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Hydrothermal modification of host rock geochemistry within Mo-Cu porphyry deposits in the Galway Granite, western Ireland

Gavin Tolometti (1) and Will McCarthy (2)
(1) United Kingdom (gavintolometti@hotmail.com), (2) United Kingdon (wm37@st-andrews.ac.uk)

Hydrothermal alteration of host rock is a process inherent to the formation of porphyry deposits and the required geochemical modification of these rocks is regularly used to indicate proximity to an economic target. The study involves examining the changes in major, minor and trace elements to understand how the quartz vein structures have influenced the chemistry within the Murvey Granite that forms part of the 380-425Ma Galway Granite Complex in western Ireland. Molybdenite mineralisation within the Galway Granite Complex occurred in close association with protracted magmatism at 423Ma, 410Ma, 407Ma, 397Ma and 383Ma and this continues to be of interest to active exploration. The aim of the project is to characterize hydrothermal alteration associated with Mo-Cu mineralisation and identify geochemical indicators that can guide future exploration work.

The Murvey Granite intrudes metagabbros and gneiss that form part of the Connemara Metamorphic complex. The intrusion is composed of albite-rich pink granite, garnetiferous granite and phenocrytic orthoclase granite. Minor doleritic dykes post-date the Murvey Granite, found commonly along its margins. Field mapping shows that the granite is truncated to the east by a regional NW-SE fault and that several small subparallel structures host Mo-Cu bearing quartz veins. Petrographic observations show heavily sericitized feldspars and plagioclase and biotite which have undergone kaolinization and chloritisation. Chalcopyrite minerals are fine grained, heavily fractured found crystallized along the margins of the feldspars and 2mm pyrite crystals. Molybdenite are also seen along the margins of the feldspars, crystallized whilst the Murvey Granite cooled. Field and petrographic observations indicate that mineralisation is structurally controlled by NW-SE faults from the selected mineralization zones and conjugate NE-SW cross cutting the Murvey Granite. Both fault orientations exhibit quartz and disseminated molybdenite mineralization.

Extensive hydrothermal alteration is observed within 75 meters of veins that exhibit prominent disseminated mineralisation. To investigate associated geochemical alteration 24 samples were selected along two traverses that cross cut two distinct vein structures. XRF analysis results show that calcium decreases from 1.8 – 0.2 wt% and sulphur increases from 0.2 – 0.9 wt% moving away from the mineralized zones which is to be expected due to their mobile nature. Unexpectedly, minor element data shows no fluctuation in Cu concentrations moving away from either vein structures, despite chalcopyrite found greatest near the vein structures.

XRF data analysis is underway to compare the non-mobile and mobile elements to investigate the extent of the decreasing and increasing trends moving proximal to the mineralization zones. The relative decrease in calcium may be caused by the exchange of ion end members between feldspars and this will be tested using a WDS electron micro-probe.