Temperature and Pressure Determination of Fluid Inclusion Formation from Salmita Mine, NWT

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Salmita Mine, located ~240 kilometers NNW of Yellowknife, NWT, produced 179,000 ounces of gold from 1983 to 1987. However, the style of gold mineralization at Salmita is still controversial, with different workers classifying the deposit as either an Archean epithermal deposit or as an orogenic gold deposit. Mineralization is hosted in Mesoarchean mafic and felsic volcanics. The majority of gold produced came from a single vein, the B-vein, which is hosted within mafic volcanics crosscut by a major fault and shear zone. Stratigraphically overlying the mafic volcanics is a unit of felsic volcanics that host a lower-grade quartz vein, the T-vein. Gold mineralization is localized in quartz veins and stringers within the mine and is lithologically-controlled, with major gold mineralization dominantly occurring in mafic volcanics in a sheer zone. Gold mineralization is correlated with sulfide mineral deposition, dominated by pyrrhotite, sphalerite, and pyrite which occur as bands within the B-vein and as disseminated sulfides within the mafic volcanics.. Fluid inclusion analyses reveal that high salinity inclusions are present in the veins wherever sulfide mineralization occurs, but are very rare outside of such zones. Additionally, fluid inclusions commonly contain “double bubbles,” indicating high concentrations of CO_2 within the ore zones. Analyses by Raman spectroscopy reveal that the fluid inclusions commonly contain CH_4 and graphite. Together, the presence of CO_2, CH_4 and graphite suggests an equilibrium reaction of the type $CO_2 + CH_4 = 2C + 2H_2O$ was concurrent with gold deposition, which has also been recently documented in other Archean gold deposits in the Yellowknife greenstone belt, such as at Giant Mine. Collectively, these results are broadly consistent with an orogenic style of gold deposition at Salmita.

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