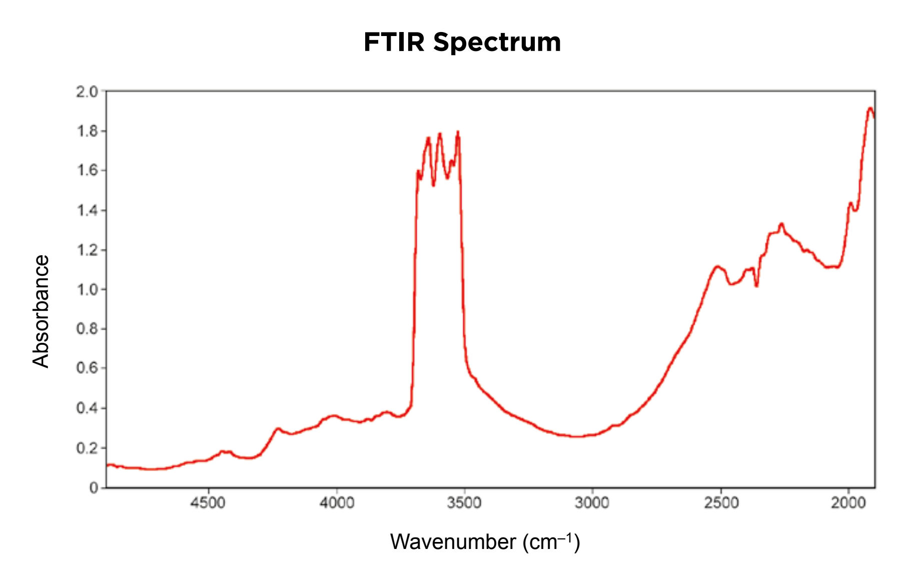

Figure 24: A strong absorption band in the mid-infrared region centred at around 3600 cm^{-1} is indicative of a high water content and is typical of hessonite.

Fourier-transform infrared (FTIR) spectroscopy using a Magilabs GemmoFtir showed a distinctive water absorption band centred at around 3600 cm^{-1} (Figure 24), which in these authors' experience is a consistent feature of hessonite.

Kinnaird and Jackson (2000) documented three different types of orange to red garnets from Somaliland: grossular, pyrope and almandine. The grossular was orange-red (i.e. hessonite) with a composition of $Grs_{86.9}And_{9.86}Alm_{2.57}$ (with traces of pyrope and spessartine components), and it contained a cluster of parallel, tubular, partially liquid-filled inclusions. Clark (2014) also documented a hessonite from Somalia, which was orange and had an RI of 1.741; it was described as containing small flake-like inclusions and transparent needle-like and tabular crystals, descriptions consistent with the inclusions noted in the present hessonites. In addition, as in the present samples, the stone examined by Clark (2014) lacked a roiled appearance.

The presence of hessonite in the Daarbuduq area is consistent with the geology of the region. According to the geological map presented by Kinnaird and Jackson (2000), the area is underlain by Proterozoic marbles and other metamorphic rocks of the Mora complex that are intruded by granitic rocks of mainly Cambrian age (500–550 million years old). The interaction between marble and granitic rock is favourable for the formation of skarn, which is a common host rock for grossular.

Bear Williams FGA and Cara Williams FGA

Abdiaziz Mohamed Yousuf
Addis Ababa, Ethiopia

Brendan M. Laurs FGA

References

Clark, B. 2014. Gem Notes: Hessonite from Somalia. *Journal of Gemmology*, **34**(4), 293.

Kinnaird, J.A. & Jackson, B. 2000. Somaliland – A potential gem producer in the Mozambique Belt. *Journal of Gemmology*, **27**(3), 139–154, https://doi.org/10.15506/jog.2000.27.3.139.

