Figure 7: These samples of rough and cut grossular are reportedly from the Tanga region of north-eastern Tanzania. The rough stones show various amounts of iron staining on their surfaces. The cut stone was faceted by the author and weighs 8.89 ct. Photo by V. Lanzafame, SSEF.

Grossular from Tanzania with Uncommon Inclusions

At the October 2018 mineral and gem show in Munich, Germany, rough stone dealer Fabian Kneipp (Rough-store24 GmbH, Herrsching, Germany) presented the author with some interesting grossular specimens from the Tanga region of north-eastern Tanzania (Figure 7). Kneipp reported that several kilograms of the material had recently come to the market. The author purchased several rough specimens, and Kneipp kindly donated some additional pieces containing small green colour concentrations for further study at the Swiss Gemmological Institute SSEF (Figure 8).

After a search of the literature and of the SSEF rough stone collection, it became clear that this material was not actually new to the market. Similar grossular from Tanzania was described in the 1980s (Manson & Stockton 1982; Hänni 1987) and was catalogued in 2004 in SSEF's reference collection, and material resembling this garnet was also available on the Internet dating back several years. Nevertheless, since this grossular has not yet been characterised in detail, the author analysed six samples consisting of five rough pieces (1.10–4.64 g) and one faceted stone (8.89 ct).

The rough specimens appeared water-worn and some of them showed a granular-appearing surface texture. The rough ranged from near-colourless to light yellow and orangey yellow, while the faceted stone was near-colourless (again, see Figure 7). The RI varied slightly from 1.739 to 1.741, with an average RI of 1.740. Hydrostatic SG values were 3.57–3.62 (average 3.60) and were consistent with those reported in the literature. All samples were inert to long- and short-wave UV radiation.

Chemical analysis by energy-dispersive X-ray fluorescence (EDXRF) spectroscopy with a Thermo Scientific ARL Quant'X instrument revealed a composition consistent with that of nearly pure grossular, with major amounts of Si, Al and Ca, as well as minor Fe and traces of Ti and Mn. In addition, traces of Cr were measured in the samples containing green areas.

In addition to a roiled appearance seen in the faceted stone, some of the samples contained mineral inclusions that were visible with the unaided eye or a 10× loupe. Two of them were selected for Raman microspectroscopy with a Renishaw inVia microscope equipped with a 514 nm argon-ion laser. Transparent, well-shaped crystals in one rough sample (Figure 9) were identified as titanite

Figure 8: Two of the rough grossular samples (2.40 g and 0.59 g) obtained for this study contain small green zones. Photo by V. Lanzafame, SSEF.

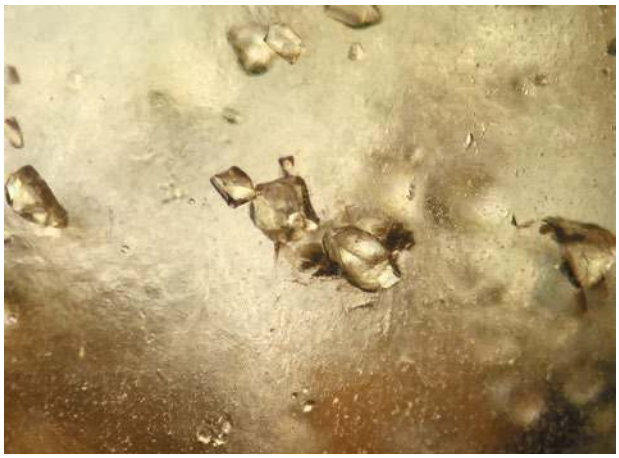

Figure 9: Raman analysis identified this group of well-formed crystals as titanite. Photomicrograph by S. Hänsel; image width 2.8 mm.

(sphene), and an eye-visible inclusion in the faceted stone (Figure 10) turned out to be anhydrite. Although so far not documented as inclusions in gem-quality grossular, both titanite and anhydrite are well known from grossular-bearing metamorphic rocks. Titanite is a common accessory mineral found together with grossular in Ca-silicate rocks (e.g. skarn-related or by metasomatism during regional metamorphism), and anhydrite has been attributed to the presence of evaporites in the genesis of gems (e.g. Feneyrol *et al.* 2012).

Sebastian Hänsel
(sebastian.haensel@ssef.ch)
Swiss Gemmological Institute SSEF
Basel, Switzerland

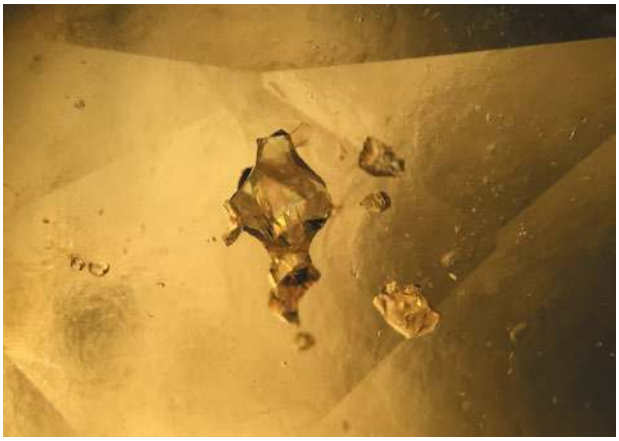

Figure 10: The largest transparent crystal with high relief shown here was identified as anhydrite by Raman analysis. Photomicrograph by S. Hänsel; image width 4.0 mm.

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Purple Hydroxylherderite from Brazil

Hydroxylherderite [$CaBePO_4(OH,F)$] is a phosphate mineral that forms a solid-solution series with herderite in which hydroxyl (OH) is dominant over fluorine (F). The term *herderite* is commonly used to refer to both minerals of the herderite-hydroxylherderite series, although most specimens on the market are actually hydroxylherderite (www.mindat.org/min-1876.html). Mainly found in granitic pegmatites, herderite can crystallise as attractive, well-formed crystals, and is sometimes transparent enough for faceting. Most gem-quality herderite comes from Minas Gerais in Brazil (Johnson 1996; Wentzell 2004) and from northern Pakistan (Laurs & Quinn 2006). It is found in a limited range of colours, including colourless, grey, brown, pale yellow, pale green and greenish yellow, and much more rarely light blue and purple.

The 1.57 ct round brilliant-cut gemstone described in this report shows an unusually strong purple colour (Figure 11) and was therefore characterised in detail. It reportedly came from Virgem da Lapa in the Araçuaí region of Minas Gerais, Brazil. One deposit in this area, the Xanda (Xandra) mine, is a known source of hydroxylherderite—especially showing purple colour—along with other minerals such as feldspar, tourmaline, muscovite and quartz (Dunn *et al.* 1979; www.mindat.org/loc-6818.html).

Figure 11: The faceted purple hydroxylherderite from Virgem da Lapa described here weighs 1.57 ct. Photo by T. Cathelineau.