

CHEMICAL INVESTIGATION OF HEATED, LOW QUALITY GEM ZIRCON FROM SRI LANKA

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Heat treatment is commonly done to improve color and clarity of gem stones. In Sri Lanka, heat treatment is mainly performed on *geuda* variety of corundum. However, the dark, low quality zircons found in gem pits in Sri Lanka are an untapped resource. Therefore, the main objective of this research was to investigate the possibility of improving the quality of zircon by heat treatment and to establish optimum heat treatment conditions to improve the gem quality of the dark zircon. Zircon samples for this study were collected from Ratnapura, the major gem mining area of Sri Lanka. These samples were sliced into four slices and both sides were polished. The slices were subjected to heat treatment, while one slice was kept untreated. The treatment was done in reducing atmospheric condition with temperature varying from 700⁰C to 1000⁰C using “Lakmini” gas furnace. Then, Infrared absorption spectrum and major element composition were obtained using Fourier Transform Infrared (FTIR) spectrometer and Electron Probe Micro Analyzer (EPMA), respectively. Our preliminary results showed that, optimum temperature to obtain green zircon was 900 ⁰C. The blue color was formed at 1000⁰C under reducing atmosphere, but the clarity of the blue color was weak. FTIR results showing distinct broad O-H stretching band was observed around at 3525 cm⁻¹ due to hydrogrossular-type (OH)⁻₄ cluster. This band became narrow after heat treatment. Additional low intensity hydroxyl band was observed at 3680 cm⁻¹ in heated blue zircon. The result of EPMA analysis showed that ZrO₂, SiO₂, HfO₂, CaO, FeO, Al₂O₃, MgO and TiO₂ concentration were 64.92, 32.64, 1.66, 0.005, 0.03, 0.001, 0.002, and 0.02%. The results clearly indicate that, there exists a great potential to improve the gem quality of zircon by heat treatment in Sri Lanka. Further, heated green zircon can be distinguished from the natural zircon based on OH stretching bond.
