

# Treatments done on Pearls

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Last December, the Thailand Conference GIT2012 had some interesting presentations on pearls. One of them was on the identification of irradiation treatment done on pearls. Irradiation is only one of the many treatments. Today, cultured pearls undergo some form of processing or treatment after their removal from the mollusc. This is true of sea pearls as well as freshwater pearls. Pearl treatments are driven largely by price and demand. In the fast moving world, pearl cultivators are under constant pressure to produce greater quantities of lower-priced pearls, which results in the decrease of cultivation time. Pearls that once were allowed to remain within the mollusc for several years are now removed after just eight months. This results in thinner-nacreous layer. Such pearls do not exhibit the rich pearly lustre and orient of their thick-nacred predecessors. Thin nacre can result in pearls that chip, crack, or rapidly lose their beauty. This has sparked off the need for more treatments to improve inferior-quality pearls.



In the earlier days when the pearls were first extracted from the oyster or mussel, they were tumbled and cleaned to remove residue and odour and marketed as that was all that was done to the finest-quality cultured pearls. In the recent times pearls are regularly subjected to other processes or treatments to enhance their beauty. "Treatments have become routine in the pearl industry today. This was not the case 20 years ago," says Antoinette Matlins,

gemmologist and author of *The Pearl Book*. Let us understand some of these treatments.

### **Polishing**

Pearl Cultivators wash and polish cultured pearls by tumbling them in a concentrated water and salt solution that's abrasive enough to remove any mucus or tissue that clings to the cultured pearls' surfaces. This is usually followed by chemical treatments that bleach the cultured pearls to make them white. Australian farmers wash marketable South Sea cultured pearls and then lightly polish them.

### **Maeshori**

Maeshori is a form of new lustre treatment that involves the heating and cooling of a pearl in order to cause its lustre to be artificially enhanced. It is a Japanese word that literally means before (*mae*) treatment (*shori*). Originally, maeshori involved dipping Akoyas in a solvent – mainly methyl alcohol – to clean them and remove impurities so they could be bleached more efficiently.

The procedure expanded to include several other techniques that are also applied to most freshwater cultured pearls and some South Sea cultured pearls. The newer techniques which are designed to enhance lustre, while different, are also called maeshori and are properly regarded as treatments.

Maeshori is a treatment used on all Akoya pearls (grown in *pinctada fucata*), Freshwater pearls (usually those grown in *hyriopsis cumingii*) and some South Sea pearls (grown in *pinctada maxima*). Maeshori treatments vary from factory to factory. It tightens the nacre and pulls moisture out, which will enhance the lustre but also make the nacre more brittle.

This process also sometimes involves adding a coating to the exterior of the pearl. Despite contrary claims South Sea pearls, even those from Australia, are now routinely treated. Untreated pearls will show a softer “creamy” lustre. Japan is Australia's largest trading partner and regardless of what may happen in the land Down Under as soon as the pearls hit the beach in Japan, they are processed. The procedure known involves chemicals and heating. The pearls are heated and then cooled to tighten up the nacre producing a fine lustre. ----- maeshori is a treatment that enhances the lustre of a pearl by 'pulling together' the outer layers, as if tightening the skin in a face lift.

Some Maeshori treatments enhance lustre with solutions of mineral salts, ammonia, and water, or mineral salts and methyl alcohol. One of the Maeshori

processes involves soaking pearls in hydrogen peroxide and methyl alcohol. The duration of the pearls being soaked varies anywhere between 30 minutes and 30 days. While in the solution, heat is also usually used to aid the process. Solution treatments work by swelling the nacre platelets, thereby closing or filling minute spaces and creating a tighter, smoother surface that reflects and refracts light better. The result is better lustre.

Another treatment enhances lustre by exposing the cultured pearls to hot, dry air in equipment that resembles a fruit or nut dryer. That treatment works by drying and tightening surface nacre. Tighter nacre has fewer tiny spaces, so it achieves the same results as the solution treatment. Neither of these lustre treatments are permanent, and will fade over time. The duration it takes before the lustre fades would vary according to pearl type and the technicians' skills in these treatments. Pre-treated pearls may fade in about six months and may progress to dullness in a few years. This also means that pre-treated pearls would have a shorter shelf-life.



