

**GENETIC MODEL OF HIGH SULFIDATION EPITHERMAL GOLD  
DEPOSIT AT CISURU PROSPECT, PAPANDAYAN DISTRICT, GARUT  
REGENCY, WEST JAVA, INDONESIA**

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**ABSTRACT**

Cisuru area is situated in the Papandayan District, Garut Regency, West Java, Indonesia. This prospect lies within the central portion of the Cenozoic Sunda Banda Magmatic Arc which trends southeast from northern Sumatra to west Java then eastward through east Java. The geology of the study area is commonly occupied by Tertiary calc-alkaline volcanic and volcanoclastic rocks which is composed of andesite lava, andesitic breccia, volcanic breccia, dacite and lapilli tuff. Mineralization is related with hydrothermal alteration which is hosted by andesite lava, lapilli tuff, dacite and volcanic breccia. There are generally characterized by four types of alteration. There are silicic alteration, advanced argillic, argillic and propylitic alterations. The silicic and advanced argillic alterations core was followed in an outward direction by argillic alteration (illite-smectite) and outermost zone of propylitic alteration include chlorite-calcite. Alteration mineral includes quartz, alunite, kaolinite, dickite, pyrophyllite, illite, smectite, chlorite, calcite and pyrite.

In the research area, mineralization found as vuggy to massive silica and quartz vein which is hosted by lapilli tuff, dacite, andesite lava and volcanic breccia. Mineralized veins are mostly developed as vugs filling, massive vein, veinlet, replacement, dissemination and matrix cemented in the breccia. Gold

develop as vuggy silica and massive vein in volcanic breccia. Ore minerals were filling the vugs and the fracture of quartz vein which is formed in silicic and advanced argillic alteration. The common ore minerals of Cisuru prospect are pyrite, tennantite, chalcopyrite, enargite, luzonite, sphalerite, galena and gold. Enargite is the of the index mineral of high sulfidation. Gold is commonly accompanied with pyrite. The content of gold is 0.16 ppm to 1.74 ppm. At present, ore mineral assemblages are pyrite - sphalerite-enargite/luzonite – alunite  $\pm$  gold, pyrite – tennantite – chalcopyrite - enargite/luzonite – galena - alunite  $\pm$  gold. Wall rock alteration and mineralization are hosted by andesite lava and lapilli tuff and controlled to NE-SW trending strike-slip fault.

The Cisuru host rocks are classified as andesite lava and dacite. The MORB normalized trace elements spider diagram show variable enrichment of LILEs (Sr, K, Rb, Ba, Th) which is characteristic of calc-alkalic arc. Moreover, the characteristics REE patterns of Cisuru volcanic rocks exhibit steepened LREE slope followed by flat HREE pattern are reliable with calc-alkaline arc volcanic rocks.

Two phase of fluid inclusions are mostly occurred in mineralized quartz veins as liquid-rich, vapor-rich and coexisting of liquid-rich and vapor-rich inclusions. Their salinity is range from 0.2 to 7.2 Wt. % NaCl equivalent with temperature of homogenization range from 200 - 395 °C. According to the mineralogical and geochemical studies, ore texture, type of hydrothermal alteration, mineralization and the character of the fluids, it is suggested that the mineralization of the Cisuru prospect is interpreted a high sulfidation epithermal deposit.

**Keywords:** Hydrothermal Alteration and Mineralization, Hydrothermal Fluid, High Sulphidation, Epithermal Deposit.

## ABSTRAK

Area Cisuru berlokasi di Kecamatan Talegong, Kabupaten Garut, Jawa Barat, Indonesia. Daerah penelitian ini terdalah di bagian tengah pada busur magmatik Kenozoikum Sunda Banda yang membentang ke arah tenggara dari Sumatera bagian Utara sampai Jawa Barat dan kemudian ke arah timur melewati Jawa Timur. Geologi area studi ini disusun oleh batuan vulkanik tersier bersifat kalk-alkalin dan vulkaniklastik yang terdiri dari lava andesit, breksi andesit, breksi vulkanik, lapili tuf andasit. Alterasi hidrotermal yang berasosiasi dengan mineralisasi terbentuk pada lava andesit, lapili tuf, dasit and breksi vulkanik. Secara umum terdapat empat tipe alterasi: alterasi silikasi, alterasi argilik lanjut, alterasi argilik dan alterasi propilitik. Alterasi silisifikasi dan alterasi argilik lanjut sebagai alterasi prosimal diikuti ke arah luar dengan alterasi argilik oleh mineral illit-smektit dan zona terluar adalah alterasi propilitik. Mineral mineral alterasi terletak adalah kuarsa, alunit, kaolinit, diorit, pirofilit, illit, smektit, klorit dan pirit.

Pada penelitian ini, mineralisasi ditemukan pada tekstur sebagai sisa *vuggy*, silika masif dan urat kuarsa yang terisi oleh lapili tuf, dasit, lava andesit and breksi vulkanik. Urat mineralisasi utamanya sebagai *vugs filling*, urat masif, *veinlet*, pergantian, *dissemination* dan matriks di dalam breksi Bijih mineral mengisi *vuggy* dan rekahan urat kuarsa yang terdapat pada alterasi silisifikasi dan argilik lanjut. Bijih mineral yang telah teridentifikasi pada penelitian ini adalah pirit,

tenantit, kalkopirit, enargit, luzonit, sfalerit dan galena. Sedangkan, asosiasi mineral bijih umumnya adalah pirit – tenantit – kalkopirit – sfalerit - emas dan pirit – tenantit – kalkopirit – enargit – luzonit – galena – emas dan emas sering berasosiasi dengan pirit. Unit batuan permeabel dari lava andesit dan lapili tuf mendominasi sebagai batuan induk mineralisasi dan arah sistem trend *NE-SW* jalur patahan strike-slip dikembangkan untuk mengartikan aktivitas hidrotermal.

Batuan *induk pada mineralisasi Cisuru* diklasifikasikan sebagai lava andesit dan dasit. Diagram *spider* dari *MORB normalized trace elements* menunjukkan kelimpahan dari *LILE* (Sr, K, Rb, Ba, Th) yang bervariasi mengindikasikan sebagai magma kalk-alkalin. Selain itu, REE dari batuan vulkanik Cisuru menunjukkan LREE pola yang lereng curam diikuti oleh pola HREE yang mendatar dimana pola terekut merupakan karakter dari batuan vulkanik busur kalk-alkalin.

Dua fase dari inklusi cairan sebagian besar terjadi pada urat kuarsa termineralisasi sebagai inklusi yang kaya cairan, kaya uap, dan kaya cairan dan kaya uap bersamaan. Kadar salinitas berkisar dari 0.2 sampai 7.2 Wt. % NaCl ekuivalen dengan kadar temperatur homogenization dari 200 - 395 °C. Dengan karakter tersebut dapat disimpulkan bahwa mineralisasi dari Cisuru dapat diklasifikasikan sebagai deposit epithermal dengan sulfidasi tinggi.

**Kata Kunci:** alterasi and mineralisasi hidrotermal, cairan hydrothermal, Sulfidasi Tinggi, Deposit Epithermal