

## **Zonation in Rhodizite-Londonite from Madagascar**

David London  
School of Geology & Geophysics  
University of Oklahoma  
Norman, OK 73019

October 8, 2002

It stands to reason that I would be interested in some aspects of the composition and occurrence of rhodizite ( $\text{KAl}_4\text{Be}_4\text{B}_{12}\text{O}_{24}$ ) and londonite ( $\text{CsAl}_4\text{Be}_5\text{B}_{11}\text{O}_{24}$ ). Colleagues Skip Simmons, Federico Pezzotta, Al Falster, and Karen Webber identified the Cs-dominant phase, londonite, in association with quartz, red-brown tourmaline, microcline, minor apatite, pollucite, spodumene, and rarer minerals in pegmatites from Madagascar (Simmons et al., 2001). In their article, they observed that individual crystals of rhodizite-londonite commonly show complex internal zonation (Figure 3 of Simmons et al., 2001). Our examination of a sample from Antsogombato, the Betafo region south of Mahaiza, Madagascar, illustrates how incredibly complex that zonation can be, and begs the questions, "how?" and "why?" in isometric crystals. The zonation rarely is centrosymmetric (Figure 1), as is typical for example of compositional variations in garnet. Sector zoning along the principal axial directions is present (Figure 2), although both directions are structurally equivalent (isometric). Most of all, patchy zonation prevails (Figures 3 and 4).

We were able to grow patchy zoned intergrowths in an isometric phase by synthesis of pollucite-analcime solid solutions from supercooled melts (Figure 1 of London et al., 1998). At the conditions of synthesis ( $450^\circ\text{-}550^\circ\text{C}$ ), these melts would have been close to their glass transition temperatures. Patchy intergrowths of other phases, such as feldspars, are also common when crystal growth commences several hundred degrees below the liquidus temperature of the melt phase (e.g., Petersen and Lofgren, 1986; London et al., 1989).

Regardless of the origins, please enjoy these photos of some remarkably zoned isometric crystals. Thanks to George Morgan for the image capture.

### **References**

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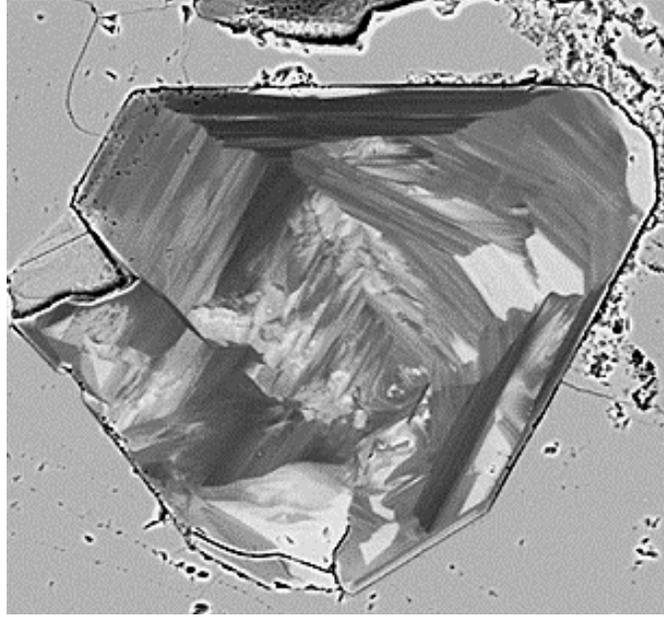


Figure 1. Backscattered electron image of rhodizite-londonite in quartz, 263 x 263  $\mu\text{m}$ .

