MAJORICA IMITATION PEARLS

By June Hanano, Mary Wildman, and Philip G. Yurkiewicz

Pearls are one of the most popular gem materials, but only in the past few decades has technology advanced to the point that good-quality imitations could be made. The Majorica S.A. product is remarkably similar in appearance to saltwater cultured pearls. These imitations, often set in high-karat gold in contemporary styles, are sold throughout the world. This article discusses the history of the Majorica imitation pearl, the manufacturing and marketing processes, and the separation of the Majorica product from its cultured counterparts.

ABOUT THE AUTHORS

Ms. Hanano is supervisor of instructor training, Ms. Wildman is general manager of residence gemology, and Mr. Yurkiewicz is supervisor of extension gemology, at the Gemological Institute of America, Santa Monica, California.

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With the increasing cost of cultured pearls and the astronomical cost of the rare natural pearls, people have turned to imitations as an affordable alternative. The trademark *faux* pearls of U.S. First Lady Barbara Bush have also helped bring this fashion alternative to the attention of millions (Reilley, 1990). Among the many imitation pearls currently available, the Majorica product is perhaps the most widely marketed and meticulously manufactured imitation today. Their sales figures mirror the rise in interest by the general populace, with a 50% increase in total sales (to US$60 million) from 1986 to 1989. The Majorica imitation pearls closely resemble cultured pearls (figure 1), although they are produced in an entirely different manner.

In the fall of 1989, the authors visited the headquarters of Majorica S.A. in Barcelona and their production plant on the island of Majorca, off the eastern coast of Spain. Through interviews with a number of senior executives, including Director General Jaime Peribañez and Executive Vice-President Luis Bonel, and a rare behind-the-scenes look at the actual production process, we obtained a comprehensive picture of the Majorica imitation pearl. This article reviews the history of the material and the manufacturing process used, describes the different products available and how they are marketed, and examines the separation of the Majorica imitation from saltwater cultured pearls.

HISTORICAL PERSPECTIVE

The story of Majorica pearls begins in 1890, when German immigrant Eduardo Hugo Heusch established a small factory in the Spanish city of Barcelona (J. Peribañez, pers. comm., 1989). There he manufactured sewing notions such as needles, clasps, zippers, and imitation pearl buttons. In the early 1900s, he started to produce imitation pearls for use in jewelry. These early imitations were essentially glass beads coated with man-made resins. With

Figure 1. Majorica S.A. manufactures imitation pearls that closely resemble cultured pearls. These 6-mm imitations are from their line of "Lady Di" jewelry. Courtesy of Majorica S.A.; photo by Shane McClure.

time, the operation advanced and expanded considerably.

In 1920, the Heusch family moved the factory to Majorca, the largest of the Balearic Islands, located approximately 180 km southeast of Barcelona in the Mediterranean Sea. Majorca was chosen in part because its geographic isolation left it relatively free from the political and social unrest that plagued Spain at the time, but also because it was the home of fine lace makers, whose dexterity would become valuable for stringing the beads.

In 1939, at the end of the Spanish civil war, the managers of the Heusch operation gathered to discuss the creation of a special imitation pearl that truly duplicated the appearance of the natural material. By 1951, 12 years after the decision was made to produce a more natural-appearing product, research finally produced the imitation pearl that is now marketed as Majorica.

Before 1939, all of the Heusch family's imitation pearls had been sold simply as "Spanish pearls." For the new product, however, the name *Majorica* was chosen. *Majorica* comes from the old Roman spelling for the island now known as Majorca or, in Spanish, Mallorca. It was trademarked in Spain in 1950 and worldwide in 1961, for use exclusively by the Heusch company for their imitation pearls. The only exception to worldwide trademarking is Brazil, which does not allow the importation of man-made pearl imitations (J. Peribañez, pers. comm., 1989).

