

## Treatments and Artificial Coloration

It is a known fact that cultured pearls are bleached, polished, artificially stained and dyed, irradiated and coated in order to improve their appearance. The fact develops into a problem if no one talks about the treatments. There are no fixed boundaries between what is necessary and tolerable (for instance cleaning and polishing the pearls after harvesting) and what is deception. Also, not all methods used can afterwards be recognized.

In an interview he gave to the American “National Jeweler” magazine in early 1998, the American pearl dealer Salvador Assael accused the pearl trade of often failing to declare treated and artificially colored pearls to the consumer. Assael, who also spoke openly about artificially dyed golden South Sea pearls in this interview, provoked a storm of disapproval from his colleagues.

However, the trade can only secure consumer confidence if precise definitions of processing, improvement, embellishing, treatment, artificial coloration and falsification are declared. In the United States, the rules of the Federal Trade Commission (FTC) fulfill this role, and the CIBJO Pearl Book assumes it in Europe and a number of other countries. The Pearl Book allows bleaching and polishing and also allows pink vegetable dyes which cannot be detected. However, a declaration of artificial coloration, irradiation and a number of other treatments is insisted on.

### Methods of Treatment

Until today, Japan has remained the master of the so-called “pearl processing technology”, which uses technically perfect and subtle methods in order to improve the appearance of cultured pearls. Other countries, for example China, use their own methods which are not yet so perfect.

### Bleaching

Only a general description can be given here. The Japanese harvest is certainly always bleached and the same is true of the Chinese Akoya production. Bleaching is an age-old method which was also applied to natural pearls. George Frederick Kunz wrote in 1908 that dealers in Bombay immersed their pearls in water-filled bottles and then placed them in the sun on their roofs.

The Japanese factories use a weak solution of hydrogen peroxide. In addition, the pearls are slightly heated over a prolonged period of time or are placed under an intensive light source which produces white, fluorescent light. Sometimes only a light source is used and sometimes this is replaced with ultraviolet light. The pearls are placed in wooden boxes which are painted white on the inside or are lined with an aluminum foil.

The bleaching process changes the color pigments contained in the organic substance. The



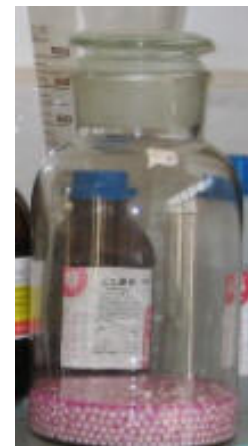
time required is between seven to sixty days, and it is applied until the pearls have reached a uniform white colour. A period of more than thirty days may prove damaging to the pearls, as they may begin to show cracks due to the progressive desiccation of the conchioline substance

## **Pink Coloration**

About 95 per cent of all pearls in Japan are treated with a coloring agent after the bleaching process, producing a light even hue and a more or less pink overtone. The coloration is hardly perceptible and can be compared to a cosmetic treatment. The method was already applied before WWII when eosin a vegetable dye was used. The actual process- may take up to sixty days and the pearls are usually heated slightly as well. Other coloring agents, as for instance cobalt salts, are probably used in place of eosin today, but information is kept strictly secret. Mikimoto himself already tried to develop a method in which the pink overtone was initiated during the pearl growth. According to his biographer, he even asked his staff on the last day of his life how far the experiments had progressed.

Both the bleaching and the dyeing processes require experience and knowledge and there is never a guarantee of achieving the required result. Different pearls react differently to the same methods of treatment and there is always a certain risk, although the techniques have been perfected over the last few decades and most factories can achieve the results they want.

The pink coloration is more or less accepted in the trade as long as it is permanent, does not look artificial and cannot be recognized at the drill hole or the surface of the pearl. The CIBJO rules do not demand that this treatment be declared, and it is usually not mentioned when the pearls are sold.



## **Artificial Black Colors Dyeing with Silver Salt**

### **Japanese Akoya Cultured Pearls**

Treatment with silver nitrate solutions ( $\text{AgNO}_3$ ) is applied since the nineteen thirties to Japanese Akoya cultured pearls. The method was used at the end of the 19th century in the mother-of-pearl industry and natural pearls were also dyed this way.

The pearls are immersed for a period of several days or weeks to several months in diluted silver nitrate solution (the dilution ratio is 3 to 4 per

cent) and are kept in a dark room. After this, they are exposed to a strong light source (either sun light or artificial light) or they are treated with hydrogen sulphate. Both methods lead to the deposition of metallic silver in an extremely fine distribution in the pearl, causing the dark color. The method enables the production of lighter or darker hues, depending on the quantity of silver produced. An immersion period of several months is required in order to produce truly black colors while shorter periods lead to more brownish or grayish hues.



