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Some Papers (2009-present) 主要著作（**2009** 年至今）

- Youngchool Kim, Hyunmin, Choi, Bohyun Lee and Ahmadjan Abduriyim, Identification of Irradiated South Sea Cultured pearls Using Electron Spin Resonance Spectroscopy, Gems & Gemology, 48(4)(2012) P.292-299
- H.M. Choi, B.H. Lee, and Y.C. Kim, Detection of gamma irradiated South Sea cultured pearls II, Journal of the Korean Crystal Growth and Crystal Technology 22(1)(2012)
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- Hyunjin Lim, Sooyoun park, Hyeonsik Cheong, Hyunmin Choi and Youngchool Kim, Discrimination between natural and HPHT treated type IIa diamonds using photoluminescence spectroscopy, Diamond & Related Materials, 19(2010), 1254-1258
- Micro-structural defects in ruby samples from Mong Hsu, Myanmar, Journal of the Korean Crystal Growth and Crystal Technology 19(2) (2009)
- Nano inclusions in sapphire samples from Sri Lanka, Journal of the Korean Crystal Growth and Crystal Technology 19(2) (2009)

Identification of Gamma-ray Irradiated Cultured Pearls

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Abstract

Irradiation is widely used to alter pearl color. Lower-quality freshwater and saltwater cultured pearls are regularly exposed to ^{60}Co gamma-ray radiation in an attempt to simulate black pearls or enhance orient.

In recent years, the irradiation process has been applied to not only Akoya cultured pearls and freshwater cultured pearls, but also to South Sea cultured pearls. Gamma-ray irradiated SSCPs with colors ranging from white to cream turned light gray to silver (Choi et al., 2012; Kim et al., 2012).

Irradiated Akoya cultured pearls with a nacre thickness of 0.2-0.6 mm can be identified by general gemological testing such as light transmission method and nucleus (bead) observation through a drilled hole (Komatsu, 1999). But for SSCPs with a nacre thickness of approximately 1.0-3.0 mm, detection of irradiated pearl is not easy by means of such gemological methods.

Thus this study intended 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 CO_2^- radicals are formed. This study shows that the presence of these CO_2^- radicals can be confirmed using ESR spectroscopy. The amount of CO_2^- radicals correlates to the irradiation dose rates. Our study has shown, that they are better detectable in the nacre than in the nucleus (bead).

Concludingly, the results of this study show, that it is possible to separate pearls of natural color from pearls with an artificial color modification by gamma-irradiation on the base of ESR spectra.

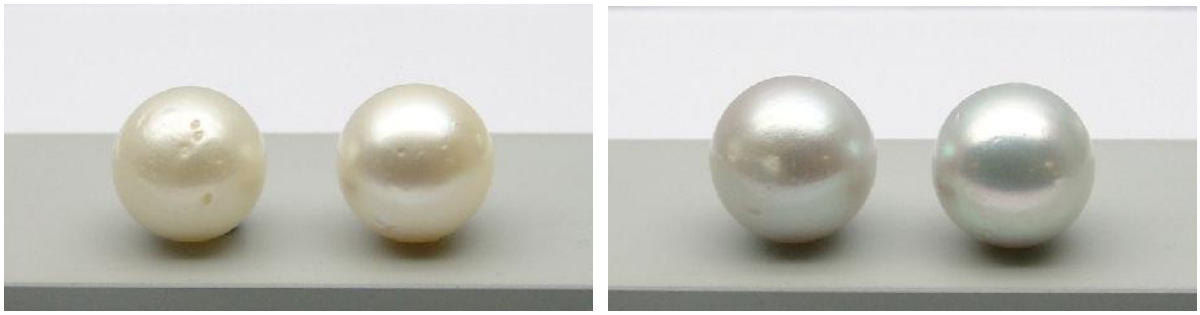

Figure 1:Two samples of South Sea cultured pearls before and after exposure to gamma-irradiation (left). After irradiation, the pearls show an attractive slightly gray to silver gray color (right).

