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Tale-tell minerals from massive sulfide deposits of the Bathurst Mining Camp, Canada and new exploration approaches

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Middle Ordovician metamorphosed (greenschist facies) volcanogenic massive sulfide deposits of the Bathurst Mining Camp are investigated for mineral compositional variation. Phyllosilicates (white mica and chlorite) and sulfides (pyrite and sometimes pyrrhotite) are ubiquitous phases in the host rocks. The proportion of chlorite and pyrite increases toward the ore horizon, whereas white mica is more widespread outboard of the hydrothermal zones. LA-ICP-MS analyses of white mica ($n = 733$), chlorite ($n = 403$), and pyrite ($n = 1540$) were conducted to document their volatile-element concentrations (As, Tl, Sb, Hg, In, Cd, Sn, Se, and Bi). The volatile element signature of the examined minerals is a mineral-specific characteristic that is controlled by substitution mechanisms and effects of subsequent metamorphic and deformation. The observed volatile-element dispersion patterns can, at the deposit scale, be used to vector to ore. In the proximal footwall and hangingwall zones (within 50 m of the ore horizon), the Tl, Hg, Sn, Sb, and In abundances of all three mineral phases increase with proximity to the ore horizon. This trend is typical of all footwall zones examined; however, not a common feature of all hanging wall zones. In the distal footwall zones, i.e., greater than 50 m stratigraphically below the massive sulfide lens (depending on the main lithology), white mica plays a significant role in concentrating Sn, Tl, Hg, and Sb.

