Geophysical Research Abstracts
Vol. 21, EGU2019-16364, 2019
EGU General Assembly 2019

The Gorno Zn project (Bergamo, Italy): mineralogy, isotopic characterization and genesis of the “oxide-type” ores

Nicola Mondillo (1), Maria Boni (1), Federica Lupone (1), Michael Joachimski (2), Giuseppina Balassone (1), Marcello De Angelis (3), and Simone Zanin (3)

(1) Università degli Studi di Napoli Federico II, Department of Earth, Environmental and Resources Science, Italy (nicola.mondillo@unina.it), (2) GeoZentrum Nordbayern, University of Erlangen-Nuremberg, Germany, (3) Alta Zinc Ltd., Italy

The Gorno Zn-Pb(Ag) deposit (Bergamo, northern Italy) is a mixed sulfide-nonsulfide mineralization located in the “Alpine metallogenic province”: a region of the eastern Alps comprising other similar deposits, which include the former Bleiberg, Raibl and Mežica mines. The Alpine district has a long history of mining, extending back to pre-Roman times. The Gorno mine ceased operations in the early 1980s, even though excellent intercepts of Zn, Pb and Ag were identified in numerous locations (i.e. the “Colonna Zorzone”, which was ready to be developed before operations prematurely stopped). Extensive drilling carried out from 2015 onward by Alta Zinc Ltd. (the current owner of the mining concession and exploration licenses in the area) allowed to estimate in the Colonna Zorzone at least 3.3 Mt JORC compliant indicated+inferred resources at 4.9% Zn, 1.3% Pb, and 27.2 ppm Ag (cut-off grade 1% Zn). In this area, the mineralization, consisting of sphalerite and galena (with inclusions of Ag-bearing sulfosalts), is hosted in Triassic carbonaceous schists of the Calcare Metallifero Bergamasco Formation, and has mostly a stratabound orientation, with an overall thickness ranging from 6 to 14 m.
The presence of an oxidized Zn-Pb mineralization has been identified in a further mineralized nucleus located in the Oltre il Colle-Pian Bracca area, in a partially developed network of galleries extending 500 m below the surface, between 990 to 1028 m.a.s.l. This “nonsulfide” mineralization, hosted in the Triassic limestone of the Breno Formation underlying the sulfide-bearing schists, occurs in sub-vertical breccia bodies associated with several normal faults that displace the sulfide lenses. The nonsulfide concentrations commonly show Zn grades around 20 wt.% (locally higher than 35 wt.%), and a mineral association mostly consisting of smithsonite, hydrozincite, hemimorphite, cerussite and anglesite. These minerals formed after the alteration of pre-existing sulfides, when Zn and Pb precipitated in the fracture network of the fault zones, after the reaction of the Zn-Pb-bearing fluids with the carbonate host rock.
Carbon and oxygen isotope analyses have been performed on Zn-Pb carbonates of different generations. The C-O compositions of the various Zn-carbonates group in two distinct δ13C vs. δ18O clusters. The first cluster is characterized by δ18O ratios ranging between 24.1 and 26.8‰ VSMOW and δ13C from 1.7 to -3.1‰ VPDB. The second cluster shows δ13C and δ18O values between 0 to -6.0‰ VPDB and 21.9 to 23.9‰ VSMOW, respectively. The origin of the more positive δ13C composition of the nonsulfides in the first group suggests a stronger contribution of host rock carbon, whereas δ18O indicates an isotopically relatively uniform fluid and constant temperature. The lower δ13C and δ18O values of the second group indicate a stronger contribution of carbon from the oxidized organic matter and isotopically lighter precipitating fluids. The progressive 18O depletion of the mineral-precipitating waters could be interpreted with the progressive involvement of meteoric water sourced from higher altitudes: this evolution could be related to the uplift processes affecting the Gorno area during Alpine tectonics.