore, GIT has undertaken an ongoing research project to upgrade and standardize our 2007 master set. Our main objective is again to create a set of genuine master stones to cover the padparadscha color range that is acceptable by the trade for practical usage in the lab.

Samples and Procedures

In this research, we firstly made a literature survey of current references related to padparadscha. We have modified the color range of the GIT 2007 Master stones set compatible with those defined by LMHC Information Sheet #4. This color range is used because it is well accepted by the leading gemological laboratories and somewhat similar to those proposed by Hughes (2016), except the Hughes' version encompasses a wider range of hues and saturations. Both the LMHC's and Hughes', however, define their color ranges based on the color charts, which are 2-dimensional, and are not practical to be used in the lab for color grading of the stone--which is 3-dimensional. So we have to find the real stones that match the color chart of padparadscha.

For the samples themselves, we used our 2007 original padparadscha master stones (Figure 1), as the starting specimens. We started our work by scrutinizing the pros and cons of this original master set. Then, we acquired additional stones from a number of trusted traders with the following selection criteria: natural stones (untreated or conventional heat-treated, no Be-treatment or irradiation), weights from 0.50 to 1.00 ct for the ease of color observation; and the colors ranging from orange-pink to pink-orange of padparadscha in the trade.

After that, we compared the color of the stones to the Munsell color charts (Munsell Book of Color, 2014) under a specified viewing environment and a systematic comparison method to determine the color code of the stones by at least 2 experienced graders. We used a Macbeth standard light booth with two light sources having the color temperature of 5000K (i.e., 2 Gretag Macbeth 5000K F20T12/50 light bulbs) which provide color shades least affecting the gemstone colors. The results from both graders were considered and selected for the only color chip with the closest match to the stone. The hue, value and chroma of the final chosen color were recorded.

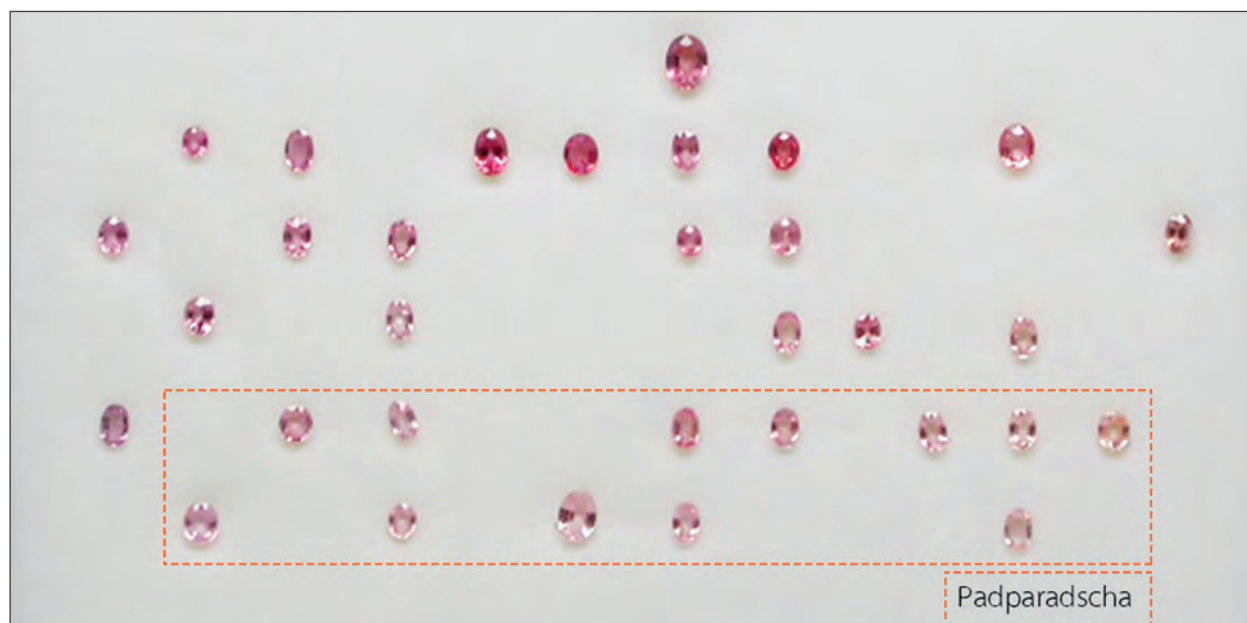


Figure 1. The original set of GIT's padparadscha master stones in 2007 (the lowest dashed rectangular).

After the final hue, value and chroma of each stone were compared to the LMHC's padparadscha color charts, a new set of genuine master stones was selected and formulated into our padparadscha standard. Finally, the research team conducted a survey to acquire opinions of connoisseurs and Thai, Sri Lankan, and Japanese entrepreneurs regarding the master stone set to specify color names and color ranges conforming to the ones known in the gem market.

