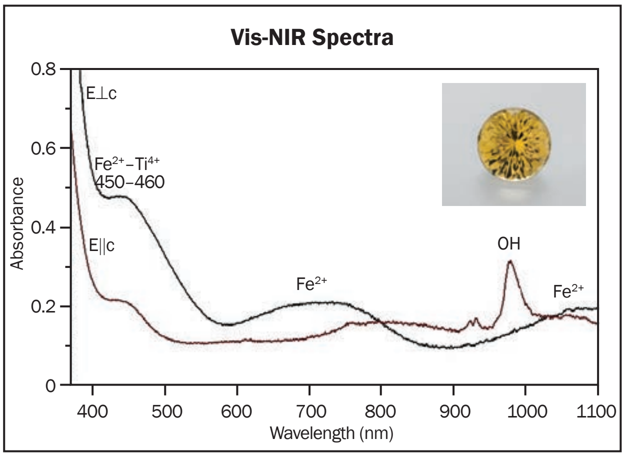


Figure 14: Polarized Vis-NIR absorption spectra of the yellow dravite show a dominant feature in the 450–460 nm region that is caused by $Fe^{2+}$–$Ti^{4+}$ intervalence charge transfer. The spectrum is plotted for a 10.0 mm sample thickness.

the stone with the beam polarized both parallel and perpendicular to the girdle direction, corresponding to the E⊥c direction and approximately to E||c, respectively. A prominent absorption feature was recorded in the 450–460 nm region, and this is also an important characteristic of brown dravite such as the material from Yinnietharra, Australia. It arises from $Fe^{2+}$–$Ti^{4+}$ intervalence charge transfer (Mattson and Rossman, 1988), and is the dominant cause of colour in this dravite. $Fe^{2+}$-related features occurred near 700 and 1100 nm, and narrower peaks in the 900–1000 nm region were overtones of OH absorptions in the infrared.

This attractive yellow dravite is much lighter coloured than typical brown dravite because of its low Fe and Ti contents. Its spectrum is similar to that of the golden dravite from Kenya (cf. Simonet, 2000), except that the broad absorption band in that material was centred at 435 nm rather than in the 450–460 nm region.

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## New Garnets from East Africa

During a buying trip to Arusha, Tanzania, from late May to early June 2016, rough stone dealer Farooq Hashmi encountered some new garnet rough that was reported to be from north-eastern Tanzania or south-eastern Kenya. Several kilograms were available as pebbles and fractured pieces ranging up to ~10 g. The garnet was sold by local dealers as rhodolite. The colour of the material showed some variation, and Hashmi purchased only the lighter material (with a more purple colour in daylight), which he has marketed as ‘Rhodolaya’.

Hashmi loaned three faceted stones (e.g. Figure 15) and 18 rough samples to authors CW and BW for examination. The cut stones weighed 3.24, 3.36 and 3.89 ct, and measured up to 9.4 × 8.2 ×

Figure 15: These two specimens (3.24 and 3.89 ct) are representative of some of the new garnet production from East Africa. The stones were faceted by Marvin M. Wambua, Safigemscutters Ltd., Nairobi, Kenya; photo by B. Williams.

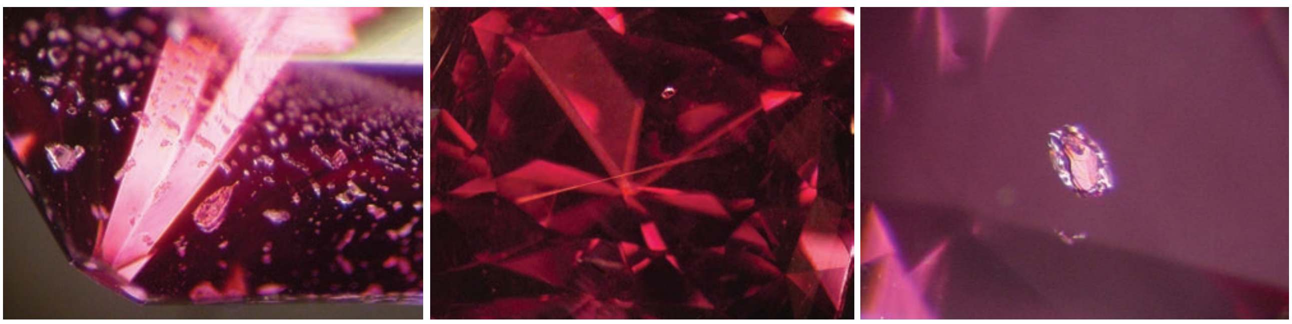
*Figure 16: These rough garnets (2.1–5.4 g) appear strongly bluish purple in daylight (left) and slightly orangey red in incandescent light (right). Photos by B. Williams.*

