

# **Geology and mineralization in the Suyoc epithermal deposit, Mankayan District, Philippines: insights from ore mineralogy, fluid inclusion microthermometry and stable isotope studies**

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## **ABSTRACT**

The Mankayan Mineral District is known for the world-class Lepanto epithermal gold and Far Southeast porphyry copper deposits. However, the district also hosts other deposits that have yet to be investigated in detail, such as the Suyoc epithermal deposit located south of the Lepanto deposit. This study presents detailed characteristics of the geology and mineralization characteristics of the epithermal mineralization in Suyoc from field data, ore mineralogy, fluid inclusion properties and O and H isotope values.

The oldest rocks in Suyoc are the Oligocene to Early Miocene volcanoclastics that are in fault contact with the Middle to Late Miocene conglomerates. These units are intruded by Oligocene and Pliocene dioritic stocks and overlain by unmineralized Pleistocene dacite. Mineralization is hosted in Miocene conglomerate and volcanoclastic rocks that are intruded by diorite stocks and overlain by dacite. The N-S and N-E-trending epithermal veins are characterized by crustiform quartz and rhodochrosite that vary in width from 3-10 mm veinlet swarms to 30-70 cm veins. Alteration adjacent to the veins were identified to be illite and chlorite based on XRD analysis. The sulfide assemblage consists of pyrite, chalcopyrite, sphalerite and galena. Native gold and electrum occurs within the pyrite grains. Fluid inclusion analysis from quartz grains reveal homogenization temperatures of 230-250°C with salinity values of 0.4-3.7 wt% NaCl of two-phased liquid-rich and vapor-rich inclusions. Mineral chemistry analysis of sphalerite grains indicate 0.5-8.3 FeS mole %. The quartz veins subjected to stable isotope analysis showed  $\delta D$  values of -66.1 to -63.23 ‰ and  $\delta^{18}O$  values of 5.5 to 7.8 ‰.

The results indicate that the mineralization in Suyoc is related to near-neutral pH fluids that experienced degassing (based on the low  $\delta D$  values). Furthermore, the mineralization characteristics point to an intermediate sulfidation state of Au mineralization for the Suyoc epithermal prospect.