St. John's 2012

Technical Program

GS5: Economic Geology

Organizers / Organisateurs: **James Conliffe**
Room / Salle: **Salon A**
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Presenter: **Colter J. Kelly**

Cathodoluminescent images and chemical composition of quartz from auriferous veins in the Musselwhite Mine, northern Ontario

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Cathodoluminescent SEM (CL-SEM) images of quartz have been used to show the evolution of mineralized hydrothermal systems. The technique was particularly effective in displaying the timing of metal introduction in porphyry copper deposits, but it has not been applied to orogenic gold deposit. This study is the first documentation of CL-SEM images of quartz from the banded iron formation-hosted gold deposit at Musselwhite mine in the North Caribou terrane of the western Superior province of Canada. Gold in the deposit is accompanied by sulphides (pyrrhotite and chalcopyrite), grunerite and garnet.

Two samples are used for this study. One represents a high-grade quartz vein associated with abundant sulphides, which is hosted by alternating bands of garnet-bearing green amphibole and grunerite. The second sample is a lean ore in alternating bands of garnet-bearing green amphibole and grunerite. Sulphide content is low in the second sample. Quartz in the high grade sample are less than 0.4 mm in size, have well defined crystal faces and show minor undulose extinction and no evidence of grain-boundary migration. Quartz in the lean ore sample is generally small ranging from 0.15 to 0.5mm in size, showing evidence of grain boundary migration and weakly developed undulose extinction.

The observed samples are essentially free of inclusions of other minerals and fluid inclusions. Transmitted and reflected-light microscopy show transparent, well-crystalline quartz in both samples. Back-scattered electron images show homogeneous compositions of quartz, yet Cl-SEM images show several fragments within individual grains. Variation in the CL response of quartz is most likely caused by defects within quartz structure and minor elements of Ti, Al and Na. The fragmentation is apparent in the high-grade samples. This evidence suggests that the auriferous hydrothermal activity at the Musselwhite mine is accompanied by complex deformation causing fragmentation and recrystallization of quartz.