6.2 mm. The rough material weighed a total of 50.1 g and the piece with the longest dimension measured 21.3 mm. The faceted stones appeared moderate purplish red (typical of rhodolite) under daylight-type illumination, and changed to a slightly orangey red (as commonly seen in malaya garnet) in incandescent light. However, in these authors' opinion, there was not enough of a shift to label it colour-change garnet. The rough stones appeared slightly orangey red in incandescent light and displayed a strong bluish purple in transmitted daylight (Figure 16), but the latter colour was not evident in the faceted stones, possibly due to dichromatism as a result of their smaller size and therefore shorter path length of light.

Refractive indices varied slightly from 1.743 to 1.749, and the hydrostatic SG value of all three cut stones was 3.82; these data are consistent with pyralspite garnet. The faceted samples exhibited various appearances between crossed polarizers, with one showing no strain and remaining dark during rotation, one behaving like an anisotropic stone and blinking four times during a complete rotation, and one showing patchy anomalous birefringence. Some of the rough material also displayed patchy birefringence. All of the faceted stones were eye-clean, but the microscope revealed a 'fingerprint', a fine colourless needle and a dark reflective crystalline inclusion surrounded by tension fractures (Figure 17). UV-Vis spectroscopy showed mainly almandine-related absorptions at 505, 527 and 575 nm. Raman analysis yielded a pattern expected for pyralspite garnets, and the samples showed moderate magnetic susceptibility.

Chemical data for the three faceted stones was obtained by author AUF via standard-based SEM-EDS analysis using a Jeol JSM-6400 instrument with the Iridium Ultra software package by IXRF Systems Inc. The data showed a similar composition for all three samples (Table I), consisting mainly of the pyrope component (58.9–62.2 mol%) with ma-

*Figure 17: The faceted garnet samples were found to contain a 'fingerprint' (left), a colourless needle (centre) and a crystalline inclusion (centre and right). Photomicrographs by C. Williams; magnified 40× (left and right) and ~15x (centre).*