Today, Majorica S.A. struggles to maintain its established trademarked name. Other imitation-pearl producers on the island sell their products as "Majorca Pearls" after the current spelling. The very subtle differences in spellings may lead to consumer confusion.

PRODUCTION

Two components make up the imitation pearl produced by Majorica S.A.: a translucent to opaque, white bead nucleus (figure 2) and a special iridescent coating. The material used to form the nucleus is imported from Belgium; the Majorica people refer to it as "opalene" (L. Bonel, pers. comm., 1989). When examined with magnification in transmitted light, a sample of uncoated nucleus showed gas bubbles and swirl striations (figure 3). These visual characteristics and the spot refractive index of 1.52 are typical of glass. To confirm the nature of this material, we asked Robert Kane of the GIA Gem Trade Laboratory to perform an X-ray powder diffraction analysis. Using a diamond scraper, he removed a minute amount of powder from a sample nucleus. The X-ray diffraction pattern produced showed no evidence of a crystalline structure. This proves that the material is amorphous, and probably a glass. Subsequent energy dispersive X-ray fluorescence (EDXRF) analysis of this same material by Sam Muhlmeister and Dr. Emmanuel Fritsch of the GIA Research Department established that the nucleus material is a lead silicate.

Figure 2. The Majorica imitation pearls typically contain transparent to opaque white nuclei similar to those shown here. Referred to as "opalene" by Majorica S.A., the material used to form these nuclei is actually a lead-based glass. Photo by Robert Weldon.

Figure 3. Examination of one of the Majorica bead nuclei with 10× magnification revealed the swirl striations and gas bubbles that are typical of a glass. Photomicrograph by John I. Koivula.

The nuclei are produced in one of two ways, depending on the size and shape desired. Currently, all spherical nuclei larger than 9 mm and all pear-shaped nuclei are still manufactured entirely by hand (figure 4). Specially trained technicians work long, narrow glass rods under a stationary hot flame until the end of the rod melts into a ball onto a rotated metal wire. During the authors' visit to the factories, there were only two women with the skill to produce these nuclei manually. For the smaller round nuclei, automation has replaced what once required the efforts of as many as 240 workers. Special machinery designed by in-house engineers allows the material to be melted in the form of a ball onto the metal wire. The wire remains either partially embedded for post mounting or passed completely through the nucleus for stringing. The finished beads are checked for roundness (figure 5), and those that don't meet quality standards are removed and reserved for use in lesser-grade imitations (E. Blauer, 1985). Last, the beads are placed in an acid bath to dissolve the metal wire and then are passed through sieves that sort them into size categories with a tolerance of 0.2 mm (figure 6).

Figure 4. Although most nuclei are produced by Majorica's specialized machinery, those larger than 9 mm and those used to form pear-shaped beads are generally produced by hand. Today there are only a few women with the developed skill to make the near-perfect glass beads. Here, the technician controls the flame in one hand and manipulates the glass rod from which the nuclei are formed in the other. The end of the rod is worked under the flame until it begins to melt into a sphere onto a rotating wire. Photo by June Hanano.

