bedded to laminated rocks are mostly thought to have formed from hydrothermal precipitates of submarine hydrothermal vent fluids that settled on the ocean floor.

Bulk geochemical data indicate that in addition to direct hydrothermal input of certain elements, exhalites contain variable contributions from clastic/volcaniclastic detritus and seawater. The hydrothermal component is generally greater than 40 wt.%, and commonly greater than 70 wt.%. Element associations indicate that Fe, Mn, Pb, and Zn are generally of hydrothermal origin, whereas Al and Ti originate from detrital clastic/volcaniclastic material. Varying physicochemical conditions of the venting fluids and the depositional site (e.g., temperature, fO_2, pH, Eh or pE, fS_2, fCO_2, and ionic strength) can control the proximity of exhalites to sulphide mineralization, their layering, and their mineralogy. Other extrinsic controls affecting the distribution and mineralogy of iron formation include the degree of detrital input and the degree of basin isolation from this input, rate and longevity of hydrothermal venting, fluid/rock ratio, bottom currents, and the basin topography, and any subsequent metamorphism.

There have been several attempts to use exhalites in the exploration for concealed VMS deposits. Primarily these attempts have used spatial and temporal relationships to mineralization, and bulk geochemical, mineralogical, and mineral chemical vectors. These approaches have met with varying degrees of success. Some studies have determined that there are characteristic minerals or a suite of minerals that are useful indicators of proximity to mineralization; however, others have failed to identify such relationships. Elevated concentrations of elements originating from the hydrothermal source and ratios of hydrothermal elements to clastic elements have proven to be useful indicators for mineralization in several area or camps, including the Bathurst Mining Camp, New Brunswick. Positive europium anomalies may serve as effective guides to mineralization because they seemingly reflect high-temperature (> 250 °C) venting. However, this is not a universal axiom since not all exhalites possess such anomalies. Variations in the composition of certain minerals in exhalites are not a universal panacea in the guide to mineralization because different districts exhibit different trends. Thus, the application of exhalites in exploration to a specific area must be evaluated and tailored on a deposit or district/camp basis.

Exhalites: their genesis and use in volcanogenic massive sulphide deposit exploration

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It has long been recognized that there are spatial relationships between certain types of chemical sedimentary rocks and volcanogenic massive sulphide (VMS) deposits. These rocks are most commonly iron-rich (termed iron formations), but they may also contain significant Mn, Ba, P, and other elements. These rocks were first referred to in the Canadian literature as tuffites or exhalites. They can occur in the immediate vicinity of VMS mineralization and typically at the same horizon, or lower or higher in the stratigraphic sequence. These thinly banded, or

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