Preliminary Investigation on the Occurrence of Reddish Brown Colour in Zircon from Kolonna, Sri Lanka

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Sri Lanka is famous for various types of gem minerals. From among these minerals, gem-quality zircon is found in both primary and secondary deposits. Kolonna is a location where zircon is found in primary deposits with a reddish-brown colour. The main objective of this study was to investigate the occurrence of reddish-brown colour in zircon from Kolonna area. Although many factors could cause the colour of gem minerals, the colour of zircons is known to be produced by trace elements (transition metals, lanthanides, actinides, and REEs), radiation damage (radiation-induced color centers) and charge transfer. Five randomly selected reddish-brown zircon samples were selected for this study. All samples were translucent, highly fractured, sub-adamantine, and with euhedral to subhedral crystal form. Samples were analyzed with EDXRF, UV-Vis Spectrophotometer, and FTIR methods. The UV-Vis spectrum of these samples showed an increase in absorption towards the UV region and declines towards the NIR region with a shoulder at around 500 nm. This can be identified as a structurally defected colour center that may occur due to the radiation damage caused by radioactive elements such as U and Th. This was further confirmed by the U^{4+} peak at 654 and 690 nm. The U^{5+} peak at 6663 cm^{-1} in the FTIR spectrum further confirmed the presence of U in samples. This was confirmed by the EDXRF analyses that showed a trace amount of radioactive elements. The average weight percentage of U and Th were 0.06 and 0.02, respectively. It was also noted an occurrence of an OH^- group indicated at 3196 cm^{-1} on FTIR spectra. This may be probably due to slight radiation damage caused by radioactive elements in zircon samples. This study revealed the presence of U which accounts for structural defects that form colour centers in reddish-brown zircon from the Kolonna region.

Keywords: Absorption, Colour center, Cause of color, Zircon, Radiation