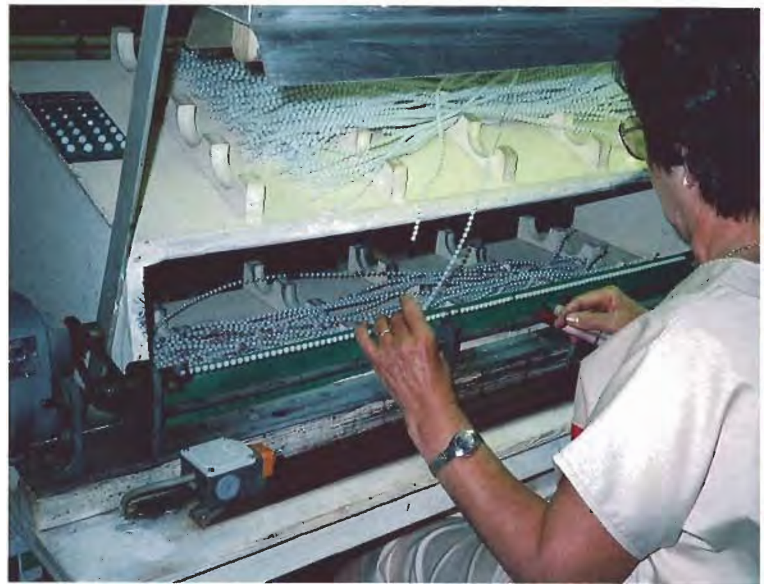


Figure 5. The glass bead nuclei are rotated and inspected for roundness. Rejected nuclei are marked and later used for a lower-grade imitation pearl that Majorica S.A. markets under a different trade name. Photo by June Hanano.

The second component of the process is the coating of the nucleus with a material referred to by Majorica S.A. as "essence of orient" or "pearl essence," which is produced through an exclusive process developed by Majorica (J. Peribañez, pers. comm., 1989). The raw material used for the coating comes from scales taken from fish found in the Atlantic Ocean and concentrated around the Canary Islands. Majorica S.A. has developed special machinery that removes the necessary fish scales while leaving the fish in marketable condition for the food industry. The gathered fish scales are sent to Barcelona, where the substance that causes the iridescence of the fish scales is removed. It is this substance that is mixed with coloring and binding agents to manufacture a form of "pearl essence" (figure 7). When this transparent to translucent material is applied to the bead in consecutive layers, it produces the interference and diffraction of light that causes the prismatic colors seen on these imitations.

"Pearl essence" was discovered in the late 17th century by a French rosary maker named Jacquin.

Figure 6. After the nuclei pass inspection, each "strand" is placed in an acid bath to remove the wire on which they were originally formed. Then, as shown here, the loose beads are sorted through sieves that place them into size categories with a tolerance of 0.2 mm. Photo by June Hanano.

Figure 7. The iridescent material ("pearl essence") used on the Majorica imitation pearl to simulate nacre is formed by mixing the guanine extracted from fish scales with binding and coloring agents. Photo by June Hanano.

Jacquin noticed that after his servant had scaled bleak fish (*Alburnus lucidus*), the water contained iridescent reflections. Closer examination revealed that these reflections were produced by the dissolution of a fine thin film that covered the scales. Jacquin then filtered the water to recover the pearly substance and mixed it with a varnish (Taburiaux, 1985). Since then, it has been determined that the iridescence is caused by minute crystals embedded in the skin covering the fish scales. These crystals are an organic waste material named guanine, which is closely allied to uric acid (Farn, 1986). Because approximately 2,000 bleak are needed to produce one liter of essence, other fish such as shad, herring, and salmon have also been used.

GIA's Research Department used a Nicolet 60SX Fourier transform infrared (FTIR) spectrometer to analyze the coating material on one black and one white Majorica imitation pearl. Their data showed that in the near-infrared range, outside of the total absorption caused by the glass nucleus, there are a number of weak features consistent with a reference spectrum of guanine ($C_5H_5N_5O$).

In preparation for the coating process, the glass beads are placed on posts set in frames. The beads then undergo a number of consecutive dipping and drying steps (figure 8), each of which is followed by cleaning and polishing with an increasingly finer

Figure 8. The glass bead nuclei are placed on posts in preparation for the coatings of "pearl essence." They then undergo a series of dipping and drying steps, each followed by a cleaning and polishing. For the final coat, Majorica uses a special chemical that hardens the surface and protects the color from U.V. radiation. Although some beads are processed by hand, as shown here, most are done by automation. Photo by June Hanano.

grade of brush. During the final production phase, a special chemical dipping—possibly cellulose acetate and cellulose nitrate (Read, 1986)—polymerizes the organic material, hardens the surface, and protects it from chipping and ultraviolet radiation (which could cause discoloration). Majorica offers a 10-year guarantee against deterioration of their product.

