

### **Carbon and Oxygen Isotope Analyses with Paired Geochemical Data in Exploration for Cu-Zn Skarn Mineralization at Antamayo, Central Peru**

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Skarns can host significant endowment of base and precious metals, commonly at grades that can support economic open pit and/or underground mining, and as such can comprise attractive exploration targets. However, along with other carbonate-hosted ore deposits, skarns are often marked by narrow and irregular alteration haloes, presenting a clear challenge for mineral exploration, as well as an opportunity, given potential for undiscovered ore systems.

We present geochemical data and carbon and oxygen isotopic analyses from skarn-focused exploration programs at the Antamayo prospect in the Miocene magmatic belt of central Peru, including both selective samples targeting visible alteration and mineralization, and systematic grid based samples. Isotopic data is compiled with analyses from other occurrences in central Peru, providing valuable context for defining the main isotopic reservoirs in the area, including calcite- and dolomite-bearing carbonate host rocks, and hydrothermal carbonate in equilibrium with two separate fluids, inferred to reflect magmatic-hydrothermal (skarn, hornfels and vein samples) and meteoric fluids (vein samples). Most data can be explained by equilibration of pure and impure carbonate host-rocks, with a magmatic-hydrothermal fluid with up to ~10% CO<sub>2</sub>, with input of meteoric fluids only locally evident. Our findings suggest that in exploration settings, carbon and oxygen isotopes are best used in tandem with geochemical analyses and geologic observations, and collectively can increase the confidence in identified anomalies, such that wide-spaced (e.g. 500 x 500m) systematic sample grids can be a cost-effective approach for early exploration targeting. While isotopic results at Antamayo do not delineate a materially larger footprint than evident from geochemical data, isotopic data appears to be less prone to impacts of selective sampling. Results speak to the importance of systematic sampling in delineation of subtle alteration footprints for skarns and other carbonate-hosted ore deposits in mineral exploration.