Laurentthomasite, a New Gem Mineral

In March 2020, the GIT Gem Testing Laboratory (GIT-GTL) received two greenish blue faceted stones that weighed 0.98 and 1.67 ct for identification (Figure 25a). The stones' owner indicated that they reportedly consisted of a newly described mineral, laurentthomasite, named after the French mineral dealer Laurent Thomas of Polychrom France (www.mindat.org/min-53556.html). The mineral was discovered in Madagascar's Toliara Province, and in April 2019 it was approved by the International Mineralogical Association as a new member of the milarite (osumilite) group—specifically the Mg analogue of milarite ($KCa_2AlBe_2Si_{12}O_{30} \cdot 0.5H_2O$)—with an ideal chemical formula of $KMg_2AlBe_2Si_{12}O_{30}$ and hexagonal symmetry (Ferraris *et al.* 2019).

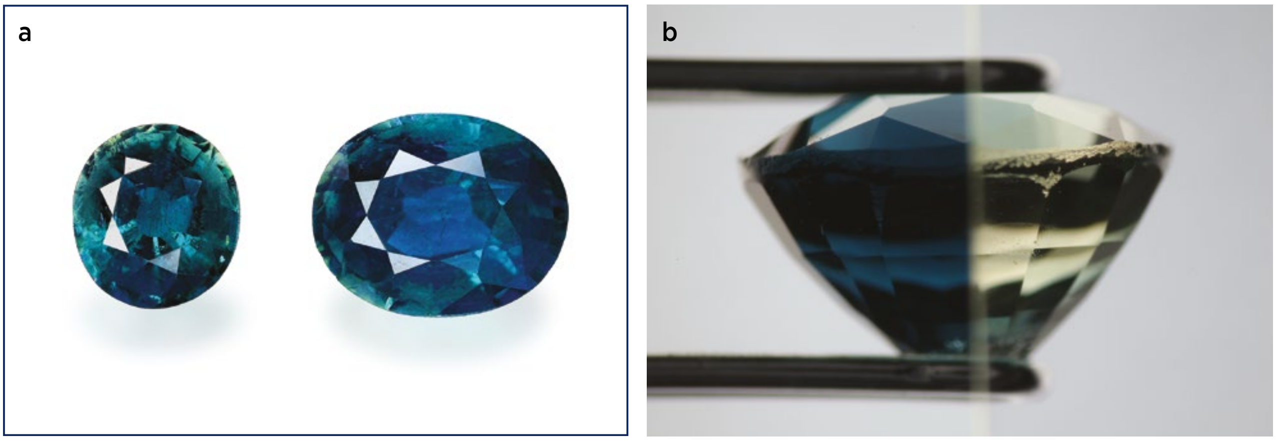

Figure 25: (**a**) The two laurentthomasite gemstones described here weigh 0.98 and 1.67 ct. (**b**) They exhibit strong dichroism in greenish blue and light greenish yellow, as shown here for the 0.98 ct stone. Photos by (a) C. Kamemaganon and (b) P. Ounorn.

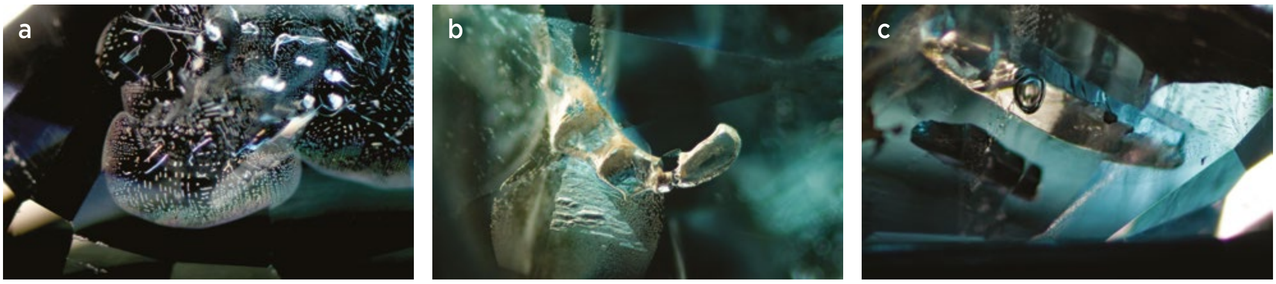

Figure 26: Magnification of the laurentthomasite gems shows (**a**) 'fingerprints', (**b**) negative crystals and (**c**) primary two-phase (liquid-gas) inclusions. Photomicrographs by P. Ounorn and C. Suphan, using darkfield illumination; image widths 3.2 mm (a) and 2.8 mm (b and c).