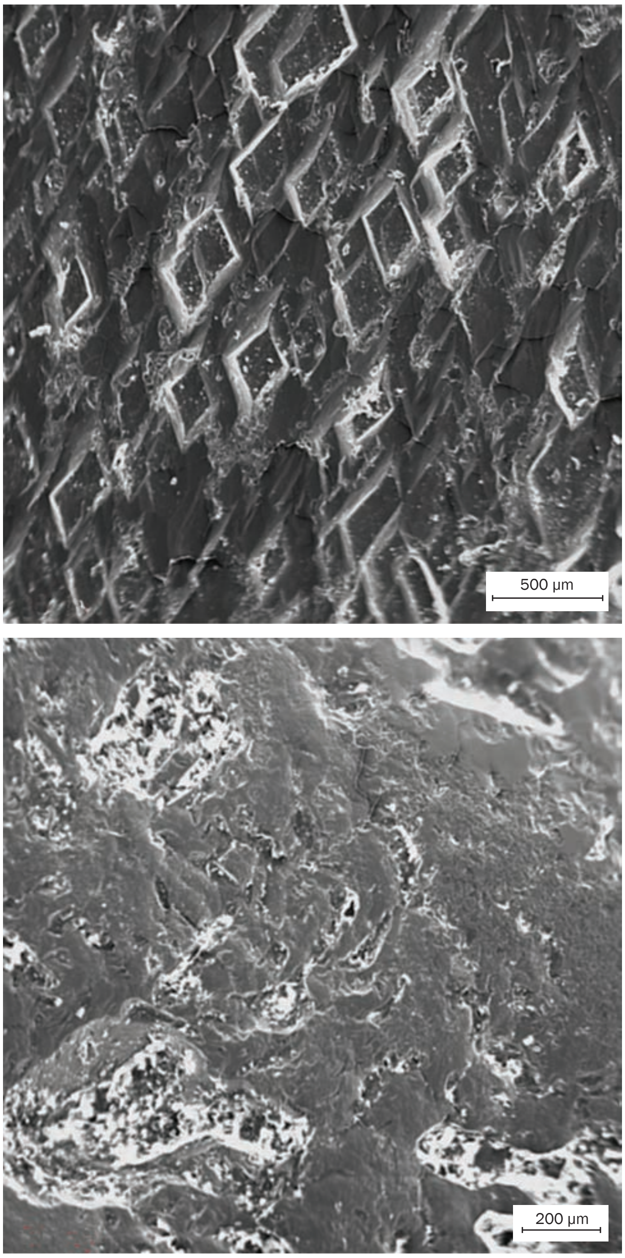



*Figure 18: These SEM images of the surface features of two garnet pebbles show evidence of chemical etching (top) and the effects of mechanical abrasion from alluvial transport (bottom). Images by A. U. Falster.*

*Table I: Representative SEM-EDS analyses of three new garnets from East Africa.**

| Composition | Trilliant | Round | Cushion |
|---|---|---|---|
| **Oxide (wt.%)** | | | |
| $SiO_2$ | 40.89 | 41.03 | 41.01 |
| $TiO_2$ | 0.15 | 0.17 | 0.11 |
| $Al_2O_3$ | 23.04 | 23.02 | 22.98 |
| $Cr_2O_3$ | 0.15 | 0.15 | 0.20 |
| $V_2O_3$ | 0.26 | 0.24 | 0.05 |
| FeO | 12.41 | 11.89 | 13.98 |
| MnO | 4.71 | 4.20 | 3.35 |
| MgO | 16.15 | 17.30 | 16.32 |
| CaO | 2.24 | 2.00 | 2.00 |
| **Total** | **100.00** | **100.00** | **100.00** |
| **Ions based on 12 oxygens** | | | |
| Si | 2.990 | 2.985 | 2.999 |
| Ti | 0.008 | 0.009 | 0.006 |
| Al | 1.986 | 1.975 | 1.981 |
| $Cr^{3+}$ | 0.009 | 0.009 | 0.012 |
| $Bi^{3+}$ | 0.000 | 0.000 | 0.000 |
| $V^{3+}$ | 0.015 | 0.014 | 0.003 |
| $Fe^{2+}$ | 0.759 | 0.724 | 0.855 |
| Mn | 0.292 | 0.259 | 0.207 |
| Mg | 1.761 | 1.876 | 1.778 |
| Ca | 0.175 | 0.156 | 0.157 |
| **Mol% end members** | | | |
| Pyrope | 58.9 | 62.2 | 59.4 |
| Almandine | 25.4 | 24.0 | 28.5 |
| Spessartine | 9.8 | 8.6 | 6.9 |
| Grossular | 5.9 | 5.2 | 5.2 |

* Data are auto-normalized by the software, and therefore the sum of the oxides is 100 wt.%.

jor almandine (24.0–28.5 mol%), and much lower spessartine (6.9–9.8 mol%) and grossular (5.2–5.9 mol%) components. Minor amounts of V, Cr and Ti also were present in all samples. This combination is commonly seen in garnets of the rhodolite and malaya varieties. Interestingly, SEM images of the surface of the rough samples showed evidence of both chemical etching and mechanical abrasion from alluvial transport (Figure 18).

East Africa continues to be an important source of gem-quality pyralspite garnets, as shown by this attractive new material.

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## Quartz Cubes from Volodarsk-Volynski, Ukraine

The Volynian granitic pegmatite deposits in western Ukraine are historic sources of superb gem-quality beryl, topaz and smoky quartz (Lyckberg et al., 2009). Quartz was the main target for min-