Petrographic, chemostratigraphic, and alteration analysis through the deformed volcanosedimentary sequence hosting the Boomerang massive sulfide deposits, Tulks belt, central Newfoundland

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A detailed study of 8 drill holes through the Cambrian to mid-Ordovician rocks of the Tulks volcanic belt that hosts the 1.3 Mt Boomerang massive sulfide deposit in central Newfoundland is an attempt to unravel the complicated host stratigraphy and enhance correlations in this belt. The deposit strikes at approximately 225° and dips 80° to the NW. Rock types include various felsic, intermediate, and mafic pyroclastic rocks (ash tuffs, lapilli tuffs, and agglomerates), mafic to intermediate dykes and sills, and sedimentary rocks (greywacke, grey siltstone, graphitic argillites, and carbonaceous phyllites).

The hanging wall tuffs are composed of approximately 50% fine grained quartz with rare quartz and feldspar phenoclasts (10%), 30% fine-grained muscovite with minor sericite, and rare carbonate and sulfides; dominantly pyrite with very rare base metals and rare accessory minerals. The footwall tuffs differ with increased fine-grained muscovite and sericite up to 50% with 30% fine-grained quartz and increased base metals including sphalerite with less chalcopyrite and galena.

Immobile elements and their ratios prove very useful in stratigraphic interpretation. Four populations of dykes and sills have been identified, ranging from basaltic andesite to rhyolitic dacite, based on element abundances and ratios including (Winchester and Floyd inverse ratio numbers in italics) TiO_2/Zr (213.1, 98.97, 51.04, 83.79)(*0.0048, 0.010, 0.020, 0.013*), Y/Nb (10.6, 5.51, 4.30, 10.1)(*0.098, 0.20, 0.24, 0.10*), TiO_2/1000 (9.45, 13.1, 9.28, 7.10), Y+Nb (20.5, 29.3, 35.8, 29.6), Zr/Y (2.43, 5.49. 6.40, 3.14, Zr (45.56, 136.1, 182.4, 83.79), V (399.9, 232.5, 108.3, 45.29), Y (18.6, 24.4, 29.0, 26.8), Nb (1.81, 4.92, 6.75, 2.76), Rb (7.00, 18.8, 28.9, 14.94), and Th (2.00, 3.75, 6.25, 2.74). The footwall and hanging wall tuffs are geochemically very similar shown by element ratio averages of (Winchester and Floyd inverse ratio numbers in italics) TiO_2/Zr (HW=77.22, *0.026*, FW=85.20, *0.018*), Al_2O_3/Zr (HW=2062.51, *0.0007*, FW=2432.66, *0.0005*), Zr/Y (HW=3.98, FW=4.12), TiO_2/Y (HW=244.23, *0.006*, FW=280.34, *0.004*), Al_2O_3/Y (HW=6995.25, *0.00018*, FW=8717.30, *0.00013*), TiO_2/Al_2O_3 (HW=343.17, FW=328.22), Th/Nb (HW=1.20, FW=1.03), and Zr/Th (HW=3.98, *0.033*,FW=4.12, *0.034*) and range from basaltic andesite to rhyolitic dacite.

Towards the ore horizon deformation increases in intensity with two directions of foliation which are enhanced by increased sericite. The alteration system and stockwork zone are recognizable by: (1) increased Fe-rich chlorite and disseminated and veined sulfides in the hanging wall; and (2) intense sericite alteration with increased disseminated and veined base-metal sulfides in the footwall. This is consistent with the fact that $Al_2O_3/(Al_2O_3 + K_2O + Na_2O)$ increases with proximity to the ore horizon.

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