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Characterising potential gem quality garnet and tourmaline pegmatite veins, Giyani Greenstone Belt, South Africa

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Potential gem quality garnet and tourmaline mineralisation has been identified in pegmatite veins of the Giyani Greenstone Belt of South Africa. The main rock types found in the Giynani Greenstone Belt are meta-volcanic of mafic and ultra-mafic composition and subordinate meta-sediments of banded ironstone formation (BIF), quartzite, pelitic schist and minor dolomite. There is no uniform stratigraphy neither does the stratigraphy have an overall synformal geometry. The area was also affected by numerous and extensive tectonic deformation. The area was also subjected to later age dolerite intrusions. The pegmatite veins exploit faulting and cross-cut various lithologies. Previous studies on the muscovite in the pegmatites gave emplacement ages of 2632 Ma to 2506 Ma.

The aim of the study was to characterise the garnet and tourmaline mineralised pegmatite veins. Grab samples and drill core samples were collected of both mineralised and unmineralised veins. Thin sections were described under transmitted light in terms of the crystal and matrix contact and the mineral grain contacts. This provides insight into the behaviour of fracturing during manual liberation of the garnet and tourmaline crystals from the matrix.

The samples were also submitted for x-ray diffraction (XRD) and x-ray fluorescence (XRF) analyses. The dominant garnet is almandine with subordinate pyrope. The tourmaline is various shades of black to brown dravite. It is determined that the matrix of the garnet-rich pegmatite consist predominantly of quartz making up more than half the volume. The remainder of the matrix is made up of the feldspars, plagioclase and microcline. Muscovite is the only mica developed in these pegmatites. The tourmaline-bearing pegmatite is dominantly feldspar, plagioclase and microcline, with lesser quartz. Muscovite is again the only mica developed in the mineralised pegmatite. Pyrope is generally associated with the occurrence of dravite.

It was determined that the more feldspar-rich the pegmatite vein, the higher the proportion of potential gem quality garnet (pyrope) and tourmaline (dravite). Manual liberation of the garnet is more successful with round crystals versus more angular of fractured garnet crystals. Liberation of the tourmaline is more challenging, especially of the larger crystals. Collector's quality muscovite is liberated with ease from the matrix by only sacrificing the outer-most layer of the muscovite package.