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Choi H.M., Lee B.H., Kim Y.C., 2012, Detection of gamma irradiated South Sea cultured pearls I , Journal of the Korean Crystal Growth and Crystal Technology, Vol. 22, No. 1, p. 36-41.

Kim Y.C., Choi H.M., Lee B.H., Abduriyim A., 2012, Identification of irradiated South Sea cultured pearls using electron spin resonance spectroscopy, Gems & Gemology, Vol. 48, No. 4, p. 292-299.

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經伽瑪射線輻射處理的養殖珍珠的鑑定

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摘要

輻射處理被廣泛應用於改變珍珠色澤。低等級的淡水養殖珍珠和海水養殖珍珠通常經過^{60}Co伽瑪射線輻射處理後，可用於模仿黑珍珠，並呈現出迷人的珍珠光澤。

近年來，採用輻射處理的珍珠包括Akoya養殖珍珠、淡水養殖珍珠及南洋養殖珍珠。經伽瑪射線輻射處理後的SSCP（南洋養殖珍珠），可呈現出白色、奶油灰及以銀色等色澤（Choi et al., 2012; Kim et al., 2012）。

經輻射處理的Akoya養殖珍珠，其珍珠層厚度為0.2-0.6mm，可通過普通的珠寶鑑定方法鑑定出來，例如透光法以及通過鑽孔觀察珠核的方法（Komatsu，1999）。但此類常規珠寶鑑定方法對於珍珠層厚度為1.0-3.0mm的SSCP（南洋養殖珍珠）而言，就有些力不從心了。

因此，本文將介紹通過電子自旋轉共振（ESR）光譜法來鑑定經輻射處理的南洋養殖珍珠。該方法亦廣泛用於經輻射處理的食品的檢測。

伽瑪射線輻射將產生原本不應存在的CO_2自由基。研究說明，可通過ESR光譜，可以將CO_2自由基探測出來。CO_2自由基的數目同輻射量存在一定的比例關係。我們的研究還證明了珍珠層中的CO_2自由基比珍珠核中的CO_2自由基更容易探測出來。

我們的研究結果表明，可通過ESR光譜法將擁有天然色澤的珍珠同經過伽瑪射線輻射處理著色的珍珠區別開來。

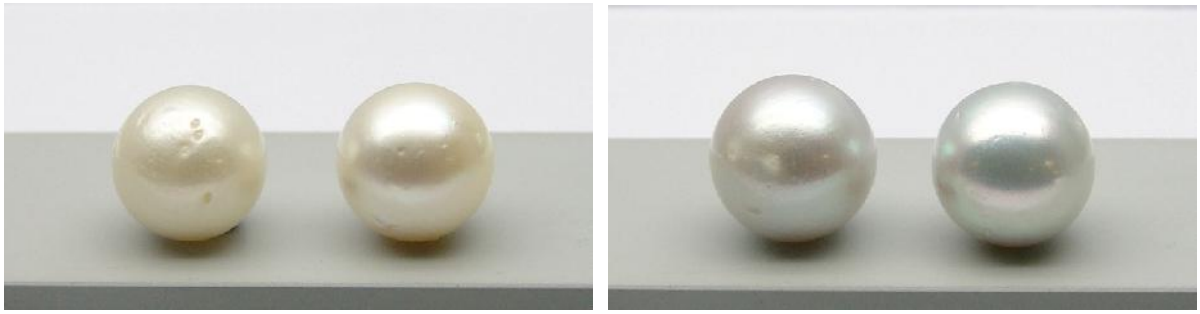

圖1：圖為經過伽瑪射線輻射處理前後的一對南洋養殖珍珠（左）。處理後的珍珠散發出從淺灰到銀灰色的光澤，光彩迷人（右）。

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Kim Y.C.，Choi H.M.，Lee B.H.及 Abduriyim A.，2012，採用電子自旋共振光譜技術鑑定經輻射處理的南洋養殖珍珠，《Gems & Gemology》，第48卷，No.4，p. 292-299。

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