Mineralogy and Gemological Characteristics of Reddish Brown Scapolites from Madagascar

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INTRODUCTION

Scapolite is a tectosilicate mineral that crystallizes in the tetragonal crystal system. Its general chemical formula is $(Na,Ca,K)_4Al_3(Si,Al)_3Si_6O_{24}(Cl,F,OH,CO_3,SO_4)_{12}$, representing a solid solution series between the end-members marialite ($Na_4Al_3Si_9O_{24}Cl$) and meionite ($Ca_4Al_6Si_6O_{24}CO_3$)

Results and Discussion

The study examined 30 scapolite samples weighing between 2.046 and 8.680 grams. These samples range from transparent to translucent and can be classified into three distinct color groups: colorless, light brown, and dark brown. Standard gemological testing revealed a specific gravity (SG) ranging from 2.737 to 2.745, a refractive index (RI) between 1.560 and 1.580, and a birefringence of 0.010 to 0.020. Additionally, under ultraviolet (UV) examination, the samples exhibited red fluorescence under long-wave UV (LWUV) but remained inert under short-wave UV (SWUV). Microscopic examination of the internal features revealed various inclusions, hollow tubes (Fig 2), including fingerprint inclusions (Fig 3) and needle-like structures (Fig 4).

MATERIALS AND METHODS

- Scapolite samples from Madagascar were studied for Mineralogy and Gemological Characteristics. The 30 studied samples (Fig 1) are ranging weight from 2.046-8.680 grams.
- 15 samples were selected to determine UV Vis NIR absorption spectra.
- 6 samples were chosen for chemiacal analysis using scanning electron microscopy (SEM)



