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Characterization of Polymetallic Vein-Type Occurrences in the Meguma Terrane: A Lesser-Known Gold Deposit Type for Nova Scotia?

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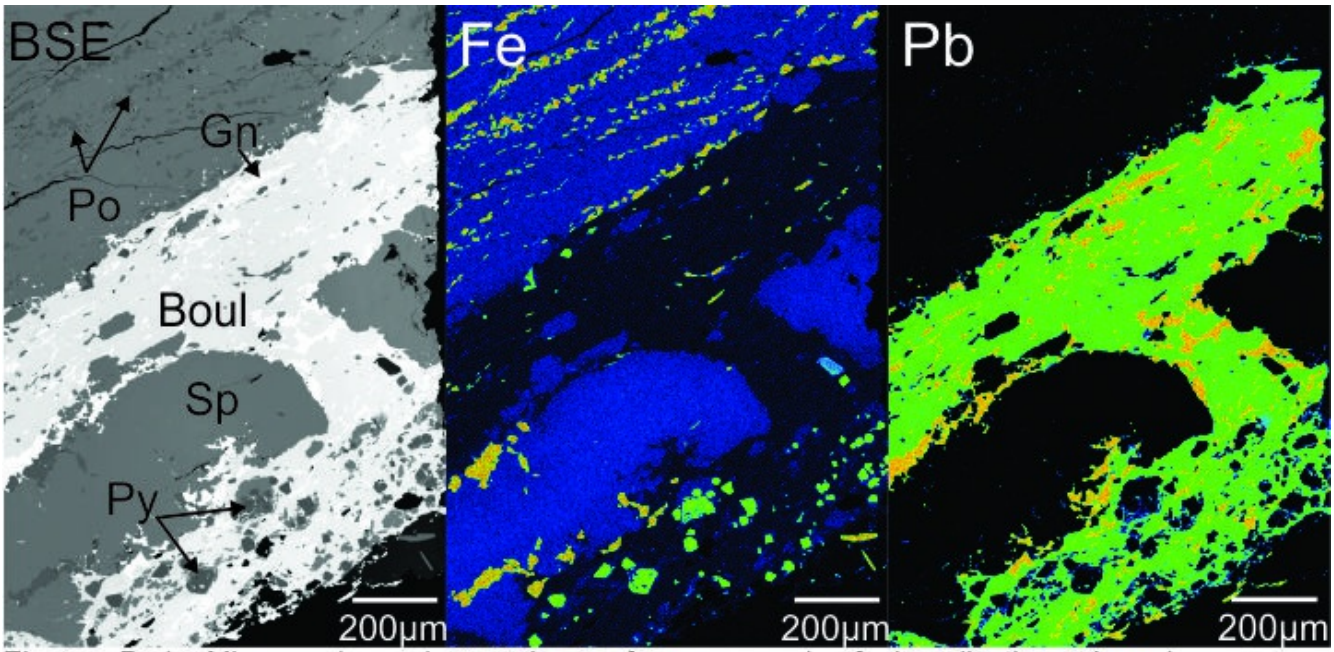
This study focuses on three Au-bearing, polymetallic (Sb-Pb-Zn-Co-Ni-Cu-Bi-Ag-Au) vein occurrences in the western Meguma Terrane with a suspected, but unproven, genetic link. The aim is to understand how the occurrences formed, including their timing, sources of metals, and relationships to other Meguma Au deposits and metasedimentary-hosted polymetallic vein deposits globally (e.g., Sb-Au deposits of the Bohemian Massif, Variscan Orogen, Europe).

At the Lansdowne and Cape Saint Mary's (CSM) occurrences in Digby County, Bear River Formation, metapelites are intruded by gabbro (~440 Ma; apatite U-Pb) and crosscut by quartz ± carbonate veins, some of which host multi-stage, sulfide-sulfosalt mineralization. At Lansdowne, mineralization crosscuts the early quartz veins and consists of an early Fe-As stage (pyrite-arsenopyrite-pyrrhotite), a Zn-Cu stage [(Cd-rich) sphalerite-chalcopyrite], and a later Pb-Sb stage (boulangerite-jamesonite-galena) with multiple generations of quartz-calcite-chlorite gangue. Arsenopyrite thermometry indicates temperatures of 425°-450°C, while chlorite of the Zn-Cu stage provides a lower temperature of 350°-390°C. The latest chlorite provides a temperature of 120°-160°C. Isocon diagrams generated using least- and most-altered samples from the mafic intrusions and metapelites indicate variable depletion in the above metals (except Sb, which was gained), potentially indicating these rocks as metal sources.

At the CSM Stibnite Occurrence, siderite infilled-breccia hosts mineralization and crosscuts earlier, brittle-ductile deformed quartz veins in Bear River Formation metapelites. Mineralization consists of an early As ± Co-Ni stage [arsenopyrite-(Co-rich) gersdorffite], followed by a Cu-Sb-Ag stage [tetrahedrite-(Ag-rich) freibergite], a Cu-Sb-Bi stage (chalcopyrite, Bi-Sb alloy), and late REE-P alteration (florencite-pyrite). At the Mavillette Beach Occurrence, Pb-Sb mineralization (boulangerite-jamesonite-galena) is observed in quartz-pyrite veins.

At the Nictaux Falls Dam Occurrence (NFDO), variably mineralized quartz veins and quartz-infilled breccia cut Kentville Formation metapelites near their contact with the South Mountain Batholith (370 Ma), diabase dykes, and a gabbro intrusion (~380 Ma; apatite U-Pb). Mineralization consists of early pyrite, a zoned Fe-Co-Ni-As stage (arsenopyrite-cobaltite-gersdorffite) with chlorite (~280°C) and rutile, and late-stage electrum.

The mineralogy, paragenesis, metal associations, and ore textures are distinct from typical Meguma Au deposits. The occurrence of mineralization in breccias and mineral thermometry suggest their formation in relatively shallow crustal environments at moderate to high temperature. Striking similarities between Lansdowne and CSM with the West Gore Sb-Au deposit (Hants Country, N.S.) in terms of mineralogy and paragenesis are noted. Future work includes Re-Os dating of arsenopyrite and trace element work on ore minerals to compare with similar deposit types.



Electron Probe Micro-analyzer elemental maps for core sample of mineralization at Lansdowne (sample LAN2-2). BSE image with labelled minerals: sphalerite (Sp), pyrite (Py), pyrrhotite (Po), boulangerite (Boul), and galena (Gn). Fe map differentiates pyrite (green) and pyrrhotite (orange). Pb map differentiates boulangerite (green) and galena (orange).