

Transition Between Advanced Argillic and Porphyry-Style Alteration at the Far Southeast Porphyry Deposit, Mankanyan District, Philippines

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Recent diamond drilling of 96 holes (~102 km) by Far Southeast Gold Resources Inc. at the Far Southeast Cu-Au porphyry deposit provides a 3-D exposure of the deposit and orebody (500 to –300 m elevation at 2 g/t gold equivalent), enabling new observations of the transition downward from high-sulfidation epithermal alteration and mineralization to the top of the porphyry deposit, through to its roots. Drill holes, collared underground at +700 m elevation (600 m below the present surface), have north and east azimuths and reach depths of –750 m elevation.

Drill core logging and SWIR (Short Wavelength Infra-Red) spectral analysis has revealed early potassic (biotite), followed by SCA (sericite-chlorite ± albite) and subsequent phyllic and advanced argillic (AA) alteration assemblages. A spatial distribution of AA alteration, plotted along Section 1863400N, indicates that above ~700 m elevation, assemblages consists of quartz-alunite-pyrite and below the ~700 m level, quartz-pyrophyllite-diaspore with pyrite and minor kaolinite. The alteration typically has a massive texture (locally patchy) and a pinkish color. Massive AA alteration reaches ~350 m elevation within the main porphyry orebody but as deep as –400 m elevation west of ~478400E where it occurs as narrow veins in propylitic alteration; alunite as a minor mineral is found down to –100 m elevation in these structures. Minor (<1 vol %) anhydrite-quartz-pyrite-enargite veins as well as remnants of SCA halos to quartz stockwork (interpreted to be residual from earlier porphyry-style alteration) are present in AA altered zones.

At the transitional zone between massive AA and porphyry-style alteration (below ~500 m elevation), alternating bands of massive pink AA and SCA are found, with SCA dominating towards the porphyry center and with increasing depth. In this zone, AA-altered rock is dominantly composed of quartz-pyrophyllite-diaspore ± kaolinite, plus illite believed to be residual. Below the base of massive AA alteration, pyrophyllite is also found in the white halo of sulfide-dominant porphyry-style veins. Such pyrophyllite is visually indistinguishable from illite. This type of pyrophyllite is present in narrow zones (typically <2 m) and extends to –700 m elevation, i.e., near the end of the deepest drill holes. Due to its transitional nature with illite, pyrophyllite found at depth is likely caused by increased reactivity due to cooling of white mica-stable liquid. In contrast, the pyrophyllite in massive AA is interpreted to be caused by reactive liquid generated by the condensation of magmatic vapor into ground water.

Considering, (1) secondary biotite and alunite are coeval at deep and shallow levels, as documented by previous studies, (2) massive pyrophyllite-diaspore AA has overprinted porphyry-style alteration (SCA and associated veins, with or without phyllic overprint); and (3) pyrophyllite has overprinted white mica halos at depth, we propose that multiple fluid pulses were released due to progressive crystallisation of the underlying magma chamber. Each fluid pulse produced a set of alteration styles with an upward spatial pattern of potassic, SCA, phyllic, and AA. Later, lower temperature fluids generated the same patterns at progressively lower elevations. Overprinting of alteration caused by successive fluid release events resulted in the complex zoning pattern seen today.