

Magmatic-Hydrothermal History at the Antakori Cu-Au-Ag Project, Northern Peru: New Ages from U-Pb and Re-Os Geochronology

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The Antakori project is located 50 km northwest of the city of Cajamarca in the Hualgayoc district and is part of the Miocene cluster of Cu-Au-Ag deposits of northern Peru, which includes Cerro Corona, Tantahuatay and Yanacocha. The geology consists of a Cretaceous sedimentary basement overlain by mid-Miocene volcanic rocks of the Calipuy Group. The stratigraphy has been intruded by numerous andesite to rhyolite intrusions and breccias that have generated different styles of mineralization including skarn, porphyry and epithermal high and intermediate sulfidation styles. New U-Pb and Re-Os geochronology ages from 12 intrusive phases and 3 molybdenite occurrences helped to define more accurate relationships between magmatism and hydrothermal activity. The results show that there were five main stages of magmatic-hydrothermal activity at Antakori. The first stage was associated with a series of dioritic intrusions emplaced between 15 and 14 Ma that caused thermal metamorphism, porphyry-skarn style alteration and Cu-Au-Ag-(Zn) mineralization. A second stage occurred between 13.5 and 12.5 Ma, characterized by the emplacement of andesitic to dacitic intrusions that generated porphyry-style alteration and mineralization at depth, and an extensive advanced argillic alteration zone with associated high sulfidation epithermal Cu-Au-Ag mineralization at shallower levels in the near-surface volcanic environment. A third stage of magmatic-hydrothermal activity was associated with another group of andesite to rhyodacite intrusions and breccias that formed between 12 and 11.2 Ma, with associated porphyry-style Cu-Au-Ag mineralization. The fourth stage occurred between 11 and 10.4 Ma, marked by the emplacement of rhyodacite flow-dome complexes and phreatic breccias, with associated intermediate sulfidation epithermal Cu-Au-Ag-Pb-Zn mineralization. A final stage occurred between 10 and 9.5 Ma, when series of barren, hypabyssal rhyolite dykes were emplaced, representing the latest magmatic-hydrothermal activity at Antakori. Thus, mineralization at Antakori is the result of multiple overprinting events with magmatic-hydrothermal activity that lasted at least 5.5 m.y.