

Pyrite: Fool's gold or not? Insights into the VMS deposits of the Bathurst Mining Camp and potential use as vectoring tool in exploration of VMS deposits

A. SOLTANI DEHNAVI^{1*}, D. R. LENTZ¹ AND
C. R. M. MCFARLANE¹

¹Department of Earth Sciences, University of New Brunswick,
Fredericton, NB, E3B 5A3, Canada

(*correspondence: azam.soltani@unb.ca) (dlentz@unb.ca,
crmm@unb.ca)

Pyrite is a major constituent of volcanogenic massive sulfide (VMS) deposits located in the Bathurst Mining Camp, Canada. Optical characterization of pyrite indicates significant textural and size variability. Pyrite is texturally categorized in two main groups: pre-metamorphism (primary: including framboidal, spongy core, colloform pyrite) and syn-, and post-metamorphism (secondary: including ductile, brittle, and annealed pyrite). *In situ* LA-ICP-MS and imaging of texturally-distinct pyrite shows compositional variations related to depositional conditions followed by superimposed metamorphism and deformation. High As (up to 7.3 wt %) concentrations in pyrite from the BMC categorize them as arsenian pyrite. The highest As concentrations are commonly related to primary textures of pyrite, in which Tl, Hg, Sb, Pb, Cu, and Zn are enriched as well. On the other hand, secondary pyrites are chemically more variable and typically not carrying high concentrations of trace elements. LA-ICP-MS imaging pyrite demonstrates complex trace element zoning, including multiple trace element enrichment and depletion zones. As a result, it is likely indicative of multi growth stages of pyrite during metamorphism and deformation. Pyrite of VMS deposits of the BMC host appreciable abundances of trace elements, allowing it to be used as a potential vectoring mineral in VMS exploration. For instance, the proximal pyrite in the altered footwall units of Heath Steele B Zone (Drill hole 3409) exhibits systematically increasing volatile elements with decreasing distance from the ore horizon. Hence, we present this innovative approach as a potential complementary technique for VMS exploration.