Characteristics of epithermal high sulfidation of Cijulang prospect Garut, West Java, Indonesia

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Introduction

The Cijulang prospect is part of Papandayan Project for gold exploration concession operated by PT. ANTAM Tbk in Garut, West Java, Indonesia (Fig.1). The project area consists of several hydrothermal prospects for gold deposit including epithermal low sulfidation, intermediate sulfidation, high sulfidation and hydrothermal porphyry types.

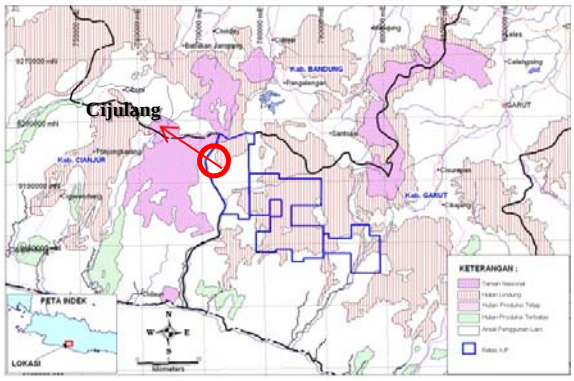

Figure 1 Location of Cijulang Prospect, in Papandayan Project, Garut-WestJava, Indonesia

The exploration history within the prospect was begun in 1994 for preliminary exploration by PT. ANTAM Tbk. The next phase of exploration was joint venture between PT. ANTAM Tbk and Strait for exploration detail and drilling program in Kuda prospect from 1996 – 2003. After that the exploration program was postponing for several reason (Antam, 2011).

In 2011 PT. ANTAM Tbk continue the detail exploration activity in Cijulang prospect with the main tagert for discovery of high sulfidation type deposit as well as for porphyry deposit that associated with the high sulfidation system.

Method

Based on the exploration results, epithermal high sulfidation signatures for gold deposit were observed and indicated from surface and drilling data. However, there is no detail study have been done to identified the characteristics of the deposit.

This paper focuses study of samples from Cijulang prospect based on drill holes and surface outcrop, which uses for petrography, mineragraphy observation, ASD, XRD, XRF analysis, and assay data.

Regional Geology

The Cijulang prospect is located within the Neogene Sunda-Banda magmatic arc that trending from very west in Sumatera Island and continue up to east part of Nusa Tenggara Island. Physiographically, the area lies in the interior of Southern Mountains of Western Java (Van Bemmelen, 1949; Martodjojo, 1982).

According to regional geology of Sindangbarang and Bandarwaru sheets (Koesmono, et al, 1996), the Cijulang area is covered by sedimenclastic rocks of Bentang Formation of Middle Miocene and sedimenclastic and epiclastics of Koleberes Formation

of Late Miocene ages and the youngest Quaternary volcanic rocks overlay the early rocks. Regional tectonics of Southern Mountains is occurred during Oligocence – Miocene; Midlle Miocene; Pliocene – Pleistocene; and Quaternary ages, respectively. Tectonic during Pliocene-Pleistocene is believed to be responsible for the occurrences of gold mineralization along the Southern Mountain in the southern part of West Java Island.

Local Geology of Cijulang

Lithology of Cijulang prospect is covered by volcanic rocks that simplified into four rock units: Crystal tuff and Vitric tuff of Pleistocene age; and microdiorite dike to dacite of Late Miocene age.

The major structure of strike-slip fault can be observed trending almost NS along the Cikahuripan River (Limbong et al, 2013), minor structures are cross cutting the main is mainly trending NE-SW (Fig. 2).

Mineralization of Cijulang prospect mostly well exposed along the Cikahuripan main River that trending almost NS.