Both gems consisted of oval mixed cuts. Standard gemmological testing showed the following properties: RIs—1.555–1.560, birefringence—0.005, optic character—doubly refractive and uniaxial positive, hydrostatic SG—2.59–2.63, and fluorescence—inert to long- and short-wave UV radiation. Their most distinct optical characteristic was strong dichroism in greenish blue and light greenish yellow (Figure 25b). Magnification showed various features, such as 'fingerprints', negative crystals and primary two-phase (liquid and gas) fluid inclusions (Figure 26).

Polarised UV-Vis-NIR absorption spectra of the two samples in the range of 300–1500 nm, collected by a PerkinElmer Lambda 1050 spectrophotometer, showed features at 374, 407, 423, 441, 455 and 486 nm, along with a broad band at around 600–1400 nm (Figure 27).

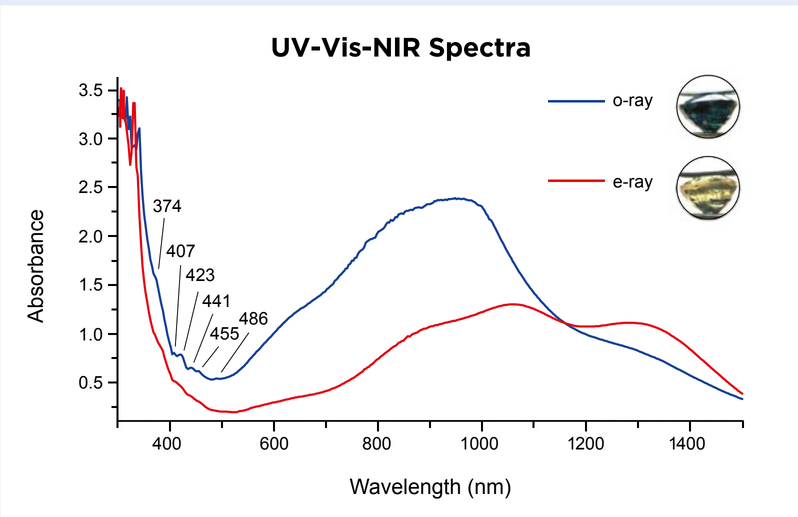

Figure 27: Representative polarised UV-Vis-NIR spectra (recorded here from the 0.98 ct stone) show broad bands centred at around 900 nm for the o-ray and 1040 nm for the e-ray, which are responsible for the strong dichroism of laurentthomasite. The path length of the beam was about 5–6 mm.

The strong dichroism corresponded to differences in the intensity and position of this broad band, which for the o-ray was centred at around 900 nm and for the e-ray was centred at around 1040 nm (and relatively weaker). As such, a distinct spectral window transmits in the blue region for the o-ray, while relatively weaker blue-green-yellow transmission is present in the e-ray direction (again, see Figure 27). (*Editor's note:* Raw data for the UV-Vis-NIR spectra are available in *The Journal*'s online data depository.)

The mid-infrared spectra of both samples, recorded with a Thermo Nicolet 6700 FTIR spectrometer, showed broad transmission in the 7000–2000 cm^{-1} range along with weak absorption features at approximately 5000, 3550, 3447 and 3253 cm^{-1} (Figure 28a). Raman spectra, collected with a Renishaw inVia spectrometer using 532 nm laser excitation, showed dominant peaks (Raman shifts) at 287, 380, 490 and 566 cm^{-1} (Figure 28b). The overall pattern was similar to the reference spectrum of milarite but showed somewhat different positions for some peaks.

