Purple Garnets from East Africa

During the June 2015 JCK gem and jewellery show in Las Vegas, Nevada, USA, news circulated about some attractive new purple garnets from East Africa. Gem dealer Geoffrey Watt (Mayer & Watt, Maysville, Kentucky, USA) had an intense purple 3.87 ct cushion (Figure 5, centre), which was one of two faceted purple garnets that he bought from a Sri Lankan cutter at the 2015 Tucson gem shows. The cutter said he had purchased the rough material in Tanzania. Later, shortly before the JCK show, a 5.86 ct intense purple garnet was faceted by Jeff White (J.L. White Fine Gemstones, Kingsport, Tennessee, USA; see cover of this issue). Subsequently White cut nine more of these garnets, ranging from ~2 ct to 13.31 ct. He purchased the rough from Steve Ulatowski (New Era Gems, Grass Valley, California, USA), who obtained the material in March–April 2015 while on a buying trip to Arusha, Tanzania. His supplier initially told him that the source was Tanzania, but he subsequently confirmed that the material actually came from Catandica, Mozambique. (This also may apply to the origin of Watt's garnet.) Ulatowski noted that the pieces appeared alluvial and were irregularly shaped with a pitted surface texture. After several buying trips to Arusha and Bangkok through October 2015, Ulatowski obtained a total of 1 kg of this garnet (only selecting the better-quality material), commonly in pieces weighing around ½ g each.

Ulatowski also mentioned encountering a different type of purple garnet since December 2014, represented as 'rhodolite' from Salima, Malawi. This material also appeared alluvial but had better shape (like 'gumdrops') and smoother surfaces, and it was available in larger sizes, though stones exceeding 10 g appeared over-dark; he obtained 5–6 kg of this garnet. According to Bill Barker (Barker & Co., Scottsdale, Arizona, USA, the shape of this garnet enables a good cutting yield; he attained 40% from a 1 kg parcel, with individual stones weighing up to 10 ct. Dudley Blauwet also acquired some of the Malawi garnet from an East African supplier, and from 10 pieces of rough weighing 26.4 g, he cut 10 stones (49.96 carats total weight) ranging from 1.47 to 10.60 ct; he loaned two of the more purple gems for examination. They were gemmologically characterized by three of the authors (CW, BW and DH), along with the 3.87 ct cushion from Geoffrey Watt (Figure 5).

Figure 5: Attractive purple garnets were recently produced from East Africa. The cushion-cut gem in the centre (reportedly from Tanzania, but possibly Mozambique) weighs 3.87 ct, and the slightly paler purple stones from Malawi on either side weigh 2.14 ct (left) and 1.47 ct (right). Photo by B. Williams.

The gemmological properties of the three samples are summarized in Table I. They are consistent with those reported for pyralspite garnets by Stockton and Manson (1985), and the RI values of all three samples fall within the ranges expected for both pyrope-almandine (rhodolite) and pyrope-spessartine, with or without some grossular (cf. Jackson, 2006). The magnetic data measured for the 1.47 and 3.87 ct garnets further indicated a pyrope-almandine composition with Pyr>Alm for both gems (cf. Hoover, 2008).

EDXRF spectroscopy using an Amptek X123-SDD instrument with a DP5 preamplifier showed a major amount of Fe, present in approximately equal amounts in all three stones. A small amount of Ca was detected in the three garnets, with slightly more in the 1.47 ct sample; that stone also contained a significant amount of Mn and Cr. (Note: Although Mg was not seen, it is only marginally detectable with this instrumentation.) UV-Vis spectroscopy of the 3.87 and 1.47 ct samples using an Ocean Optics USB4000 instrument showed slightly greater absorption in the ~420 nm region of the 1.47 ct sample. This created a more pronounced transmission window in the violet range for the 3.87 ct stone, corresponding to its more intense purple colour.

Ultraviolet-visible–near infrared (UV-Vis-NIR) absorption spectra also were collected on two

Table I: Properties of the faceted purple garnets from East Africa.[a]

Locality	Tanzania/Mozambique?	Salima, Malawi	
Source	Watt	Blauwet	
Weight (ct)	3.87	2.14	1.47
Colour	Vivid slightly reddish purple	Moderate purplish pink, shifting to a moderate slightly purplish pink in incandescent light	Deep reddish purple, brightening to a vivid reddish purple in incandescent light
RI	1.765	1.749	1.748
SG	3.89[b]	3.75	3.73
Magnetic data[c]	18.01 × 10^{-4} SI	Not determined	11.76 × 10^{-4} SI
Internal features	Many parallel needles, some appearing as broken lines and others corresponding to growth tubes	Clusters of small, colourless, iridescent, crumb-like inclusions and a few short needles	A few fine parallel needles

[a] None of the garnets showed any reaction to the Chelsea filter or UV radiation.

[b] A cavity on the pavilion appeared to be filled with a polishing medium, and it is possible that it may have slightly lowered the SG value.

