

Research programme on the Vazante nonsulfide Zn deposits (Calamines) in the Minas Gerais region (Brazil)

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In June 2019 Nexa Resources Brazil and the Mineral Deposits research group (MDRG) of the DiSTAR (M. Boni, G. Balassone, N. Mondillo) informally agreed to start a scientific collaboration aimed to study the geology, mineralogy and geochemistry of the Nonsulfide Zinc deposits (“Calamines”) owned by Nexa in the Vazante and Paracatú areas (Minas Gerais, Brazil). The Company belongs to Nexa Resources S.A., the metals and mining division of Votorantim S.A and is one of the biggest mining companies in the world, and a leader in Latin America. The MDRG has a recognized expertise on nonsulfide deposit type, having worked in the last decades on several Calamine deposits not only in South America, but also in other parts of the world (see attached literature).

One of the assets of Nexa Resources in Brazil is the “Willemite/Calamine” property located near the small town of Vazante (Minas Gerais). The deposit is located in a moderately deformed Proterozoic-age fold belt and consists of two different types of mineralization. The primary hypogene mineralization (Willemite) is controlled by a tectonic structure and is contained within dolomites, shales, and a typical hematite breccia. The Willemite orebody is currently exploited mainly underground, whereas part of the Calamines was exploited in open pits until the end of the ‘90ties. In the Vazante area, there are several types of Calamine bodies (mainly derived from the weathering of the Willemite orebody): 1. Association of secondary Zn-minerals in concretions, white cements in veins and host rock replacements, within dissolution/collapse breccias; 2. Same as 1., but strongly oxidized (reddish in colour); 3. Incoherent filling of open cavities. The Calamines are currently object of renewed interest: this mineralization is going through a process of intense exploration, drilling and resource definition, with associated technical studies, aimed to find the best metallurgical treatment for the ores.

Main scope of the research project is to conduct a mineralogical and geochemical study of characteristic ore types in the Vazante Calamine mineralization, to gain more understanding on the nature of the key minerals, mainly for extraction and metallurgical purposes. In addition, the geochemistry of stable isotopes (C, O, Zn) in Zn-Pb minerals will be studied at the deposit and the district scale for better understanding the genesis of the Zn mineralization, and possibly identifying vectors to new ores. Nexa Resources Brazil will grant the MDRG access to all geological information on the Vazante and nearby located deposits, as well as to existing data on drilling, sampling and previous analytical work, and shall eventually support the MDRG for internal travels, fieldwork, and part of the analytical costs.

Proposal for a PhD position for the study of the Vazante Calamine deposits in the Minas Gerais region (Brazil)

The proposed PhD project is aimed to study the geology, mineralogy and geochemistry of the Nonsulfide (“Calamines”) Zinc mineralization in the Vazante and Paracatú areas (Minas Gerais). The study is informally supported by Nexa, and will be carried out through fieldwork, and mineralogical and geochemical investigations on Zn-Pb nonsulfide samples from the Vazante and Paracatú areas.

The proposed PhD project is based on basic mineralogical and geochemical ore characterization (bulk-rock chemical analysis, X-ray powder diffraction, petrographic studies in thin sections, SEM-EDS-WDS microanalysis), followed by specific analyses to investigate the fractionation of stable isotopes (C, O, Zn) in Zn-Pb minerals at the deposit and the district scale for vectoring reasons. The main deliverable of the study will be a mineralogical and geochemical model explaining the genesis of the nonsulphide ores in the Vazante and Paracatú areas.

The possible candidate should have a good knowledge of Economic Geology, as well as of the techniques of mineralogical and geochemical analysis. He/she must be fluent in English and, if possible, also in Portuguese.

The PhD study will be carried out with the following chronology:

months	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	24-27	27-30	30-33	33-36
Bibliographic research	X											
Field work		X	X	X	X		X					
Sample preparation		X	X		X		X					
Basic mineralogical analysis			X	X	X			X				
Basic chemical analysis			X	X	X			X				
Stable isotopic analyses				X	X	X		X	X			
Geochemical modelling								X	X	X		
Metallogenetic modelling								X	X	X		
Courses	X			X			X					
Participation at conferences				X				X		X		X
Paper preparation					X		X		X	X	X	X
Thesis work										X	X	X

Projects

Informal agreement between the MDRG, and the Company Nexa Resources Brazil. The agreement establishes a scientific collaboration between the two parties aimed to study the nonsulfide mineralization of the Vazante and Paracatú areas.