Mineralogical and Geochemical Characterization of the Punta Corna Fe-Co-Ni Mineralization in Piedmont, Italy: Implications for Late-Alpine Hydrothermal Ore Deposition and Metallogenesis

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Keywords: five-element, cobalt, arsenides.

The Punta Corna Mining District is located in the Lanzo Valleys, Piedmont (Italy). It consists of Fe-Co-Ni mineralization exploited for Fe and Co until the 19th century and then abandoned. However, the global concern for strategic raw material supply, such as Co, has raised a renewed interest in old mining sites where economic potential was not fully investigated. Since 2018 the Junior Exploration Company AltaMin ltd. owns the exploration license of the Punta Corna area for assessing the economic viability of the ore.

The mineralization at Punta Corna consists of a complex vein system interpreted as the product of late Alpine (post metamorphic) hydrothermal events (Castelli et al., 2011). The host rocks are represented by the volcanic products (metabasalts) and the metasedimentary cover (calcschists and minor micaschists) of the Internal Piedmont Zone (IPZ) ophiolites (Dal Piaz et al., 2003).

The ore minerals detected so far are represented by dominant Co-Ni di- and tri-arsenides and base metal sulfides chalcopyrite, pyrite and rare sphalerite and galena, accompanied by tetrahedrite, Bi—Sb-rich phases, native Bi and argentite. The utilization of SEM imaging and EPMA analyses facilitated the evaluation of the relationships between the different Co-Ni arsenides as well as the precise identification and distribution of tetrahedrite and accessory Bi-Sb phases. The latter are represented by terms of the Cu-bearing emplectite-chalcostibite series and of stibnite – bismuthinite series (horobetsuite). Gangue minerals include calcite, dolomite, siderite, ankerite and quartz. Chlorite and white mica are common hydrothermal alteration products in the wallrocks. The ore precipitation sequence starts with Co-Ni arsenides, characterized by tri-arsenides often overgrown by concretional Ni-Co di-arsenides. The last precipitation stage is represented by base metal sulfides, tetrahedrite intergrown with the Bi-rich phases and native Bi, plus late argentite. Mineralization is characterized by different textures suggesting various stages of brecciation, overgrowth and replacement, with polyphase deposition of carbonate-quartz gangue.

Mineral assemblage and deposition below 200°C from metal-rich brines (from preliminary fluid inclusion analyses; Moroni et al., 2019) suggest analogies with five element-vein deposits, while the occurrence of Bi-Sb phases at Usseglio may represent a link with the nearby Gran Paradiso Massif which hosts mineralization belonging to the regional Au- vein system of the Western Alps.

Further investigations will be addressed towards including new fluid inclusion analyses, detailed ore characterization during the upcoming drilling campaign, identification of possible sources for metals (especially Co) from metamorphosed volcanogenic ores in the local ophiolites; C-O isotope analyses of gangue carbonates and U-Pb dating of the Co-rich vein swarm within the framework of the late-alpine hydrothermal activity along the western Alpine sector.

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