Result and Conclusion

As shown in Table 1 and Figure 2, the result of hue, value and chroma of all stones are compared with 6 hue charts of the LMHC's padparadscha color, i.e., orangy pink 10RP to 2.5R, orange-pink 5R to 7.5R and pinkish orange 10R to 2.5YR (LMHC Information Sheet #4).

Altogether 21 stones that fell within the LMHC's padparadscha color range were selected and arranged into our new GIT's padparadscha master stone set (Figure 3). The color ranges of our current padparadscha master set are able to specify the border line colors more accurately. Furthermore, the survey results with traders in major padparadscha producing (Sri Lanka), trading (Thailand) and consuming (Japan) countries revealed that the range of color proposed by LMHC was acceptable but most of them advised that more colors should be added to cover the range of "Padparadscha" use in their markets. Finally, even though the true international acceptance of the color standard of our padparadscha sapphire master stones still need time, but, at least, this work should help color grading of padparadscha with better precision and accuracy. It could also reduce the difficulty in communication with business operators and promote padparadscha trading.

LMHC Chart	Color	Stones match with the chart
1	Orangy pink (10RP)	Pad57-009, Pad57-069, Pad57-011, Pad57-006, Pad57-019
2	Orangy pink (2,5R)	PAD57-031, PAD 57-024, PAD57-013
3	Orange-Pink (5R)	PAD57-032, PAD57-025, PAD57-026, PAD57-042, PAD57-022, PAD57-027
4	Orange-Pink (7,5R)	PAD57-070, PAD57-039, PAD57-041
5	Pinkish orange (10R)	PAD57-036, PAD57-005
6	Pinkish orange (2,5YR)	PAD57-005, PAD57-067, PAD57-037

Table 1. A list of the GIT's stones that match with the 6 color charts of LMHC's padparadscha

