VMS exploration: Oxygen isotope mapping from top to bottom

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Oxygen isotope mapping to delineate paleo-submarine hydrothermal systems associated with volcanogenic massive sulfide (VMS) deposits is a robust technique for exploration. Early studies in Japan [1] and California [2] documented some features of system tops and bottoms in weakly metamorphosed terranes. Subsequent studies have amplified and extended these findings to VMS deposits of many ages, and in various grades of metamorphism and tectonic settings [3,4,5] supporting a general model [6]. For some hydrothermal systems, the size of the 'thermal footprint' (area of isotopic zoning) broadly correlates with tonnage of VMS mineralization [7]. Whereas high-temperature upflow zones along synvolcanic faults provide vectors for exploration from the footwall [8], hanging wall indicators can be important, particularly in areas of cover. The Izok Lake deposit, Nunavut, Canada is a particularly good example where comparison of lithogeochemical and field-based spectral IR mapping and oxygen isotope mapping clearly indicate the advantages of the isotopic method [3]. Comparisons to other deposit areas, including, Snow Lake [9], Flin Fon [10], Sturgeon Lake [5], and La Ronde [11] indicate the importance of scale and volcanic history in interpretation and application.

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