Because the dipping produces a tail-like accumulation of the coating, each bead is trimmed by hand with a razor to form a more perfect sphere (figure 9). However, some of the imitations examined showed evidence that the final chemical dipping was done after the trimming: With magnification, a transparent layer could be seen covering the drill hole. Majorica claims that approximately 25% of their total production of finished beads

Figure 9. Once the final coating is dry, the tail-like accumulation of pearl essence (left) is trimmed by hand. This ensures a more perfect sphere (right). Photo by Robert Weldon.

Figure 10. As a final step, selected strands of the finished Majorica beads are subjected to strenuous durability testing. Here, the strands are mounted on a special machine that literally "beats" them against a rotating bar to simulate years of wear. Photo by June Hanano.

does not pass quality standards and is destroyed (J. Peribañez, pers. comm., 1990).

The finished imitation pearls are either mounted for use as earrings, pendants, pins, or rings, or are strung on a strand comprised of 80% silk and 20% rayon. The stringing work is farmed out to cottage laborers, who hand knot 2.5 million strands per year (L. Bonel, pers. comm., 1989). Selected finished strands are then mounted on a special machine that literally "beats" them for several minutes to confirm their durability (figure 10). Once a strand has passed quality control, it is tagged and numbered, then boxed in a distinctive red jewelry case for final distribution.

VISUAL APPEARANCE OF MAJORICA PEARLS

Colors. The main colors that Majorica S.A. produces are cream rosé, white, black, and gray (figure 11). The principal colors are based on the demands of three key markets: Europe (cream rosé) and the United States (cream rosé with white on the

Figure 11. These strands of 8-mm Majorica imitation pearls are typical of the four main colors produced: white, cream rosé, gray, and black. Photo by Robert Weldon.

increase); Japan (cream rosé); and Scandinavia and Canada (white). Cream rosé represents 85% of Majorica's total production; white, gray and black represent the remaining 15%. White is the most expensive color to produce, because it is more difficult both to extract the guanine from the fish scales to produce white and then to apply the resulting "pearl essence" to the bead; the slightest contamination of the solution (e.g., dust) will also contaminate the color (L. Bonel, pers. comm., 1989).

Sizes. The Majorica imitations range from as small as 1 mm to as large as 22 mm. The 6-mm and 7-mm beads dominate the market, with 8 mm following closely behind (J. Peribañez, pers. comm, 1989). Demand for larger sizes (10+ mm) is rapidly growing in the U.S. market. Majorica attributes this to First Lady Barbara Bush's use of imitation pearls, her open fondness for larger pearls, and the increasing popularity of large South Seas cultured pearls.

Shapes. Most Majorica pearls are round, but other shapes are also produced, including half spheres, heart shapes, pear shapes, and ovals. There are a limited number of baroque shapes as well. However, because these shapes are more difficult to manufacture, they cannot compete monetarily with many of the cultured freshwater baroques.

MARKETING

In 1955, the Majorica imitations were virtually unknown outside of Spain. Today, the Majorica product is sold in 76 different countries. Cooperative advertising with major department stores in the U.S. and abroad has stimulated this international recognition. Currently, the largest market is

TABLE 1. Comparison of the gemological properties of saltwater cultured pearls and four different colors of Majorica imitation pearls.[a]