**Bleached Pearls**

### **Bleaching**

Bleaching is often used to lighten and even out pearl colour. The first layer deposited over the surface of a nucleus is conchiolin, a dark, porous protein. Bleaching lightens this layer. This is especially important when the nacre is too thin to mask the dark layer, so pearls with thick nacre often do not require bleaching. Bleaching is the oldest method which is applied to Natural Pearls. Japanese factories use a weak solution of hydrogen peroxide. The bleaching process changes the colour pigments contained in the organic substance. The time required is between seven to sixty days, and it is applied until the pearls have reached a uniform white colour.

Chinese freshwater pearls and medium-to low-quality Akoya pearls (marine water pearls) are often bleached with chemicals after drilling. This whitens them

and makes the colour look more even. Improper bleaching can soften the nacre and make it more susceptible to wear, especially if the nacre is thin. High quality pearls do not need to be bleached, and it would be pointless to possibly reduce their lustre and durability by treating them.

American freshwater pearls, black pearls and light coloured South Sea pearls are not normally bleached. However, this is changing with white South Sea pearls. Some of the South Sea Pearls also undergo chemical bleaching.

### **Buffing:**

This is occasionally done to improve lustre and remove superficial scratches. Beeswax or chemical polishes are sometimes used during buffing to add lustre. The wax wears off fast and the chemicals may eat away the nacre. Buffing without chemical intervention is considered acceptable if it's done to clean off oil and dirt from the pearl and remove some of the minor scratches.

### **Coating:**

Pearls are sometimes coated with lacquer. If pearls are coated in this manner, the lacquer temporarily improves lustre. It eventually wears off over time, leaving buyers feeling deceived if they were not advised of the coating. Good-quality pearls do not have to be coated to look lustrous.

Silicone polymers are unusually stable compounds composed of the elements silicon and oxygen. When used to coat cultured pearls, they improve surface quality by covering or minimising blemishes, and replacing poor or fair natural lustre with good or excellent artificial lustre. Thicker silicone polymer coatings sometimes trap dirt and air bubbles, making the coatings obvious. Thinner coatings are sometimes incomplete, or they tend to peel. Either fault makes the coatings obvious.

In a few instances, pearls have been darkened with thin plastic coatings to make these pearls look like the original Tahitian pearls. This coating can be easily detected by its strange feel and by bald spots on the pearl where the coating may have worn away. Coating pearls in this manner is not an accepted trade practice.

### **Filling:**

Low-quality cultured baroque pearls are occasionally filled with an epoxy substance if they are partially hollow or have a loose nucleus. This helps the bead nucleus stay in position when the pearls are restrung; it makes the pearls more solid and improves their durability. As per the report of Stephen J. Kennedy of the Gem Testing Laboratory of Great Britain, "Hollow natural pearls are often filled with foreign materials to bring them to somewhere near the weight one would expect for a pearl of that size,"

## Polishing

Polishing is another common practice. Pearls are often gently tumbled with natural materials — anything from slivers of bamboo to ground-up walnut shells to eucalyptus leaves — in an oily medium such as beeswax that smoothes out small imperfections, generating a greater polish and enhancing lustre. "It's simple and non-intrusive," says Fred Ward. However, the beeswax or other oily substances used to improve lustre will wear off over time.



Tumbling machine used for pearls (Photo GIA)

Taking such treatments a step further, various substances may be used to fill in cracks, pits, or drill holes in pearls. These often blend in with the colour and lustre of the nacre, but can sometimes be detected using a 10x lens. Occasionally epoxy substances are used to fill low-quality baroque pearls if they are hollow or have a loose nucleus. This improves durability and makes them more solid.



Dyed Pearls

## Dyeing

Pearls are dyed to satisfy the tastes of a particular market, to provide colours that are rare, such as golden South Sea pearls, and to make it easier to create a matched strand. It may take a producer of Tahitian pearls two to three years to

accumulate sufficient matching, natural-coloured pearls to string a necklace. The next option is to dye pearls instead of waiting for three years.

According to Fred Ward, Japanese cultured pearl producers (Akoya producers) discovered early on that consumers in different countries preferred specific shades of pearls. Americans like their pearls with a pink tone, Germans like white pearls, the Indian (especially from west coast), French and South Americans prefer a cream colour, and buyers in Arab nations like them creamier still. "All these pearls are coming out of the same oysters in the same water — something must have been done to produce that range of colours," says Ward.

Dyed pearls are typically lower-priced than comparable untreated cultured pearls. If pearls are dyed after drilling, and dye can often be detected by looking at the drill holes and surface imperfections with a loupe for concentrations of colour.