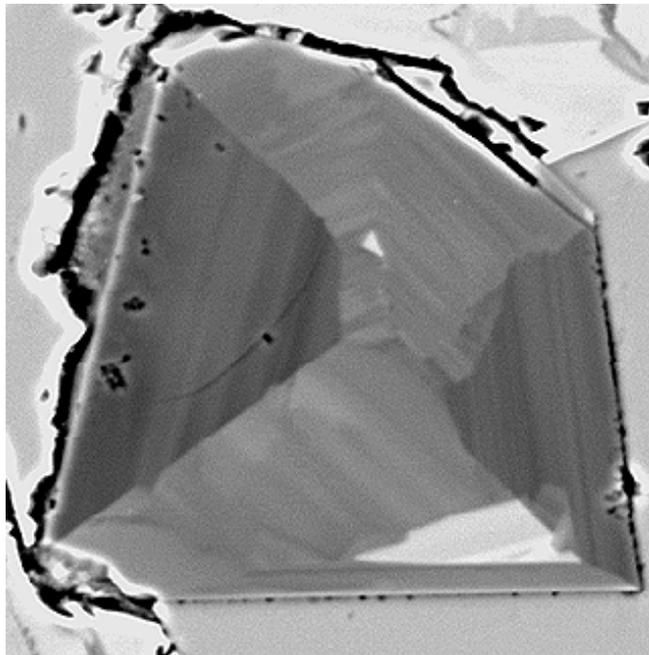


Figure 2. Backscattered electron image of rhodizite-londonite in quartz, showing sector zoning, 88 x 88  $\mu\text{m}$ .

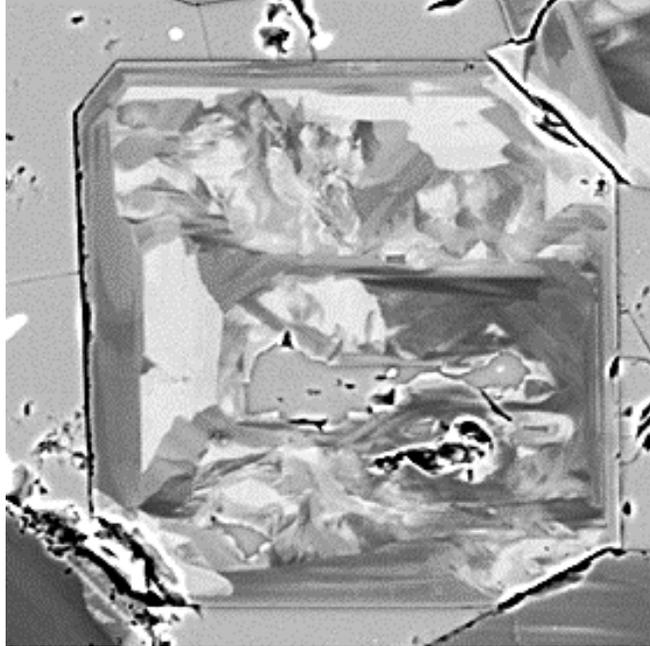


Figure 3. Backscattered electron image of rhodizite-londonite in quartz, showing remarkable patchy zonation and heterogeneous rim compositions (note the high BSE, Cs-dominant rims on only three of the four corners!), 158 x 158  $\mu\text{m}$ .

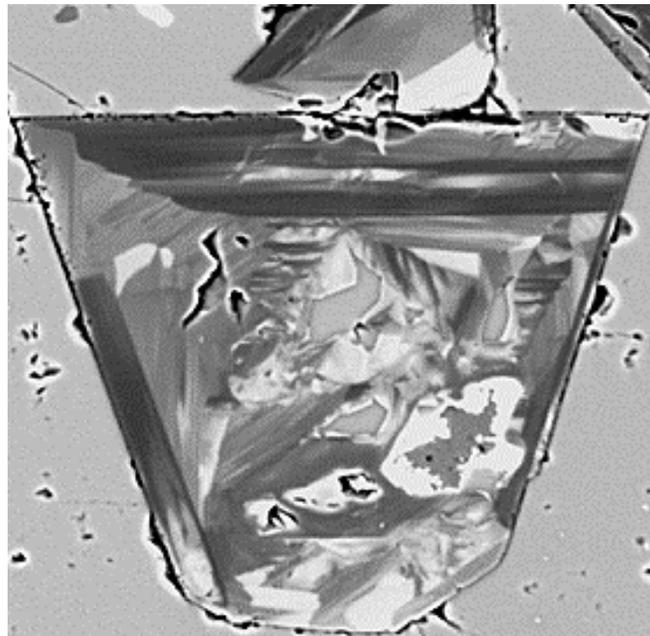


Figure 4. Backscattered electron image of rhodizite-londonite in quartz, with an inclusion of apatite (bright mass) growing into a dark phase identified by energy-dispersive x-ray analysis as containing only P + O + Cl, 176 x 176  $\mu\text{m}$ .