

Fraud with cultured pearls can be detected

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Scientists at the Johannes Gutenberg University Mainz (Germany) advise buyers of cultured pearls to be more vigilant. "In Germany too, we are increasingly seeing Chinese sweet-water cultured pearls being marketed as Japanese, although they actually originate from China," say Dr Dorrit Jacob and Ursula Wehrmeister of the Institute of Geosciences.

Even gemmologists, i.e. experts in precious stones and pearls, cannot distinguish between pearls from Japan and China with the naked eye. However, Japanese pearls can fetch a price ten times that of Chinese pearls. Over the past two years, the two scientists from Mainz University have developed a method that makes it possible to clearly identify the origin of pearls.

At the beginning of the 20th century, the Japanese managed to produce the first round cultured pearls. Pearl culture entails inserting small round pellets, usually made of oyster shell nacre, into the oysters. The important factor during this operation is that a small section of the mother-of-pearl forming tissue must also be implanted. The oyster then gradually coats the foreign body - the core - that has been introduced with many layers of nacre. In this way, a new pearl is produced over a period of two to three years. Cultured pearls can be produced in all regions of the world where natural pearls form. Most pearls on the market today are cultured pearls, as real pearls are rare - and expensive.

In China, sweet-water pearl farming now produces pearls for the mass market rapidly and with relative ease. "The oysters are easy to care for and the pearls grow very quickly and can be cultivated from a core or

even from very small tissue samples," explains Ursula Wehrmeister. The gemmologist notes that Chinese farmers implant up to 60 cores into one oyster - a form of biological mass production. At the same time, Chinese pearl culture does produce some oddities: Large discs or hemispheres are implanted to obtain custom-made pearls for rings and ear-rings - even Mickey Mouse has served as a model. "Traditional Japanese sweet-water pearl farmers, on the other hand, implant only one or two cores, but are rewarded for their troubles with a very good quality", states Wehrmeister.

High production volumes, and possibly also the manner in which the oysters are cultivated, means that most of the Chinese yield consists of rejects that cannot be used. "We suspect that the animals are subjected to enormous stress," claims Wehrmeister, thus explaining one possible cause of this poor quality. The pearls they produce are not round, but misshapen and cannot be processed by the jewellery industry. The problem of vaterite is also becoming more common. Mother-of-pearl, and thus also pearls, are biominerals consisting of calcium carbonate with a small proportion of organic substances, rather like a brick wall made from bricks and mortar. In particularly attractive, lustrous pearls, the inorganic calcium carbonate fraction is mainly made up of aragonite. The scientists from Mainz found that Chinese pearls contain more vaterite, not only within the pearls, but also on the outside, where the substance forms a matt surface with white spots, rendering the pearls unsuitable for sale.

High-quality Chinese pearls, however, cannot be distinguished from Japanese pearls with the naked eye, even by experts. "We can use trace element analysis to establish the origin of the pearls beyond doubt," explains Dorrit Jacob, a geochemist. A UV laser is used to cut an almost invisibly small sample in a size ranging of 5 - 100 micrometres from the study material (by way of comparison, a human hair has a diameter of about 40 micrometres). This mini-sample is rinsed into the analysis

device with the aid of an inert gas and the content of trace elements, particularly barium and strontium, can then be established. The ratio between barium and strontium in comparison with total strontium content indicates the origin of the material.

"We have been developing this practically non-destructive test method since 2006 in order to distinguish between Japanese and Chinese pearls," says Jacob. "We are also able to use this method, known as laser ablation ICP mass spectrometry, to determine whether pearls contain vaterite and whether certain sapphires have been subsequently treated." The large number of especially orange- and blue-colored sapphires currently on the market cannot all be natural. This means that sapphires with a less marked coloration, which would normally not be marketable, have been colored more brightly with beryllium.

The next step for the two scientists will be to analyze coral in more detail and to create a basis for learning more about the structure and origin of this resource created by undersea creatures and the jewellery that can be made from it.

Source: Johannes Gutenberg University Mainz

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