Test	Saltwater cultured pearl	Majorica white	Majorica gray	Majorica cream rosé	Majorica black
Refractive index (spot)	1.53–1.68 (birefringence blink)	1.48	1.48	1.48	1.48
Specific gravity (hydrostatic)	2.72–2.78	2.67	2.57	2.67	2.51
Hardness	3	2–3 (coating)	2–3 (coating)	2–3 (coating)	2–3 (coating)
X-radiography	Large nucleus, contrast between nucleus and nacre layer apparent	Opaque	Opaque	Opaque	Opaque
X-ray fluorescence	Faint to medium greenish white	Strong yellow	None	Strong yellow	None
Fluorescence to U.V. radiation					
Short-wave	None to faint medium greenish blue	Weaker pink	None	Weak pink	None
Long-wave	None to medium greenish blue	Weak pink	None	None	None
Hydrochloric acid (10% solution)	Effervesces	None	None	None	None
Magnification of drill hole	Dark conchiolin layer between nacre and mother-of-pearl nucleus; sharp edges	No dark separation layer; ragged edges	Same	Same	Same
Tooth test	Gritty	Smooth	Smooth	Smooth	Smooth

[a] *Testing performed on several saltwater cultured pearls and a representative 8-mm Majorica bead from each color category by David Hargett, GIA Gem Trade Laboratory, Inc., New York.*

Spain, followed by the U.S., France, and, surprisingly, Japan (L. Di Cristofano, pers. comm., 1990). For 1989, Majorica S.A. reported total sales of imitation pearls at US$60 million.

Distribution is controlled by 45 diversified distributors who sell to jewelry and department stores, as well as to airlines, duty-free shops, cruise-ship gift shops, military bases, and boutiques. Jewelry is produced only in direct response to orders received, all of which are processed through corporate headquarters in Barcelona. Inventory is kept at a minimum.

Majorica continues to expand their product line. Today, the company is trying to increase the appeal of their product by designing with 14K gold and colored stones for the U.S. market, and with 18K gold and diamond accents for the European market (A. Corbero, pers. comm., 1989).

IDENTIFICATION

Of paramount importance to the jeweler-gemologist is the separation of the Majorica imitations from their costlier counterparts: saltwater cultured pearls. Although natural pearls are another possibility, they are extremely uncommon today and therefore were not included in this study. Most of the surface characteristics of natural pearls, however, overlap those of cultured pearls and so would provide similar identification clues.

To establish standard means by which the two products could be separated, we submitted a representative bead from each of four 16-inch strands of Majorica pearls – one each of 8-mm white, cream rosé, gray, and black beads (again, see figure 11) – to standard gemological tests. We then compared our results to those gained on several saltwater cultured pearls of similar color and shape. The results are reported in table 1 and discussed below.

To the untrained eye, Majorica imitation pearls look very much like saltwater cultured pearls (figure 12). An iridescence resembling the orient seen on some cultured pearls may also be observed on Majoricas. On cultured pearls, however, this phenomenon more commonly occurs on irregular surfaces rather than smooth. On the Majorica imitations, obvious iridescence is often seen in conjunction with a smooth surface. The Majorica beads also have a very high luster which, in combination with the iridescence and on the smooth surface, provides visual indication that the bead is an imitation (figure 13). Note that the

Figure 12. To the untrained eye, Majorica imitation pearls may be confused with cultured pearls. The larger beads are Majorica imitations; the two smaller strands are cultured pearls. Photo by Shane McClure.

process used to produce most other imitation pearls involves dipping or painting the beads with a resin; thus, these imitations lack the iridescence of the Majorica product and its cultured counterpart.

Since visual observation is not always conclusive, gemological testing may be needed to separate the Majorica imitation from cultured pearls. We determined that four tests are conclusive in making this separation: refractive index, magnification, X-radiography, and the tooth test.

As table 1 indicates, the spot refractive index of the Majorica imitations is significantly lower than that of a cultured pearl. Also, the Majorica beads do not exhibit birefringence.