Semi-quantitative EDXRF chemical analyses of both stones obtained with an Eagle III spectrometer revealed enriched Si contents, minor amounts of Al, Mg, K, Fe, Sc and Mn, and traces of Rb and Y (Table III). In addition, a significant amount of Be was detected by laser-induced breakdown spectroscopy (LIBS). The data obtained by EDXRF were normalised to 100 wt.% but do not include Be, so the actual content of Si (by far the most abundant element) is expected to be somewhat lower than the amount shown in Table III. Overall, the compositions we obtained are consistent with the chemical formula of an Al-Mg-K-Be silicate mineral (i.e. laurentthomasite) containing minor amounts of Fe, Sc and Mn.

Table III: Semi-quantitative normalised EDXRF chemical data for laurentthomasite.*

Oxides (wt.%)	0.98 ct	1.67 ct
SiO_2	83.08	80.72
Al_2O_3	3.70	4.38
Sc_2O_3	2.40	2.21
Y_2O_3	0.54	0.56
Fe_2O_3	2.37	2.87
MnO	1.26	1.66
MgO	3.39	3.97
K_2O	2.87	3.21
Rb_2O	0.39	0.42
Sum	100.00	100.00

* Be cannot be detected by EDXRF, so the Si data shown here are believed to be too high.

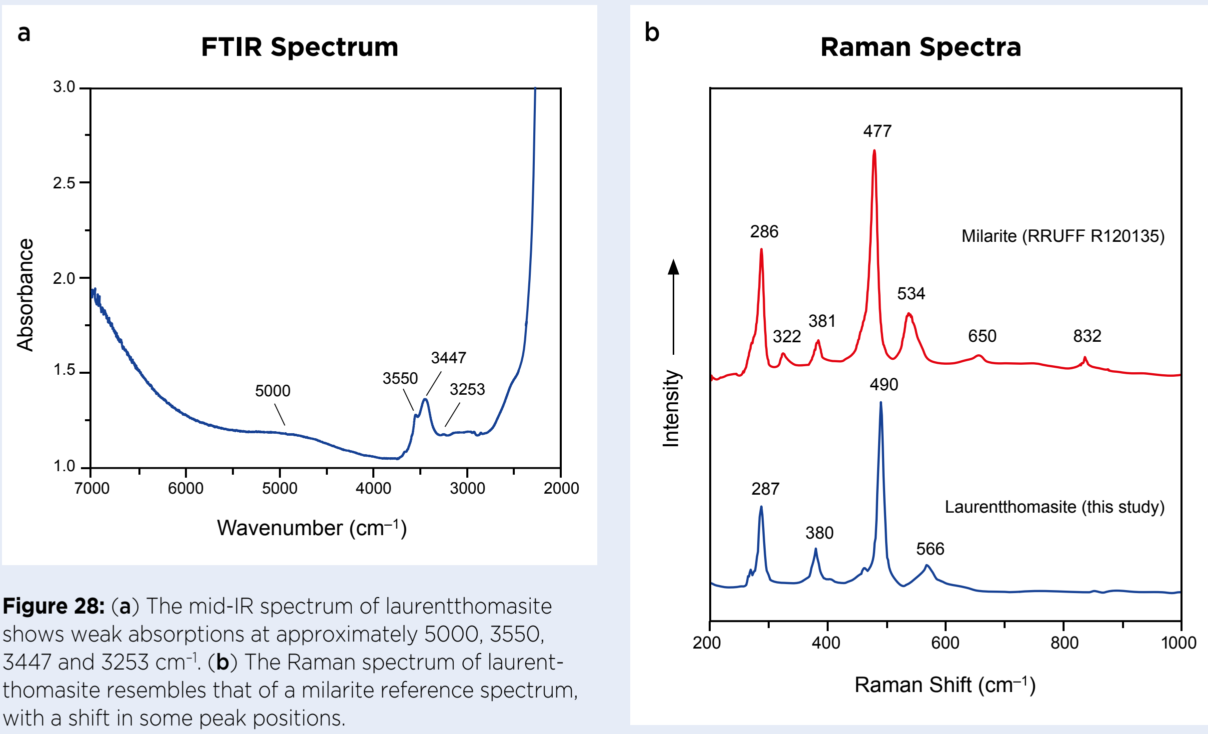

Figure 28: (**a**) The mid-IR spectrum of laurentthomasite shows weak absorptions at approximately 5000, 3550, 3447 and 3253 cm^{-1}. (**b**) The Raman spectrum of laurentthomasite resembles that of a milarite reference spectrum, with a shift in some peak positions.

Table IV: Properties of laurentthomasite.

Property	This study	C. Ferraris (pers. comm. 2020)
Colour	Greenish blue	Greenish blue
Pleochroism	Very strong, in greenish blue and light greenish yellow	Very strong, in 'cobalt' blue and greenish yellow
Optic character	Doubly refractive (uniaxial +)	Doubly refractive (uniaxial +)
RI	1.555–1.560 (birefringence 0.005)	1.540–1.545 (birefringence 0.005)
SG	2.59–2.63	2.66
Hardness (Mohs)	Not determined	Approximately 6
Cleavage	Not observed	Poor
Fluorescence	Inert to both long- and short-wave UV	Inert to both long- and short-wave UV
Inclusions	Negative crystals, 'fingerprints', primary two-phase (liquid-gas) inclusions	Dark elongated crystals (Fe-rich oxides)
