Title : Gemological characteristics and chemical composition of kornerupine claimed to be from Tanzania

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ABSTRACT

This study aims to examine the gemological properties and chemical composition of kornerupine, a silicate mineral. Its chemical composition is $(Mg, Fe^{2+})_4Al_6(Si, Al, B)_5O_{21}(OH)$. Twenty-seven samples were analyzed in this study with weights ranging from 0.226 to 0.641 carats. All samples were translucent to transparent. The samples were categorized into four groups according to their apparent colors: light green, dark green, greenish-blue, and bluish-purple, and their specific gravity values were between 3.17 and 3.33. The refractive indices showed n_ω = 1.649–1.670 and n_E = 1.662–1.678 with the birefringence ranging from 0.009 to 0.014. The samples displayed double refraction and showed pleochroic colors including green, yellowish-green, purple, and colorless. The samples fluoresced from moderate yellow to inert under long-wave UV radiation, while under short-wave UV radiation, they fluoresced from strong yellow to inert. The observed inclusions under the microscope included fingerprints, fractures, two-phase inclusions, and hollow tubes. UV-Visible-Near Infrared spectrometry was used to investigate the causes of the colors of the samples. The absorption bands of vanadium (V^{3+}) and chromium (Cr^{3+})

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at 455 to 652 nm, chromium (Cr^{3+}) at 690 nm, and iron (Fe^{3+}) at 890–1,020 nm were recognized. Chemical composition analysis was conducted on eight representative samples (two from each color group) using a scanning electron microscope equipped with an energy-dispersive spectrometer (SEM-EDS). The results indicated that all eight samples contained Mg (16.10–18.46 wt%), Al (44.07–47.15 wt%), and Si (35.09–39.30 wt%), which are major elements in the chemical formula of kornerupine.

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