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不同颜色的淡水养殖珍珠呈色机理研究

Investigation on the Coloring Mechanism of Freshwater Cultured Pearls with Different Color

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作者	单位
严俊	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013
胡仙超	浙江工业大学分析测试中心, 浙江 杭州 310014
王巨安	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013
严雪俊	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013
胡丹静	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013
刘培钧	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013
方诗彬	浙江省质量检测科学研究院黄金珠宝检测中心, 浙江 杭州 310013

中文摘要:

珍珠的呈色机理一直存在有机物致色学说与微量金属离子致色学说,鉴于有机物致色机理与物体本身结构无关及珍珠中微量金属元素的测定,这些理论用于解释珍珠时呈色存在明显的局限,直至目前珍珠的呈色机理尚无定论。本文采用傅立叶变换红外光谱(FTIR)、X射线荧光光谱(XRF)、场发射扫描电镜(FE-SEM)等技术,对白、紫、粉红三种颜色的淡水养殖珍珠的呈色机理进行较为系统的研究。结果表明:不同颜色珍珠的红外光谱无明显差异;粉色珍珠中Ti、Fe、Mg与Cu的含量较白色与紫色珍珠高,白色珍珠中Mn的含量较粉色珍珠高;粉色与白色珍珠中Ti、Fe、Cu的含量差异较大,但紫色与白色珍珠中Ti、Fe、Cu的含量几乎接近;不同颜色珍珠的研磨粉体的颜色基本一致,反射主波长为(582±1) nm,说明珍珠内有机质与致色金属元素不应是珍珠呈色差异的主要原因。在同一直径不同颜色的珍珠中,其近外表面区域内珍珠层文石板片的厚度大小不一,其中粉色珍珠中文石板片的厚度相对较薄;珍珠表面的"叠瓦状"结构疏密也并不一致,粉色珍珠表面的文石片层更为紧密。研究认为,珍珠中内部文石板片厚度及其外表面形貌的差异应是珍珠呈现不同颜色的直接原因。

英文摘要:

The coloring mechanism of pearls was debated on organic pigment or trace metal ions. In view of the theory of the coloring mechanism from organic pigment, which had no relationship with the structure of the object combined with the results of the trace metal elements determined by X-ray Fluorescence Spectrometry or the other instruments, the above two theories can not explain the coloring of pearls. The coloring mechanism of freshwater cultured pearls was investigated by Fourier Transform Infrared Spectroscopy, X-ray Fluorescence Spectrometry and Field Emission-Scanning Electronic Microscope. The results indicate that, in terms of pearls with different color, the characteristic peaks were almost the same in the middle IR spectra of freshwater cultured pearls, which is due to the chemical bonds of organics in pearls. The contents of Ti, Fe, Mg and Cu elements in pink pearls were higher than those in white and purple pearls. Additionally, the content of Mn in white pearl was higher than that in pink ones. The contents of Ti, Fe and Cu elements were different between white and pink pearls, but they were the same between white and purple pearls. The color of ground powders of white, violet and pink pearls was almost the same yellow and the domain reflection wavelength was (582±1) nm. The above results showed that the coloring mechanism is from organic pigment or those trace metal elements directly. Although the diameters of pearls were the same, it was firstly discovered that the thickness of aragonite sheets were obviously different in the nacreous layer near the surface region of pearls for different colored pearls. The aragonite sheets hosted in pink pearls were the thinnest. Furthermore, the imbricate structure and morphology were also different on the surface of pearls, and that on the surface of pink pearls was the most inseparable when comparing with white and purple pearls. Hereby, the coloring mechanism of freshwater cultured pearl was attributed to the differences in the thickness of aragonite sheets and surface morphology.

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国家地质实验测试中心

通讯地址:北京市西城区百万庄大街26号
E-mail：ykcs_zazhi@163.com；ykcs_zazhi@sina.com
京ICP备05032737号-2
技术支持：北京勤云科技发展有限公司

邮 编：100037
电 话：010-68999562 68999563
传 真：010-68999563