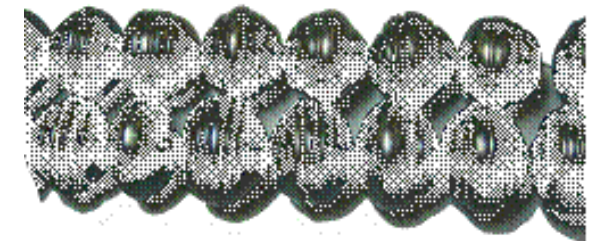
The silver nitrate solution intrudes into the ultra-thin conchioline layers and circulates there. The black color will be caused by the deposition of silver oxide within the layers, but possibly also by the deposition of non-crystalline carbon as a reduction product of the organic matrix. In the case of natural pearls with prismatic layers, the solution will possibly become concentrated and drain away between the calcite prisms, and a comparably small amount will be left to intrude between the aragonite platelets of the upper layers. In such cases, they will not assume a dark color, although the pearls will appear dark to the naked eye. In the case of Japanese Akoya cultured pearls, the silver solution only rarely intrudes into the mother-of-pearl nucleus. This means that the nucleus remains white, while the outer pearly layer takes on the dark color. The deposition of silver seems to concentrate in the conchioline layer which is often present between the nucleus and the pearly layer. The distribution of silver gets less towards the surface of the pearl. In the case of undrilled pearls diffusion of silver oxide starts however from the surface while in the case of drilled pearls the silver solution will more directly find its way to the border area between nucleus and outer pearly layer.

### **Tahitian Cultured Pearls**

The method is also used for Tahitian cultured pearls, where light colored pearls of a low color range are dyed black (originally, white South Sea cultured pearls from other countries may have been used for the same purpose). Artificially dyed pearls are found in a variety of sizes and shapes, and they are above all seen in large, so-called circle shapes.

### **Chinese Freshwater Cultured Pearls**

In 1997, artificially dyed black Chinese freshwater cultured pearls in round shapes and sizes of up to 11 mm were offered on the market in Hong Kong. Since then, large quantities have reached the international market, where they can be purchased at reasonable to low prices. They have an astonishing resemblance to Tahitian cultured pearls, as they almost perfectly replicate the green to purple overtones and are already called “peacock pearls” in the Asian pearl trade.



Several companies in Hong Kong offer the treatment and are often speaking of “laser treatment”. However, this is not true and neither is irradiation used. Although the exact method has not yet been made known, it is probably correct to assume that silver salts and other coloring agents are used.

### **South Sea Cultured Pearls**

The artificial coloration of South Sea cultured pearls is a more problematic issue, as it imitates yellow and golden hues which also occur naturally the coloration represents an improvement or even a deception and it can-not always be easily distinguished from natural colors.

Since 1994, a wholesaler from New York has offered artificially colored South Sea cultured pearls on the market. He uses undrilled pearls of an originally light green or light yellow body color and otherwise good quality factors and bleaches and subsequently treats them with a chemical dye. Another company from New Jersey applies a heat treatment.



Prices for artificially produced strong golden hues are in the range of only 10 to 30 per cent of the prices for pearls with a natural color. The price difference is less pronounced for pearls with an artificial yellow color which cost only about 20 to 30 per cent less than pearls with a natural yellow color. The reason for this is that yellow hues do not have the same high ranking value as the golden hues. The same is true for more bronze-colored yellow hues which have lately been offered on the market and which seem to be artificially treated Tahitian cultured pearls.

The American companies declare the artificial coloration of their pearls. They assume that dyed pearls will make the sale of golden pearls possible to people who cannot afford to buy natural colors. The last five years have seen a rising demand for dyed pearls, above all in Asia. In addition to Japan and Korea, this applies to Thailand, the Philippines, Indonesia and Malaysia.

Artificial yellow and golden colors now come mainly from Japan, where different methods are apparently used. Some companies are supposed to use organic dyes, which have the disadvantage, however, that they fade under strong light and tend to develop an irregular distribution of color. Other companies are reported to neither apply bleaching nor dyeing but to use a method which has remained undisclosed so far, but produces a permanent color change.

Insiders believe today that 80 per cent of the yellow and golden South Sea cultured pearls are dyed artificially. When the Board of the South Sea Pearl Consortium met in Japan in November 1997, its members (who came from the best-known companies in the pearl industry) had to admit that they were no longer able to distinguish treated from untreated pearls by visual inspection alone.

The problem is that there still is no method to prove in all cases the presence of an artificial golden color with certainty. Traditional methods only help in certain cases. The Gemological Institute of America, which has received generous donations from the South Sea Pearl Consortium and other organizations over the last few years, is currently working on the development of a reliable testing method.

The sale of artificially dyed pearls is only a problem if the treatment is not declared. The artificial golden colors are therefore not really a danger to the market, but they are not good for the image of the South Sea cultured pearl, as they create uncertainty. The majority of treated pearls are sold without disclosure. The lower prices do, however, reflect the facts and buyers should be on the alert. It cannot be denied that artificially dyed pearls of strong golden colors are occasionally offered on the market for the same high prices as natural golden pearls. This means that the consumer can only rely on the integrity of the jeweler and the jeweler is well advised to buy only from reliable importers and dealers.

## Other Coloration

Chinese freshwater cultured pearls in striking artificial colors have been seen on the market since the nineteen eighties. In addition to yellow, there are red, pink, orange brown blue green purple and lilac although rice crispies, baroques and flats were used mainly in the beginning; there have been more rounded shapes also over recent years. Intensely blue, green, yellow, pink, red and purple nearly round pearls, no doubt dyed with chemical agents, have been seen at international trade shows since the late nineteen nineties. No detailed information is available as to the methods used. The colors seem to be permanent and — needless to say — fall into the lowest price range. They can be identified



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Pearls

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