

Hyperspectral Reassessment of Indonesia's Oldest Abandoned Gold Mine: The Salido Prospect, West Sumatra

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The Salido gold prospect in South Pesisir Regency, West Sumatra (1°10'2" S, 100°34'56" E) represents one of Indonesia's oldest abandoned epithermal gold systems, remaining inadequately characterized due to limitations of legacy exploration methods. This study applies PRISMA Level-1 hyperspectral imagery (239 spectral bands, VNIR 400 to 1010 nm and SWIR 920 to 2500 nm, 30 m spatial resolution) to map hydrothermal alteration mineral assemblages across a 432 km² study area. Atmospheric correction was performed using the FLAASH algorithm based on MODTRAN-4 radiative transfer modeling, converting top-of-atmosphere radiance to surface reflectance. Sequential spectral feature extraction involved band ratio analysis targeting Al-OH (2.20/2.10 μm), Fe-OH (2.26/2.10 μm), and Mg-Fe-OH (2.33/2.20 μm) absorption features within the 2.0 to 2.4 μm SWIR diagnostic window, followed by continuum removal to normalize absorption feature depth for inter-spectral comparison. Mineral classification was executed using the Spectral Angle Mapper (SAM) algorithm referenced against USGS and JPL spectral libraries. The analysis resolved three alteration assemblages: advanced argillic (alunite, kaolinite, dickite) confined to structurally elevated ridges and fault intersection zones with strong Al-OH absorption at 2.20 μm; argillic (illite, montmorillonite, smectite) occupying transitional zones; and propylitic (chlorite, epidote, hematite) defining the peripheral alteration envelope under low-temperature, reducing conditions via Mg-Fe-OH absorption at 2.33 μm. Fe-oxide zones, identified through hematite and goethite reflectance between 0.53 and 0.75 μm, align with fracture-controlled topographic ridges and are interpreted as oxidation caps above paleo-hydrothermal conduits. The concentric alteration zonation pattern is spatially correlated with NNW-SSE to NW-SE structural lineaments of the Great Sumatran Fault system, confirming structurally controlled hydrothermal fluid circulation. Persistent Al-OH and Fe-oxide enrichment in the southeastern sector identifies an untested prospective zone warranting field validation, petrographic characterization, and geochemical verification.