Ten-power magnification of the drill hole also proved to be conclusive in making the separation. A cultured pearl shows the thin, often dark layer of conchiolin that separates the mother-of-pearl bead nucleus from the nacre, and the edges of the drill hole are sharp and well defined (figure 14). In contrast, there is no separation between the glass

Figure 13. The prismatic colors known as orient are most apparent on cultured pearls with irregular surfaces. However, Majorica imitation pearls often exhibit iridescence in combination with a relatively smooth surface. This uncommon combination (for cultured pearls) of obvious iridescence and a smooth surface provide visual indications that the bead is actually a Majorica imitation. Photo by Robert Weldon.

nucleus and the coating of the Majorica imitation pearl, and the drill hole itself shows the ragged edges of the coating (figure 15). Higher magnification (50 ×) of the surface also revealed the recessed, step-like depressions on the nacre of a cultured pearl in contrast to the more pitted and dimpled texture of the Majorica imitation (figure 16).

With X-radiography, the Majorica imitations appear almost opaque, with no distinction between the bead nucleus and the coating (figure 17). The mother-of-pearl bead that forms the nucleus in cultured pearls, is significantly less opaque than the glass bead of the Majorica product and there is usually a distinct difference in opacity between the layers of nacre and the nucleus.

The separation is most easily made by the tooth test. When gently rubbed against the cutting edge of the front teeth, cultured pearls feel gritty while the Majorica imitations feel smooth. However, this can be a damaging test. Also, note that Majorica S.A. indicated to the authors that they have the technology to produce their product with a gritty surface texture, but they have made a conscious decision not to do so (L. Bonel, pers. comm., 1989). Other manufacturers are not as conscientious, so the test does not exclude other imitations if a gritty texture is encountered.

With regard to the other tests performed, the results for specific gravity and hardness indicate an overlap between the Majorica products and

Figure 14. When examined with 10× magnification, the drill hole of a cultured pearl shows the outer nacreous layer separated from the mother-of-pearl nucleus by the slightly darker layer of conchiolin. Note also that the edges of the hole are sharp and well defined. Photomicrograph by John I. Koivula.

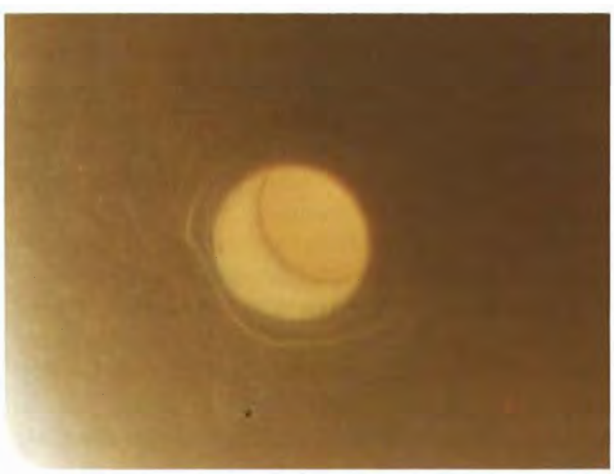
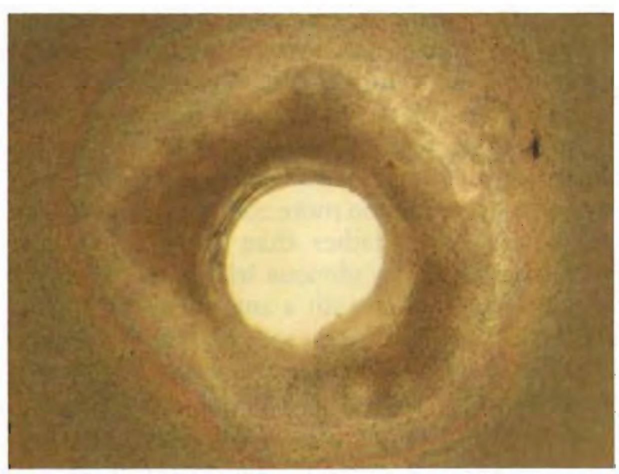


Figure 15. In contrast to figure 14, the drill hole of the Majorica bead shows the ragged edges of the coating and no distinct separation from the glass nucleus. Photomicrograph by John I. Koivula; magnified 10×.



