
Distribution, form, and origin of precious metals related to the Boomerang and Domino volcanogenic massive sulfide deposits, Tulks belt, central Newfoundland

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The Boomerang and Domino volcanogenic massive sulfide (VMS) deposits are hosted within felsic pyroclastic rocks of the Victoria Lake Supergroup located in central Newfoundland's Tulks belt. The Tulks belt is a Late Cambrian to Middle

Ordovician bimodal volcanic arc and back-arc basin assemblage. Numerous other prospective VMS deposits occur in this belt, e.g., Tulks Hill, Tulks East, Bobby's Pond, Daniel's Pond, Jack's Pond, and Curve Pond. Indicated mineral resources for the Boomerang deposit were recently calculated to be 1.36 million tonnes grading 7.09% Zn, 3.00% Pb, 0.51% Cu, 110.4 g/t Ag, and 1.66 g/t Au at a 1% Zn cut-off grade with similar inferred grades calculated for the nearby Domino deposit, and other deposits with this belt. The Boomerang and Domino massive sulfides commonly occur as lenses hosted within fine to sandy ash tuffs of dacitic composition with rare lapilli clasts and intervals of graphitic argillite in the hangingwall. In hand sample, sulfide banding is evident as thin layers rich in sphalerite ranging from nearly massive units to laminated fine-grained sphalerite and galena in association with pyrite, locally with irregular-shaped chalcopyrite forming pressure shadows, up to 5 cm in size. In general, the sulfide assemblage consists of intergrown equigranular, subhedral sphalerite, galena, and pyrite with lesser amounts of chalcopyrite, tetrahedrite, and arsenopyrite. Pyrite constitutes over 40% of the total sulfide content at the Boomerang and Domino deposit as primary fine grained, euhedral porphyroblasts within the sulfide assemblage, but is also brecciated to form porphyroclasts. Generally, coarse-grained pyrite and arsenopyrite are intergrown, reflecting recrystallization as a result of regional deformation. Tetrahedrite commonly occurs as interlocking grains, inclusions, and along grain boundaries of the other sulfides. EPMA reveals Ag as a solid solution component within tetrahedrite, with minimal Ag within galena.

Multi-element ICP-ES analysis of precious metal-enriched massive sulfides ($n = 156$) of the Boomerang deposit show positive Spearman Rank correlations between Au and Ag (respectively) with As ($r = 0.91$ and $r = 0.81$), Cd ($r = 0.53$ and $r = 0.73$), Cu ($r = 0.66$ and $r = 0.82$), Fe ($r = 0.57$ and $r = 0.45$), Hg ($r = 0.70$ and $r = 0.73$), Pb ($r = 0.79$ and $r = 0.96$), Sb ($r = 0.84$ and $r = 0.84$), and Zn ($r = 0.59$ and $r = 0.79$); Au and Ag are strongly correlated ($r = 0.86$). These precious metal and whole-rock element associations reflect cryptic mineralogical relationships throughout this deposit, i.e., Au is associated with arsenian phases and Ag is associated with tetrahedrite- and galena-rich assemblages.

Laser ablation ICP-MS results from selected samples ($n = 8$) reveal elemental abundance variations from core to rim, complimenting earlier EPMA results. Arsenopyrite rims are enriched in precious metals, averaging 228 ppm Au and 25 ppm Ag with Co richer cores. Precious metal enrichment is evident in the cores of pyrite porphyroclasts, averaging 13 ppm Au and 382 ppm Ag with Co, Ni, and Hg concentrated in the rims.