

The Alteration Box Plot: A Simple Approach to Understanding the Relationship between Alteration Mineralogy and Lithochemistry Associated with Volcanic-Hosted Massive Sulfide Deposits

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Abstract

Zonal alteration is a common feature in volcanic rocks surrounding sea-floor massive sulfide deposits. Alteration indexes, such as the Ishikawa alteration index (AI) and the chlorite-carbonate-pyrite index (CCPI), have been developed to measure the intensity of sericite, chlorite, carbonate, and pyrite replacement of sodic feldspars and glass associated with hydrothermal alteration proximal to the orebodies. In this paper a simple graphical representation of the Ishikawa AI plotted against the CCPI, termed the "alteration box plot," is used to characterize the different alteration trends related to massive sulfide ores and to assist in the distinction of volcanic-hosted massive sulfide (VHMS)-related hydrothermal alteration from regional diagenetic alteration. Although there are some limitations with the technique, a series of case studies are used to demonstrate that the alteration box plot is a powerful means of understanding the relationship between mineralogy, lithochemistry, and intensity of alteration in zoned alteration systems related to VHMS deposits and should assist the exploration geologist in determining vectors to the center of the ore system.