Precious metal distribution in the Epigenetic Stringer Sulphide Zone at the Brunswick No. 12 deposit, Bathurst, New Brunswick

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There has been little published information on the occurrence, distribution, and abundance of gold in massive sulphide deposits of the Bathurst Mining Camp although it is extracted as a byproduct during the smelting of both the Cu and Pb concentrates (4.1 and 0.9 g/t, respectively) from the Brunswick No. 12 deposit, with a total annual production of 280 to 310 kg representing a 12% recovery. Gold is commonly enriched in the hydrothermal feeder system (stringer sulphides) to the exhalative sulphide ores. Therefore, as part of a larger study of alteration around the deposit, drill hole A1 was selected for a detailed analysis of Au and trace element analyses because this hole transgresses the hanging wall into the footwall sedimentary and volcanic rocks that hosts the main stringer sulphide mineralization. Native gold, electrum, arsenopyrite, and arsenian pyrite are the principal Au-bearing phases, and tetrahedrite, galena, pyrargyrite are the principle Ag-bearing phases in the Brunswick No. 12 deposit. Anomalous Au (200 to 600 ppb) with low but variable Ag/Au (10 to 50) occur in portions of the stringer sulphide mineralization that exhibits intense silicic alteration. The typical massive sulphide ore grade is 0.55 to 0.72 g/t Au, although the secondary Pb-oxide-bearing ore contains up to 2.25 g/t Au resulting in a high Ag/Au (140) ratio. The As/S ratio is high (0.02 to 0.2) but irregular in the stringer mineralization compared to 0.01 for the typical ore. This is consistent with the pronounced decrease in As solubility as arsenopyrite with decreasing temperatures and increasing oxygen fugacity. Within the sequence sampled (n = 47), there is a strong positive correlation between Au and As (0.84) and S (0.69) whereas Ag correlates with Zn (0.76), In (0.74), and Sb (0.66). The correlations may be explained mineralogically (i.e., Ag substitution in tetrahedrite or Au substitution in arsenopyrite or arsenian pyrites). However, the enrichment of Au is probably related to the destabilization of Au complexes (chloride, thioarsenide, or bisulphide) within the near-surface silica-rich stringer sulphide vein system.