Chemostratigraphy and alteration at Lucky Strike — potential application to implication for the Buchans camp

L.S. Winter[1], D.H.C. Wilton[1], and J. Tuach[2]
[1]Department of Earth Sciences, Memorial University of Newfoundland, St. Johns, NF
[2]Buchans River Ltd., Suite W-210, Ballyrou Place, 280 Torbay Road, A1A 3W8, St. John's, NF

Utilizing the ratios of high field strength immobile elements (Zr, Nb, Y, Sc, TiO_2, P_2O_5) at least four distinct lithological types are recognized in the vicinity of the Lucky Strike deposit. These include tholeiitic andesitic-basalt, transitional andesitic-basalt, and a genetically related transitional dacite-rhyodacite, as well as calc-alkalic dacite-rhyodacite. The tholeiitic to transitional units are in the footwall to the ore horizon only, whereas, the calc-alkalic units represent the immediate hanging wall sequence. This transition from units with tholeiitic/transitional affinity to younger rocks with calc-alkalic affinity demarcates a distinctive petrogenetic (and tectonic?) boundary within the evolution of the Ordovician arc sequence where geological conditions were optimal for VMS formation.

Based on the MacLean method using immobile element ratios as monitors, mass balance calculations for major oxides, as well as some low field strength elements (Ba, Rb, Sr), indicate that many of these elements were significantly mobile. In the mafic rocks, two types of alteration are identified from mass changes: sericitization (addition of K_2O, removal of Na_2O, CaO), and chloritization (addition of MgO, removal of alkalis). Most mafic rocks are also silicified. Felsic rocks most commonly are sericitized and show losses of Na_2O, CaO and SiO_2, but with gains of K_2O up to ~3%. Gains of more than 3% K_2O coupled with Na_2O loss are indicative of K-feldspar - sericite alteration, commonly known as "white rhyolite". Only a few of the felsic rocks sampled have significant chlorite-carbonate development and these are geochemically distinguished by MgO and CaO enrichment. These chlorite-carbonate altered rocks are confined to stockwork zones immediately underneath the ore horizon.

Due to structural juxtaposing of stratigraphy, the depth extent of altered footwall rocks cannot be determined. Alteration is present to a depth of ~320 meters, however, and involved complete feldspar destruction and generation of chlorite–quartz–sericite assemblages. Up to 100 meters below the ore horizon, intense chlorite – pyrite ± quartz ± carbonate stockwork alteration is developed that is transitional into quartz stockwork and basemetal-sulphide mineralization at the core of the system. In the hanging wall, feldspars phenocrysts in the host rocks are commonly only partly altered and are generally unaffected after tens of metres.

The results of this study have direct applications to exploration for VMS deposits in the Buchans camp.

Geochemical discrimination diagrams can be used to identify relative positions with respect to ore horizons within a volcanic stratigraphy. Hydrothermal alteration does not affect elements used in this classification and data can be obtained by relatively inexpensive analytical methods such as pressed powder pellet X-ray fluorescence. Other mobile major and trace element data can then be used to classify alteration styles within these units and further refine exploration ideas. Prospective zones of hydrothermal alteration in the Buchans area will be compared to the data from the Lucky Strike area.