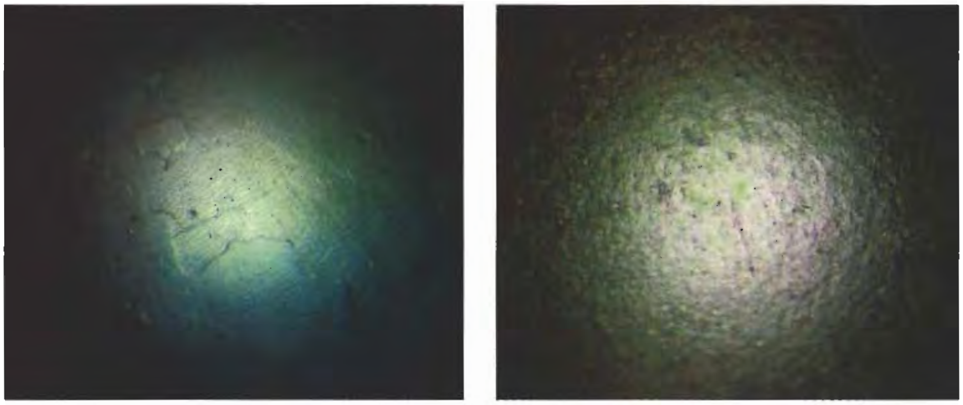


Figure 16. At 50× magnification, the surface of a cultured pearl (left) typically reveals recessed, step-like depressions, while that of a Majorica imitation (right) shows a more pitted and dimpled texture. Photomicrographs by John I. Koivula.

cultured pearls. Although X-ray fluorescence is considered conclusive when it is used in conjunction with X-radiography, this test is of questionable value when used alone. This is also the case with fluorescence to both long- and short-wave ultraviolet radiation. Although reaction to a 10% hydrochloric acid solution is definitive (cultured pearls effervesce, but the Majorica imitations do not), this test is highly destructive and so is not recommended. Also, some other imitation pearls may effervesce (C. Fryer, pers. comm., 1990).

To further substantiate the thickness of the coating or nacre seen with magnification, C. Y. Sheng of GIA's Jewelry Manufacturing Arts Department cut one Majorica imitation and one cultured pearl in half for comparison (figure 18). In the cultured pearl, the wavy, parallel structure of the mother-of-pearl nucleus is seen, surrounded by the dark conchiolin layer and then the outermost layer of nacre. The thickness of the nacre layer will vary depending on the amount of time the nucleated mollusk was allowed to grow before harvest. Generally, however, it is significantly thicker

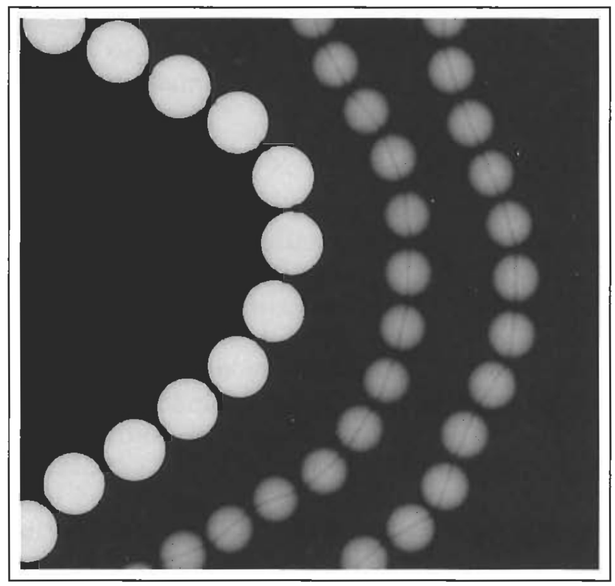


Figure 17. With X-radiography, the Majorica imitation pearls (here, the larger beads) are typically very opaque compared to their cultured counterparts. X-radiograph by Robert E. Kane.

