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 × 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.

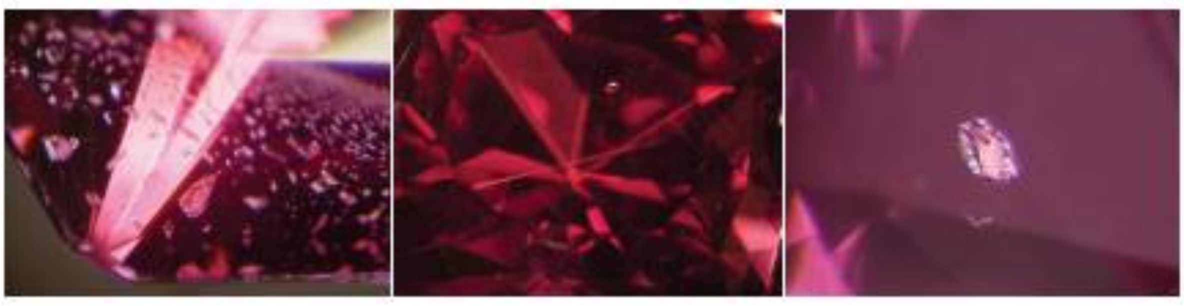
Figure 15: These two specimens (3.24 and 3.89 ct) are representative of some of the new garnet production from East Africa. The stones were faceted by Marvin M. Wambua, Safigemscutters Ltd., Nairobi, Kenya; photo by B. Williams.

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.

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 major 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).

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).



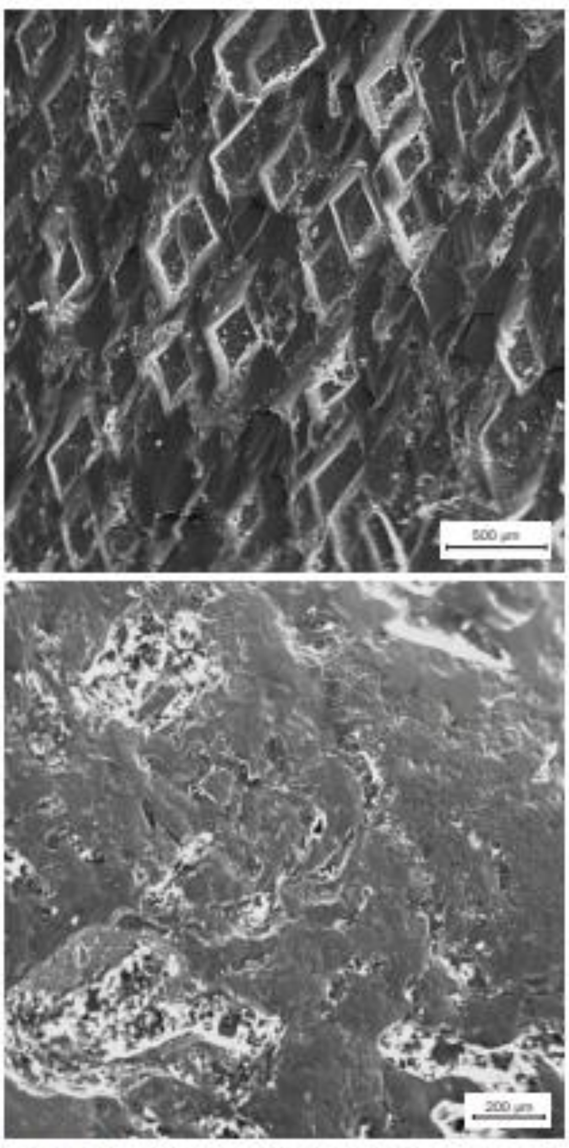


Figure 18: These SEM images of the surface features of two garnet pebbles show evidence of chemical etching (top) and the effects of mechanical abrasion from alluvial transport (bottom). Images by A. U. Falster.

*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.%.

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

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