

A Preliminary Study to Determine the Geographic Origin of Low-Gem Quality Corundum in Sri Lanka

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The value of a gemstone largely depends on its rarity, size, clarity, and durability. At present, the geographic origin of a gemstone is also an important factor that affects its value. In heat treatment, the geographic origin is highly important as the physical and chemical properties of gemstone could be varied among different gem-bearing localities. Therefore, the present study aimed to determine the origin of low-gem quality corundum in Sri Lanka based on spectrophotometric data and trace element concentrations. Thirty-five gem samples were directly purchased from mines located at Marapana and Horana. The physical properties of samples such as weight, refractive index, and fluorescence were measured. Inclusions were observed using the optical microscope. Spectrophotometric properties were determined using Raman spectrophotometer and Fourier-transform infrared spectrophotometer (FTIR). Initial observations made by magnification lenses suggested that most of the samples contained mineral inclusions, cracks and had a translucent appearance. The Raman spectroscopic observations revealed peaks at 417 cm⁻¹, 644 cm⁻¹, and 750 cm⁻¹ corresponding to corundum. The observed inclusions and FTIR results confirmed that the samples are natural and have not been subjected to any heat treatment. However, none of the FTIR spectra of samples revealed characteristic peaks that could be successfully used to distinguish the geographic origin of the samples. The X-ray fluorescence and laser ablation-inductively coupled plasma-mass spectrometry-based investigations should be performed in a wide range of gem samples from the two localities in order to compare the geographic origin.

Keywords: Gemstones, Gem localities, Inclusions, Trace Elements