Styles and setting of volcanogenic massive sulphide (VMS) mineralization in the Victoria Lake supergroup, Newfoundland Appalachians

Stephen J. Piercey[1] and John G. Hinchey[2]

1. Department of Earth Sciences, Memorial University, 9 Artic Ave, St. John's, Newfoundland and Labrador A1B 3X5, Canada <spiercey@mun.ca>

2. Geological Survey of Newfoundland and Labrador, Department of Natural Resources, P.O. Box 8700, St. John's, Newfoundland and Labrador A1B 4J6, Canada

The Victoria Lake supergroup (VLSG), Newfoundland Appalachians, hosts numerous volcanogenic massive sulphide (VMS) deposits with varying stratigraphic settings, styles, ages, and emplacement mechanisms. The oldest VMS deposits are bimodal felsic deposits hosted within the ~513–509 Ma Tally Pond group, and includes the pastproducing Cu-Zn-rich Boundary and Duck Pond deposits, and the Zn-Pb-Ag-Au-Ba-rich Lemarchant deposit. All deposits are hosted predominantly in rhyolite flows and volcaniclastic rocks and range from replacement-style mineralization (Boundary, Duck Pond) to that deposited by exhalation in shallow water (i.e., <1500 m water depth); the latter being associated with precious metal enrichment (e.g. Lemarchant). New U-Pb ages (~514–506 Ma) illustrate that the Long Lake group is coeval with the Tally Pond group, and the group contains Zn-Pb-Ba(Cu) mineralization hosted predominantly by an older (~514 Ma) package of felsic volcanic and volcaniclastic rocks (e.g. Long Lake deposit). Younger VMS mineralization in the VLSG, occurring within the westerly Tulks belt, is much more diverse in style and is hosted predominantly in the 498–488 Ma rocks of the Tulks and Pats Pond groups. In the southwestern portion of the Tulks Group, the Boomerang cluster of Zn-Pb-(Cu-Ag-Au) deposits are hosted in a felsic volcaniclastic and shale-rich sequence with local mafic and felsic intrusive rocks, and is interpreted to have formed via subseafloor replacement and exhalation. Towards the central portion of the Tulks belt, both exhalative and replacement-style Zn-Cu mineralization occur hosted in felsic volcaniclastic rocks and lesser sedimentary rocks (e.g., Tulks Hill, Tulks East). In the northern portion of the Tulks belt, deposits are hosted in felsic flows and fragmental rocks with lesser volcaniclastic rocks. These deposits exhibit evidence for deposition in shallow water and (like Lemarchant) show hybrid features between VMS deposits and epithermal Au-Ag deposits (i.e., magmatic fluid input; Bobby's Pond and Daniel's Pond).

Volcanogenic massive sulphide deposits in the VLSG are the product of episodic arc rifting along the Cambrian margin of Ganderia, with the local style, geometry, and metal budgets of mineralization ultimately controlled by host stratigraphy lithofacies, fluid temperatures and their fluctuations, seawater depth, and the presence or absence of magmatic fluids.

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