Mineral chemistry of gahnite from the Lalor metamorphosed VMS deposit, Snow Lake, MB

EA Wehrle[1], DK Tinkham[1], AM McDonald[1]

[1]Harquail School of Earth Sciences, Laurentian University, Sudbury, Ontario;

The Lalor deposit (Snow Lake, MB) is a Paleoproterozoic, Zn-rich VMS deposit. Lower-amphibolite facies metamorphism has formed gahnite ($ZnAl_2O_4$) as an accessory mineral. Hand sample observation, optical microscopy and SEM-EDS were used to characterize the textural and chemical nature of gahnite to help understand the deposit-scale processes by which it developed. Gahnite occurs in talc-chlorite-rich, biotite-chlorite-rich, quartz-rich and sphalerite-rich assemblages. These assemblages reflect primary VMS-related hydrothermal alteration. It generally develops in association with disseminated or stringer sphalerite. Petrographic observations indicate that most (95%) gahnite is related to the consumption of sphalerite, with a lesser amount (5%) sourced from the breakdown of staurolite, and sometimes biotite. Texturally, gahnite forms as: (1) euhedral, inclusion-poor porphyroblasts; (2) anhedral poikiloblasts with quartz and sulfide inclusions; and (3) corona rims to other minerals. Gahnite derived through sphalerite consumption spans this variety in texture, while that related to silicate breakdown forms corona to staurolite and biotite grains. All grains are unzoned with respect to Zn, Fe and Mg, and cluster within a narrow compositional range: $Ghn_{63\text{-}75}Hc_{15\text{-}22}Spl_{10\text{-}18}$. Variations in host-mineral assemblage, texture and gahnite-forming reaction are not strongly reflected in the major-element chemistry. The *Zn#* [Zn/(Zn+Fe) *apfu*] of sphalerite and gahnite, in assemblages where gahnite is inferred to be the product of sphalerite decomposition, are 0.86 – 0.91 for sphalerite and 0.78 – 0.84 for gahnite. In all cases, the *Zn#* of sphalerite is higher than that of gahnite of the same assemblage, and within 0.1. A moderate negative correlation (R = -0.72) is observed between Zn *apfu* and the *Fe#* [$Fe^{2+}/(Fe^{2+} + Fe^{3+})$ *apfu*]. This is particularly evident in sphalerite-rich assemblages, which may also contain anhydrite. The primary trigger for sphalerite breakdown in gahnite-forming reactions appears to be increasing fO_2, and metamorphic grade is interpreted to be the strongest control on gahnite major-element chemistry in these systems.