Crosscutting Relations in Advanced Argillic Environment Revealed by Hyperspectral Core Imaging: Antakori Cu-Au-Ag Project Case Study

David G. Portocarrero
University of Tasmania, Hobart, TAS, Australia

The Antakori project is located 50 km northwest of the city of Cajamarca and is part of the Miocene cluster of Cu-Au-Ag deposits of northern Peru. An extensive advanced argillic alteration zone is developed in the shallower parts of the Antakori project, mainly above the contact between the cretaceous sedimentary rocks and the middle-Miocene volcanic rocks of the Calipuy Group, extending to the west to the Tantahuatay oxide mine and to the east near the Sinchao fault. The alteration develops open-space filling, vein selvages, and pervasive and patchy textures that destroy primary textures and give a powdery, white to grey appearance to the rocks. Epithermal high-sulphidation Cu-Au-Ag mineralization occurs in this environment as disseminations, veins, and semimassive subvertical structures and subhorizontal replacement bodies. The ore assemblage is dominated by enargite-luzonite-pyrite-tetrahedrite with lesser chalcocite, bornite, covellite, and Pb-sulphosalts. Three assemblages of advanced argillic alteration were recognized based on crosscutting relations: (I) pyrophyllite±diaspore, (II) kaolinite±dickite±white-mica±topaz, and (III) alunite±zunyite. There is a clear spatial and genetic association between high-sulphidation Cu-Au-Ag mineralization and assemblages (II) and (III), with increasing grades when zunyite and topaz are more abundant. The observations made in the present research led to the conclusion that the advanced argillic alteration found at Antakori is the product of two different hydrothermal fluids. An early assemblage of pyrophyllite±diaspore is developed at the base of an interpreted barren and extensive lithocap (stage I) formed at expenses of an underlying degassing magma. The early assemblage is then followed by an ore-related, structurally controlled, F- and Cl-rich hydrothermal fluid responsible for the formation of kaolinite±dickite±white-mica±topaz and alunite±zunyite assemblages (stage II) that may be related to a deeper mineralized porphyry system at depth. Thus, the occurrence of zunyite and topaz can be used to vector exploration for high-sulfidation mineralization in the lithocap environment.