Discovery, exploration, and paragenesis of the Virginia silver veins in the Deseado Massif, Patagonia, Argentina*

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The Virginia silver project is located in the center-north of Santa Cruz province, Argentina, 184 km southwest of the town of Las Heras, in the Deseado Massif and is hosted by Jurassic volcanic rocks. The silver mineralization at Virginia is hosted by veins of quartz with textures typical of epithermal systems, although its mineralogy and some geochemical aspects make it unique in the Deseado Massif. Unlike other epithermal deposits in the Deseado Massif, Virginia veins contain abundant specular hematite with quartz and a low proportion of iron sulfides. The specular hematite is interpreted to be a primary hydrothermal mineral and is found from surface to the deepest depth drilled to date of 150 m. Acanthite (Ag₂S) is the main silver mineral and galena is also present but is not closely correlated with silver values.

The mineralized veins are oriented NW, NNW, and NNE. The texture of the veins is banded with signs of successive pulses of hydrothermal fluids and brecciation. Early quartz vein textures are banded chalcedonic, and massive saccharoidal, with both of these found as fragments in hydrothermal breccia veins with quartz cement. Coarse-grained acanthite is preferentially observed in greenish-colored, massive, saccharoidal quartz. It is clear that the hydrothermal breccia is posterior because it contains fragments of banded and massive saccharoidal vein. The mineralogy of the veins consists mainly of quartz, hematite, galena, and acanthite. Post-hydrothermal oxidation affects the vein deeply and forms earthy iron and manganese oxides, and abundant kaolinite. Finally, the weathered profile is apparently affected by periglacial processes producing sand-filled fractures to a depth of a few metres.

The exploration of Virginia began with the discovery by geologists of Mirasol Resources Ltd. in 2009, of an out-cropping quartz vein system that was previously unknown. The exploration of the veins was based on geologic mapping, geochemical analysis of rock and channel samples, geophysical methods (magnetic and gradient induced polarization), mineralogical studies by microprobe, portable XRF, XRD, trenching and drilling. Four phases of drilling were made, with a total of 195 holes and 32 twins (23,318 m drilled), that defined 7 deposits: Julia Norte, Julia Central, Julia Sur, Naty, Ely Norte, Ely Sur, and Martina, with potential economic significance. For example, the Julia Norte vein channel sampling contains on average 792 g/t silver over a width of 1.88 m. The distribution of silver grades and specular hematite are interpreted as a primary characteristic, and not a product of oxidation near surface. The silver values are roughly 5,000 times higher than gold, making Virginia a very silver-rich system. The project is at the stage of resource definition. All the deposits begin at or near the surface, and are therefore are potentially accessible for open cut development. Studies are being done on the paragenesis and textures of vein minerals to determine the different mineralization pulses. Fluid inclusion studies of the different quartz generations are planned to determine the conditions of veins formation.