

## New Method for Identification of Blue Topaz—An Application of Cathodoluminescence(CL)

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### Abstract

Blue colored topaz is the most commercialized gemstone worldwide at present. Very rare in nature, most of these topazes are treated by laboratory irradiation with gamma ray, neutron or electron, or in combination with them ever since more than 30 years ago. Knowledge about the origin of the blue color in topazes is not well understood, and a method to identify blue topaz nondestructively is a worldwide problem.

In this research, the tested samples were natural blue, colorless topazes and irradiated blue topazes which were firstly tested by using UV lamp (λ=365, 254nm). Results showed that the UV fluorescence of the natural blue topazes ranged

from very strong to very weak, while those of the irradiated blue topazes were always very weak or even no fluorescence. Based on the UV fluorescence testing, their cathodoluminescence(CL) characteristics were studied emphasisly by using CL-2 cathodoluminescence spectroscope produced by Gemmological Institute of CUG and USB2000 CCD multi-channel spectroscope produced by Ocean Optics, U.S. For this study, CL spectra was acquired at an accelerating voltage of 9.5~10.5 kV, a 0.95~1.05 mA beam current, and entrance and exit slit widths of 4 mm. Results indicated that the maximum of the broad emission bands of all the topazes were always at approximately 500 nm with a side band at approximately 492 nm, and CL of natural blue topazes was the strongest (about 40~50 counts), followed by the natural colorless topazes (about 20~30 counts) and the irradiated blue topazes(less than 15 counts), only

1/3 of the natural blue topazes. Therefore, CL characteristics could be used to separate the natural blue topaz from the irradiated blue topazes rapidly and nondestructively.

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