

VALUE ADDITION OF SRI LANKAN GEM ZIRCON VIA HEAT TREATMENT

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A semiprecious gem variety called zircon is abundant in most gem bearing regions of Sri Lanka. Naturally zircon could be found in variety of colours but majority of stones found in brownish colours and do not fetch higher prices compared to their other colour varieties. Now most countries heat treat their inferior quality zircon and produce most sought after colours such as Emerald green, yellow and especially blue colour. So far heat treatment of zircon is not popular in Sri Lanka. As such the material sells in bulk quantities for a lower price tag. On the other hand, chemistry of Sri Lankan zircon is not identical to zircons from other countries. As such it is not possible to apply the same techniques directly to Lankan zircon, applied elsewhere. During this study heat treatment of Sri Lankan gem zircon carried out in both oxidizing and reducing conditions, incorporating gas and electrical furnace.

Low quality zircon samples from Rathnapura and Kawisigamuwa (E-166533/ N-256334) localities were collected and surfaces of the stones were cleaned. Thereafter each sample was sliced in to two parts and polished both sides of the slices. Heat treatment was carried out for one slice from each sample subjected to temperatures of 800⁰C to 1300⁰C for reddish brown zircon whereas 1600⁰C to 1800⁰C for greenish coloured zircon using gas and electric furnace. Different atmospheric conditions (reducing and oxidizing) were maintained and samples were Soaked for three hours. Treated and raw samples were visually observed under reflected and transmitted light for colour and clarity. EDXRF analysis was carried out for treated and non-treated samples to obtain the chemistry.

Reddish brown zircon turned yellowish at 900⁰C within oxidizing atmosphere in 'Lakmini' furnace whereas the same variety turned into pale blue colour at 1100⁰C subjected to strong reducing atmosphere. Greenish zircon turned into pale blue when treated at 1750⁰C in reducing atmosphere. Chemistry was obtained for reddish brown zircon as ZrO₂, SiO₂, HfO₂, K₂O, CaO, Fe₂O₃, Cr₂O₃, CuO, NiO in concentrations of (all are % values) 66.2, 30.3, 2.62, 0.54, 0.19, 0.03, 0.01, 0.11, 0.01% respectively. In addition, the same constituents recorded in 64.7, 31.8, 2.33, 0.57, 0.27, 0.13, 0.01, 0.11, 0.02% values for greenish variety with the aid of EDXRF.

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Most sought after colours of zircon are obtained by means of heat treatment yet the clarity remains unattractive in most cases. Further studies are required to improve both colour and the clarity within low quality zircons found in Sri Lankan gem fields. Marked chemical changes were not observed through EDXRF analysis to separate heated stones from unheated zircon. Locality differences of zircon varieties found in different localities of Sri Lanka (e.g. Kavisigamuwa, Ratnapura) need to be studied in detail to decide the most appropriate conditions suitable for colour enhancement of the zircon. The study is still in progress. Finally, it could be concluded that Inferior quality zircon was yet another ideal gem stone variety that could turned into value added product by applying simple treatments. This is an instance where simple value addition processes could be used to harness the maximum earnings out of our gem resources.