The Brunswick No. 6 VMS Cu Zone, Bathurst Camp, New Brunswick: petrology, geochemical composition and petrogenesis

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Cu-rich massive sulphides envelope the north-end and base of the Brunswick No. 6 Pb-Zn massive-sulphide lens. Preliminary ore reserve calculations indicate 1.7 Mt grading 0.9% Cu (William Luff, personal communication). Mineralogically, the principle minerals are pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, magnetite, and trace arsenopyrite, cobaltite, and cassiterite. Generally, chalcopyrite and pyrite are fine-grained, although cataclastically deformed pyrite porphyroblasts (porphyroclasts) are hosted in a recrystallized pyrrhotite-rich matrix. In this study, 11 sample intervals 5 feet long from 10 drill holes into the Cu zone were re-assayed yielding an average of 0.90% Cu, 1.28% Zn, 0.42% Pb, 28.6 g/t Ag, 0.046% Bi, and 0.225 g/t Au, as well as 0.131% As, 0.030% Sb, 0.069% Co, and Sn values below the detection limit of 0.005%. Diamond Drill hole B-259 into the exhalative was re-assayed (n = 6) and yielded an average of 0.78% Cu, 1.08% Pb, 3.46% Zn, 0.051% Bi, 0.311% As, 0.063% Sb, 0.07% Co, 58.62 g/t Ag and 0.495 g/t Au. Bulk sulphur analyses (n = 11) conducted on 10 drill holes within the Cu zone yielded an average $\delta^{34}S$ value of 14.6 per mil. Additionally, Hole B-259 sampled (n = 6) from the Pb-Zn exhalative deposit averaged $\delta^{34}S = 14$ per mil creating an increasing trend of $\delta^{34}S$ values entering the Cu zone. A similar trend occurs at the Brunswick No. 12 deposit. There is a notable decrease in Cu, Pb, Ag, As, and Sb concentrations and marked decrease in Zn values with increased depth into the Cu zone. Bi and Au concentrations exhibit a "U" shaped trend with the lowest concentrations occurring at approximately the centre of the Cu zone. The high Cu and low base-metals within the basal massive-sulphide zone compared to the Zn-Pb-Ag exhalative massive sulphides in both the No. 6 and No. 12 deposits is common in proximal VMS deposits. It is usually interpreted as a hydrothermal zone-refining feature, which is consistent with: 1) the relatively high pyrrhotite to pyrite abundance and higher abundance of chalcopyrite, arsenopyrite, bismuthinite, and cassiterite that have higher temperature-sensitive solubilities; 2) lower sphalerite, galena, tetrahedrite/tennantite, and argentite concentrations; and 3) its occurrence above the stockwork feeder zone that formed the deposit.