Using Assay Data to Map Mineralogy and Alteration to Help Develop a Predictive Geometallurgical Model for the Taca Taca Cu-Mo-Au Porphyry Deposit, Argentina

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Taca Taca is a large Cu-Mo-Au deposit in NW Argentina (2,165 Mt at 0.44% Cu, 0.013% Mo, and 0.08 g/t Au) which is currently undergoing feasibility studies by First Quantum Minerals. In a large low-grade mining operation, the largest cost component is power consumption. The amount of energy that is required to drill and blast and then grind the ore to liberate sulfides is dependent on the mineralogy of the gangue. Therefore, the value of a block of ore in the resource model depends not just on the contained metal, but also on the nature of the gangue.

Core logging is a very subjective process. Every geologist has a different perception of mineralogy and intensity of alteration. This makes it almost impossible to create a robust 3-D mineralogy model of a mineral deposit just from the geologists' observations. At Taca Taca, all of the drill holes were assayed using a four-acid digest, ICP-AES method. This provides a uniform, quantitative dataset for the entire deposit. Using the major element analyses from the ICP package, relative proportions of silicate, sulfide, and sulfate minerals can be estimated. This was done with a graphical method by plotting the chemistry as a series of molar ratio plots that show components of the mineralogy, and then classifying the assay points on the basis of the proportions of those minerals.

At Taca Taca the potassic zone is characterized by intense potassium feldspar and secondary biotite alteration. The highest copper grades are associated with the transition from K-feldspar to muscovite. Through time, this reaction front contracted inward, with later-formed micas overprinting earlier-formed K-feldspar. Mineralogical estimations based on the major element analyses will allow us to populate domains in 3D with estimates of quantities and ratios of sulfides, silicates, and sulfates. Metallurgical test work, particularly rock hardness and grinding tests, can be targeted based on the gangue mineral domains. The assay table can then be used as a proxy for mineralogy and processing parameters that can be extrapolated to the entire orebody and populate the entire resource block model with estimated mining and processing cost factors.