

### **Multiple Magmatic-Hydrothermal Centers at the Filo del Sol Deposit, Argentina: New Insights from Petrography, Mineral Chemistry and Sulfur Isotope Ratios**

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The Filo del Sol (FDS) deposit represents a premier example of a giant Cu-Au-Ag porphyry-epithermal system, spanning an 8.5 km strike length within the newly defined Vicuña Metallogenic Belt in the Argentina-Chile Andean Cordillera. While exploration and research have primarily focused on the high-grade Aurora and Filo areas, the northern extension, comprising the Refugio, Bonita and Maranceles targets, provides an excellent opportunity to test whether FDS originated from a single or multiple magmatic-hydrothermal centers. This study integrates core logging and petrographic observations with mineral geochemistry, including in situ sulfur isotopes, to characterize mineralization styles across the northern targets. Northern Refugio–Western Bonita and Maranceles host high-sulfidation epithermal mineralization dominated by pyrite, enargite, tennantite and Cu-sulfides. While Northern Refugio–Western Bonita contains Sb-poor enargite and Zn-rich tennantite, Maranceles is characterized by Au-, Ag- and Sb-rich enargite and Zn-poor, Fe-rich, Cu-excess tennantite. Conversely, Eastern Bonita exhibits intermediate-sulfidation epithermal mineralization with pyrite, tennantite-tetrahedrite, Cu-sulfides, sphalerite, and galena, that are more enriched in Ag, Zn, Cd, In and/or Sb relative to the other two areas. Preliminary sulfur isotopes in pyrite exhibit lighter  $\delta^{34}\text{S}$  values (avg -11.4 ‰) in Eastern Bonita compared to Northern Refugio–Western Bonita (avg -6.6‰) and Maranceles (avg -6.4‰). Additional  $\delta^{34}\text{S}$  data for sulfates and other sulfides will be presented. The distinctive features of Eastern Bonita are attributed to fluid cooling and decreased metal solubility, likely derived from adjacent Northern Refugio–Western Bonita or Maranceles. Although a genetic link between Refugio and Aurora to the south has been proposed, the mineralogical and geochemical contrasts between Northern Refugio–Western Bonita and Maranceles are inconsistent with a single evolving ore-forming fluid and instead indicate at least two compositionally distinct ore fluids. All this evidence suggests that FDS comprises multiple magmatic–hydrothermal centers, thereby expanding the exploration potential toward its northern part.