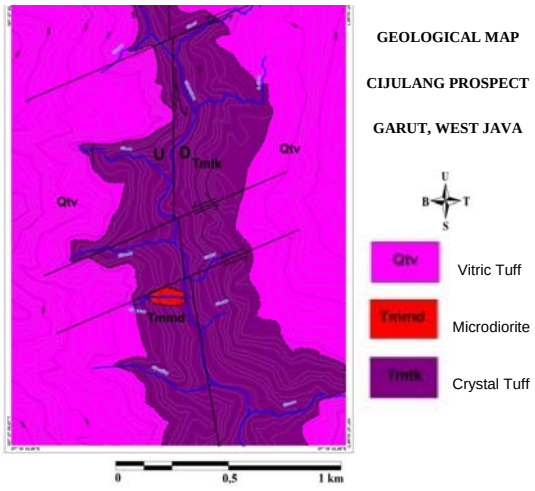

Figure 2. Simplify geological map of Cijulang Prospect, Garut, WestJava, Indonesia

Alteration

Field observation indicated the alteration within the Cijulang prospect is control by type of lithology and structure. It can be classified into four alteration zonation are as follow: Massive quartz; Advanced argillic; Prophyllitic; and Argillic zone respectively. The advance argillic alteration covered widely for about 75% of the area, while prophyllitic is about 12% and distributed parallel along the Cikahuripan especially in the downstream of Cisuren, Ciranda, Cilangong and Ciseda Creeks. The argillic zone is limited for about 5% in the slope of Cisuru and Cilukut Creek, respectively. The massive silica zone covered about 8% and is very easy to distinguish due to its topographic exposure of high relief. The well exposure of massive silica zone is located in Cisuru Peak, Limus Peak, Dangur and in the downstream of Ciseda creek.

Analytical Spectral Device (ASD) measured for several hand specimens outcrop samples were done in the field, and were indicated the occurrence of alunite, dickite and phyrophylite from the samples of advance argilic alteration zone (Fig.3), illite kaolinite from argillic zone and chlorite from prophylitic zone (Fig. 4). The distribution of alteration zonation is shows in fig 5.

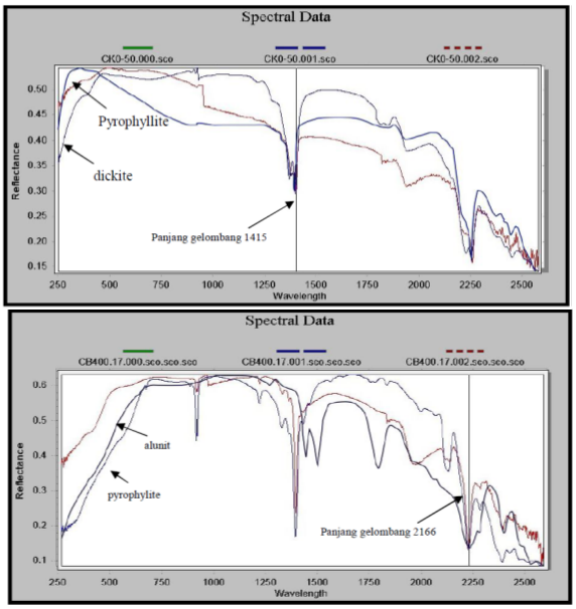

Figure 3. Spectral data of alunite, pyrophyllite and dickite from outcrop sample of advance argilic zone

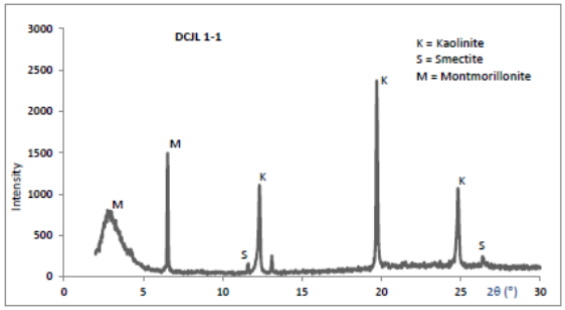

Figure 4. XRD pattern of clay minerals from drill core sample of Cijulang prospect

