Comparison of ammonium abundance and its short wave infrared absorption spectrum based on alteration halo of Mexican silver deposits

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Epithermal silver mineralization is commonly accompanied by ammonium bearing alteration halos. Since ammonium produces absorption in shortwave infrared (SWIR), a portable SWIR spectrometer is widely used in exploration, but the detection limit of spectrometers is unknown. Furthermore, minerals hosting ammonium are not well understood. Samples were collected from the El Zapote prospect of the Tizapa mining district in the Sierra Madre Occidental of Mexico. The Ag mineralization forms quartz veins in Tertiary rhyolitic intrusions near the contacts with Mesozoic metasedimentary rocks of phyllite and limestone. Rhyolite samples are pervasively altered to form quartz, illite, muscovite and kaolinite. Samples with high ammonium abundance (~ 1000 ppm) are found near Ag veins (1000 ppm, produces the features of ammonium absorption in SWIR spectra, but the relationship between ammonium content and absorption is not apparent for samples with less than 500 ppm. Samples with no absorption of ammonium in SWIR spectrum yielded ammonium from 330 ppm to 1020 ppm, whereas samples with 540 ppm and 830 ppm ammonium show the specific absorption in the SWIR spectra. N isotopic composition values are similar among the samples, ranging from +1.1 to +9.2 ‰, plot within the range of sediments. The data suggest ammonium is derived from sediments, but the metamorphosed direct country rocks are an unlikely source.

Mobilization of Ni-Cu-(PGE) mineralization at the Cubric showing in the Southern Manneville fault zone, southern Abitibi subprovince, Quebec

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The Cubric Ni-Cu-(PGE) showing occurs in the Southern Manneville fault zone in the Abitibi greenstone belt of the Superior Province, ~ 24 km north of Malartic, Quebec. New geological mapping, core logging, petrographic-geochemical analyses, and high-resolution aeromagnetics provide new insights into the modification of Ni-Cu-(PGE) mineralization in the Abitibi Belt. Host rocks include ultramafic to felsic metavolcanic rocks of the 2714 ± 1 Ma La Motte-Vassan formation of the Malartic Group, a 2680 ± 1.5 Ma hornblende gabbro, and an oxide-facies iron formation. This age on the hornblende gabbro constrains both the maximum ages of D2 and D3 deformation as well as the maximum age of sulfide mobilization at the Cubric showing. D2 is manifested as a generally east-west striking primary S2 foliation related to the Southern Manneville fault and associated isoclinal folds, whereas D3 is manifested as a superimposed non-penetrative northeast-striking S3 cleavage. Ni-Cu-(PGE) mineralization occurs as semi-massive brecciated sulfides within the margins of the hornblende gabbro, as transposed sulfide bands parallel to foliation and durchbewegung texture within the iron formation, and as disseminated sulfides within ultramafic rocks. Sulfides are recrystallized and include pyrite-pyrrhotite-violarite-chalcopyrite-millerite-magnetite-pentlandite ± sphalerite ± galena. The mineralization has average grades of 2.5 % Ni and 0.2 % Cu at surface. The high Ni/Cu ratio suggests derivation from komatiites of the La Motte-Vassan Formation, which also host the nearby Marbridge deposit, and mobilization into the iron formation and hornblende gabbro, rather than derivation from the gabbro. Based on the lack of fractionation of Cu-rich and Cu-poor sulfides the sulfides appear to have been mobilized as monosulfide solid solution at amphibolite-facies metamorphic temperatures, but two end-member hypotheses – which are not mutually exclusive – are being considered for the mechanism of