Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22976

Mineralogical and textural characterization of the gold mineralization in the LP zone of the Great Bear deposit, Ontario, Canada

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The Great Bear deposit, with a combined (measured + indicated) resource estimate of 2.8 Moz at 2.7 g/t Au, and an additional inferred resource estimate of 3.3. Moz at 4.5 g/t Au, occurs in the Red Lake greenstone belt within the Mesoarchean to Neoarchean Uchi sub-province of the Canadian Superior Craton. The deposit is located 25 km southeast of the historically productive Red Lake mine trend and includes multiple distinct mineralization styles. This study focusses on the NW-SE trending LP zone, a spatially continuous, up to 400 m wide mineralized zone of increased strain and metamorphic grade. The LP zone is predominantly hosted by Neoarchean felsic metavolcanic and metasedimentary rocks metamorphosed to greenschist to amphibolite facies conditions that are crosscut by mafic intrusive lithologies. Core logging and petrographic investigations of mineralized intervals were conducted to characterize mineralization assemblage and its textures, mineralization style, and impact of metamorphism and deformation on metal tenor in the LP zone.

Gold mineralization in the LP zone is primarily associated with quartz ± calcite veins crosscutting the prevalent foliation at a shallow angle. The ore assemblage consists of multiple generations of pyrite (Py1-4), pyrrhotite, and arsenopyrite, accompanied by minor chalcopyrite, sphalerite, galena, magnetite, and trace Bi-Te minerals and gold. Along strike of the LP zone, a subtle zoning was observed, consisting of (1) highest gold grades in the central and southeastern LP zone, (2) an arsenopyrite-pyrite dominated ore assemblage in the central LP zone, and (3) a pyrite-pyrrhotite-arsenopyrite ore assemblage in the southeastern LP zone.

Petrographic studies on mineralized thin sections show that gold primarily occurs interstitially along grain boundaries of coarse quartz in both quartz ± calcite veins and adjacent host rock. A close spatial and textural relationship between gold, Bi-Te minerals, galena, and coarse, recrystallized pyrite has been observed. These relationships include intergrowths between Bi-Te minerals, galena, and gold, inclusions of gold, Bi-Te minerals, and galena in coarse recrystallized pyrite and potential exsolution of Bi-Te minerals from galena. The observed relationships indicate a complex genetic relationship between host rocks, quartz ± calcite veins, metamorphism and deformation, and mineralization.