



亓利劍，教授
同濟大學寶石及工藝材料實驗室

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簡 歷:

亓利劍，教授，現任職上海同濟大學海洋與地球科學學院，主要從事寶石及材料工藝的科研與教學工作。近年來，負責完成（含在研）國家自然科學基金專案 3 項，省級自然科學基金專案 3 項，省部級橫向科研專案及國家重點開放實驗室項目 7 項，作為主要研究人員（第二）參與部級重點攻關項目和國家自然科學基金專案 2 項。

在國內外刊物上公開發表與寶石學相關的科技論文 103 篇，其中 51 篇被 SCI、EI、CA 收錄。曾獲地礦部科技成果三等獎 2 項，國家發明專利 1 項，省級教學成果一等獎和國家級教學成果二等獎各 1 項。

主要學術兼職，中國實驗室計量認證/認可國家級評審員，國家寶玉石首飾類檢驗技術專家委員會委員，國家 CGC 執業資格考試專家委員。

Curriculum Vitae

Mr. Qi Lijian, an incumbent professor at School of Ocean and Earth Science, Tongji University, is engaged in the scientific research and teaching of gem and material technology. During recent years, Professor Qi has completed (or still has been actively engaged in the on-going research of) three projects aided by Natural Science Foundation of China, three projects aided by provincial-level natural science foundations, seven provincial-level horizontal cooperative scientific research projects and national key open laboratory projects. Meanwhile, Mr. Qi also participated in, as a major (No. 2) researcher, one ministerial-level key project and one project aided by Natural Science Foundation of China.

As a fruitful researcher, Professor Qi has published a total of 103 scientific articles on gemology in both domestic and abroad magazines, among which, 51 are collected by SCI, EI, and CA. Also, he has been bestowed with many honors, including two third prizes of Outstanding Scientific Research Award granted by Ministry of Geology and Mineral Resources, one national invention patent, one provincial-level first prize and one national-level second prize for excellent teaching performance.

As to his part-time academic job, Professor Qi also works as a national-level assessor for laboratory accreditation and metrology authentication in China, member of National Expert Committee for Testing Technology of Gem and Jade Jewellery and Expert Committee for Examination of Certified Gemologist of China.

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輻照與 HPHT 綜合處理彩色鑽石色心及 UV-VIS 光譜解析

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The Color-Centre of Irradiated-HPHT Fancy Diamonds and the Analysis on their UV-VIS Spectrums

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摘要：

近期國內面市的部分人工處理彩色鑽石由以往單一輻照或高溫高壓（HPHT）處理，發展為輻照退火與HPHT綜合處理，鑽石的顏色更加豔麗、持久。本文採用UV-VIS、FT-IR、PL及CL分析測試方法並配合輻照退火實驗，就該類彩色鑽石的吸收、振動及發光光譜特徵進行研究，結果表明：輻照與HPHT綜合處理 IIa型藍色鑽石中並存GR1、620、472、271等複雜色心組合；經HPHT處現後，IIa型棕褐色鑽石和CVD合成淺褐色鑽石均易誘生N-V色心，並以強度不等的271nm吸收峰為特徵。HPHT處理粉紅色、紫紅色鑽石中除出現550nm ($\pm 5\text{nm}$) 吸收寬峰外，尚伴生與HPHT處理相關的470~475nm鑑定意義的特徵吸收寬峰。綜合處理黃色鑽石內一併兼含輻照退火和HPHT處理過程中誘生的複合色心，前者以594nm吸收弱峰為代表，後者則以470~475nm吸收寬峰為特徵，二者聯合作用導致鑽石呈現金黃色、黃色。HPHT條件誘生以473nm為中心的晶體缺陷心，與此同時，呈電中性的H3心($\text{N}-\text{V}-\text{N}$)轉變為H2心($\text{N}-\text{V}-\text{N}^-$)心。473心、594心是導致黃綠色鑽石賦色的主要緣由，與H2心(987nm)一併構成綜合處理彩色鑽石的鑑定依據。

Abstracts:

Recently, there are some treated color diamonds with combine treatment of irradiation and HPHT flow into the China market, their color are fancier and much more long-lasting than those treated by single irradiation or single HPHT. We have a research on the diamond-spectra of absorption, vibration and luminescence, using the analysis methodology of UV-VIS, FTIR, PL and CL together with the anneal procedure, and conclude as follows: the combined treated (Irradiated+HPHT) blue diamond (IIa) is found with the complicated color centres of GR1, 620, 472 and 271; for the HPHT treated stones, the brown IIa diamonds and the light brown CVD diamonds are commonly found with N-V color centre and characterized with 271nm absorption. The pink and violet HPHT diamonds can be found with the 550($\pm 5\text{nm}$) wide absorption and the concerned diagnostic absorptions in 470-475nm. The combined-treated yellow diamonds can have the compound color centres induced by the irradiation+anneal (594nm) and the HPHT treatment (470-475nm), these two procedures lead to a golden yellow color in the diamonds. The HPHT induces the defect centre of 473nm and changes the H3 to H2. The greenish yellow of the diamonds are mainly contributed to the centers of 473 and 594 centres, they constitute the identifying features the combined color treated fancy diamonds.