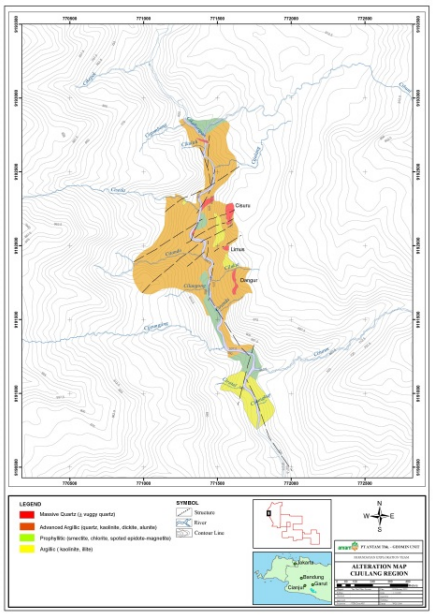

Figure 5. Alteration zonation of Cijulang prospect

Mineralization

The mineralization in the Cijulang prospect is well develop within the massive silica zona, and is characterized by massive quartz texture and locally with vuggy texture and veinlet of black sulfide. The main mineralized ore body is in massive to vuggy quartz texture. Those are located in Cisuru, Dangur, Limus hill and locally along the Cikahuripan and Citando Rivers (Figure 6).

Figure 6. Outcrop of massive quartz in Cikahuripan River (left) and black sulfide band in massive quartz

Mineragraphy analysis indicate the ore mineral composition mainly occurred associated within the massive silica and occurred within the veinlet of black sulfide that composed mainly by pyrite that accompanying by tenantite-tetrahedrite, enargite, chalcopyrite, covelite and rare galena coexisting with tenantite-tetrahedrite (Figure 7).

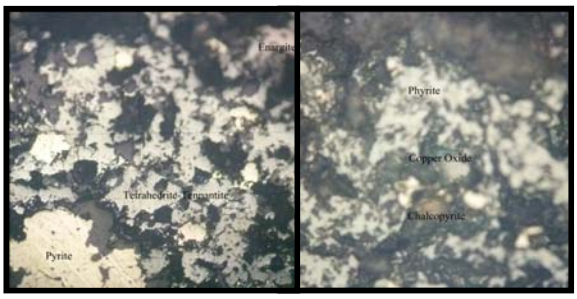

Figure 7. Fotomicrography of tenantite-tetrahedrite and enargite associated with pyrite from black sulfide vein in massive quartz ore body

Discussion

This study has identified several fault system also control the distribution of alteration and mineralization specially along the Cikahurpan River in Cijulang prospect (Limbong et al 2013). Based on mineral alteration determined by petrography, ASD and XRD, the alteration is grading from massive – vuggy silica zone in the centre, and follows by advance argilic zone (alunite, pyrophylite, kaolinite, halloysite, and dickite),

and argilic zone (illite, smectite, pyrite), and in the outer part of prophylitic zone (mainly composed of chlorite) in contact with host rock. The mineralization is hosted by volcanic tuff and in place by hydrothermal breccia and microdiorite of Miocene age. The ore mineral assemblage is dominated by pyrite with various amount of enargite, tenantite-tetrahedrite, hematite and rare galena and sphalerite.

Based on the above characteristic, it indicates that the hydrothermal fluid responsible for mineralization is come from acid fluid (acid pH) It's shown by acid alteration mineral assemblages. The quartz texture and ore mineral also indicated the most character for high sulfida epithermal deposit (Arribas, 1995), although few sample indicated the occurrence of galena coexisting with tenantite-tetrahedrite in black sulfide vein-veinlet within the main ore body. The assay analysis from core sample also indicates the higher content of lead (Pb) and shows good correlation with arsenic (As) and copper (Cu).

Further analysis is still in progress to observed more characteristics of chemical composition minerals, fluid salinity and temperature as well as others properties.

Acknowledgments

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