

Enhancement of the Colour of Natural Greenish Yellow Chrysoberyl Using Heat Treatment Techniques

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Sri Lanka is one of the greatest gem sources and trading place in the world and has a rich, almost unparalleled tradition and remains vitally important to the global gemstone market. Chrysoberyl (BeAl_2O_4) is a variety of gemstone which is predominantly greenish, yellow, yellowish green, brown or rarely green in colour. The most common colour of chrysoberyl in Sri Lanka is transparent greenish yellow which less appealing than the yellowish green colour. The exposure of a gem to high temperatures for the purpose of altering its colour and/or clarity was a common practice for centuries and research on chrysoberyl seldom carried out in Sri Lanka. Thus, the study based on heat treatment of chrysoberyl in order to enhance the colour and the clarity. 10 samples were collected from Ratnapura, Eheliyagoda and Rakwana area and samples were cut into two pieces along C axis (Optic axis) using a lapidary sawing machine. Heat treatment was done in both oxidizing and reducing atmospheric conditions and by varying the temperatures from 700 °C to 1200 °C, with the soaking time of 15 minutes to 2 hours. Untreated and treated stones were analyzed using Raman spectroscopy. Best colour and clarity enhancement were obtained when treating the stones under reducing atmosphere and greenish yellow colour chrysoberyls transformed into an apple green colour. Furthermore, with the increase in temperature, the colour change from greenish yellow to light green appeared more dominantly. In prospect of clarity during the heat treatment got enhanced the clarity by dissolving the colloidal impurities inside the stone. The greenish yellow chrysoberyl which has an unappealing colour could be converted into a more desirable green colour under reducing condition with the maximum temperature of 1200 °C. Raman spectroscopy has indicated peaks at 100 cm^{-1} , 400 cm^{-1} due to OH bond stretching. Analyzing the Raman spectroscopy of the heat treated Chrysoberyl samples, some peaks got increase and some peaks got decrease significantly. Therefore, the Raman spectroscopy could use to identify the heated chrysoberyls from the unheated.

Keywords: Chrysoberyl, Raman spectroscopy, Heat treatment