Figure 1 Scapolite samples from Madagascar in this study

UV VIS NIR spectrophotometer

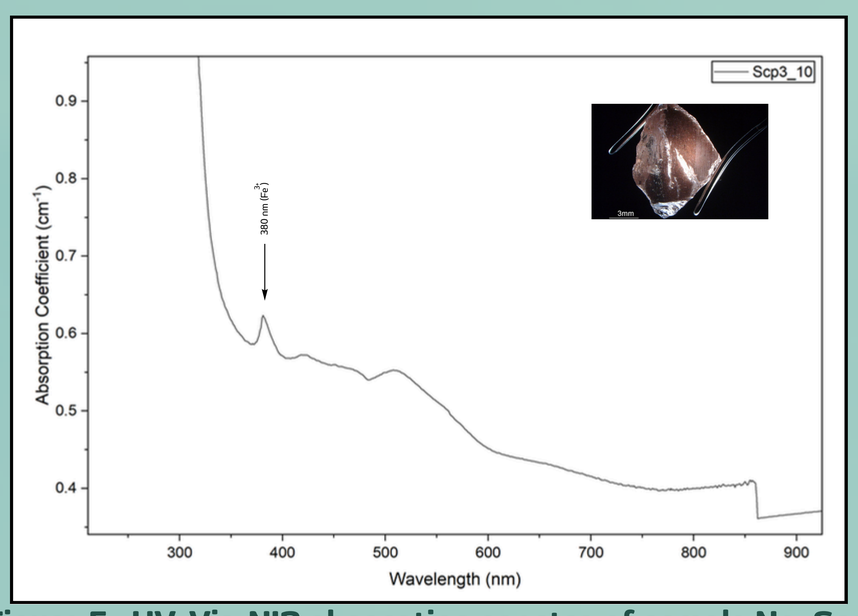


Figure 5 : UV-Vis-NIR absorption spectra of sample No. Scp3_10

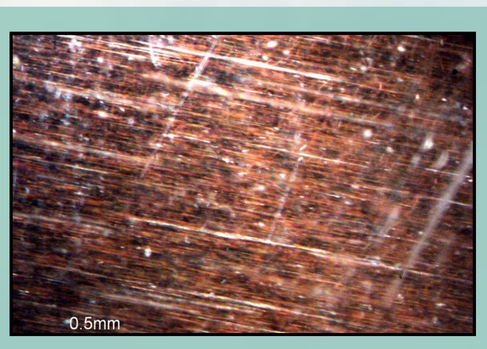


Figure 2

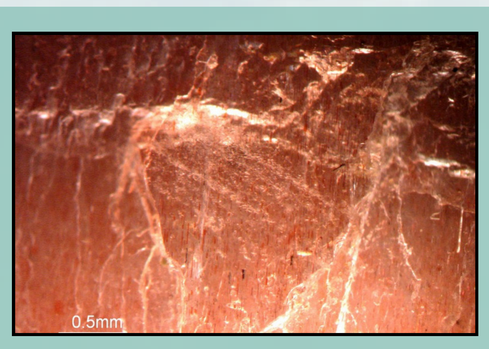


Figure 3

The Uv-Vus-NIR absorption spectra of the sample display absorption peak at approximately 380 nm. Attributed to Fe^{3+}.

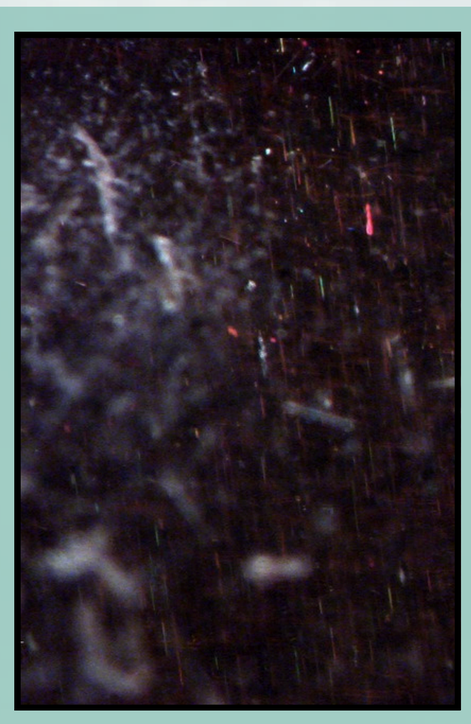


Figure 4

SEM-EDS

6 samples were chosen for chemical analysis by Scanning Electron Microscope (SEM) with energy dispersive X-ray spectrometer and found major elements of 33.44% oxygen, 8.82% carbon, 11.40% calcium, 27.20% silicon, 12.92% aluminum, and 1.82% iron.



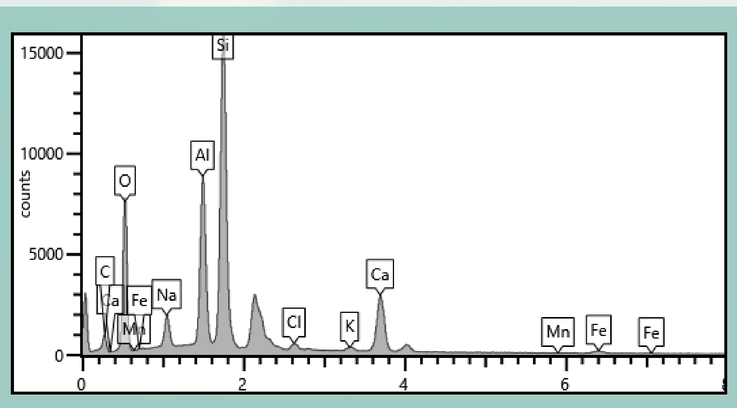


Figure 6 : Scanning Electron Microscope (left) and EDS spectrum (right) of scapolite sample

Conclusion

In conclusion, the Madagascar samples are confirmed as scapolite within the marialite-meionite solid solution series, characterized by a refractive index of 1.560–1.580, a specific gravity of 2.737–2.745, and distinct red fluorescence under long-wave ultraviolet light. Microscopic examination identified characteristic internal features, including fingerprint inclusions, hollow tubes, and needle-like structures. Furthermore, the reddish-brown coloration of the scapolite is primarily attributed to the presence of iron (Fe). This conclusion is strongly supported by SEM analysis, which detected 1.82% iron content, and UV-Vis-NIR spectroscopy, which revealed a distinct iron-related absorption peak at approximately 380 nm.

References

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