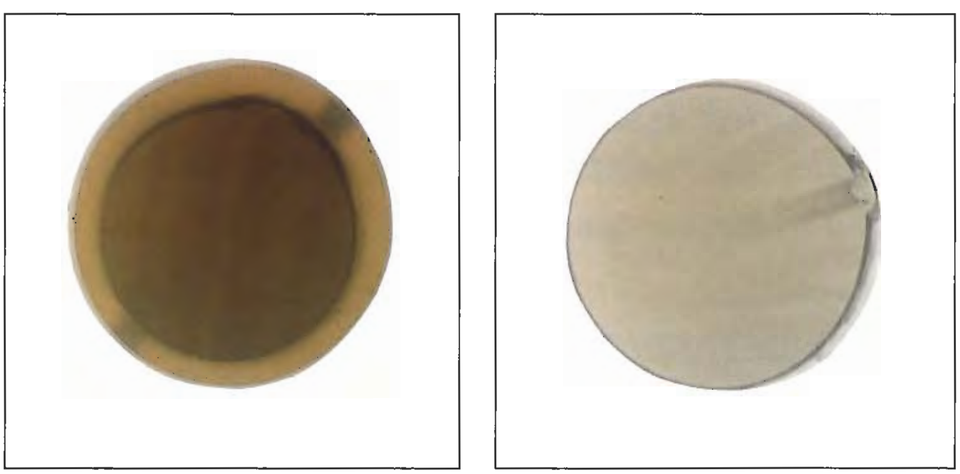


Figure 18. Typically, the nacreous layer of a cultured pearl (left) is significantly thicker than the "pearl essence" coating on a Majorica imitation (right). Note also on these cross-sections the wavy, parallel structure of the mother-of-pearl nucleus in the cultured pearl and the swirl striations of the glass nucleus in the Majorica imitation. Photos by John I. Koivula.

(0.5–0.8 mm on the section in figure 18) than the coating on the glass bead of the Majorica imitation (0.2 mm in figure 18). The Majorica imitation pearl also shows the swirl striations of the glass nucleus. Gas bubbles were again observed in the nucleus.

Durability testing was approached from the point of view of key concerns during average wear. A strand of cream rosé Majorica imitation pearls was immersed in perfume for a week, then exposed to a week of California summer sun. When the test strand was compared to untested strands of the same color, we observed no color change in the tested beads, only a slight yellowing of the thread. While this test is not conclusive, it does provide some indication of the general stability of the product.

CONCLUSION

More and more consumers are choosing imitation pearls as a less expensive alternative to the natural or cultured gem material. Greater consumer acceptance of imitations can also be attributed to the influence of those – such as First Lady Barbara Bush – who are spotlighted by the media.

Majorica imitation pearls are manufactured by a meticulous process that involves multiple dippings of a glass nucleus into a compound extracted from fish scales. Each dipping is followed by a separate polishing of the bead. A final coating serves to harden the bead and protect it from discoloration by ultraviolet radiation. It is this process that sets the Majorica product apart from most other imitations, which use coatings of resin paints.

Although Majorica imitation pearls are produced in many colors and in a variety of shapes and sizes, the most popular are the round, 6–7 mm cream rosé beads. Majorica jewelry is marketed throughout the world; in 1989, sales reached US$60 million.

At a glance, it is possible to mistake Majorica imitation pearls for cultured pearls; however, they are easily separated with standard gemological testing. The high luster, absence of blemishes, and distinct iridescence of the Majorica product are strong visual clues. The significantly lower refractive index (and absence of birefringence) in the Majorica product, together with the ragged drill hole edges viewed with magnification and its opacity to X-radiography, provide conclusive means of identification. The smooth surface of the Majorica product when rubbed against the cutting edge of the front teeth (as compared to the gritty surface of cultured or natural pearls) is also conclusive, but this test is potentially damaging.

The Majorica imitation also appears to be durable under normal conditions of wear. Overall, it is a useful substitute for cultured or natural pearls.

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