[c] Volume magnetic susceptibility measurements were performed by author DH using the method described in Hoover (2008).

additional samples by one of us (GRR), merging data from three spectrometers: an OceanOptics UV CCD, a silicon-diode array visible spectrometer and a Nicolet iS50 near-infrared unit (Figure 6). Both samples consisted of doubly-polished slabs. Sample 3237 was prepared from a piece of Mozambique rough material supplied by Jeff White (e.g. see border region of cover photo) that was originally obtained from Steve Ulatowski, and sample 3235 was a slightly less intense purple garnet supplied by Ulatowski from a much earlier find that occurred in Tanga, Tanzania. Both pieces had nearly identical spectra, except 3235 showed greater absorption in the violet range (near 400 nm). The more intense purple sample 3237 had less absorption in that region, producing increased transmission. Manganese (Mn^{2+}) is responsible for absorption in the 400–440 nm region of the spectrum (Manning 1967), and chemical analysis (Table II) showed that sample 3235 had >20% more Mn than 3237. The additional manganese absorption in sample 3235 removed more of the violet light, causing it to appear less purple than 3237. An additional factor contributing to the

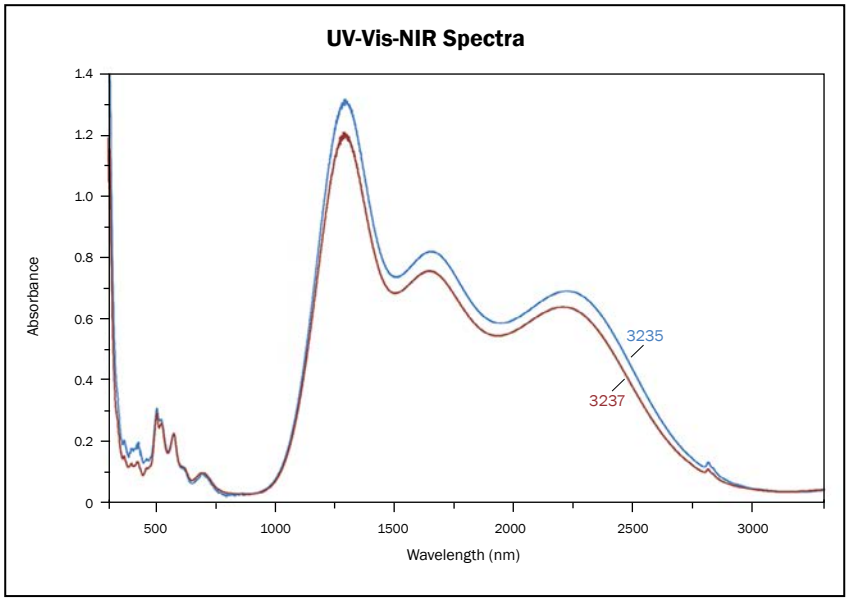

Figure 6: UV-Vis-NIR absorption spectra of two purple garnet slabs from Tanzania (sample 3235) and Mozambique (sample 3237) show nearly identical patterns until the violet range, where 3235 has greater absorption. The more pronounced transmission window in this region for 3237 corresponds to its slightly more intense purple colour. Both samples were scaled to plot as 1.0 mm thick.

colour of 3237 is the absence of Fe^{3+}, that both by itself and through interactions with Fe^{2+} would absorb light in the blue region of the spectrum.

*Table II: Electron microprobe analyses of purple pyrope-almandine garnets from Tanzania and Mozambique.**

Sample no.	3235	3237
Location	Tanga, Tanzania	Catandica, Mozambique
Oxides (wt.%)		
SiO_2	40.40	40.23
Al_2O_3	22.95	23.01
FeO	22.17	24.03
MgO	13.36	12.72
CaO	1.35	0.77
MnO	0.25	0.21
Total	100.48	100.97
Ions per 12 oxygens		
Si	3.002	2.995
Al	2.010	2.019
Fe	1.378	1.496
Mg	1.480	1.412
Ca	0.107	0.061
Mn	0.016	0.013

* Average of five analyses per sample. Cr and Ti were analysed for but not detected. Analyst: Chi Ma. End-member compositions determined by author DH using procedure of Locock (2008): Sample 3235: $Pyr_{49.00}Alm_{44.29}Gro_{5.10}Sps_{0.52}And_{0.48}$ Sample 3237: $Alm_{48.49}Pyr_{46.81}Gro_{3.57}Sps_{0.44}$

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Green Prase Opal from the Kondoa District, Tanzania

A historically important deposit of chrysoprase and prase opal in Tanzania is located at Haneti, situated north of Dodoma in central Tanzania (Shigley et al., 2009). During the 2015 Tucson gem shows, rough and polished material (e.g. Figure 7) from a new deposit in Tanzania was shown by Werner Radl (Mawingu Gems, Niederwörresbach, Germany). He indicated that mining started in early 2014 near Kwa Mtoro village in the Kondoa District; this is also in the Dodoma region of Tanzania, but further north of Haneti. It is likely that several hundred kilograms of rough material have been produced. Radl obtained ~50 kg of rough, some of which he processed into spheres, cabochons and tumbled pieces.

Radl donated two rough pieces (Figure 8) to Gem-A, and they were analysed by this author. Both were largely bluish green and translucent, with portions containing white opaque material (and also some dark brown matrix in one piece). They measured approximately 21.0 × 20.7 × 11.3 mm and 24.3 × 17.0 × 18.0 mm, and weighed 4.44 and 4.46 g, respectively.

A hydrostatic SG of 2.17 was measured on the larger sample. (The SG of the other piece could not be reliably measured, due to the presence of several cracks and voids.) Both samples appeared green through the Chelsea filter. Their reaction to long-wave UV radiation varied from partly inert to a weak chalky blue-