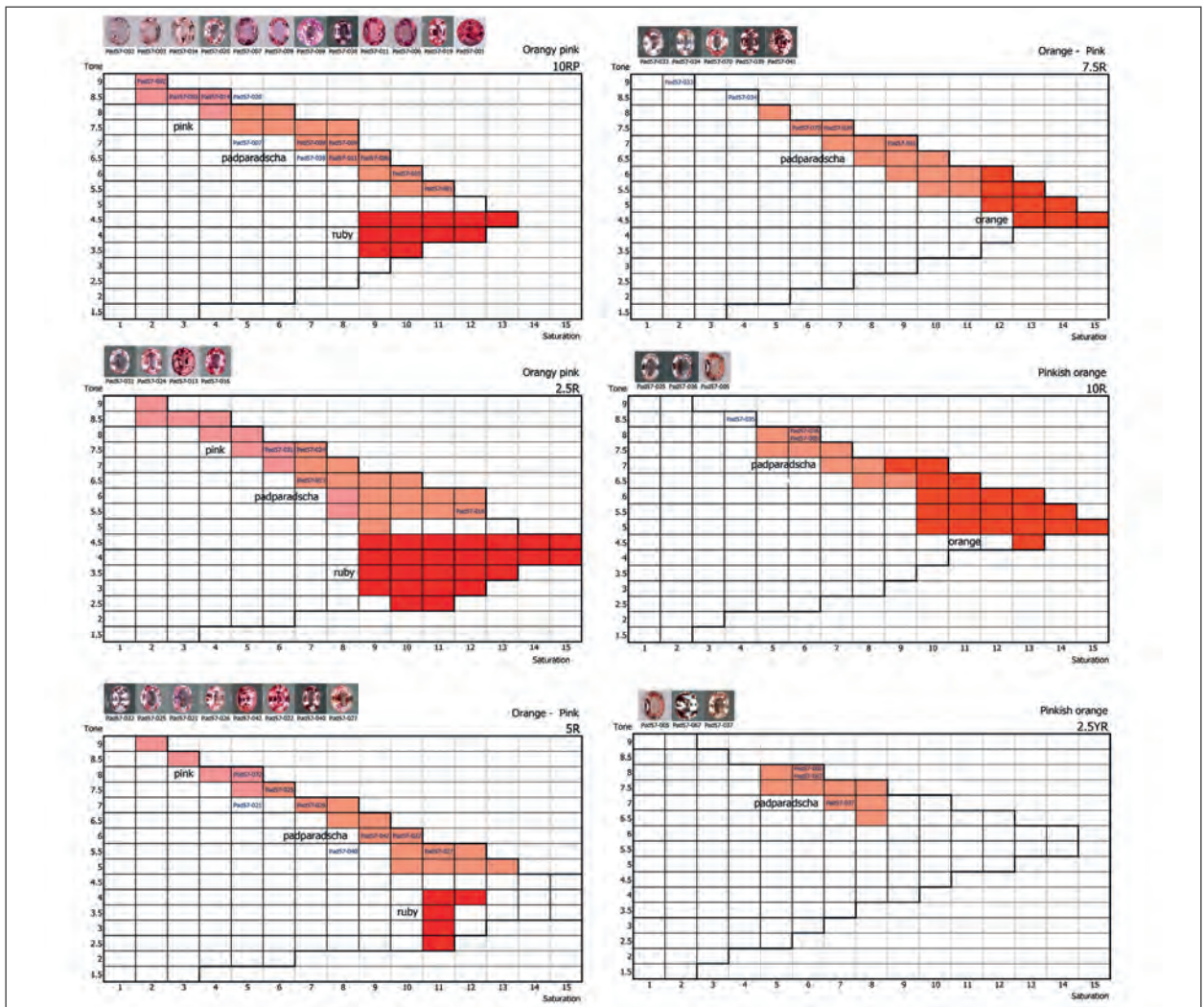


Figure 2. Matching of the GIT's stones with the 6 color charts of LMHC's padparadscha.

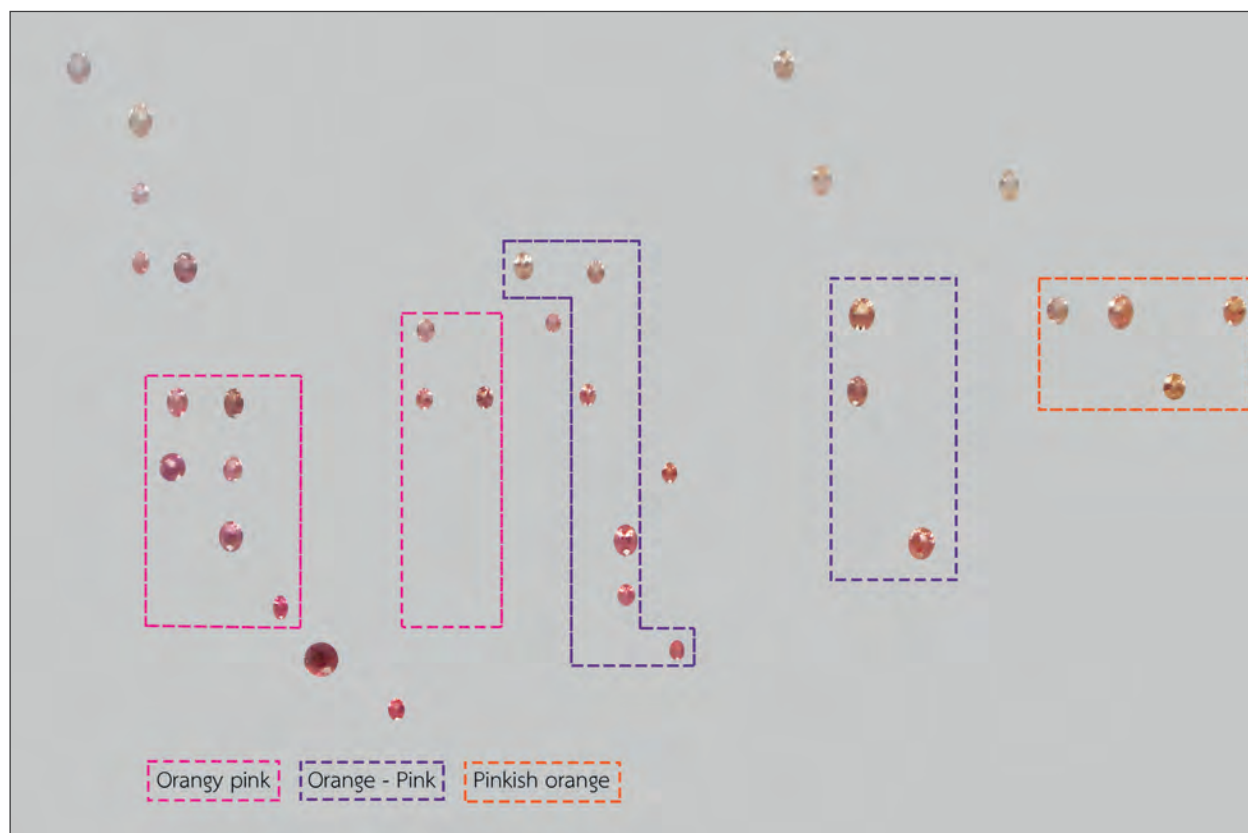


Figure 3. The current GIT's padparadscha master stone set showing three main hues (orangy pink, orange-pink and pinkish orange) along the X-axis, and the tone variation along the Y-axis.

References

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LMHC Information Sheet #4, http://www.lmhc-gemology.org/pdfs/IS4_18012010.pdf

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