Since untreated Tahitian black pearls start at approximately 8 mm in size, it's safe to assume that any black pearls under 8 mm have been dyed. Buyers can also rely on their eyes. "If the colour is too perfect or just looks unnatural — it probably is," says Ward.

But there are other ways to enhance colour in pearls, and some of them are more difficult to detect. Jack Lynch of Sea Hunt Pearls reports spotting a strand of heat- and pressure-treated chocolate-coloured Tahitian pearls the Tucson show. When one sees something like that, that's brown and well matched in colour, one needs to question.



**Treated pink pearl**

## **Pinking**

Pinking is a process to which pearls can be subjected in order to artificially extract the more desirable and popular "pink" overtone through a chemical dying process.



Fresh water Irradiated pearls

### **Irradiation**

When light coloured Pearls are subjected to gamma rays, the irradiated Pearls achieve an iridescent bluish or greenish grey colour. This method works well on Freshwater Pearls and can be used with dyeing. Sometimes these are sold as Tahitian black pearls, but the colour and shine usually look suspicious.

One must remember that irradiating pearls is an expensive treatment than dyeing and it is said that some of the Chinese factories cannot afford it. Thus, irradiation treatment is usually done on more expensive pearls. In Japan, the Akoya pearls and some of the South Seas are irradiated. Irradiation turns the pearls black. Gamma radiation changes cultured pearl colour because of its effect on the chemical element manganese. Freshwater cultured pearls have manganese in them. Except for Keshi cultured pearls that occur accidentally as a result of the culturing process, most saltwater cultured pearls contain freshwater mussel shell-bead nuclei, which are affected by gamma rays. This allows processors to change the colour of some saltwater cultured pearls by affecting their nuclei. Irradiation often turns a saltwater cultured pearl to tones of grey, including a silvery colour, but seldom deep black. That's because the nacre itself is not affected by the radiation, but the irradiation-darkened bead nucleus shows through. The thicker the nacre, the less visible the darkened nucleus is.

Bohyun Lee of Hanmi Gemological Institute, Korea had presented a paper at GIT 2012 on a method to identify irradiated SSCPs using electron spin resonance (ESR) spectroscopy which is widely used for the detection of irradiated food. By the gamma-irradiation, formerly non-existent  $\text{CO}_2^-$  radicals are formed. The presence of these  $\text{CO}_2^-$  radicals can be confirmed using ESR

spectroscopy. The amount of  $\text{CO}_2^-$  radicals correlates to the irradiation dose rates and are better detectable in the nacre than in the nucleus (bead).



Rainbow sheen in black pearls

It is also important to remember that the black colour with multicolour sheen like Tahitian pearls may have natural peacock colours even without treatment. Pearls may have undergone metal vapour deposition. Niobium deposition gives the black colour on pearls with a rainbow-type metallic sheen.



Untreated Tahitian rainbow sheen on cultured pearls

Some freshwater pearls may retain their orient after being dyed inside out.



Natural Golden pearl necklace



Treated golden pearl

## Heat treatment

It is believed that heat treatment on pearls has been going on for some time. The Chinese have pioneered this method, and are responsible for producing some beautiful golden coloured pearls. Golden pearls are usually a result of natural colour in pearls or by dyeing. Natural coloured golden pearls are usually found in South Sea pearls (*pinctada maxima*) and sometimes Akoya pearls (*pinctada fucata*) can have a medium yellow colour. Heat treatment is done by placing the pearls for a few days in heating cabinets at a temperature of up to 80°C. Akoya pearls without treatment are often light yellow in colour. This is not a popular colour thus they are bleached or dyed golden yellow. Heat treatment is done to improve the lustre of pearls which is usually done after cold treatment/bleaching (cold treatment means soaking the pearls in bottles of hydrogen peroxide solution under intense light of about 33°C-40°C). Pearls that do not undergo cold treatment before bleaching are usually soaked in distilled water to avoid drying out the pearls during heat treatment. Heat treatment in Akoya pearls can make the nacre brittle and thus prone to peeling.

In freshwater pearls (usually *hyriopsis cumingii*), heat treatment is done first before cold treatment as the heat treatment retains more conchiolin thus turning the pearls brown.

Conclusion: At the end of the day one can conclude like Antoinette Matlins who says "There is nothing wrong with buying or selling pearls that are treated to improve color, luster or surface, as long as they are properly represented and appropriately priced."

References:

Elisabeth Strack, Fred Ward, Antoinette Matlins, GIT 2012, GIA Pearl Notes