UV-Vis-NIR spectrum	Absorption peaks at 374, 407, 423, 441, 455 and 486 nm with a broad absorption band at around 600–1400 nm	Not reported
FTIR spectrum	Broad transmission in the 7000–2000 cm^{-1} range with weak absorption features at about 5000, 3550, 3447 and 3253 cm^{-1}	Not reported
Raman spectrum	Peaks at 287, 380, 490 and 566 cm^{-1}	Not reported
Chemical composition	Al-Mg-K-Be-Fe-Sc-Mn silicate	$(K,Na,Y,Ca)(Mg,Sc,Fe^{2+},Mn)_2$ $[(Be,Al,Mg,Fe^{3+})_2(Si,Al)_{12}O_{30}]$

A summary of the properties obtained for the laurentthomasite samples we examined is presented in Table IV and compared to data supplied by C. Ferraris (pers. comm. 2020; further information to be published in a future mineralogical article). The gemmological characteristics are similar except for somewhat higher RI and lower SG values shown by the two stones examined in the present study. Furthermore, the chemical data we obtained by EDXRF and LIBS analyses are consistent with the formula of laurentthomasite. Moreover, the Raman spectrum indicates a close association with milarite. Although the gemmological properties of laurentthomasite are similar to those of milarite (cf. www.gemdat.org/gem-2710.html), laurentthomasite has distinctly different colour/pleochroism than milarite, which is colourless to pale yellow or green.

Acknowledgements: The authors would like to thank Gemshoppe Co. Ltd for supplying the samples examined for this study. We also thank GIT-GTL deputy director Thanong Leelawatanasuk and GIT advisory team members Dr Visut Pisutha-Arnond, Prof. Dr Chakkaphan Sutthirat and Wilawan Atichat for reviewing this article, as well as Dr Cristiano Ferraris (National Museum of Natural History, Paris, France) for providing some unpublished data on laurentthomasite.

Papawarin Ounorn (opapawarin@git.or.th), Budsabakorn Srisataporn and Cheewaporn Suphan
GIT Gem Testing Laboratory
Bangkok, Thailand

Reference

Ferraris, C., Pignatelli, I., Cámara, F., Ponti, S., Schreyer, M., Parodi, G.C. & Wei, F. 2019. CNMNC Newsletter No. 49: Laurentthomasite, IMA 2018-157. *Mineralogical Magazine*, **83**, 480, https://doi.org/10.1180/mgm.2019.35.