PEARLS

Pearl Marking: An Innovative Non-destructive Method

During the past few years, the gem and jewellery market has increasingly demanded better product knowledge, in particular regarding product origin and traceability. Various worldwide organizations have attempted to address this need with 'best practice' codes and verification systems. The cultured pearl industry also faces issues of traceability, and since the culturing process often uses a bead for nucleation, several projects have focused on the concept of bead marking and related means of recognition (Hänni and Cartier, 2013).

In March 2014, a relatively new technique for pearl tagging called 'Heart of Pearls' (HoP) was presented to the LFG (French Gemmological Laboratory) by Jean-Pierre Le Pollès (Auffargis, France). The technique was designed with the cultured pearl industry in mind, but it may be applied to natural as well as cultured pearls, including those mounted in jewellery.

The HoP concept is very simple: application of a very small label designed not to distract the eye but nevertheless to be quite easy to find with magnification. The microscopic label (e.g. Figure 12) carries a high-resolution holographic image to ensure authenticity, and further security is provided by an embedded invisible coding. (Note: To protect the security of this technique, which is patent pending, the coding specifications are not described here, and the tags shown in this report are samples.) The tag is personalized by an alphanumeric code that is integrated within its structure. In this way, the tag can include relevant data such as the cultured pearl's quality grade, geographical origin, farm name, year of harvest, type of host mollusc, ethics label, ID number, brand and security key. The data on the tag are listed on three lines using a combination of letters or numbers (Figure 13), and can be customized according to local regulations or a customer's request. The label is affixed using a proprietary UV-fluorescent glue, thus enabling the tag to be quickly located (Figure 14). The colour of the glue's fluorescence is controlled by various

Figure 12: This example of the 'Heart of Pearls' marking technique shows an octagonal tag measuring 400 µm across that is glued to the surface of a Pinctada margaritifera *cultured pearl. The tag is inscribed with 'A.BCD', which is clearly visible with a gemmological microscope. The tag is surrounded by a hardened layer of colourless transparent glue. Photomicrograph by O. Segura.*

Figure 13: Data on the HoP tag may be coded in three lines, as shown in this example for a cultured pearl produced in the Cook Islands in 2014. Courtesy of Jean-Pierre Le Pollès.

Key

CK:	Cook Islands ISO 3166-1-alpha-2
14:	2014
XXXX:	ID number and/or pearl grade
PR:	Producer
99:	Security key

Figure 14: When exposed to long- or short-wave UV radiation, the glue used to affix the HoP tag in this prototype example fluoresces blue, while the surrounding cultured pearl is inert, enabling the marker to be easily located. The size of the fluorescent spot is approximately 1 mm in diameter. Photomicrograph by O. Segura.

dopants, and a different luminescence colour can be assigned according to the type of mollusc and/or country of origin. Both the fluorescence and the information on the tag can be observed with an inexpensive pocket microscope equipped with 60× magnification and a UV LED (e.g. Figure 15).

All of the usual laboratory techniques that are used to analyse pearls (X-radiography, spectroscopy, etc.) can be accomplished without the results being disturbed by the tag. If necessary, the tag and its UV-fluorescent glue can be removed using nail polish remover (acetone). Thus, the cultured or natural pearl may be returned to its initial state without any remnants of the tagging process; the final consumer may therefore return it to its pristine state without any damage if they wish to do so.

Figure 15: A pocket microscope can be used to read an HoP tag, and also to view the UV luminescence colour of the glue that is used to affix it. Photo by Jean-Pierre Le Pollès.

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Reference

Hänni H.A. and Cartier L.E., 2013. Tracing cultured pearls from farm to consumer: A review of potential methods and solutions. *Journal of Gemmology*, **33**(7–8), 239–245, http://dx.doi.org/10.15506/jog.2013.33.7.239.

SYNTHETICS AND SIMULANTS

Modern Doublets, Manufactured in Germany and India

At the November 2014 Hong Kong Jewellery and Gem Fair, one of the authors (HAH) noticed some attractive faceted stones in colours resembling popular gem materials (e.g. Figure 16). These samples were actually doublets produced by a German lapidary, Viktor Kämmerling of Idar-Oberstein. They were manufactured using colourless gem materials cemented by an artificial resin that had been dyed to create strikingly realistic gems. Both the crown and pavilion consisted of beryl (for emerald substitutes), topaz (for imitations of spessartine, tanzanite, Paraíba tourmaline and rubellite), tourmaline (for another Paraíba tourmaline substitute) and quartz (for imitations of

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